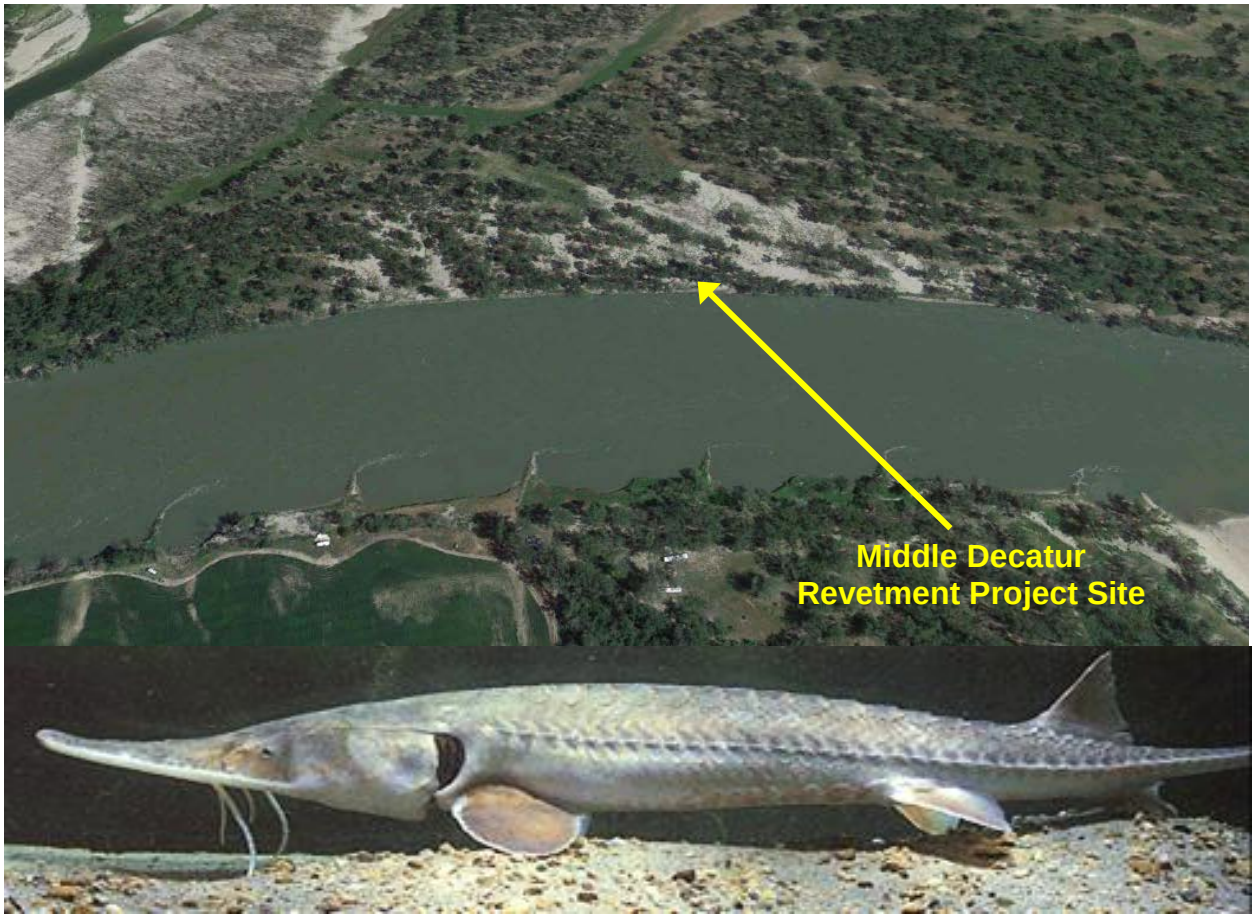
U.S. Army Corps of Engineers
Omaha District

Water Quality Sampling Report and Factual Determinations

Results of Sediment Sampling and Elutriate Testing at the Proposed Middle Decatur Revetment Shallow Water Habitat Project Site



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Water Quality Sampling Report
and
Factual Determinations

Results of Sediment Sampling and Elutriate Testing at the Proposed Middle Decatur Revetment Shallow Water Habitat Project Site

Prepared by:

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Water Control and Water Quality Section
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U.S. Army Corps of Engineers

July 2014

TABLE OF CONTENTS

1 BACKGROUND INFORMATION

1.1 Project Description

A project is being proposed to construct shallow-water habitat (SWH) along Middle Decatur Bend of the Missouri River in Burt County, Nebraska. The U.S. Army Corps of Engineers (USACE) is constructing SWH along the lower Missouri River downstream of Gavins Point Dam to mitigate aquatic habitat lost from past bank stabilization and channelization, and enhance habitat for the endangered pallid sturgeon (*Scaphirhynchus albus*) population along the lower Missouri River. The Omaha District (District) is referring to the proposed project as the Middle Decatur Revetment project. The District plans to construct SWH by excavating material behind an existing revetment. The removal of deposited sediment will involve hydraulic dredging and it is proposed that the dredge spoil be discharged to the adjacent Missouri River. It is believed that some of the sediment to be dredged was newly deposited during the Missouri River flood of 2011 and will be primarily sand with some silts and clays. An estimated 264,000 cubic yards of sediment/soil would be excavated and discharged to the Missouri River.

1.2 Project Location

The proposed Middle Decatur Revetment project site is located along the Missouri River at RM688.5 just downstream of Decatur, Nebraska (Figure 1). The proposed project site is on the east side of the Missouri River, but within the jurisdiction of Burt County, Nebraska.

1.3 Section 404 Permitting Requirements – 404(b)(1) Guidelines

Section 404 of the Federal Clean Water Act (CWA) requires that a §404 permit be appropriately obtained prior to the discharge of any dredge or fill material into waters of the United States. The issuance of §404 permits is pursuant to the Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material [40 CFR Ch. I (7-1-10 Edition)]. Fundamental to the 404(b)(1) Guidelines is the precept that dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern. No discharge of dredged or fill material is permitted: 1) if it will cause or contribute, after consideration of disposal site dilution and dispersion, to violations of any applicable State water quality standard; 2) if it will cause or contribute to significant degradation of the waters of the United States; or 3) unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic system.

Compliance with the 404(b)(1) Guidelines is based, in part , on “Factual Determinations” of the potential impact of the proposed dredge and fill on the aquatic environment. The §404 permitting authority is required to determine in writing the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment. These Factual Determinations are used in making findings of compliance or non-compliance with the restrictions on discharge. The 404(b)(1) Guidelines at §230.11 identify the following eight Factual Determinations that are to be made on the effects of each proposed discharge of dredge and fill material:

1) Physical substrate determinations.
2) Water circulation, fluctuation, and salinity determinations.
3) Suspended particulate/turbidity determinations.
4) Contaminant determinations.
5) Aquatic ecosystem and organism determinations.

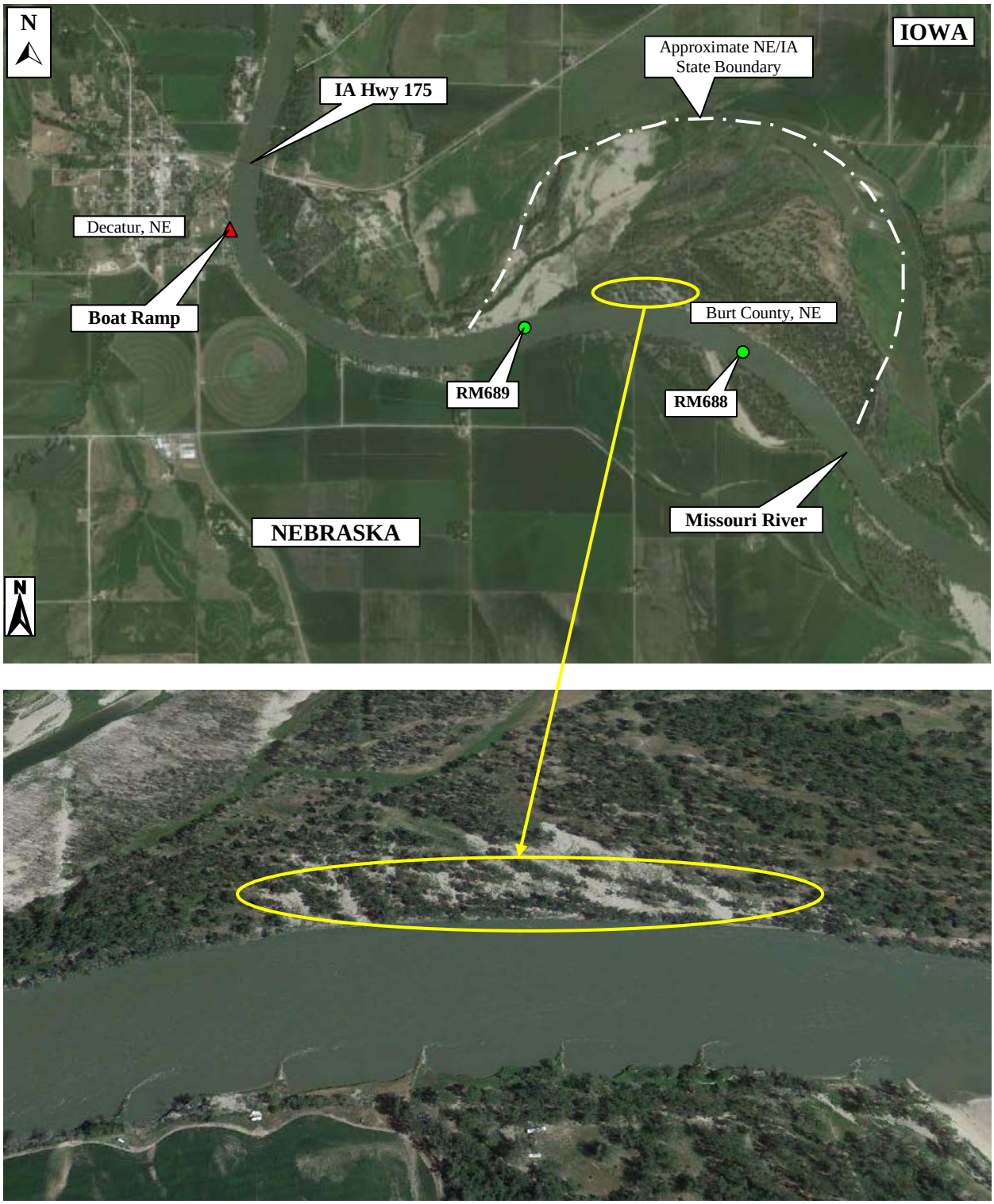


Figure 1. Location of proposed Middle Decatur Revetment shallow water habitat project site along the Missouri River east of Decatur, NE. *(Imagery Date: 18-July-2012, Google Earth)*

6) Proposed disposal site determinations.
7) Determination of cumulative effects on the aquatic ecosystem.
8) Determination of secondary effects on the aquatic ecosystem.

The intent of this report is to provide Factual Determinations of the potential water quality impacts of the proposed hydraulic dredging discharge at the Middle Decatur Revetment project site on the Missouri River. As defined in the Federal CWA and USACE Regulation No. 1110-2-8154, water quality is defined as the physical, chemical, and biological characteristics of water. This report specifically provides information for water quality Factual Determinations regarding:

- Physical substrate determinations,
- Suspended particulate/ turbidity determinations,
- Contaminant determinations,
- Proposed disposal site determinations.

The following describe the Factual Determinations that are to be made pursuant to the 404(b)(1) Guidelines regarding water quality impacts.

1.3.1 Physical Substrate Determinations

Determine the nature and degree of effect that the proposed discharge will have on the characteristics of the substrate at the proposed disposal site. Consideration shall be given to the similarity in particle size, shape, and degree of compaction of the material proposed for discharge and the material constituting the substrate at the disposal site, and any potential changes in substrate elevation and bottom contours, including changes outside of the disposal site which may occur as a result of erosion, slumpage, or other movement of the discharged material.

1.3.2 Suspended Particulate/Turbidity Determinations

Determine the nature and degree of effect that the proposed discharge will have in terms of potential changes in the kinds and concentrations of suspended particulate/turbidity in the vicinity of the disposal site. Consideration is to be given to the grain size of the material proposed for discharge, the shape and size of the plume of suspended particulates, the duration of the discharge and resulting plume and whether or not the potential changes will cause violations of applicable water quality standards.

1.3.3 Contaminant Determinations

Determine the degree to which the material proposed for discharge will introduce, relocate, or increase contaminants. This determination shall consider the material to be discharged, the aquatic environment at the proposed disposal site, and the availability of contaminants.

1.3.4 Proposed Disposal Site Determinations

The disposal site is specified through the application of the 404(b)(1) Guidelines. The mixing zone associated with the discharge is to be confined to the smallest practicable zone that is consistent with the type of dispersion determined to be appropriate. In a few special cases under unique environmental conditions, where there is adequate justification to show that widespread dispersion by natural means will result in no significantly adverse environmental effects, the discharged material may be intended to be spread naturally in a very thin layer over a large area of the substrate rather than be contained within the disposal site.

1.4 Section 401 Water Quality Certification

Under §401 of the Federal CWA an applicant for a federal license or permit (i.e. §404 permit) must obtain a certification that the discharge and activity is consistent with State or Tribal effluent limitations (CWA §301), water quality related effluent limitations (CWA §302), water quality standards and implementation plans (CWA §303), national standards of performance (§306), toxic and pretreatment effluent standards (CWA §307) and "any other appropriate requirement of State or Tribal law set forth in such certification." Regarding the Middle Decatur Revetment project, a §401 water quality certification will be requested from the Nebraska Department of Environmental Quality (NDEQ). This report and water quality Factual Determinations will be provided to the NDEQ to appropriately facilitate their water quality certification review pursuant to §401.

1.5 Water Quality Standards Classifications of the Missouri River

1.5.1 Nebraska

The State of Nebraska has designated the following uses to the entire length of the Missouri River in Nebraska: Primary Contact Recreation, Warmwater Aquatic Life Class A, Agricultural Water Supply, and Aesthetics. It has designated the use of public drinking water supply to the river downstream of the confluence of the Niobrara River, and industrial water supply to the river downstream of the confluence of the Big Sioux River. Nebraska has not identified the Missouri River in the vicinity of the Middle Decatur Revetment project as a National or State Resource Water. As appropriate, Nebraska's antidegradation policy provides Tier 2 protection (existing water quality) to the Missouri River. Tier 1 protection (existing uses) applies and the State designated beneficial uses must be protected and associated numeric and narrative water quality criteria to protect these beneficial uses are not to be violated.

1.5.2 Iowa

The State of Iowa designates the following uses to the Missouri River from the Iowa-Missouri state line to the confluence with the Big Sioux River: Primary Contact Recreation, Warmwater Type 1 Aquatic Life, and Human Health. The Missouri River at the Council Bluffs water works intake is also designated a use of raw water source of potable water supply. Pursuant to Iowa's antidegradation policy, the Missouri River in the vicinity of the proposed Middle Decatur Revetment project is not identified as an outstanding State water (Tier 2½) or an outstanding National Resource Water (Tier 3). As appropriate, Iowa's antidegradation policy provides Tier 2 protection (existing water quality) to the Missouri River. Tier 1 protection (existing uses) applies and the State designated beneficial uses must be protected and associated numeric and narrative water quality criteria to protect these beneficial uses are not to be violated.

1.6 Use of Sediment/Soil Analysis, Elutriate Testing, and Ambient Missouri River Water Quality Data for Factual Determinations

Factual Determinations regarding potential water quality impacts from the proposed hydraulic dredging to construct SWH at the proposed Middle Decatur Revetment project was based on the analyses of representative sediment/soil samples collected from the identified excavation area at the proposed project site. The collected sediment/soil samples were also subjected to elutriate testing pursuant to the Inland Testing Manual, "Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual (USEPA and USACE, 1998). Historic ambient water quality data collected along the Missouri River by the District were assessed.

2 SITE-SPECIFIC WATER QUALITY CONCERNS

2.1 Fish Consumption Advisory

The State of Nebraska had issued a fish consumption advisory for Dieldrin and PCBs on the Missouri River downstream of Gavins Point Dam. This advisory was based on the analysis of past fish tissue sampling that found levels of these substances at concentrations above the State's defined risk factor for protecting public health via fish consumption. However, the fish consumption advisory has recently been removed based on recent fish tissue sampling (NDEQ, 2012).

2.2 Section 303(d) Impaired Waters Listings

Section 303(d) of the Federal CWA requires States to evaluate water quality conditions in designated waterbodies, and list as impaired (i.e. 303(d) list) any waterbodies not meeting water quality standards. As appropriate, States must develop and implement Total Maximum Daily Loads –TMDLs (i.e. pollutant management plans) for waterbodies identified as impaired.

2.2.1 Nebraska

Nebraska's water quality standards identify the Missouri River from the Big Sioux River to the Platte River as designated Segment MT1-10000. Segment MT1-10000 is listed on Nebraska's 2012 Section 303(d) list as impaired due to a fish consumption advisory. The identified parameters of concern are Cancer Risk & Hazard Index Compounds, specifically, Dieldrin and PCBs. After the Nebraska Department of Environmental Quality (NDEQ) published their 2012 Integrated Water Quality Report and Section 303(d) list on 1-April-2012 that listed Segment MT1-10000 as impaired due to the fish consumption advisory in effect, the NDEQ published the report, "Findings of the 2010 Regional Ambient Fish Tissue Program in Nebraska" in June, 2012 (NDEQ, 2012). That report indicated that Dieldrin and PCBs were no longer a fish tissue concern on Segment MT1-10000. This resulted in the fish consumption advisory for the Missouri River regarding Dieldrin and PCBs being removed. Based on the removal of the fish consumption advisory for the Missouri River, the NDEQ's 2014 "*Draft Water Quality Integrated Report*" has removed the impaired listing for Segment MT1-10000 (NDEQ, 2014).

2.2.2 Iowa

Iowa has not listed the Missouri River in the area of the proposed Middle Decatur Revetment project site on the State's most recent (i.e. 2012) 303(d) Category 5 impaired waters list requiring a TMDL. The State has listed the Missouri River segment from the Little Sioux River to Elm Creek at RM 691 (Waterbody ID Code: IA 06-WEM-0040_1) as a Category 4c impaired water for aquatic life – game fish. A Category 4c impairment means at least one use is impaired, but the impairment is not caused by a "pollutant" and a TMDL is not required. The listed Category 4c impairment of the Missouri River in this segment is due to habitat alterations and flow modifications that resulted from development of the river for navigation uses in the mid-Twentieth Century (IDNR, 2014). It is noted that the planned Middle Decatur Revetment project to construct SWH will help mitigate the cited habitat alterations contributing to the identified Category 4c impairment.

2.3 Nutrients

2.3.1 Gulf of Mexico Hypoxia

A large area of the northern Gulf of Mexico is experiencing low dissolved oxygen or hypoxia during periods in the summer off the coasts of Louisiana and Texas. The hypoxia is primarily caused by excess nutrients – originating from cities, farms, and industries in the Mississippi River Basin – which

cause extensive growths of algae that deplete the oxygen in the water when they die, sink to the bottom, and decompose. The condition is exacerbated by the stratification of the water column – result of warmer, low salinity surface waters that isolate the organic-rich bottom waters from the surface and prevent oxygen exchange with the atmosphere. Nutrient loading reduction targets of 45% of the current total nitrogen and total phosphorus riverine loads have been identified to achieve the goal for hypoxic zone size and to facilitate water quality improvements in the basin (MRGMWNTF, 2008).

The watershed of the Mississippi River drains 41 percent of the contiguous United States and includes waters from several major river systems, including the Missouri/Platte River Basin, the Ohio/Tennessee River Basin, and the Arkansas/Red/White River Basin. The Mississippi River Basin includes two functionally distinct zones, each with its own potential to contribute to Gulf hypoxia. These zones include the huge Mississippi watershed with its tributary network, and at the lower end of the river system, the deltaic zone that formerly dispersed river water naturally throughout Southeast Louisiana via a distributary (deltaic) network. While the tributaries of the Mississippi River are the sources of nutrient loading to the river trunk, the distributaries within the Mississippi Delta are critical to the final dispersal of nutrients and sediments into the Gulf of Mexico and the salinity of the estuaries and coastal waters. During the past two centuries the hydrology of the distributary zone was totally modified by the construction of flood levees, closing of key distributaries for flood control, and navigation enhancement programs. These structures isolated the river from its delta, causing an ongoing catastrophic collapse in the deltaic landscape, primarily wetlands. The hydrologic changes that have caused such damage to South Louisiana also exacerbate Gulf hypoxia by jetting most nutrient-rich river water and sediments directly into the Gulf of Mexico, bypassing the deltaic wetlands that captured the nutrients and sediments.

2.3.2 Iowa Nutrient Reduction Strategy

The 2008 Gulf Hypoxia Action Plan calls for the 12 states along the Mississippi River to develop strategies to reduce nutrient loading to the Gulf of Mexico (MRGMWNTF, 2008). In this regard, the State of Iowa has recently finalized the *"Iowa Nutrient Reduction Strategy – A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico"* (IDALS et. al., 2013). The Iowa strategy follows the recommended framework provided by EPA in 2011, and is only the second state to complete a statewide nutrient reduction strategy. The Iowa Nutrient Reduction Strategy is a science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico. It is designed to direct efforts to reduce nutrients in surface water from both point and nonpoint sources in a scientific, reasonable and cost-effective manner. The Iowa strategy proposes a pragmatic, strategic and coordinated approach for reducing nutrient loads discharged from the state's largest wastewater treatment plants, in combination with targeted practices designed to reduce loads from nonpoint sources now while evaluating the future need for nutrient water quality standards.

For Iowa streams, EPA's recommended water quality standards' criteria range is from 0.712 to 3.26 mg/L for total N and from 0.070 to 0.118 mg/L total P (IDALS et.al., 2013). If these nutrient criteria recommendations were adopted as Iowa water quality standards, cities would be required to pay for expensive wastewater treatment plant upgrades that would address only a fraction of the overall amount of nutrients discharged to Iowa's streams while leaving wastewater treatment facilities unable to comply with permit limits (IDALS et.al., 2013). If compliance with stringent numeric effluent limits on point source discharges did not eliminate an existing impairment, the receiving stream would continue to exceed the water quality standard and would require development of a total maximum daily load (TMDL). At that point, any further reduction required by a TMDL would need to be accomplished through voluntary controls placed only on nonpoint sources. Because of the lack of confidence in EPA's recommended criteria and substantial financial costs associated with implementing nutrient removal technologies, legitimate concerns about the value of numeric nutrient criteria have been raised (IDALS, et.al., 2013). Other criteria derivation approaches such as nutrient stressor-response analysis and

reference condition modeling are better alternatives that Iowa will continue assessing as a basis for appropriate nutrient standards for implementation within an adaptive watershed management framework (IDALS et.al, 2013).

2.4 National Research Council of the National Academies Assessment of Missouri River Water Quality and Sediment Management

USACE's SWH and emergent sandbar habitat (ESH) projects are directly depositing sediment into the mainstem Missouri River. Concerns have been expressed regarding the potential water quality impacts of those projects downstream and into the northern Gulf of Mexico. The following questions were tasked to the National Research Council regarding water quality and sediment management in the Missouri River:

- *What is the significance of the Missouri River sediments to the Gulf of Mexico hypoxia problem?*
- *What are the key environmental and economic considerations regarding nutrient loads and/or contaminants in Missouri River sediment? To what extent can such issues be addressed with management strategies?*

The following discussion and conclusions are taken from the document, "Missouri River Planning – Recognizing and Incorporating Sediment Management" prepared by the National Research Council (NRC, 2011).

Excess nitrogen loads are responsible for the long-term increase in the hypoxic area in the northern Gulf of Mexico; however, recent studies suggest that phosphorus may also be contributing to hypoxia, especially near the mouths of the Mississippi and Atchafalaya Rivers during the spring. The USACE's construction of SWH projects will result in releases of both nitrogen and phosphorus to the Missouri River because much of the topsoil portion of the sediment disposed of in the river has been heavily fertilized.

The National Research Council further assessed the situation based on total nitrogen (TN) and total phosphorus (TP) levels representative of excavated sediment/soil at SWH project sites and current TN and TP loads in the Missouri River and delivered to the Gulf of Mexico. It was concluded that the TN loads from constructed SWH projects will be insignificant compared to the current TN loads transported in the Missouri River and to the Gulf. Phosphorus loadings to the Missouri River from these projects, however, are likely to constitute a much greater fraction of the current load than additional nitrogen loadings. An upper-bound estimate of the increase in TP loadings to the Gulf of Mexico as a result of all potential SWH projects is a 6 to 12 percent increase. This estimate represents an upper bound assuming all sediment is delivered to the Gulf. In reality, sediment deposition processes in the Missouri and lower Mississippi river channels would reduce loads delivered downstream and eventually to the Gulf of Mexico. A comparison of potential phosphorus loads from USACE's SWH projects, with load increments required to produce measurable changes in the areal extent of Gulf hypoxia, showed these projects will not significantly change the extent of the hypoxic area in the Gulf of Mexico.

3 SAMPLING AND ANALYSIS METHODS

Sediment/soil samples, representative of the areas to be excavated for SWH construction at the proposed Middle Decatur Revetment project site, were collected, analyzed, and subjected to elutriate testing. The results were used to assess the potential water quality impacts that the discharge from hydraulic dredging at the proposed project site would have on the Missouri River. Sediment/soil sampling occurred on 8-May-2014.

3.1 Quality Control Plan

A Quality Control Plan (QCP) was developed to collect sediment/soil samples at the proposed Middle Decatur Revetment project site and conduct elutriate testing of the collected samples. The QCP was developed in consultation with the NDEQ. The QCP was implemented as written with no modifications and is included as Attachment 1. The parameters that were measured in the field and analyzed in the laboratory for the collected sediment/soil samples and prepared samples for elutriate testing are listed in Table 1. Analytical methods are provided in the attached QCP (Attachment 1).

3.2 Collection of Sediment/Soil Samples

Ten sediment/soil samples were collected at two sites (i.e. MDR-S1 and MDR-S2) at the proposed Middle Decatur Revetment project site on 8-May-2014 for sediment analysis and elutriate testing. The two sites where the sediment/soil samples were collected are shown in Figure 2 and described in Table 2.

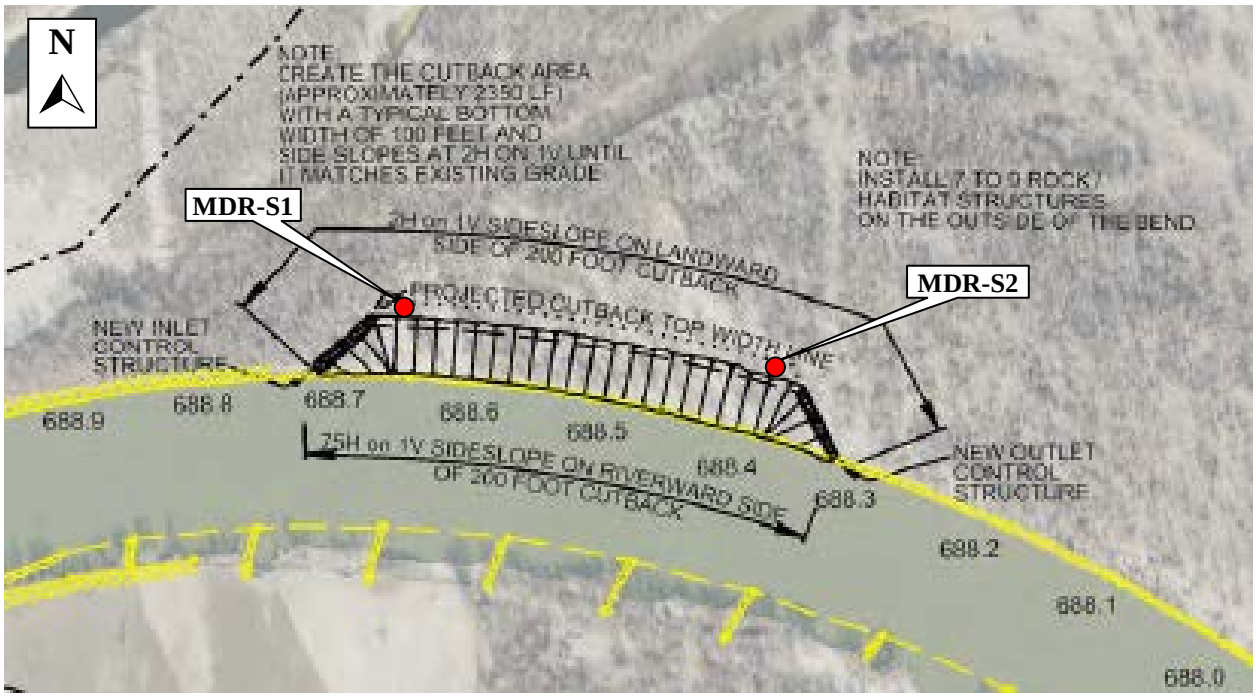


Figure 2. Locations of the two sites where sediment/soil samples were collected at the proposed Middle Decatur Revetment project site for analysis and elutriate testing.

The sediment samples at each of the two sites were collected with a gas-powered auger equipped with a 3¼-in diameter stainless steel coring bit. At each site composite sediment/soil samples were collected in 2-foot increments from the surface to a depth of 10 feet (i.e. five 2-foot composite samples) (Table 3). The 2-foot increment sediment/soil samples were analyzed individually for nutrients, and a site composite sample of all the five 2-foot sediment/soil samples was prepared for elutriate testing (i.e. one composite sediment/soil sample was prepared from the five 2-foot increment samples) (Table 3). For elutriate testing, 1-gallon of the composited sediment/soil material was retained and transported to the laboratory for analysis.

Table 1. Parameters measured in the field and analyzed in the laboratory for the different media assessed as part of the sampling and elutriate testing conducted at the Middle Decatur Revetment project site**.**

Parameter	Soil Elutriate Analysis	Soil Nutrient Analysis	Receiving Water	Pre-Elutriate Water	Elutriate Water	
					Non-Filtered	Filtered
FIELD MEASUREMENTS						
Water Temperature (°C)			X			
Dissolved Oxygen (mg/L and % Sat)			X			
pH (S.U.)			X			
Specific Conductance (µS/cm)			X			
Turbidity			X			
PHYSICAL AND AGGREGATE PROPERTIES						
Particle Size	X	X				
Percent Solids	X	X				
pH	X	X				X
Total Suspended Solids			X	X	X	
Turbidity				X	X	
NUTRIENTS						
Nitrogen, Ammonia as N	X	X	X	X	X	X
Nitrogen, Nitrate/Nitrite as N)	X	X	X	X		X
Nitrogen, Total Kjeldahl as N	X	X	X	X	X	
Phosphorus, Dissolved			X			X
Phosphorus, Orthophosphate			X			X
Phosphorus, Total	X	X	X	X	X	
AGGREGATE ORGANIC CONSTITUENTS						
CBOD			X	X	X	
Chemical Oxygen Demand			X	X	X	
Organic Carbon, Total	X	X	X	X	X	
METALS (Dissolved)						
Dissolved Metals Scan			X			X
METALS (Total)						
Total Metals Scan			X	X	X	
Arsenic, Total	X					
Cadmium, Total	X					
Chromium, Total	X					
Copper, Total	X					
Lead, Total	X					
Mercury, Total	X					
Nickel, Total	X					
Zinc Total	X					
PESTICIDES and PCBs						
Atrazine	X		X		X	
Organochlorine Pesticide/PCB Scan	X		X		X	

Table 2. Geo-referenced locations of the two sites where sediment/soil samples were collected at the proposed Middle Decatur Revetment project site.

Site	Latitude	Longitude
MDR-S1	41° 59’ 52.6”	96° 12’ 29.7”
MDR-S2	41° 59’ 51.3”	96° 12’ 16.4”

Table 3. Sediment/soil samples collected at the proposed Middle Decatur Revetment shallow-water habitat project site for analysis and elutriate testing.

Sample Type	Sample ID	Sample Date	Sampled Depth	Sampling Method
Sediment/Soil	MDR-S1	8-May-2014	0 - 10 feet	Composited from individual 2-ft cores
	MDR-S1A		0 - 2 feet	Composite Core
	MDR-S1B		2 - 4 feet	
	MDR-S1C		4 - 6 feet	
	MDR-S1D		6 - 8 feet	
	MDR-S1E		8 - 10 feet	
Sediment/Soil	MD-S2	8-May-2014	0 - 10 feet	Composited from individual 2-ft cores
	MDR-S2A		0 - 2 feet	Composite Core
	MDR-S2B		2 - 4 feet	
	MDR-S2C		4 - 6 feet	
	MDR-S2D		6 - 8 feet	
	MDR-S2E		8 - 10 feet	

3.3 Collection of Receiving Water

In accordance with the “*Inland Testing Manual*”, receiving water was collected from the Missouri River for elutriate testing. Receiving water measurements and samples were collected from the Missouri River at site at the Decatur, NE boat ramp (Figure 1). The mean daily flow of the Missouri River at Decatur, NE (RM691) when receiving water samples were collected on 8-May-2014 was 30,000 cfs.

3.4 Elutriate Testing

The process that was used to implement elutriate testing of the sediment/soil samples collected at the proposed Middle Decatur Revetment project site is depicted in Figure 2.

