Sleeping Bear Dunes National Lakeshore

Conceptual Design Study for Boat Access to Platte Bay

FINAL REPORT

Contract No. 1443CX2000

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Prepared for the National Park Service

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Introduction

Platte River Point is located approximately 12 miles southwest of the community of Empire, Michigan, in Township 27N, Range 15W, Sections 20 and 21 in Benzie County (Figure 1). The study area is within the Platte River District, which is the southernmost portion of the National Park Service's (NPS) Sleeping Bear Dunes National Lakeshore (SLBE). The study area extends from Platte River Point approximately 1.5 miles east along the shoreline to the beach access at the end of Tiesma Road (also known as Isle View Drive).

Figure 1. Project location within the Platte River District of SLBE.

Goals and Objectives

The focus of this study is to develop a set of alternatives for providing recreational boat access to Platte Bay on Lake Michigan and restoring the natural fluvial processes of the reach of the Platte River from the boat ramp at Platte River Point to the river mouth. A secondary goal of the study is to provide a detailed evaluation of the existing stockpiled dredge spoil materials and river sediments located at the river mouth and to develop alternatives for disposal of this material.

The following sections provide background information, alternatives for recreational boat access, an evaluation of the stockpiled dredge spoil materials, and alternatives for disposition of the existing dredge spoil material. Given the independent nature of the two goals and the ability of the NPS to implement alternatives separately, the alternatives for the boat ramp will be presented separately from those for the stockpiled dredge spoil material. The Appendices provide supporting information.

Background

In an effort to gain a better understanding of existing resources and management goals for these resources, the project team reviewed a number of documents including the 2008 General Management Plan (GMP) and the 2009 Natural Resource Assessment.

> "*The dunes, forests, and aquatic systems are managed from an ecosystem perspective, considering both internal and external factors affecting visitor use, environmental quality, and resource stewardship. Management decisions about ecosystems are based on scholarly and scientific information. Resources and visitation are managed in consideration of the ecological and social conditions of the National Lakeshore and surrounding area.*" (2008 GMP)

Natural resources present within the Platte River Point study area identified within the GMP include: dunes and shore, critical dunes, coastal forest, Piping Plover critical habitat, northern hardwoods, and northern conifers (Figure 2).

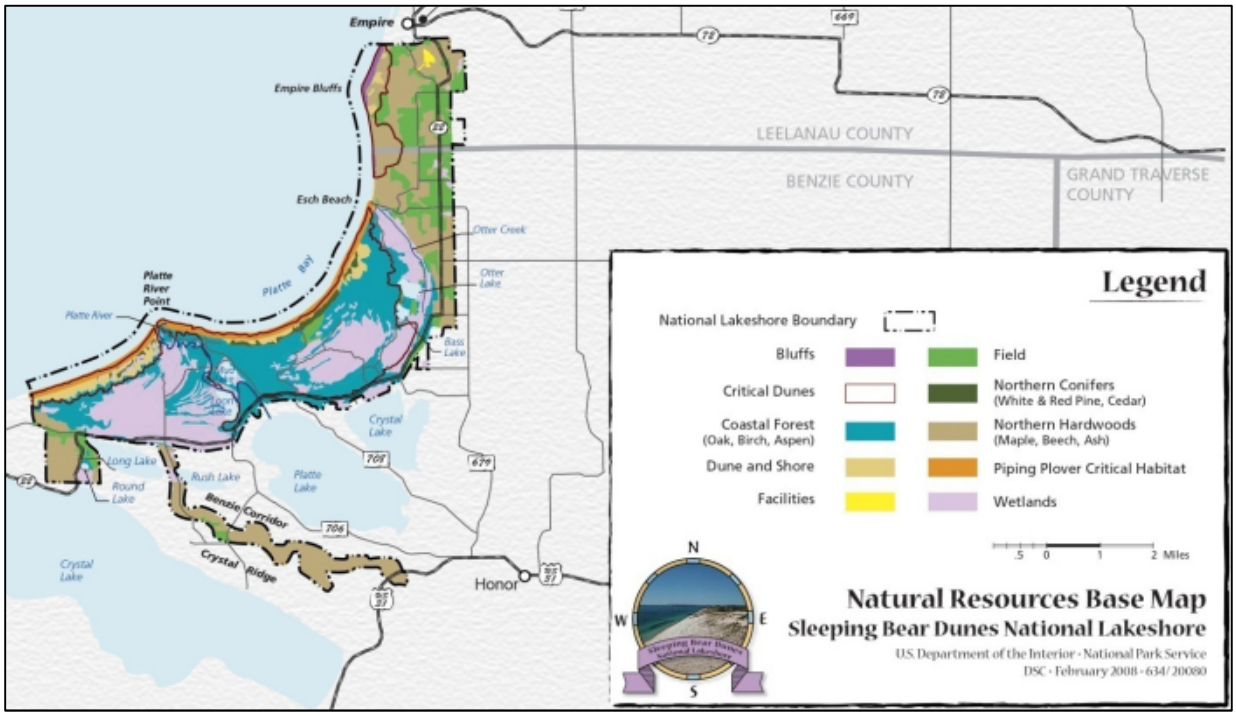

Figure 2. Base map of natural resources within the Platte River District of SLBE (2008 GMP).

Management of resources within the park is divided into management zones that prescribe how resources, visitors, and facilities will be managed in the different areas in an effort to protect natural and cultural resources to the greatest extent possible given available funds. The park is divided into four management zones: High Use, Experience History, Recreation, and Experience Nature. The Platte River and adjacent areas immediately to the east are currently located in a High Use zone (Figure 3) that entails the most intensive management. This zone is designated for visitor orientation, education, and other structured activities. The High Use designation provides additional challenges to resource management.

The High Use zoning of this area allows the NPS to provide boat ramps or docks for access to Lake Michigan, if appropriate. However, if these uses are determined to be inappropriate, the area near the mouth of the Platte River would revert to Experience Nature zoning and the area around Tiesma Road would revert to Recreation zoning. The Experience Nature and Recreation zones are intended to be natural in character with a high priority being placed on protecting and preserving natural resources.

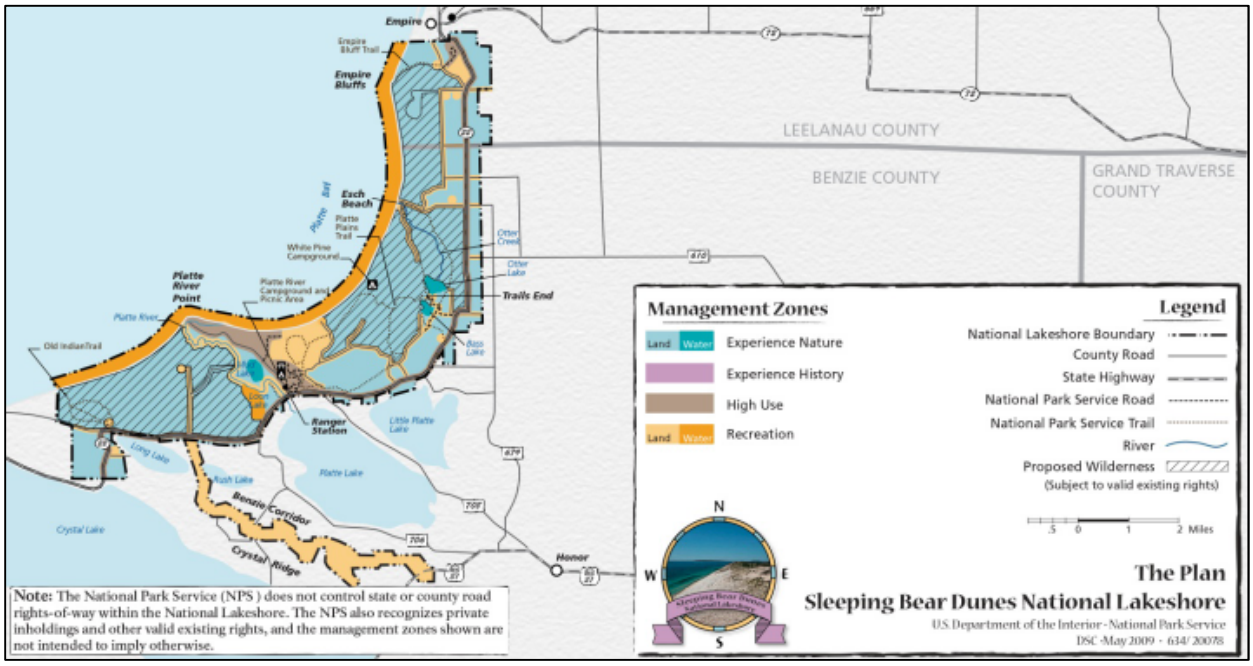

Figure 3. Management zones within the Platte River District of SLBE (2008 GMP).

Platte River Point attracts a large number of visitors annually. Monthly public use within the Platte River District for 2011 through 2013 indicates a range of 82,000 to 93,000 visitors recorded for the Platte River alone. Annually, the number of canoes averaged almost 12,000; fishermen have steadily increased from 727 in 2011 to over 1,100 in 2013, and the number of boats (other than canoes) has also been increasing from 449 in 2011 to 659 in 2013. The numbers for users listed above is down from those reported by

Pranger (2005). However, the increasing number of visitors places additional demands on resources, facilities, and staff, and increases the potential for conflicts between the current user groups.

The Platte River District is located within the Platte River watershed, which is 179 mi^2 in size and includes the Platte River as the primary stream. The Platte River originates from lake outflows with its start at Lake Ann. It flows through Platte and Loon Lakes and receives water from Mud Lake prior to reaching Lake Michigan. The river has stable groundwater, high flow stability, and low susceptibility to drying out due to significant groundwater input and low flow variability. Water resources are generally considered to be of good quality, with biotic communities more likely controlled by biologic processes within the stream than by environmental variability (NPS, 2009). However, the Platte River is still considered an area of concern as it is susceptible to impairment due to inputs from outside sources including septic systems, stormwater runoff, and increasing recreational uses.

The Platte River is a primary conduit for salmon to get to Lake Michigan from the state fish hatchery located approximately four miles east of Honor, Michigan. The introduction of salmon into the Great Lakes was started in 1966 as a means of controlling invasive fish species like alewives that were decimating the native trout populations. A side benefit to the presence of salmon in the Great Lakes is their popularity for sport fishing. Salmon fishing is most popular in the spring and fall. The Platte River allows the returning salmon spawning run from Lake Michigan to the hatchery. The spawning run, which is greatest in the portion of the river from the lower weir to the river mouth, from mid-September to late October, attracts numerous fishermen who fish from the riverbanks and who want boat access to Lake Michigan. According to NPS staff, a storm-related accident during the 1967 fall salmon season initiated the dredging practices at the mouth of the Platte River for increased safety. These dredging practices are still in effect today.

The 2009 *Assessment of Natural Resources Report* (NPS, 2009) identified three primary threats to SLBE: climate change, invasion of exotic species, and development pressure. Due in part to these factors, the report noted that the forecast for Lake Michigan is reduced ice cover, declining lake levels, reduced groundwater levels and stream base flows, and higher runoff during extreme precipitation events. Each of these threats contributes to the challenges of managing the diverse resources within SLBE.

The NPS' Geological Resources Division (GRD) conducted an assessment of the short- and long-term effects of deposited dredge materials on shoreline processes, the impacts of dredging on sand movement, and dredging operation impacts on coastal and stream channel processes (Pranger, 2005). The study concluded that human disturbances, dredging operations, and the deposition of dredge materials along the

river banks had directly altered the reach of the Platte River from the boat ramp at Platte River Point to the river mouth, and the adjacent lakeshore environments. However, these ecosystems have shown remarkable resiliency and this recovery suggests that the river channel and lakeshore would recover their natural characteristics fairly quickly if dredging ceased and the dredge spoil piles were removed.

Pranger reviewed aerial photographs taken as early as 1938 to evaluate geomorphic changes in the reach of the Platte River from the boat ramp to the river mouth, and the lakeshore. The photographs clearly show how dredging of the river mouth and deposition of the sediment on the river banks have resulted in a narrower channel, which must either increase its velocity or become deeper in order to maintain flow continuity. Pranger noted that dredging practices in this reach have reduced the river from its natural width of 80 feet to an average of 30 to 50 feet and the depth has been increased from 1 foot or less to 2.5 feet.

The GRD provided several recommendations, including that dredging be discontinued; and that the reach of the Platte River from the boat ramp to the mouth of the river, along with the associated lakeshore area, be allowed to recover through natural geomorphic processes. The GRD did acknowledge that while dredging should be discontinued based on ecological impacts, there are social, political, and policy factors related to the recreational use of the river that also must be considered.

A December 2011 report by Baird/URS for the US Army Corps of Engineers-Detroit District (USACE) evaluated existing conditions within this reach of the Platte River and historical shoreline change using aerial and satellite imagery; provided a brief evaluation of five conceptual alternatives for boat access; and developed alternative disposal options (including in-water) for future and existing stockpiled dredged sediment along the eastern riverbank. The report assumed a dredge amount of 32,000 cubic yards (CY) for estimating removal costs.

Recreational Boat Access

An existing boat launch is located approximately 900 feet from the river mouth at the end of Lake Michigan Road. Salmon fishermen working to get their boats out into Platte Bay and greater Lake Michigan use the boat launch most heavily during the fall salmon season (primarily September through October). Daily use of this access by fisherman during this period ranges from zero to 20 boats, with an estimated average of 12 boats. Dredging between the boat launch and river mouth has been performed since 1968. Dredging currently occurs for up to 30 days after Labor Day, extending from the boat launch through the sand bars until open water is reached. The current Michigan Department of Environmental Quality (MDEQ) dredge permit allows for the NPS to

remove a maximum of 900 CY annually, and place it along the adjacent river banks, to retain reliable boat access to Lake Michigan.

NPS staff identified recreational boat needs as follows:

- Peak seasonal use occurs during the fall salmon season
- Approximately 300 boaters use this access over a typical salmon season
- Parking is needed to accommodate on average 12 vehicles with trailers
- Typical boat length is 16 feet with a minimum water depth for boat launching of 30 inches

Existing Conditions

Understanding existing conditions is critical to developing and evaluating alternatives to eliminate dredging in the Platte River while still providing recreational boat access within the Park's designated High Use zone. Project team members conducted background research; and conducted a site visit October 24 and 25, 2013 to observe existing conditions, meet with park staff, and explore potential alternative sites for boat access to Lake Michigan. The results are described below.

Landforms within the region were shaped by continental glaciations. The dominant landforms include beaches, dunes, moraines, kettles, and embayment lakes. The dunes, that are a prominent feature of the Park, were formed by fluctuating water levels in the ancient lakes predating Lake Michigan, along with wind and wave action. The soils are well-drained, sandy or sand mixed with gravel and often found on steep slopes covered with a thin layer of topsoil.

Lake Michigan affects the region's climate, resulting in a relatively temperate and humid environment that directly influences the composition of the surrounding plant communities. The ecological communities present within the study area are primarily dune shore and coastal forest. Northern hardwoods and northern coniferous communities are present along the eastern end of the study area. In the shoreline areas, vegetation consisting of grasses, forbs, and shrubs begins at the back of the "storm beach", which is devoid of vegetation due to high waves, ice, and drifting sand. The coastal forest is subdivided into oak-pine and birch-maple-aspen communities.

The shoreline along the southernmost part of SLBE provides habitat for a variety of wildlife including the state and federally threatened and endangered Piping Plover. This species of migratory shorebird prefers wide, sandy, open beaches along the lakeshore for feeding and nesting. Nesting territories are generally sparsely vegetated with scattered cobblestones. Wetlands, lagoons, and river habitats are also necessary to provide food for chicks.

Records of nest sites for the Piping Plover within the Platte River Point study area over the last three years indicate consistent use with 5 to 7 sites on the western side of the Platte River and three on the eastern side. The three sites on the eastern side are quite spread out with one occurring on the existing dredge pile, another located northeast of the end of Illinois Drive, and the third located northeast of the parking lot at the end of Tiesma Road. Nesting season begins in April with the young fledging in August. NPS staff monitors potential nests and fences off areas surrounding active nests to prevent visitors from disturbing the nests.

The whole shoreline of Lake Michigan within the Platte River District is denoted as Piping Plover Critical Habitat in the GMP (Figure 2). Management of this critical habitat is quite challenging when considering the high public use in and around the Platte River. As visitor use is likely to continue to increase, it will make the task of managing this critical habitat even more difficult within this park area.

Currently, recreational boat access to Lake Michigan within the region around the Platte River District is available at Platte River Point, Empire, and Glen Arbor. The Platte River Point ramp is a poured-in-place concrete slab approximately 40 feet wide located on the eastern side of the Platte River approximately 900 feet from the confluence with Lake Michigan. The boat ramps at Empire and Glen Arbor are both removable steel grate systems. The ramps are put out in the spring and brought back in the fall to accommodate use during key recreational months and to minimize maintenance costs. None of these boat ramp locations uses wave attenuation devices in the lake to accommodate ramp use during windy or stormy conditions.

The facilities at Platte River Point include a boat launch, canoe/kayak take-out, parking lots, park, and restrooms (Figure 4). The existing boat launch and road are owned and maintained by Benzie County. Lake Township owns and maintains the small park, canoe/kayak take-out, and the adjacent parking lot (47 spaces) between the park and Lake Michigan Road. The NPS owns and maintains the large parking lot (60 spaces) and restroom facility to the east of the park, and the small parking lot (20 spaces) on the northern side of the road next to the boat ramp. As numbers of visitors increases, the demand for facilities is often stretched beyond capacity. For example, NPS staff has noted instances during peak use times where the existing facilities cannot accommodate the number of visitors, which results in people parking along Lake Michigan Road to gain access to the Point. There are a number of hiking trails in the area with a primary hiking trail to the beach that begins at the northeast corner of the small NPS parking lot adjacent to the boat launch.

Figure 4. Existing facilities at Platte River Point.

Alternative Concepts for Recreational Boat Access

The project team was given the primary goal of eliminating future dredging of the Platte River while still providing recreational boat access to Lake Michigan. The team evaluated the existing facilities and associated opportunities and constraints and developed alternatives for boat access in three locations: Alternative 3: Platte River Point; Alternative 4: Illinois Drive; and Alternative 5: Tiesma Road. Two additional alternatives (Alternative 1: No Action; and Alternative 2: Continue Dredging and In-Water Disposal, the Preferred Alternative from the 2011 Baird/URS Report) are included to assist NPS staff in complying with the National Environmental Policy Act (NEPA) alternatives analysis. This section describes proposed recreational boat access alternatives, the necessary supporting infrastructure, probable costs for construction and operations and maintenance (O&M), and needs for future data collection and analysis to facilitate final design.

Preparation of the Class C Cost Estimate (Appendix A) while unique for Alternatives 3 through 5 required similar assumptions and methods to ensure that the conceptual plans for each alternative were feasible and comparable. The following list describes

the methods, types of structures, and annual O&M all of which are assumed to be the same for these three alternatives. The cost estimate for disposal of the dredge material stockpile is separate from this Class C Estimate. See Appendix A for cost estimate details.

- **Clearing and Tree Removal:** Each alternative will require clearing and tree removal to different extents. Clearing is typically described on a per-acre basis, while tree removal is done by a contractor based on each tree counted and specified. Since no exact tree count exists for each alternative's impact, an average of 400 trees per acre was used to approximate an estimated cost of around $54,000 an acre for tree removal. Areas of impact for tree removal were only calculated for the widened or new roadway footprint and the parking lot/restroom facilities located within forested areas.

- **Roadways:** Each alternative will require new roadways or upgrades to existing vehicular roadways to provide the necessary widths and grades that allow for two-way traffic ingress and egress. Existing roadways (Illinois Drive and Tiesma Road) generally need to be widened by approximately 6 feet, and it was assumed that each linear foot of roadway widening would require 3 CY of grading. New roadway sections were proposed with a 20-foot top width and it was assumed that each linear foot of new road width would require 12 CY of grading. Construction methods assumed that all of the grading could be completed using typical earthmoving equipment without the requirement for off-site hauling; therefore, a unit cost of $8.85 per CY was used based on the 2012 Michigan Department of Transportation's (MDOT) Weighted Average Item Price Report.

  All existing roadways that are currently surfaced with aggregate were assumed to remain as aggregate after improvements. This will maintain the aesthetics of the primitive roadway and reduce the overall cost for providing boat access at a new location. The existing roadways could be converted to asphalt in the future if warranted by the use. New access roadways are proposed as asphalt for ease of maintenance given their location in the foredune and beach areas. Both road types will require maintenance and replacement on a somewhat frequent basis. Aggregate may need to be added every one to two years, but could be done with a front loader or road grader if the supplier delivers the aggregate and places it on the road at specific intervals. Asphalt repair and replacement will occur at least every 8 years and will likely require the NPS to retain a contractor. The portion of roadway within the dune area will also require cleaning or removal of windblown sand every 10 to 14 days during public use. A rough estimate of annual maintenance cost is approximately $0.50 per square yard (SY) for aggregate and $1.00 per SY for asphalt.

- **Parking Lot:** One parking lot is proposed for each alternative and is expected to have a total of 30 parking stalls that can accommodate boat trailers. Each parking area is generally 60 feet wide by 150 feet long. Asphalt surfacing is proposed for the parking lot, which will require annual maintenance, consisting of cleaning or removal of windblown sand every 10 to 14 days during public use, and repair or replacement every 8 years. The annual maintenance cost is estimated at $1,800 for asphalt maintenance and sand removal.

- **Boat Ramp:** The boat ramp proposed for each alternative is a removable ramp, either concrete geoweb sections tied together with cable wire or metal fabricated sections that can be lifted and pinned together. Removable boat ramp applications were preferred over a permanent ramp approach to avoid frequent maintenance costs associated with removing sand deposited on the ramps in areas of accretion or trying to repair erosion damage in areas like Platte River Point. The removable ramp is also preferable in dealing with lake level fluctuations every year. Prices were similar for both types of applications, so the costs in the estimate are for the concrete geoweb.

  The length and width of the proposed boat ramp was assumed to approximately match the width of the existing ramp into the Platte River (40 feet), but would need to be longer (70 feet vs. 56 feet) in order to cover a minimum depth of 4 feet below water at each site. Concrete geoweb sections, 6 inches thick, were assumed to be 18 feet wide by 9 feet long, meaning that 16 sections would be needed. Each section would have to be dragged or lifted into place with a front end loader or a rented hydraulic lift. The weight of each section would be approximately 12,000 pounds (lbs). The size of the metal fabricated ramps is 10 feet wide by 12 feet long, requiring 24 sections. Installation requirements would be similar to that of the concrete geoweb. The end of the ramp can be supported by a metal type "sawhorse" within the water if the grade becomes too deep.

  Currently, the Village of Empire works with a contractor each year to use his hydraulic lift to place and remove each section. Annual maintenance costs are based on discussion with the Village or Empire and are assumed to be $4,000 per year. It was assumed that the annual maintenance costs of installing and removing the ramp would be less than the costs and time associated with trying to control the extreme variability of the Lake Michigan shoreline and lake level.

- **Wave Attenuation:** Construction of a wave attenuation structure at any of the proposed alternative locations is not recommended. The project team visited both the Empire and Glen Arbor ramp locations on a moderately windy day and noted 3 to 5 foot waves. The possibility for much stronger winds and higher waves makes the design of a wave protection structure impractical. Most

protected boat launch facilities along other areas of the Lake Michigan shore are either part of an inland harbor or require very heavy protection. The potential for floating wave attenuation was investigated, but it was determined that the anchoring and upfront costs of such a sturdy application would be cost-prohibitive.

- **Restroom:** A single-vault restroom facility was considered as part of the conceptual plan for each alternative. Pre-fabricated, commercially available concrete structures were proposed that would be easy to operate and maintain. The Class C Cost Estimate was based on pricing provided for a recreation development project bid within the last 6 months.

  O&M tasks for the single vault restrooms include: daily inspection, thorough cleaning once a month, and annual waste pumping of the vault. Costs associated with this type of maintenance are estimated at $2,500 per year, and were provided by staff from the State Park Division of the Missouri Department of Natural Resources.

- **Construction:** Timing for construction of each of the alternatives would be approximately 3 to 4 months.

- **Data Needs:** Future information and data needed to facilitate development of the conceptual plan for the preferred alternative into preliminary and final plans include:

  - Topographic survey and confirmation of bathymetry
  - Geotechnical borings for analysis of available structural fill material

- **Project Permitting:** If the NPS decides to move recreational boat access to one of the three alternative locations described within this analysis, and moves forward with design and construction, environmental permitting through MDEQ will likely be required. Potential permits include but, are not limited to:

  - Part 323 Shorelands Protection and Management Permit
  - Part 353 Sand (Critical) Dunes Protection and Management Permit
  - National Pollutant Discharge Elimination System (NPDES) Land Disturbance Permit

Alternative 1: No Action

Under a "No Action" approach, no changes would be made to the current NPS management practices that include annual dredging and disposal of dredge material on the eastern bank of the Platte River at the confluence with Lake Michigan. Impacts to Piping Plover nesting habitat would be neutral as the existing dredge pile has been continuously used as a nesting site for at least three years, and would likely continue even with the annual addition of dredge materials. See site photographs in Figure 5.

Pros

- Maintains current recreational boat access to Lake Michigan, especially for fall salmon fishing.
- Maintains access for salmon and other fish migrating into and out of the Platte River.
- Retains recreational boat access within the High Use management zone of the park.
- Does not incur new costs (capital or O&M) beyond those already budgeted.

Cons

- Does not reduce impacts to the aquatic ecosystem and fluvial processes within the mouth of the Platte River.
- Contradicts the desire of the NPS to restore and promote the natural function of the river and shoreline.
- Continues to add to the existing dredge material stockpile that is altering the appearance and function of the beach and associated habitats.
- Continues to constrain the natural lateral movement of the river at the mouth.
- Requires continual annual funding for dredging.
- Does not reduce negative user experience of the stockpiled dredge material on the scenic resources.
- Does not reduce user conflicts between park users, canoe and kayakers, and fishermen.
- Does not reduce the need for additional parking and associated facilities due to increasing public use of this area.
- Requires renewal of MDEQ Dredge Permit every 5 years.

Probable Costs

- Based on the most recent records for dredging costs: $10,000+/year. This cost assumes that the dredged materials would continue to be placed on the adjacent river banks.

