ANCHOR QEA

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MEMORANDUM

To:	Rich Galloway, Honeywell	**Date:**	August 12, 2014
From:	Mark Reemts, Karin Olsen, and Ram Mohan, Anchor QEA	**Project:**	110287-11.01
Cc:	Bill Hague, Honeywell		
Re:	Sampling Approach for Residual Sediment in DMUs 9 and 10		

Remedial dredging will be conducted in the Buffalo River Area of Concern (AOC) as part of the ongoing remediation under the Great Lakes Legacy Act. This memorandum provides a sampling approach for residual sediment in AOC dredging management units (DMUs) 9 and 10 located adjacent to the Buffalo Color Area A property. An upland remedy for the Buffalo Color Area A site has already been implemented, including the installation of a slag cement/bentonite cutoff wall and a series of anchored marine mattresses composed of geo-composite grids filled with armor stone.

During the development of the remedial dredging design for the Buffalo River AOC, the Buffalo Color Area A was identified as one of 20 critical structures due to the presence of the cutoff wall and marine mattresses, necessitating protection of the existing slope and its structural integrity, which are integral to the success of the upland remedy. At the request of Honeywell and the U.S. Environmental Protection Agency (USEPA), Anchor QEA, LLC evaluated potential impacts to the critical structure (i.e., marine mattress and slopes) at Area A. As part of this effort, several alternatives were evaluated for managing post-dredge residual sediments that may be left in place at the base of the marine mattress area to provide the necessary slope stability for the critical structure (Anchor QEA 2014).

Based on this evaluation, Alternative 3A (Environmental dredging with a 10-foot offset from the toe of the marine mattresses and a 3:1 slope tie into the edge of the federal navigation channel) was selected as the most feasible alternative because it provides the requisite slope stability, reduces the risk of damage to the mattress during construction, follows approved final design elements for other critical structures and shorelines in the AOC, and is readily implementable within the current project schedule.

Although the proposed alternative is estimated to remove approximately 97% of the targeted sediment from DMUs 9 and 10, this alternative may also leave in place approximately 1,300 cubic yards of residual sediment along the edge of the marine mattresses to provide slope stability. The sampling approach detailed below was developed at the request of the New York State Department of Environmental Conservation (NYSDEC) to characterize the concentrations of the contaminants of concern (COCs) present in those residual sediments.

The residual sediments are estimated to extend approximately 300 feet along the edge of the marine mattresses and may be up to 30 feet wide, extending into the federal navigation channel. To characterize the physical and chemical characteristics of the sediment within the residual footprint, sediment sampling at three locations is proposed. The locations will be spaced approximately 100 feet apart, as shown in Table 1 below and in Figure 1.

Table 1
Proposed Sediment Sampling Locations for Buffalo River AOC DMUs 9 and 10

Sample	Easting	Northing
BR14-01	1078124.9810	1042855.7734
BR14-02	1078200.1708	1042938.2707
BR14-03	1078170.8468	1042893.3643

Sediment cores will be collected from each location, representing the vertical extent of the residual sediment, defined as the area from the surface of the proposed dredge cut to the till. Because the depth to till is variable, it is anticipated that cores will be between 3 and 6 feet in length, depending on the location. In consideration of risk potential for exposure and long-term surface weighted average concentration (SWAC) goals for the AOC, surficial sediments retrieved from the 0- to 6-inch depth interval will be submitted for physical and chemical testing. The remainder of each core will be archived for future analysis based on the results of the surficial sampling.

Given the small quantity of material found in the surficial sediments, multiple cores per location may be necessary to obtain the required sediment volume for analytical testing at each location. Multiple cores may be collected at a single location and composited together to ensure that a sufficient volume of sediment is obtained for testing.