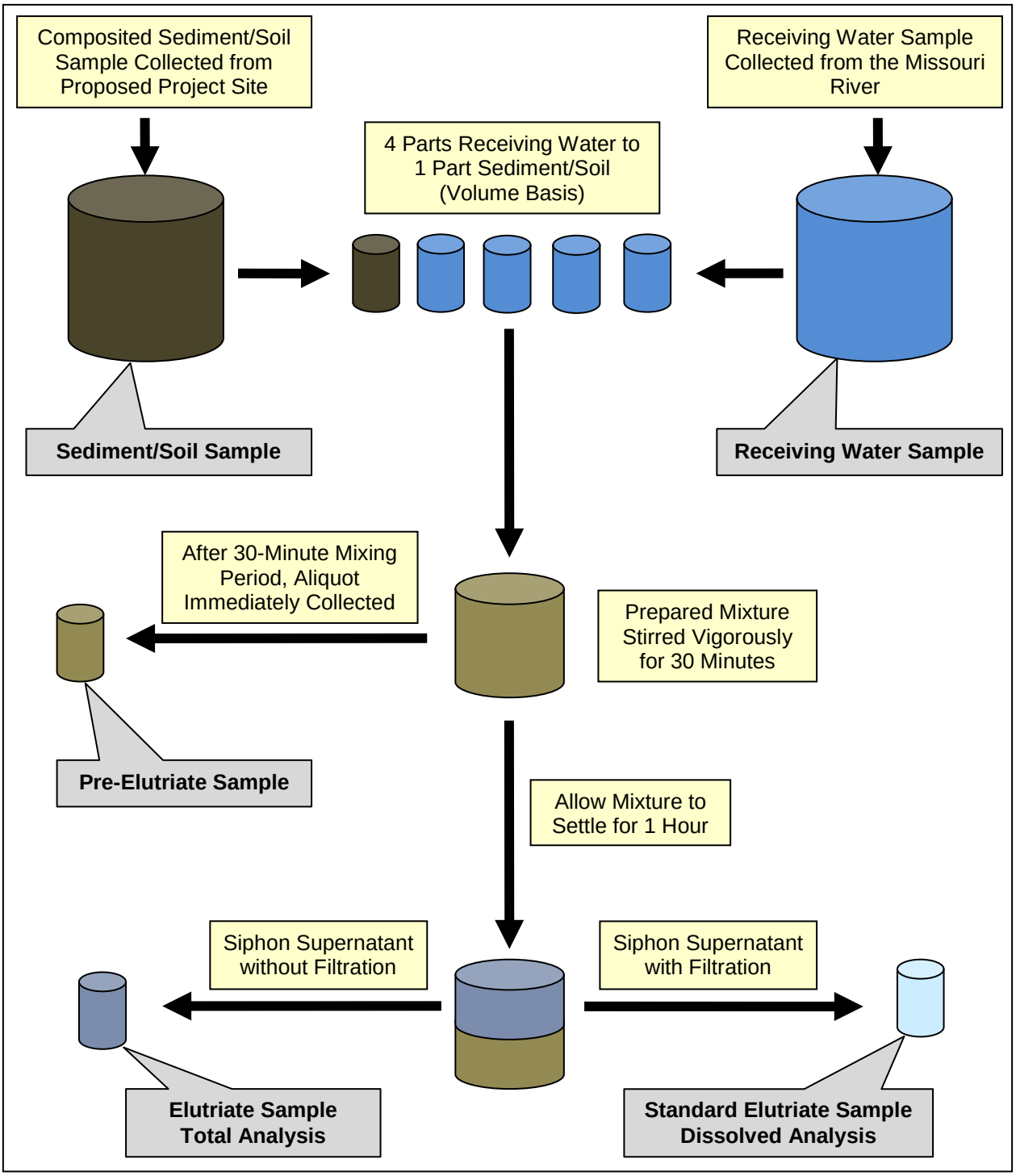


Figure 2. Process used to prepare samples for elutriate testing from sediment/soil samples collected at the proposed Middle Decatur Revetment project site.

3.4.1 Elutriate Samples

Elutriate samples were prepared in accordance with the "*Inland Testing Manual*", and were prepared by using receiving water collected from the Missouri River at the Decatur, NE boat ramp. The samples were prepared in the laboratory by sub-sampling 1-liter of the collected sediment/soil sample from the well-mixed original sample. The sediment material and unfiltered receiving water were then combined in a sediment-to-water ratio of 1:4 on a volume basis at room temperature (22 ± 2°C). The 1:4 sediment-to-water ratio is believed to represent "end-of-pipe" discharge conditions for hydraulic dredging. After the correct ratio was achieved, the mixture was stirred vigorously for 30 minutes with a mechanical stirrer/shaker. After the 30-minute mixing period, the mixture is allowed to settle for one hour. The supernatant was then siphoned off without disturbing the settled material. Analysis for total constituents was done on the supernatant without filtration, and the supernatant was filtered through a 0.45-micron filter for analysis of dissolved constituents. The filtered water is the standard elutriate sample identified by the *"Inland Testing Manual"* and represents the dissolved constituents that could be released from dredged material during the hydraulic dredging process.

3.4.2 Pre-Elutriate Samples

Prepared pre-elutriate samples were analyzed. The pre-elutriate samples were prepared the same as standard elutriate samples through the point of the 30-minute mixing period. At that time an aliquot of water was immediately drawn off the mixed solution and identified as the pre-elutriate sample. The pre-elutriate sample was analyzed for the following constituents: Total Kjeldahl Nitrogen, Total Ammonia Nitrogen, Total Nitrate-Nitrite Nitrogen, Total Phosphorus, Total Organic Carbon, Total Metals Scan, Total Suspended Solids, Turbidity, and pH. The pre-elutriate sample is believed to represent conditions of the "end-of-pipe" hydraulic dredging discharge slurry prior to any mixing with the receiving water (i.e. Missouri River).

3.4.3 Metal Analysis

The metals Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc were identified as parameters of concern by the State of Nebraska. Collected sediment/soil samples were directly analyzed for these metals. Total and dissolved metals scans were run on the collected receiving water and appropriately run on the prepared elutriate samples. Many of Nebraska's water quality standards for metals are hardness based. The District has monitored ambient water quality conditions of the Missouri River at Decatur, NE (RM691) over the 11-year period 2003 through 2013. Based on quarterly measurements, hardness (mg/L) in the Missouri River ranged from 236 to 381, averaged 274, and had a median of 266. The hardness of the receiving water sample collected on 8-May-2014 was 280 mg/L.

4 RESULTS

4.1 Sediment/Soil Samples

4.1.1 Particle Size Analysis

The collected sediment/soil samples were analyzed for particle size using Method ASTM D422. The Particle Size Distribution Reports for the analyzed sediment/soil samples collected at sites MDR-S1, MDR-S1A, MDR-S1B, MDR-S1C, MDR-S1D, MDR-S1E, MDR-S2, MDR-S2A, MDR-S2B, MDR-S2C, MDR-S2D, and MDR-S2E are provided in Attachment 2. Table 4, Figure 3, and Figure 4 summarize the particle size percent composition of the collected sediment/soil samples. The collected

sediment/soil samples ranged from 59.0% to 94.9% sand and 5.1% to 22.5% fines. None of the collected sediment/soil samples contained material of a grain size greater than sand (Table 4).

Table 4. Summary of particle size analysis of the sediment/soil samples collected at the proposed Middle Decatur Revetment project site.

Sample ID	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
MDR-S1	0.0	0.0	0.0	0.3	14.8	78.1	5.5	1.3
MDR-S1A	0.0	0.0	0.0	0.1	13.4	81.4	3.8	1.3
MDR-S1B	0.0	0.0	0.0	0.0	10.5	83.7	4.5	1.3
MDR-S1C	0.0	0.0	0.0	0.1	5.9	86.4	6.3	1.3
MDR-S1D	0.0	0.0	0.0	0.0	13.8	76.0	8.6	1.6
MDR-S1E	0.0	0.0	0.0	0.1	28.3	65.8	4.5	1.3
MDR-S2	0.0	0.0	0.0	0.6	18.5	58.4	18.7	3.8
MDR-S2A	0.0	0.0	0.0	0.0	1.2	86.4	10.8	1.6
MDR-S2B	0.0	0.0	0.0	0.0	0.4	58.6	31.9	9.1
MDR-S2C	0.0	0.0	0.0	0.6	27.8	50.1	17.7	3.8
MDR-S2D	0.0	0.0	0.0	0.4	31.5	57.6	9.2	1.3
MDR-S2E	0.0	0.0	0.0	0.5	21.4	71.7	5.1	1.3
MEAN	**0.0**	**0.0**	**0.0**	**0.2**	**15.6**	**71.2**	**10.6**	**2.4**

See Attachment 2 for defination of particle sizes.

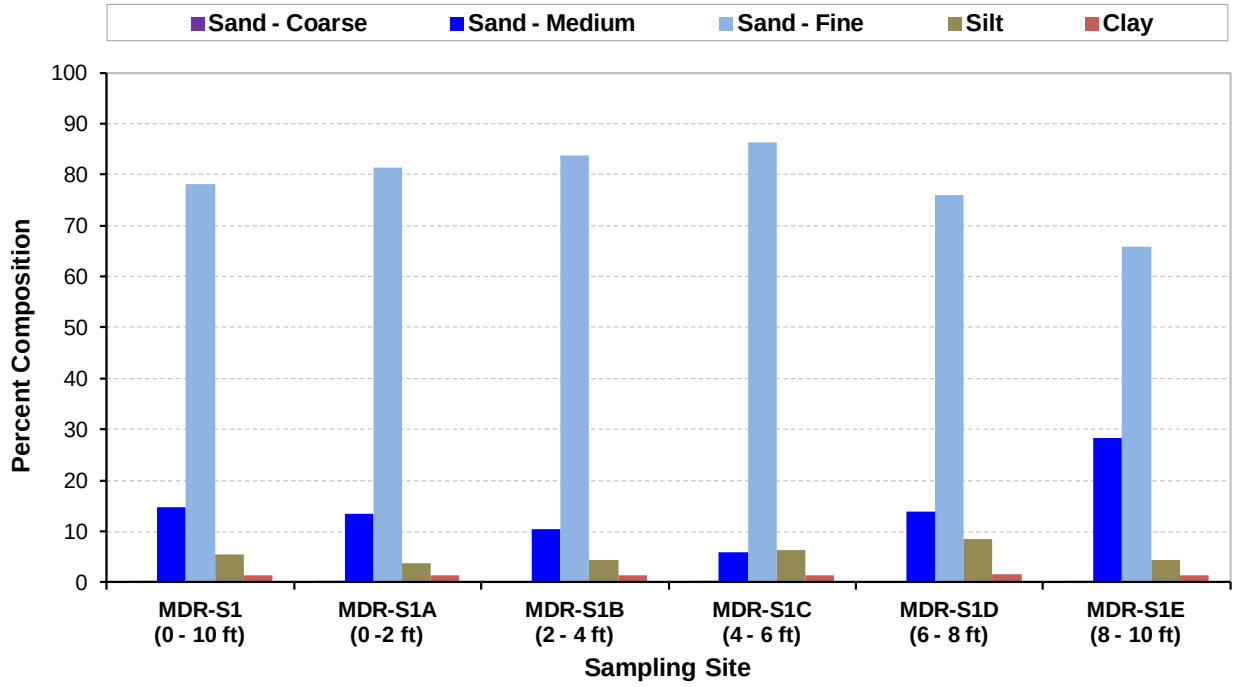


Figure 3. Particle size percent composition of sediment/soil samples collected at sites MDR-S1, MDR-S1A, MDR-S1B, MDR-S1C, MDR-S1D, and MDR-S1E.

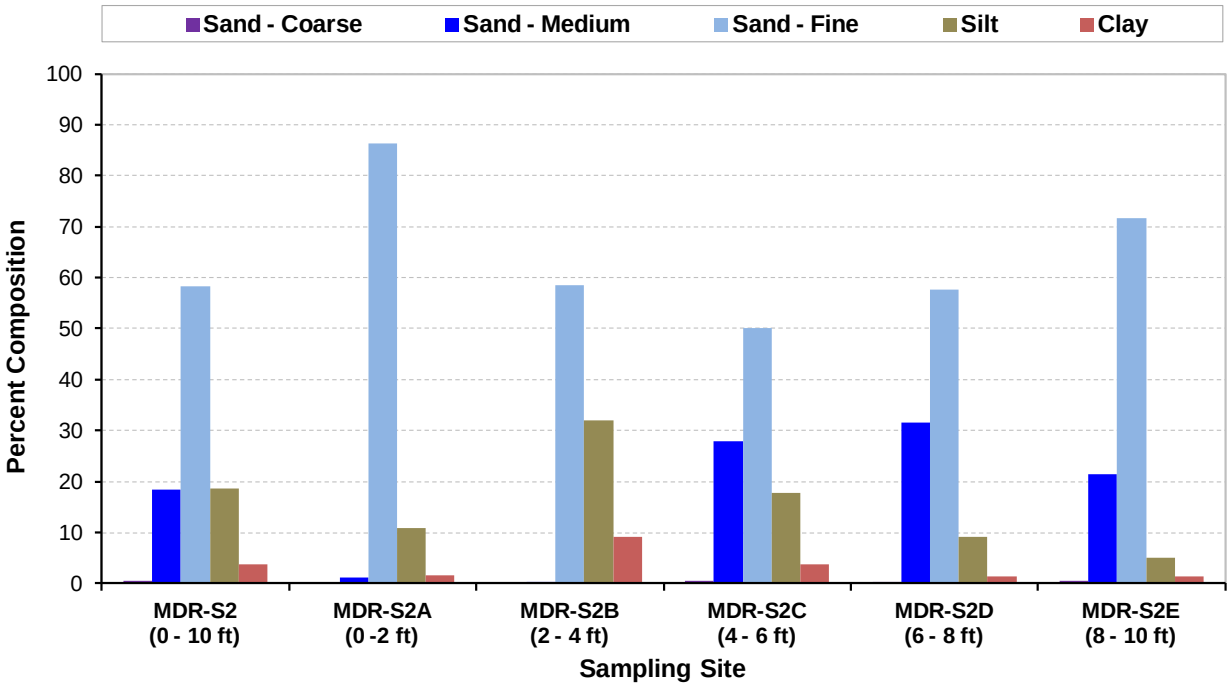


Figure 4. Particle size percent composition of sediment/soil samples collected at sites MDR-S2, MDR-S2A, MDR-S2B, MDR-S2C, MDR-S2D, and MDR-S2E.

4.1.2 Physicochemical Analysis

The lab report for the physicochemical analyses of the collected sediment/soil samples is provided in Attachment 3. Table 5 summarizes the physicochemical results of the sediment/soil samples collected at location MDR-S1 (i.e. MDR-S1, MDR-S1A, MDR-S1B, MDR-S1C, MDR-S1D, and MDR-S1E), and Table 6 summarizes the physicochemical results of the sediment/soil samples collected at location MDR-S2 (i.e. MDR-S2, MDR-S2A, MDR-S2B, MDR-S2C, MDR-S2D, and MDR-S2E). The 2-foot depth-increment samples were used to plot soil-depth profiles at sites MDR-S1 and MDR-S2 for total phosphorus, total Kjeldahl nitrogen, and total organic carbon (Figure 5).

4.2 Water Samples

Water quality constituent results for the collected receiving water and prepared pre-elutriate, elutriate-nonfiltered (total), and elutriate-filtered (dissolved) samples are summarized below.

4.2.1 Receiving Water Field Measurements

The receiving water used for the elutriate testing was collected from the Missouri River at the Decatur, NE boat ramp. Water quality conditions of the receiving water measured in the field on 8-May-2014 at the time of collection were: Water Temperature, 14.4°C; Dissolved Oxygen, 10.2 mg/l and 105.2% saturation; pH, 8.4 S.U.; Specific Conductance, 831 µS/cm; and Turbidity, 10 NTU.

Table 5. Results of physicochemical analyses of sediment/soil samples collected at Site MDR-S1 (i.e. MDR-S1, MDR-S1A, MDR-S1B, MDR-S1C, MDR-S1D, and MDR-S1E).

Parameter	Sample Identification					
	MDR-S1	MDR-S1A	MDR-S1B	MDR-S1C	MDR-S1D	MDR-S1E
Carbon, Total Organic (mg/kg)	2,000	1,700	900	1,100	2,100	1,000
Nitrogen, Ammonia as N (mg/kg)	0.6	0.7	0.6	0.8	0.8	0.7
Nitrogen, Nitrate/Nitrite as N (mg/kg)	<0.04	0.40	0.10	<0.04	0.05	0.10
Nitrogen, Total Kjeldahl as N (mg/kg)	92	142	101	89	103	60
Percent Solids (%)	94.8	95.3	95.1	94.9	94.3	95.5
pH (S.U.)	7.8	7.7	8.0	7.7	7.6	7.9
Phosphorus, Total (mg/kg)	300	324	303	319	361	284
Arsenic, Total (mg/kg dry)	6	-----	-----	-----	-----	-----
Cadmium, Total (mg/kg dry)	0.12	-----	-----	-----	-----	-----
Chromium III, Total (mg/kg dry)	6.1	-----	-----	-----	-----	-----
Copper, Total (mg/kg dry)	2.8	-----	-----	-----	-----	-----
Lead, Total (mg/kg dry)	6.7	-----	-----	-----	-----	-----
Mercury, Total (mg/kg dry)	0.004	-----	-----	-----	-----	-----
Nickel, Total (mg/kg dry)	10.7	-----	-----	-----	-----	-----
Zinc, Total (mg/kg dry)	20.4	-----	-----	-----	-----	-----
Atrazine (ug/g)	<0.008	-----	-----	-----	-----	-----
Organochlorine Pesticide Scan (ug/kg)	n.d.	-----	-----	-----	-----	-----
PCB Scan (ug/kg)	n.d.	-----	-----	-----	-----	-----

n.d. = Non-detect

Table 6. Results of physicochemical analyses of sediment/soil samples collected at Site MDR-S2 (i.e. MDR-S2, MDR-S2A, MDR-S2B, MDR-S2C, MDR-S2D, and MDR-S2E).

Parameter	Sample Identification					
	MDR-S2	MDR-S2A	MDR-S2B	MDR-S2C	MDR-S2D	MDR-S2E
Carbon, Total Organic (mg/kg)	1,700	3,300	3,900	3,300	2,800	900
Nitrogen, Ammonia as N (mg/kg)	1.0	0.7	1.5	1.0	0.8	0.9
Nitrogen, Nitrate/Nitrite as N (mg/kg)	0.40	0.70	0.70	0.20	0.10	0.30
Nitrogen, Total Kjeldahl as N (mg/kg)	156	228	312	457	76	55
Percent Solids (%)	93.5	94.0	84.4	90.9	94.6	96.5
pH (S.U.)	7.7	7.7	7.6	7.8	7.9	8.0
Phosphorus, Total (mg/kg)	361	360	485	378	317	303
Arsenic, Total (mg/kg dry)	6.0	-----	-----	-----	-----	-----
Cadmium, Total (mg/kg dry)	0.12	-----	-----	-----	-----	-----
Chromium III, Total (mg/kg dry)	8.4	-----	-----	-----	-----	-----
Copper, Total (mg/kg dry)	4.1	-----	-----	-----	-----	-----
Lead, Total (mg/kg dry)	5.5	-----	-----	-----	-----	-----
Mercury, Total (mg/kg dry)	0.007	-----	-----	-----	-----	-----
Nickel, Total (mg/kg dry)	11.5	-----	-----	-----	-----	-----
Zinc, Total (mg/kg dry)	24.1	-----	-----	-----	-----	-----
Atrazine (ug/g)	<0.008	-----	-----	-----	-----	-----
Organochlorine Pesticide Scan (ug/kg)	n.d.	-----	-----	-----	-----	-----
PCB Scan (ug/kg)	n.d.	-----	-----	-----	-----	-----

n.d. = Non-detect

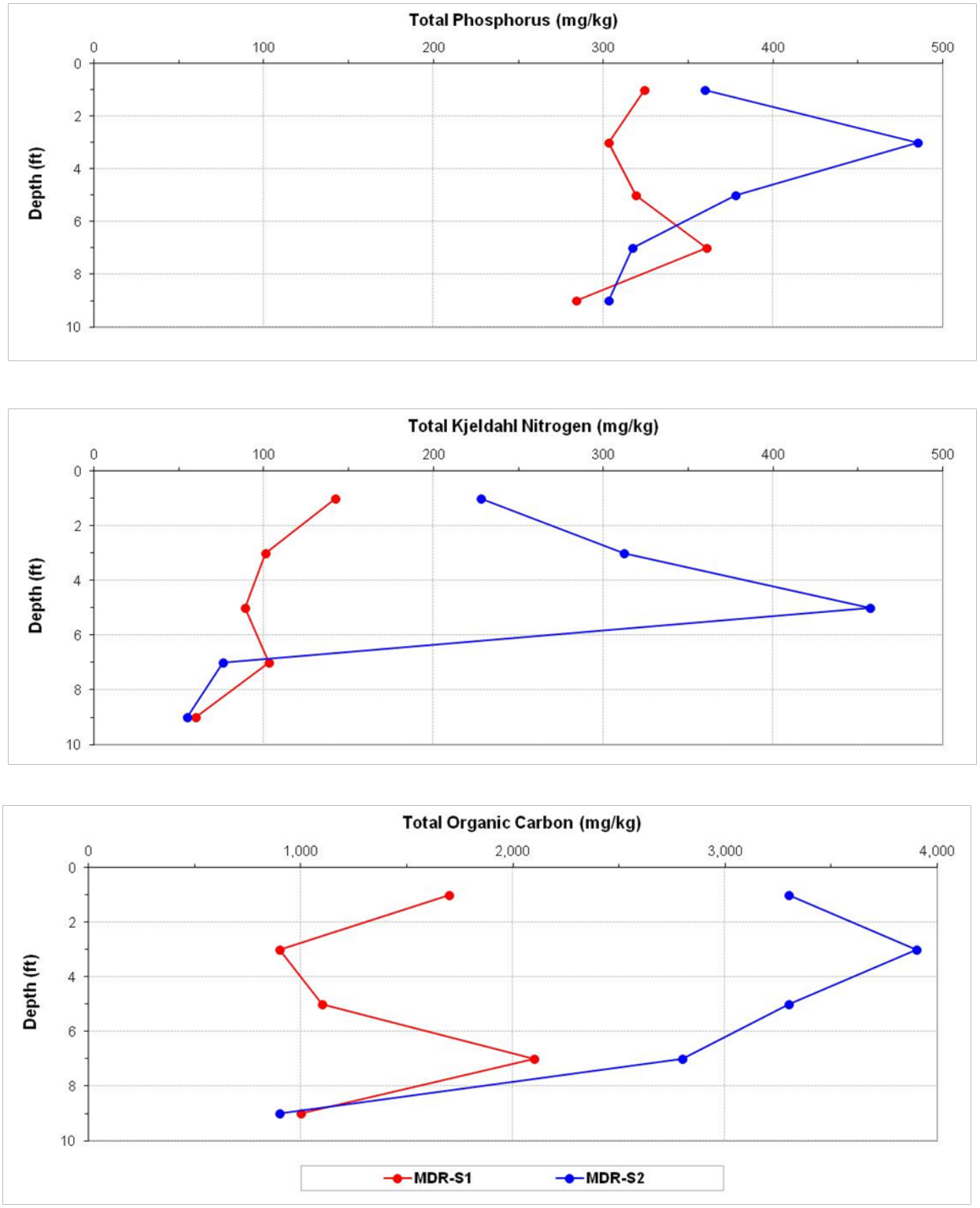


Figure 5. Soil-depth profiles for Total Phosphorus, Total Kjeldahl Nitrogen, and Total Organic Carbon based on 2-foot depth increment composite samples collected at sites MDR1 and MDR2.

4.2.2 Physiochemical Analysis for the Collected Receiving Water Samples and and the Prepared Pre-Elutriate and Elutyriate Testing Samples

The laboratory report of the analyses of the collected receiving water and prepared pre-elutriate, and elutriate samples is provided in Attachment 4. Table 7 and Table 8, respectively, summarize these results for sites MDR-S1 and MDR-S2 and provide Nebraska water quality standards criteria for reference. The ammonia water quality standards criteria given are based on the measured pH (8.4 S.U.) and water temperature (14.4°C) of the Missouri River when the receiving water sample was collected. The metals criteria are based on the dissolved hardness (280 mg/L) for the analyzed receiving water sample. As expected the pre-elutriate levels were high (1:4 sediment to receiving water dilution), but no elutriate testing results indicated a violation of Nebraska's water quality standards.

5 WATER QUALITY FACTUAL DETERMINATIONS

5.1 Physical Substrate Determinations

Table 4, Figure 3 and Figure 4 describe the particle size composition of the material identified for excavation for the construction of SWH at the proposed Middle Decatur Revetment project site. A mean particle size composition for the material identified for excavation at the proposed project site was calculated from the 12 collected sediment/soil samples at the two sites (Table 4). The sediment/soil to be excavated is believed to be sandy alluvial material.

As part of Bank Stabilization and Navigation Project (BSNP), the Omaha District irregularly samples substrate composition in the navigation channel of the Missouri River. In 2008, particle size composition of the river bottom was measured at sites along the river. At each location two to three substrate samples were collected from the navigation channel. Table 9 shows the particle size composition of the substrate samples collected from the navigation channel upstream and downstream of the proposed Middle Decatur Revetment project site (RM688) at RM690 and RM685. The substrate particle size composition in the navigation channel of the Missouri River indicates that the finer material has been washed out and transported downstream. This is in line with the management goals of the BSNP to maintain the navigation channel.

Figure 6 plots the mean particle size composition of the sediment/soil samples collected at the proposed Middle Decatur Revetment project site and from the navigation channel of the Missouri River at RM690 and RM685. As seen in Figure 6, the sediment identified for excavation at the proposed Middle Decatur Revetment project site as compared to the bottom substrate of the Missouri River navigation channel has a few more fines, but is very similar. This is not unexpected given that the existing sediment to be dredged at the proposed project site is in a "bench" area and is believed to have been recently deposited during the 2011 Missouri River flooding. As occurs with sediment delivered from inflowing tributaries, the finer material in the proposed dredging discharge will be transported downstream as part of the wash-load, and any heavier material will be incorporated into the Missouri River suspended bed material and bed-load.

Table 7. Summary of water analyses for collected receiving water and elutriate testing at of sediments collected at site MDR-S1. *(Nebraska water quality standards criteria provided for reference.)*

Parameter	Receiving Water	Pre-Elutriate	Elutriate (Total)	Elutriate (Dissolved)	Water Quality Standards Criteria[A]
Atrazine (ug/L)	0.15	-----	0.15	-----	330[9], 12[10], 3[2]
Carbon, Total Organic (mg/L)	3.5	310	27.3	-----	-----
Carbonaceous BOD (mg/L)	<0.6	25	10	-----	-----
Chemical Oxygen Demand (mg/L)	9	668	54	-----	-----
Nitrogen, Ammonia as N (mg/L)	0.06	0.26	-----	0.03	3.9[1,4,6], 1.3[1,5,6]
Nitrogen, Kjeldahl as N (mg/L)	0.5	22.3	0.88	-----	-----
Nitrogen, Nitrate/Nitrite as N (mg/L)	0.11	0.15	-----	0.13	10[2,4], 100[3,4]
Phosphorus, Dissolved (mg/L)	0.02	-----	-----	<0.008	-----
Phosphorus, Total (mg/L)	0.05	16.2	0.38	-----	-----
Phosphorus, Orthophosphate (mg/L)	0.03	-----	-----	0.02	-----
Total Suspended Solids (mg/L)	25	20,100	258	-----	-----
Turbidity – Lab Measured (NTU)	6	9,750	406	-----	-----
Organochlorine Pesticide and PCB Scan (ug/L)	n.d.	-----	n.d.	-----	Varies by constituent
Metals:					
Aluminum, Dissolved (ug/L)	<40	-----	-----	50	750[7], 87[8], 200[9]
Aluminum, Total (ug/L)	440	295,500	13,140	-----	-----
Antimony, Dissolved (ug/L)	<0.03	-----	-----	<0.03	88[7], 30[8], 6[9]
Antimony, Total (ug/L)	0.6	2.5	0.1	-----	-----
Arsenic, Dissolved (ug/L)	2	-----	-----	2	340[7], 16.7[8], 10[9]
Arsenic, Total (ug/L)	3	421	15	-----	-----
Beryllium, Dissolved (ug/L)	<1	-----	-----	<1	130[7], 5.3[8], 4[9]
Beryllium, Total (ug/L)	<1	17	<1	-----	-----
Cadmium, Dissolved (ug/L)	0.008	-----	-----	0.05	16[7], 0.50[8], 5[9]
Cadmium, Total (ug/L)	0.05	14.6	0.3	-----	-----
Chromium, Dissolved (ug/L)	<4	-----	-----	<4	1,376[7], 179[8], 100[9]
Chromium, Total (ug/L)	<4	660	20	-----	-----
Copper, Dissolved (ug/L)	<6	-----	-----	<6	35[7], 22[8], 1,000[9]
Copper, Total (ug/L)	<6	370	10	-----	-----
Hardness, Dissolved (mg/L)	280	-----	-----	301	-----
Hardness, Total (mg/L)	282	1,985	322	-----	-----
Iron, Dissolved (ug/L)	<10	-----	-----	50	1,000[8]
Iron, Total (ug/L)	390	625,500	18,210	-----	-----
Lead, Dissolved (ug/L)	<0.008	-----	-----	0.04	194[7], 7.6[8], 15[9]
Lead, Total (ug/L)	1.2	477	15	-----	-----
Manganese, Dissolved (ug/L)	<3	-----	-----	<3	1,000[8]
Manganese, Total (ug/L)	40	23,130	580	-----	-----
Mercury, Dissolved (ug/L)	0.01	-----	-----	0.01	1.4[7]
Mercury, Total (ug/L)	0.02	1.1	0.04	-----	0.77[8], 2[9]
Nickel, Dissolved (ug/L)	<8	-----	-----	<8	1,119[7], 124[8], 100[9]
Nickel, Total (ug/L)	<8	940	30	-----	-----
Selenium, Dissolved (ug/L)	2	------	------	2	-----
Selenium, Total (ug/L)	2	19	2	-----	20[3,7], 5[8], 50[9]
Silver, Dissolved (ug/L)	<4	-----	-----	<4	20[7], 100[9]
Silver, Total (ug/L)	<4	<4	<4	-----	-----
Thallium, Dissolved (ug/L)	<0.003	-----	-----	<0.003	1,400[7], 6.3[8], 2[9]
Thallium, Total (ug/L)	0.4	6.5	0.2	-----	-----
Zinc, Dissolved (ug/L)	10	-----	-----	100	280[7,8], 5,000[9]
Zinc, Total (ug/L)	10	1,750	120	-----	-----

n.d. = Not detected.

[A] Criteria given for reference – actual criteria should be verified in appropriate State water quality standards.

[1] Criteria for the protection of Class I Warmwater Aquatic Life (Nebraska).

[2] Criteria for the protection of domestic water supply waters.

[3] Criteria for the protection of agricultural water supply waters.

[4] Daily maximum criterion (monitoring results directly comparable to criterion).

[5] 30-day average criterion (monitoring results not directly comparable to criterion).

[6] Total ammonia criteria pH and temperature dependent. Criteria listed are for pH of 8.4 S.U. and a temperature of 14.4°C.

[7] Acute criterion for aquatic life.

[8] Chronic criterion for aquatic life.

[9] Criterion for the protection of human health.

Note: Metals criteria are based on a hardness of 280 mg/L.

Table 8. Summary of water analyses for collected receiving water and elutriate testing at of sediments collected at site MDR-S2. *(Nebraska water quality standards criteria provided for reference.)*

Parameter	Receiving Water	Pre-Elutriate	Elutriate (Total)	Elutriate (Dissolved)	Water Quality Standards Criteria[A]
Atrazine (ug/L)	0.15	-----	0.15	-----	330[9], 12[10], 3[2]
Carbon, Total Organic (mg/L)	3.5	340	13.6	-----	-----
Carbonaceous BOD (mg/L)	<0.6	8	<0.6	-----	-----
Chemical Oxygen Demand (mg/L)	9	1,410	25	-----	-----
Nitrogen, Ammonia as N (mg/L)	0.06	0.11	-----	0.04	3.9[1,4,6], 1.3[1,5,6]
Nitrogen, Kjeldahl as N (mg/L)	0.5	44.8	0.93	-----	-----
Nitrogen, Nitrate/Nitrite as N (mg/L)	0.11	0.17	-----	0.18	10[2,4], 100[3,4]
Phosphorus, Dissolved (mg/L)	0.02	-----	-----	<0.008	-----
Phosphorus, Total (mg/L)	0.05	27.9	0.22	-----	-----
Phosphorus, Orthophosphate (mg/L)	0.03	-----	-----	0.02	-----
Total Suspended Solids (mg/L)	25	61,600	142	-----	-----
Turbidity – Lab Measured (NTU)	6	18,400	213	-----	-----
Organochlorine Pesticide and PCB Scan (ug/L)	n.d.	-----	n.d.	-----	Varies by constituent
Metals:					
Aluminum, Dissolved (ug/L)	<40	-----	-----	<40	750[7], 87[8], 200[9]
Aluminum, Total (ug/L)	440	638,900	8,820	-----	-----
Antimony, Dissolved (ug/L)	<0.03	-----	-----	<0.03	88[7], 30[8], 6[9]
Antimony, Total (ug/L)	0.6	1.6	<0.03	-----	-----
Arsenic, Dissolved (ug/L)	2	-----	-----	1	340[7], 16.7[8], 10[9]
Arsenic, Total (ug/L)	3	631	7	-----	-----
Beryllium, Dissolved (ug/L)	<1	-----	-----	<1	130[7], 5.3[8], 4[9]
Beryllium, Total (ug/L)	<1	34	<1	-----	-----
Cadmium, Dissolved (ug/L)	0.008	-----	-----	0.06	16[7], 0.50[8], 5[9]
Cadmium, Total (ug/L)	0.05	25.4	0.1	-----	-----
Chromium, Dissolved (ug/L)	<4	-----	-----	<4	1,376[7], 179[8], 100[9]
Chromium, Total (ug/L)	<4	1,080	10	-----	-----
Copper, Dissolved (ug/L)	<6	-----	-----	<6	35[7], 22[8], 1,000[9]
Copper, Total (ug/L)	<6	940	9	-----	-----
Hardness, Dissolved (mg/L)	280	-----	-----	310	-----
Hardness, Total (mg/L)	282	4,173	323	-----	-----
Iron, Dissolved (ug/L)	<10	-----	-----	<10	1,000[8]
Iron, Total (ug/L)	390	1,155,000	9,610	-----	-----
Lead, Dissolved (ug/L)	<0.008	-----	-----	0.1	194[7], 7.6[8], 15[9]
Lead, Total (ug/L)	1.2	805	6.7	-----	-----
Manganese, Dissolved (ug/L)	<3	-----	-----	<3	1,000[8]
Manganese, Total (ug/L)	40	43,250	270	-----	-----
Mercury, Dissolved (ug/L)	0.01	-----	-----	0.01	1.4[7]
Mercury, Total (ug/L)	0.02	2	0.06	-----	0.77[8], 2[9]
Nickel, Dissolved (ug/L)	<8	-----	-----	<8	1,119[7], 124[8], 100[9]
Nickel, Total (ug/L)	<8	1,490	10	-----	-----
Selenium, Dissolved (ug/L)	2	------	------	4	-----
Selenium, Total (ug/L)	2	37	3	-----	20[3,7], 5[8], 50[9]
Silver, Dissolved (ug/L)	<4	-----	-----	<4	20[7], 100[9]
Silver, Total (ug/L)	<4	<4	<4	-----	-----
Thallium, Dissolved (ug/L)	<0.003	-----	-----	<0.003	1,400[7], 6.3[8], 2[9]
Thallium, Total (ug/L)	0.4	12.4	0.08	-----	-----
Zinc, Dissolved (ug/L)	10	-----	-----	70	280[7,8], 5,000[9]
Zinc, Total (ug/L)	10	3,280	100	-----	-----

n.d. = Not detected.