Figure 5. Photographs of existing facilities located at Platte River Point.

Photographs in Figure 5, clockwise from top left: NPS parking lot and restroom facility; Lake Township parking lot, park, and canoe/kayak take-out; the end of Lake Michigan Road; and the existing recreational boat launch.

Alternative 2: Continue Dredging Operations with In-water Disposal of Dredged Material

This alternative was the preferred concept (Concept 5) presented in the 2011 Baird/URS Report. This concept satisfies the NPS criteria of providing continued recreational boat access to Lake Michigan with the existing facilities at Platte River Point. However, it does not restore fluvial processes, nor does it alleviate future dredging of the river and disposal of the dredged material. Figure 6 shows proposed dredge disposal location.

Pros

- Retains the ability to launch recreational boats at the existing access.
- Retains boat access within the High Use management zone.
- Maintains access for salmon and other fish migrating into and out of the Platte River.
- Disposal of dredge material back into the lake provides an available source of material for future beach accretion.

Cons

- Requires annual dredging; with the associated cost.
- Incurs additional costs for the in-water disposal of dredge material into Lake Michigan.
- Use of the beach or construction of an access road to the proposed in-water disposal site will damage beach and forest habitats (critical Piping Plover habitat).
- Impacts a known Piping Plover nest site located on the existing dredge material stockpiled on the eastern bank of the river.
- Does not reduce conflicts between park users, canoe and kayakers, and fishermen.
- Requires renewal of MDEQ Dredge Permit every 5 years. Will require additional MDEQ permit for in-water disposal.

Probable Costs

- Continued annual dredging cost: $25,700, due to in-water disposal.

Figure 6. Map illustrating the preferred alternative from the 2011 Baird/URS Report.

Alternative 3: Platte Bay Point – New Lake Access

Alternative 3 is to create direct access to Lake Michigan for recreational boats in a different location at Platte River Point. The new ramp location would be at the eastern end of the natural migration area for the Platte River. A review of historic aerial photographs indicates that this area is likely outside of the area influenced by the historic meandering of the river, however further study is recommended if this location were to be selected as a preferred alternative. General assumptions for this alternative are described on pages 9 through 11. Photographs of the existing site and a sketch of the concept are illustrated in Figures 7 and 8. This concept alternative would require the following:

- Asphalt Access Road – 900 feet long x 20 feet wide.
- Asphalt Parking Lot (30 vehicles with trailers) – 150 feet long x 60 feet wide
- Geoweb Boat Ramp – 36 feet wide x 72 feet long
- Single-Vault Restroom
- Clearing – 1 acre
- Tree Removal – 0.62 acres

Pros

- Creates direct boat access to Lake Michigan.
- Retains recreational boat access within the High Use management zone.
- Eliminates the need for annual dredging of the Platte River.
- Eliminates the need to stockpile and/or remove dredge materials along the river bank.
- Provides some separation of conflicting public uses.
- Increases availability of parking for other recreational users when not used by fishermen.
- Minimizes additional beach disturbance by disturbing part of the area currently occupied by the stockpiled dredge material.
- Electrical utility is available from existing park.
- Removable boat ramp provides greater flexibility in seasonal placement of the ramp if changes occur due to shifts in the shoreline topography and/or lake water levels.

Cons

- Impacts forest and beach resources due to clearing and grading for an access road and associated parking and restroom facilities.
- Impacts a known Piping Plover nest site.

- Increased public use could impact critical Piping Plover habitat, specifically nest sites which could see increased levels of disturbance due to beach use by people and domestic pets.
- Requires additional capital and O&M costs associated with construction and maintenance of the new access and facilities, and seasonal placement and removal of the boat ramp.
- Does not provide wave protection for the boat ramp.
- Increases the distance boaters must back boat trailers into the water. However, this distance is dependent upon more detailed design.
- Could conflict with natural fluvial processes of river, specifically lateral movement of the river mouth to the east. Movement of the river mouth could in turn jeopardize the structural integrity of the access road.

Probable Costs

- Probable Opinion of Cost for construction: $496,000. See Appendix A for details.
- Probable Opinion of Cost for annual O&M: $10,300. See Appendix A for details.

Figure 7. Photographs of existing conditions for location of Alternative 3.

Photographs in Figure 7, clockwise from top left: View looking southwest from the beach to the existing waking trail; looking north along the trail towards Platte Bay; looking north then looking south at the central portion of the trail; looking south at trail; looking south at the approximate location where the proposed access would meet the primary NPS parking lot entry.

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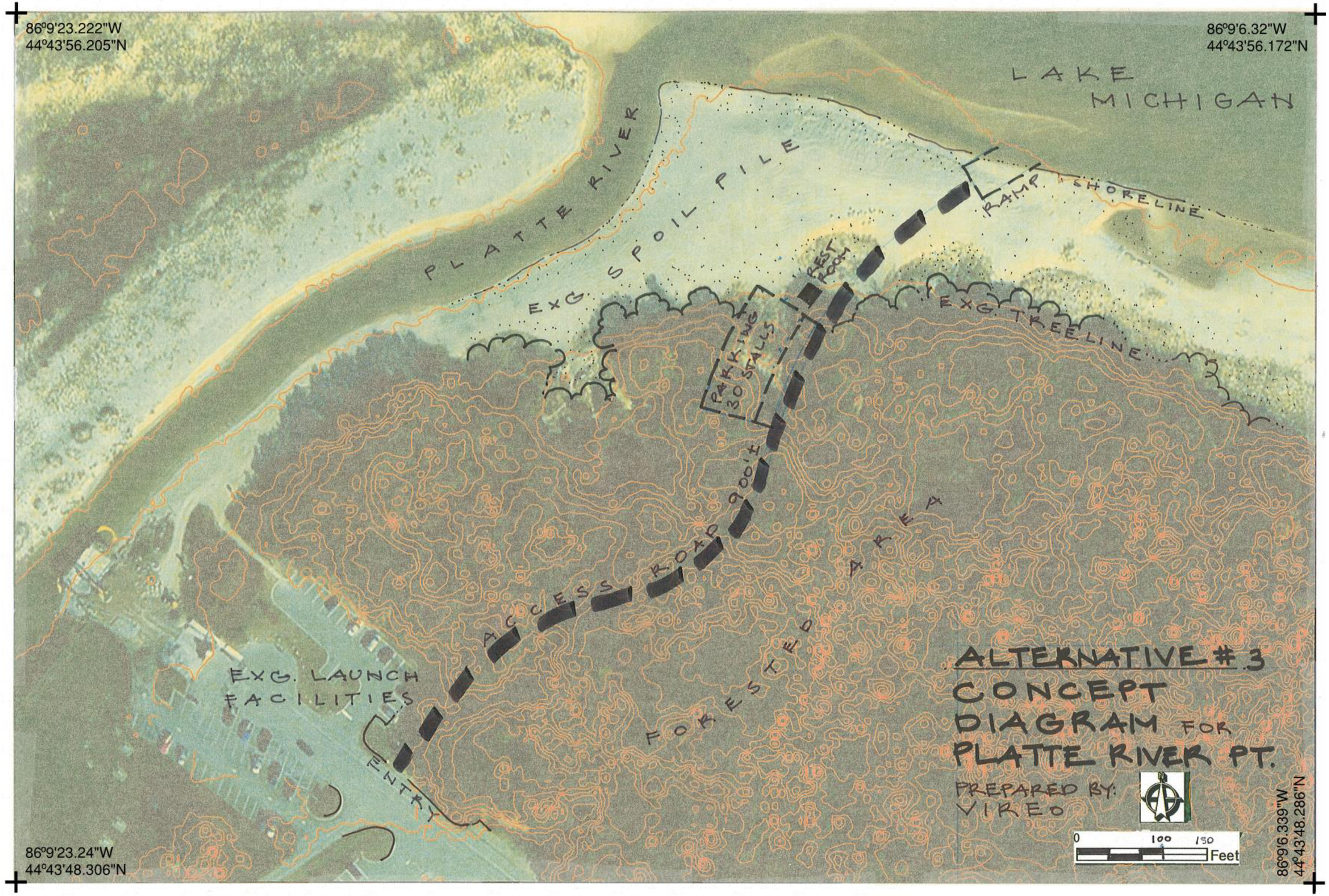

Figure 8. Alternative 3: Concept Diagram for Platte River Point.

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Alternative 4: Illinois Drive – New Lake Access

Alternative 4 provides recreational boat access to Lake Michigan via Illinois Drive, which is currently a 10-foot wide gravel road that provides access to park land as well as two private properties. This alternative would utilize an existing access road (Illinois Drive) and provide additional public access to the beach. General assumptions for this alternative are described on pages 9 through 11. Photographs of the existing site and a sketch of the concept are illustrated in Figures 9 and 10. This concept alternative would require the following:

- Improvements to Illinois Drive (aggregate surface) – 550 feet long x 16 feet wide
- Asphalt Access Road – 800 feet long x 20 feet wide
- Asphalt Parking Lot (30 vehicles with trailers) – 150 feet long x 60 feet wide
- Geoweb Boat Ramp – 36 feet wide x 72 feet long
- Single-Vault Restroom
- Clearing – 1 acre
- Tree Removal – 0.65 acres

Pros

- Creates direct recreational boat access to Lake Michigan.
- Retains recreational boat access within the High Use management zone of the park.
- Eliminates need for annual Platte River dredging.
- Does not impact existing Piping Plover nest sites.
- Places boat ramp close to transition zone between erosion and accretion zone along the lakeshore.
- Reduces user conflicts within Platte River Point.
- Electrical utility available along Illinois Drive.
- Removable boat ramp provides greater flexibility in seasonal placement of the ramp if changes occur due to shifts in the shoreline and/or lake water levels.

Cons

- Impacts forest and beach resources, due to clearing and grading of an access road and associated parking and restroom facilities.
- Increased public use could impact critical Piping Plover habitat, specifically nest sites which could see increased levels of disturbance due to beach use by people and domestic pets.

- Would increase capital and O&M costs due to construction and maintenance of the new access and facilities, and seasonal placement and removal of the boat ramp.
- Requires additional road length to accommodate steep topography.
- Increases the distance boaters must back boat trailers into the water. However, this distance is dependent upon more detailed design.

Probable Costs

- Probable Opinion of Cost for construction: $453,000. See Appendix A for details.
- Probable Opinion of Cost for annual O&M: $10,689. See Appendix A for details.

Figure 9. Photographs of existing conditions for location of Alternative 4.

Photographs in Figure 9, clockwise from top left: View looking north along Illinois Drive; looking north at the clearing adjacent to Illinois Drive that would be the entrance to the proposed access; looking north at the edge of the woodland/dune interface along the proposed road alignment; looking north at the dune area where the road to the beach would be placed; looking east at the proposed parking lot location.

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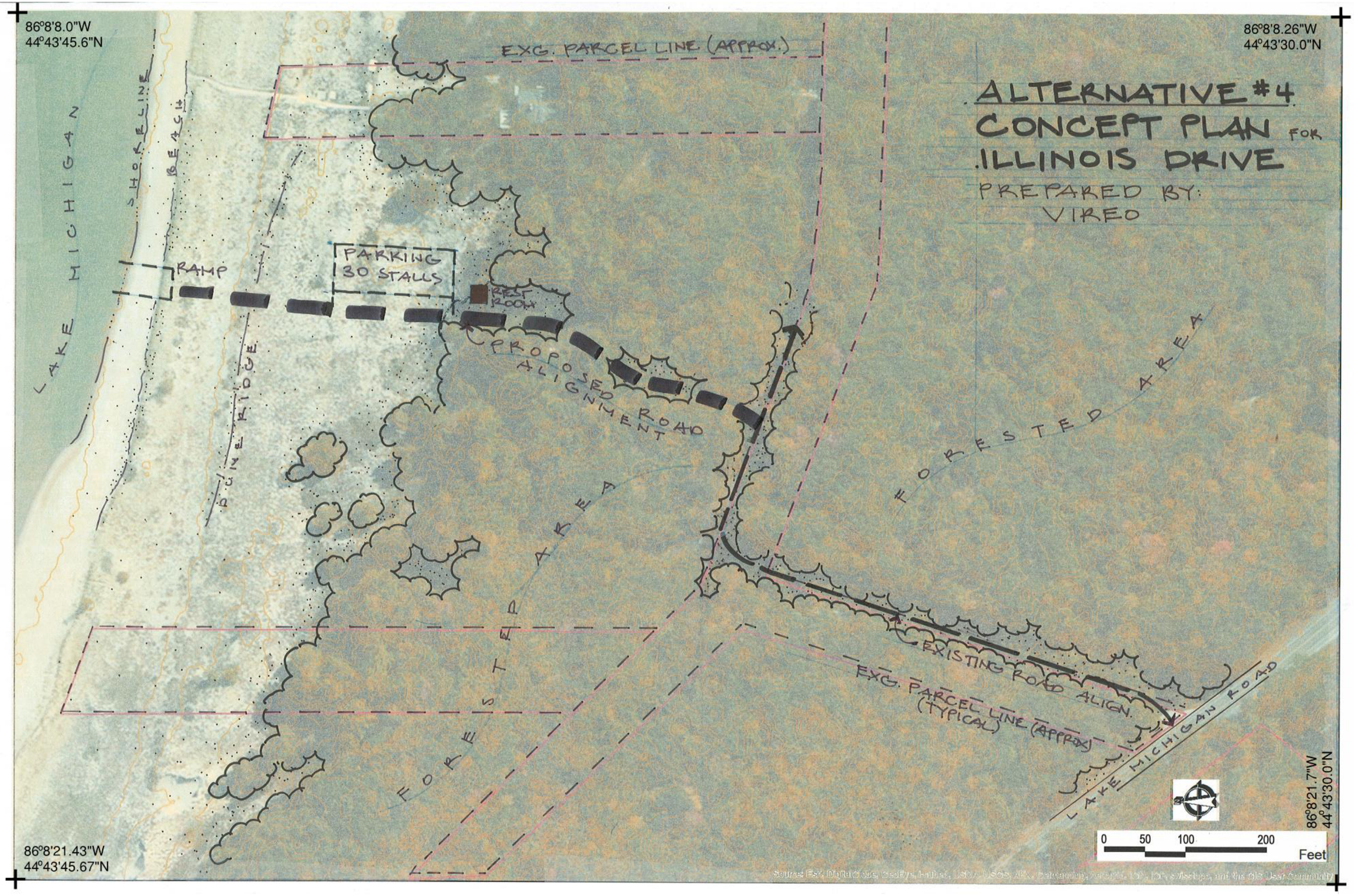

Figure 10. Alternative 4: Concept Diagram for Illinois Drive.

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Alternative 5: Tiesma Road – New Lake Access

Alternative 5 provides recreational boat access to Lake Michigan via Tiesma Road (Isle Drive), which is currently a 10-foot wide gravel road that leads to a small gravel parking lot. The road provides access to the Lake Michigan beach and shoreline for the public and for hikers coming from the Platte River campground. General assumptions for this alternative are described on pages 9 through 11. Photographs of the existing site and a sketch of the concept are illustrated in Figures 11 and 12. This concept alternative would require the following:

- Improvements to Tiesma Road (aggregate surface) – 3,200 feet long x 16 feet wide
- Asphalt Access Road – 350 feet wide x 20 feet wide
- Asphalt Parking Lot (30 vehicles with trailers) – 150 feet long x 60 feet wide
- Geoweb Boat Ramp – 36 feet wide x 72 feet long
- Single-Vault Restroom
- Clearing – 1.14 acre
- Tree Removal – 0.59 acres

Pros

- Creates direct recreational boat access to Lake Michigan.
- Retains recreational boat access within the High Use management zone of the park.
- Expands uses within an already established public use area.
- Eliminates the need for annual Platte River dredging.
- Does not impact existing Piping Plover nest sites.
- Establishes access and facilities in a previously disturbed location.
- Removable boat ramp provides greater flexibility in seasonal placement of the ramp if changes occur due to shifts in lake water levels and/or sand dunes.

Cons

- Impacts forest and beach resources, due to clearing and grading of an access road and associated parking lot and restroom facilities.
- Increased public use could impact critical Piping Plover habitat, specifically nest sites which could see increased levels of disturbance due to beach use by people and domestic pets.
- Increases capital and O&M costs due to construction and maintenance of the new access and facilities, and seasonal placement and removal of the boat ramp.

- Places the boat ramp in an accretion zone.
- May increase the distance boaters must back boat trailers into the water. However, this is dependent upon more detailed design.
- Electrical utility not available in the immediate vicinity.

Probable Costs

- Probable Opinion of Cost for construction: $480,000. See Appendix A for details.
- Probable Opinion of Cost for annual O&M: $12,634. See Appendix A for details.

Figure 11. Photographs of existing conditions for location of Alternative 5.

Photographs in Figure 11, clockwise from top left: View looking north along Tiesma Road; looking east at the existing gravel parking lot and beach access; looking north at the existing beach trail; looking south at the proposed location of the parking lot; looking north at the existing trail which would become the access road; looking north at the trail where the proposed ramp would be located.

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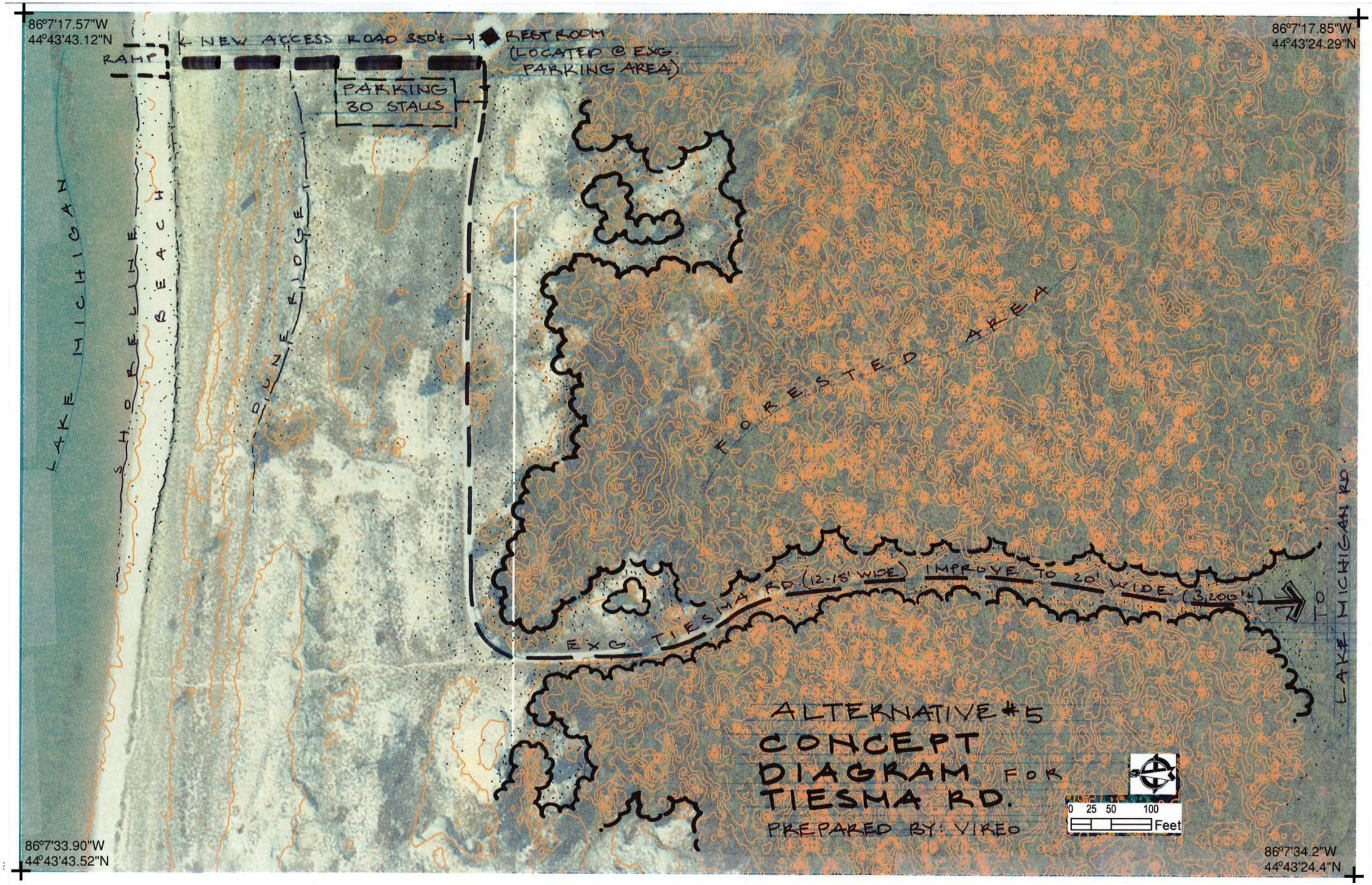

Figure 12. Alternative 5: Concept Diagram for Tiesma Road.

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Stockpiled Dredge Material and River Sediment

As previously described, dredge material removed near the confluence of the Platte River and Lake Michigan has been placed along both the eastern and western banks of the Platte River for more than 40 years. The current 5-year maintenance permit from the MDEQ allows approximately 900 CY of material to be dredged from the mouth of the Platte River and disposed of on-site in accordance with plans dated August 31, 2009.

Characterization of Existing Dredge Pile

Stockpiling of this dredge material over the years, especially during the most recent years, has been concentrated on the eastern side of the Platte River mouth between the beach and dunes of Platte Bay, which extend east to west almost up to the current eastern bank of the River. Refer to Figure 13 which shows the approximate locations of existing dredge material stockpiles. Past use of the western bank for dredge material was limited to the sloped area between the dunes along the Lake Michigan Shoreline and the Platte River, also shown in Figure 13.

Figure 13. Locations of the existing dredge material stockpiles.

Topographic LiDAR, available from the 2008 U.S. Army Corps of Engineers National Coastal Mapping and Topobathy Program, were utilized to determine the approximate elevations and profile of each stockpile, using the approximate locations shown in

Figure 13 as the extents of the stockpiles. A profile of the eastern dredge pile drawn from west to east shows the top elevation of the dredge pile was around 587.0 feet (ft.) to 587.5 ft. (orthometric heights referenced to the North American Vertical Datum of 1988) in 2008. It was assumed that these elevations have only slightly increased during the past 5 years to an average elevation of 587.5 ft.

An exact elevation of the pre-existing topography prior to the beginning of dredging in 1968 is not known; instead, it was assumed that this area had a historic elevation similar to the surrounding shoreline which is just at or above the Ordinary High Watermark established for Lake Michigan at 581.5 ft. (Indiana Department of Natural Resources, 2013). Hence, the dredge pile has an average approximate height of 6 to 7 feet, not 14 feet as previously reported. Based on this data, it can be calculated that the eastern dredge stockpile has an approximate volume of 12,000 CY, not 30,000 to 40,000 as previously reported (Baird/URS, 2011). This lower approximate value of 12,000 CY is further supported considering that during most years less than 900 CY was actually dredged from the river and in some cases just over half of that maximum volume was actually placed on the eastern stockpile.

Dredge material stockpiled along the western bank of the Platte River mouth is more difficult to quantify as pre-existing topographic elevations prior to dredging are less predictable, given the fact that historic photos show movement of the river and changes to the shape and slope of the western bank prior to 1968. Due to this limitation, along with the limitations of access and the fact that the area is heavily used by Piping Plovers for nesting sites, it is assumed that removal of dredge material from the western stockpile would not be necessary unless contaminants were detected based on field samples and testing of the eastern stockpile.

Sampling Results

The initial scope of sediment sampling included a total of four (4) samples from the river, and five (5) dredge spoil samples for laboratory analysis with one duplicate. Additionally, three (3) bulk samples were scheduled to be submitted for particle size analysis (ASTM D422/D6913). A Field Sampling Plan prepared by Coleman Engineering on September 10, 2013 is included in Appendix B. The sampling plan called for sampling the dredge spoils on the eastern and western banks at the mouth of the Platte River. Sediment sampling of the river bottom was discussed in development of the sampling plan, but was eliminated citing that the recent dredge spoils would be representative of river sediments. Reconnaissance of the site prior to sampling indicated that access to the western dredge spoil pile would be possible via wading upstream of the mouth of the river.

Sampling was completed October 24, 2013 in conjunction with an on-site meeting between the project team and NPS staff. It was observed during this meeting that dredging to open the mouth of the river to boat traffic had already occurred this fall. NPS staff also noted that access to the western spoil pile was potentially unsafe and authorized limiting the collection of the proposed 4 samples to the eastern dredge spoil stockpile. The rationalization for the sampling modification postulated that the eastern spoils would be generally representative of the dredged sediments. It was further decided that if impacts were indicated in the laboratory analysis, a supplemental sampling program could be completed on the western spoils at a later date. Sampling was completed for dredge spoils on the eastern bank at the river mouth. Subsequently, the NPS was credited for sampling and expenses for the items that were not completed. Figure 14 below show field sampling photographs.

Figure 14. Photographs of dredge material spoil pile and sampling at Platte River Point.

Photographs in Figure 14s, clockwise from top left: View of the dredge spoil pile on the eastern river bank; the dredge spoils located on the western river bank; sampling the dredge spoil pile on the eastern river bank; close up of the dredge spoil materials on the eastern river bank.

Laboratory testing of the samples was conducted by Pace Analytical Services, Inc. in Green Bay, Wisconsin. Only heavy metals such as arsenic, copper, lead, and zinc were detected. Levels of mercury were below the detection limit. Other heavy metal concentrations from Sample Nos. 1 through 3 were all noted as being below the adjusted reporting limits. The adjusted reporting limits are based on recommendations and review procedures in accordance with the MDEQ Policy and Procedure No. 09-018 for Dredge Sediments.

Sample No. 4, located closest to the lake shore, did exhibit concentrations for lead and zinc above the reporting limits (1.1 mg/kg for lead and 3.9 mg/kg for zinc). However, the laboratory test levels are still 400 to 20,000 times less for lead and zinc respectively than the statewide criteria for allowable soil concentrations. Upland disposal of the eastern dredge stockpile should pose no risk.

As recommended in the MDEQ Policy and Procedure No. 09-018, the report of MacDonald et al. (2000), entitled *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems,* was used to determine if concentrations present in Sample No. 4 would be permissible for in-water disposal. Threshold Effect Levels in the report indicate that both lead and zinc concentrations reported in Sample No. 4 are 31 times below allowable criteria and therefore, sediments would be safe to place back into Lake Michigan.