Cores will be processed in the field by splitting them lengthwise, and cores will be photographed and lithologically logged prior to subsampling. Samples submitted for analytical testing will only include sediment recovered from depths corresponding to the residual sediment. Till material, if recovered, will not be included in subsamples. Till is defined as glacial deposits native to the region and predating fluvial sediments. These deposits are typically reddish brown in color from oxidation that occurred at or shortly after the time of deposition, and they include a variety of materials, including ice-contact glacial till (unsorted sand and gravel in a fine-grained matrix), glaciofluvial and glacial outwash deposits (well-sorted silts and sands), and glaciolacustrine (lake-laid) clays.

A total of three sediment samples, plus a field duplicate and site-specific quality control samples, will be submitted for chemical analysis of the following site COCs: polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), lead, and mercury. Physical characterization of the sediments will include grain size and total organic carbon (TOC).

Analytical and data evaluation methods will be consistent with the approach used in the Feasibility Study (ENVIRON et al. 2011), as follows:

- Analytical methods include PAHs by USEPA Method 8270D, PCB Aroclors by USEPA Method 8082A, lead by USEPA Method 6020, mercury by USEPA Method 7471B, grain size by ASTM D422, and TOC by USEPA Method 9060.
- Total PAHs will be determined using the concentrations of 17 unsubstituted PAHs: acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(e)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene.
- Total PAH sediment concentrations will be determined by summing the concentrations of the 17 individual PAHs; for non-detect values, one-half the reporting limit will be used to estimate PAH concentrations.
- Total PCB concentrations will be determined using concentrations of seven PCB Arolcors: Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, and Aroclor 1260.

- Total PCB sediment concentrations will be determined by summing the concentrations of all detected individual Aroclors; for non-detect values, one-half of the reporting limit was used to estimate Aroclor concentrations for Aroclors 1242, 1254, and 1260, and a value of zero will be assigned to non-detect values for all other Aroclors.

Total PAH, total PCB, lead, and mercury concentrations in the residual sediment will be compared to the AOC-specific SWAC remedial goals (RGs), as follows:

- Total PAH = 16 parts per million (ppm)
- Total PCB = 0.20 ppm
- Lead = 90 milligrams per kilogram (mg/kg)
- mercury = 0.44 mg/kg

An Investigation Report documenting all activities associated with collection, compositing, transport, and analysis of the sediment samples will be provided to NYSDEC for review. The Investigation Report will include the following:

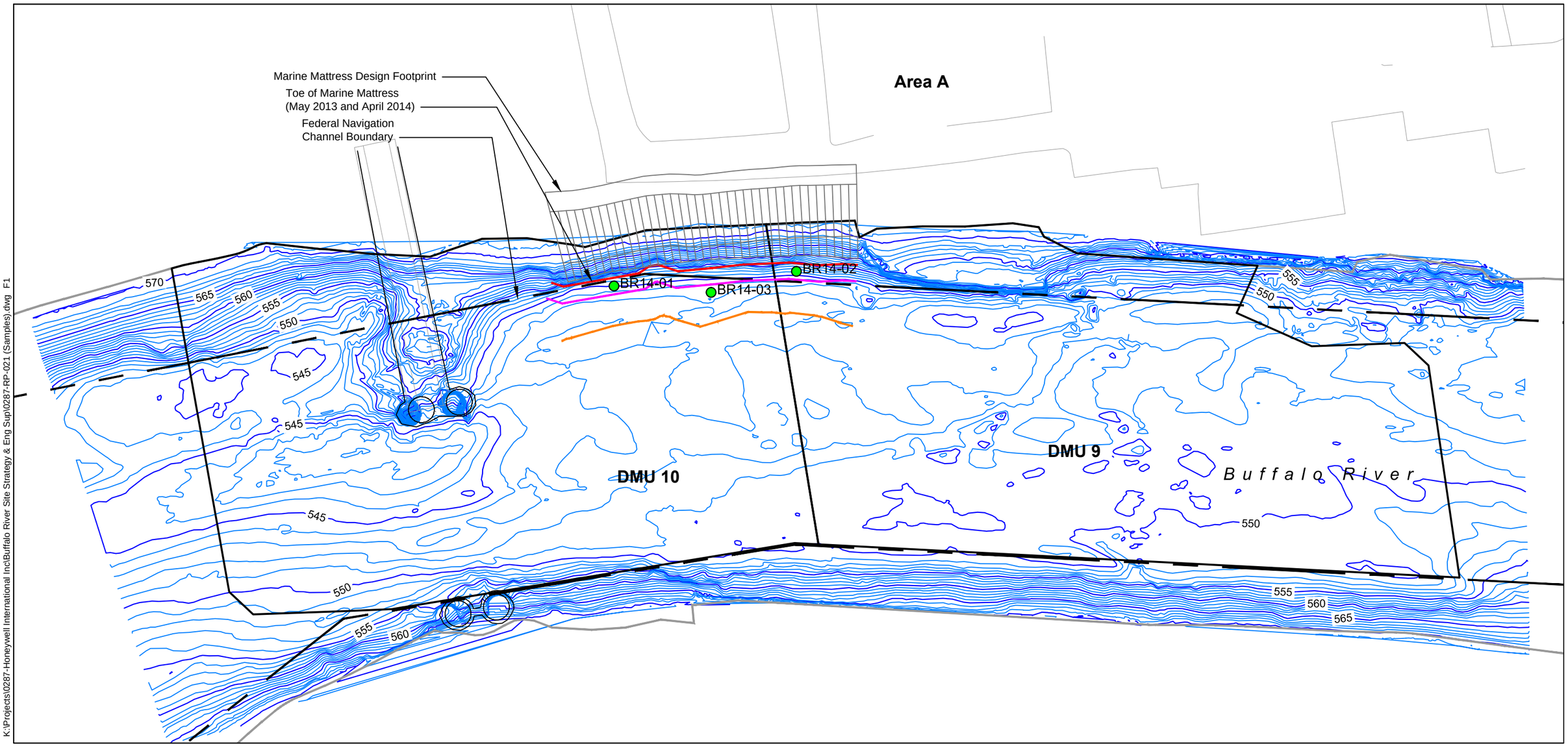
- A summary of all field activities, including field notes and boring logs
- A project map with actual sampling locations
- Data results tables that include a comparison to the SWAC RGs
- A quality assurance/quality control narrative for laboratory results

REFERENCES

Anchor QEA, 2014. *Alternatives Evaluation for DMUs 9 & 10 Marine Mattress, Buffalo River Area of Concern.* Prepared for Buffalo River Project Coordination Team. July 2014.

ENVIRON International Corporation, MACTEC Engineering & Consulting, Inc., and LimnoTech, 2011. *Feasibility Study for the Buffalo River, New York.* Prepared for Buffalo River Project Coordination Team. October 2011.

FIGURE 1
AREA A DREDGE PRISM MODIFICATION



SOURCE: Basemap prepared from CH2MHILL drawings, titled 'Existing Conditions' and 'Dredging Operations'. Bathymetry from Ocean Surveys, Inc., dated April 14, 2014
HORIZONTAL DATUM: New York State Plane West, NAD83, U.S. Feet.
VERTICAL DATUM: North American Vertical Datum 1988 (NAVD88).
NOTES:

1. Base map information including navigation channel, in-water structure and 90% Design toe of marine mattress is shown as indicated in the Basis of Design Report prepared by CH2MHill/Ecology and Environment (March, 2013)
2. Actual toe of marine mattress is based on May 28, 2013 diver survey and probing conducted by OSI (April 2014).

LEGEND:

- Existing Contours (April 2014, 1' and 5' Interval)
- Toe of Marine Mattress (May 2013 and April 2014)
- 10' Marine Mattress Offset
- Approximate Toe of Dredge Prism Modification
- Marine Mattress Design Footprint (Mactec)
- Navigation Channel
- DMU Boundary
- Naturally-sloped Shoreline
- BR14-01 Proposed Sample Location

0 100
Scale in Feet

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Figure 1
Area A Dredge Prism Modification Sampling and Analysis Plan
Buffalo River - Area A