[A] Criteria given for reference – actual criteria should be verified in appropriate State water quality standards.

[1] Criteria for the protection of Class I Warmwater Aquatic Life (Nebraska).

[2] Criteria for the protection of domestic water supply waters.

[3] Criteria for the protection of agricultural water supply waters.

[4] Daily maximum criterion (monitoring results directly comparable to criterion).

[5] 30-day average criterion (monitoring results not directly comparable to criterion).

[6] Total ammonia criteria pH and temperature dependent. Criteria listed are for pH of 8.4 S.U. and a temperature of 14.4°C.

[7] Acute criterion for aquatic life.

[8] Chronic criterion for aquatic life.

[9] Criterion for the protection of human health.

Note: Metals criteria are based on a hardness of 280 mg/L.

Table 9. Summary of particle size analysis of the sediment samples collected from the Missouri River navigation channel at RM690 and RM685 during 2008.

Sample Location	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
RM690 - 70151	0.0	0.0	0.0	0.1	47.7	51.9	0.3	
RM690 - 70152	0.0	0.0	0.0	1.9	41.2	56.3	0.6	
RM690 - 70153	0.0	0.0	0.2	0.0	51.2	48.3	0.0	
MEAN RM690	**0.0**	**0.0**	**0.1**	**0.7**	**46.7**	**52.2**	**0.3**	
RM685 - 70154	0.0	0.0	3.8	10.9	65.9	19.1	0.3	
RM685 - 70155	0.0	0.0	0.3	1.5	50.4	47.8	0.0	
RM685 - 70156	0.0	0.0	0.0	0.1	38.5	61.3	0.1	
MEAN RM685	**0.0**	**0.0**	**1.4**	**4.2**	**51.6**	**42.7**	**0.1**	

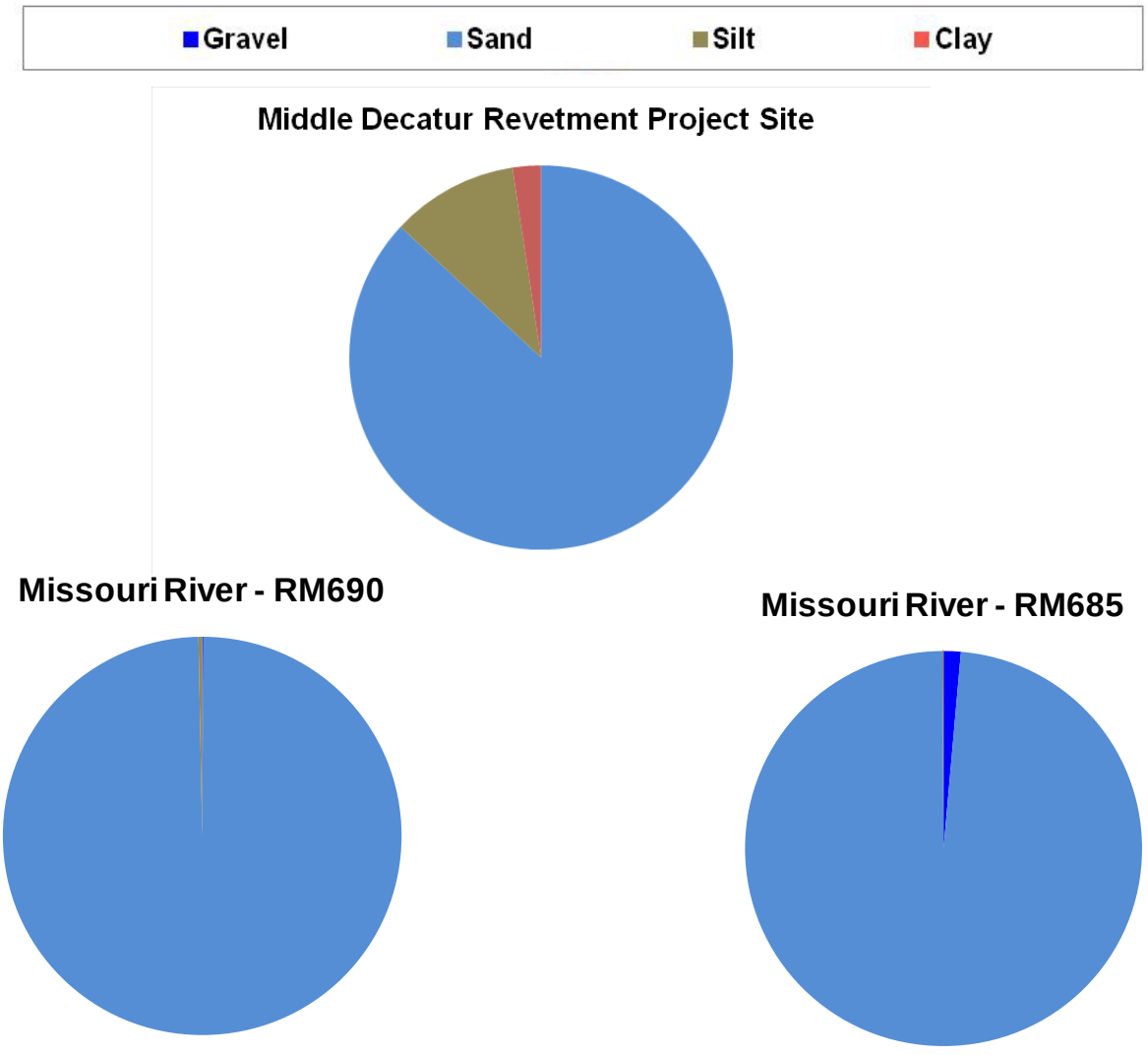


Figure 6. Particle size composition of likely dredge material at the proposed Middle Decatur Revetment project site and the substrate of the Missouri River bottom in the navigation channel in the area of the proposed project.

5.2 Suspended Particulate/Turbidity Determinations

The dredge slurry discharge at the "end-of-pipe" will have a high total suspended solids (TSS) concentration and be quite turbid. Table 10 provides the TSS and turbidity levels measured in the pre-elutriate samples prepared from sediment/soil samples collected at the proposed Middle Decatur Revetment project site. Some local impacts to existing Missouri River water quality from TSS and turbidity can be expected in the immediate vicinity of the dredging discharge.

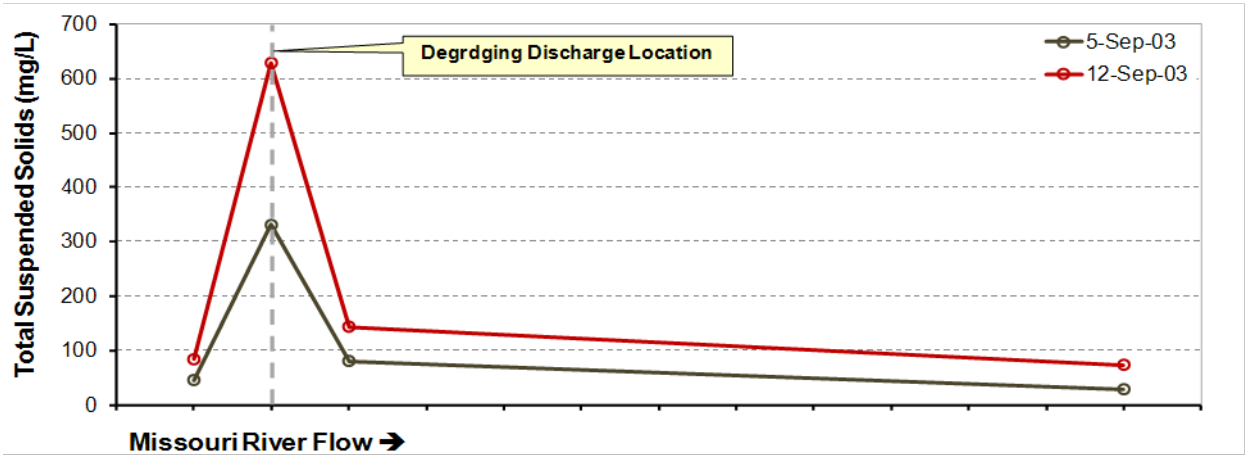
Table 10. Total suspended solids and turbidity levels measured in pre-elutriate samples prepared from sediment/soil samples collected at the proposed Middle Decatur Revetment project site.

Sediment/Soil Sample	Total Suspended Solids (mg/L)	Turbidity (NTU)
MDR-S1	20,100	9,750
MDR-S2	61,600	18,400
MEAN	**40,850**	**14,075**

Past dredging discharges to construct SWH have attempted to minimize any such impacts by targeted placement of the dredging discharge in the Missouri River (e.g. mid-channel, mid-depth, etc.). The Omaha District assessed in-river TSS and turbidity levels upstream and downstream of the dredging discharge during construction of SWH at the California Bend project site. Four sites were monitored: 1) upstream of the "end-of-pipe", 2) zone of initial dilution at the dredging discharge, 3) 200 feet downstream of the "end-of-pipe" in the discharge plume, and 4) 2,000 feet downstream of the "end-of-pipe in the discharge plume. Table 11 gives TSS and turbidity levels measured at the four locations during dredging discharge in September 2003. Figure 7 plots the same information. As seen in Table 11 and Figure 7, TSS and turbidity levels are elevated in the zone of initial dilution; however, these levels quickly dissipate downstream in the discharge plume.

Table 11. Total suspended solids and turbidity levels monitored in the Missouri River upstream and downstream of the dredging discharge to construct shallow-water habitat at the California Bend project site in 2003.

	Upstream of Discharge		Zone of Initial Dilution		200 Feet Downstream		2,000 Feet Downstream	
Date	TSS (mg/L)	Turbidity (NTUs)	TSS (mg/L)	Turbidity (NTUs)	TSS (mg/L)	Turbidity (NTUs)	TSS (mg/L)	Turbidity (NTUs)
5-Sep-03	46	30	331	218	81	90	29	38
12-Sep-03	84	43	629	414	144	94	74	56



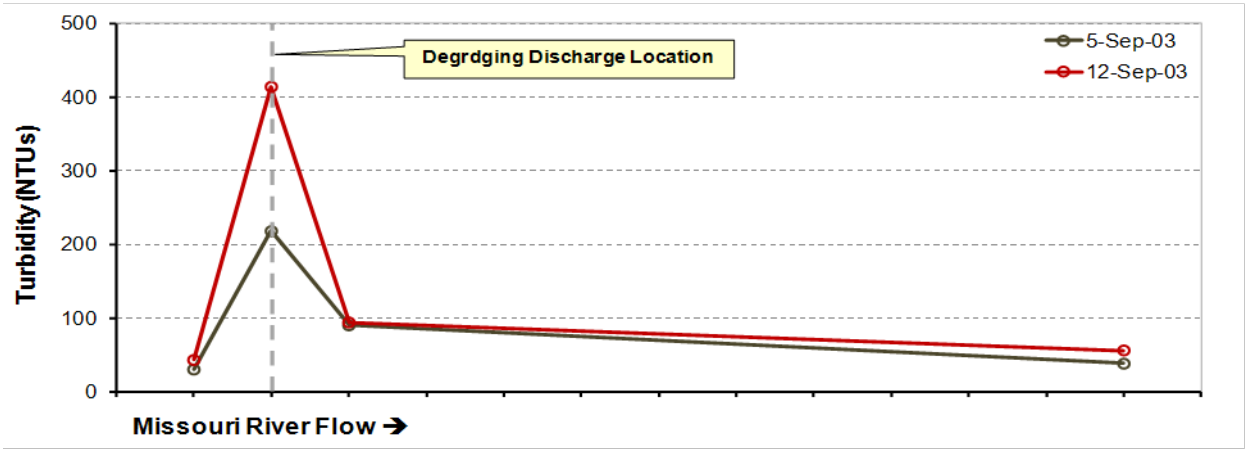


Figure 7. Total suspended solids and turbidity levels monitored in the Missouri River upstream and downstream of the dredging discharge to construct shallow-water habitat at the California Bend project in 2003.

5.3 Contaminant Determinations

5.3.1 Constituents with Promulgated State Water Quality Standards' Criteria

Elutriate testing of representative sediment/soil samples collected at the proposed Middle Decatur Revetment project included analysis for the following constituents that the State of Nebraska has promulgated water quality standards criteria: Ammonia; Atrazine; Metals: Aluminum, Antimony, Arsenic, Beryllium, Cadmium, Chromium III, Copper, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Thallium, Zinc; Nitrate-Nitrite Nitrogen; Organochlorine Pesticides; PCBs; and pH. None of the prepared elutriate samples exceeded promulgated Nebraska water quality standards criteria.

The prepared pre-elutriate samples exhibited elevated concentrations, as total, for several metals. This could represent an "end-of-pipe" concern for these metals regarding public drinking water which has metals criteria based on total metals concentrations. However, the Nebraska water quality standards state that Public Drinking Water use is for surface waters which serve as source water for a public drinking water supply. These waters must be treated (e.g., coagulation, sedimentation, filtration, chlorination)

before the water is suitable for human consumption. After treatment, these waters are to be suitable for drinking water, food processing, and similar uses. As indicated by the non-filtered and filtered elutriate testing, all metals concentrations were below Public Drinking Water standards after settling and filtration. Also, significant dilution of the dredging discharge "end-of-pipe" concentrations will immediately occur upon mixing with the Missouri River.

5.3.2 Nutrients

Table 12 summarizes the nutrient analyses of sediment/soil samples collected at the proposed Middle Decatur Revetment project site, and pre-elutriate and elutriate samples prepared from the collected sediment/soil samples. Pre-elutriate samples characterize total nutrients (i.e. settlable, suspended, and dissolved) in the prepared 1:4 (sediment to receiving water) mixture. Non-filtered elutriate samples characterize suspended and dissolved nutrients remaining in the mixture supernatant after 1-hour of settling. Filtered elutriate samples characterize dissolved nutrients in the supernatant of the settled mixture. Pre-elutriate samples represent potential "end-of-pipe" nutrient concentrations of the slurry discharge prior to any mixing with the receiving water (i.e. Missouri River). Pre-elutriate samples were analyzed for Total Kjeldahl Nitrogen, Ammonia Nitrogen, Nitrate/Nitrite Nitrogen, and Total Phosphorus. Non-filtered elutriate samples were analyzed for Total Kjeldahl Nitrogen and Total Phosphorus. Standard, filtered elutriate samples were analyzed for dissolved Ammonia Nitrogen, Nitrate-Nitrite Nitrogen, and dissolved Phosphorus.

Table 12. Summary of nutrient analyses of sediment/soil samples collected at the proposed Middle Decatur Revetment shallow-water habitat site and pre-elutriate and elutriate testing of the collected sediment/soil samples.

	Total Kjeldahl N (mg/L)	**Ammonia N (mg/L)**	**Nitrate-Nitrite N (mg/L)**	**Phosphorus (mg/L)**
Site MDR-S1:				
Sediment/Soil	91.9*	0.6*	<0.04*	300*
Pre-Elutriate	22.3	0.26	0.15	16.2
Non-Filtered Elutriate	0.88	-----	-----	0.38
Dissolved Elutriate	-----	0.03	0.13	<0.008
Site MDR-S2:				
Sediment/Soil	156*	1.0*	0.04*	361*
Pre-Elutriate	44.8	0.11	0.17	27.9
Non-Filtered Elutriate	0.93	-----	-----	0.22
Dissolved Elutriate	-----	0.04	0.18	<0.008
Mean Concentration				
Sediment/Soil	**124***	**0.8***	**<0.04***	**331***
Pre-Elutriate	**33.6**	**0.19**	**0.16**	**22.1**
Non-Filtered Elutriate	**0.91**	**-----**	**-----**	**0.30**
Dissolved Elutriate	**-----**	**0.04**	**0.16**	**<0.008**

* mg/kg

5.3.2.1 Estimated Total Tonnage of Nutrients to be Discharged to the Missouri River

It is estimated that that a total of 264,000 cubic yards of material would be excavated and discharged to the Missouri River to construct SWH at the proposed Middle Decatur Revetment project. Table 4, Figure 3, and Figure 4 describe the particle size composition of the material proposed for excavation. Based on the alluvial material to be excavated, a conversion factor of 95 lbs/ft^3 was used to convert the estimated material volume (264,000 yd^3) to estimated material weight (338,580 tons / 307,158 metric tons). The metric tonnage of nutrients that would be discharged to the Missouri River during the period of SWH construction was estimated from the mean nutrient levels determined for the collected sediment/soil samples and the total material to be excavated (Table 13). Currently, the total phosphorus load to the Gulf of Mexico is estimated to be 154,300 metric tons per year, with the contribution of the Missouri River to this total load estimated to be between 16.8% and 20% (NRC, 2011). If the proposed SWH construction at the Middle Decatur Revetment project was completed within one year and the estimated total discharge of 101.67 metric tons of total phosphorus made it to the Gulf of Mexico in one year, it would represent 0.358% of the annual Missouri River total phosphorus load delivered to the Mississippi River, and 0.066% of the annual total phosphorus load delivered to the Gulf of Mexico. These percentages are upper bound estimates, as sediment deposition processes in the Missouri and Mississippi River channels would reduce loads delivered to the Gulf, and actual downstream deliveries would be significantly less than these values.

Table 13. Estimated metric tonnage of nutrients that would be discharged to the Missouri River during the entire period shallow-water habitat was constructed at the proposed Middle Decatur Revetment project.

Total Kjeldahl Nitrogen (metric tons)	Ammonia (metric tons)	Nitrate-Nitrite Nitrogen (metric tons)	Total Phosphorus (metric tons)
38.09	0.25	0.012	101.67

Note: 1 metric ton = 1,000 kg = 2,205 lbs.

5.3.2.2 Potential Impacts to Missouri River Water Quality

5.3.2.2.1 Dredging Discharge Flows

The following information was taken from EM 1110-2-5025 (25-Mar-1983), "*Dredging and Dredged material Disposal*" (USACE, 1983):

> "The hydraulic pipeline cutterhead suction dredge … is equipped with a rotating cutter apparatus surrounding the intake end of the suction pipe, it can effectively dig and pump all types of alluvial materials and compacted deposits, such as clay and hardpan. Slurries of 10 to 20 percent solids (by dry weight) are typical, depending upon the material being dredged, dredging depth, horsepower of dredge pumps, and pumping distance to disposal area. If no other data are available, a pipeline discharge concentration of 13 percent by dry weight (145 ppt) should be used for design purposes. Pipeline discharge velocity, under routine working conditions, ranges from 15-20 ft/sec. Table 14 presents theoretical pipeline discharge rates as functions of pipeline discharge velocity for dredges ranging from 8 to 30 in."

Table 14. Suction dredge pipeline discharge rates (cfs)[(a)] [taken from EM 1110-2-5025].

	Discharge Pipe Diameter			
Discharge Velocity (ft/sec)	**8-inch**	**18-inch**	**24-inch**	**30-inch**
10	3.5	17.7	31.4	49.1
15	5.2	26.5	47.1	73.6
20	7.0	35.3	62.8	98.1
25	8.7	44.2	78.5	122.7

(a) Discharge rate = pipeline area x discharge velocity.
Discharge rate for 20-inch diameter pipe:
Pipe radius = 10 in. = 0.833 ft.
Pipe area = $\pi r^2 = (3.1416)(0.833)^2 = 2.18$ ft^2
Discharge rate = 2.18 ft^2 x 20 ft/sec = 43.6 cfs
Note: Given a velocity of 20 ft/sec was used, this is a maximum estimate for discharge rate.

5.3.2.2.2 Elutriate Testing of Sediment/Soil Samples Collected at the Middle Decatur Revetment Site

Elutriate testing of the sediment/soil samples collected at the proposed Middle Decatur Revetment project site was done pursuant to the "*Inland Testing Manual"*. A test slurry was prepared based on a dilution of 1 part sediment to 4 parts receiving water on a volume basis. The 1:4 dilution for elutriate testing represents a 20% slurry. However, elutriate testing is done using "wet" sediment to avoid volatilization of any potential contaminants in the sediment during a drying process. The "wet" sediment was analyzed for percent solids and the amount of water present in the sediment sample can be mathematically converted to "dry weight" based on the percent solids quantification. Table 15 estimates the dry-weight percent slurries for each of the elutriate mixtures prepared from the sediment/soil samples collected at the proposed project site. The percent slurry estimate is based on the measured percent solids of the collected sediment/soil samples and the 1:4 dilution used to prepare elutriate samples. All of the prepared elutriate mixtures from the collected sediment/soil samples fall within the 10 to 20 percent solids (by dry weight) typical for a hydraulic pipeline cutterhead suction dredge (Table 15).

Table 15. Dry-weight percent slurries represented by the elutriate mixtures prepared from the sediment/soil samples collected at the proposed Middle Decatur Revetment shallow-water habitat site.

Sediment/Soil Sample	Percent Solids	Percent Slurry (Based on Estimated Dry Weight)
MDR-S1	94.8%	19.0%
MDR-S2	93.5%	18.7%

Note: Based on a 1:4 (dry-weight sediment to water ratio):
- 100% percent solids = 20% slurry
- 50% percent solids = 10% slurry

5.3.2.2.3 Missouri River Nutrient Conditions at Middle Decatur Revetment Area on 8-May-2014

Table 16, Table 17, and Table 18, respectively, summarize the nutrient concentrations, fluxes, and loadings present in the Missouri River on 8-May-2014 when sediment/soil samples were collected at the proposed Middle Decatur Revetment project site.

Table 16. Nutrient concentrations measured in the Missouri River at RM691 (i.e. Decatur, NE boat ramp) on 8-May-2014.

Total Kjeldahl N (mg/L)	Ammonia N (mg/L)	Nitrate-Nitrite N (mg/L)	Total P (mg/L)	Dissolved P (mg/L)
0.49	0.06	0.11	0.05	0.02

Table 17. Estimated nutrient fluxes in the Missouri River at RM691 on 8-May-2014 based on measured nutrient concentrations and recorded mean daily flow of 30,000 cfs.

Flow (cfs)	Total Kjeldahl N (kg/sec)	Ammonia N (kg/sec)	Nitrate-Nitrite N (kg/sec)	Total P (kg/sec)	Dissolved P (kg/sec)
30,000	0.4162	0.0510	0.0934	0.0425	0.0170

Table 18. Estimated daily nutrient loadings in the Missouri River at RM691 on 8-May-2014 based on estimated nutrient fluxes.

Flow (cfs)	Total Kjeldahl N (tons/day)	Ammonia N (tons/day)	Nitrate-Nitrite N (tons/day)	Total P (tons/day)	Dissolved P (tons/day)
30,000	39.64	4.85	8.90	4.05	1.62

5.3.2.2.4 Missouri River Mean Nutrient Conditions at Decatur (RM691) and Rulo (RM498) Nebraska

Mean nutrient conditions were determined for the Missouri River at Decatur (RM691) and Rulo (RM498) Nebraska from monthly water quality sampling of the river by the District at the two sites over the 11-year period 2003 through 2013 (Table 19). The Decatur site represents conditions of the Missouri River in the area of the proposed Middle Decatur Revetment project, and the Rulo site the conditions of the Missouri River as it leaves the boundaries of the Omaha District.

Table 19. Long-term mean nutrient concentrations measured in the Missouri River at Decatur (RM691) and Rulo (RM498) Nebraska by the Omaha District over the 11-year period 2003 through 2013.

Location	Total Kjeldahl N (mg/L)	Ammonia N (mg/L)	Nitrate-Nitrite N (mg/L)	Total P (mg/L)	Dissolved P (mg/L)
Decatur, NE (RM691)	0.84	0.12	0.89	0.17	0.05
Rulo, NE (RM498)	1.16	0.14	1.63	0.34	0.10

The average mean daily flow of the Missouri River at Decatur (USGS gauge 06601200) and Rulo (USGS gauge 06813500) Nebraska was determined from USGS flow records. The average mean daily flow of the Missouri River at Decatur (period of record 1988 -2013) was determined to be 31,442 cfs (range = 7,070 - 189,000 cfs; median = 28,400 cfs). The average mean daily flow of the Missouri River at Rulo (period of record 1967 -2013) was determined to be 45,896 cfs (range = 7,450 – 302,000 cfs; median = 40,800 cfs). The mean daily flows were used to determine nutrient fluxes and loadings based on the Missouri River water quality conditions monitored by the Omaha District over the 11-year period 2003 through 2013. Table 20 and Table 21, respectively, summarize the mean nutrient fluxes and loadings for the Missouri River at Decatur and Rulo, Nebraska.

Table 20. Estimated mean nutrient fluxes in the Missouri River at Decatur, NE (RM691) and Rulo, NE (RM498) based on period of record flows and water quality conditions monitored during the 11-year period 2003 through 2013.

Location	Flow (cfs)	Total Kjeldahl N (kg/sec)	Ammonia N (kg/sec)	Nitrate-Nitrite N (kg/sec)	Total P (kg/sec)	Dissolved P (kg/sec)
Decatur, NE (RM691)	31,442	0.7479	0.1068	0.7924	0.1514	0.0445
Rulo, NE (RM498)	45,896	1.5075	0.1819	2.1183	0.4419	0.1300

Table 21. Estimated mean nutrient loadings in the Missouri River at Decatur, NE (RM691) and Rulo, NE (RN498) based on estimated mean nutrient fluxes.

Location	Flow (cfs)	Total Kjeldahl N (tons/day)	Ammonia N (tons/day)	Nitrate-Nitrite N (tons/day)	Total P (tons/day)	Dissolved P (tons/day)
Decatur, NE (RM691)	31,442	71.23	10.18	75.47	14.41	4.24
Rulo, NE (RM498)	45,896	143.58	17.33	201.75	42.08	12.38

5.3.2.2.5 Estimation of Nutrient Loadings from Potential Hydraulic Dredging Discharge for the Construction of SWH at the Proposed Middle Decatur Revetment Project Site

5.3.2.2.5.1 Calculated Nutrient Fluxes and Loadings from a Potential 20-Inch Hydraulic Dredge Discharge of Excavated Sediment/Soil

Potential nutrient fluxes from hydraulic dredging to excavate SWH at the proposed Middle Decatur Revetment project site were calculated. The calculated nutrient fluxes were based on use of a typical 20-inch hydraulic dredge (i.e. 43.6 cfs discharge), and mean nutrient levels determined from the sediment/soil samples collected from the proposed project site. As appropriate, nutrient fluxes for total (pre-elutriate and non-filtered elutriate), and dissolved (filtered elutriate) nutrients were estimated from pre-elutriate and elutriate testing results. Table 22 shows the calculated nutrient fluxes for Total Kjeldahl Nitrogen, Ammonia, Nitrate-Nitrite Nitrogen, Total Phosphorus, and Dissolved Phosphorus. Table 23 shows the estimated daily loadings (tons/day) based on 12 hours of daily operation and the calculated nutrient fluxes. Table 24 compares the nutrient daily loadings calculated for the 20-inch hydraulic dredge discharge to the long-term average daily loadings for the Missouri River at Decatur (RM691) and Rulo (RM498) Nebraska.

Table 22. Nutrient flux rates calculated for a typical 20-inch hydraulic dredge discharge (43.6 cfs) based on mean sediment/soil nutrient levels sampled at the proposed Middle Decatur Revetment project site.

Total Kjeldahl Nitrogen (kg/sec)		Ammonia (kg/sec)		Nitrate-Nitrite Nitrogen (kg/sec)		Phosphorus (kg/sec)		
Pre-Elutriate	Non-Filtered Elutriate	Pre-Elutriate	Filtered Elutriate	Pre-Elutriate	Filtered Elutriate	Pre-Elutriate	Non-Filtered Elutriate	Filtered Elutriate
0.0415	0.0011	0.0002	0.00005	0.0002	0.0002	0.0273	0.0004	0.000005

Table 23. Nutrient loadings estimated for a typical 20-inch hydraulic dredge discharge (43.6 cfs) operating 12 hours a day based on nutrient fluxes calculated for mean sediment/soil nutrient levels sampled at the proposed Middle Decatur Revetment project site.

Total Kjeldahl Nitrogen (tons/day)		Ammonia (tons/day)		Nitrate-Nitrite Nitrogen (tons/day)		Phosphorus (tons/day)		
Pre-Elutriate	Non-Filtered Elutriate	Pre-Elutriate	Filtered Elutriate	Pre-Elutriate	Filtered Elutriate	Pre-Elutriate	Non-Filtered Elutriate	Filtered Elutriate
0.9877	0.0268	0.0056	0.0012	0.0047	0.0047	0.6497	0.0088	0.0001

Table 24. Comparison of daily nutrient loadings for the estimated dredging discharge from the proposed Middle Decatur Revetment shallow-water habitat construction project and the Missouri River average conditions at Decatur (RM691) and Rulo (RM498) Nebraska.

Total Kjeldahl Nitrogen (tons/day)		Ammonia (tons/day)		Nitrate-Nitrite Nitrogen (tons/day)		Phosphorus (tons/day)		
Pre-Elutriate	Non-Filtered Elutriate	Pre-Elutriate	Filtered Elutriate	Pre-Elutriate	Filtered Elutriate	Pre-Elutriate	Non-Filtered Elutriate	Filtered Elutriate
20-inch Hydraulic Dredge Discharge (43.6 cfs)								
0.9877	0.0268	0.0056	0.0012	0.0047	0.0047	0.6497	0.0088	0.0001
Missouri River Long-Term Mean Conditions at Decatur – RM691 (Mean Flow = 31,442 cfs)								
71.2		10.2		75.5		14.4		4.2
20-in Hydraulic Dredge Discharge Load as a Percent of the Long-term Mean Missouri River Load at RM691								
1.39%	0.04%	0.05%	0.01%	0.01%	0.01%	4.51%	0.06%	<0.01%
Missouri River Long-Term Mean Conditions at Rulo – RM498 (Mean Flow = 45,896 cfs)								
143.6		17.3		201.8		42.1		12.4
20-in Hydraulic Dredge Discharge Load as a Percent of the Long-term Mean Missouri River Load at RM498								
0.69%	0.02%	0.03%	0.01%	<0.01%	<0.01%	1.54%	0.02%	<0.01%

Note: Dredge flow (43.6 cfs) to mean Missouri River flow at Decatur, NE (31,442 cfs) is 0.14% (i.e. a dredging discharge of 43.6 cfs would represent 0.14% of the mean Missouri River flow at Decatur, NE of 31,442 cfs when the dredge was discharging).

5.3.2.2.6 Comparison of Estimated Nutrient Loadings from Hydraulic Dredging at the Proposed Middle Decatur Revetment Project to Ambient Nutrient Loadings in the Missouri River

The District monitors water quality conditions in the Missouri River from near Landusky, MT (RM1922) to Rulo, NE (RM498). This includes seven locations monitored monthly since 2003 from the Gavins Point Dam tailwaters (RM810) to Rulo, NE. Nutrient constituents monitored monthly include Total Kjeldahl Nitrogen, Ammonia, Nitrate-Nitrite, Total Phosphorus, and Dissolved Phosphorus. Figure 8 displays the mean daily loads calculated for Total Nitrogen (i.e. Total Kjeldahl + Nitrate-Nitrite Nitrogen), Nitrate-Nitrite Nitrogen, and Total Phosphorus for the seven monitored locations on the Missouri River downstream of Gavins Point Dam over the 5-year period 2008 through 2012. Figure 8 also shows the location of the proposed Middle Decatur Revetment project site. Figure 9 compares the estimated daily dredging discharge loading for Total Nitrogen, Nitrate-Nitrite Nitrogen, and Total Phosphorus and the calculated mean daily loads for the Missouri River immediately upstream (i.e. RM691) and downstream (i.e. RM619) of the proposed Middle Decatur Revetment project site. As indicated in Table 24 and Figure 9, the estimated daily nutrient loading from the proposed Middle

Decatur Revetment project site is minor compared to the nutrient mean daily loading currently present in the Missouri River. The greatest nutrient loading from the proposed dredging would be for Total Phosphorus where the dredging discharge daily loading could result in a 4.5% increase in the mean daily suspended Total Phosphorus loading currently present in the Missouri River at Decatur, NE. It is noted that some of the discharged particulate material, and associated phosphorus, would settle out in the Missouri River when discharged and be incorporated in the river's bed-load. The difference between a pre-elutriate sample and a non-filtered elutriate sample for Total Phosphorus is 1-hour of settling time. The elutriate testing of the collected Middle Decatur Revetment sediment samples resulted in mean pre-elutriate and non-filtered elutriate Total Phosphorus concentrations of 22.1 mg/L and 0.30 mg/L, respectively (i.e. 98.6% of the total phosphorus present in the pre-elutriate samples settled out after 1-hour).