A particle-size analysis was conducted on three separate samples taken from the eastern dredge stockpile. The purpose of this mechanical sieve analysis was to characterize the distribution and future potential uses of the dredged material from the Platte River mouth. The complete results of the lab analysis are in Appendix C.

The results indicate a mixture of predominantly sand with approximately 20% to 40% fine gravel. The sand grain size is mostly fine to medium in particle size. Using the Unified Soil Classification System (USCS) adapted from ASTM D2487, the aggregate would be classified as poorly graded sand with gravel.

Based on this classification, potential uses of the dredge material were investigated in accordance with a report on the Beneficial Uses of Great Lakes Dredge Material *(*produced by the Great Lakes Commission, 2001), and based on standard aggregate construction material specifications from the MDOT. Beneficial uses presented in the Commission report include beach/littoral nourishment, habitat restoration, and landscaping or construction materials. Since the dredge material has a fair percentage of fine gravel, use as beach nourishment may require particle separation to extract the sand. Habitat restoration could be an ideal use for the dredge material, based on current wildlife usage at Platte River Point, including Piping Plover.

Potential use as a construction material is based on the sieve analysis and the MDOT's (2012) Standard Specifications for Construction. The dredge material would be considered a Class I, Class II/IIA, and Class III granular material available for use as a sub-base, but not in a mixture for Portland cement concrete, or hot mix asphalt.

Dredge Material Stockpile Disposal Options

Due to the absence of reports and historic data describing the topography of the dredge material stockpile location prior to 1968, cross sections from the 2008 topographic LiDAR closest to the stockpile location were analyzed to provide a best approximation of natural conditions prior to initiation of dredging practices within this portion of the Platte River. Using the natural shoreline and foredune area just east of the stockpile as of October 2013 as a reference, the 100 feet closest to the shoreline would have an elevation varying between lake level (assume 580.0 ft.) and 583 ft. with an average of 581.5 ft. The next 100 feet would be considered foredune area and would range up and down in elevation between 582 ft. and 587 ft. where it meets the elevation of the high dunes. If the stockpile area is reconstructed to aesthetically match the natural shoreline and foredune area just to its east, the stockpile would only need to be lowered approximately 4.5 to 6 feet. The removed volume would be about 11,000 CY. It is assumed that this removal would reshape the stockpile location to relatively natural conditions, see Figure 15, and allow the mouth of the Platte River to migrate further to the east as it did historically.

Given the quantity and quality characteristics of the dredge spoils, potential options for removing the existing dredge spoil stockpiles were evaluated and compared based on their pros and cons, and estimates of the associated costs. The options evaluated include:

A. In-water disposal
B. Platte Bay dune re-creation and upland disposal
C. Use as a construction material
D. Off-site hauling and upland disposal near existing Tiesma Road parking lot

Potential locations for Options A, B, and D are represented in Figure 16 below. Given the presence of Piping Plover critical habitat throughout this area of the lakeshore and SLBE, all options proposed will likely required coordination with Federal and state fish and wildlife agencies.

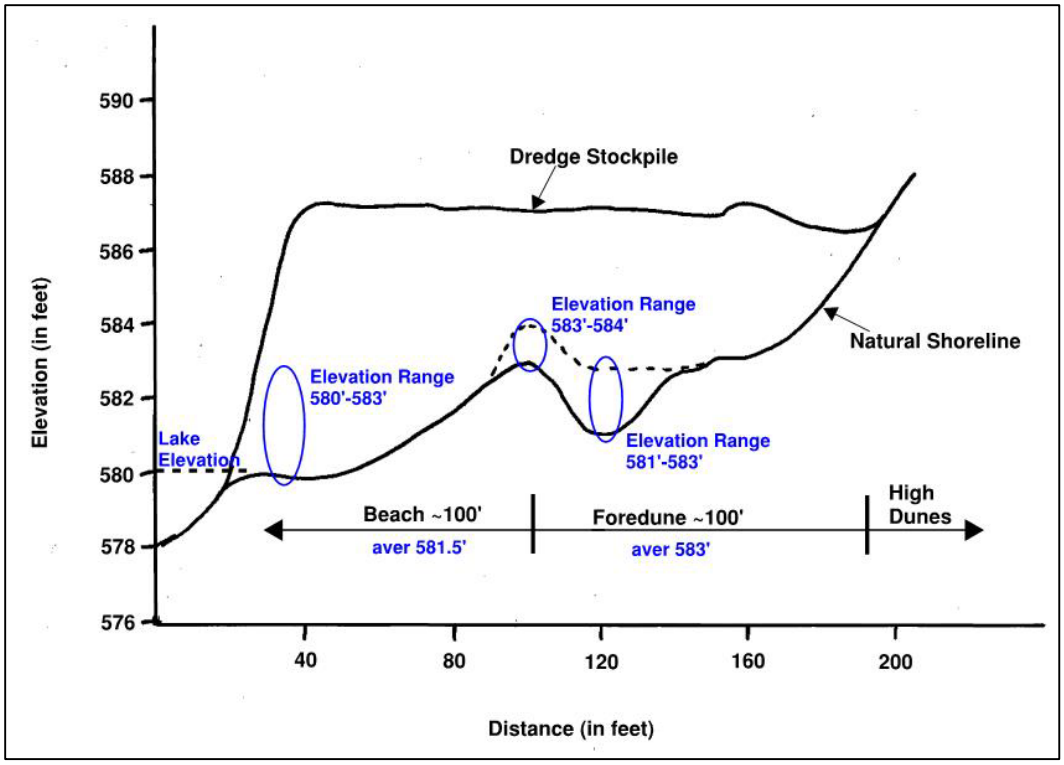

Figure 15. Graph of beach and dune elevations for dredge stockpile removal.

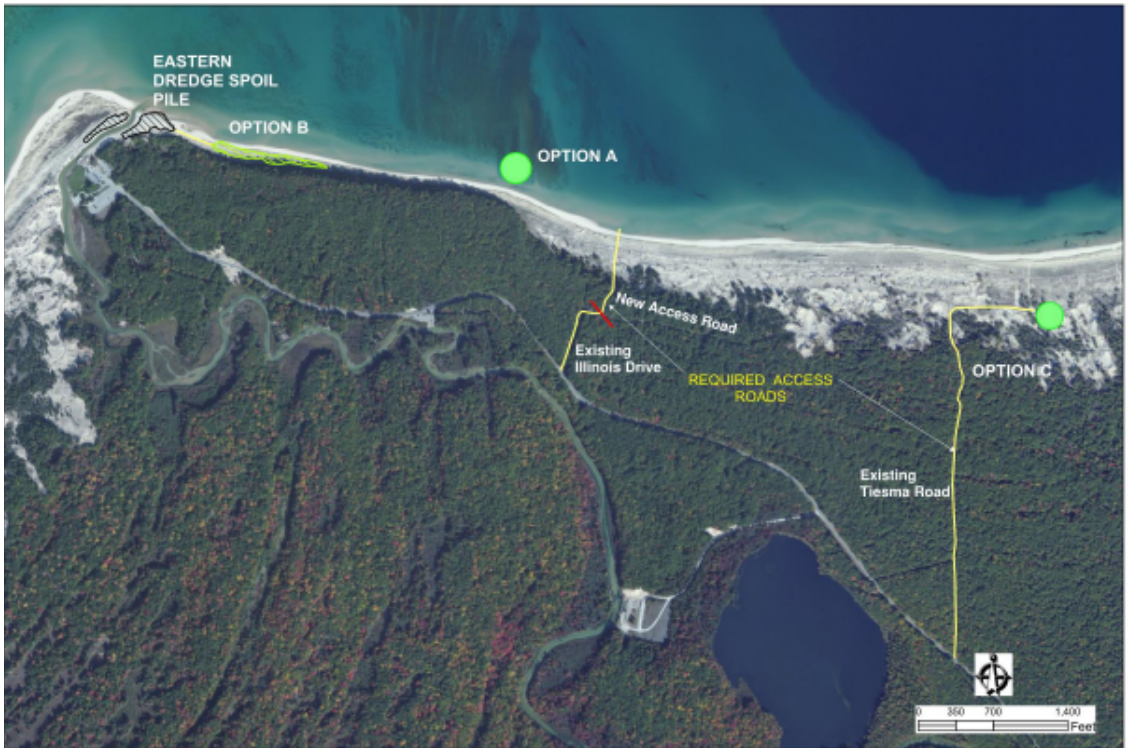

Figure 16. Alternative locations for disposal of the eastern dredge material stockpile.

Option A: In-water Disposal

In-water disposal was discussed in the 2011 Baird/URS Report (see Alternative 2, pg 14). In-water disposal would require excavation and hauling of the approximate 11,000 CY of dredge material (using a specifically constructed haul route) to a recommended location approximately 3,000 feet east of the Platte River mouth. The disposal location would be near the transition zone between erosion and accretion, see Figure 16. The 2011 Baird/URS Report proposed this same location so that erosion would move the material into the accretion zone, balancing the littoral system. Disposal of the dredge material would be in the water at a depth of 5 feet or less.

Disposal of the dredge material closer to the mouth of the Platte River is not recommended due to the limited available area and the potential for unintended affects if the larger gravel does not erode, which could change the underwater bathymetry near the point.

Grading and excavation of the existing dredge material would likely utilize a track excavator (backhoe), and dump trucks to transport and place the material. The proposed location provides the greatest opportunity for disposing of the dredge material into shallow water. A beach access road extending from Illinois Drive would be developed as illustrated in Alternative 4 (see Figure 10, page 25). Transport to the disposal location via the beach is not an option due to the negative impacts the trucks would have on the beach and foredune area which is all considered critical Piping Plover habitat.

Pros

- Provides material for future beach accretion.
- Would promote natural coastal and fluvial processes at Platte River Point.
- Reshapes the remaining stockpile material to provide a more natural look and function to the beach and foredune area.

Cons

- Only feasible if access is provided to the disposal location.
- Requires additional permitting and environmental monitoring.
- Disposal into the lake may require pumping from the dump trucks.
- Would impact a known Piping Plover nest site, and the new access road could impact additional critical habitat.
- Will require permit from MDEQ for in-water disposal.

Probable Cost

- $214,500; assumes $12.00 per CY for removal and hauling over a 1.5 mile distance; plus an additional $3.00 per CY for placing the material in the lake; and a 30 percent contingency for design and permitting.

Option B: Platte Bay Dune Re-creation and Upland Disposal

This option includes removing and disposing of the excess dredge material (approximately 11,000 CY), within the depressional dune areas just east of the current dredge pile location. Dredge material would be removed from the stockpile area using a large front-end loader. A small dozer would be used to reshape the remaining material to match existing topography and retain undulating foredune elevations between 582.0 ft. and 585.0 ft. See Figure 16 for approximate location of disposal and grading area.

Pros

- Eliminates hauling removed material.
- Reshapes the stockpile location to provide a more natural look and function to the beach and foredune area.
- Would confine construction to one area.
- Would promote future coastal processes and potentially restore fluvial river processes at Platte River Point.
- Could potentially create additional nesting habitat for Piping Plover.

Cons

- Impacts existing vegetated areas, but within the High Use zone.
- Impacts a known Piping Plover nest site. Creation of nesting habitat in an area that has the potential for high public use could cause greater conflicts between wildlife and public use.

Probable Cost

- $126,500; assumes an approximate cost of $8.85 per CY for grading; plus a 30 percent contingency for design and permitting.

Option C: Use as Construction Material

In this option, it was estimate that approximately 2,000 CY of the 11,000 CYs could be used as construction material and the remainder would be disposed of as described in Option B.

The particle size analyses conducted on representative samples from prior investigations, and this investigation, indicate that the sediments and dredge spoils consist primarily of medium-to fine-grained sand with some gravel. The gravel fraction ranged from 17 to 40 percent. Based on review of the MDOT specifications for various aggregates and construction materials, the material appears best suited for granular backfill as identified in Table 902-3 "Grading Requirements of Granular Materials;" specifically Class I, Class II/IIA, and Class III material. An aggregate producer should be consulted regarding its use for construction aggregates (asphalt paving, concrete, drainage stone, base aggregates); however, the percentage of the gravel sized fraction should not significant enough to warrant a screening operation. Applicable sections of the MDOT Aggregate Specifications are in Appendix D.

Depending on which boat launch access site is ultimately chosen, the dredge spoil material may potentially be used as a roadway sub-base or simply as fill. The possible costs associated with using the excess 11,000 CY as construction material is dependent on the haul distance and time as well as the overall need for aggregate or fill material. Grading quantities in the Class C Cost Estimate for the boat ramp alternatives are preliminary estimates of excavation and fill, and may change depending on the final access road elevation and profile.

Pros

- Provides a sustainable reuse for a portion of the excess dredge material.

Cons

- Would require hauling of material; but may offset haul costs charged by a construction contractor to transport material from off-site.
- Would have to be coupled with another option to remove the recommended quantity of stockpiled dredge material.
- Impacts a known Piping Plover nest site. Creation of nesting habitat in an area that has the potential for high public use could cause greater conflicts between wildlife and public use.

Probable Cost

- $104,000; assumes 2,000 CY used for construction is part of other construction costs. The cost listed is to grade the remaining 9,000 CY of material as described in Option B, at a unit cost of $8.85 per CY; plus a 30 percent contingency for design and permitting.

Option D: Off-site Hauling and Upland Disposal near Existing Tiesma Road Parking Lot

This option includes removal of approximately 11,000 CY of the dredge material from the eastern dredge spoil area, and disposing of the material in upland areas near the existing Tiesma Road parking lot; see Figure 16. The remnant dredge spoil pile area would be reshaped with a small bulldozer to match surrounding topography.

Pros

- Reshapes the remaining stockpile material to provide a more natural look and function to the beach and foredune area.
- Would promote future coastal processes and restore fluvial river processes at Platte River Point.
- Could create additional habitat for Piping Plover nesting.

Cons

- Impacts a known Piping Plover nest site and nesting habitat. Creation of nesting habitat in an area that has the potential for high public use could cause greater conflicts between wildlife and public use.

Probable Cost

- $172,000; assumes $12.00 per CY for removal and hauling over a 3 mile distance; plus a 30 percent contingency for design and permitting.

Summary

Managing resources and public use within SLBE presents a challenging task for NPS staff. Platte River Point is located in a High Use management zone within the southernmost district of SLBE. The park and associated resources and facilities are used by a variety of visitors including swimmers, fishermen, canoe/kayakers, and recreational boaters. Usage has been steadily increasing in recent years, increasing concerns about the ability of the site resources to support all of these uses while retaining their integrity, and the quality of visitor experience.

Five alternatives, summarized in the table below, would provide direct recreational boat access to Lake Michigan. Alternatives 3 to 5 would meet the NPS criteria of eliminating future dredging of the Platte River. A Class C Cost Estimate is provided for each of the alternatives (Appendix A).

Table 1. Summary of recreational boat access alternatives.

	Alternatives				
Activities	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**
Eliminates Dredging	No	No	Yes	Yes	Yes
Provides Boat Access to Lake MI	Yes	Yes	Yes	Yes	Yes
Impacts Piping Plover Nest Sites	Yes	Yes	Yes	No	No
Reduces Pressure on Existing Resources and Facilities at the Point	No	No	Yes	Yes	Yes
Requires Construction of New Facilities	No	No	Yes	Yes	Yes
Requires Additional Operations and Maintenance Costs	No	Yes	Yes	Yes	Yes
Construction Cost Estimate	NA	NA	$496,000	$453,000	$480,000
Annual O&M Cost Estimate	$10,000	$25,700	$10,300	$10,689	$12,634

The NPS and MI DNR have been dredging the mouth of the Platte River for over 40 years to provide recreational boat access to Lake Michigan for salmon fishing during the fall. River dredging and stockpiling along the river banks has impacted the river's fluvial processes and ecological functions. Additionally, the timing of the salmon spawning run and the dredging of the river mouth often causes conflicts with other park users.

If the practice of dredging the Platte River is discontinued and direct access to Lake Michigan for salmon fishermen and other recreational boat users is still desirable, development of an alternative location may be necessary. Cessation of dredging will eliminate the need and cost for future river sediment disposal. The impact on salmon

migration into and out of the Platte River should be monitored to determine if additional actions would be necessary to provide river access in the absence of dredging.

As described previously, removal of the dredge spoil stockpile on the eastern bank of the Platte River was also evaluated. Four options were developed for the removal and disposal of this material. The amount of material removed and the location for disposal were discussed with each option. The probable costs for each option are:

- Option A - $214,500
- Option B - $126,500
- Option C - $104,000
- Option D - $172,000

Removal and disposal of the existing dredge spoil materials on the eastern bank could happen in conjunction with or separate from resolving the issue of recreational boat access.

Regardless of the available disposal options, removal of the dredge material stockpile on the eastern side of the river will impact at least one existing Piping Plover nest location. However, dependent upon the disposal option selected, additional habitat for nest sites could be created in locations that are likely to be less susceptible to disturbances by visitors. Increased public use and the potential for increased disturbances to critical Piping Plover habitat is also dependent upon the decision made regarding recreational boat access to Lake Michigan.

References

Baird/URS. 2011. *Platte River, Sleeping Bear Dunes – Conceptual Solutions for Platte River Dredged Material*. Prepared for the U.S. Army Corps of Engineers, Detroit District. Contract No. W911K-10-D-002, Task Order 0016.

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U.S. Department of the Interior, National Park Service (NPS). 2009. *Assessment of Natural Resource Conditions – Sleeping Bear Dunes National Lakeshore*. Natural Resource Report NPS/NRPC/WRD/NRR-2009/097, Fort Collins, CO.

NPS. 2008. *Final General Management Plan, Wilderness Study, Environmental Impact Statement – Sleeping Bear Dunes National Lakeshore*.

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Appendices

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United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

BASIS OF ESTIMATE

APPENDIX A

PROJECT INFORMATION

Project:	Conceptual Design Study for Boat Access to Platte Bay
Park:	Sleeping Bear Dunes National Lakeshore
Park Alpha:	Park Code
PMIS Number:	Contract No. 1443CX2000
Estimate Date:	03.31.2014
Prepared By:	Paul W Woodward, PE, CFM
Company:	Olsson Associates (sub to SFS Architecture)
Address:	2111 S 67th Street, Suite 200
City, State Zip:	Omaha, NE 68106
Phone:	402.938.2470

BACKGROUND SUPPORTING MATERIAL (Scope of Work):

Basis of work is in accordance with the Sleeping Bear Dunes National Lakeshore: Conceptual Design Study for Boat Access to Platte Bay Task Order dated August 20, 2013, including conceptual design drawings for each alternative dated December 12, 2013.

SOURCE OF COST DATA:

Documentation for cost data used in this estimate was from the Michigan Department of Transportation Weighted Average Item Price Report for the period of October 1, 2011 to February 8, 2013.

ESTIMATE ASSUMPTIONS:

See attachment for assumptions.

MAJOR CHANGES FROM PREVIOUS ESTIMATE:

Assumptions from cost estimates dated December 12, 2013 and February 17, 2014 have been refined and updated.

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

BASIS OF ESTIMATE

PROJECT INFORMATION

Project: Conceptual Design Study for Boat Access to Platte Bay

Park: Sleeping Bear Dunes National Lakeshore
Park Alpha: Park Code
PMIS Number: Contract No. 1443CX2000
Estimate Date: 03.31.2014

DESCRIPTION OF MARK-UP & ADD-ONS:

Location Factor:	0.00%	Describe source and rationale for location factor here
Remoteness Factor:	10.00%	Site is 25 miles from Traverse City and this accounts for increased mobilization costs.
Wage Rate Factor:	0.00%	Explain method and justify value
State & Local Taxes:	0.00%	Describe type of tax and rates used
Design Contingency:	30.00%	Conceptual Level Design
Standard. General Conditions:	0.00%	Explain & Justify
Government General Conditions:	0.00%	Explain & Justify
Historic Preservation Factor:	0.00%	Describe rationale for using this factor
Contractor Overhead:	0.00%	Explain & Justify
Contractor Profit:	0.00%	Explain & Justify
Bonds and Permits:	12.00%	Expected to cover future field investigations, final design, and permitting
Contracting Method Adjustment:	0.00%	Describe anticipated contract method and justify value used.
Annual Inflation Escalation Factor:	0.00%	Projected annual inflation rate.
Time Until Project Midpoint (Months)	0	Number of months from estimate (or data) date until the projects midpoint of construction.

OTHER COMMENTS:

Provide any additional information, qualifications, etc.

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

PROJECT COST SUMMARY

Project: Conceptual Design Study for Boat Access to Platte Bay
Park: Sleeping Bear Dunes National Lakeshore
Alpha: Park Code
PMIS: Contract No. 1443CX2000

Estimate By: W Woodward, PE,
Date: 03.31.2014

Reviewed By: Dave
Date: 04.01.2014

Item No.	Description	Quantity	Unit	Cost/Unit	Total
1	Platte River Point Boat Access	1	VALUE	$316,575	$316,575
2	Not Used	1	VALUE	$0	$0
3	Not Used	1	VALUE	$0	$0
4	Not Used	1	VALUE	$0	$0
5	Not Used	1	VALUE	$0	$0
6	Not Used	1	VALUE	$0	$0
7	Not Used	1	VALUE	$0	$0
8	Not Used	1	VALUE	$0	$0
9	Not Used	1	VALUE	$0	$0
10	Not Used	1	VALUE	$0	$0
11	Not Used	1	VALUE	$0	$0
12	Not Used	1	VALUE	$0	$0
13	Not Used	1	VALUE	$0	$0
14	Not Used	1	VALUE	$0	$0
15	Not Used	1	VALUE	$0	$0
16	Not Used	1	VALUE	$0	$0
17	Not Used	1	VALUE	$0	$0
18	Not Used	1	VALUE	$0	$0
	Subtotal Direct Construction Costs				**$316,575**
	Value of Government Furnished Property (GFP) Included in Direct Cost (see footnote)*				**$0**
				Direct Cost Subtotal without GFP	**$316,575**
	Published Location Factor	0.00%			$0
	Remoteness Factor	10.00%			$31,658
	Federal Wage Rate Factor	0.00%			$0
	State & Local Taxes	0.00%			$0
	Design Contingency	30.00%			$94,973
	Total Direct Construction Costs				**$443,205**
	Standard General Conditions	0.00%			$0
	Government General Conditions	0.00%			$0
	Historic Preservation Factor	0.00%			$0
	Subtotal NET Construction Cost				**$443,205**
	Overhead	0.00%			$0
	Profit	0.00%			$0
	Estimated NET Construction Cost				**$443,205**
	Bonds & Permits	12.00%			**$53,185**
	Contracting Method Adjustment	0.00%			$0
	Inflation Escalation	0	Months	0.00%	$0
	Total Estimated NET Cost of Construction				**$496,390**

* GFP costs are only used when the Government pre-purchases items, or provides other materials out of Government inventory, to be installed by contractor. Adjustments and Markup on GFP only include Inflation Escalation; No other adjustment factors or O&P markup have been applied.