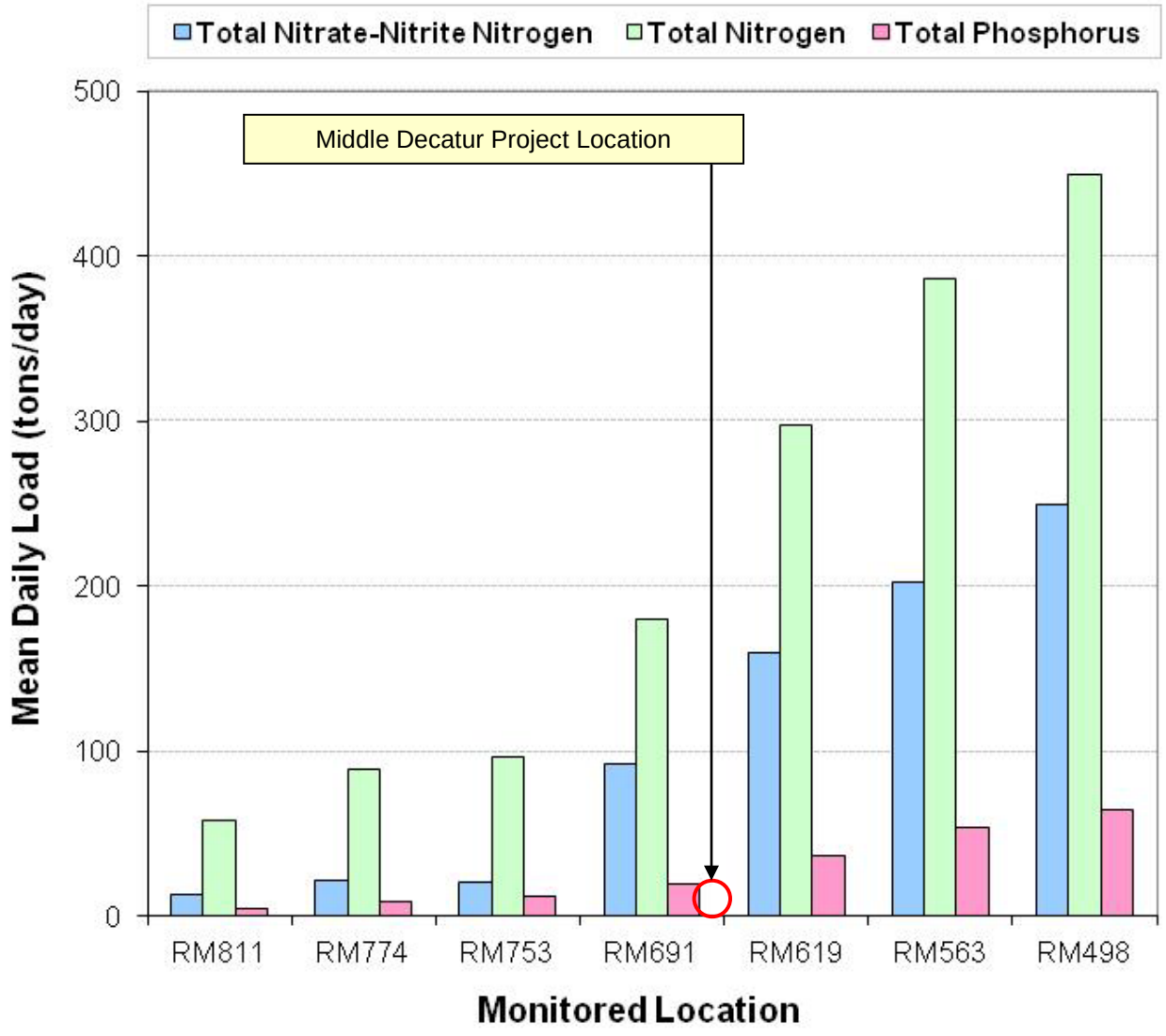


Figure 8. Mean daily loads for Total Nitrogen, Nitrate-Nitrite Nitrogen, and Total Phosphorus based on monthly monitoring along the Missouri River from Gavins Point Dam to Rulo, Nebraska over the 5-year period 2008 through 2012.

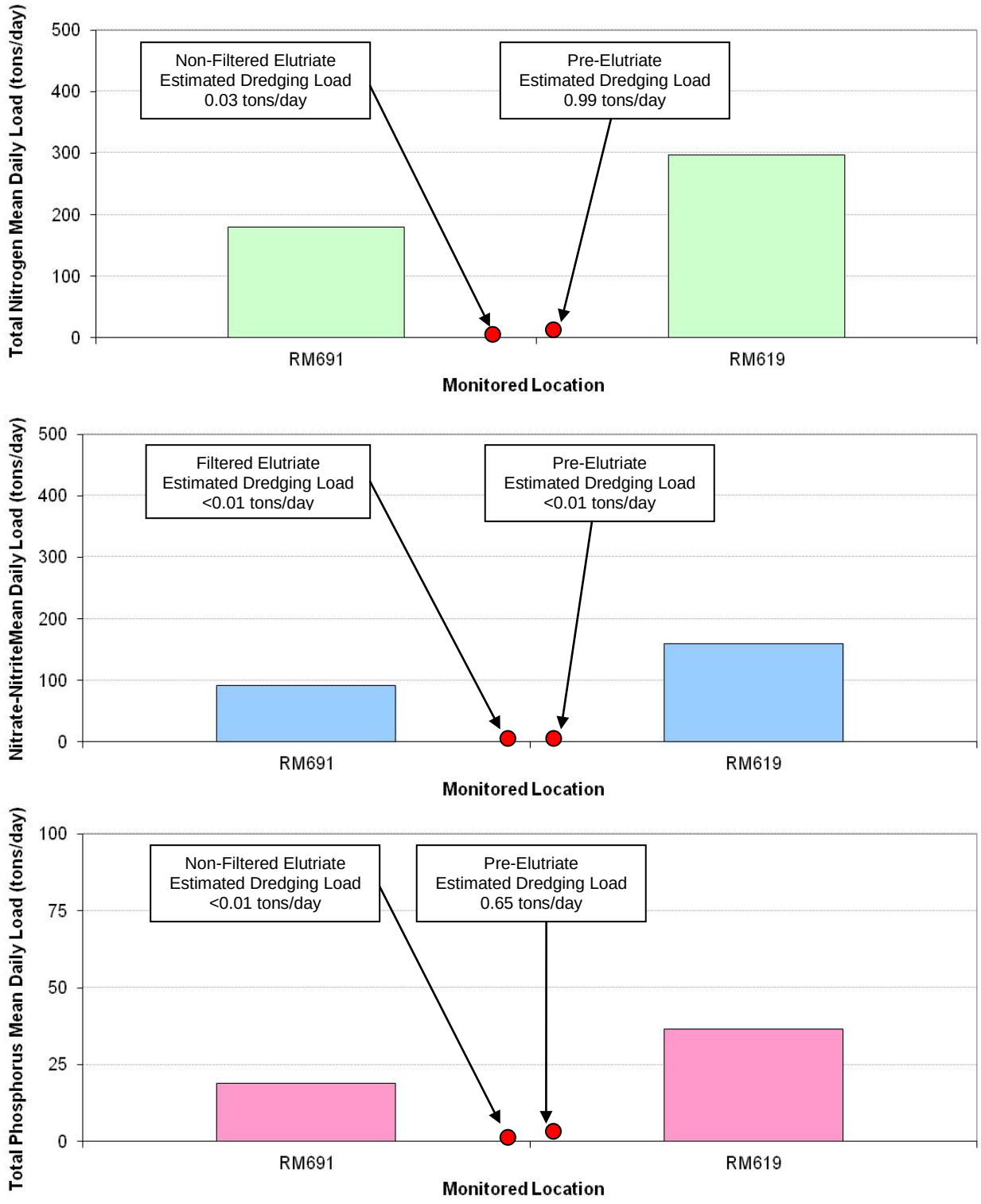


Figure 9. Comparison of estimated Total Nitrogen, Nitrate-Nitrite Nitrogen, and Total Phosphorus daily loadings from hydraulic dredging discharge to construct proposed shallow-water habitat at the Middle Decatur Revetment project site to mean daily loadings calculated for the Missouri River at RM691 and RM619 over the 5-year period 2008 though 2012.

5.4 Proposed Disposal Site Determinations

Mixing zone provisions for water quality standards application typically apply to "toxic contaminants" released from a point source discharge. State water quality standards, in most cases, define acute and chronic numeric criteria for toxic contaminants. Mixing zones are meant to provide water quality protection to a waterbody receiving a point source discharge, while at the same time allowing the discharge to initially mix and disperse within the receiving waterbody. Generally, mixing zones include both "acute" and "chronic" zones of mixing. Acute mixing zones (exceedance of acute criteria) are more restricted and typically must allow for a zone of passage for aquatic life and are not to extend across public drinking water supply intakes, heavily used recreation areas, mouths of tributary streams, etc. Chronic mixing zones (exceedance of chronic criteria) are less restrictive in that a zone of passage is typically not required, but they also typically are not to extend across public drinking water supply intakes and heavily used recreation areas.

The Section 404(b)(1) Guidelines, at §230.11(f), allow for mixing zones. Mixing zones for dredge and fill discharges are to be confined to the smallest practicable zone that is consistent with the type of dispersion determined to be appropriate. The following factors are identified in §230.11(f) for consideration in determining the acceptability of a proposed mixing zone:

- Depth of water at the disposal site;
- Current velocity, direction, and variability at the disposal site;
- Degree of turbulence;
- Stratification attributable to causes such as obstructions, salinity or density profiles at the disposal site;
- Rate of discharge;
- Ambient concentration of constituents of interest;
- Dredged material characteristics, particularly concentrations of constituents, amount of material, type of material (sand, silt, clay, etc.) and settling velocities;
- Number of discharge actions per unit of time; and
- Other factors of the disposal site that affect the rates and patterns of mixing.

Elutriate testing of the collected sediment/soil samples at the proposed Middle Decatur Revetment project site indicated that all assessed constituents met applicable acute and chronic Nebraska numeric water quality standards criteria. Pre-elutriate testing indicated potentially elevated total metals levels that could be problematic regarding Public Drinking Water Supply standards – there are no drinking water intakes in the immediate vicinity of the proposed dredging discharge at the Middle Decatur Revetment project site. Since a "regulated" mixing is not needed to ensure compliance with acute aquatic life water quality criteria and no drinking water supply intakes are in the immediate vicinity of the proposed dredging discharge, it's assumed complete mixing of the dredging discharge with the flow in the Missouri River is appropriate in evaluating potential impacts to existing water quality pursuant to State and Federal antidegradation provisions. It is assumed antidegradation provisions would apply at the edge of a permitted mixing zone.

5.4.1 Completely Mixed Conditions

Impacts of the proposed dredging discharge on existing water quality in the Missouri River was evaluated after consideration was given for complete mixing of the dredging discharge with the long-term mean flow in the Missouri River. This was accomplished by calculating a flow-weighted average concentration for a water quality constituent based on flow and constituent concentration in the Missouri River and dredging discharge. The average mean daily flow of the Missouri River at Decatur, Nebraska was determined from USGS flow records (USGS gauge 06813500). The average mean daily flow of the Missouri River at Decatur (period of record 1988 -2013) was determined to be 31,442 cfs (range = 7,070 - 189,000 cfs; median = 28,400 cfs).

5.4.2 Existing Missouri River Water Quality

Since 2003, the District has monitored water quality conditions monthly at seven locations along the Missouri River from the Gavins Point Dam tailwaters to Rulo, Nebraska. Constituents monitored monthly include Total Organic Carbon, Total Kjeldahl Nitrogen, Ammonia, Nitrate-Nitrite, Total Phosphorus, and Dissolved Phosphorus. The elutriate testing results of the sediment/soil collected at the proposed Middle Decatur Revetment project site were compared (plotted) to the ambient water quality conditions monitored in the Missouri River over the 5-year period 2008 through 2012 (Figure 10 through Figure 15). Calculation of completely mixed conditions was applied to the estimated pre-elutriate results for Total Organic Carbon, Total Kjeldahl Nitrogen, and Total Phosphorus; and monitored Missouri River water quality conditions over the 11-year period (2003 - 2013) (Table 25). As indicated in Table 25, completely mixed conditions are only slightly highly than average conditions for the three assessed constituents.

Table 25. Completely mixed, flow-weighted conditions for estimated pre-elutriate concentrations of Total Organic Carbon, Total Kjeldahl Nitrogen and Total Phosphorus.

Water Quality Constituent	Missouri River		Dredging Discharge		Completely Mixed Concentration
	Average Flow (cfs)	Average Concentration	Design Flow (cfs)	Average Pre-Elutriate Concentration	
Carbon, Total Organic (mg/L)	31,719	4.89	43.6	325	5.33
Nitrogen, Kjeldahl Total as N (mg/L)	31,719	0.84	43.6	33.6	0.89
Phosphorus, Total (mg/L)	31,179	0.17	43.6	22.1	0.20

5.5 Summary of Water Quality Factual Determinations

- Elutriate testing of the collected sediment/soil samples at the proposed Middle Decatur Revetment project site indicated that all assessed constituents met applicable acute and chronic Nebraska numeric water quality standards criteria. Elutriate testing results were for both dissolved and non-filtered elutriate sample analyses prepared in accordance with the *"Inland Testing Manual"*.
- The proposed dredging discharge at the Middle Decatur Revetment project site would likely have only minor, short-term impacts to the existing water quality of the Missouri River; especially after complete mixing is achieved in the river. Based on analyzed water quality constituents, only minor increases in constituent concentrations, within the natural variability of water quality in the Missouri River, are indicated.
- The dredging discharge to construct SWH at the proposed Middle Decatur Revetment project site would likely cause a slight increase to the nutrient loading currently present in the Missouri River. It is estimated that the mean daily suspended load for Total Kjeldahl Nitrogen could be increased by 1.39%, the mean daily suspended load for Nitrate-Nitrite Nitrogen could be increased by 0.01%, and the mean daily suspended load for Total Phosphorus could be increased by 4.51%. It is noted that the 4.51% increase in the suspended Total Phosphorus loadings is a worst-case estimate. Most of the suspended Total Phosphorus load is bound to particulate matter. As such, most will settle and become incorporated into the bed-load of the Missouri River**.** As indicated by elutriate testing results, the estimated mean suspended Total Phosphorus concentration of 22.1 mg/L (pre-elutriate) could decrease to 0.30 mg/L (non-filtered elutriate) after 1-hour of settling time (i.e. 98.6% of the total phosphorus present in the pre-elutriate samples settled out after 1-hour).

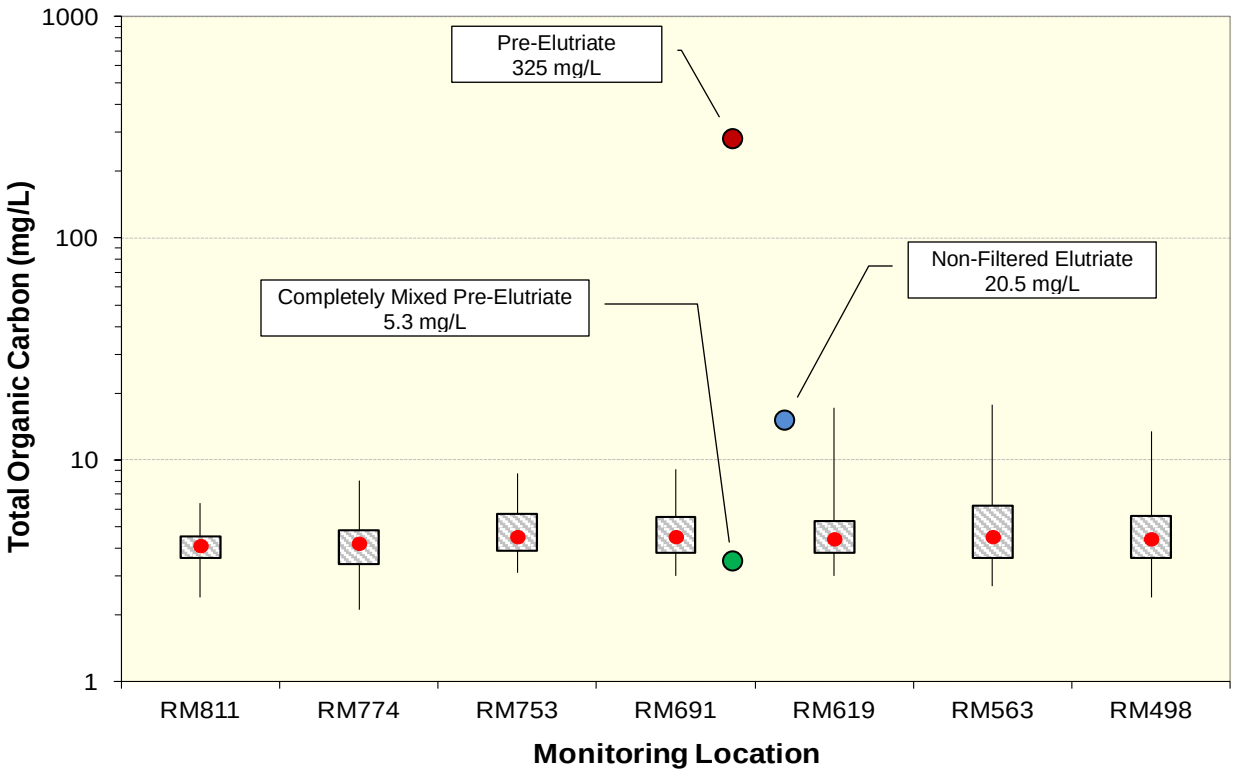


Figure 10. Mean elutriate testing results for Total Organic Carbon as compared to ambient Missouri River conditions monitored over the 5-year period 2008 through 2012**.**

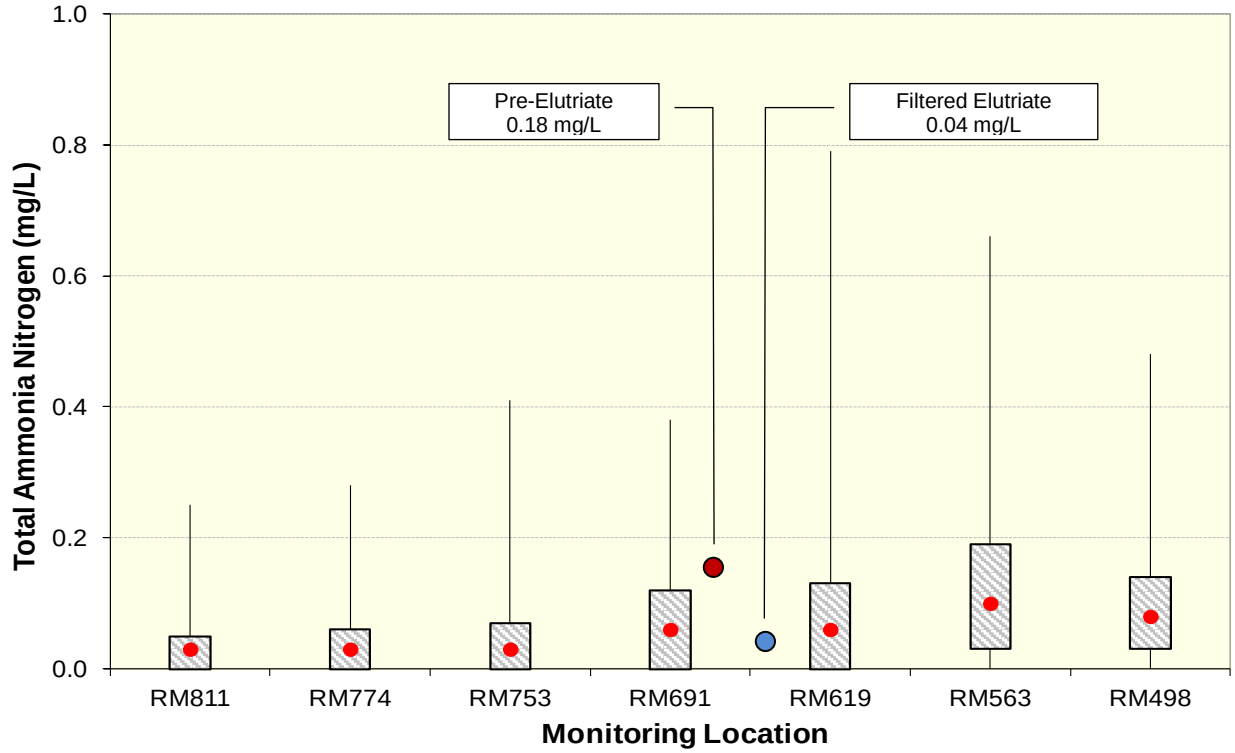


Figure 11. Mean elutriate testing results for Ammonia as compared to ambient Missouri River conditions monitored over the 5-year period 2002 through 2012.

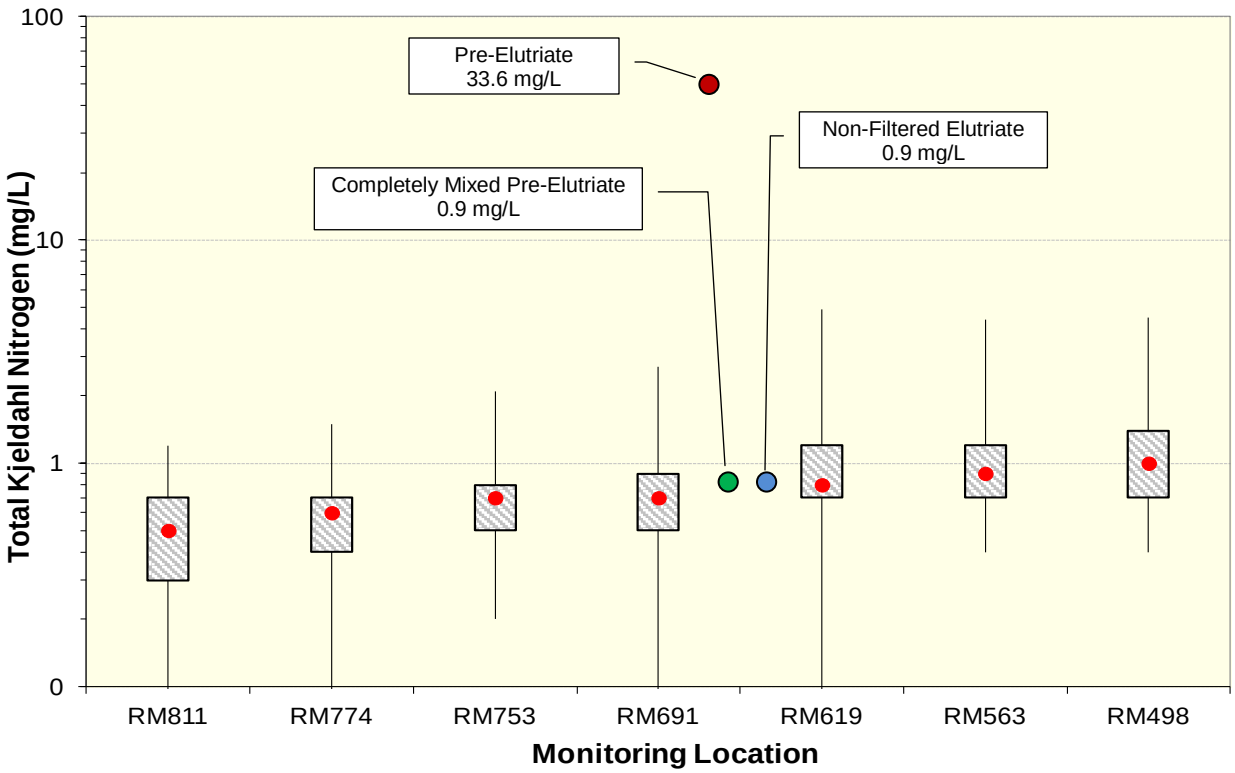


Figure 12. Mean elutriate testing results for Total Kjeldahl Nitrogen as compared to ambient Missouri River conditions monitored over the 5-year period 2008 through 2012.

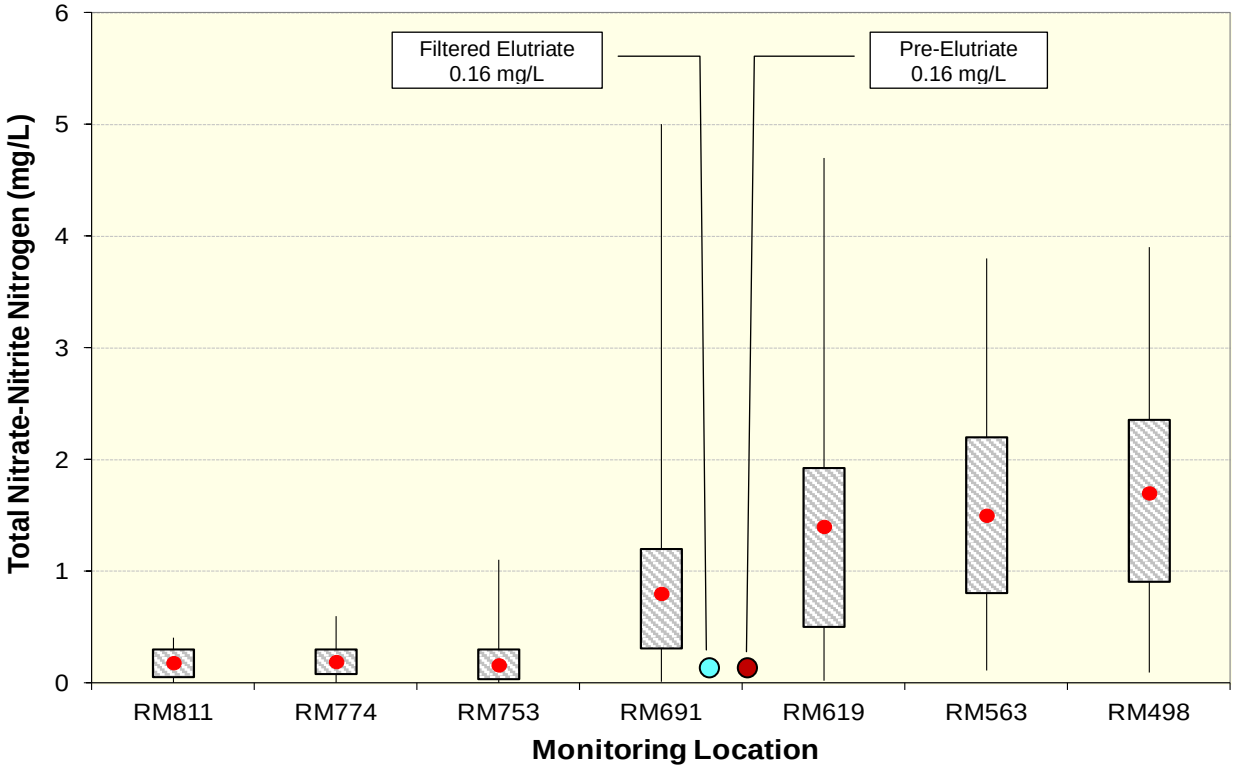


Figure 13. Mean elutriate testing results for Nitrate-Nitrite Nitrogen as compared to ambient Missouri River conditions monitored over the 5-year period 2008 through 2012.

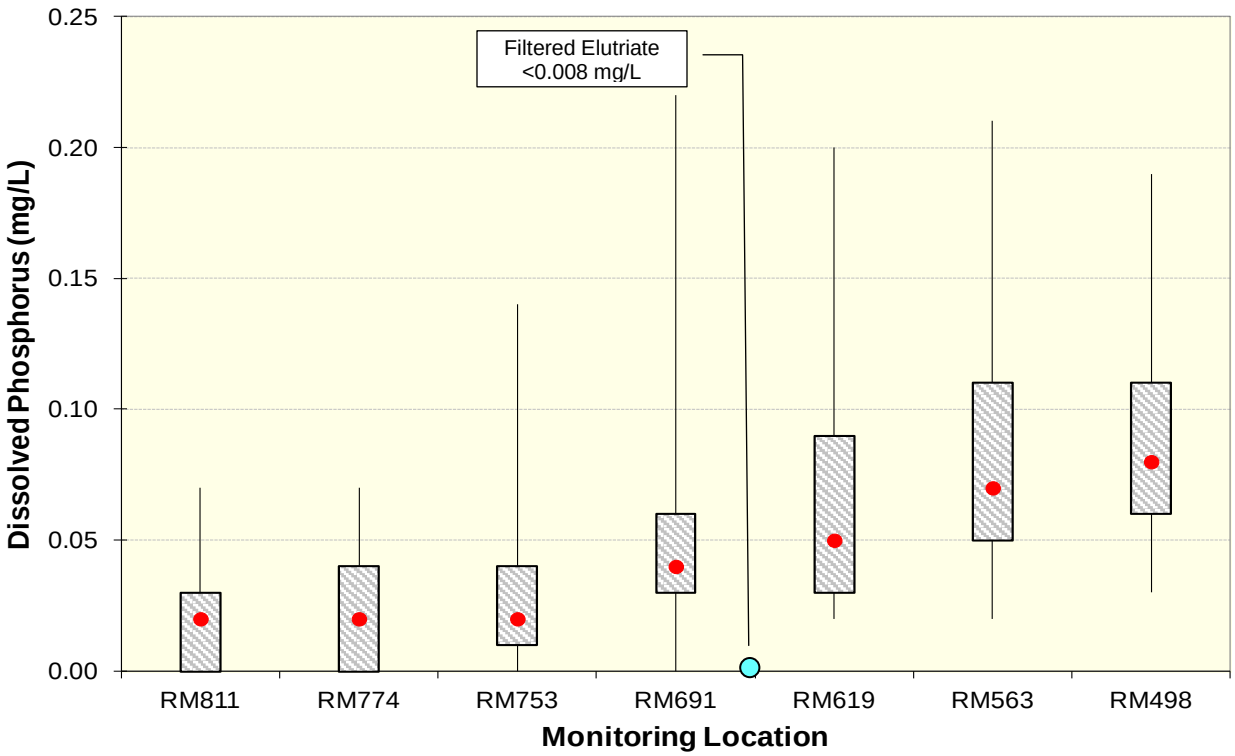


Figure 14. Mean elutriate testing results for Dissolved Phosphorus as compared to ambient Missouri River conditions monitored over the 5-year period 2008 through 2012.

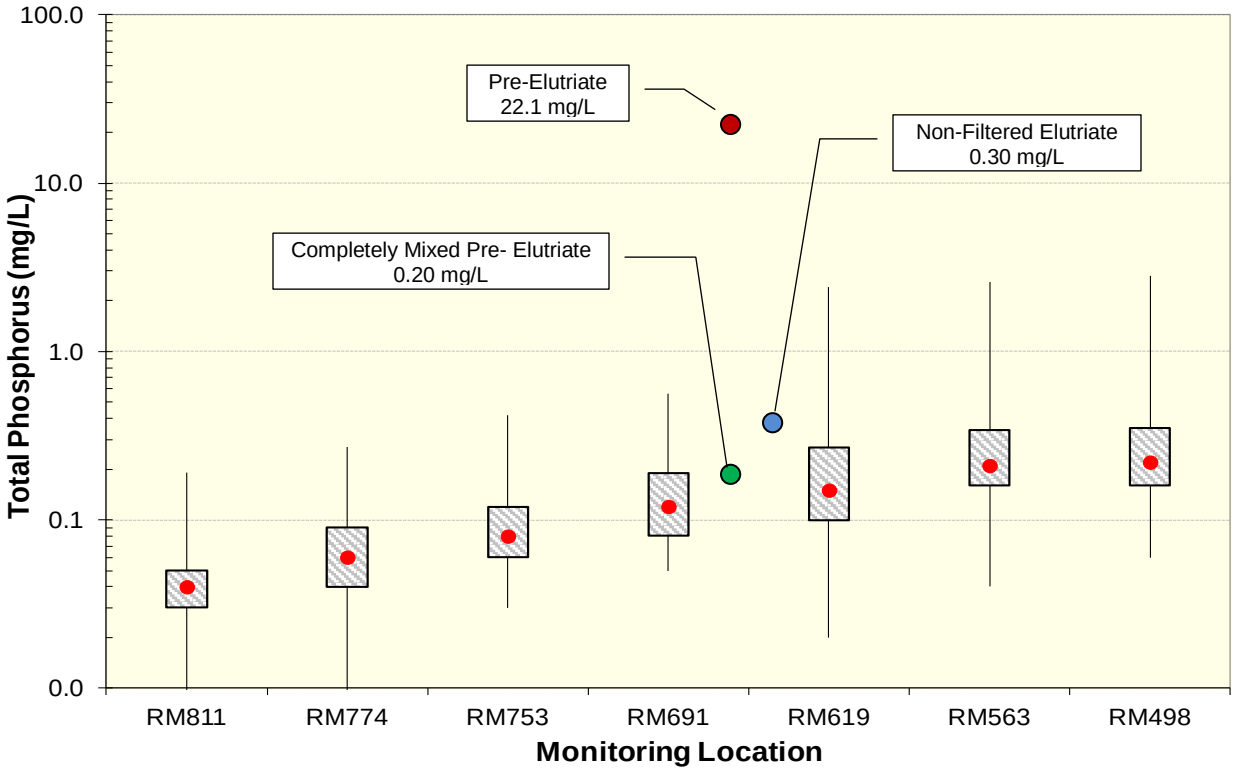


Figure 15. Mean elutriate testing results for Total Phosphorus as compared to ambient Missouri River conditions monitored over the 5-year period 2008 through 2012.

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ATTACHMENT 1.

Sampling and Analysis Plan for 2014 Elutriate Testing at the Middle Decatur Revetment Shallow Water Habitat Site.

QUALITY CONTROL PLAN

for

2014 Elutriate Sampling – Missouri River
Middle Decatur Revetment SWH Project Area

Project Number: SPS-MDECRV-001

Prepared By:

Water Control and Water Quality Section
Hydrologic Engineering Branch
U.S. Army Corps of Engineers – Omaha District

April 2014

Dave Jensen – Water Quality Group	10-Apr-2014 Date
John Hargrave – Water Quality Group	11-Apr.-2014 Date
Bill Otto – Water Quality Group	21 APR 2014 Date
Kellie Bergman USACE – Chief, Water Control and Water Quality Section	14 Apr 2014 Date
USACE – Chief, Sedimentation & Channel Stabilization Section	15 Apr 2014 Date
USACE – (CENWO-PM-AC)	23-Apr 2014 Date

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TABLE OF CONTENTS

Page

1. PROJECT DESCRIPTION

1.1. BACKGROUND INFORMATION

Shallow-water habitat (SWH) will be constructed along the Missouri River at RM688 as part of the Middle Decatur Revetment project. The Omaha District (District) plans to excavate sediment/soil behind an existing revetment to create SWH. As appropriate, removal of sediment/soil would involve hydraulic dredging and it is proposed that the dredge spoil be discharged to the adjacent Missouri River. It is believed the sediment/soil is alluvial material and will be primarily sand with some silts and clays.

1.1.1. Project Location

The proposed Middle Decatur Revetment project site is located along the Missouri River just downstream of Decatur, NE between RM688.3 and RM688.7 (Figure 1). The project site is on the east side of the Missouri River, but is within the legal boundary of the State of Nebraska.

1.1.2. 404 Permitting Requirements

The requirements for a U.S. Army Corps of Engineers (USACE) individual Section 404 permit, as appropriate, must be met for dredging activities to construct SWH at the proposed site. To meet the Section 404 Individual Permit requirements, a Section 401 Certification "letter" will be requested from the Nebraska Department of Environmental Quality (NDEQ) stating that the proposed actions will not "violate" water quality standards. To facilitate review of the proposed Middle Decatur Revetment project for Section 401 Certification, sediment/soil samples will be collected from the proposed dredging sites and analyzed. "Elutriate testing" of selected sediment/soil samples will also be conducted. As appropriate, elutriate testing of collected sediment/soil samples will be in accordance with the U.S. Environmental Protection Agency (USEPA) and USACE guidance document, "Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – *Inland Testing Manual"* (USEPA and USACE, 1998).

2. PROJECT/TASK ORGANIZATION AND RESPONSIBILITIES

The District's Water Control and Water Quality Section will conduct the sampling required to facilitate sediment/soil analyses and elutriate testing of prospective dredge material at the proposed Middle Decatur Revetment project area. Collected samples will be delivered to Midwest Laboratories, Inc. Omaha, NE for analysis and elutriate testing.

<u>Staff Responsibilities and Contacts for Sampling:</u>
Sample Collection: Bill Otto (995-2313), John Hargrave (995-2347)
Sampling Coordination: John Hargrave
Data Quality Review: Dave Jensen (995-2310)
Water Quality Sampling Report: Dave Jensen
Laboratory Analysis: Midwest Laboratories, Prem Arora (402-829-9878)
Middle Decatur Revetment SWH Project Coordinator: Matthew Vandenberg

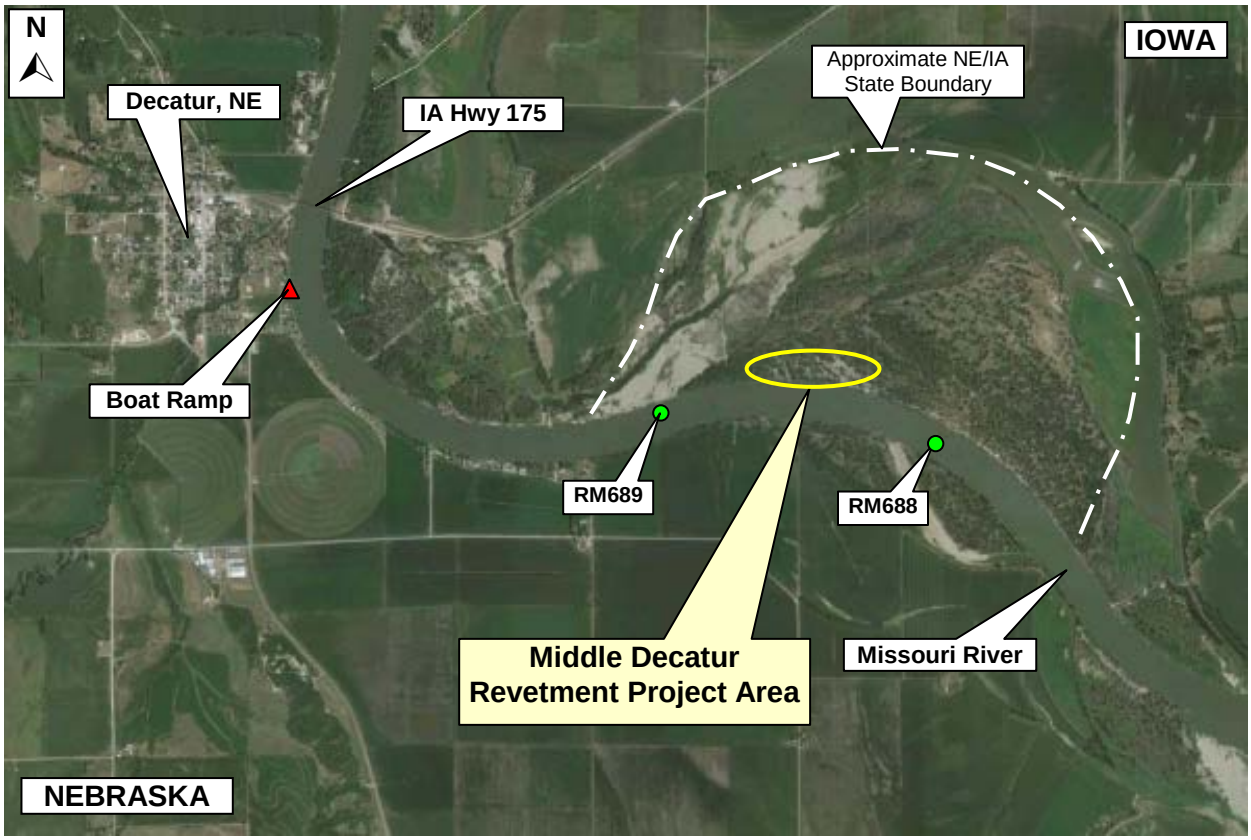

Figure 1. Location of proposed Middle Decatur Revetment project site (*Imagery Date: 18-Jul-2012*).

3. SITE-SPECIFIC WATER QUALITY CONCERNS

3.1. SECTION 303(D) IMPAIRED WATERS LISTINGS

Nebraska's water quality standards identify the Missouri River from the Big Sioux River to the Platte River as designated Segment MT1-10000. Segment MT1-10000 is listed on Nebraska's 2012 Section 303(d) list as impaired due to a fish consumption advisory. The identified parameters of concern are Cancer Risk & Hazard Index Compounds, specifically, Dieldrin and PCBs. After the Nebraska Department of Environmental Quality (NDEQ) published their 2012 Integrated Water Quality Report and Section 303(d) list on 1-April-2012 that listed Segment MT1-10000 as impaired due to the fish consumption advisory in effect, the NDEQ published the report, "Findings of the 2010 Regional Ambient Fish Tissue Program in Nebraska" in June, 2012 (NDEQ, 2012). That report indicated that Dieldrin and PCBs were no longer a fish tissue concern on Segment MT1-10000. This resulted in the fish consumption advisory for the Missouri River regarding Dieldrin and PCBs being removed. Based on the removal of the fish consumption advisory for the Missouri River, the NDEQ's 2014 *"Draft Water Quality Integrated Report*" has removed the impaired listing for Segment MT1-10000. Personnel communication with NDEQ has indicated that elutriate testing for Dieldrin and PCBs to a detection limit of 0.4 parts-per-trillion is no longer required.

3.2. NUTRIENTS

Concerns have been expressed regarding the nutrient enrichment and loading that proposed dredging for SWH construction might pose to the Missouri River and ultimately to the Gulf of Mexico. Currently, no numeric water quality standards criteria have been promulgated by the States of Nebraska or Iowa for the Missouri River regarding nutrient enrichment. The State of Iowa was prepared the "*Iowa Nutrient Reduction Strategy: A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico."* For background information, nutrients will be included in the sediment analysis and elutriate testing of sediment/soil samples collected at the proposed Middle Decatur Revetment project site.

4. DATA QUALITY OBJECTIVES

A Water Quality Sampling Report and Factual Determinations will be prepared that compiles results of the analysis and elutriate testing of representative sediment/soil samples collected at the proposed Middle Decatur Revetment project site, and assesses the water quality impacts the proposed hydraulic dredging at the project site poses to the Missouri River. The report will be provided to the NDEQ to facilitate appropriate Section 401 water quality certification review of the proposed dredging project by the State of Nebraska. The report will also be used by the District to finalize the dredging plan for construction of SWH at the proposed Middle Decatur Revetment project site.

5. DATA COLLECTION APPROACH

5.1. SEDIMENT/SOIL SAMPLING LOCATIONS

Sediment/soil samples will be collected at two sites (MDR-S1 and MDR-S2) located about 300 meters (1,000 feet) apart along the proposed excavation area (Table 1 and Figure 2). The "actual" locations of the sampled sites will be determined with a GPS unit in the field when the samples are collected.

Table 1. Geo-referenced locations of sites targeted for sediment/soil sampling at the proposed Middle Decatur Revetment SWH project site.

Site	Latitude	Longitude
MDR-S1	41° 59' 52.6"	96° 12' 29.7"
MDR-S2	41° 59' 51.3"	96° 12' 16.4"

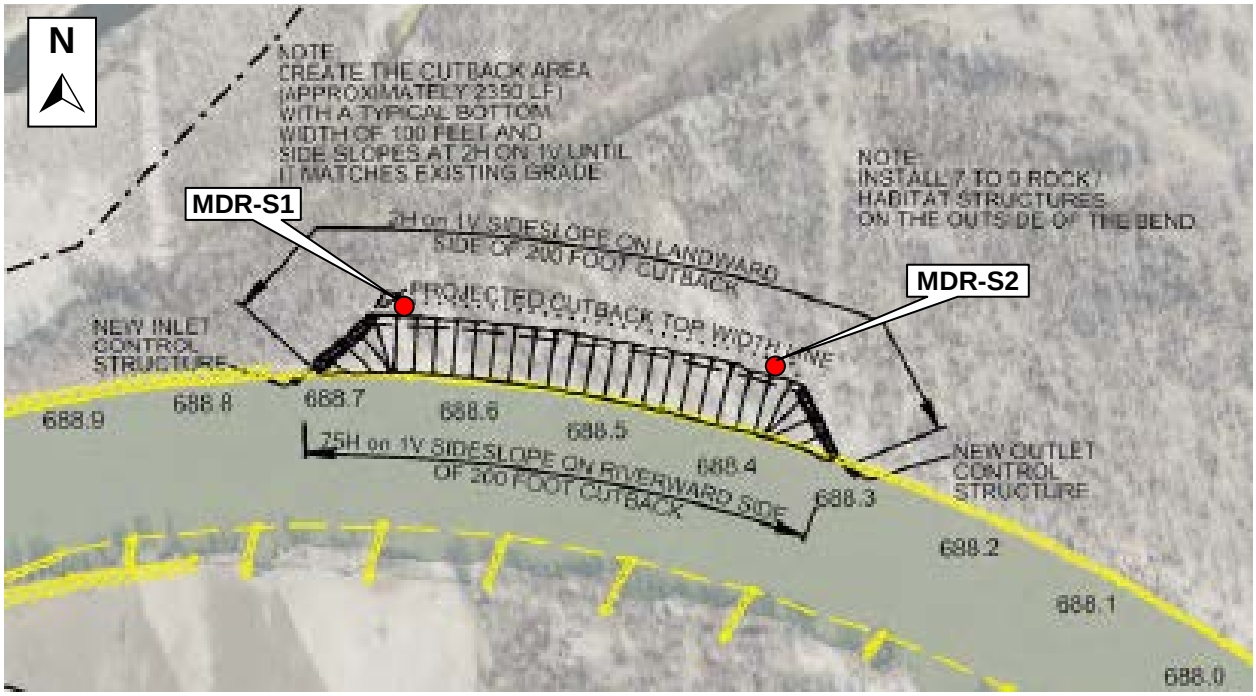

Figure 2. Location of sediment/soil sampling sites at the proposed Middle Decatur Revetment project site.

5.2. MEASUREMENT AND SAMPLING METHODS

5.2.1. Receiving Water Sample

Water collected from the Missouri River near the project site (i.e., receiving water) will be used for elutriate testing. The laboratory requires 2 parts receiving water for each 1 part of soil/sediment to be analyzed. In addition to the 2 parts of water for each 1 part soil/sediment, additional receiving water is required for analysis. The receiving water will be collected at the Decatur, NE boat ramp (Figure 1).

At the time the receiving water is collected, the following field measurements will be taken: water temperature, dissolved oxygen (mg/L and % saturation), pH, specific conductance, and turbidity. These measurements will be obtained with a "HydroLab" equipped with a MS5 DataSonde and Surveyor data logger. Measurements will be taken by immersion of the DataSonde directly into the river and the measurements will be appropriately recorded on a field sheet (Attachment 1).

5.2.2. Sediment/Soil Samples

Sediment/soil samples will be collected at two locations (MDR-S1 and MDR-S2). At each site an attempt will be made to collect composite sediment/soil samples in 2-foot increments from the surface to a depth of 10 feet (i.e. five 2-foot composite samples). Once the water table is encountered, sediment/soil sample collection to deeper depths will be contingent upon the bore-hole integrity being maintained. The side walls of the bore hole have a high

tendency to collapse when boring through saturated and/or highly-sandy, unconsolidated sediment/soil.

5.2.2.1. Equipment and Supplies

The equipment, supplies, and procedures to be used to collect the sediment/soil samples are as follows.

1) Gas powered boring unit
2) Gasoline
3) Stainless steel auger (3¼ inch diameter)
4) Stainless steel auger rods
5) 1-gallon wide-mouth glass jars (elutriate testing sediment samples)
6) 1-gallon narrow-mouth glass jugs (elutriate testing receiving water)
7) 500-mL wide mouth plastic bottles (nutrient testing sediment samples)
8) 1-liter wide-mouth plastic bottles (foe composite sediment samples)
9) Sample bottle labels
10) Chain-of-Custody (COC) form
11) Field sheets
12) GPS device
13) 5-gallon plastic buckets
14) Shovel
15) Miscellaneous tools to remove collected sediment from coring device (i.e., wood stakes, mallet, screwdriver, putty knife, etc.)
16) Scrub brush

5.2.2.2. Sediment/Soil Collection Procedure

1) Locate sample site and record general information (including Latitude/Longitude) on the field sheet.
2) Remove any vegetation near the located boring site (2-3 foot diameter circle).
3) Set out equipment near the boring site making sure to keep extraneous material out of the sample collection bucket.
4) Assemble powered boring unit, auger rods, and auger. Bore down and collect sediment/soil through appropriate 2-foot depth increment, collecting bored material in a 5-gallon plastic bucket.
5) When all sediment/soil material from a 2-foot depth increment has been collected in the 5-gallon plastic bucket, mix the contents thoroughly and fill one 1-liter and one 500-mL plastic bottles. The filled 500-mL plastic bottle is capped and labeled. The filled 1-L bottle is retained for preparing the 10-foot composite sediment/soil sample for elutriate.
6) The five 1-liter sediment/soil samples (i.e. 2-foot increments) are combined in the 5-gallon bucket and thoroughly mixed to prepare a composited 10-foot sediment/soil sample. If hole collapse prevents boring to a depth of 10 feet, a composited sample is prepared for the maximum depth bored. A 1-gallon wide-mouth glass jar is filled from the 10-foot composited sample, or appropriate maximum depth composite sample, and labeled.
7) Clean the coring device, tools and sample collection bucket between sample collections.
8) The collected sediment/soil samples and a chain-of-custody form are delivered to the laboratory analyzing the samples and conducting the elutriate testing.

5.2.3. Preparation of Elutriate Samples

Elutriate testing will been done on the 10-foot composited sediment/soil samples, or maximum depth composite samples if less than a 10-foot depth is bored, collected at sites MDR-S1 and MDR-S2. The procedures that will be used to process collected sediment/soil samples for elutriate testing is depicted in Figure 3.

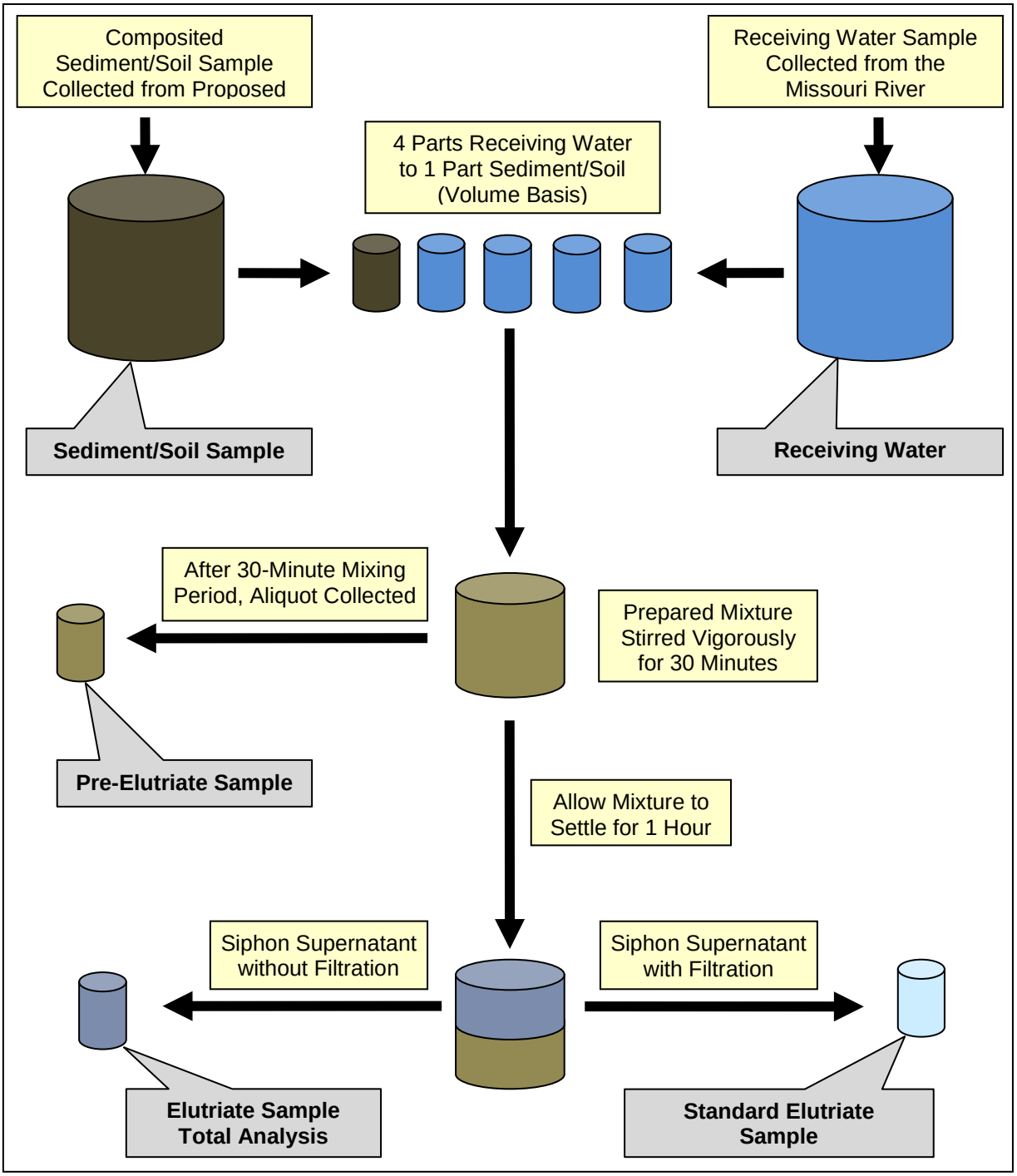

Figure 3. Procedures to be used to process collected sediment/soil samples for elutriate testing.

5.2.3.1. Standard Elutriate Samples

Standard elutriate samples will be prepared in accordance with the "*Inland Testing Manual*." The elutriate sample is prepared in the laboratory by sub-sampling approximately 1-liter of the collected sediment/soil composite sample from the well-mixed original sample. The sediment material and collected receiving water (i.e. Missouri River water collected at the Decatur, NE boat ramp) are then combined in a sediment-to-water ratio of 1:4 on a volume basis at room temperature (22 ± 2°C). The 1:4 sediment-to-water ratio is believed to represent "end-of-pipe" discharge conditions for hydraulic dredging**.** After the correct ratio is achieved, the mixture is stirred vigorously for 30 minutes with a mechanical stirrer/shaker. After the 30-minute mixing period, the mixture is allowed to settle for one hour. The supernatant is then siphoned off without disturbing the settled material. Analysis for total constituents is done on the supernatant without filtration, and the supernatant is filtered through a 0.45-micron filter for analysis of dissolved constituents. The filtered water is the standard elutriate sample identified by the *"Inland Testing Manual"* and represents the soluble constituents that could be released from dredged material during the hydraulic dredging process.

5.2.3.2. Pre-Elutriate Samples

Pre-elutriate samples will be prepared for analysis of selected constituents. The pre-elutriate samples are prepared the same as standard elutriate samples through the point of the 30-minute mixing period. At that time an aliquot of water is immediately drawn off the mixed solution and identified as the pre-elutriate sample. The pre-elutriate sample is believed to represent conditions of the "end-of-pipe" hydraulic dredging discharge slurry prior to any mixing with the receiving water (i.e. Missouri River).

5.3. SAMPLE HANDLING, CUSTODY, AND TRANSPORT

The collected samples will be transported by sampling personnel to Midwest Laboratories, Inc. in Omaha, Nebraska for elutriate testing and analysis. A Chain-of-Custody (COC) will be completed and submitted with the samples delivered to the laboratory. Samples are to be at all times stored in an upright condition. Samples will be transported by Water Quality Group personnel directly to Midwest Laboratories. Laboratory personnel should be alerted an appropriate time in advance of when samples are going to be delivered so any necessary arrangements for sample receipt by Midwest Laboratories can be made.

Samples delivered to Midwest Laboratories by Water Quality Group personnel will be taken to a staging area and grouped by sample location. This will provide an accurate count of sample bottles delivered and allow for ease of log in by laboratory personnel. Laboratory personnel will compare the physical samples to information on the COC, sign and date the form, and provide a copy. The original COC form will be retained by the laboratory.

5.4. PARAMETERS TO BE MEASURED

The parameters that will be measured or analyzed for the different types of samples are listed in Table 2.

Table 2. Parameters to be measured and analyzed.

Parameter	Soil Elutriate Analysis	Soil Nutrient Analysis	Receiving Water	Pre-Elutriate Water	Elutriate Water	
					Non-Filtered	Filtered
FIELD MEASUREMENTS						
Water Temperature (°C)			X			
Dissolved Oxygen (mg/L and % Sat)			X			
pH (S.U.)			X			
Specific Conductance (µS/cm)			X			
Turbidity			X			
PHYSICAL AND AGGREGATE PROPERTIES						
Particle Size	X	X				
Percent Solids	X	X				
pH	X	X				X
Total Suspended Solids			X	X	X	
Turbidity				X	X	
NUTRIENTS						
Nitrogen, Ammonia as N	X	X	X	X	X	X
Nitrogen, Nitrate/Nitrite as N)	X	X	X	X		X
Nitrogen, Total Kjeldahl as N	X	X	X	X	X	
Phosphorus, Dissolved			X			X
Phosphorus, Orthophosphate			X			X
Phosphorus, Total	X	X	X	X	X	
AGGREGATE ORGANIC CONSTITUENTS						
CBOD			X	X	X	
Chemical Oxygen Demand			X	X	X	
Organic Carbon, Total	X	X	X	X	X	
METALS (Dissolved)						
Dissolved Metals Scan			X			X
METALS (Total)						
Total Metals Scan			X	X	X	
Arsenic, Total	X					
Cadmium, Total	X					
Chromium, Total	X					
Copper, Total	X					
Lead, Total	X					
Mercury, Total	X					
Nickel, Total	X					
Zinc Total	X					
PESTICIDES and PCBs						
Atrazine	X		X		X	
Organochlorine Pesticide/PCB Scan	X		X		X	

All collected sediment/soil samples (i.e. 2-foot and 10-foot or and maximum-depth composites) will be analyzed for: Particle Size, pH, Ammonia, Nitrate/Nitrite, Total Kjeldahl Nitrogen, Total Phosphorus, and Total Organic Carbon (Table 2). The 10-foot or maximum depth composited sediment/soil samples will also be analyzed for Total Metals, Atrazine, and Organochlorine/PCB Scan (Table 2).

5.5. LABORATORY ANALYTICAL METHODS AND COSTS

Table 3 provides methods, detection limits, and costs for parameters to be analyzed on collected sediment/soil samples. Table 5 provides methods, detection limits, and costs for parameters to be analyzed on pre-elutriate samples. Table 7 provides methods, detection limits, and costs for parameters to be analyzed on standard filtered elutriate samples. Table 8 provides methods, detection limits, and costs for parameters to be analyzed on non-filtered elutriate samples. Table 10 provides methods, detection limits, and costs for parameters to be analyzed on receiving water.

Table. 3. Parameters to be Analyzed on Collected Sediment/Soil Samples and Unit Costs.

Parameter	Method	Detection Limit	Analytical Cost
PHYSICAL AND AGGREGATE PROPERTIES			
Particle Size	Sieve (Minimum Sieve #200)	0.001 mm	$65.00
Percent Solids	SM 2540 G	0.01%	10.00
pH	EPA 150.1	0.1 S.U.*	10.20
NUTRIENTS			
Nitrogen, Ammonia Total as N	EPA 350.1	0.02 mg/kg	26.00
Nitrogen, Kjeldahl Total as N	EPA 351.3	0.2 mg/kg	27.50
Nitrogen, Nitrate/Nitrite Total as N	EPA 353.2	0.02 mg/kg	13.50
Phosphorus, Total	SM4500PF	0.02 mg/kg	27.00
AGGREGATE ORGANIC CONSTITUENTS			
Total Organic Carbon	EPA 415.1	0.4 mg/kg	20.40
Total Laboratory Cost for Analyzing a Soil Sample for Nutrients Only			**$199.60**
TOTAL METALS			
Arsenic, Total	EPA 6010B	10 mg/kg	13.00
Cadmium, Total	EPA 6010B	0.2 mg/kg	13.00
Chromium, Total	EPA 6010B	1 mg/kg	13.00
Copper, Total	EPA 6010B	1 mg/kg	13.00
Lead, Total	EPA 6010B	13 mg/kg	13.00
Mercury, Total	EPA 6010B	0.1 mg/kg	41.95
Nickel, Total	EPA 6010B	1 mg/kg	13.00
Zinc Total	EPA 6010B	2 mg/kg	13.00
PESTICIDES AND PCBs			
Atrazine, Total	EPA 507	0.05 mg/kg	85.00
Organochlorine Pesticide and PCB Scan	EPA 8081 and EPA 8082	See Table 4	180.00
		Subtotal	**$397.95**
Total Laboratory Cost for Analyzing a Soil Sample for Elutriate Testing			**$597.55**

* Resolution limit.

Table 4. Detection and Reporting Limits for individual parameters included in the Organochlorine Pesticide and PCB Scan of sediment/soil samples.

Parameter	Detection Limit (µg/kg)	Reporting Limit (µg/kg)	Parameter	Detection Limit (µg/kg)	Reporting Limit (µg/kg)
DDE	0.8	9.9	Alpha-BHC (alpha-Lindane)	0.4	5.1
DDD	0.7	9.9	Beta-BHC (beta-Lindane)	1.0	5.1
DDT	1.0	9.9	Delta-BHC (delta-Lindane)	1.8	5.1
Methoxychlor	1.2	5.1	Gamma-BHC (gamma-Lindane)	0.6	5.1
Aldrin	0.7	5.1	Gamma-Chlordane	0.8	5.1
Dieldrin	0.7	9.9	PCB - Aroclor1016	10	50
Endosulfan 1	0.7	5.1	PCB - Aroclor1260	10	50
Endosulfan 2	0.8	9.9	PCB - Aroclor1221	10	50
Endosulfan Sulfate	1.0	9.9	PCB - Aroclor1248	10	50
Endrin	1.0	9.9	PCB - Aroclor1268	10	50
Endrin Aldehyde	1.0	9.9	PCB - Aroclor1232	10	50
Endrin Ketone	0.8	9.9	PCB - Aroclor1254	10	50
Heptachlor	0.6	5.1	PCB - Aroclor1242	10	50
Heptachlor Epoxide	0.8	5.1	PCB - Aroclor1262	10	50
Alpha-Chlordane	0.8	5.1			

Table. 5. Parameters to be Analyzed in Pre-Elutriate Water Samples and Unit Costs.

Parameter*	Method	Detection Limit	Analytical Cost
SAMPLE PREPARATION			
Elutriate Sample Preparation	1:4 Sediment:Receiving Water	-----	$182.10
PHYSICAL AND AGGREGATE PROPERTIES			
Total Suspended Solids	EPA 160.1	5 mg/l	11.10
Turbidity	EPA 180.1	1 NTU	13.75
NUTRIENTS			
Nitrogen, Ammonia as N,	EPA 350.1	0.02 mg/l	18.05
Nitrogen, Total Kjeldahl as N	EPA 351.3	0.2 mg/l	20.95
Nitrogen, Nitrate/Nitrite as N	EPA 353.2	0.02 mg/l	13.50
Phosphorus, Total	SM4500PF	0.02 mg/l	19.20
AGGREGATE ORGANIC CONSTITUENTS			
CBOD	SM 5210.B	1 mg/l	29.65
Chemical Oxygen Demand	ASTM D1252	3 mg/l	18.60
Organic Carbon, Total	EPA 415.1	0.4 mg/l	27.00
METALS			
Total Metals Scan	EPA 6010B	See Table 6	171.65
Total Laboratory Cost for Analyzing a Pre-Elutriate Water Sample			**$525.55**

Table 6. Detection and Reporting Limits for individual metals included in the Total and Dissolved Metals Scan of analyzed water samples.

Metal	Detection Limit (µg/l)	Reporting Limit (µg/l)	Metal	Detection Limit (µg/l)	Reporting Limit (µg/l)
Aluminum	20	50	Lead	0.5	2
Antimony	0.03	0.5	Magnesium	1,000	3,000
Arsenic	1	3	Manganese	2	10
Beryllium	0.2	1	Mercury	0.02	0.05
Cadmium	0.2	1	Nickel	2	10
Calcium	1,000	3,000	Selenium	0.4	1
Chromium III	4	10	Silver	0.05	1
Copper	2	10	Thallium	0.05	0.5
Iron	5	50	Zinc	2	10

Table 7. Parameters to be Analyzed in Standard Filtered Elutriate Water Samples and Unit Costs.

Parameter	Method	Detection Limit	Analytical Cost
PHYSICAL AND AGGREGATE PROPERTIES			
pH	EPA 150.1	0.1 S.U.*	$10.20
NUTRIENTS			
Nitrogen, Ammonia as N	EPA 350.1	0.02 mg/l	18.05
Nitrogen, Nitrate/Nitrite as N (mg/l)	EPA 353.2	0.02 mg/l	13.50
Phosphorus, Dissolved	SM4500PF	0.02 mg/l	19.20
Phosphorus, Orthophosphate	EPA 365.1	0.02 mg/l	14.30
METALS			
Dissolved Metals Scan	EPA 6010B	See Table 6	171.65
Total Laboratory Cost for Analyzing a Standard Filtered Elutriate Water Sample			**$246.90**

* Resolution limit.

Table. 8. Parameters to be Analyzed in Non-Filtered Elutriate Water Samples and Unit Costs.

Parameter*	Method	Detection Limit	Analytical Cost
PHYSICAL AND AGGREGATE PROPERTIES			
Total Suspended Solids	EPA 160.1	5 mg/l	$11.10
Turbidity	EPA 180.1	1 NTU	13.75
NUTRIENTS			
Nitrogen, Ammonia as N	EPA 350.1	0.02 mg/l	18.05
Nitrogen, Total Kjeldahl as N	EPA 351.3	0.2 mg/l	20.95
Nitrogen, Nitrate-Nitrite as N	EPA 353.2	0.02 mg/l	13.50
Phosphorus, Total	SM4500PF	0.02 mg/l	19.20
AGGREGATE ORGANIC CONSTITUENTS			
CBOD	SM 5210.B	1 mg/l	29.65
Chemical Oxygen Demand	ASTM D1252	3 mg/l	18.60
Organic Carbon, Total	EPA 415.1	0.4 mg/l	27.00
METALS TOTAL			
Total Metals Scan	EPA 6010B	See Table 6	171.65
PESTICIDES and PCBs			
Atrazine	EPA 507	0.05 mg/kg	166.45
Organochlorine Pesticide and PCB Scan (ug/l)	EPA 8081 EPA 8082	See Table 9	183.60
Total Laboratory Cost for Analyzing a Pre-Elutriate Water Sample			**$693.50**

Table 9. Detection and Reporting Limits for individual parameters included in the Organochlorine Pesticide and PCB Scan of water samples.

Parameter	Detection Limit (µg/l)	Reporting Limit (µg/l)	Parameter	Detection Limit (µg/l)	Reporting Limit (µg/l)
DDE	0.005	0.1	Alpha-BHC (alpha-Lindane)	0.009	0.05
DDD	0.005	0.1	Beta-BHC (beta-Lindane)	0.009	0.05
DDT	0.004	0.1	Delta-BHC (delta-Lindane)	0.014	0.05
Methoxychlor	0.005	0.5	Gamma-BHC (gamma-Lindane)	0.035	0.05
Aldrin	0.008	0.5	Gamma-Chlordane	0.006	0.05
Dieldrin	0.004	0.1	PCB - Aroclor1016	0.2	1.0
Endosulfan 1	0.006	0.05	PCB - Aroclor1260	0.2	1.0
Endosulfan 2	0.003	0.1	PCB - Aroclor1221	0.2	2.0
Endosulfan Sulfate	0.010	0.1	PCB - Aroclor1248	0.3	1.0
Endrin	0.003	0.1	PCB - Aroclor1268	0.3	1.0
Endrin Aldehyde	0.011	0.1	PCB - Aroclor1232	0.2	1.0
Endrin Ketone	0.006	0.1	PCB - Aroclor1254	0.2	1.0
Heptachlor	0.009	0.05	PCB - Aroclor1242	0.2	1.0
Heptachlor Epoxide	0.007	0.05	PCB - Aroclor1262	0.2	1.0
Alpha-Chlordane	0.011	0.05			

Table 10. Parameters to be Analyzed on Receiving Water Sample and Unit Costs.