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

LINE ITEM COST SUMMARY

Project:	**Conceptual Design Study for Boat Access to Platte Bay**	**Estimate By:**	Paul W Woodward, PE, C
Park:	**Sleeping Bear Dunes National Lakeshore**	**Date:**	03.31.2014
Park Alpha:	**Park Code**	**Reviewed By:**	Dave Ciaccio
PMIS Number:	**Contract No. 1443CX2000**	**Date:**	04.01.2014
Summary Item 1	**Platte River Point Boat Access**	**Total Cost:**	$316,575

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
F20	**SELECTIVE BUILDING DEMOLITION**					
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
SUBTOTAL SELECTIVE BUILDING DEMOLITION		**1**	**VALUE**	**$ -**	**$0**	

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G10	**SITE PREPARATION**					
Level 3 Code	Clearing	1	Acres	$ 1,000.00	$1,000	
Level 3 Code	Tree Removal	0.62	Acres	$ 54,000.00	$33,480	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
SUBTOTAL SITE PREPARATION		**1**	**VALUE**	**$ 34,480.00**	**$34,480**	

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

LINE ITEM COST SUMMARY

Project:	**Conceptual Design Study for Boat Access to Platte Bay**	**Estimate By:**	Paul W Woodward, PE, C
Park:	**Sleeping Bear Dunes National Lakeshore**	**Date:**	03.31.2014
Park Alpha:	**Park Code**	**Reviewed By:**	Dave Ciaccio
PMIS Number:	**Contract No. 1443CX2000**	**Date:**	04.01.2014
Summary Item 1	**Platte River Point Boat Access**	**Total Cost:**	$316,575

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G20	**SITE IMPROVEMENTS**					New roadway is 900 LF and 20' wide; Parking lot is 150' by 60'; Geoweb is 6" thick in 9' by 18' sections; Prefabricated double vault toilet quote is from CXT
Level 3 Code	New Roadway Grading	11700	CY	$ 8.85	$103,545	
Level 3 Code	New Roadway Aggregate Sub-base	2000	SY	$ 4.37	$8,740	
Level 3 Code	New Roadway Hot Milled Asphalt (HMA)	2000	SY	$ 9.93	$19,860	
Level 3 Code	Parking Lot Grading	3600	CY	$ 8.85	$31,860	
Level 3 Code	Parking Lot Aggregate Sub-base	1000	SY	$ 3.30	$3,300	
Level 3 Code	Parking Lot Hot Milled Asphalt (HMA)	1000	SY	$ 9.93	$9,930	
Level 3 Code	Geoweb Boat Ramp (36' wide by 72' long)	2592	SF	$ 17.50	$45,360	
Level 3 Code	Prefabricated Double Vault Toilet	1	LS	$ 37,000.00	$37,000	
	SUBTOTAL SITE IMPROVEMENTS	**1**	**VALUE**	**$ 259,595.00**	**$259,595**	

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G30	**SITE CIVIL/MECHANICAL UTILITIES**					
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
	SUBTOTAL SITE CIVIL/MECHANICAL UTILITES	**1**	**VALUE**	**$ -**	**$0**	

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

LINE ITEM COST SUMMARY

Project:	**Conceptual Design Study for Boat Access to Platte Bay**	**Estimate By:**	Paul W Woodward, PE, C
Park:	**Sleeping Bear Dunes National Lakeshore**	**Date:**	03.31.2014
Park Alpha:	**Park Code**	**Reviewed By:**	Dave Ciaccio
PMIS Number:	**Contract No. 1443CX2000**	**Date:**	04.01.2014
Summary Item 1	**Platte River Point Boat Access**	**Total Cost:**	$316,575

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G 40	**SITE ELECTRICAL UTILITIES**					
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
SUBTOTAL SITE ELECTRICAL UTILITIES		**1**	**VALUE**	**$ -**	**$0**	

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G50	**OTHER SITE CONSTRUCTION**					
Level 3 Code	Native Seeding	0.5	Acres	$ 12,000.00	$6,000	
Level 3 Code	Erosion Control Blanket	4000	SY	$ 3.50	$14,000	
Level 3 Code	Signage	1	LS	$ 2,500.00	$2,500	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
SUBTOTAL OTHER SITE CONSTRUCTION		**1**	**VALUE**	**$ 22,500.00**	**$22,500**	

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

LINE ITEM COST SUMMARY

Project:	**Conceptual Design Study for Boat Access to Platte Bay**	**Estimate By:**	Paul W Woodward, PE, C
Park:	**Sleeping Bear Dunes National Lakeshore**	**Date:**	03.31.2014
Park Alpha:	**Park Code**	**Reviewed By:**	Dave Ciaccio
PMIS Number:	**Contract No. 1443CX2000**	**Date:**	04.01.2014
Summary Item 1	**Platte River Point Boat Access**	**Total Cost:**	$316,575

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
TOTAL COST - Platte River Point Boat Access		**1**	**VALUE**	**$ 316,575.00**	**$316,575**	

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

PROJECT COST SUMMARY

Project: Conceptual Design Study for Boat Access to Platte Bay
Park: Sleeping Bear Dunes National Lakeshore
Alpha: Park Code
PMIS: Contract No. 1443CX2000

Estimate By: W Woodward, PE,
Date: 03.31.14

Reviewed By: Dave Ciacco
Date: 04.01.2014

Item No.	Description	Quantity	Unit	Cost/Unit	Total
1	Illinois Drive Boat Access	1	VALUE	$288,875	$288,875
2	Not Used	1	VALUE	$0	$0
3	Not Used	1	VALUE	$0	$0
4	Not Used	1	VALUE	$0	$0
5	Not Used	1	VALUE	$0	$0
6	Not Used	1	VALUE	$0	$0
7	Not Used	1	VALUE	$0	$0
8	Not Used	1	VALUE	$0	$0
9	Not Used	1	VALUE	$0	$0
10	Not Used	1	VALUE	$0	$0
11	Not Used	1	VALUE	$0	$0
12	Not Used	1	VALUE	$0	$0
13	Not Used	1	VALUE	$0	$0
14	Not Used	1	VALUE	$0	$0
15	Not Used	1	VALUE	$0	$0
16	Not Used	1	VALUE	$0	$0
17	Not Used	1	VALUE	$0	$0
18	Not Used	1	VALUE	$0	$0
	Subtotal Direct Construction Costs				**$288,875**
	Value of Government Furnished Property (GFP) Included in Direct Cost (see footnote)*				**$0**
				Direct Cost Subtotal without GFP	**$288,875**
	Published Location Factor	0.00%			$0
	Remoteness Factor	10.00%			$28,887
	Federal Wage Rate Factor	0.00%			$0
	State & Local Taxes	0.00%			$0
	Design Contingency	30.00%			$86,662
	Total Direct Construction Costs				**$404,425**
	Standard General Conditions	0.00%			$0
	Government General Conditions	0.00%			$0
	Historic Preservation Factor	0.00%			$0
	Subtotal NET Construction Cost				**$404,425**
	Overhead	0.00%			$0
	Profit	0.00%			$0
	Estimated NET Construction Cost				**$404,425**
	Bonds & Permits	0.00%			**$0**
	Contracting Method Adjustment	12.00%			$48,531
	Inflation Escalation	0	Months	0.00%	$0
	Total Estimated NET Cost of Construction				**$452,956**

* GFP costs are only used when the Government pre-purchases items, or provides other materials out of Government inventory, to be installed by contractor. Adjustments and Markup on GFP only include Inflation Escalation; No other adjustment factors or O&P markup have been applied.

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

LINE ITEM COST SUMMARY

Project:	**Conceptual Design Study for Boat Access to Platte Bay**	**Estimate By:**	Paul W Woodward, PE, C
Park:	**Sleeping Bear Dunes National Lakeshore**	**Date:**	03.31.14
Park Alpha:	**Park Code**	**Reviewed By:**	Dave Ciaccio
PMIS Number:	**Contract No. 1443CX2000**	**Date:**	04.01.2014
Summary Item 1	**Illinois Drive Boat Access**	**Total Cost:**	$288,875

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
F20	**SELECTIVE BUILDING DEMOLITION**					
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
SUBTOTAL SELECTIVE BUILDING DEMOLITION		**1**	**VALUE**	**$ -**	**$0**	

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G10	**SITE PREPARATION**					
Level 3 Code	Clearing	1	Acre	$ 1,000.00	$1,000	
Level 3 Code	Tree Removal	0.65	Acre	$ 54,000.00	$35,100	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
SUBTOTAL SITE PREPARATION		**1**	**VALUE**	**$ 36,100.00**	**$36,100**	

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

LINE ITEM COST SUMMARY

Project:	**Conceptual Design Study for Boat Access to Platte Bay**	**Estimate By:**	Paul W Woodward, PE, C
Park:	**Sleeping Bear Dunes National Lakeshore**	**Date:**	03.31.14
Park Alpha:	**Park Code**	**Reviewed By:**	Dave Ciaccio
PMIS Number:	**Contract No. 1443CX2000**	**Date:**	04.01.2014
Summary Item 1	**Illinois Drive Boat Access**	**Total Cost:**	$288,875

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G20	**SITE IMPROVEMENTS**					Use existing roadway for approx 550 LF and is widened by 6' on avg; New roadway is 800 LF and 20' wide and includes some cuts 10' deep; Parking lot is 150' by 60'; Geoweb is 6" thick in 9' by 18'
Level 3 Code	Existing Roadway Widening Grading	1650	CY	$ 8.85	$14,603	
Level 3 Code	Existing Roadway Aggregate Surfacing	367	SY	$ 6.90	$2,530	
Level 3 Code	New Roadway Grading	9600	CY	$ 8.85	$84,960	
Level 3 Code	New Roadway Aggregate Sub-base	1778	SY	$ 4.37	$7,769	
Level 3 Code	Parking Lot Grading	3600	CY	$ 5.25	$18,900	
Level 3 Code	Parking Lot Aggregate Sub-base	1000	SY	$ 4.37	$4,370	
Level 3 Code	Geoweb Boat Ramp (36' wide by 72' long)	2592	SF	$ 17.50	$45,360	
Level 3 Code	Prefabricated Double Vault Toilet	1	LS	$ 37,000.00	$37,000	
	SUBTOTAL SITE IMPROVEMENTS	**1**	**VALUE**	**$ 215,491.39**	**$215,491**	

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G30	**SITE CIVIL/MECHANICAL UTILITIES**					
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
	SUBTOTAL SITE CIVIL/MECHANICAL UTILITES	**1**	**VALUE**	**$ -**	**$0**	

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

LINE ITEM COST SUMMARY

Project:	**Conceptual Design Study for Boat Access to Platte Bay**	**Estimate By:**	Paul W Woodward, PE, C
Park:	**Sleeping Bear Dunes National Lakeshore**	**Date:**	03.31.14
Park Alpha:	**Park Code**	**Reviewed By:**	Dave Ciaccio
PMIS Number:	**Contract No. 1443CX2000**	**Date:**	04.01.2014
Summary Item 1	**Illinois Drive Boat Access**	**Total Cost:**	$288,875

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G 40	**SITE ELECTRICAL UTILITIES**					
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
SUBTOTAL SITE ELECTRICAL UTILITIES		**1**	**VALUE**	**$ -**	**$0**	

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G50	**OTHER SITE CONSTRUCTION**					
Level 3 Code	New Roadway Hot Milled Asphalt (HMA)	1778	SY	$ 9.93	$17,653	
Level 3 Code	Parking Lot Hot Milled Asphalt (HMA)	1000	SY	$ 9.93	$9,930	
Level 3 Code	Native Seeding	0.6	Acres	$ 12,000.00	$7,200	
Level 3 Code	Sinage	1	LS	$ 2,500.00	$2,500	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
SUBTOTAL OTHER SITE CONSTRUCTION		**1**	**VALUE**	**$ 37,283.33**	**$37,283**	

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

LINE ITEM COST SUMMARY

Project:	**Conceptual Design Study for Boat Access to Platte Bay**	**Estimate By:**	Paul W Woodward, PE, C
Park:	**Sleeping Bear Dunes National Lakeshore**	**Date:**	03.31.14
Park Alpha:	**Park Code**	**Reviewed By:**	Dave Ciaccio
PMIS Number:	**Contract No. 1443CX2000**	**Date:**	04.01.2014
Summary Item 1	**Illinois Drive Boat Access**	**Total Cost:**	$288,875

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
TOTAL COST - Illinois Drive Boat Access		**1**	**VALUE**	**$ 288,874.72**	**$288,875**	

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

PROJECT COST SUMMARY

Project: Conceptual Design Study for Boat Access to Platte Bay
Park: Sleeping Bear Dunes National Lakeshore
Alpha: Park Code
PMIS: Contract No. 1443CX2000

Estimate By: W Woodward, PE,
Date: 03.31.2014

Reviewed By: Dave Ciacco
Date: 04.01.2014

Item No.	Description	Quantity	Unit	Cost/Unit	Total
1	Tiesma Road Boat Access	1	VALUE	$306,232	$306,232
2	Not Used	1	VALUE	$0	$0
3	Not Used	1	VALUE	$0	$0
4	Not Used	1	VALUE	$0	$0
5	Not Used	1	VALUE	$0	$0
6	Not Used	1	VALUE	$0	$0
7	Not Used	1	VALUE	$0	$0
8	Not Used	1	VALUE	$0	$0
9	Not Used	1	VALUE	$0	$0
10	Not Used	1	VALUE	$0	$0
11	Not Used	1	VALUE	$0	$0
12	Not Used	1	VALUE	$0	$0
13	Not Used	1	VALUE	$0	$0
14	Not Used	1	VALUE	$0	$0
15	Not Used	1	VALUE	$0	$0
16	Not Used	1	VALUE	$0	$0
17	Not Used	1	VALUE	$0	$0
18	Not Used	1	VALUE	$0	$0
	Subtotal Direct Construction Costs				**$306,232**
	Value of Government Furnished Property (GFP) Included in Direct Cost (see footnote)*				**$0**
				Direct Cost Subtotal without GFP	**$306,232**
	Published Location Factor	0.00%			$0
	Remoteness Factor	10.00%			$30,623
	Federal Wage Rate Factor	0.00%			$0
	State & Local Taxes	0.00%			$0
	Design Contingency	30.00%			$91,870
	Total Direct Construction Costs				**$428,725**
	Standard General Conditions	0.00%			$0
	Government General Conditions	0.00%			$0
	Historic Preservation Factor	0.00%			$0
	Subtotal NET Construction Cost				**$428,725**
	Overhead	0.00%			$0
	Profit	0.00%			$0
	Estimated NET Construction Cost				**$428,725**
	Bonds & Permits	12.00%			**$51,447**
	Contracting Method Adjustment	0.00%			$0
	Inflation Escalation	0	Months	0.00%	$0
	Total Estimated NET Cost of Construction				**$480,172**

* GFP costs are only used when the Government pre-purchases items, or provides other materials out of Government inventory, to be installed by contractor. Adjustments and Markup on GFP only include Inflation Escalation; No other adjustment factors or O&P markup have been applied.

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

LINE ITEM COST SUMMARY

Project:	**Conceptual Design Study for Boat Access to Platte Bay**	**Estimate By:**	Paul W Woodward, PE, C
Park:	**Sleeping Bear Dunes National Lakeshore**	**Date:**	03.31.2014
Park Alpha:	**Park Code**	**Reviewed By:**	Dave Ciaccio
PMIS Number:	**Contract No. 1443CX2000**	**Date:**	04.01.2014
Summary Item 1	**Tiesma Road Boat Access**	**Total Cost:**	$306,232

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
F20	**SELECTIVE BUILDING DEMOLITION**					
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
SUBTOTAL SELECTIVE BUILDING DEMOLITION		**1**	**VALUE**	**$ -**	**$0**	

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G10	**SITE PREPARATION**					
Level 3 Code	Clearing	1.14	Acres	$ 1,000.00	$1,140	
Level 3 Code	Tree Removal	0.59	Acres	$ 54,000.00	$31,860	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
SUBTOTAL SITE PREPARATION		**1**	**VALUE**	**$ 33,000.00**	**$33,000**	

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

LINE ITEM COST SUMMARY

Project:	**Conceptual Design Study for Boat Access to Platte Bay**	**Estimate By:**	Paul W Woodward, PE, C
Park:	**Sleeping Bear Dunes National Lakeshore**	**Date:**	03.31.2014
Park Alpha:	**Park Code**	**Reviewed By:**	Dave Ciaccio
PMIS Number:	**Contract No. 1443CX2000**	**Date:**	04.01.2014
Summary Item 1	**Tiesma Road Boat Access**	**Total Cost:**	$306,232

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G20	**SITE IMPROVEMENTS**					Existing roadway is 3200 LF and is widened by 6' on avg; New roadway is 350 LF and 20' wide; Parking lot is 150' by 60'; Geoweb is 6" thick in 9' by 18' sections; Prefabricated double vault toilet quote
Level 3 Code	Existing Roadway Widening Grading	9600	CY	$ 8.85	$84,960	
Level 3 Code	Existing Roadway Aggregate Surfacing	2133	SY	$ 6.90	$14,720	
Level 3 Code	New Roadway Grading	4200	CY	$ 8.85	$37,170	
Level 3 Code	New Roadway Aggregate Sub-base	778	SY	$ 4.37	$3,399	
Level 3 Code	Parking Lot Grading	3600	CY	$ 5.25	$18,900	
Level 3 Code	Parking Lot Gravel Sub-base	1000	SY	$ 4.37	$4,370	
Level 3 Code	Geoweb Boat Ramp (36' wide by 72' long)	2592	SF	$ 17.50	$45,360	
Level 3 Code	Prefabricated Double Vault Toilet	1	LS	$ 37,000.00	$37,000	
	SUBTOTAL SITE IMPROVEMENTS	**1**	**VALUE**	**$ 245,878.89**	**$245,879**	

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G30	**SITE CIVIL/MECHANICAL UTILITIES**					
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
	SUBTOTAL SITE CIVIL/MECHANICAL UTILITES	**1**	**VALUE**	**$ -**	**$0**	

United States Department of the Interior
National Park Service
Class C Construction Cost Estimate

LINE ITEM COST SUMMARY

Project:	**Conceptual Design Study for Boat Access to Platte Bay**	**Estimate By:**	Paul W Woodward, PE, C
Park:	**Sleeping Bear Dunes National Lakeshore**	**Date:**	03.31.2014
Park Alpha:	**Park Code**	**Reviewed By:**	Dave Ciaccio
PMIS Number:	**Contract No. 1443CX2000**	**Date:**	04.01.2014
Summary Item 1	**Tiesma Road Boat Access**	**Total Cost:**	$306,232

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G 40	**SITE ELECTRICAL UTILITIES**					
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
SUBTOTAL SITE ELECTRICAL UTILITIES		**1**	**VALUE**	**$ -**	**$0**	

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
G50	**OTHER SITE CONSTRUCTION**					
Level 3 Code	New Roadway Hot Milled Asphalt (HMA)	778	SY	$ 9.93	$7,723	
Level 3 Code	Parking Lot Hot Milled Asphalt (HMA)	1000	SY	$ 9.93	$9,930	
Level 3 Code	Native Seeding	0.6	Acres	$ 12,000.00	$7,200	
Level 3 Code	Sinage	1	LS	$ 2,500.00	$2,500	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
Level 3 Code	Description	0	Unit	$ -	$0	
SUBTOTAL OTHER SITE CONSTRUCTION		**1**	**VALUE**	**$ 27,353.33**	**$27,353**	

United States Department of the Interior
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Class C Construction Cost Estimate

LINE ITEM COST SUMMARY

Project:	**Conceptual Design Study for Boat Access to Platte Bay**	**Estimate By:**	Paul W Woodward, PE, C
Park:	**Sleeping Bear Dunes National Lakeshore**	**Date:**	03.31.2014
Park Alpha:	**Park Code**	**Reviewed By:**	Dave Ciaccio
PMIS Number:	**Contract No. 1443CX2000**	**Date:**	04.01.2014
Summary Item 1	**Tiesma Road Boat Access**	**Total Cost:**	$306,232

Uniformat II WBS Code	Description	Quantity	Unit	Cost/Unit	Total Cost	Remarks
TOTAL COST - Tiesma Road Boat Access		**1**	**VALUE**	**$ 306,232.22**	**$306,232**	

Class C Cost Estimate Assumptions – Conceptual Design Study for Boat Access to Platte Bay

Preparation of the Class C Cost Estimate for alternatives 3 through 5, did require similar assumptions and methods to ensure that the conceptual plans for each alternative were feasible and comparable. The following list describes the methods, types of structures, and annual O&M that are assumed to be the same for these three alternatives.

Clearing and Tree Removal: Each alternative will require clearing and tree removal to different extents. Clearing is typically described on a per acre basis, while tree removal is done by a contractor based on each tree counted and specified. Since no exact tree count exists for each alternative's impact, an average of 400 trees per acre was used to approximate an estimated cost of around $54,000 an acre for tree removal. Areas of impact for tree removal were only calculated for the widened or new roadway footprint and the parking lot/restroom facilities located within forested areas.

Roadways: Each alternative will require new roadways or upgrades to existing vehicular roadways to provide the necessary widths and grades to allow for two way traffic ingress and egress. Existing roadways (Illinois Drive and Tiesma Road) generally need to be widened by approximately 6 feet and it was assumed that each linear foot of roadway widening would require 3 CY of grading. New roadway sections were proposed with a 20 foot top width and it was assumed that each linear foot of widening would require 12 CY of grading. Construction methods assumed that all of the grading could be completed using typical earthmoving equipment without the requirement for off-site hauling; therefore, a unit cost of $8.85 per CY was used based on the 2012 Michigan Department of Transportation's (MDOT) Weighted Average Item Price Report.

All existing roadways which are currently surfaced with aggregate were assumed to remain as aggregate after improvements. This will maintain the aesthetics of the primitive roadway and reduce the overall cost for providing access at a new location. The existing roadways could be converted to asphalt in the future if warranted by the use. New roadways are proposed as asphalt for ease of maintenance given their location in the dunes and beach areas. Both road types will require maintenance and replacement on a somewhat frequent basis. Aggregate may need to be added every one to two years, but could be done with a front loader or road grader if the supplier delivers the aggregate and places it on the road at specific intervals. Asphalt repair and replacement will occur at least every 8 years and will likely require the NPS to retain a contractor. A rough estimate of annual maintenance cost is approximately $0.50 per square yard (SY) for aggregate and $1.00 per SY for asphalt.

Parking Lot: One parking lot is proposed for each alternative and is expected to have a total of 30 parking stalls that can accommodate boat trailers. Each parking area is generally 60 feet wide by 150 feet long. Asphalt surfacing is proposed for the parking lot and this will not only require repair and maintenance every 8 years, but will most likely require cleaning or removal of windblown sand every 10 to 14 days during public use. Annual maintenance cost is estimated at $1,800 for asphalt maintenance and sand removal.

Boat Ramp: The boat ramp proposed for each alternative is a removable ramp, either concrete geoweb sections tied together with cable wire or metal fabricated sections which can be lifted and pinned together. The length and width of the proposed boat ramp was assumed to approximately match the width of the existing ramp into the Platte River (40 feet), but would need to be longer (70 feet vs. 56 feet) in order to cover a minimum depth of 4 feet below water at each site. Concrete geoweb sections, 6 inches thick, were assumed to be 18 feet wide by 9 feet long, meaning that 16 sections would be needed. Each section would have to be dragged or lifted into place with a front end loader or potentially rented hydraulic lift. The weight of each section would be approximately 12,000 lbs. The size of the metal fabricated ramps is 10 foot wide by 12 feet long, requiring 24 sections. Installation requirements would be similar to that of the concrete geoweb.

Currently, the Village of Empire works with a contractor each year to use his hydraulic lift to place each section. The end of the ramp can be supported by a metal type "sawhorse" within the water if the grade becomes too deep. Prices were fairly similar for both types of applications, so the costs in the estimate are for the concrete geoweb sections. Removable boat ramp applications were preferred over a permanent ramp approach to avoid frequent maintenance costs associated with removing sand deposited on the ramps in areas of accretion or trying to repair erosion damage in areas like Platte River Point. The removable ramp is also very favorable in dealing with lake level fluctuations every year. Overall, it was assumed that the annual maintenance costs of installing and removing the ramp would be less than the costs and time associated with trying to control the extreme variability of the Lake Michigan shoreline and lake level. Annual maintenance costs are based on discussion with the Village or Empire and are assumed to be $4,000 per year.

Wave Attenuation: Having visited both the Empire and Glen Arbor ramp locations on a moderately windy day when 3 to 5 foot waves were witnessed, construction of a wave attenuation structure at any of the proposed alternative locations is not recommended. The possibility for much stronger winds and higher waves makes the design of a wave protection structure impractical. Most protected boat launch facilities along other areas of the Lake Michigan shore are either part of an inland harbor or require very heavy protection. The potential for floating wave attenuation

was investigated, but it was determined that the anchoring and upfront costs of such a sturdy application would be cost prohibitive.

Restroom: A single vault restroom facility was considered as part of the conceptual plan for each alternative. Pre-fabricated, commercially available concrete structures were proposed that would be easy to operate and maintain. The Class C Cost Estimate was based on pricing provided for a recreation development project bid within the last 6 months.

O&M tasks for the single vault restrooms include: daily inspection, thorough cleaning once a month, and pump out of vault one time per year. Costs associated with this type of maintenance are estimated at $2,500 per year, and were provided by staff from the State Park Division of the Missouri Department of Natural Resources.

Construction: Timing for construction of each of the alternatives would be approximately three to four months.

Data Needs: Future information and data needed to facilitate development of the conceptual plan for the preferred alternative into preliminary and final plans include:

- Topographic survey and confirmation of bathymetry
- Geotechnical borings for analysis of available structural fill material

Project Permitting: If the NPS decides to move recreational boat access to one of the three alternative locations provided within this analysis, and move forward with design and construction, environmental permitting through MDEQ will likely be required to address construction of the facilities. Potential permits include but, are not limited to:

- Part 323 Shorelands Protection and Management Permit
- Part 353 Sand (Critical) Dunes Protection and Management Permit
- National Pollutant Discharge Elimination System (NPDES) Land Disturbance Permit

Cost Estimate Calculations for Annual O&M

Assumptions for these costs are in the text above.

Platte Point	Unit	Area	Unit Cost	Cost
Aggregate	sq yd	0	$0.50	$0.00
Asphalt Road	sq yd	2,000	$1.00	$2,000.00
Asphalt Parking Lot	sq yd	1,000	$1.80	$1,800.00
Boat Ramp	LS	1	$4,000.00	$4,000.00
Vault Toilet	LS	1	$2,500.00	$2,500.00
Total Annual O&M				**$10,300.00**

Illinois Drive	Unit	Area	Unit Cost	Cost
Aggregate	sq yd	1,222	$0.50	$611.11
Asphalt Road	sq yd	1,778	$1.00	$1,778.00
Asphalt Parking Lot	sq yd	1,000	$1.80	$1,800.00
Boat Ramp	LS	1	$4,000.00	$4,000.00
Vault Toilet	LS	1	$2,500.00	$2,500.00
Total Annual O&M				**$10,689.00**

Tiesma Road	Unit	Area	Unit Cost	Cost
Aggregate	sq yd	7,111	$0.50	$3,555.56
Asphalt Road	sq yd	778	$1.00	$778.00
Asphalt Parking Lot	sq yd	1,000	$1.80	$1,800.00
Boat Ramp	LS	1	$4,000.00	$4,000.00
Vault Toilet	LS	1	$2,500.00	$2,500.00
Total Annual O&M				**$12,634.00**

APPENDIX B

SLEEPING BEAR DUNES NATIONAL LAKESHORE, MI
RECREATIONAL BOAT ACCESS TO PLATTE BAY, LAKE MICHIGAN

SEDIMENT SAMPLING AND ANALYSIS PLAN

NATIONAL PARK SERVICE

October 2013

Coleman Engineering

Civil Engineering • Environmental Engineering
Geotechnical Engineering • Land Surveying • Test Drilling
Construction Quality Control • Materials Laboratory Testing

SLEEPING BEAR DUNES NATIONAL LAKESHORE, MI
RECREATIONAL BOAT ACCESS TO PLATTE BAY,
LAKE MICHIGAN

SEDIMENT SAMPLING AND ANALYSIS PLAN

NATIONAL PARK SERVICE

October 2013

Prepared By:

COLEMAN ENGINEERING COMPANY
635 Circle Drive
Iron Mountain, Michigan 49801

CEC Project #EE-13354

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

Coleman Engineering Company (CEC) has prepared this Sediment and Dredge Spoils Sampling and Analysis Plan (SAP) for a project associated with the National Park Service (NPS) Task Order P13PD01727, Conceptual Designs for Recreational Boat Access to Platte Bay, Lake Michigan, Sleeping Bear Dunes. This project will develop conceptual alternatives to providing recreational boat access to Platte Bay.

The purpose of this SAP is to review the need for dredge spoil sampling, detail the sampling to be conducted and to discuss the methods and quality control measures to be employed. Following completion of this scope of work, a report will be prepared discussing test results and any resulting disposal limitations.

2.0 DREDGE SPOILS SAMPLING

Prior to conducting field activities, an on–site kick off meeting will be held with NPS staff and the Project Team to confirm dredge spoil sampling locations and fieldwork safety plan.

2.1 DREDGE SPOILS

The stockpiled dredge spoils (estimated to be 32,000-40,000 cubic yards) are located on the east side near the mouth of the river, mostly on the east side. The stockpiled material measures approximately 160’ wide, 500’ in length, and 13’ high.

Five (5) dredge spoil samples will be collected from the existing stockpiles including one (1) duplicate. Samples will generally be collected with hand tools to a depth of 2 to 5 feet.

- Collect three (3) bulk samples for geotechnical characterization to include particle size analysis and liquid/plastic limits if appropriate.

- Work will be completed utilizing hand tools and decontaminated as described below.

- The hand tools will be decontaminated by scrubbing in an Alconox/site water solution, followed with an initial rinse with site water and a final rinse with distilled water. Any Alconox wash water will be retained for disposal by client. All other water will be returned to the slip.

- Client will provide coordinates for all sampling locations. CEC will provide a Trimble model GeoXH submeter GPS unit that will be used to position the jon boat within 3 feet of the proposed sampling location provided by client. The actual sample coordinates will be recorded and photographed. Depth to bottom will also be measured and recorded at each proposed boring location.

3.0 SAMPLE COLLECTION AND ANALYSIS TECHNIQUES

Samples will be collected, preserved, and submitted under chain-of-custody to Pace Analytical, Green Bay, Wisconsin for laboratory analytical analysis to include the following:

- Total Metals (arsenic, cadmium, copper, lead, mercury, selenium, and zinc)
  EPA Method 6010

- Polynuclear Aromatic Hydrocarbons (PNAs)
  EPA Method 8270

- Total Concentration Leaching Procedure (TCLP) for above metals
  EPA Method 1311

- TCLP Semi-Volatile Compounds
  EPA Method 1311/8270

- Hazardous Waste Characterization
  Ignitability/Flashpoint
  EPA Method 1010
  Paint Filter Liquids Test
  EPA Method 9095
  Reactive Cyanide
  EPA Method 7.3.3.2
  Reactive Sulfide
  EPA Method 7.3.4.2

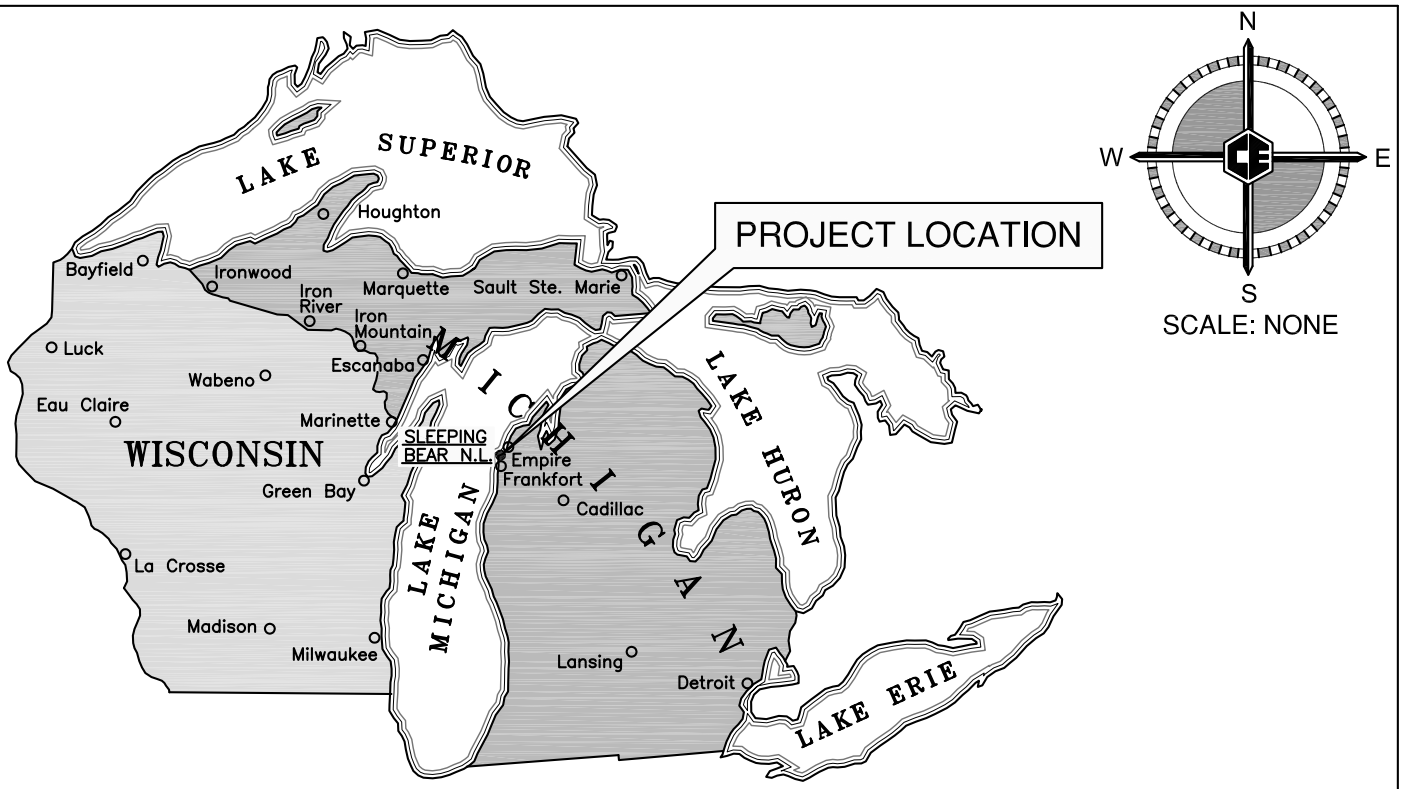
Samples collected for geotechnical analysis will be submitted to CEC for particle size/grain size (ASTM D-22 Grain size including Hydrometer) and liquid/plastic limit as deemed appropriate.

4.0 SCHEDULING

The on-site meeting and fieldwork is scheduled for October 23-24, with a draft report of findings completed by November 30, 2013.

APPENDIX A

FIGURES



PROJECT LOCATION MAP

SLEEPING BEAR DUNES NATIONAL LAKESHORE

BENZIE COUNTY, MI

COLEMAN ENGINEERING COMPANY
635 CIRCLE DRIVE • IRON MOUNTAIN, MI 49801 • PHONE: 906-774-3440
200 EAST AYER STREET • IRONWOOD, MI • PHONE: 906-932-5048

DATE 9/10/13
JOB NO 13354
CADD FILE 13354-WIW-WIQ.DWG
PDF FILE 13354-WIW-WIQ.PDF

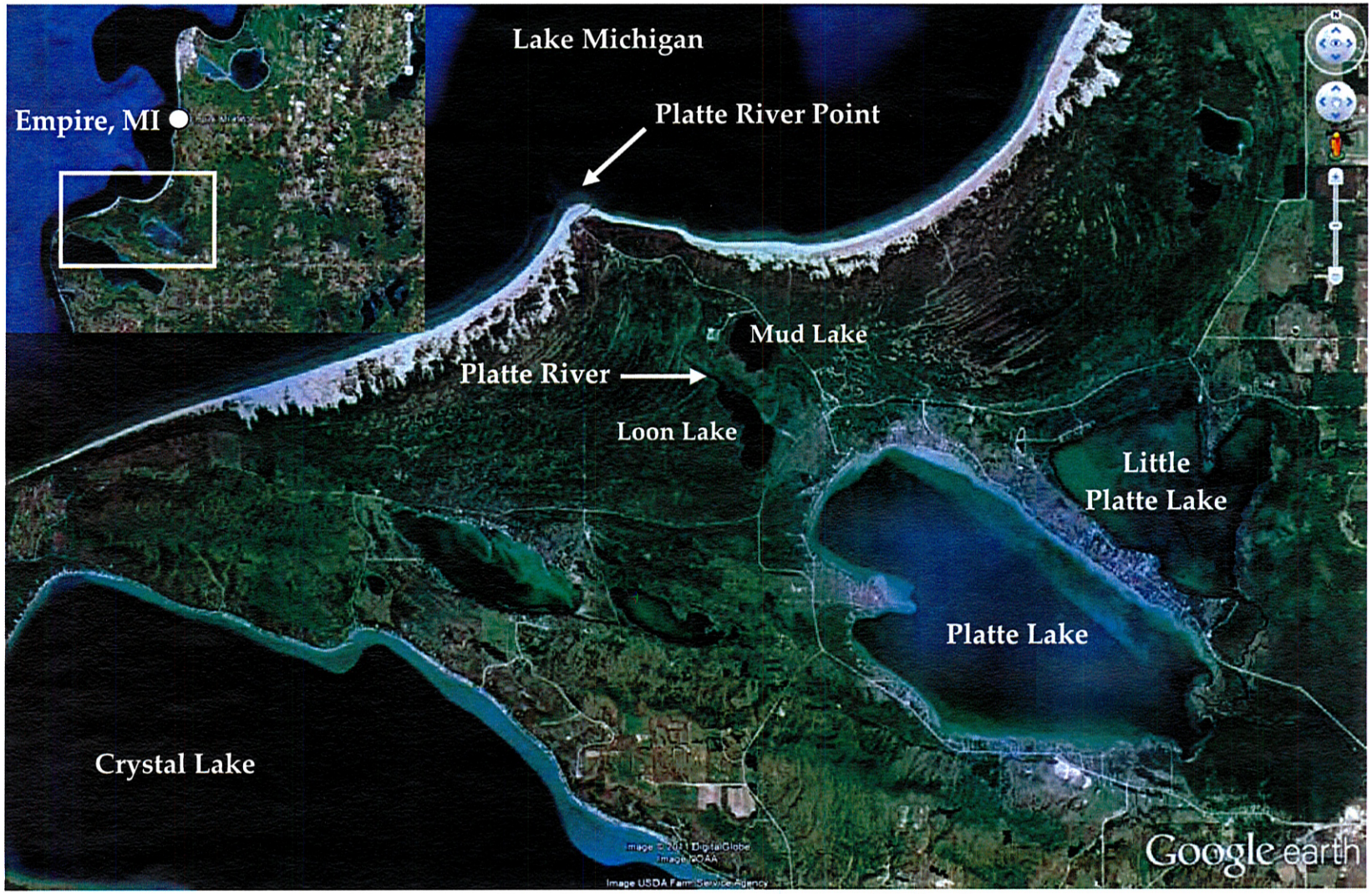
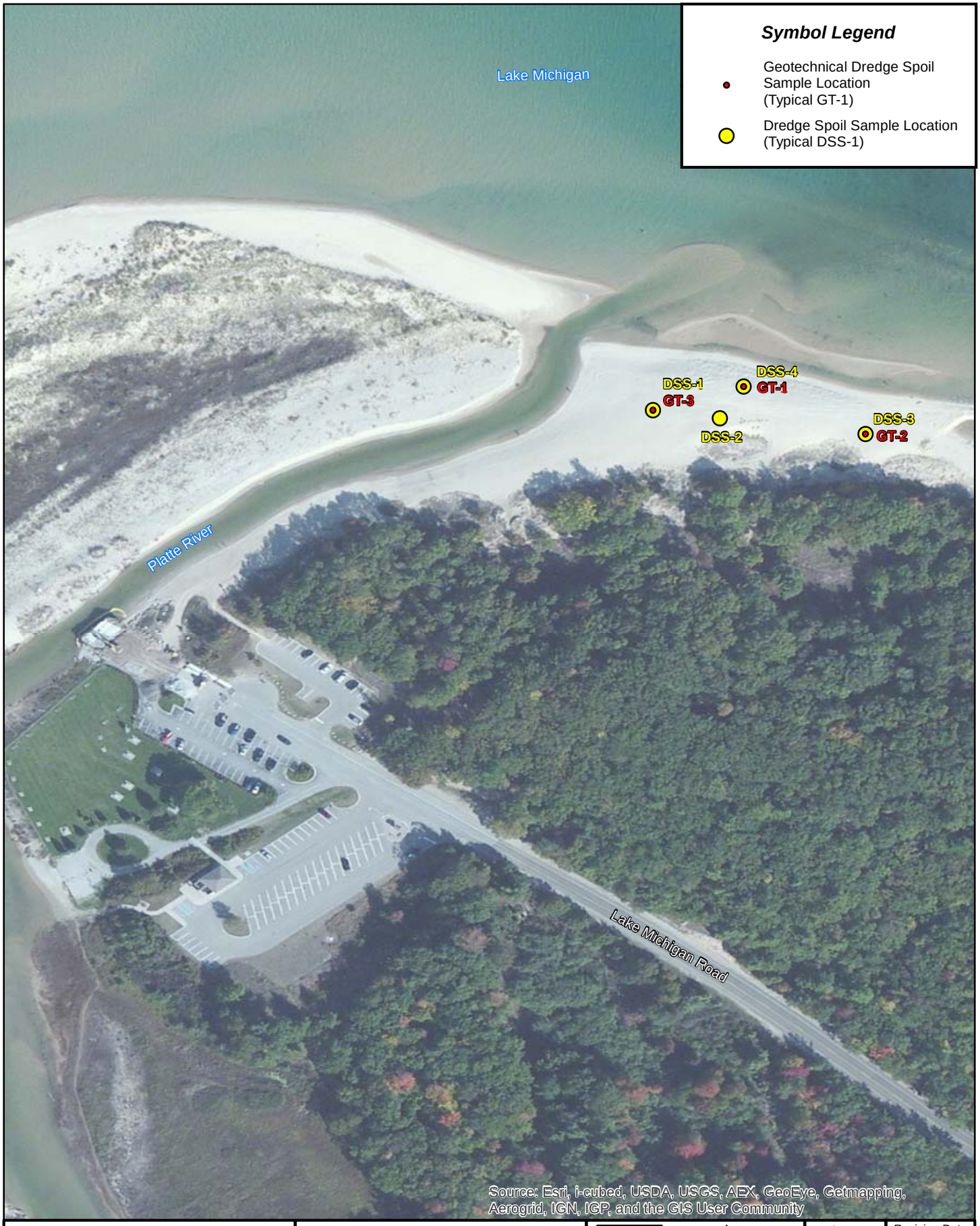


Figure 2.1 Sleeping Bear Dunes National Lakeshore

Figure 2.2 Platte River Point



Coleman Engineering Company 635 Circle Drive • Iron Mountain, MI 49801 • Phone: 906-774-3440 200 East Ayer Street • Ironwood, MI 49938 • Phone: 906-932-5048	SFS ARCHITECTURE Platte Bay Recreation Boat Access Sample Location Map Traverse City, Michigan	0 100 200 Feet 1 inch = 200 feet N W E S	Project No: 13354 Map Date: Oct 29 2013	Revision Date: Figure No: Fig 1

COLEMAN ENGINEERING COMPANY

635 CIRCLE DRIVE • IRON MOUNTAIN, MI 49801
PHONE: 906-774-3440 • FAX: 906-774-7776

200 EAST AYER STREET • IRONWOOD, MI 49938
PHONE: 906-932-5048 • FAX: 906-932-3213

LETTER OF TRANSMITTAL

TO: Mr. Kerry Newman
SFS Architecture
1150 Grand Boulevard
Suite 400
Kansas City, MO 64106

DATE: November 13, 2013
JOB NO: EE-13354
RE: Sleeping Bear National Lakeshore
Platte Bay Access
Dredge Spoils Sampling

WE ARE SENDING: ☑ Attached ☐ Under separate cover via _____ the following items:

COPIES	DATE	NO.	DESCRIPTION
1	9/10/13		Project Location Map
1	10/29/13		Sample Location Map
1	10/25/13		Geotechnical Lab Reports-Particle Size Analysis of Soils (GT-1,GT-2,GT-3)
			Pace Analytical Lab Report (Dredged Spoil Samples (DSS-1, DSS-2,
			DSS-3, and DSS-4)
			Sample Location Coordinates
1	11/12/13		Pace Lab Report

THE ABOVE TRANSMITTED (check below):

☐ For Approval ☐ As Requested ☐ Other: _____

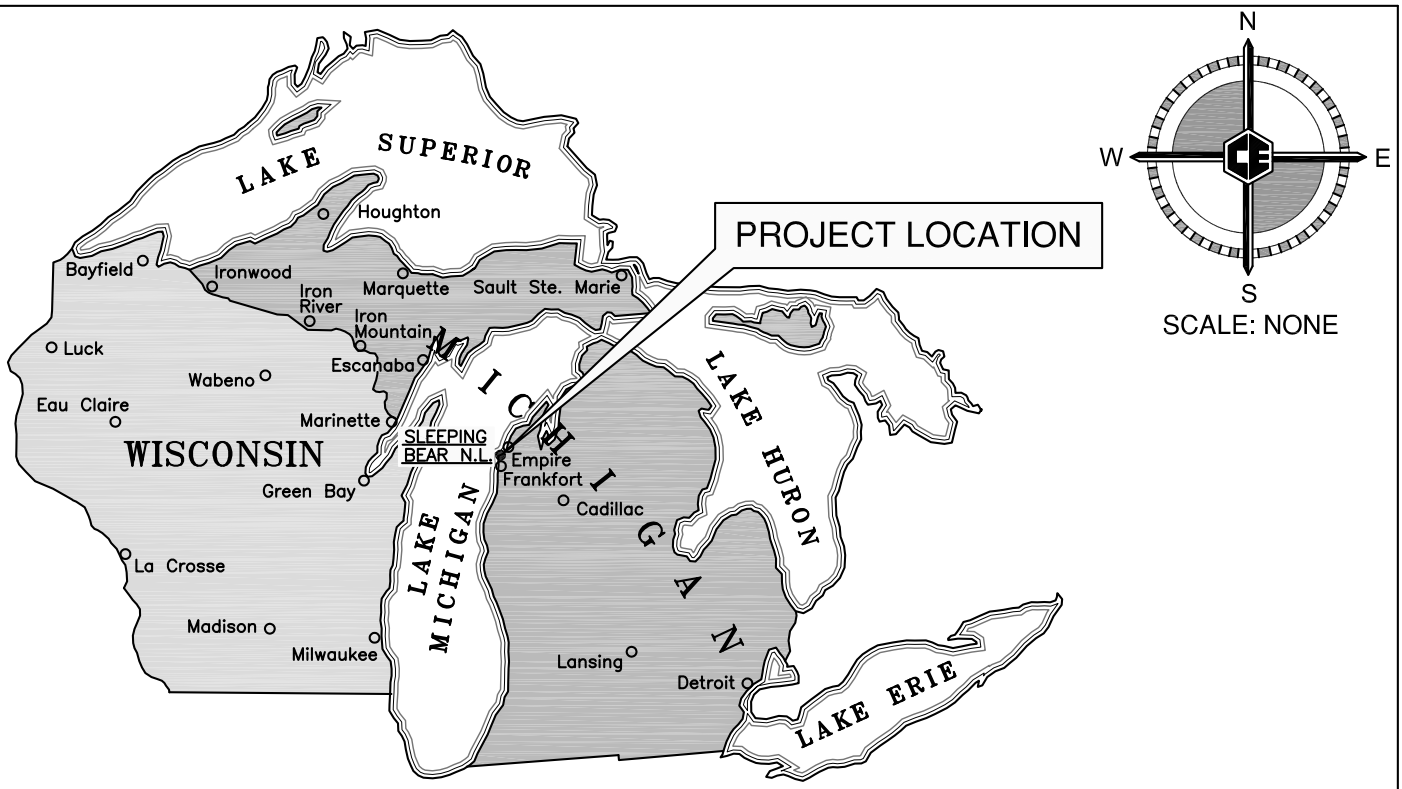
☑ For Your Use ☐ For Review and Comment

REMARKS:

If you should have any questions, please contact me.

COPY TO: Knewman@sfsarch.com
laurie@bevireo.com

SIGNED: David Schmutzler
David Schmutzler
Environmental Department Manager



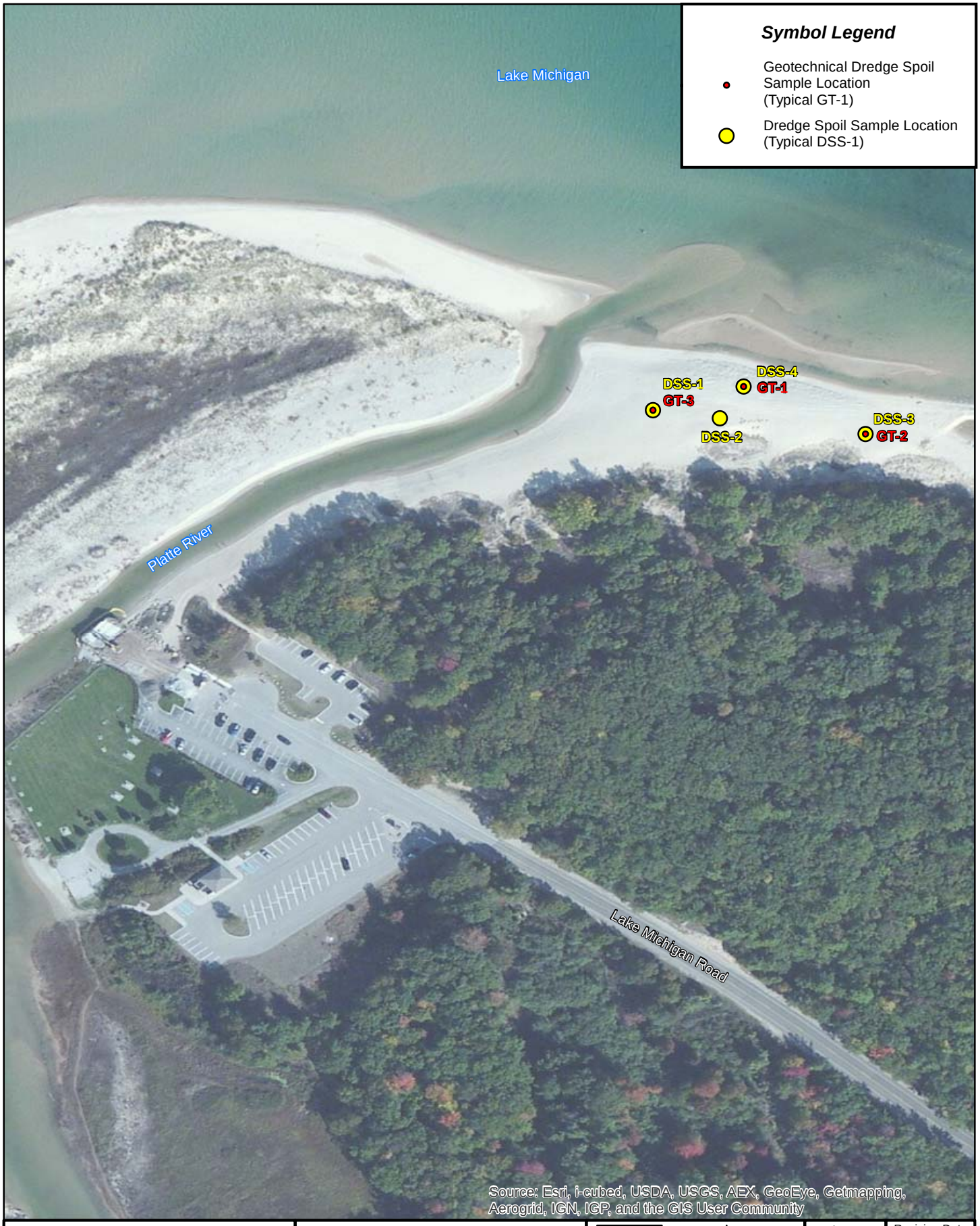
PROJECT LOCATION MAP

SLEEPING BEAR DUNES NATIONAL LAKESHORE

BENZIE COUNTY, MI

COLEMAN ENGINEERING COMPANY
635 CIRCLE DRIVE • IRON MOUNTAIN, MI 49801 • PHONE: 906-774-3440
200 EAST AYER STREET • IRONWOOD, MI • PHONE: 906-932-5048

DATE	9/10/13
JOB NO	13354
CADD FILE	13354-WIW-WIQ.DWG
PDF FILE	13354-WIW-WIQ.PDF



Coleman Engineering Company 635 Circle Drive • Iron Mountain, MI 49801 • Phone: 906-774-3440 200 East Ayer Street • Ironwood, MI 49938 • Phone: 906-932-5048	SFS ARCHITECTURE Platte Bay Recreation Boat Access Sample Location Map Traverse City, Michigan	0 100 200 Feet 1 inch = 200 feet N W E S	Project No: 13354 Map Date: Oct 29 2013	Revision Date: Figure No: Fig 1

PLATTE BAY RECREATION BOAT ACCESS
DREDGE SPOILS SAMPLING – OCTOBER 2013

Sample Location Identification	Sample Location Coordinates
DSS-1 East @ 3’	44°43’91”N 086°09’23”W 585 Elevation 16 Ft.
DSS-2 East @ 3’	44°43’91”N 86°09’21”W 601 Elevation 20 Ft.
DSS-3 East @ 2.5’	44°43’90”N 86°09’18”W 590 Elevation 23 Ft.
DSS-4 East Dup.	44°43’91”N 86°09’21”W 586 Elevation 26 Ft.