Parameter	Method	Detection Limit	Analytical Cost
PHYSICAL AND AGGREGATE PROPERTIES			
Total Suspended Solids	EPA 160.2	5 mg/l	$11.10
NUTRIENTS			
Nitrogen, Ammonia as N, Total	EPA 350.1	0.02 mg/l	18.05
Nitrogen, Total Kjeldahl as N	EPA 351.3	0.2 mg/l	20.95
Nitrogen, Nitrate/Nitrite as N	EPA 353.2	0.02 mg/l	13.50
Phosphorus, Dissolved	SM4500PF	0.02 mg/l	19.20
Phosphorus, Total	SM4500PF	0.02 mg/l	19.20
Phosphorus, Orthophosphate	EPA 365.1	0.02 mg/l	14.30
AGGREGATE ORGANIC CONSTITUENTS			
Carbonaceous Biochemical Oxygen Demand - CBOD (mg/l)	SM 5210.B	1 mg/l	29.65
Chemical Oxygen Demand	ASTM D1252	3 mg/l	18.60
Organic Carbon, Total	EPA 415.1	0.4 mg/l	27.00
METALS			
Dissolved Metals Scan	EPA 6010B	See Table 6	171.65
Total Metals Scan	EPA 6010B	See Table 6	171.65
PESTICIDES AND PCBs			
Organochlorine Pesticide and PCB Scan	EPA 8081 EPA 8082	See Table 8	183.60
Atrazine	EPA 507	0.05 mg/kg	166.45
Total Laboratory Cost for Analyzing the Receiving Water Sample			**$884.90**

5.6. QUALITY CONTROL

5.6.1. Adherence to Standard Operating Procedures and Quality Control Plans

Where applicable, field measurements and samples will be collected in accordance with Standard Operating Procedures (SOPs) developed by the Omaha District's Water Control and Water Quality Section.

Laboratory quality control samples and data quality indicators will be utilized in accordance with Midwest Laboratory's Quality Assurance Manual. Routine internal quality control checks are placed in the measurement system to assess the quality of the data generated. These checks typically include, with each preparative batch: a Method Blank, a Matrix Spike and Matrix Spike Duplicate, a Laboratory Duplicate, and a Laboratory Control Sample. Inclusion of the Matrix Spike, Matrix Spike Duplicate and Laboratory Duplicate are contingent on sufficient sample material being provided. In addition to the checks within the preparative batch there are analysis batch checks that are also completed (retained on file by the laboratory, but typically not reported in a standard data package) including Calibration Blanks, Initial Calibration Verifications, and Continuing Calibration Verifications. Additional samples are analyzed periodically (results retained on file) and may include reagent blanks, second source check standards and other performance checks. External quality control checks are provided in the form of Performance and System Audits and Surveillance.

5.6.2. Data Quality Review

All water quality measurements and analyses will be verified, validated, and compiled in accordance with SOP WQ-27202: Data Quality Review.

6. WATER QUALITY SAMPLING REPORT AND FACTUAL DETERMINATIONS

A Water Quality Sampling Report and Factual Determinations (WQSRFD) will be prepared that provides the results of the analysis and elutriate testing conducted on sediment/soil samples collected at the proposed Middle Decatur Revetment project site. Elutriate testing results will be evaluated to assess potential impacts the proposed hydraulic dredging at the site poses to water quality and nutrient loading in the Missouri River. As appropriate, elutriate results will be:

1) Compared to applicable State (i.e. Nebraska) water quality standards,
2) Evaluated for degradation of existing water quality conditions in the Missouri River, and
3) Compared to current nutrient loadings in the Missouri River.

The prepared WQSRFD will be subject to a "Peer Review/Report Check Certification" prior to release of the report to the public.

7. PROJECTED COSTS FOR LABOR AND LABORATORY ANALYSES

7.1. LABOR

Water Control and Water Quality staff time for preparation of Quality Control Plan, field collection of identified samples, quality control review of received laboratory results, and preparation of a Water Quality Sampling Report and Factual Determinations. Table 11 provides an estimate of the labor costs for the Water Control and Water Quality Section.

Table 11. Estimated labor costs to collect identified sediment/soil samples, data quality review of laboratory results, and prepare Water Quality Sampling Report and Factual Determinations.

Activity	Man Hours (hrs)	Cost ($)
Sample Collection – Field		
Travel (2 persons, 1 trip at 2 hours) and Field Preparation	12	1,000
Sediment/soil sample collection (3 persons,1 hr per site, 2 sites)	6	600
Data Quality Review	8	1,000
Prepare Water Quality Sampling Report and Factual Determinations	40	5,000
TOTAL	**64 hrs**	**$7,600**

7.2. LABORATORY ANALYSES (MIDWEST LABORATORIES):

Laboratory Analysis (Midwest Laboratories):

Analyzed Media	Number of Samples	Unit Cost per Sample	Total Cost
Soil – All Analysis	2	$597.55	$1,195
Soil – Nutrients	10	$199.60	$1,996
Pre-Elutriate	2	$525.55	$1,051
Filtered Elutriate	2	$246.90	$494
Non-Filtered Elutriate	2	$693.50	$1,387
Receiving Water	1	$884.90	$885
TOTAL ANALYTICAL COSTS			**$7,008**

8. REFERENCES

Iowa Department of Agricultural and land Stewardship, Iowa Department of natural Resources, and Iowa State University College of Agriculture and Life Sciences. 2012. Iowa Nutrient Strategy – A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico. November, 2012. http://www.nutrientstrategy.iastate.edu/

Nebraska Department of Environmental Quality. 2012. Findings of the 2010 Regional Ambient Fish Tissue Program in Nebraska. June 2012. Water Quality Assessment Section, Nebraska Department of Environmental Quality, Lincoln, NE.

USEPA and USACE. 1998. Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Test Manual: Inland Testing Manual. EPA-823-B-98-004, February 1998. U.S. Environmental Protection Agency, Office of Water. Department of Army, U.S. Army Corps of Engineers. Washington, D.C

ATTACHMENT 1. Field Sheet for Wilson Island Elutriate Monitoring Project.

(U.S. Army Corps of Engineers – Omaha District – Water Quality Group)

FIELD DATA SHEET

Project Name: Middle Decatur Revetment Elutriate Monitoring **Project Number:** SPS-MDECRV-001

Trip Number: _____ **Date:** _____

Site Location: Missouri River (RM688)

Collectors: _____

GPS MEASUREMENTS

GPS Device Used: _____

MDR-S1: Latitude: _____ Longitude: _____

MDR-S2: Latitude: _____ Longitude: _____

SEDIMENT/SOIL SAMPLES

Sample Type	Sample ID	Sampled Depth	Collection Time	Sampling Method
Sediment/Soil Sample	MDR-S1	0 - 10		Composite Core
Sediment/Soil Sample	MDR-S1A	0 - 2		Composite Core
Sediment/Soil Sample	MDR-S1B	2 - 4		Composite Core
Sediment/Soil Sample	MDR-S1C	4 - 6		Composite Core
Sediment/Soil Sample	MDR-S1D	6 - 8		Composite Core
Sediment/Soil Sample	MDR-S1E	8 - 10		Composite Core
Sediment/Soil Sample	MDR-S2	0 - 10		Composite Core
Sediment/Soil Sample	MDR-S2A	0 - 2		Composite Core
Sediment/Soil Sample	MDR-S2B	2 - 4		Composite Core
Sediment/Soil Sample	MDR-S2C	4 - 6		Composite Core
Sediment/Soil Sample	MDR-S2D	6 - 8		Composite Core
Sediment/Soil Sample	MDR-S2E	8 - 10		Composite Core

WATER QUALITY MEASUREMENTS (Decatur, NE Boat Ramp)

Time:

Temp. (°C)	pH (S.U.)	Cond. (uS/cm)	D.O. (mg/L)	D.O. (%Sat)	Turbidity (NTUs)

ATTACHMENT 2.

Particle Size Distribution Reports for Sediment/Soil Samples Collected at the Proposed Middle Decatur Revetment Shallow Water Habitat Site.

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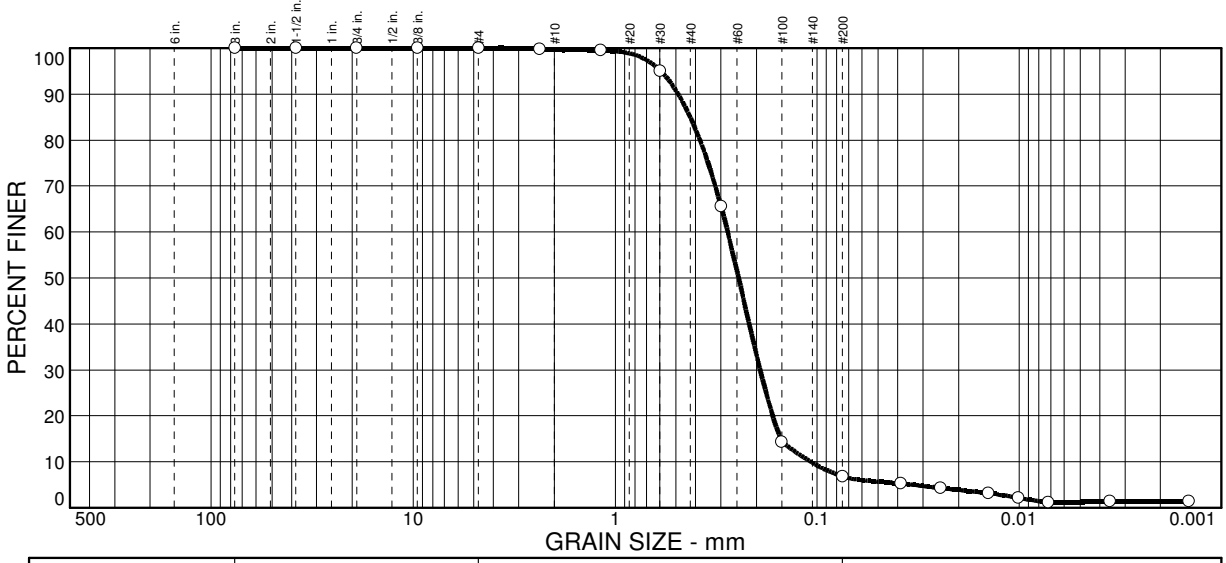
Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266899 **Source of Sample:** **Date:** 05/08/14
Location: MDR-S1 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.3	14.8	78.1	5.5	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	99.8		
#16	99.5		
#30	95.1		
#50	65.6		
#100	14.4		
#200	6.8		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.426 D_{60}= 0.278 D_{50}= 0.246
D_{30}= 0.192 D_{15}= 0.152 D_{10}= 0.108
C_u= 2.58 C_c= 1.23

Classification
USCS= AASHTO=

Remarks

Figure

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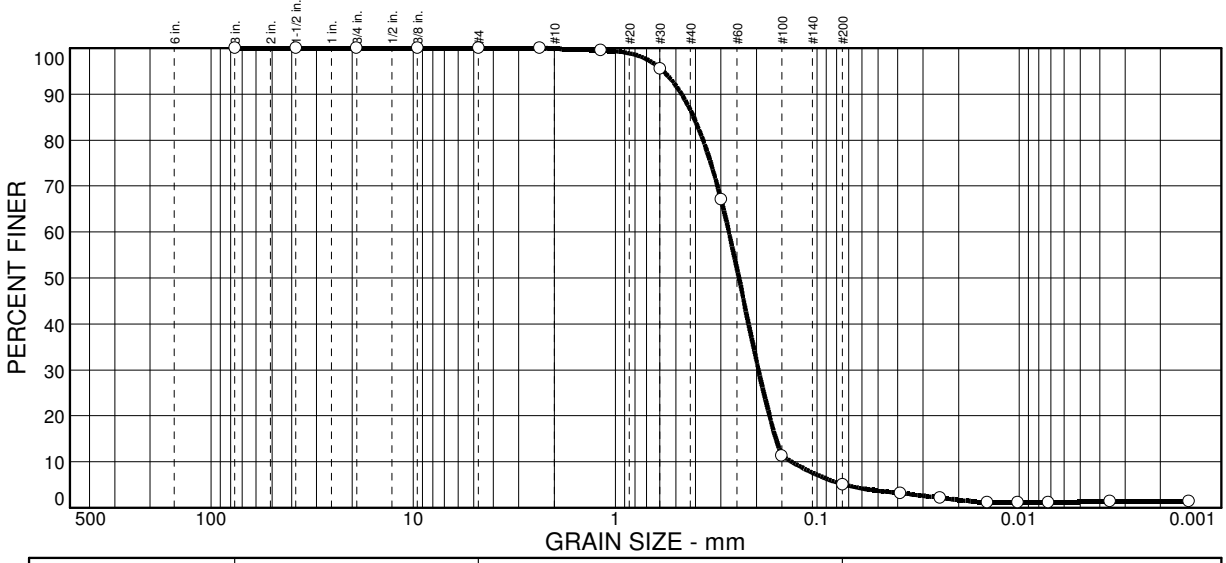
Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266901 **Source of Sample:** **Date:** 05/08/14
Location: MDR-S1A **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	13.4	81.4	3.8	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	100.0		
#16	99.5		
#30	95.6		
#50	67.1		
#100	11.3		
#200	5.1		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.410 D_{60}= 0.274 D_{50}= 0.245
D_{30}= 0.196 D_{15}= 0.160 D_{10}= 0.134
C_u= 2.05 C_c= 1.04

Classification
USCS= AASHTO=

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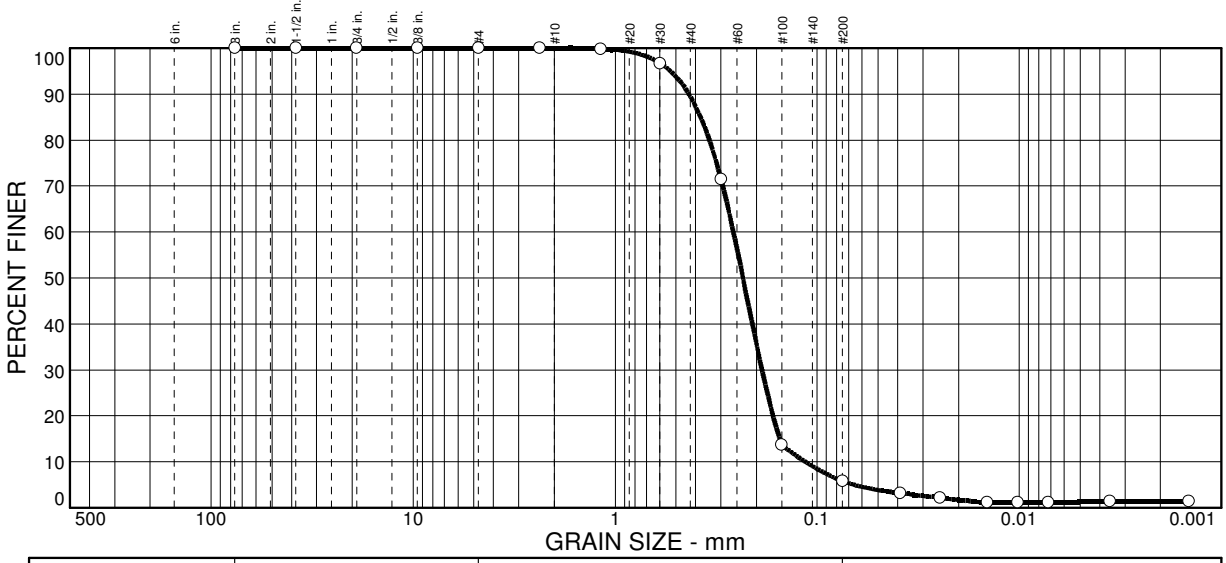
Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266902 **Source of Sample:** **Date:** 05/08/14
Location: MDR-S1B **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	10.5	83.7	4.5	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	100.0		
#16	99.8		
#30	96.7		
#50	71.5		
#100	13.7		
#200	5.8		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.378 D_{60}= 0.261 D_{50}= 0.234
D_{30}= 0.188 D_{15}= 0.154 D_{10}= 0.115
C_u= 2.28 C_c= 1.18

Classification
USCS= AASHTO=

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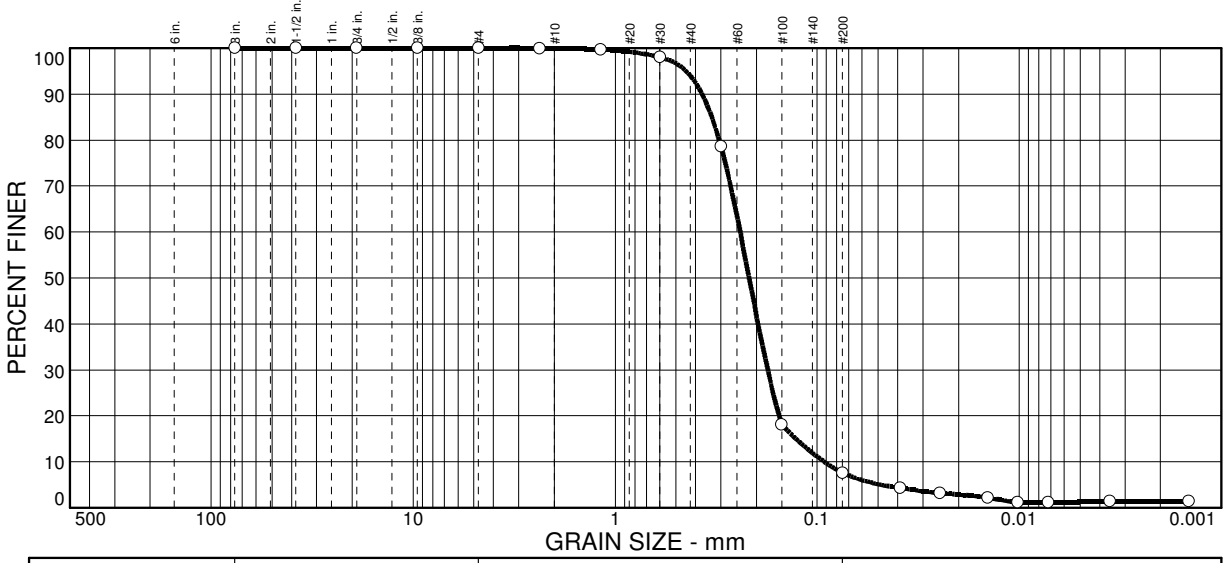
Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266903 **Source of Sample:** **Date:** 05/08/14
Location: MDR-S1C **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	5.9	86.4	6.3	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	99.9		
#16	99.7		
#30	98.0		
#50	78.6		
#100	18.1		
#200	7.6		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.333 D_{60}= 0.241 D_{50}= 0.218
D_{30}= 0.176 D_{15}= 0.128 D_{10}= 0.0924
C_u= 2.61 C_c= 1.39

Classification
USCS= AASHTO=

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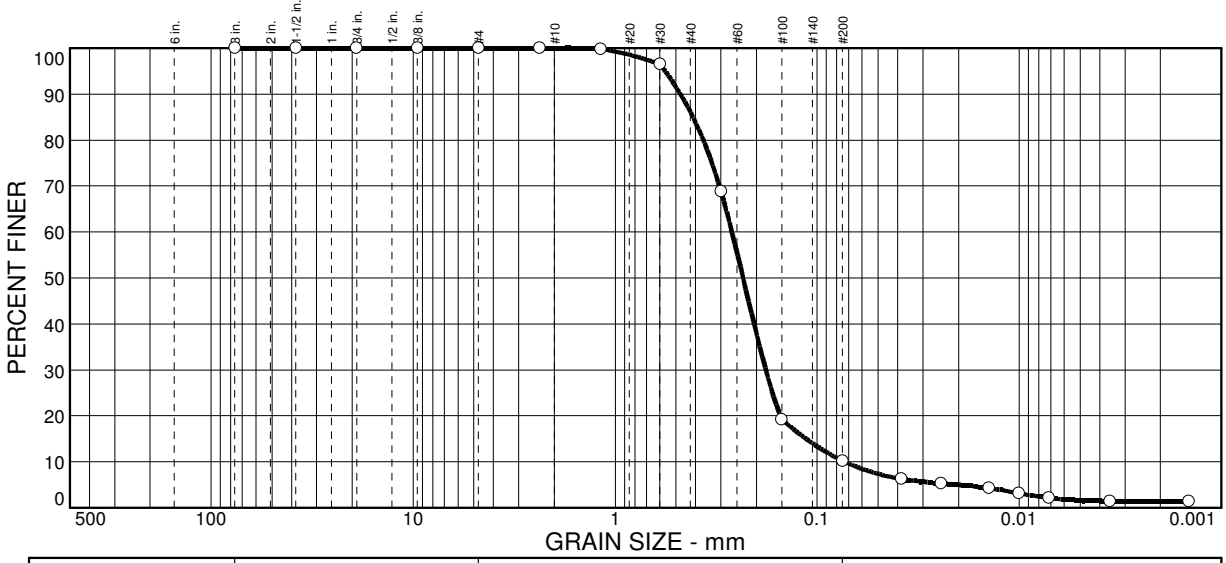
Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266904 **Source of Sample:** **Date:** 05/08/14
Location: MDR-S1D **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	13.8	76.0	8.6	1.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	100.0		
#16	99.8		
#30	96.5		
#50	68.8		
#100	19.2		
#200	10.2		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.413 D_{60}= 0.265 D_{50}= 0.233
D_{30}= 0.180 D_{15}= 0.114 D_{10}= 0.0733
C_u= 3.62 C_c= 1.67

Classification
USCS= AASHTO=

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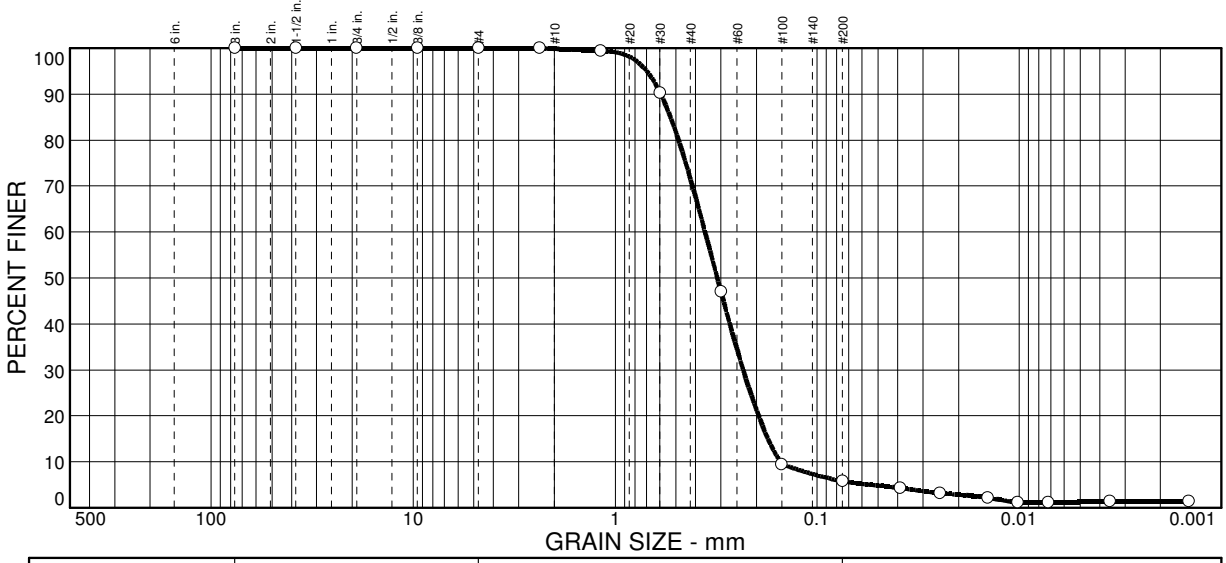
Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266905 **Source of Sample:** **Date:** 05/08/14
Location: MDR-S1E **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	28.3	65.8	4.5	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	100.0		
#16	99.4		
#30	90.3		
#50	47.0		
#100	9.5		
#200	5.8		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.533 D_{60}= 0.360 D_{50}= 0.313
D_{30}= 0.233 D_{15}= 0.175 D_{10}= 0.153
C_u= 2.36 C_c= 0.99

Classification
USCS= AASHTO=

Remarks

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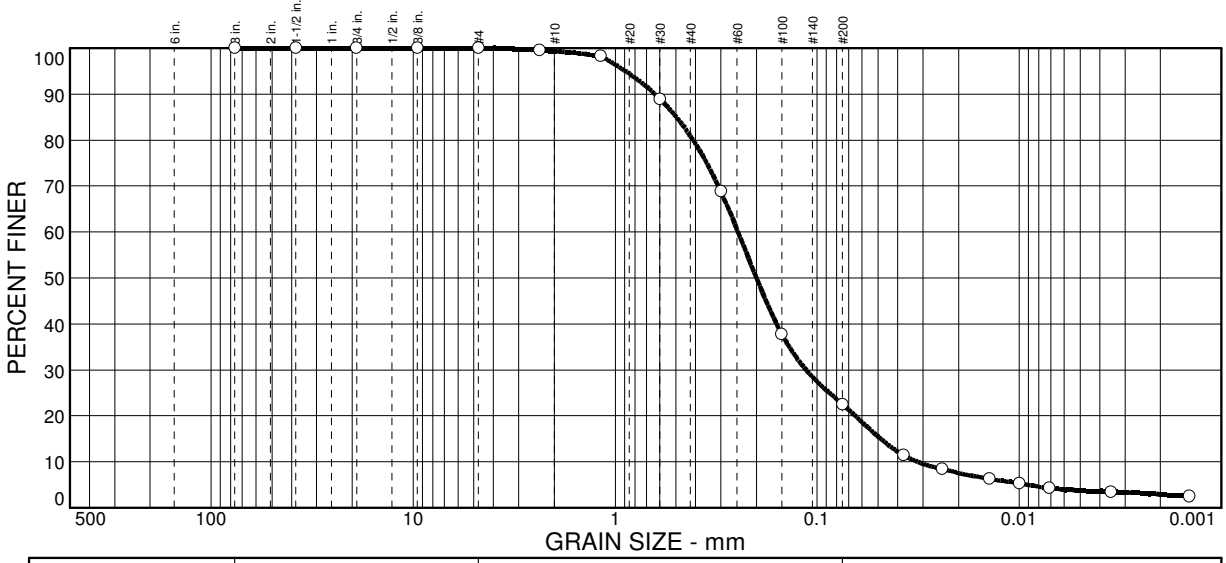
Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266900 **Source of Sample:** **Date:** 05/08/14
Location: MDR-S2 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.6	18.5	58.4	18.7	3.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	99.6		
#16	98.3		
#30	88.9		
#50	68.8		
#100	37.8		
#200	22.5		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.499 D_{60}= 0.247 D_{50}= 0.200
D_{30}= 0.114 D_{15}= 0.0485 D_{10}= 0.0319
C_u= 7.73 C_c= 1.64

Classification
USCS= AASHTO=

Remarks

Figure

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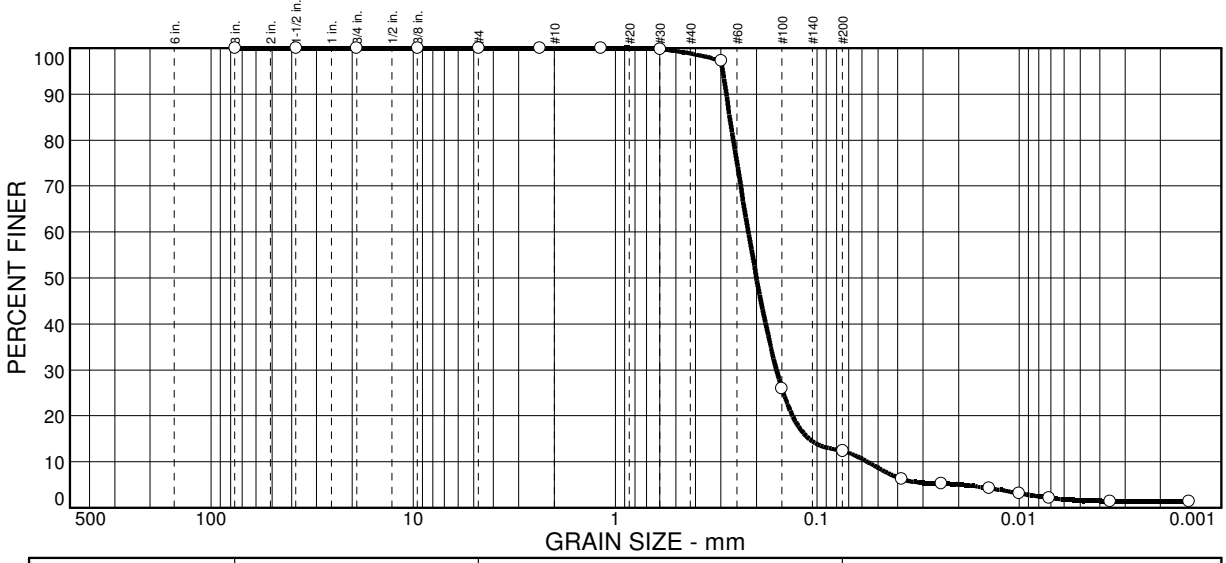
Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266906 **Source of Sample:** **Date:** 05/08/14
Location: MDR-S2A **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	1.2	86.4	10.8	1.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	100.0		
#16	100.0		
#30	99.8		
#50	97.3		
#100	26.0		
#200	12.4		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.272 D_{60}= 0.220 D_{50}= 0.200
D_{30}= 0.159 D_{15}= 0.110 D_{10}= 0.0565
C_u= 3.89 C_c= 2.05

Classification
USCS= AASHTO=

Remarks

Figure

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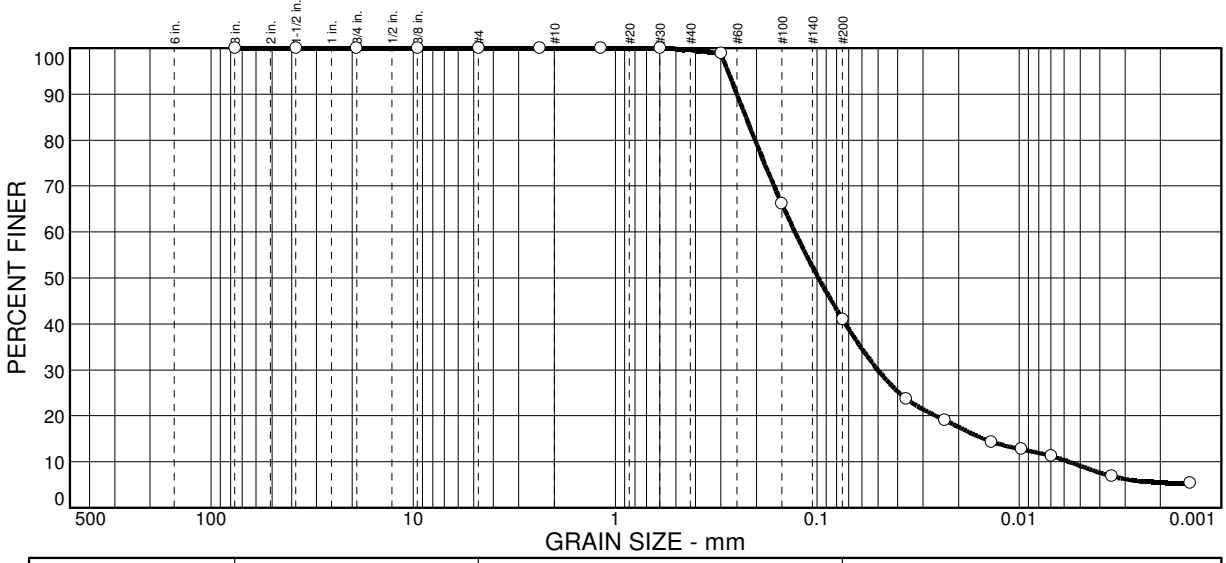
Report Number
14-142-2052

Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266907 **Source of Sample:** **Date:** 05/08/14
Location: MDR-S2B **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.4	58.6	31.9	9.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	100.0		
#16	100.0		
#30	100.0		
#50	98.9		
#100	66.2		
#200	41.0		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.226 D_{60}= 0.129 D_{50}= 0.0987
D_{30}= 0.0502 D_{15}= 0.0150 D_{10}= 0.0057
C_u= 22.81 C_c= 3.46