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

November 12, 2013

Dave Schmutzler
Coleman Engineering
635 CIRCLE DRIVE
Iron Mountain, MI 49801

RE: Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Dear Dave Schmutzler:
Enclosed are the analytical results for sample(s) received by the laboratory on October 29, 2013. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Dan Milewsky

dan.milewsky@pacelabs.com
Project Manager

Enclosures

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

CERTIFICATIONS

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Green Bay Certification IDs
1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 11888
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
US Dept of Agriculture #: S-76505
Wisconsin Certification #: 405132750

Kansas Certification IDs
9608 Loiret Boulevard, Lenexa, KS 66219
WY STR Certification #: 2456.01
Arkansas Certification #: 13-012-0
Illinois Certification #: 003097
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212008A
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407-13-4
Utah Certification #: KS000212013-3
Illinois Certification #: 003097

Pace Analytical Services, Inc.
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Green Bay, WI 54302
(920)469-2436

SAMPLE SUMMARY

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Lab ID	Sample ID	Matrix	Date Collected	Date Received
4087492001	**DSS-1-EAST @ 3'**	Solid	10/24/13 12:15	10/29/13 08:35
4087492002	**DSS-2-EAST @ 3'**	Solid	10/24/13 12:30	10/29/13 08:35
4087492003	**DSS-3-EAST @ 2.5'**	Solid	10/24/13 12:45	10/29/13 08:35
4087492004	**DSS-4-EAST @ 4.0'**	Solid	10/24/13 13:00	10/29/13 08:35
4087492005	**DSS-4-DUP**	Solid	10/24/13 00:00	10/29/13 08:35

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

SAMPLE ANALYTE COUNT

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
4087492001	**DSS-1-EAST @ 3'**	EPA 6010	DLB	6	PASI-G
		EPA 6010	DLB	6	PASI-G
		EPA 7470	CMS	1	PASI-G
		EPA 7471	CMS	1	PASI-G
		EPA 8270 by SIM	ARO	18	PASI-G
		EPA 8270	RJN	16	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
		EPA 1010	DEY	1	PASI-G
		SW-846 7.3.4.2	AJM	1	PASI-K
		EPA 9095	DDY	1	PASI-G
		SW-846 7.3.3.2	AJM	1	PASI-K
4087492002	**DSS-2-EAST @ 3'**	EPA 6010	DLB	6	PASI-G
		EPA 6010	DLB	6	PASI-G
		EPA 7470	CMS	1	PASI-G
		EPA 7471	CMS	1	PASI-G
		EPA 8270 by SIM	ARO	18	PASI-G
		EPA 8270	RJN	16	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
		EPA 1010	DEY	1	PASI-G
4087492003	**DSS-3-EAST @ 2.5'**	EPA 6010	DLB	6	PASI-G
		EPA 6010	DLB	6	PASI-G
		EPA 7470	CMS	1	PASI-G
		EPA 7471	CMS	1	PASI-G
		EPA 8270 by SIM	ARO	18	PASI-G
		EPA 8270	RJN	16	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
		EPA 1010	DEY	1	PASI-G
4087492004	**DSS-4-EAST @ 4.0'**	EPA 6010	DLB	6	PASI-G
		EPA 6010	DLB	6	PASI-G
		EPA 7470	CMS	1	PASI-G
		EPA 7471	CMS	1	PASI-G
		EPA 8270 by SIM	ARO	18	PASI-G
		EPA 8270	RJN	16	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
		EPA 1010	DEY	1	PASI-G
		SW-846 7.3.4.2	AJM	1	PASI-K
		EPA 9095	DDY	1	PASI-G

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

SAMPLE ANALYTE COUNT

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		SW-846 7.3.3.2	AJM	1	PASI-K
4087492005	**DSS-4-DUP**	EPA 6010	DLB	6	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
		EPA 1010	DEY	1	PASI-G

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

ANALYTICAL RESULTS

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Sample: DSS-1-EAST @ 3' **Lab ID: 4087492001** Collected: 10/24/13 12:15 Received: 10/29/13 08:35 Matrix: Solid
Results reported on a "dry-weight" basis

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	**0.98J**	mg/kg	1.7	0.47	1	10/30/13 10:01	10/30/13 19:31	7440-38-2	
Cadmium	**<0.044**	mg/kg	0.43	0.044	1	10/30/13 10:01	10/30/13 19:31	7440-43-9	
Copper	**0.39J**	mg/kg	0.87	0.14	1	10/30/13 10:01	10/30/13 19:31	7440-50-8	
Lead	**0.77J**	mg/kg	0.87	0.25	1	10/30/13 10:01	10/30/13 19:31	7439-92-1	
Selenium	**<0.51**	mg/kg	1.7	0.51	1	10/30/13 10:01	10/30/13 19:31	7782-49-2	
Zinc	**1.7J**	mg/kg	3.5	0.23	1	10/30/13 10:01	10/30/13 19:31	7440-66-6	
6010 MET ICP, TCLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
	Leachate Method/Date: EPA 1311; 11/06/13 00:00								
Arsenic	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:00	7440-38-2	
Cadmium	**0.0031J**	mg/L	0.0050	0.0025	1	11/07/13 11:16	11/07/13 17:00	7440-43-9	
Copper	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:00	7440-50-8	
Lead	**<0.015**	mg/L	0.038	0.015	1	11/07/13 11:16	11/07/13 17:00	7439-92-1	
Selenium	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:00	7782-49-2	
Zinc	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:00	7440-66-6	
7470 Mercury, TCLP	Analytical Method: EPA 7470 Preparation Method: EPA 7470								
	Leachate Method/Date: EPA 1311; 11/06/13 00:00								
Mercury	**<0.10**	ug/L	0.20	0.10	1	11/07/13 13:50	11/07/13 18:30	7439-97-6	1q
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471								
Mercury	**<0.0031**	mg/kg	0.0061	0.0031	1	11/04/13 13:30	11/05/13 10:42	7439-97-6	
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546								
Acenaphthene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	83-32-9	
Acenaphthylene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	208-96-8	
Anthracene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	120-12-7	
Benzo(a)anthracene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	56-55-3	
Benzo(a)pyrene	**<3.0**	ug/kg	17.1	3.0	1	11/01/13 07:45	11/01/13 17:23	50-32-8	
Benzo(b)fluoranthene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	205-99-2	
Benzo(g,h,i)perylene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	191-24-2	
Benzo(k)fluoranthene	**<3.0**	ug/kg	17.1	3.0	1	11/01/13 07:45	11/01/13 17:23	207-08-9	
Chrysene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	218-01-9	
Dibenz(a,h)anthracene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	53-70-3	
Fluoranthene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	206-44-0	L2
Fluorene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	86-73-7	
Indeno(1,2,3-cd)pyrene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	193-39-5	
Naphthalene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	91-20-3	
Phenanthrene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	85-01-8	
Pyrene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:23	129-00-0	
Surrogates									
2-Fluorobiphenyl (S)	73	%	40-130		1	11/01/13 07:45	11/01/13 17:23	321-60-8	
Terphenyl-d14 (S)	67	%	40-130		1	11/01/13 07:45	11/01/13 17:23	1718-51-0	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

ANALYTICAL RESULTS

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Sample: DSS-1-EAST @ 3' **Lab ID: 4087492001** Collected: 10/24/13 12:15 Received: 10/29/13 08:35 Matrix: Solid
Results reported on a "dry-weight" basis

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV TCLP Sep Funnel	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
	Leachate Method/Date: EPA 1311; 11/06/13 00:00								
1,4-Dichlorobenzene	**<8.6**	ug/L	50.0	8.6	1	11/08/13 09:17	11/11/13 15:36	106-46-7	
2,4-Dinitrotoluene	**<8.0**	ug/L	50.0	8.0	1	11/08/13 09:17	11/11/13 15:36	121-14-2	M1
Hexachloro-1,3-butadiene	**<6.6**	ug/L	100	6.6	1	11/08/13 09:17	11/11/13 15:36	87-68-3	
Hexachlorobenzene	**<11.1**	ug/L	50.0	11.1	1	11/08/13 09:17	11/11/13 15:36	118-74-1	
Hexachloroethane	**<5.8**	ug/L	50.0	5.8	1	11/08/13 09:17	11/11/13 15:36	67-72-1	
2-Methylphenol(o-Cresol)	**<9.7**	ug/L	50.0	9.7	1	11/08/13 09:17	11/11/13 15:36	95-48-7	
3&4-Methylphenol(m&p Cresol)	**<7.7**	ug/L	50.0	7.7	1	11/08/13 09:17	11/11/13 15:36		
Nitrobenzene	**<13.7**	ug/L	50.0	13.7	1	11/08/13 09:17	11/11/13 15:36	98-95-3	M1
Pentachlorophenol	**<10.8**	ug/L	100	10.8	1	11/08/13 09:17	11/11/13 15:36	87-86-5	
Pyridine	**<14.3**	ug/L	50.0	14.3	1	11/08/13 09:17	11/11/13 15:36	110-86-1	
2,4,5-Trichlorophenol	**<10**	ug/L	50.0	10	1	11/08/13 09:17	11/11/13 15:36	95-95-4	
2,4,6-Trichlorophenol	**<10.7**	ug/L	50.0	10.7	1	11/08/13 09:17	11/11/13 15:36	88-06-2	
Surrogates									
Nitrobenzene-d5 (S)	107	%	59-130		1	11/08/13 09:17	11/11/13 15:36	4165-60-0	
2-Fluorobiphenyl (S)	91	%	60-130		1	11/08/13 09:17	11/11/13 15:36	321-60-8	
Phenol-d6 (S)	37	%	19-130		1	11/08/13 09:17	11/11/13 15:36	13127-88-3	
2,4,6-Tribromophenol (S)	101	%	34-143		1	11/08/13 09:17	11/11/13 15:36	118-79-6	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**2.5**	%	0.10	0.10	1		10/29/13 16:21		
1010 Flashpoint,Closed Cup	Analytical Method: EPA 1010								
Flashpoint	**>210**	deg F			1		10/30/13 12:17		
Reactive Sulfide	Analytical Method: SW-846 7.3.4.2								
Sulfide, Reactive	**0.0J**	mg/kg	100		1		11/04/13 09:30		
9095 Paint Filter Liquid Test	Analytical Method: EPA 9095								
Free Liquids	**pass**	no units			1		11/04/13 12:11		
733C S Reactive Cyanide	Analytical Method: SW-846 7.3.3.2								
Cyanide, Reactive	**<0.016**	mg/kg	0.050	0.016	1		11/01/13 15:08		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
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ANALYTICAL RESULTS

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Sample: DSS-2-EAST @ 3' **Lab ID: 4087492002** Collected: 10/24/13 12:30 Received: 10/29/13 08:35 Matrix: Solid
Results reported on a "dry-weight" basis

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	**1.7J**	mg/kg	2.0	0.54	1	10/30/13 10:01	10/30/13 19:33	7440-38-2	
Cadmium	**<0.051**	mg/kg	0.50	0.051	1	10/30/13 10:01	10/30/13 19:33	7440-43-9	
Copper	**0.35J**	mg/kg	1.0	0.16	1	10/30/13 10:01	10/30/13 19:33	7440-50-8	
Lead	**0.76J**	mg/kg	1.0	0.29	1	10/30/13 10:01	10/30/13 19:33	7439-92-1	
Selenium	**<0.59**	mg/kg	2.0	0.59	1	10/30/13 10:01	10/30/13 19:33	7782-49-2	
Zinc	**1.9J**	mg/kg	4.0	0.27	1	10/30/13 10:01	10/30/13 19:33	7440-66-6	
6010 MET ICP, TCLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
	Leachate Method/Date: EPA 1311; 11/06/13 00:00								
Arsenic	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:06	7440-38-2	
Cadmium	**<0.0025**	mg/L	0.0050	0.0025	1	11/07/13 11:16	11/07/13 17:06	7440-43-9	
Copper	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:06	7440-50-8	
Lead	**0.058**	mg/L	0.038	0.015	1	11/07/13 11:16	11/07/13 17:06	7439-92-1	
Selenium	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:06	7782-49-2	
Zinc	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:06	7440-66-6	
7470 Mercury, TCLP	Analytical Method: EPA 7470 Preparation Method: EPA 7470								
	Leachate Method/Date: EPA 1311; 11/06/13 00:00								
Mercury	**<0.10**	ug/L	0.20	0.10	1	11/07/13 13:50	11/07/13 18:32	7439-97-6	1q
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471								
Mercury	**<0.0034**	mg/kg	0.0067	0.0034	1	11/04/13 13:30	11/05/13 10:44	7439-97-6	
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546								
Acenaphthene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	83-32-9	
Acenaphthylene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	208-96-8	
Anthracene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	120-12-7	
Benzo(a)anthracene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	56-55-3	
Benzo(a)pyrene	**<3.0**	ug/kg	17.0	3.0	1	11/01/13 07:45	11/01/13 17:41	50-32-8	
Benzo(b)fluoranthene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	205-99-2	
Benzo(g,h,i)perylene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	191-24-2	
Benzo(k)fluoranthene	**<3.0**	ug/kg	17.0	3.0	1	11/01/13 07:45	11/01/13 17:41	207-08-9	
Chrysene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	218-01-9	
Dibenz(a,h)anthracene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	53-70-3	
Fluoranthene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	206-44-0	L2
Fluorene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	86-73-7	
Indeno(1,2,3-cd)pyrene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	193-39-5	
Naphthalene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	91-20-3	
Phenanthrene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	85-01-8	
Pyrene	**<8.5**	ug/kg	17.0	8.5	1	11/01/13 07:45	11/01/13 17:41	129-00-0	
Surrogates									
2-Fluorobiphenyl (S)	77	%	40-130		1	11/01/13 07:45	11/01/13 17:41	321-60-8	
Terphenyl-d14 (S)	72	%	40-130		1	11/01/13 07:45	11/01/13 17:41	1718-51-0	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

ANALYTICAL RESULTS

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Sample: DSS-2-EAST @ 3' **Lab ID: 4087492002** Collected: 10/24/13 12:30 Received: 10/29/13 08:35 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV TCLP Sep Funnel	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
	Leachate Method/Date: EPA 1311; 11/06/13 00:00								
1,4-Dichlorobenzene	**<8.6**	ug/L	50.0	8.6	1	11/08/13 09:17	11/11/13 16:42	106-46-7	
2,4-Dinitrotoluene	**<8.0**	ug/L	50.0	8.0	1	11/08/13 09:17	11/11/13 16:42	121-14-2	
Hexachloro-1,3-butadiene	**<6.6**	ug/L	100	6.6	1	11/08/13 09:17	11/11/13 16:42	87-68-3	
Hexachlorobenzene	**<11.1**	ug/L	50.0	11.1	1	11/08/13 09:17	11/11/13 16:42	118-74-1	
Hexachloroethane	**<5.8**	ug/L	50.0	5.8	1	11/08/13 09:17	11/11/13 16:42	67-72-1	
2-Methylphenol(o-Cresol)	**<9.7**	ug/L	50.0	9.7	1	11/08/13 09:17	11/11/13 16:42	95-48-7	
3&4-Methylphenol(m&p Cresol)	**<7.7**	ug/L	50.0	7.7	1	11/08/13 09:17	11/11/13 16:42		
Nitrobenzene	**<13.7**	ug/L	50.0	13.7	1	11/08/13 09:17	11/11/13 16:42	98-95-3	
Pentachlorophenol	**<10.8**	ug/L	100	10.8	1	11/08/13 09:17	11/11/13 16:42	87-86-5	
Pyridine	**<14.3**	ug/L	50.0	14.3	1	11/08/13 09:17	11/11/13 16:42	110-86-1	
2,4,5-Trichlorophenol	**<10**	ug/L	50.0	10	1	11/08/13 09:17	11/11/13 16:42	95-95-4	
2,4,6-Trichlorophenol	**<10.7**	ug/L	50.0	10.7	1	11/08/13 09:17	11/11/13 16:42	88-06-2	
Surrogates									
Nitrobenzene-d5 (S)	109	%	59-130		1	11/08/13 09:17	11/11/13 16:42	4165-60-0	
2-Fluorobiphenyl (S)	92	%	60-130		1	11/08/13 09:17	11/11/13 16:42	321-60-8	
Phenol-d6 (S)	42	%	19-130		1	11/08/13 09:17	11/11/13 16:42	13127-88-3	
2,4,6-Tribromophenol (S)	97	%	34-143		1	11/08/13 09:17	11/11/13 16:42	118-79-6	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**1.9**	%	0.10	0.10	1		10/29/13 16:21		
1010 Flashpoint,Closed Cup	Analytical Method: EPA 1010								
Flashpoint	**>210**	deg F			1		10/30/13 13:29		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

ANALYTICAL RESULTS

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Sample: DSS-3-EAST @ 2.5' **Lab ID: 4087492003** Collected: 10/24/13 12:45 Received: 10/29/13 08:35 Matrix: Solid
Results reported on a "dry-weight" basis

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	**0.94J**	mg/kg	2.0	0.53	1	10/30/13 10:01	10/30/13 19:36	7440-38-2	
Cadmium	**<0.050**	mg/kg	0.49	0.050	1	10/30/13 10:01	10/30/13 19:36	7440-43-9	
Copper	**0.41J**	mg/kg	0.98	0.16	1	10/30/13 10:01	10/30/13 19:36	7440-50-8	
Lead	**0.87J**	mg/kg	0.98	0.29	1	10/30/13 10:01	10/30/13 19:36	7439-92-1	
Selenium	**<0.58**	mg/kg	2.0	0.58	1	10/30/13 10:01	10/30/13 19:36	7782-49-2	
Zinc	**1.9J**	mg/kg	3.9	0.26	1	10/30/13 10:01	10/30/13 19:36	7440-66-6	
6010 MET ICP, TCLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
	Leachate Method/Date: EPA 1311; 11/06/13 00:00								
Arsenic	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:13	7440-38-2	
Cadmium	**0.0028J**	mg/L	0.0050	0.0025	1	11/07/13 11:16	11/07/13 17:13	7440-43-9	
Copper	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:13	7440-50-8	
Lead	**<0.015**	mg/L	0.038	0.015	1	11/07/13 11:16	11/07/13 17:13	7439-92-1	
Selenium	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:13	7782-49-2	
Zinc	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:13	7440-66-6	
7470 Mercury, TCLP	Analytical Method: EPA 7470 Preparation Method: EPA 7470								
	Leachate Method/Date: EPA 1311; 11/06/13 00:00								
Mercury	**<0.10**	ug/L	0.20	0.10	1	11/07/13 13:50	11/07/13 18:34	7439-97-6	1q
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471								
Mercury	**<0.0031**	mg/kg	0.0062	0.0031	1	11/04/13 13:30	11/05/13 10:46	7439-97-6	
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546								
Acenaphthene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	83-32-9	
Acenaphthylene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	208-96-8	
Anthracene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	120-12-7	
Benzo(a)anthracene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	56-55-3	
Benzo(a)pyrene	**<3.0**	ug/kg	17.1	3.0	1	11/01/13 07:45	11/01/13 17:58	50-32-8	
Benzo(b)fluoranthene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	205-99-2	
Benzo(g,h,i)perylene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	191-24-2	
Benzo(k)fluoranthene	**<3.0**	ug/kg	17.1	3.0	1	11/01/13 07:45	11/01/13 17:58	207-08-9	
Chrysene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	218-01-9	
Dibenz(a,h)anthracene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	53-70-3	
Fluoranthene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	206-44-0	L2
Fluorene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	86-73-7	
Indeno(1,2,3-cd)pyrene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	193-39-5	
Naphthalene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	91-20-3	
Phenanthrene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	85-01-8	
Pyrene	**<8.5**	ug/kg	17.1	8.5	1	11/01/13 07:45	11/01/13 17:58	129-00-0	
Surrogates									
2-Fluorobiphenyl (S)	60	%	40-130		1	11/01/13 07:45	11/01/13 17:58	321-60-8	
Terphenyl-d14 (S)	59	%	40-130		1	11/01/13 07:45	11/01/13 17:58	1718-51-0	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
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ANALYTICAL RESULTS

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Sample: DSS-3-EAST @ 2.5' **Lab ID: 4087492003** Collected: 10/24/13 12:45 Received: 10/29/13 08:35 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV TCLP Sep Funnel	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
	Leachate Method/Date: EPA 1311; 11/06/13 00:00								
1,4-Dichlorobenzene	**<8.6**	ug/L	50.0	8.6	1	11/08/13 09:17	11/11/13 17:15	106-46-7	
2,4-Dinitrotoluene	**<8.0**	ug/L	50.0	8.0	1	11/08/13 09:17	11/11/13 17:15	121-14-2	
Hexachloro-1,3-butadiene	**<6.6**	ug/L	100	6.6	1	11/08/13 09:17	11/11/13 17:15	87-68-3	
Hexachlorobenzene	**<11.1**	ug/L	50.0	11.1	1	11/08/13 09:17	11/11/13 17:15	118-74-1	
Hexachloroethane	**<5.8**	ug/L	50.0	5.8	1	11/08/13 09:17	11/11/13 17:15	67-72-1	
2-Methylphenol(o-Cresol)	**<9.7**	ug/L	50.0	9.7	1	11/08/13 09:17	11/11/13 17:15	95-48-7	
3&4-Methylphenol(m&p Cresol)	**<7.7**	ug/L	50.0	7.7	1	11/08/13 09:17	11/11/13 17:15		
Nitrobenzene	**<13.7**	ug/L	50.0	13.7	1	11/08/13 09:17	11/11/13 17:15	98-95-3	
Pentachlorophenol	**<10.8**	ug/L	100	10.8	1	11/08/13 09:17	11/11/13 17:15	87-86-5	
Pyridine	**<14.3**	ug/L	50.0	14.3	1	11/08/13 09:17	11/11/13 17:15	110-86-1	
2,4,5-Trichlorophenol	**<10**	ug/L	50.0	10	1	11/08/13 09:17	11/11/13 17:15	95-95-4	
2,4,6-Trichlorophenol	**<10.7**	ug/L	50.0	10.7	1	11/08/13 09:17	11/11/13 17:15	88-06-2	
Surrogates									
Nitrobenzene-d5 (S)	109	%	59-130		1	11/08/13 09:17	11/11/13 17:15	4165-60-0	
2-Fluorobiphenyl (S)	93	%	60-130		1	11/08/13 09:17	11/11/13 17:15	321-60-8	
Phenol-d6 (S)	40	%	19-130		1	11/08/13 09:17	11/11/13 17:15	13127-88-3	
2,4,6-Tribromophenol (S)	88	%	34-143		1	11/08/13 09:17	11/11/13 17:15	118-79-6	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**2.3**	%	0.10	0.10	1		10/29/13 16:21		
1010 Flashpoint,Closed Cup	Analytical Method: EPA 1010								
Flashpoint	**>210**	deg F			1		10/30/13 14:00		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

ANALYTICAL RESULTS

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Sample: DSS-4-EAST @ 4.0' **Lab ID: 4087492004** Collected: 10/24/13 13:00 Received: 10/29/13 08:35 Matrix: Solid
Results reported on a "dry-weight" basis

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	**1.1J**	mg/kg	1.8	0.49	1	10/30/13 10:01	10/31/13 14:22	7440-38-2	
Cadmium	**0.088J**	mg/kg	0.45	0.046	1	10/30/13 10:01	10/31/13 14:22	7440-43-9	
Copper	**0.74J**	mg/kg	0.90	0.15	1	10/30/13 10:01	10/31/13 14:22	7440-50-8	
Lead	**1.1**	mg/kg	0.90	0.26	1	10/30/13 10:01	10/31/13 14:22	7439-92-1	
Selenium	**<0.54**	mg/kg	1.8	0.54	1	10/30/13 10:01	10/31/13 14:22	7782-49-2	
Zinc	**3.9**	mg/kg	3.6	0.24	1	10/30/13 10:01	10/31/13 14:22	7440-66-6	
6010 MET ICP, TCLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
	Leachate Method/Date: EPA 1311; 11/06/13 00:00								
Arsenic	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:15	7440-38-2	
Cadmium	**<0.0025**	mg/L	0.0050	0.0025	1	11/07/13 11:16	11/07/13 17:15	7440-43-9	
Copper	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:15	7440-50-8	
Lead	**<0.015**	mg/L	0.038	0.015	1	11/07/13 11:16	11/07/13 17:15	7439-92-1	
Selenium	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:15	7782-49-2	
Zinc	**<0.12**	mg/L	0.25	0.12	1	11/07/13 11:16	11/07/13 17:15	7440-66-6	
7470 Mercury, TCLP	Analytical Method: EPA 7470 Preparation Method: EPA 7470								
	Leachate Method/Date: EPA 1311; 11/06/13 00:00								
Mercury	**<0.10**	ug/L	0.20	0.10	1	11/07/13 13:50	11/07/13 18:36	7439-97-6	1q
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471								
Mercury	**<0.0028**	mg/kg	0.0056	0.0028	1	11/04/13 13:30	11/05/13 10:48	7439-97-6	
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546								
Acenaphthene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	83-32-9	
Acenaphthylene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	208-96-8	
Anthracene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	120-12-7	
Benzo(a)anthracene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	56-55-3	
Benzo(a)pyrene	**<3.0**	ug/kg	17.1	3.0	1	11/02/13 12:00	11/06/13 16:12	50-32-8	
Benzo(b)fluoranthene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	205-99-2	
Benzo(g,h,i)perylene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	191-24-2	
Benzo(k)fluoranthene	**<3.0**	ug/kg	17.1	3.0	1	11/02/13 12:00	11/06/13 16:12	207-08-9	
Chrysene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	218-01-9	
Dibenz(a,h)anthracene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	53-70-3	
Fluoranthene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	206-44-0	
Fluorene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	86-73-7	
Indeno(1,2,3-cd)pyrene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	193-39-5	
Naphthalene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	91-20-3	
Phenanthrene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	85-01-8	
Pyrene	**<8.6**	ug/kg	17.1	8.6	1	11/02/13 12:00	11/06/13 16:12	129-00-0	
Surrogates									
2-Fluorobiphenyl (S)	73	%	40-130		1	11/02/13 12:00	11/06/13 16:12	321-60-8	
Terphenyl-d14 (S)	75	%	40-130		1	11/02/13 12:00	11/06/13 16:12	1718-51-0	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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ANALYTICAL RESULTS

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Sample: DSS-4-EAST @ 4.0' **Lab ID: 4087492004** Collected: 10/24/13 13:00 Received: 10/29/13 08:35 Matrix: Solid
Results reported on a "dry-weight" basis

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV TCLP Sep Funnel	Analytical Method: EPA 8270 Preparation Method: EPA 3510								
	Leachate Method/Date: EPA 1311; 11/06/13 00:00								
1,4-Dichlorobenzene	**<8.6**	ug/L	50.0	8.6	1	11/08/13 09:17	11/11/13 17:48	106-46-7	
2,4-Dinitrotoluene	**<8.0**	ug/L	50.0	8.0	1	11/08/13 09:17	11/11/13 17:48	121-14-2	
Hexachloro-1,3-butadiene	**<6.6**	ug/L	100	6.6	1	11/08/13 09:17	11/11/13 17:48	87-68-3	
Hexachlorobenzene	**<11.1**	ug/L	50.0	11.1	1	11/08/13 09:17	11/11/13 17:48	118-74-1	
Hexachloroethane	**<5.8**	ug/L	50.0	5.8	1	11/08/13 09:17	11/11/13 17:48	67-72-1	
2-Methylphenol(o-Cresol)	**<9.7**	ug/L	50.0	9.7	1	11/08/13 09:17	11/11/13 17:48	95-48-7	
3&4-Methylphenol(m&p Cresol)	**<7.7**	ug/L	50.0	7.7	1	11/08/13 09:17	11/11/13 17:48		
Nitrobenzene	**<13.7**	ug/L	50.0	13.7	1	11/08/13 09:17	11/11/13 17:48	98-95-3	
Pentachlorophenol	**<10.8**	ug/L	100	10.8	1	11/08/13 09:17	11/11/13 17:48	87-86-5	
Pyridine	**<14.3**	ug/L	50.0	14.3	1	11/08/13 09:17	11/11/13 17:48	110-86-1	
2,4,5-Trichlorophenol	**<10**	ug/L	50.0	10	1	11/08/13 09:17	11/11/13 17:48	95-95-4	
2,4,6-Trichlorophenol	**<10.7**	ug/L	50.0	10.7	1	11/08/13 09:17	11/11/13 17:48	88-06-2	
Surrogates									
Nitrobenzene-d5 (S)	105	%	59-130		1	11/08/13 09:17	11/11/13 17:48	4165-60-0	
2-Fluorobiphenyl (S)	89	%	60-130		1	11/08/13 09:17	11/11/13 17:48	321-60-8	
Phenol-d6 (S)	39	%	19-130		1	11/08/13 09:17	11/11/13 17:48	13127-88-3	
2,4,6-Tribromophenol (S)	93	%	34-143		1	11/08/13 09:17	11/11/13 17:48	118-79-6	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**2.5**	%	0.10	0.10	1		10/29/13 16:22		
1010 Flashpoint,Closed Cup	Analytical Method: EPA 1010								
Flashpoint	**>210**	deg F			1		10/30/13 14:45		
Reactive Sulfide	Analytical Method: SW-846 7.3.4.2								
Sulfide, Reactive	**10.1J**	mg/kg	100		1		11/04/13 09:30		
9095 Paint Filter Liquid Test	Analytical Method: EPA 9095								
Free Liquids	**pass**	no units			1		11/04/13 12:13		
733C S Reactive Cyanide	Analytical Method: SW-846 7.3.3.2								
Cyanide, Reactive	**<0.016**	mg/kg	0.050	0.016	1		11/01/13 15:08		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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ANALYTICAL RESULTS

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Sample: DSS-4-DUP **Lab ID: 4087492005** Collected: 10/24/13 00:00 Received: 10/29/13 08:35 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050								
Arsenic	**1.5J**	mg/kg	1.9	0.51	1	10/30/13 10:01	10/31/13 14:24	7440-38-2	
Cadmium	**0.088J**	mg/kg	0.47	0.047	1	10/30/13 10:01	10/31/13 14:24	7440-43-9	
Copper	**0.57J**	mg/kg	0.93	0.15	1	10/30/13 10:01	10/31/13 14:24	7440-50-8	
Lead	**1.1**	mg/kg	0.93	0.27	1	10/30/13 10:01	10/31/13 14:24	7439-92-1	
Selenium	**<0.55**	mg/kg	1.9	0.55	1	10/30/13 10:01	10/31/13 14:24	7782-49-2	
Zinc	**2.4J**	mg/kg	3.7	0.25	1	10/30/13 10:01	10/31/13 14:24	7440-66-6	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**2.5**	%	0.10	0.10	1		10/29/13 16:22		
1010 Flashpoint,Closed Cup	Analytical Method: EPA 1010								
Flashpoint	**>210**	deg F			1		10/30/13 15:46		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

QC Batch: MERP/3954 Analysis Method: EPA 7470
QC Batch Method: EPA 7470 Analysis Description: 7470 Mercury TCLP
Associated Lab Samples: 4087492001, 4087492002, 4087492003, 4087492004

METHOD BLANK: 890651 Matrix: Water
Associated Lab Samples: 4087492001, 4087492002, 4087492003, 4087492004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	<0.10	0.20	11/07/13 18:13	

LABORATORY CONTROL SAMPLE: 890652

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	5	4.7	94	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 890653 890654

Parameter	Units	4087826001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	ug/L	<0.10	5	5	5.0	5.2	99	103	85-115	4	20	

MATRIX SPIKE SAMPLE: 890655

Parameter	Units	4087799001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	<0.10	5	2.2	44	85-115	M0

MATRIX SPIKE SAMPLE: 890656

Parameter	Units	4087799002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	<0.10	5	4.1	83	85-115	M0

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

QC Batch: MERP/3944 Analysis Method: EPA 7471
QC Batch Method: EPA 7471 Analysis Description: 7471 Mercury
Associated Lab Samples: 4087492001, 4087492002, 4087492003, 4087492004

METHOD BLANK: 887922 Matrix: Solid
Associated Lab Samples: 4087492001, 4087492002, 4087492003, 4087492004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/kg	<0.0033	0.0067	11/05/13 10:07	

LABORATORY CONTROL SAMPLE: 887923

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	.17	0.16	97	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 887924 887925

Parameter	Units	4087478008 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	0.024	.21	.2	0.21	0.21	90	88	85-115	3	20	

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

QC Batch: MPRP/9414 Analysis Method: EPA 6010
QC Batch Method: EPA 3050 Analysis Description: 6010 MET
Associated Lab Samples: 4087492001, 4087492002, 4087492003, 4087492004, 4087492005

METHOD BLANK: 884630 Matrix: Solid
Associated Lab Samples: 4087492001, 4087492002, 4087492003, 4087492004, 4087492005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/kg	<0.54	2.0	10/30/13 18:38	
Cadmium	mg/kg	<0.051	0.50	10/30/13 18:38	
Copper	mg/kg	<0.16	1.0	10/30/13 18:38	
Lead	mg/kg	<0.29	1.0	10/30/13 18:38	
Selenium	mg/kg	<0.59	2.0	10/30/13 18:38	
Zinc	mg/kg	<0.27	4.0	10/30/13 18:38	

LABORATORY CONTROL SAMPLE & LCSD: 884631 884632

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Arsenic	mg/kg	50	48.8	48.6	98	97	80-120	0	20	
Cadmium	mg/kg	50	49.0	49.0	98	98	80-120	0	20	
Copper	mg/kg	50	49.4	49.6	99	99	80-120	0	20	
Lead	mg/kg	50	48.7	48.4	97	97	80-120	1	20	
Selenium	mg/kg	50	50.4	50.6	101	101	80-120	1	20	
Zinc	mg/kg	50	50.8	50.8	102	102	80-120	0	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 884633 884634

Parameter	Units	4087395001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	4.2	61.7	61.8	59.8	61.8	90	93	75-125	3	20	
Cadmium	mg/kg	0.33J	61.7	61.8	58.9	60.6	95	97	75-125	3	20	
Copper	mg/kg	12.3	61.7	61.8	69.7	70.7	93	95	75-125	1	20	
Lead	mg/kg	6.8	61.7	61.8	59.7	60.7	86	87	75-125	2	20	
Selenium	mg/kg	<0.73	61.7	61.8	57.7	60.1	93	97	75-125	4	20	
Zinc	mg/kg	53.4	61.7	61.8	106	107	85	87	75-125	1	20	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
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(920)469-2436

QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

QC Batch: MPRP/9453 Analysis Method: EPA 6010
QC Batch Method: EPA 3010 Analysis Description: 6010 MET TCLP
Associated Lab Samples: 4087492001, 4087492002, 4087492003, 4087492004

METHOD BLANK: 890213 Matrix: Water
Associated Lab Samples: 4087492001, 4087492002, 4087492003, 4087492004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/L	<0.025	0.050	11/07/13 16:55	
Cadmium	mg/L	<0.00050	0.0010	11/07/13 16:55	
Copper	mg/L	<0.025	0.050	11/07/13 16:55	
Lead	mg/L	<0.0030	0.0075	11/07/13 16:55	
Selenium	mg/L	<0.025	0.050	11/07/13 16:55	
Zinc	mg/L	<0.025	0.050	11/07/13 16:55	

LABORATORY CONTROL SAMPLE: 890214

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/L	.5	0.47	94	80-120	
Cadmium	mg/L	.5	0.48	96	80-120	
Copper	mg/L	.5	0.49	98	80-120	
Lead	mg/L	.5	0.48	95	80-120	
Selenium	mg/L	.5	0.48	96	80-120	
Zinc	mg/L	.5	0.49	98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 890215 890216

Parameter	Units	4087492001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/L	<0.12	2.5	2.5	2.4	2.4	96	96	75-125	0	20	
Cadmium	mg/L	0.0031J	2.5	2.5	2.5	2.5	100	99	75-125	0	20	
Copper	mg/L	<0.12	2.5	2.5	2.5	2.5	100	99	75-125	1	20	
Lead	mg/L	<0.015	2.5	2.5	2.4	2.4	97	96	75-125	2	20	
Selenium	mg/L	<0.12	2.5	2.5	2.5	2.4	99	98	75-125	1	20	
Zinc	mg/L	<0.12	2.5	2.5	2.5	2.5	99	99	75-125	0	20	

MATRIX SPIKE SAMPLE: 890217

Parameter	Units	4087799001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/L	<0.12	2.5	2.4	97	75-125	
Cadmium	mg/L	<0.0025	2.5	2.5	99	75-125	
Copper	mg/L	<0.12	2.5	2.6	102	75-125	
Lead	mg/L	<0.015	2.5	2.5	98	75-125	
Selenium	mg/L	<0.12	2.5	2.5	100	75-125	
Zinc	mg/L	0.95	2.5	3.6	105	75-125	

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

MATRIX SPIKE SAMPLE: 890218

Parameter	Units	4087799002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/L	<0.12	2.5	2.4	97	75-125	
Cadmium	mg/L	0.0043J	2.5	2.5	99	75-125	
Copper	mg/L	<0.12	2.5	2.6	100	75-125	
Lead	mg/L	0.015J	2.5	2.5	97	75-125	
Selenium	mg/L	<0.12	2.5	2.4	98	75-125	
Zinc	mg/L	0.17J	2.5	2.7	100	75-125	

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

QC Batch: OEXT/20430 Analysis Method: EPA 8270 by SIM
QC Batch Method: EPA 3546 Analysis Description: 8270/3546 MSSV PAH by SIM
Associated Lab Samples: 4087492001, 4087492002, 4087492003

METHOD BLANK: 886550 Matrix: Solid
Associated Lab Samples: 4087492001, 4087492002, 4087492003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Acenaphthene	ug/kg	<8.3	16.7	11/01/13 11:37	
Acenaphthylene	ug/kg	<8.3	16.7	11/01/13 11:37	
Anthracene	ug/kg	<8.3	16.7	11/01/13 11:37	
Benzo(a)anthracene	ug/kg	<8.3	16.7	11/01/13 11:37	
Benzo(a)pyrene	ug/kg	<3.0	16.7	11/01/13 11:37	
Benzo(b)fluoranthene	ug/kg	<8.3	16.7	11/01/13 11:37	
Benzo(g,h,i)perylene	ug/kg	<8.3	16.7	11/01/13 11:37	
Benzo(k)fluoranthene	ug/kg	<2.9	16.7	11/01/13 11:37	
Chrysene	ug/kg	<8.3	16.7	11/01/13 11:37	
Dibenz(a,h)anthracene	ug/kg	<8.3	16.7	11/01/13 11:37	
Fluoranthene	ug/kg	<8.3	16.7	11/01/13 11:37	
Fluorene	ug/kg	<8.3	16.7	11/01/13 11:37	
Indeno(1,2,3-cd)pyrene	ug/kg	<8.3	16.7	11/01/13 11:37	
Naphthalene	ug/kg	<8.3	16.7	11/01/13 11:37	
Phenanthrene	ug/kg	<8.3	16.7	11/01/13 11:37	
Pyrene	ug/kg	<8.3	16.7	11/01/13 11:37	
2-Fluorobiphenyl (S)	%	52	40-130	11/01/13 11:37	
Terphenyl-d14 (S)	%	53	40-130	11/01/13 11:37	

LABORATORY CONTROL SAMPLE: 886551

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Acenaphthene	ug/kg	333	212	63	55-130	
Acenaphthylene	ug/kg	333	198	60	55-130	
Anthracene	ug/kg	333	224	67	66-130	
Benzo(a)anthracene	ug/kg	333	193	58	55-130	
Benzo(a)pyrene	ug/kg	333	213	64	56-130	
Benzo(b)fluoranthene	ug/kg	333	208	62	53-130	
Benzo(g,h,i)perylene	ug/kg	333	214	64	51-130	
Benzo(k)fluoranthene	ug/kg	333	202	60	52-130	
Chrysene	ug/kg	333	205	62	58-130	
Dibenz(a,h)anthracene	ug/kg	333	243	73	55-130	
Fluoranthene	ug/kg	333	196	59	62-130	L0
Fluorene	ug/kg	333	210	63	58-130	
Indeno(1,2,3-cd)pyrene	ug/kg	333	226	68	54-130	
Naphthalene	ug/kg	333	182	55	41-130	
Phenanthrene	ug/kg	333	209	63	60-130	
Pyrene	ug/kg	333	198	59	51-130	
2-Fluorobiphenyl (S)	%			63	40-130	
Terphenyl-d14 (S)	%			59	40-130	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 886552 886553

Parameter	Units	4087478008 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Acenaphthene	ug/kg	<10.5	419	419	228	235	54	56	31-130	3	35	
Acenaphthylene	ug/kg	<10.5	419	419	215	220	51	52	32-130	3	25	
Anthracene	ug/kg	<10.5	419	419	226	227	54	54	39-131	0	38	
Benzo(a)anthracene	ug/kg	<10.5	419	419	188	175	45	42	29-130	7	30	
Benzo(a)pyrene	ug/kg	<3.7	419	419	204	190	49	45	35-130	7	33	
Benzo(b)fluoranthene	ug/kg	<10.5	419	419	215	181	51	43	21-142	17	44	
Benzo(g,h,i)perylene	ug/kg	<10.5	419	419	142	125	34	30	12-134	13	33	
Benzo(k)fluoranthene	ug/kg	<3.7	419	419	184	187	44	45	35-130	2	37	
Chrysene	ug/kg	<10.5	419	419	202	189	48	45	37-130	7	38	
Dibenz(a,h)anthracene	ug/kg	<10.5	419	419	189	166	45	39	23-130	13	27	
Fluoranthene	ug/kg	<10.5	419	419	193	187	46	44	29-137	3	50	
Fluorene	ug/kg	<10.5	419	419	221	225	53	54	32-130	2	32	
Indeno(1,2,3-cd)pyrene	ug/kg	<10.5	419	419	171	151	41	36	17-134	12	28	
Naphthalene	ug/kg	<10.5	419	419	224	219	53	52	24-130	2	40	
Phenanthrene	ug/kg	<10.5	419	419	212	212	50	51	27-135	0	46	
Pyrene	ug/kg	<10.5	419	419	200	190	48	45	24-130	5	49	
2-Fluorobiphenyl (S)	%						49	52	40-130			
Terphenyl-d14 (S)	%						43	41	40-130			

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

QC Batch: OEXT/20444
QC Batch Method: EPA 3546
Analysis Method: EPA 8270 by SIM
Analysis Description: 8270/3546 MSSV PAH by SIM
Associated Lab Samples: 4087492004

METHOD BLANK: 887819 Matrix: Solid
Associated Lab Samples: 4087492004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Acenaphthene	ug/kg	<8.3	16.7	11/04/13 11:22	
Acenaphthylene	ug/kg	<8.3	16.7	11/04/13 11:22	
Anthracene	ug/kg	<8.3	16.7	11/04/13 11:22	
Benzo(a)anthracene	ug/kg	<8.3	16.7	11/04/13 11:22	
Benzo(a)pyrene	ug/kg	<3.0	16.7	11/04/13 11:22	
Benzo(b)fluoranthene	ug/kg	<8.3	16.7	11/04/13 11:22	
Benzo(g,h,i)perylene	ug/kg	<8.3	16.7	11/04/13 11:22	
Benzo(k)fluoranthene	ug/kg	<2.9	16.7	11/04/13 11:22	
Chrysene	ug/kg	<8.3	16.7	11/04/13 11:22	
Dibenz(a,h)anthracene	ug/kg	<8.3	16.7	11/04/13 11:22	
Fluoranthene	ug/kg	<8.3	16.7	11/04/13 11:22	
Fluorene	ug/kg	<8.3	16.7	11/04/13 11:22	
Indeno(1,2,3-cd)pyrene	ug/kg	<8.3	16.7	11/04/13 11:22	
Naphthalene	ug/kg	<8.3	16.7	11/04/13 11:22	
Phenanthrene	ug/kg	<8.3	16.7	11/04/13 11:22	
Pyrene	ug/kg	<8.3	16.7	11/04/13 11:22	
2-Fluorobiphenyl (S)	%	74	40-130	11/04/13 11:22	
Terphenyl-d14 (S)	%	72	40-130	11/04/13 11:22	

LABORATORY CONTROL SAMPLE: 887820

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Acenaphthene	ug/kg	333	277	83	55-130	
Acenaphthylene	ug/kg	333	258	78	55-130	
Anthracene	ug/kg	333	293	88	66-130	
Benzo(a)anthracene	ug/kg	333	250	75	55-130	
Benzo(a)pyrene	ug/kg	333	265	79	56-130	
Benzo(b)fluoranthene	ug/kg	333	291	87	53-130	
Benzo(g,h,i)perylene	ug/kg	333	272	82	51-130	
Benzo(k)fluoranthene	ug/kg	333	246	74	52-130	
Chrysene	ug/kg	333	270	81	58-130	
Dibenz(a,h)anthracene	ug/kg	333	295	89	55-130	
Fluoranthene	ug/kg	333	252	76	62-130	
Fluorene	ug/kg	333	277	83	58-130	
Indeno(1,2,3-cd)pyrene	ug/kg	333	282	85	54-130	
Naphthalene	ug/kg	333	242	73	41-130	
Phenanthrene	ug/kg	333	273	82	60-130	
Pyrene	ug/kg	333	262	79	51-130	
2-Fluorobiphenyl (S)	%			77	40-130	
Terphenyl-d14 (S)	%			72	40-130	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
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(920)469-2436

QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 887821 887822

Parameter	Units	4087651040 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Acenaphthene	ug/kg	<20.6	411	411	319	332	77	80	31-130	4	35	
Acenaphthylene	ug/kg	<20.6	411	411	297	312	72	76	32-130	5	25	
Anthracene	ug/kg	<20.6	411	411	335	350	80	84	39-131	4	38	
Benzo(a)anthracene	ug/kg	<20.6	411	411	282	297	67	71	29-130	5	30	
Benzo(a)pyrene	ug/kg	<20.6	411	411	314	316	75	76	35-130	1	33	
Benzo(b)fluoranthene	ug/kg	<20.6	411	411	331	341	80	82	21-142	3	44	
Benzo(g,h,i)perylene	ug/kg	<20.6	411	411	324	336	78	81	12-134	4	33	
Benzo(k)fluoranthene	ug/kg	<20.6	411	411	275	291	66	70	35-130	6	37	
Chrysene	ug/kg	<20.6	411	411	301	316	72	75	37-130	5	38	
Dibenz(a,h)anthracene	ug/kg	<20.6	411	411	360	373	87	91	23-130	4	27	
Fluoranthene	ug/kg	<20.6	411	411	289	302	66	69	29-137	5	50	
Fluorene	ug/kg	<20.6	411	411	317	330	77	80	32-130	4	32	
Indeno(1,2,3-cd)pyrene	ug/kg	<20.6	411	411	341	353	82	85	17-134	4	28	
Naphthalene	ug/kg	<20.6	411	411	270	275	63	64	24-130	2	40	
Phenanthrene	ug/kg	<20.6	411	411	308	321	71	74	27-135	4	46	
Pyrene	ug/kg	<20.6	411	411	292	304	68	71	24-130	4	49	
2-Fluorobiphenyl (S)	%						67	69	40-130			
Terphenyl-d14 (S)	%						61	63	40-130			

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

QC Batch: OEXT/20505 Analysis Method: EPA 8270
QC Batch Method: EPA 3510 Analysis Description: 8270 TCLP MSSV
Associated Lab Samples: 4087492001, 4087492002, 4087492003, 4087492004

METHOD BLANK: 891141 Matrix: Water
Associated Lab Samples: 4087492001, 4087492002, 4087492003, 4087492004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,4-Dichlorobenzene	ug/L	<1.7	10.0	11/11/13 13:24	
2,4,5-Trichlorophenol	ug/L	<2.0	10.0	11/11/13 13:24	
2,4,6-Trichlorophenol	ug/L	<2.1	10.0	11/11/13 13:24	
2,4-Dinitrotoluene	ug/L	<1.6	10.0	11/11/13 13:24	
2-Methylphenol(o-Cresol)	ug/L	<1.9	10.0	11/11/13 13:24	
3&4-Methylphenol(m&p Cresol)	ug/L	<1.5	10.0	11/11/13 13:24	
Hexachloro-1,3-butadiene	ug/L	<1.3	20.0	11/11/13 13:24	
Hexachlorobenzene	ug/L	<2.2	10.0	11/11/13 13:24	
Hexachloroethane	ug/L	<1.2	10.0	11/11/13 13:24	
Nitrobenzene	ug/L	<2.7	10.0	11/11/13 13:24	
Pentachlorophenol	ug/L	<2.2	20.0	11/11/13 13:24	
Pyridine	ug/L	<2.9	10.0	11/11/13 13:24	
2,4,6-Tribromophenol (S)	%	89	34-143	11/11/13 13:24	
2-Fluorobiphenyl (S)	%	86	60-130	11/11/13 13:24	
Nitrobenzene-d5 (S)	%	101	59-130	11/11/13 13:24	
Phenol-d6 (S)	%	33	19-130	11/11/13 13:24	

LABORATORY CONTROL SAMPLE: 891142

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,4-Dichlorobenzene	ug/L	50	27.8	56	53-130	
2,4,5-Trichlorophenol	ug/L	50	43.9	88	70-130	
2,4,6-Trichlorophenol	ug/L	50	43.8	88	70-130	
2,4-Dinitrotoluene	ug/L	50	62.3	125	69-134	
2-Methylphenol(o-Cresol)	ug/L	50	36.5	73	48-130	
3&4-Methylphenol(m&p Cresol)	ug/L	50	31.5	63	43-130	
Hexachloro-1,3-butadiene	ug/L	50	29.5	59	53-130	
Hexachlorobenzene	ug/L	50	51.3	103	59-130	
Hexachloroethane	ug/L	50	24.3	49	47-130	
Nitrobenzene	ug/L	50	58.1	116	66-130	
Pentachlorophenol	ug/L	50	42.6	85	54-130	
Pyridine	ug/L	50	21.5	43	10-130	
2,4,6-Tribromophenol (S)	%			92	34-143	
2-Fluorobiphenyl (S)	%			88	60-130	
Nitrobenzene-d5 (S)	%			96	59-130	
Phenol-d6 (S)	%			34	19-130	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

MATRIX SPIKE SAMPLE: 891143

Parameter	Units	4087492001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
1,4-Dichlorobenzene	ug/L	<8.6	250	178	71	50-130	
2,4,5-Trichlorophenol	ug/L	<10	250	267	107	65-130	
2,4,6-Trichlorophenol	ug/L	<10.7	250	241	97	64-130	
2,4-Dinitrotoluene	ug/L	<8.0	250	360	144	49-136	M1
2-Methylphenol(o-Cresol)	ug/L	<9.7	250	192	77	33-130	
3&4-Methylphenol(m&p Cresol)	ug/L	<7.7	250	171	69	35-130	
Hexachloro-1,3-butadiene	ug/L	<6.6	250	185	74	48-130	
Hexachlorobenzene	ug/L	<11.1	250	261	105	57-130	
Hexachloroethane	ug/L	<5.8	250	167	67	45-130	
Nitrobenzene	ug/L	<13.7	250	346	138	62-130	M1
Pentachlorophenol	ug/L	<10.8	250	239	96	10-149	
Pyridine	ug/L	<14.3	250	117	47	10-130	
2,4,6-Tribromophenol (S)	%				103	34-143	
2-Fluorobiphenyl (S)	%				99	60-130	
Nitrobenzene-d5 (S)	%				109	59-130	
Phenol-d6 (S)	%				37	19-130	

MATRIX SPIKE SAMPLE: 891144

Parameter	Units	4087826001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
1,4-Dichlorobenzene	ug/L	<8.6	250	154	62	50-130	
2,4,5-Trichlorophenol	ug/L	<10	250	246	99	65-130	
2,4,6-Trichlorophenol	ug/L	<10.7	250	223	89	64-130	
2,4-Dinitrotoluene	ug/L	<8.0	250	319	127	49-136	
2-Methylphenol(o-Cresol)	ug/L	<9.7	250	184	74	33-130	
3&4-Methylphenol(m&p Cresol)	ug/L	<7.7	250	151	61	35-130	
Hexachloro-1,3-butadiene	ug/L	<6.6	250	173	69	48-130	
Hexachlorobenzene	ug/L	<11.1	250	253	101	57-130	
Hexachloroethane	ug/L	<5.8	250	153	61	45-130	
Nitrobenzene	ug/L	<13.7	250	322	129	62-130	
Pentachlorophenol	ug/L	<10.8	250	221	88	10-149	
Pyridine	ug/L	<14.3	250	110	44	10-130	
2,4,6-Tribromophenol (S)	%				92	34-143	
2-Fluorobiphenyl (S)	%				92	60-130	
Nitrobenzene-d5 (S)	%				101	59-130	
Phenol-d6 (S)	%				33	19-130	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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(920)469-2436

QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

QC Batch: PMST/9084 Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 4087492001, 4087492002, 4087492003, 4087492004, 4087492005

SAMPLE DUPLICATE: 884442

Parameter	Units	4087463003 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	6.9	6.9	0	10	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

QC Batch: WET/16784 Analysis Method: EPA 1010
QC Batch Method: EPA 1010 Analysis Description: 1010 Flash Point, Closed Cup
Associated Lab Samples: 4087492001, 4087492002, 4087492003, 4087492004, 4087492005

LABORATORY CONTROL SAMPLE: 884693

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Flashpoint	deg F		82.2			

SAMPLE DUPLICATE: 885235

Parameter	Units	4087492005 Result	Dup Result	RPD	Max RPD	Qualifiers
Flashpoint	deg F	>210	>210			

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

QC Batch: WET/44357 Analysis Method: SW-846 7.3.4.2
QC Batch Method: SW-846 7.3.4.2 Analysis Description: Reactive Sulfide
Associated Lab Samples: 4087492001, 4087492004

METHOD BLANK: 1281918 Matrix: Solid
Associated Lab Samples: 4087492001, 4087492004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfide, Reactive	mg/kg	0.0J	100	11/04/13 09:30	

LABORATORY CONTROL SAMPLE: 1281919

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfide, Reactive	mg/kg	200	190	95	77-110	

MATRIX SPIKE SAMPLE: 1281920

Parameter	Units	60156444001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfide, Reactive	mg/kg	ND	500	455	91	67-116	

SAMPLE DUPLICATE: 1281921

Parameter	Units	60156446001 Result	Dup Result	RPD	Max RPD	Qualifiers
Sulfide, Reactive	mg/kg	ND	0.0J		30	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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(920)469-2436

QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

QC Batch: WET/16841 Analysis Method: EPA 9095
QC Batch Method: EPA 9095 Analysis Description: 9095 PAINT FILTER LIQUID TEST
Associated Lab Samples: 4087492001, 4087492004

SAMPLE DUPLICATE: 888028

Parameter	Units	4087492004 Result	Dup Result	RPD	Max RPD	Qualifiers
Free Liquids	no units	pass	pass			

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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Green Bay, WI 54302
(920)469-2436

QUALITY CONTROL DATA

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

QC Batch: WETA/26927 Analysis Method: SW-846 7.3.3.2
QC Batch Method: SW-846 7.3.3.2 Analysis Description: 733C Reactive Cyanide
Associated Lab Samples: 4087492001, 4087492004

METHOD BLANK: 1281926 Matrix: Solid
Associated Lab Samples: 4087492001, 4087492004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Cyanide, Reactive	mg/kg	<0.016	0.050	11/01/13 15:00	

LABORATORY CONTROL SAMPLE: 1281927

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Cyanide, Reactive	mg/kg	.5	0.50	99	71-123	

MATRIX SPIKE SAMPLE: 1281928

Parameter	Units	60156444001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Cyanide, Reactive	mg/kg	ND	1	0.92	91	57-132	

SAMPLE DUPLICATE: 1281929

Parameter	Units	60156446001 Result	Dup Result	RPD	Max RPD	Qualifiers
Cyanide, Reactive	mg/kg	ND	<0.016		23	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

QUALIFIERS

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PRL - Pace Reporting Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-G	Pace Analytical Services - Green Bay
PASI-K	Pace Analytical Services - Kansas City

BATCH QUALIFIERS

Batch: MSSV/6179

[IP]	Benzo(b)fluoranthene and benzo(k)fluoranthene were in the check standard but did not meet the resolution criteria in SW846 Method 8270C. Whereas sample results included are reported as individual isomers, the lab and the customer must recognize them as an isomeric pair.