Classification
USCS= AASHTO=

Remarks

Figure

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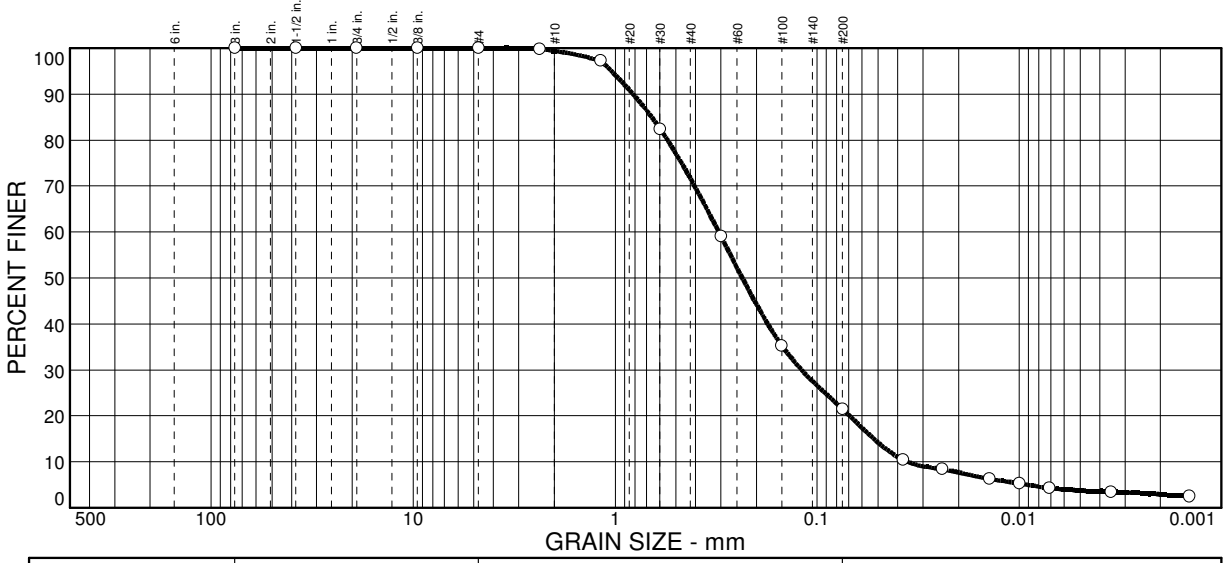
Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266908 **Source of Sample:** **Date:** 05/08/14
Location: MDR-S2C **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.6	27.8	50.1	17.7	3.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	99.8		
#16	97.3		
#30	82.4		
#50	59.1		
#100	35.3		
#200	21.5		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.661 D_{60}= 0.307 D_{50}= 0.235
D_{30}= 0.120 D_{15}= 0.0525 D_{10}= 0.0357
C_u= 8.60 C_c= 1.30

Classification
USCS= AASHTO=

Remarks

Figure

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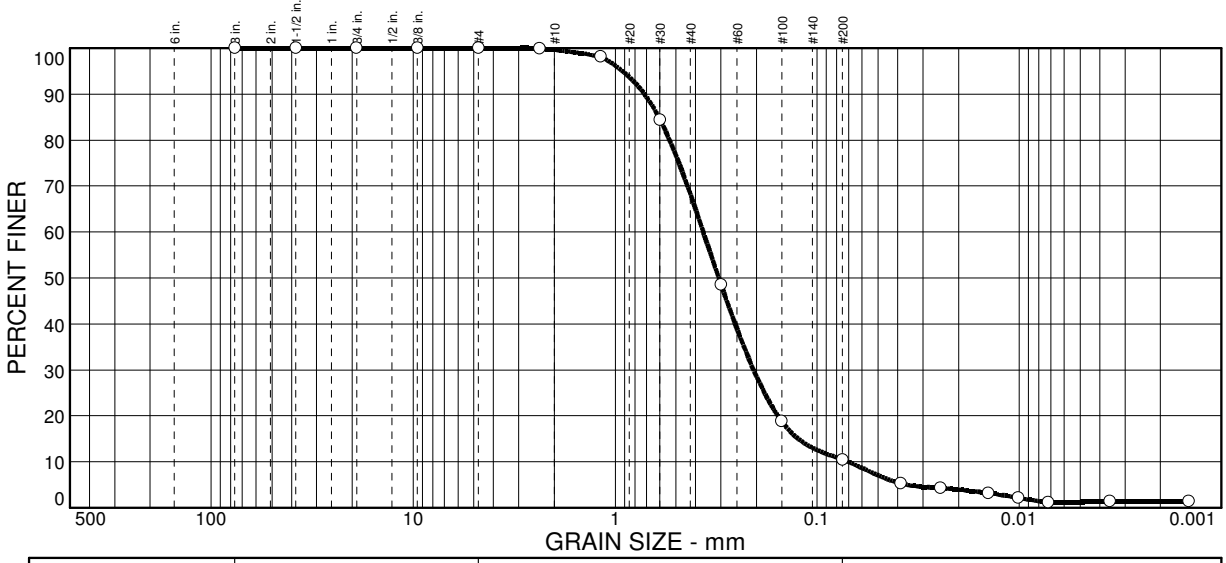
Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266909 **Source of Sample:** **Date:** 05/08/14
Location: MDR-S2D **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.4	31.5	57.6	9.2	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	99.9		
#16	98.2		
#30	84.4		
#50	48.6		
#100	18.8		
#200	10.5		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.610 D_{60}= 0.367 D_{50}= 0.308
D_{30}= 0.207 D_{15}= 0.124 D_{10}= 0.0702
C_u= 5.23 C_c= 1.66

Classification
USCS= AASHTO=

Remarks

Figure

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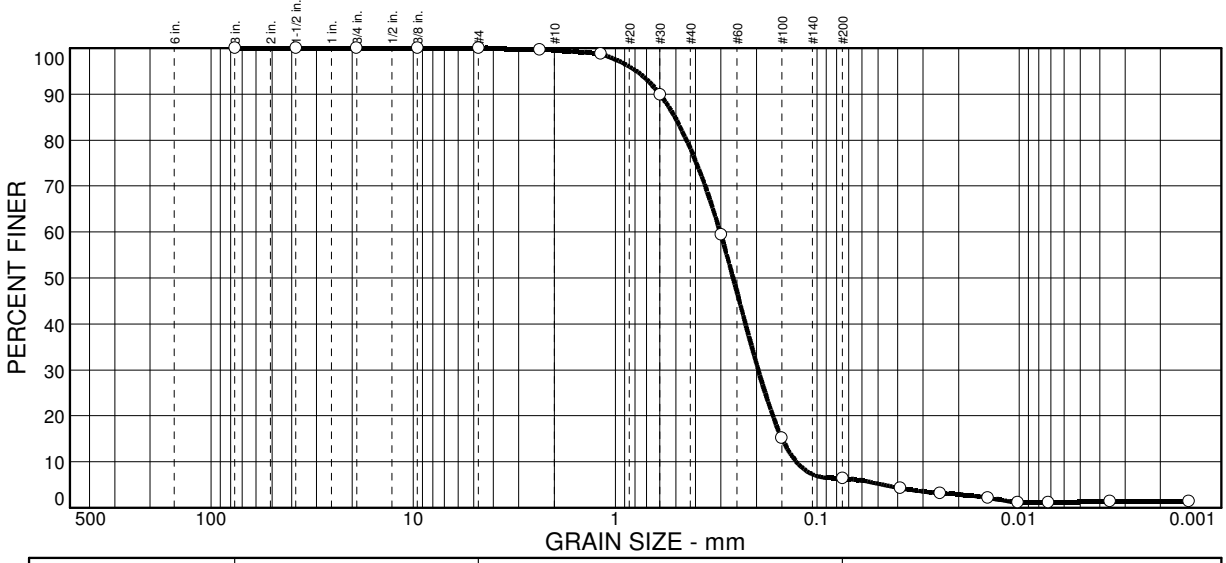
Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266910 **Source of Sample:** **Date:** 05/08/14
Location: MDR-S2E **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.5	21.4	71.7	5.1	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	99.7		
#16	98.8		
#30	89.9		
#50	59.4		
#100	15.2		
#200	6.4		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.508 D_{60}= 0.303 D_{50}= 0.261
D_{30}= 0.196 D_{15}= 0.149 D_{10}= 0.127
C_u= 2.38 C_c= 1.00

Classification
USCS= AASHTO=

Remarks

Figure

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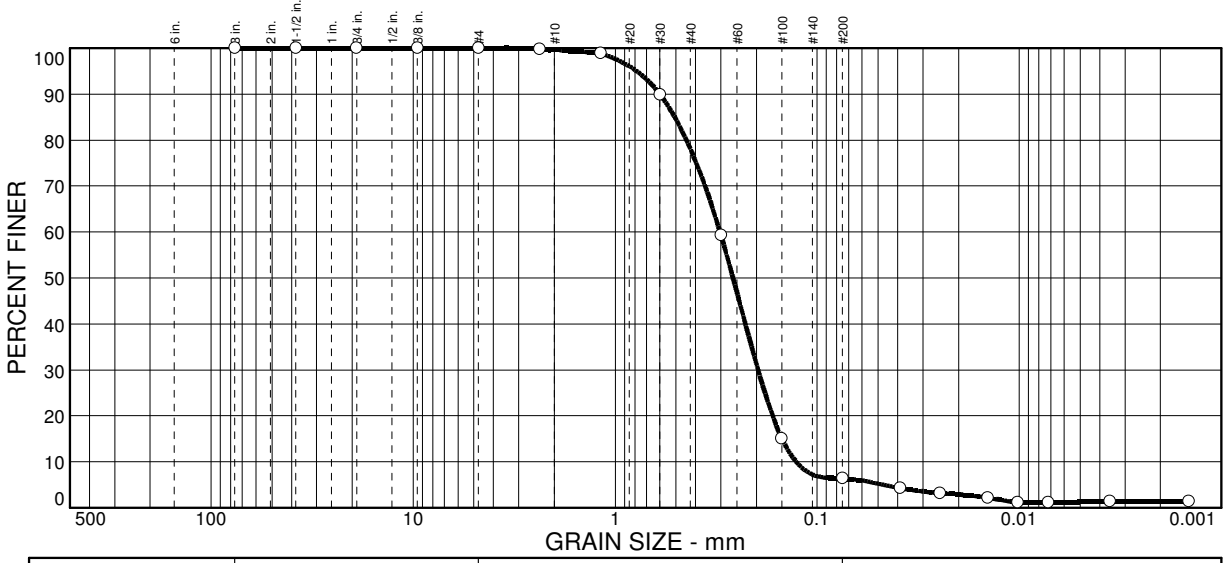
Particle Size Distribution Report

Project: MIDDLE DECATUR REVETMENT ELUTRIATE SOILS WO1401161 **Report No.:** 14-142-2052
Client: US ARMY CORPS OF ENGINEERS

Sample No: 2266910 DUP **Source of Sample:** **Date:** 05/08/14
Location: MDR-S2E DUP **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.4	21.6	71.6	5.1	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	99.8		
#16	98.9		
#30	89.9		
#50	59.3		
#100	15.1		
#200	6.4		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.508 D_{60}= 0.303 D_{50}= 0.262
D_{30}= 0.197 D_{15}= 0.150 D_{10}= 0.127
C_u= 2.38 C_c= 1.00

Classification
USCS= AASHTO=

Remarks

Figure

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ATTACHMENT 3.

Laboratory Report of Results for Physicochemical Analysis of Collected Sediment/Soil Samples at the Proposed Middle Decatur Revetment Shallow Water Habitat Site.

Station	Date	Time	Depth (ft)	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL	AnalysisDate	LabNumber
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	4,4'-DDD	<0.005	ug/kg	U	EPA 8081	496.524	0.005	10	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	4,4'-DDE	<0.005	ug/kg	U	EPA 8081	496.524	0.005	10	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	4,4'-DDT	<0.009	ug/kg	U	EPA 8081	496.524	0.009	10	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Acetochlor	<0.007	ug/g	U	NEP	99.2063	0.007	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Alachlor	<0.007	ug/g	U	NEP	99.2063	0.007	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Aldrin	<0.004	ug/kg	U	EPA 8081	496.524	0.004	5	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	alpha-BHC	<0.005	ug/kg	U	EPA 8081	496.524	0.005	5	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	alpha-Chlordane	<0.004	ug/kg	U	EPA 8081	496.524	0.004	5	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Ametryn	<0.01	ug/g	U	NEP	99.2063	0.01	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Ammonia as N	0.6	mg/kg dry	J	SM 4500-NH3 G	5		1.1	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Aroclor-1016	<0.4	ug/kg	U	EPA 8082	496.524	0.4	100	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Aroclor-1221	<0.4	ug/kg	U	EPA 8082	496.524	0.4	100	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Aroclor-1232	<0.4	ug/kg	U	EPA 8082	496.524	0.4	100	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Aroclor-1242	<0.4	ug/kg	U	EPA 8082	496.524	0.4	100	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Aroclor-1248	<0.4	ug/kg	U	EPA 8082	496.524	0.4	100	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Aroclor-1254	<0.4	ug/kg	U	EPA 8082	496.524	0.4	100	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Aroclor-1260	<0.4	ug/kg	U	EPA 8082	496.524	0.4	100	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Aroclor-1262	<0.4	ug/kg	U	EPA 8082	496.524	0.4	100	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Aroclor-1268	<0.4	ug/kg	U	EPA 8082	496.524	0.4	100	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Arsenic (Total)	6	mg/kg dry		EPA 6020	100	0.002	0.5	14-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Atrazine	<0.008	ug/g	U	NEP	99.2063	0.008	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Benfluralin	<0.008	ug/g	U	NEP	99.2063	0.008	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	beta-BHC	<0.01	ug/kg	U	EPA 8081	496.524	0.01	5	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Bromacil	<0.005	ug/g	U	NEP	99.2063	0.005	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Butachlor	<0.006	ug/g	U	NEP	99.2063	0.006	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Butylate	<0.005	ug/g	U	NEP	99.2063	0.005	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Cadmium (Total)	0.12	mg/kg dry		EPA 6020	100	0.0007	0.05	14-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Chlorpyrifos	<0.006	ug/g	U	NEP	99.2063	0.006	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Chromium (Total)	6.1	mg/kg dry		EPA 6010B	47.85	0.3	0.5	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Copper (Total)	2.8	mg/kg dry		EPA 6010B	47.85	0.2	0.5	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Cyanazine	<0.004	ug/g	U	NEP	99.2063	0.004	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Decachlorobiphenyl	239	ug/kg		EPA 8081	496.524	0		20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Decachlorobiphenyl	239	ug/kg		EPA 8082	496.524			20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Deisopropylatrazine	<0.007	ug/g	U	NEP	99.2063	0.007	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	delta-BHC	<0.005	ug/kg	U	EPA 8081	496.524	0.005	5	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Desethylatrazine	<0.009	ug/g	U	NEP	99.2063	0.009	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Dieldrin	<0.007	ug/kg	U	EPA 8081	496.524	0.007	10	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Dimethenamid	<0.006	ug/g	U	NEP	99.2063	0.006	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Endosulfan I	<0.007	ug/kg	U	EPA 8081	496.524	0.007	5	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Endosulfan II	<0.007	ug/kg	U	EPA 8081	496.524	0.007	10	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Endosulfan sulfate	<0.007	ug/kg	U	EPA 8081	496.524	0.007	10	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Endrin	<0.01	ug/kg	U	EPA 8081	496.524	0.01	10	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Endrin aldehyde	<0.009	ug/kg	U	EPA 8081	496.524	0.009	10	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Endrin ketone	<0.02	ug/kg	U	EPA 8081	496.524	0.02	10	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	EPTC	<0.005	ug/g	U	NEP	99.2063	0.005	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Ethalfluralin	<0.009	ug/g	U	NEP	99.2063	0.009	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Fonofos	<0.006	ug/g	U	NEP	99.2063	0.006	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	gamma-BHC (Lindane)	<0.006	ug/kg	U	EPA 8081	496.524	0.006	5	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	gamma-Chlordane	<0.006	ug/kg	U	EPA 8081	496.524	0.006	5	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Heptachlor	<0.004	ug/kg	U	EPA 8081	496.524	0.004	5	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Heptachlor Epoxide	<0.005	ug/kg	U	EPA 8081	496.524	0.005	5	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Hexazinone	<0.005	ug/g	U	NEP	99.2063	0.005	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Isophenphos	<0.006	ug/g	U	NEP	99.2063	0.006	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Lead (Total)	6.7	mg/kg dry		EPA 6020	100	0.003	0.1	14-May-14	1401161-01

Station	Date	Time	Depth (ft)	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL	AnalysisDate	LabNumber
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Mercury (Total)	0.004	mg/kg dry	J	EPA 7471	200	0.0008	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Methoxychlor	<0.007	ug/kg	U	EPA 8081	496.524	0.007	50	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Metolachlor	<0.006	ug/g	U	NEP	99.2063	0.006	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Metribuzin	<0.005	ug/g	U	NEP	99.2063	0.005	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Nickel (Total)	10.7	mg/kg dry		EPA 6010B	47.85	0.2	0.5	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Nitrate/Nitrite Nitrogen	<0.04	mg/kg dry	U	EPA 353.2	5	0.04	1.1	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Oxadiazon	<0.005	ug/g	U	NEP	99.2063	0.005	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Pendimethalin	<0.008	ug/g	U	NEP	99.2063	0.008	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Percent Solids	94.8	%		SM 2540 G	1	0.01	0.01	14-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	pH	7.82	S.U.		EPA 9045	1			12-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Phorate	<0.005	ug/g	U	NEP	99.2063	0.005	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Phosphorus (Total)	299.9	mg/kg dry		EPA 6010B	47.85	0.7	5	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Prometon	<0.01	ug/g	U	NEP	99.2063	0.01	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Prometryn	<0.01	ug/g	U	NEP	99.2063	0.01	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Propachlor	<0.005	ug/g	U	NEP	99.2063	0.005	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Propazine	<0.006	ug/g	U	NEP	99.2063	0.006	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Simazine	<0.01	ug/g	U	NEP	99.2063	0.01	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Terbufos	<0.006	ug/g	U	NEP	99.2063	0.006	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Tetrachloro-m-xylene	235	ug/kg		EPA 8081	496.524	0		20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Tetrachloro-m-xylene	235	ug/kg		EPA 8082	496.524			20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Total Kjeldahl Nitrogen	91.9	mg/kg dry		PAI-DK 01	5	1.4	26.4	22-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Total Organic Carbon	0.2	% dry		ASTM D5373-08(mod)	1	0.01	0.01	21-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Toxaphene	<0.09	ug/kg	U	EPA 8081	496.524	0.09	500	20-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Triallate	<0.006	ug/g	U	NEP	99.2063	0.006	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Trifluralin	<0.007	ug/g	U	NEP	99.2063	0.007	0.05	13-May-14	1401161-01
MDR-S1	8-May-14	9:30 AM	0 -10	Composite	Zinc (Total)	20.4	mg/kg dry		EPA 6010B	47.85	0.5	0.5	13-May-14	1401161-01
MDR-S1A	8-May-14	9:30 AM	0 - 2	Composite	Ammonia as N	0.7	mg/kg dry	J	SM 4500-NH3 G	5		1	13-May-14	1401161-03
MDR-S1A	8-May-14	9:30 AM	0 - 2	Composite	Nitrate/Nitrite Nitrogen	0.4	mg/kg dry	J	EPA 353.2	5	0.04	1	13-May-14	1401161-03
MDR-S1A	8-May-14	9:30 AM	0 - 2	Composite	Percent Solids	95.28	%		SM 2540 G	1	0.01	0.01	14-May-14	1401161-03
MDR-S1A	8-May-14	9:30 AM	0 - 2	Composite	pH	7.67	S.U.		EPA 9045	1			12-May-14	1401161-03
MDR-S1A	8-May-14	9:30 AM	0 - 2	Composite	Phosphorus (Total)	324.3	mg/kg dry		EPA 6010B	44.8	0.6	4.7	13-May-14	1401161-03
MDR-S1A	8-May-14	9:30 AM	0 - 2	Composite	Total Kjeldahl Nitrogen	142	mg/kg dry		PAI-DK 01	5	1.4	26.2	22-May-14	1401161-03
MDR-S1A	8-May-14	9:30 AM	0 - 2	Composite	Total Organic Carbon	0.17	% dry		ASTM D5373-08(mod)	1	0.01	0.01	21-May-14	1401161-03
MDR-S1B	8-May-14	9:30 AM	2 - 4	Composite	Ammonia as N	0.6	mg/kg dry	J	SM 4500-NH3 G	5		1.1	13-May-14	1401161-04
MDR-S1B	8-May-14	9:30 AM	2 - 4	Composite	Nitrate/Nitrite Nitrogen	0.1	mg/kg dry	J	EPA 353.2	5	0.04	1.1	13-May-14	1401161-04
MDR-S1B	8-May-14	9:30 AM	2 - 4	Composite	Percent Solids	95.13	%		SM 2540 G	1	0.01	0.01	14-May-14	1401161-04
MDR-S1B	8-May-14	9:30 AM	2 - 4	Composite	pH	7.95	S.U.		EPA 9045	1			12-May-14	1401161-04
MDR-S1B	8-May-14	9:30 AM	2 - 4	Composite	Phosphorus (Total)	302.7	mg/kg dry		EPA 6010B	49.95	0.7	5.3	13-May-14	1401161-04
MDR-S1B	8-May-14	9:30 AM	2 - 4	Composite	Total Kjeldahl Nitrogen	101	mg/kg dry		PAI-DK 01	5	1.4	26.3	22-May-14	1401161-04
MDR-S1B	8-May-14	9:30 AM	2 - 4	Composite	Total Organic Carbon	0.09	% dry		ASTM D5373-08(mod)	1	0.01	0.01	21-May-14	1401161-04
MDR-S1C	8-May-14	9:30 AM	4 - 6	Composite	Ammonia as N	0.8	mg/kg dry	J	SM 4500-NH3 G	5		1.1	13-May-14	1401161-05
MDR-S1C	8-May-14	9:30 AM	4 - 6	Composite	Nitrate/Nitrite Nitrogen	<0.04	mg/kg dry	U	EPA 353.2	5	0.04	1.1	13-May-14	1401161-05
MDR-S1C	8-May-14	9:30 AM	4 - 6	Composite	Percent Solids	94.9	%		SM 2540 G	1	0.01	0.01	14-May-14	1401161-05
MDR-S1C	8-May-14	9:30 AM	4 - 6	Composite	pH	7.74	S.U.		EPA 9045	1			12-May-14	1401161-05
MDR-S1C	8-May-14	9:30 AM	4 - 6	Composite	Phosphorus (Total)	318.9	mg/kg dry		EPA 6010B	50.08	0.7	5.3	13-May-14	1401161-05
MDR-S1C	8-May-14	9:30 AM	4 - 6	Composite	Total Kjeldahl Nitrogen	89.4	mg/kg dry		PAI-DK 01	5	1.4	26.3	22-May-14	1401161-05
MDR-S1C	8-May-14	9:30 AM	4 - 6	Composite	Total Organic Carbon	0.11	% dry		ASTM D5373-08(mod)	1	0.01	0.01	21-May-14	1401161-05
MDR-S1D	8-May-14	9:30 AM	6 - 8	Composite	Ammonia as N	0.8	mg/kg dry	J	SM 4500-NH3 G	5		1.1	13-May-14	1401161-06
MDR-S1D	8-May-14	9:30 AM	6 - 8	Composite	Nitrate/Nitrite Nitrogen	0.05	mg/kg dry	J	EPA 353.2	5	0.04	1.1	13-May-14	1401161-06
MDR-S1D	8-May-14	9:30 AM	6 - 8	Composite	Percent Solids	94.31	%		SM 2540 G	1	0.01	0.01	14-May-14	1401161-06
MDR-S1D	8-May-14	9:30 AM	6 - 8	Composite	pH	7.55	S.U.		EPA 9045	1			12-May-14	1401161-06
MDR-S1D	8-May-14	9:30 AM	6 - 8	Composite	Phosphorus (Total)	360.8	mg/kg dry		EPA 6010B	51.28	0.7	5.4	13-May-14	1401161-06
MDR-S1D	8-May-14	9:30 AM	6 - 8	Composite	Total Kjeldahl Nitrogen	103	mg/kg dry		PAI-DK 01	5	1.4	26.5	22-May-14	1401161-06
MDR-S1D	8-May-14	9:30 AM	6 - 8	Composite	Total Organic Carbon	0.21	% dry		ASTM D5373-08(mod)	1	0.01	0.01	21-May-14	1401161-06

Station	Date	Time	Depth (ft)	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL	AnalysisDate	LabNumber
MDR-S1E	8-May-14	9:30 AM	8 - 10	Composite	Ammonia as N	0.7	mg/kg dry	J	SM 4500-NH3 G	5		1	13-May-14	1401161-07
MDR-S1E	8-May-14	9:30 AM	8 - 10	Composite	Nitrate/Nitrite Nitrogen	0.1	mg/kg dry	J	EPA 353.2	5	0.04	1	13-May-14	1401161-07
MDR-S1E	8-May-14	9:30 AM	8 - 10	Composite	Percent Solids	95.52	%		SM 2540 G	1	0.01	0.01	14-May-14	1401161-07
MDR-S1E	8-May-14	9:30 AM	8 - 10	Composite	pH	7.92	S.U.		EPA 9045	1			12-May-14	1401161-07
MDR-S1E	8-May-14	9:30 AM	8 - 10	Composite	Phosphorus (Total)	284.4	mg/kg dry		EPA 6010B	49.83	0.7	5.2	13-May-14	1401161-07
MDR-S1E	8-May-14	9:30 AM	8 - 10	Composite	Total Kjeldahl Nitrogen	60	mg/kg dry		PAI-DK 01	5	1.4	26.2	22-May-14	1401161-07
MDR-S1E	8-May-14	9:30 AM	8 - 10	Composite	Total Organic Carbon	0.1	% dry		ASTM D5373-08(mod)	1	0.01	0.01	21-May-14	1401161-07
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	4,4'-DDD	<0.005	ug/kg	U	EPA 8081	493.583	0.005	10	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	4,4'-DDE	<0.005	ug/kg	U	EPA 8081	493.583	0.005	10	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	4,4'-DDT	<0.009	ug/kg	U	EPA 8081	493.583	0.009	10	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Acetochlor	<0.007	ug/g	U	NEP	97.2763	0.007	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Alachlor	<0.007	ug/g	U	NEP	97.2763	0.007	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Aldrin	<0.004	ug/kg	U	EPA 8081	493.583	0.004	5	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	alpha-BHC	<0.005	ug/kg	U	EPA 8081	493.583	0.005	5	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	alpha-Chlordane	<0.004	ug/kg	U	EPA 8081	493.583	0.004	5	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Ametryn	<0.01	ug/g	U	NEP	97.2763	0.01	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Ammonia as N	1	mg/kg dry	J	SM 4500-NH3 G	5		1.1	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Aroclor-1016	<0.4	ug/kg	U	EPA 8082	493.583	0.4	100	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Aroclor-1221	<0.4	ug/kg	U	EPA 8082	493.583	0.4	100	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Aroclor-1232	<0.4	ug/kg	U	EPA 8082	493.583	0.4	100	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Aroclor-1242	<0.4	ug/kg	U	EPA 8082	493.583	0.4	100	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Aroclor-1248	<0.4	ug/kg	U	EPA 8082	493.583	0.4	100	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Aroclor-1254	<0.4	ug/kg	U	EPA 8082	493.583	0.4	100	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Aroclor-1260	<0.4	ug/kg	U	EPA 8082	493.583	0.4	100	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Aroclor-1262	<0.4	ug/kg	U	EPA 8082	493.583	0.4	100	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Aroclor-1268	<0.4	ug/kg	U	EPA 8082	493.583	0.4	100	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Arsenic (Total)	6	mg/kg dry		EPA 6020	100	0.002	0.5	14-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Atrazine	<0.008	ug/g	U	NEP	97.2763	0.008	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Benfluralin	<0.008	ug/g	U	NEP	97.2763	0.008	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	beta-BHC	<0.01	ug/kg	U	EPA 8081	493.583	0.01	5	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Bromacil	<0.005	ug/g	U	NEP	97.2763	0.005	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Butachlor	<0.006	ug/g	U	NEP	97.2763	0.006	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Butylate	<0.005	ug/g	U	NEP	97.2763	0.005	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Cadmium (Total)	0.12	mg/kg dry		EPA 6020	100	0.0007	0.05	14-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Chlorpyrifos	<0.006	ug/g	U	NEP	97.2763	0.006	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Chromium (Total)	8.4	mg/kg dry		EPA 6010B	46.77	0.3	0.5	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Copper (Total)	4.1	mg/kg dry		EPA 6010B	46.77	0.1	0.5	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Cyanazine	<0.004	ug/g	U	NEP	97.2763	0.004	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Decachlorobiphenyl	259	ug/kg		EPA 8081	493.583	0		20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Decachlorobiphenyl	259	ug/kg		EPA 8082	493.583			20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Deisopropylatrazine	<0.007	ug/g	U	NEP	97.2763	0.007	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	delta-BHC	<0.005	ug/kg	U	EPA 8081	493.583	0.005	5	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Desethylatrazine	<0.009	ug/g	U	NEP	97.2763	0.009	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Dieldrin	<0.007	ug/kg	U	EPA 8081	493.583	0.007	10	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Dimethenamid	<0.006	ug/g	U	NEP	97.2763	0.006	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Endosulfan I	<0.007	ug/kg	U	EPA 8081	493.583	0.007	5	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Endosulfan II	<0.007	ug/kg	U	EPA 8081	493.583	0.007	10	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Endosulfan sulfate	<0.007	ug/kg	U	EPA 8081	493.583	0.007	10	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Endrin	<0.01	ug/kg	U	EPA 8081	493.583	0.01	10	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Endrin aldehyde	<0.009	ug/kg	U	EPA 8081	493.583	0.009	10	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Endrin ketone	<0.02	ug/kg	U	EPA 8081	493.583	0.02	10	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	EPTC	<0.005	ug/g	U	NEP	97.2763	0.005	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Ethalfluralin	<0.009	ug/g	U	NEP	97.2763	0.009	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Fonofos	<0.006	ug/g	U	NEP	97.2763	0.006	0.05	13-May-14	1401161-02

Station	Date	Time	Depth (ft)	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL	AnalysisDate	LabNumber
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	gamma-BHC (Lindane)	<0.006	ug/kg	U	EPA 8081	493.583	0.006	5	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	gamma-Chlordane	<0.006	ug/kg	U	EPA 8081	493.583	0.006	5	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Heptachlor	<0.004	ug/kg	U	EPA 8081	493.583	0.004	5	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Heptachlor Epoxide	<0.005	ug/kg	U	EPA 8081	493.583	0.005	5	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Hexazinone	<0.005	ug/g	U	NEP	97.2763	0.005	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Isophenphos	<0.006	ug/g	U	NEP	97.2763	0.006	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Lead (Total)	5.5	mg/kg dry		EPA 6020	100	0.003	0.1	14-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Mercury (Total)	0.007	mg/kg dry	J	EPA 7471	200	0.0009	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Methoxychlor	<0.007	ug/kg	U	EPA 8081	493.583	0.007	50	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Metolachlor	<0.006	ug/g	U	NEP	97.2763	0.006	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Metribuzin	<0.005	ug/g	U	NEP	97.2763	0.005	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Nickel (Total)	11.5	mg/kg dry		EPA 6010B	46.77	0.2	0.5	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Nitrate/Nitrite Nitrogen	0.4	mg/kg dry	J	EPA 353.2	5	0.04	1.1	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Oxadiazon	<0.005	ug/g	U	NEP	97.2763	0.005	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Pendimethalin	<0.008	ug/g	U	NEP	97.2763	0.008	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Percent Solids	93.54	%		SM 2540 G	1	0.01	0.01	14-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	pH	7.7	S.U.		EPA 9045	1			12-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Phorate	<0.005	ug/g	U	NEP	97.2763	0.005	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Phosphorus (Total)	360.7	mg/kg dry		EPA 6010B	46.77	0.7	5	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Prometon	<0.01	ug/g	U	NEP	97.2763	0.01	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Prometryn	<0.01	ug/g	U	NEP	97.2763	0.01	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Propachlor	<0.005	ug/g	U	NEP	97.2763	0.005	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Propazine	<0.006	ug/g	U	NEP	97.2763	0.006	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Simazine	<0.01	ug/g	U	NEP	97.2763	0.01	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Terbufos	<0.006	ug/g	U	NEP	97.2763	0.006	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Tetrachloro-m-xylene	254	ug/kg		EPA 8081	493.583	0		20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Tetrachloro-m-xylene	254	ug/kg		EPA 8082	493.583			20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Total Kjeldahl Nitrogen	156	mg/kg dry		PAI-DK 01	5	1.5	26.7	22-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Total Organic Carbon	0.17	% dry		ASTM D5373-08(mod)	1	0.01	0.01	21-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Toxaphene	<0.09	ug/kg	U	EPA 8081	493.583	0.09	500	20-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Triallate	<0.006	ug/g	U	NEP	97.2763	0.006	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Trifluralin	<0.007	ug/g	U	NEP	97.2763	0.007	0.05	13-May-14	1401161-02
MDR-S2	8-May-14	10:20 AM	0 - 10	Composite	Zinc (Total)	24.1	mg/kg dry		EPA 6010B	46.77	0.5	0.5	13-May-14	1401161-02
MDR-S2A	8-May-14	10:20 AM	0 - 2	Composite	Ammonia as N	0.7	mg/kg dry	J	SM 4500-NH3 G	5		1.1	13-May-14	1401161-08
MDR-S2A	8-May-14	10:20 AM	0 - 2	Composite	Nitrate/Nitrite Nitrogen	0.7	mg/kg dry	J	EPA 353.2	5	0.04	1.1	13-May-14	1401161-08
MDR-S2A	8-May-14	10:20 AM	0 - 2	Composite	Percent Solids	94.01	%		SM 2540 G	1	0.01	0.01	14-May-14	1401161-08
MDR-S2A	8-May-14	10:20 AM	0 - 2	Composite	pH	7.69	S.U.		EPA 9045	1			12-May-14	1401161-08
MDR-S2A	8-May-14	10:20 AM	0 - 2	Composite	Phosphorus (Total)	360.1	mg/kg dry		EPA 6010B	50.68	0.7	5.4	13-May-14	1401161-08
MDR-S2A	8-May-14	10:20 AM	0 - 2	Composite	Total Kjeldahl Nitrogen	228	mg/kg dry		PAI-DK 01	5	1.5	26.6	22-May-14	1401161-08
MDR-S2A	8-May-14	10:20 AM	0 - 2	Composite	Total Organic Carbon	0.33	% dry		ASTM D5373-08(mod)	1	0.01	0.01	21-May-14	1401161-08
MDR-S2B	8-May-14	10:20 AM	2 - 4	Composite	Ammonia as N	1.5	mg/kg dry		SM 4500-NH3 G	5		1.2	13-May-14	1401161-09
MDR-S2B	8-May-14	10:20 AM	2 - 4	Composite	Nitrate/Nitrite Nitrogen	0.7	mg/kg dry	J	EPA 353.2	5	0.04	1.2	13-May-14	1401161-09
MDR-S2B	8-May-14	10:20 AM	2 - 4	Composite	Percent Solids	84.36	%		SM 2540 G	1	0.01	0.01	14-May-14	1401161-09
MDR-S2B	8-May-14	10:20 AM	2 - 4	Composite	pH	7.63	S.U.		EPA 9045	1			12-May-14	1401161-09
MDR-S2B	8-May-14	10:20 AM	2 - 4	Composite	Phosphorus (Total)	484.9	mg/kg dry		EPA 6010B	49.55	0.8	5.9	13-May-14	1401161-09
MDR-S2B	8-May-14	10:20 AM	2 - 4	Composite	Total Kjeldahl Nitrogen	312	mg/kg dry		PAI-DK 01	5	1.6	29.6	22-May-14	1401161-09
MDR-S2B	8-May-14	10:20 AM	2 - 4	Composite	Total Organic Carbon	0.39	% dry		ASTM D5373-08(mod)	1	0.01	0.01	21-May-14	1401161-09
MDR-S2C	8-May-14	10:20 AM	4 - 6	Composite	Ammonia as N	1	mg/kg dry	J	SM 4500-NH3 G	5		1.1	13-May-14	1401161-10
MDR-S2C	8-May-14	10:20 AM	4 - 6	Composite	Nitrate/Nitrite Nitrogen	0.2	mg/kg dry	J	EPA 353.2	5	0.04	1.1	13-May-14	1401161-10
MDR-S2C	8-May-14	10:20 AM	4 - 6	Composite	Percent Solids	90.88	%		SM 2540 G	1	0.01	0.01	14-May-14	1401161-10
MDR-S2C	8-May-14	10:20 AM	4 - 6	Composite	pH	7.79	S.U.		EPA 9045	1			12-May-14	1401161-10
MDR-S2C	8-May-14	10:20 AM	4 - 6	Composite	Phosphorus (Total)	377.6	mg/kg dry		EPA 6010B	51.12	0.8	5.6	13-May-14	1401161-10
MDR-S2C	8-May-14	10:20 AM	4 - 6	Composite	Total Kjeldahl Nitrogen	457	mg/kg dry		PAI-DK 01	5	1.5	27.5	22-May-14	1401161-10
MDR-S2C	8-May-14	10:20 AM	4 - 6	Composite	Total Organic Carbon	0.33	% dry		ASTM D5373-08(mod)	1	0.01	0.01	21-May-14	1401161-10

Station	Date	Time	Depth (ft)	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL	AnalysisDate	LabNumber
MDR-S2D	8-May-14	10:20 AM	6 - 8	Composite	Ammonia as N	0.8	mg/kg dry	J	SM 4500-NH3 G	5		1.1	13-May-14	1401161-11
MDR-S2D	8-May-14	10:20 AM	6 - 8	Composite	Nitrate/Nitrite Nitrogen	0.1	mg/kg dry	J	EPA 353.2	5	0.04	1.1	13-May-14	1401161-11
MDR-S2D	8-May-14	10:20 AM	6 - 8	Composite	Percent Solids	94.61	%		SM 2540 G	1	0.01	0.01	14-May-14	1401161-11
MDR-S2D	8-May-14	10:20 AM	6 - 8	Composite	pH	7.92	S.U.		EPA 9045	1			12-May-14	1401161-11
MDR-S2D	8-May-14	10:20 AM	6 - 8	Composite	Phosphorus (Total)	316.5	mg/kg dry		EPA 6010B	45.54	0.7	4.8	13-May-14	1401161-11
MDR-S2D	8-May-14	10:20 AM	6 - 8	Composite	Total Kjeldahl Nitrogen	76.1	mg/kg dry		PAI-DK 01	5	1.4	26.4	22-May-14	1401161-11
MDR-S2D	8-May-14	10:20 AM	6 - 8	Composite	Total Organic Carbon	0.28	% dry		ASTM D5373-08(mod)	1	0.01	0.01	21-May-14	1401161-11
MDR-S2E	8-May-14	10:20 AM	8 - 10	Composite	Ammonia as N	0.9	mg/kg dry	J	SM 4500-NH3 G	5		1	13-May-14	1401161-12
MDR-S2E	8-May-14	10:20 AM	8 - 10	Composite	Nitrate/Nitrite Nitrogen	0.3	mg/kg dry	J	EPA 353.2	5	0.04	1	13-May-14	1401161-12
MDR-S2E	8-May-14	10:20 AM	8 - 10	Composite	Percent Solids	96.49	%		SM 2540 G	1	0.01	0.01	14-May-14	1401161-12
MDR-S2E	8-May-14	10:20 AM	8 - 10	Composite	pH	8.04	S.U.		EPA 9045	1			12-May-14	1401161-12
MDR-S2E	8-May-14	10:20 AM	8 - 10	Composite	Phosphorus (Total)	302.6	mg/kg dry		EPA 6010B	50.71	0.7	5.3	13-May-14	1401161-12
MDR-S2E	8-May-14	10:20 AM	8 - 10	Composite	Total Kjeldahl Nitrogen	54.7	mg/kg dry		PAI-DK 01	5	1.4	25.9	22-May-14	1401161-12
MDR-S2E	8-May-14	10:20 AM	8 - 10	Composite	Total Organic Carbon	0.09	% dry		ASTM D5373-08(mod)	1	0.01	0.01	21-May-14	1401161-12

ATTACHMENT 4.

Laboratory Report of Results for Physicochemical Analysis of Collected Receiving Water and the Prepared Pre-Elutriate and Elutriate Testing Samples for the Proposed Middle Decatur Revetment Shallow Water Habitat Site.

Station	Date	Time	Depth (ft)	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL	AnalysisDate	LabNumber
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	4,4'-DDD	<0.002	ug/L	U	EPA 8081	5	0.002	0.1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	4,4'-DDE	<0.002	ug/L	U	EPA 8081	5	0.002	0.1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	4,4'-DDT	<0.005	ug/L	U	EPA 8081	5	0.005	0.1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Aldrin	<0.006	ug/L	U	EPA 8081	5	0.006	0.5	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	alpha-BHC	<0.003	ug/L	U	EPA 8081	5	0.003	0.05	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	alpha-Chlordane	<0.003	ug/L	U	EPA 8081	5	0.003	0.05	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Aluminum (Dissolved)	<40	ug/L	U	EPA 200.7	1	40	50	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Aluminum (Total)	440	ug/L		EPA 200.7	1	40	50	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Ammonia as N	0.06	mg/L	J	SM 4500-NH3 G	1	0.02	0.1	12-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Antimony (Dissolved)	<0.03	ug/L	U	EPA 200.8	1	0.03	0.5	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Antimony (Total)	0.6	ug/L		EPA 200.8	1	0.03	0.5	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Aroclor-1016	<0.5	ug/L	U	EPA 8082	5	0.5	1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Aroclor-1221	<0.5	ug/L	U	EPA 8082	5	0.5	1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Aroclor-1232	<0.5	ug/L	U	EPA 8082	5	0.5	1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Aroclor-1242	<0.5	ug/L	U	EPA 8082	5	0.5	1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Aroclor-1248	<0.5	ug/L	U	EPA 8082	5	0.5	1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Aroclor-1254	<0.5	ug/L	U	EPA 8082	5	0.5	1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Aroclor-1260	<0.5	ug/L	U	EPA 8082	5	0.5	1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Aroclor-1262	<0.5	ug/L	U	EPA 8082	5	0.5	1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Aroclor-1268	<0.5	ug/L	U	EPA 8082	5	0.5	1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Arsenic (Dissolved)	2	ug/L		EPA 200.8	1	0.008	1	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Arsenic (Total)	3	ug/L		EPA 200.8	1	0.008	1	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Atrazine	0.15	ug/L	J	NEP	1.0101	0.02	0.5	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Beryllium (Dissolved)	<1	ug/L	U	EPA 200.7	1	1	1	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Beryllium (Total)	<1	ug/L	U	EPA 200.7	1	1	1	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	beta-BHC	<0.003	ug/L	U	EPA 8081	5	0.003	0.05	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Cadmium (Dissolved)	0.008	ug/L	J	EPA 200.8	1	0.007	0.5	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Cadmium (Total)	0.05	ug/L	J	EPA 200.8	1	0.007	0.5	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Calcium (Dissolved)	66.2	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Calcium (Total)	66.7	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Carbonaceous BOD	<0.6	mg/L	U	SM 5210 B-2001	1	0.6	2	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Chemical Oxygen Demand	9	mg/L		ASTM D1252-95-B	1	2	5	16-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Chromium (Dissolved)	<4	ug/L	U	EPA 200.7	1	4	10	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Chromium (Total)	<4	ug/L	U	EPA 200.7	1	4	10	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Copper (Dissolved)	<6	ug/L	U	EPA 200.7	1	6	10	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Copper (Total)	<6	ug/L	U	EPA 200.7	1	6	10	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Decachlorobiphenyl	2.09	ug/L		EPA 8081	5	0		20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Decachlorobiphenyl	2.09	ug/L		EPA 8082	5	0	1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	delta-BHC	<0.002	ug/L	U	EPA 8081	5	0.002	0.05	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Dieldrin	<0.004	ug/L	U	EPA 8081	5	0.004	0.1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Endosulfan I	<0.004	ug/L	U	EPA 8081	5	0.004	0.05	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Endosulfan II	<0.007	ug/L	U	EPA 8081	5	0.007	0.1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Endosulfan sulfate	<0.004	ug/L	U	EPA 8081	5	0.004	0.1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Endrin	<0.005	ug/L	U	EPA 8081	5	0.005	0.1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Endrin aldehyde	<0.004	ug/L	U	EPA 8081	5	0.004	0.1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Endrin ketone	<0.003	ug/L	U	EPA 8081	5	0.003	0.1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	gamma-BHC (Lindane)	<0.002	ug/L	U	EPA 8081	5	0.002	0.05	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	gamma-Chlordane	<0.002	ug/L	U	EPA 8081	5	0.002	0.05	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Heptachlor	<0.003	ug/L	U	EPA 8081	5	0.003	0.05	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Heptachlor Epoxide	<0.004	ug/L	U	EPA 8081	5	0.004	0.05	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Iron (Dissolved)	<10	ug/L	U	EPA 200.7	1	10	50	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Iron (Total)	390	ug/L		EPA 200.7	1	10	50	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Lead (Dissolved)	<0.008	ug/L	U	EPA 200.8	1	0.008	0.5	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Lead (Total)	1.2	ug/L		EPA 200.8	1	0.008	0.5	15-May-14	1401162-01

Station	Date	Time	Depth (ft)	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL	AnalysisDate	LabNumber
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Magnesium (Dissolved)	27.76	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Magnesium (Total)	28.04	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Manganese (Dissolved)	<3	ug/L	U	EPA 200.7	1	3	10	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Manganese (Total)	40	ug/L		EPA 200.7	1	3	10	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Mercury (Dissolved)	0.01	ug/L	J	EPA 245.1	1	0.002	0.4	21-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Mercury (Total)	0.02	ug/L	J	EPA 245.1	1	0.002	0.4	21-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Methoxychlor	<0.003	ug/L	U	EPA 8081	5	0.003	0.5	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Nickel (Dissolved)	<8	ug/L	U	EPA 200.7	1	8	10	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Nickel (Total)	<8	ug/L	U	EPA 200.7	1	8	10	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Nitrate/Nitrite Nitrogen	0.11	mg/L	J	EPA 353.2	1	0.02	0.2	12-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Orthophosphate (Dissolved)	0.03	mg/L	J	SM 4500-P G-1999	1	0.005	0.05	15-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Phosphorus (Total Dissolved)	0.02	mg/L	J	SM 4500-P F	1	0.008	0.05	16-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Phosphorus (Total)	0.05	mg/L		SM 4500-P F	1	0.008	0.05	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Selenium (Dissolved)	2	ug/L		EPA 200.8	1	0.06	1	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Selenium (Total)	2	ug/L		EPA 200.8	1	0.06	1	15-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Silver (Dissolved)	<4	ug/L	U	EPA 200.7	1	4	10	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Silver (Total)	<4	ug/L	U	EPA 200.7	1	4	10	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Tetrachloro-m-xylene	2.16	ug/L		EPA 8081	5	0		20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Tetrachloro-m-xylene	2.16	ug/L		EPA 8082	5	0	1	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Thallium (Dissolved)	<0.003	ug/L		EPA 200.8	1	0.003	0.5	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Thallium (Total)	0.4	ug/L	J	EPA 200.8	1	0.003	0.5	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Total Kjeldahl Nitrogen	0.49	mg/L	J	EPA 351.2	1	0.08	0.5	16-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Total Organic Carbon	3.5	mg/L		SM 5310 B-2000	1	0.3	1	16-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Total Suspended Solids	25	mg/L		SM 2540 D-1997	1	4	4	15-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Toxaphene	<0.09	ug/L	U	EPA 8081	5	0.09	5	20-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Turbidity	5.93	NTU		EPA 180.1	10	0.1	0.1	9-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Zinc (Dissolved)	10	ug/L		EPA 200.7	1	6	10	14-May-14	1401162-01
MDR-W1	8-May-14	11:00 AM	0.1	Receiving Water	Zinc (Total)	10	ug/L		EPA 200.7	1	6	10	14-May-14	1401162-01
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Aluminum (Total)	297500	ug/L		EPA 200.7	1	40	50	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Ammonia as N	0.26	mg/L		SM 4500-NH3 G	1	0.02	0.1	12-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Antimony (Total)	2.5	ug/L		EPA 200.8	1	0.03	0.5	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Arsenic (Total)	421	ug/L		EPA 200.8	1	0.008	1	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Beryllium (Total)	17	ug/L		EPA 200.7	1	1	1	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Cadmium (Total)	14.6	ug/L		EPA 200.8	1	0.007	0.5	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Calcium (Total)	505.8	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Carbonaceous BOD	25	mg/L		SM 5210 B-2001	1	0.6	2	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Chemical Oxygen Demand	668	mg/L		ASTM D1252-95-B	10	19	50	16-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Chromium (Total)	660	ug/L		EPA 200.7	1	4	10	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Copper (Total)	370	ug/L		EPA 200.7	1	6	10	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Iron (Total)	625500	ug/L		EPA 200.7	10	140	500	16-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Lead (Total)	476.6	ug/L		EPA 200.8	1	0.008	0.5	15-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Magnesium (Total)	175.3	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Manganese (Total)	23130	ug/L		EPA 200.7	1	3	10	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Mercury (Total)	1.1	ug/L		EPA 245.1	1	0.002	0.4	21-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Nickel (Total)	940	ug/L		EPA 200.7	1	8	10	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Nitrate/Nitrite Nitrogen	0.15	mg/L	J	EPA 353.2	1	0.02	0.2	12-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Phosphorus (Total)	16.2	mg/L		SM 4500-P F	10	0.08	0.5	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Selenium (Total)	19	ug/L		EPA 200.8	1	0.06	1	15-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Silver (Total)	<4	ug/L	U	EPA 200.7	1	4	10	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Thallium (Total)	6.5	ug/L		EPA 200.8	1	0.003	0.5	14-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Total Kjeldahl Nitrogen	22.3	mg/L		EPA 351.2	5	0.42	2.5	16-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Total Organic Carbon	310	mg/L		SM 5310 B-2000	200	53	200	16-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Total Suspended Solids	20100	mg/L		SM 2540 D-1997	1	4	4	15-May-14	1401162-02
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Turbidity	9750	NTU		EPA 180.1	50000	500	500	14-May-14	1401162-02

Station	Date	Time	Depth (ft)	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL	AnalysisDate	LabNumber
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Pre	Zinc (Total)	1750	ug/L		EPA 200.7	1	6	10	14-May-14	1401162-02
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Aluminum (Total)	638900	ug/L		EPA 200.7	1	40	50	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Ammonia as N	0.11	mg/L		SM 4500-NH3 G	1	0.02	0.1	12-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Antimony (Total)	1.6	ug/L		EPA 200.8	1	0.03	0.5	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Arsenic (Total)	631	ug/L		EPA 200.8	1	0.008	1	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Beryllium (Total)	34	ug/L		EPA 200.7	1	1	1	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Cadmium (Total)	25.4	ug/L		EPA 200.8	1	0.007	0.5	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Calcium (Total)	1021	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Carbonaceous BOD	8	mg/L		SM 5210 B-2001	1	0.6	2	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Chemical Oxygen Demand	1410	mg/L		ASTM D1252-95-B	10	19	50	16-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Chromium (Total)	1080	ug/L		EPA 200.7	1	4	10	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Copper (Total)	940	ug/L		EPA 200.7	1	6	10	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Iron (Total)	1155000	ug/L		EPA 200.7	10	140	500	16-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Lead (Total)	805.3	ug/L		EPA 200.8	1	0.008	0.5	15-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Magnesium (Total)	394.2	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Manganese (Total)	43250	ug/L		EPA 200.7	1	3	10	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Mercury (Total)	2	ug/L		EPA 245.1	1	0.002	0.4	21-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Nickel (Total)	1490	ug/L		EPA 200.7	1	8	10	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Nitrate/Nitrite Nitrogen	0.17	mg/L	J	EPA 353.2	1	0.02	0.2	12-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Phosphorus (Total)	27.9	mg/L		SM 4500-P F	10	0.08	0.5	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Selenium (Total)	37	ug/L		EPA 200.8	1	0.06	1	15-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Silver (Total)	<4	ug/L	U	EPA 200.7	1	4	10	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Thallium (Total)	12.4	ug/L		EPA 200.8	1	0.003	0.5	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Total Kjeldahl Nitrogen	44.8	mg/L		EPA 351.2	5	0.42	2.5	16-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Total Organic Carbon	340	mg/L		SM 5310 B-2000	200	53	200	16-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Total Suspended Solids	61600	mg/L		SM 2540 D-1997	1	4	4	15-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Turbidity	18400	NTU		EPA 180.1	50000	500	500	14-May-14	1401162-03
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Pre	Zinc (Total)	3480	ug/L		EPA 200.7	1	6	10	14-May-14	1401162-03
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	4,4'-DDD	<0.002	ug/L	U	EPA 8081	5.10204	0.002	0.1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	4,4'-DDE	<0.002	ug/L	U	EPA 8081	5.10204	0.002	0.1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	4,4'-DDT	<0.005	ug/L	U	EPA 8081	5.10204	0.005	0.1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aldrin	<0.006	ug/L	U	EPA 8081	5.10204	0.006	0.5	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	alpha-BHC	<0.003	ug/L	U	EPA 8081	5.10204	0.003	0.05	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	alpha-Chlordane	<0.003	ug/L	U	EPA 8081	5.10204	0.003	0.05	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aluminum (Total)	13140	ug/L		EPA 200.7	1	40	50	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Antimony (Total)	0.1	ug/L	J	EPA 200.8	1	0.03	0.5	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1016	<0.5	ug/L	U	EPA 8082	5.10204	0.5	1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1221	<0.5	ug/L	U	EPA 8082	5.10204	0.5	1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1232	<0.5	ug/L	U	EPA 8082	5.10204	0.5	1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1242	<0.5	ug/L	U	EPA 8082	5.10204	0.5	1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1248	<0.5	ug/L	U	EPA 8082	5.10204	0.5	1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1254	<0.5	ug/L	U	EPA 8082	5.10204	0.5	1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1260	<0.5	ug/L	U	EPA 8082	5.10204	0.5	1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1262	<0.5	ug/L	U	EPA 8082	5.10204	0.5	1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1268	<0.5	ug/L	U	EPA 8082	5.10204	0.5	1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Arsenic (Total)	15	ug/L		EPA 200.8	1	0.008	1	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Atrazine	0.15	ug/L	J	NEP	1.0204	0.02	0.5	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Beryllium (Total)	<1	ug/L	U	EPA 200.7	1	1	1	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	beta-BHC	<0.003	ug/L	U	EPA 8081	5.10204	0.003	0.05	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Cadmium (Total)	0.3	ug/L	J	EPA 200.8	1	0.007	0.5	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Calcium (Total)	89.63	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Carbonaceous BOD	10	mg/L		SM 5210 B-2001	1	0.6	2	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Chemical Oxygen Demand	54	mg/L		ASTM D1252-95-B	1	2	5	16-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Chromium (Total)	20	ug/L		EPA 200.7	1	4	10	14-May-14	1401162-04

Station	Date	Time	Depth (ft)	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL	AnalysisDate	LabNumber
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Copper (Total)	10	ug/L		EPA 200.7	1	6	10	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Decachlorobiphenyl	2.29	ug/L		EPA 8081	5.10204	0		20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Decachlorobiphenyl	2.29	ug/L		EPA 8082	5.10204	0	1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	delta-BHC	<0.002	ug/L	U	EPA 8081	5.10204	0.002	0.05	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Dieldrin	<0.004	ug/L	U	EPA 8081	5.10204	0.004	0.1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Endosulfan I	<0.004	ug/L	U	EPA 8081	5.10204	0.004	0.05	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Endosulfan II	<0.007	ug/L	U	EPA 8081	5.10204	0.007	0.1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Endosulfan sulfate	<0.004	ug/L	U	EPA 8081	5.10204	0.004	0.1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Endrin	<0.005	ug/L	U	EPA 8081	5.10204	0.005	0.1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Endrin aldehyde	<0.004	ug/L	U	EPA 8081	5.10204	0.004	0.1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Endrin ketone	<0.003	ug/L	U	EPA 8081	5.10204	0.003	0.1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	gamma-BHC (Lindane)	<0.002	ug/L	U	EPA 8081	5.10204	0.002	0.05	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	gamma-Chlordane	<0.002	ug/L	U	EPA 8081	5.10204	0.002	0.05	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Heptachlor	<0.003	ug/L	U	EPA 8081	5.10204	0.003	0.05	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Heptachlor Epoxide	<0.004	ug/L	U	EPA 8081	5.10204	0.004	0.05	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Iron (Total)	18210	ug/L		EPA 200.7	1	10	50	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Lead (Total)	15	ug/L		EPA 200.8	1	0.008	0.5	15-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Magnesium (Total)	23.76	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Manganese (Total)	580	ug/L		EPA 200.7	1	3	10	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Mercury (Total)	0.04	ug/L	J	EPA 245.1	1	0.002	0.4	21-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Methoxychlor	<0.003	ug/L	U	EPA 8081	5.10204	0.003	0.5	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Nickel (Total)	30	ug/L		EPA 200.7	1	8	10	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	pH	8.05	S.U.		SM 4500-H B-2000	1			9-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Phosphorus (Total)	0.38	mg/L		SM 4500-P F	1	0.008	0.05	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Selenium (Total)	2	ug/L		EPA 200.8	1	0.06	1	15-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Silver (Total)	<4	ug/L	U	EPA 200.7	1	4	10	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Tetrachloro-m-xylene	2.18	ug/L		EPA 8081	5.10204	0		20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Tetrachloro-m-xylene	2.18	ug/L		EPA 8082	5.10204	0	1	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Thallium (Total)	0.2	ug/L	J	EPA 200.8	1	0.003	0.5	14-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Total Kjeldahl Nitrogen	0.88	mg/L		EPA 351.2	1	0.08	0.5	16-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Total Organic Carbon	27.3	mg/L		SM 5310 B-2000	10	2.6	10	16-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Total Suspended Solids	258	mg/L		SM 2540 D-1997	1	4	4	15-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Toxaphene	<0.09	ug/L	U	EPA 8081	5.10204	0.09	5	20-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Turbidity	406	NTU		EPA 180.1	5000	50	50	9-May-14	1401162-04
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Zinc (Total)	120	ug/L		EPA 200.7	1	6	10	14-May-14	1401162-04
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	4,4'-DDD	<0.002	ug/L	U	EPA 8081	1.0101	0.002	0.1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	4,4'-DDE	<0.002	ug/L	U	EPA 8081	1.0101	0.002	0.1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	4,4'-DDT	<0.005	ug/L	U	EPA 8081	1.0101	0.005	0.1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aldrin	<0.006	ug/L	U	EPA 8081	1.0101	0.006	0.5	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	alpha-BHC	<0.003	ug/L	U	EPA 8081	1.0101	0.003	0.05	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	alpha-Chlordane	<0.003	ug/L	U	EPA 8081	1.0101	0.003	0.05	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aluminum (Total)	8820	ug/L		EPA 200.7	1	40	50	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Antimony (Total)	<0.03	ug/L	U	EPA 200.8	1	0.03	0.5	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1016	<0.5	ug/L	U	EPA 8082	1.0101	0.5	1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1221	<0.5	ug/L	U	EPA 8082	1.0101	0.5	1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1232	<0.5	ug/L	U	EPA 8082	1.0101	0.5	1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1242	<0.5	ug/L	U	EPA 8082	1.0101	0.5	1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1248	<0.5	ug/L	U	EPA 8082	1.0101	0.5	1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1254	<0.5	ug/L	U	EPA 8082	1.0101	0.5	1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1260	<0.5	ug/L	U	EPA 8082	1.0101	0.5	1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1262	<0.5	ug/L	U	EPA 8082	1.0101	0.5	1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Aroclor-1268	<0.5	ug/L	U	EPA 8082	1.0101	0.5	1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Arsenic (Total)	7	ug/L		EPA 200.8	1	0.008	1	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Atrazine	0.15	ug/L	J	NEP	1.0101	0.02	0.5	14-May-14	1401162-05

Station	Date	Time	Depth (ft)	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL	AnalysisDate	LabNumber
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Beryllium (Total)	<1	ug/L	U	EPA 200.7	1	1	1	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	beta-BHC	<0.003	ug/L	U	EPA 8081	1.0101	0.003	0.05	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Cadmium (Total)	0.1	ug/L	J	EPA 200.8	1	0.007	0.5	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Calcium (Total)	82.23	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Carbonaceous BOD	<0.6	mg/L	U	SM 5210 B-2001	1	0.6	2	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Chemical Oxygen Demand	25	mg/L		ASTM D1252-95-B	1	2	5	16-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Chromium (Total)	10	ug/L		EPA 200.7	1	4	10	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Copper (Total)	9	ug/L	J	EPA 200.7	1	6	10	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Decachlorobiphenyl	2.34	ug/L		EPA 8081	1.0101	0		20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Decachlorobiphenyl	2.34	ug/L		EPA 8082	1.0101	0	1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	delta-BHC	<0.002	ug/L	U	EPA 8081	1.0101	0.002	0.05	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Dieldrin	<0.004	ug/L	U	EPA 8081	1.0101	0.004	0.1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Endosulfan I	<0.004	ug/L	U	EPA 8081	1.0101	0.004	0.05	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Endosulfan II	<0.007	ug/L	U	EPA 8081	1.0101	0.007	0.1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Endosulfan sulfate	<0.004	ug/L	U	EPA 8081	1.0101	0.004	0.1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Endrin	<0.005	ug/L	U	EPA 8081	1.0101	0.005	0.1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Endrin aldehyde	<0.004	ug/L	U	EPA 8081	1.0101	0.004	0.1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Endrin ketone	<0.003	ug/L	U	EPA 8081	1.0101	0.003	0.1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	gamma-BHC (Lindane)	<0.002	ug/L	U	EPA 8081	1.0101	0.002	0.05	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	gamma-Chlordane	<0.002	ug/L	U	EPA 8081	1.0101	0.002	0.05	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Heptachlor	<0.003	ug/L	U	EPA 8081	1.0101	0.003	0.05	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Heptachlor Epoxide	<0.004	ug/L	U	EPA 8081	1.0101	0.004	0.05	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Iron (Total)	9610	ug/L		EPA 200.7	1	10	50	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Lead (Total)	6.7	ug/L		EPA 200.8	1	0.008	0.5	15-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Magnesium (Total)	28.6	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Manganese (Total)	270	ug/L		EPA 200.7	1	3	10	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Mercury (Total)	0.06	ug/L	J	EPA 245.1	1	0.002	0.4	21-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Methoxychlor	<0.003	ug/L	U	EPA 8081	1.0101	0.003	0.5	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Nickel (Total)	10	ug/L		EPA 200.7	1	8	10	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	pH	8.03	S.U.		SM 4500-H B-2000	1			9-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Phosphorus (Total)	0.22	mg/L		SM 4500-P F	1	0.008	0.05	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Selenium (Total)	3	ug/L		EPA 200.8	1	0.06	1	15-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Silver (Total)	<4	ug/L	U	EPA 200.7	1	4	10	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Tetrachloro-m-xylene	2.17	ug/L		EPA 8081	1.0101	0		20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Tetrachloro-m-xylene	2.17	ug/L		EPA 8082	1.0101	0	1	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Thallium (Total)	0.08	ug/L	J	EPA 200.8	1	0.003	0.5	14-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Total Kjeldahl Nitrogen	0.93	mg/L		EPA 351.2	1	0.08	0.5	16-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Total Organic Carbon	13.6	mg/L		SM 5310 B-2000	10	2.6	10	16-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Total Suspended Solids	142	mg/L		SM 2540 D-1997	1	4	4	15-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Toxaphene	<0.09	ug/L	U	EPA 8081	1.0101	0.09	5	20-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Turbidity	213	NTU		EPA 180.1	1000	10	10	9-May-14	1401162-05
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Nonfiltered	Zinc (Total)	100	ug/L		EPA 200.7	1	6	10	14-May-14	1401162-05
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Aluminum (Dissolved)	50	ug/L	J	EPA 200.7	1	40	50	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Ammonia as N	0.03	mg/L	J	SM 4500-NH3 G	1	0.02	0.1	12-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Antimony (Dissolved)	<0.03	ug/L	U	EPA 200.8	1	0.03	0.5	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Arsenic (Dissolved)	2	ug/L		EPA 200.8	1	0.008	1	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Beryllium (Dissolved)	<1	ug/L	U	EPA 200.7	1	1	1	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Cadmium (Dissolved)	0.05	ug/L	J	EPA 200.8	1	0.007	0.5	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Calcium (Dissolved)	85.65	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Chromium (Dissolved)	<4	ug/L	U	EPA 200.7	1	4	10	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Copper (Dissolved)	<6	ug/L	U	EPA 200.7	1	6	10	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Iron (Dissolved)	50	ug/L	J	EPA 200.7	1	10	50	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Lead (Dissolved)	0.04	ug/L	J	EPA 200.8	1	0.008	0.5	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Magnesium (Dissolved)	21.13	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-06

Station	Date	Time	Depth (ft)	SampleSource	Analyte	Result	Units	Qual	Method	DF	MDL	MRL	AnalysisDate	LabNumber
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Manganese (Dissolved)	<3	ug/L	U	EPA 200.7	1	3	10	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Mercury (Dissolved)	0.01	ug/L	J	EPA 245.1	1	0.002	0.4	21-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Nickel (Dissolved)	<8	ug/L	U	EPA 200.7	1	8	10	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Nitrate/Nitrite Nitrogen	0.13	mg/L	J	EPA 353.2	1	0.02	0.2	12-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Orthophosphate (Dissolved)	0.02	mg/L	J	SM 4500-P G-1999	1	0.005	0.05	15-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Phosphorus (Total Dissolved)	<0.008	mg/L	U	SM 4500-P F	1	0.008	0.05	16-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Selenium (Dissolved)	2	ug/L		EPA 200.8	1	0.06	1	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Silver (Dissolved)	<4	ug/L	U	EPA 200.7	1	4	10	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Thallium (Dissolved)	<0.003	ug/L		EPA 200.8	1	0.003	0.5	14-May-14	1401162-06
MDR-S1	9-May-14	11:00 AM	0	Elutriate - Filtered	Zinc (Dissolved)	100	ug/L		EPA 200.7	1	6	10	14-May-14	1401162-06
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Aluminum (Dissolved)	<40	ug/L	U	EPA 200.7	1	40	50	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Ammonia as N	0.04	mg/L	J	SM 4500-NH3 G	1	0.02	0.1	12-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Antimony (Dissolved)	<0.03	ug/L	U	EPA 200.8	1	0.03	0.5	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Arsenic (Dissolved)	1	ug/L		EPA 200.8	1	0.008	1	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Beryllium (Dissolved)	<1	ug/L	U	EPA 200.7	1	1	1	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Cadmium (Dissolved)	0.06	ug/L	J	EPA 200.8	1	0.007	0.5	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Calcium (Dissolved)	79.72	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Chromium (Dissolved)	<4	ug/L	U	EPA 200.7	1	4	10	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Copper (Dissolved)	<6	ug/L	U	EPA 200.7	1	6	10	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Iron (Dissolved)	<10	ug/L	U	EPA 200.7	1	10	50	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Lead (Dissolved)	0.1	ug/L	J	EPA 200.8	1	0.008	0.5	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Magnesium (Dissolved)	26.99	mg/L		EPA 200.7	1	0.05	0.1	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Manganese (Dissolved)	<3	ug/L	U	EPA 200.7	1	3	10	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Mercury (Dissolved)	0.01	ug/L	J	EPA 245.1	1	0.002	0.4	21-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Nickel (Dissolved)	<8	ug/L	U	EPA 200.7	1	8	10	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Nitrate/Nitrite Nitrogen	0.18	mg/L	J	EPA 353.2	1	0.02	0.2	12-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Orthophosphate (Dissolved)	0.02	mg/L	J	SM 4500-P G-1999	1	0.005	0.05	15-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Phosphorus (Total Dissolved)	<0.008	mg/L	U	SM 4500-P F	1	0.008	0.05	16-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Selenium (Dissolved)	4	ug/L		EPA 200.8	1	0.06	1	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Silver (Dissolved)	<4	ug/L	U	EPA 200.7	1	4	10	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Thallium (Dissolved)	<0.003	ug/L		EPA 200.8	1	0.003	0.5	14-May-14	1401162-07
MDR-S2	9-May-14	11:00 AM	0	Elutriate - Filtered	Zinc (Dissolved)	70	ug/L		EPA 200.7	1	6	10	14-May-14	1401162-07