Batch: MSSV/6185

[IP]	Benzo(b)fluoranthene and benzo(k)fluoranthene were in the check standard but did not meet the resolution criteria in SW846 Method 8270C. Whereas sample results included are reported as individual isomers, the lab and the customer must recognize them as an isomeric pair.

ANALYTE QUALIFIERS

1q	Negative detection value obtained for Method Blank (-0.14 ug/L).
L0	Analyte recovery in the laboratory control sample (LCS) was outside QC limits.
L2	Analyte recovery in the laboratory control sample (LCS) was below QC limits. Results may be biased low.
M0	Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: EE13354 PLATTE POINT/SFS ARCH.
Pace Project No.: 4087492

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
4087492001	**DSS-1-EAST @ 3'**	EPA 3050	MPRP/9414	EPA 6010	ICP/8287
4087492002	**DSS-2-EAST @ 3'**	EPA 3050	MPRP/9414	EPA 6010	ICP/8287
4087492003	**DSS-3-EAST @ 2.5'**	EPA 3050	MPRP/9414	EPA 6010	ICP/8287
4087492004	**DSS-4-EAST @ 4.0'**	EPA 3050	MPRP/9414	EPA 6010	ICP/8287
4087492005	**DSS-4-DUP**	EPA 3050	MPRP/9414	EPA 6010	ICP/8287
4087492001	**DSS-1-EAST @ 3'**	EPA 3010	MPRP/9453	EPA 6010	ICP/8320
4087492002	**DSS-2-EAST @ 3'**	EPA 3010	MPRP/9453	EPA 6010	ICP/8320
4087492003	**DSS-3-EAST @ 2.5'**	EPA 3010	MPRP/9453	EPA 6010	ICP/8320
4087492004	**DSS-4-EAST @ 4.0'**	EPA 3010	MPRP/9453	EPA 6010	ICP/8320
4087492001	**DSS-1-EAST @ 3'**	EPA 7470	MERP/3954	EPA 7470	MERC/5065
4087492002	**DSS-2-EAST @ 3'**	EPA 7470	MERP/3954	EPA 7470	MERC/5065
4087492003	**DSS-3-EAST @ 2.5'**	EPA 7470	MERP/3954	EPA 7470	MERC/5065
4087492004	**DSS-4-EAST @ 4.0'**	EPA 7470	MERP/3954	EPA 7470	MERC/5065
4087492001	**DSS-1-EAST @ 3'**	EPA 7471	MERP/3944	EPA 7471	MERC/5051
4087492002	**DSS-2-EAST @ 3'**	EPA 7471	MERP/3944	EPA 7471	MERC/5051
4087492003	**DSS-3-EAST @ 2.5'**	EPA 7471	MERP/3944	EPA 7471	MERC/5051
4087492004	**DSS-4-EAST @ 4.0'**	EPA 7471	MERP/3944	EPA 7471	MERC/5051
4087492001	**DSS-1-EAST @ 3'**	EPA 3546	OEXT/20430	EPA 8270 by SIM	MSSV/6179
4087492002	**DSS-2-EAST @ 3'**	EPA 3546	OEXT/20430	EPA 8270 by SIM	MSSV/6179
4087492003	**DSS-3-EAST @ 2.5'**	EPA 3546	OEXT/20430	EPA 8270 by SIM	MSSV/6179
4087492004	**DSS-4-EAST @ 4.0'**	EPA 3546	OEXT/20444	EPA 8270 by SIM	MSSV/6185
4087492001	**DSS-1-EAST @ 3'**	EPA 3510	OEXT/20505	EPA 8270	MSSV/6210
4087492002	**DSS-2-EAST @ 3'**	EPA 3510	OEXT/20505	EPA 8270	MSSV/6210
4087492003	**DSS-3-EAST @ 2.5'**	EPA 3510	OEXT/20505	EPA 8270	MSSV/6210
4087492004	**DSS-4-EAST @ 4.0'**	EPA 3510	OEXT/20505	EPA 8270	MSSV/6210
4087492001	**DSS-1-EAST @ 3'**	ASTM D2974-87	PMST/9084		
4087492002	**DSS-2-EAST @ 3'**	ASTM D2974-87	PMST/9084		
4087492003	**DSS-3-EAST @ 2.5'**	ASTM D2974-87	PMST/9084		
4087492004	**DSS-4-EAST @ 4.0'**	ASTM D2974-87	PMST/9084		
4087492005	**DSS-4-DUP**	ASTM D2974-87	PMST/9084		
4087492001	**DSS-1-EAST @ 3'**	EPA 1010	WET/16784		
4087492002	**DSS-2-EAST @ 3'**	EPA 1010	WET/16784		
4087492003	**DSS-3-EAST @ 2.5'**	EPA 1010	WET/16784		
4087492004	**DSS-4-EAST @ 4.0'**	EPA 1010	WET/16784		
4087492005	**DSS-4-DUP**	EPA 1010	WET/16784		
4087492001	**DSS-1-EAST @ 3'**	SW-846 7.3.4.2	WET/44357		
4087492004	**DSS-4-EAST @ 4.0'**	SW-846 7.3.4.2	WET/44357		
4087492001	**DSS-1-EAST @ 3'**	EPA 9095	WET/16841		
4087492004	**DSS-4-EAST @ 4.0'**	EPA 9095	WET/16841		
4087492001	**DSS-1-EAST @ 3'**	SW-846 7.3.3.2	WETA/26927		
4087492004	**DSS-4-EAST @ 4.0'**	SW-846 7.3.3.2	WETA/26927		

JBP

Appendix C

(Please Print Clearly)	
Company Name:	Coleman Engineering
Branch/Location:	Iron Mountain
Project Contact:	Dave Schmutzler
Phone:	906-774-3440
Project Number:	EE 13354
Project Name:	Platte Point/SFS Architects
Project State:	Michigan
Sampled By (Print):	WARD MITCHELL
Sampled By (Sign):	
PO #:	Regulatory Program:

Pace Analytical®
www.pacelabs.com

UPPER MIDWES
MN: 612-607-17(

WO# : 4087492

4087492

CHAIN OF CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

Mail To Contact:	Dave Schmutzler
Mail To Company:	C&C
Mail To Address:	635 Circle Dr. Iron Mountain
Invoice To Contact:	Dave Schmutzler
Invoice To Company:	CCC
Invoice To Address:	SAA
Invoice To Phone:	

Data Package Options (billable)
☐ EPA Level III
☐ EPA Level IV

MS/MSD
☐ On your sample (billable)
☐ NOT needed on your sample

Matrix Codes
A = Air, W = Water, B = Biota, DW = Drinking Water, C = Charcoal, GW = Ground Water, O = Oil, SW = Surface Water, S = Soil, WW = Waste Water, SI = Sludge, WP = Wipe

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	FILTERED? (YES/NO) Y/N	PRESERVATION (CODE)* Pick Letter	Analyses Requested: Metals by 6010 ICP	PAH	TCLP metals and SVOC	Flash point Paint Filter	Reactive Cyanide and Sulfide	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
001	DSS-1-EAST @ 3'	10/24	12:15	S			X	X	X	X	X		1-4ozpA 4-4ozagA	
002	DSS-2-EAST @ 3'	10/24	12:30	S			X	X	X	X	X			
003	DSS-3-EAST @ 2.5'	10/24	12:45	S			X	X	X	X	X			
004	DSS-4-East @ 4.0'	10/24	1:00	S			X	X	X	X	X			
005	DSS-4-Dup	10/24	—	S			X	X	X	X	X			

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed:

Transmit Prelim Rush Results by (complete what you want):

Email #1:	
Email #2:	
Telephone:	
Fax:	

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
	10/25/13 1500		
WATCO	10/29/13 0835	Mary MA Pace GB	10/29/13 0835

PACE Project No.: 4087492

Receipt Temp = °C

Sample Receipt pH OK / Adjusted

Cooler Custody Seal: Present / Not Present; Intact / Not Intact

Version 6.0 06/14/06

C019a(27Jun2006)

ORIGINAL

Pace Analytical Services, Inc
1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Pace Analytical™

Sample Condition Upon Receipt

4087492 10/29/13 DMK

Client Name: Coleman Engineering Project # 4087492

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☑ Commercial ☐ Pace Other Waltco

Tracking #: 4367169

Custody Seal on Cooler/Box Present: ☐ yes ☒ no Seals intact: ☐ yes ☒ no

Custody Seal on Samples Present: ☐ yes ☒ no Seals intact: ☐ yes ☒ no

Packing Material: ☐ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other

Thermometer Used SR54 Type of Ice: Wet Blue Dry None ☑ Samples on ice, cooling process has begun

Cooler Temperature Uncorr: 1 /Corr: 1 Biological Tissue is Frozen: ☐ yes ☐ no

Temp Blank Present: ☒ yes ☐ no

Person examining contents:
Date: 10/29/13
Initials: MH

Temp should be above freezing to 6°C for all sample except Biota.
Frozen Biota Samples should be received ≤ 0°C.

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
- VOA Samples frozen upon receipt	☐Yes ☐No	Date/Time:
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
-Pace IR Containers Used:	☐Yes ☑No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☑No ☐N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12. 003 3.4ozag do not have a depth, 14ozpt 14ozag depth listed as 3', matched by partial ID, date + time. 10/29/13 DF
-Includes date/time/ID/Analysis Matrix: S		
All containers needing preservation have been checked. (Non-Compliance noted in 13.)	☐Yes ☐No ☑N/A	13. ☐ HNO3 ☐ H2SO4 ☐ NaOH ☐ NaOH +ZnAct
All containers needing preservation are found to be in compliance with EPA recommendation. (HNO3, H2SO4 ≤2; NaOH+ZnAct ≥9, NaOH ≥12)	☐Yes ☐No ☑N/A	
exceptions: VOA, coliform, TOC, TOX, TOH, O&G, WIDROW, Phenolics. OTHER:	☐Yes ☑No	Initial when completed / Lab Std #ID of preservative / Date/ Time:
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	14.
Trip Blank Present:	☐Yes ☐No ☑N/A	15.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution: If checked, see attached form for additional comments ☐

Person Contacted: Date/Time:

Comments/ Resolution:

Project Manager Review: CH for DMK **Date:** 10/29/13

F-GR-C-031-Rev.01 (01Mar2013) SCUR Form

COLEMAN ENGINEERING COMPANY
635 Circle Drive
Iron Mountain, Michigan 49801
Telephone: (906) 774-3440 Fax: (906) 774-7776

PARTICLE-SIZE ANALYSIS OF SOILS - MECHANICAL

(ASTM D6913)

Project Name: Recreation Boat Access - Platte Bay **C.E.C. Job #:** 13354

Client: SFS Architecture

Address: 1150 Grand Boulevard, Suite 400, Kansas City, MO 64106

Soil Description:

Sample: GT-1

Remarks: 0' - 3' **Date Rec.:** 10/25/2013

Lab #4450

Sieve Size	Grain Diameter (mm)	Weight Retained	Percent Retained	Percent Finer
3"	76.2			
2"	50.8			
1 1/2"	37.5	0.0	0.0	100.0
1	25.4	45.3	5.8	94.2
3/4	19.1	80.8	10.3	83.9
3/8	9.5	112.3	14.3	69.6
4M	4.76	38.8	4.9	64.7
10M	2.00	19.3	2.5	62.2
40M	0.42	155.7	19.8	42.4
100M	0.149	332.8	42.1	0.3
200M	0.074	1.4	0.2	0.1
LBW		-	-	
Pan		0.7	0.1	

Original Sample:

Wet weight = 806.3 gm

Dry Initial weight = 787.1 gm

Moisture Content 2.4 %

Tested By: D. Edlebeck **Date:** 10/25/2013

Submitted By: **Date:** 10-28-13

Form: D422A Revision Date: 02/23/11

COLEMAN ENGINEERING COMPANY
635 Circle Drive
Iron Mountain, Michigan 49801
Telephone: (906) 774-3440 Fax: (906) 774-7776

PARTICLE-SIZE ANALYSIS OF SOILS - MECHANICAL

(ASTM D6913)

Project Name: Recreation Boat Access - Platte Bay **C.E.C. Job #:** 13354

Client: SFS Architecture

Address: 1150 Grand Boulevard, Suite 400, Kansas City, MO 64106

Soil Description:

Sample: GT-2

Remarks: 0' - 3' **Date Rec.:** 10/25/2013

Lab #4451

Sieve Size	Grain Diameter (mm)	Weight Retained	Percent Retained	Percent Finer
3"	76.2			
2"	50.8			
1 1/2"	37.5	0.0	0.0	100.0
1	25.4	42.2	5.2	94.8
3/4	19.1	23.0	2.8	92.0
3/8	9.5	47.1	5.8	86.2
4M	4.76	30.0	3.7	82.5
10M	2.00	18.5	2.3	80.2
40M	0.42	204.3	25.0	55.2
100M	0.149	451.2	54.9	0.3
200M	0.074	1.4	0.2	0.1
LBW		-	-	
Pan		0.7	0.1	

Original Sample:

Wet weight = 845.3 gm

Dry Initial weight = 818.4 gm

Moisture Content 3.3 %

Tested By: D. Edlebeck **Date:** 10/25/2013

Submitted By: **Date:** 10-28-13

Form: D422A Revision Date: 02/23/11

COLEMAN ENGINEERING COMPANY
635 Circle Drive
Iron Mountain, Michigan 49801
Telephone: (906) 774-3440 Fax: (906) 774-7776

PARTICLE-SIZE ANALYSIS OF SOILS - MECHANICAL

(ASTM D6913)

Project Name: Recreation Boat Access - Platte Bay **C.E.C. Job #:** 13354

Client: SFS Architecture

Address: 1150 Grand Boulevard, Suite 400, Kansas City, MO 64106

Soil Description:

Sample: GT-3

Remarks: 0' - 3'

Date Rec.: 10/25/2013

Lab #4452

Sieve Size	Grain Diameter (mm)	Weight Retained	Percent Retained	Percent Finer
3"	76.2			
2"	50.8			
1 1/2"	37.5	0.0	0.0	100.0
1	25.4	126.7	13.3	86.7
3/4	19.1	86.2	9.0	77.7
3/8	9.5	119.7	12.5	65.2
4M	4.76	50.4	5.3	59.9
10M	2.00	26.2	2.7	57.2
40M	0.42	168.4	17.6	39.6
100M	0.149	374.7	39.3	0.3
200M	0.074	1.5	0.2	0.1
LBW		-	-	
Pan		1.0	0.1	

Original Sample:

Wet weight = 976.1 gm

Dry Initial weight = 954.8 gm

Moisture Content 2.2 %

Tested By: D. Edlebeck **Date:** 10/25/2013

Submitted By: **Date:** 10-28-13

Form: D422A Revision Date: 02/23/11

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Table 902-1 Grading Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates

Material Type	Class Spec.	Item of Work by Section Number (Sequential) (a)	Sieve Analysis (MTM 109) Total Percent Passing (b)										Loss by Washing (MTM 108) % Passing No. 200 (b)
			2.5 in.	2 in.	1.5 in	1 in.	3/4 in.	½ in.	3/8 in.	No. 4	No. 8	No. 30	
Coarse Aggregates	4AA (c)	602	100	90-100	40-60		0-12						2.0 max.
	6AAA (c)	602			100	90-100	60-85	30-60		0-8			1.0 max. (d)
	6AA (c)	601, 602, 706, 708, 806			100	95-100		30-60		0-8			1.0 max. (d)
	6A	205, 401, 402, 601, 602, 603, 706, 806			100	95-100		30-60		0-8			1.0 max. (d)
	17A					100	90-100	50-75		0-8			1.0 max. (d)
	25A	508					100	95-100	60-90	5-30	0-12		3.0 max
	26A	706, 712					100	95-100	60-90	5-30	0-12		3.0 max.
	29A	508						100	90-100	10-30	0-10		3.0 max.
Dense-Graded Aggregates	21AA	302, 304			100	85-100		50-75			20-45		4-8 (e)(f)
	21A	302											
	22A	302, 306, 307				100	90-100		65-85		30-50		4-8 (e) (f) (g)
	23A	306, 307				100			60-85		25-60		9-16 (f)
Open -Graded Aggregates	2G	303 (h)			100	85-100		40-70			0-10	0-8	5.0 max.
	3G				100	85-100		40-70			0-30	0-13	5.0 max.
	4G (i)	303			100		60-80	35-65			10-25	5-18	6.0 max
	34R	404						100	90-100		0-5		3.0 max
	34G	404						100	95-100		0-5		3.0 max

a. Designated Item of Work (Section):
- 205 Roadway Earthwork
- 302 Aggregate Base Courses
- 303 Open-Graded Drainage Courses
- 304 Rubblizing Existing PCC Pavements - Filler Aggregate
- 306 Aggregate Surface Course
- 307 Aggregate Shoulders and Approaches
- 401 Culverts
- 402 Storm Sewers
- 404 Underdrains - Trench Backfill
- 508 Chip Seals
- 601 PCC Pavement Mixtures
- 602 Concrete Pavement Construction
- 603 Concrete Pavement Repair
- 706 Structural Concrete Construction
- 708 Prestressed Concrete Beams
- 712 Bridge Rehabilitation - Concrete
- 806 Bicycle Paths

b. Based on dry weights.
c. Class 6AAA will be used exclusively for all mainline and ramp concrete pavement when the directional commercial ADT is greater than or equal to 5000 vehicles per day
d. Loss by Washing will not exceed 2.0 percent for material produced entirely by crushing rock, boulders, cobbles, slag or concrete.
e. When used for aggregate base courses, surface courses, shoulders and approaches and the material is produced entirely by crushing rock, boulders, cobbles, slag or concrete, the maximum limit for Loss by Washing must not exceed 10 percent.
f. The limits for Loss by Washing of dense-graded aggregates are significant to the nearest whole percent.
g. For aggregates produced from sources located in Berrien County, the Loss by Washing shall not exceed 8 percent and the sum of Loss by Washing and shale particles must not exceed 10 percent.
h. For use with stabilized aggregate base.
i. Acceptance gradation at production site only.

Table 902-3 Grading Requirements for Granular Materials

Material	Sieve Analysis (MTM 109) Total % Passing (a)									Loss by Washing % Passing No. 200 (a) (b)
	6 in	3 in	2 in	1 in	½ in	3/8 in	No. 4	No. 30	No. 100	
Class I			100		45-85		20-85	5-30		0-5
Class II (c)		100		60-100					0-30 (d)	0-7 (d)
Class IIA (c)		100		60-100					0-35	0-10
Class III	100	95-100								0-15
Class IIIA						100			0-30	0-15

a. Test results based on dry weights.
b. Use test method MTM 108 for Loss by Washing.
c. Except for use in granular blankets and underdrain backfill, Class IIA granular material may be substituted for Class II granular material for projects located in the following counties: Arenac, Bay, Genessee, Gladwin, Huron, Lapeer, Macomb, Midland, Monroe, Oakland, Saginaw, Sanilac, Shiawassee, St, Clair, Tuscola and Wayne counties.
d. Grading requirements are 0-20 for No. 100 sieve and 0-5 for loss by washing when material is used as backfill for underdrains.

Table 902-2 Physical Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates

Material	Series/ Class	Gravel, Stone and Crushed Concrete						Slag (a)		All Aggregates
		Crushed Material, % min. (MTM 110, 117)	Loss, % max. Los Angeles Abrasion (MTM 102)	Soft Particles, % max. (MTM 110)	Chert, % max, (MTM 110)	Sum of Soft Particles and Chert, % max. (MTM 110)	Freeze-Thaw Dilation, % per 100 cycle max. (MTM 115) (d)	Sum of Coke and Coal Particles, % max. (MTM 110)	Freeze-Thaw Dilation, % per 100 cycle max. (MTM 115) (d)	Flat and Elongated Particles, ratio - % max (ASTM D 4791)
Coarse Aggregates	4AA (b)		40			2.0 (c)	0.020	1.0	0.020	3:1 - 15.0 (l)
	6AAA		40	2.0 (e)	2.5	4.0	0.04 0 (f)	1.0	0.04 0 (f)	
	6AA (g)		40	2.0 (e)		4.0	0.067 (h)	1.0	0.067	
	6A (g)		40	3.0 (e)	7.0	9.0	0.067	1.0	0.067	
	17A (g)		40	3.5 (e)	8.0	10.0	0.067	1.0	0.067	
	25 A	95	45	8.0 (i)		8.0		1.0		3:1 - 20.0 (m)
	26A (g)		40	2.0 (e)		4.0	0.067	1.0	0.067	
	29A	95	45	8.0 (i)		8.0		1.0		3:1 - 20.0 (m)
Dense-Graded Aggregates (j)	21AA	95	50							
	21A	25	50							
	22A	25	50							
	23A	25	50							
Open-Graded Aggregates	2G	90	45 (k)							
	3G	95	45 (k)							
	4G	95	45 (k)							
	34R	20 max.	45 (k)							
	34G	100	45 (k)							

a. Iron blast furnace and reverberatory furnace slag must contain no free (unhydrated) lime.
b. 2.50 percent maximin 24 hour soak absorption based on oven dry 6 series aggregate.
c. 1.0% maximum for particles retained on the 1 inch sieve.
d. If the bulk dry specific gravity is more than 0.04 less than the bulk dry specific gravity of the most recently tested freeze-thaw sample, the aggregate will be considered to have changed characteristics and be required to have a new freeze-thaw test conducted prior to use on Department projects.
e. Clay-Ironstone particles must not exceed 1.0 percent for 6AAA, 6AA and 26A, and 2.0 percent for 6A and 17A. Clay-Ironstone particles are also included in the percentage of soft particles for these aggregates.
f. Maximum Freeze-Thaw dilation is 0.067 when the directional commerical ADT is less than 5000 vehicles per day.
g. Except for pre-stressed beams, the sum of soft and chert particles may be up to 3.0 percent higher than the values determined from the sample tested for freeze-thaw durability. However, under no circumstances will the deleterious particle percentages exceed the specification limits in Table 902-2. In addition, a source may be restricted to a minimum percent crushed not to exceed 15 percent less than the percent in the freeze-thaw sample. When the freeze-thaw dilation is between 0.040 and 0.067 percent per 100 cycles, more restrictive limits will be applied.
h. Maximum dilation of 0.010 for prestressed concrete beams.
i. Friable sandstone is included in the soft particle determination for chip seal aggregates.
j. Quarried carbonate (limestone or dolomite) aggregate may not contain over 10 percent insoluable residue finer than Number 200 sieve when tested in accordance with MTM 103.
k. If a blend of different aggregate sources, the abrasion value applies to each source.
l. ASTM D 4791 section 8.4 will be followed. The test will be performed on the material retained down to and including the one inch sieve.
m. ASTM D 4791 section 8.4 will be followed. The test will be performed on the material retained down to and including the No. 4 sieve.

Table 902-4 Grading Requirements for Fine Aggregates

Material	Sieve Analysis (MTM 109) Total Percent Passing (a)							Loss by Washing % Passing No. 200 (a) (b)	Fineness Modulus Variation (c)
	3/8 in	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100		
2NS	100	95-100	65-95	35-75	20-55	10-30	0-10	0-3.0	±0.20 (d)
2SS (e)	100	95-100	65-95	35-75	20-55	10-30	0-10	0-4.0	±0.20 (d)
2MS		100	95-100			15-40	0-10	0-3.0	±0.20 (d)
2FA (f)	100	90-100	65-90	45-70	30-50	18-30	10-21	5-15 (g)	
3FA (f)	100	70-90	45-70	28-50	19-34	12-25	7-18	5-15 (g)	

a. Test results based on dry weights.
b. Use test method MTM 108 for Loss by Washing.
c. Aggregate having a fineness modulus differing from the base fineness modulus of the source by the amount exceeding the maximum variation specified in the table, will be rejected. Use ASTM C 136.
d. The base fineness modulus will be supplied by the aggregate producer at the start of each construction season and be within the range of 2.50 - 3.35. The base FM, including the permissible variation, will be within the 2.50 - 3.35 range.
e. Not for any application subject to vehicular traffic.
f. Gradation represents the final blended product.
g. The limits for loss by washing of Fine Aggregates, 2FA and 3FA are significant to the nearest whole percent.