ANCHOR QEA

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MEMORANDUM

To:	William Hague, Honeywell Rich Galloway, Honeywell	**Date:**	9/20/13
From:	Mark Reemts, John Laplante, Ram Mohan, Anchor QEA	**Project:**	110287-11.01
Re:	Area A Slope Stability and Revised Dredge Prism		

At the Construction Oversight meeting held in Buffalo on September 19, 2013, Honeywell requested Anchor QEA develop a memorandum summarizing the slope stability considerations related to DMU 9 & 10 dredging. This memorandum provides a high level review of those aspects.

Area A, located adjacent to DMUs 9 & 10, was identified as a critical structure during the design phase for the Buffalo River Remediation Project. This area contains a segment of shoreline protected by a marine mattress, approximately 120 feet long along the shoreline, extending from top of bank down to approximately elevation +553.5 IGLD 85. The mattress is anchored at the top of the slope, and is comprised of stone gabions reinforced with geogrid. Upland from the marine mattress is a slurry wall that was constructed as part of the brownfield cleanup operations for the former Buffalo Color site. Dredging within DMUs 9 & 10 is anticipated to be necessary immediately adjacent to the toe of the mattress, raising concerns over the stability of the shoreline mattress and slope, both during and following dredging activities.

Photo 1: Marine mattress segment at Area A

Anchor QEA performed a series of slope stability analyses to evaluate potential effects of the dredging project on the stability of the marine mattress. Early modeling results indicated the existing condition of the mattress was stable; however, it was below factors of safety that are typically utilized for design or new construction. Planned vertical dredge cuts at the toe of slope showed potential to lower the factor of safety below 1.0, potentially indicating an unstable slope condition. Depending on the size and shape of the failure mass and the upland slurry wall configuration, impacts could extend to those areas.

Additional slope stability modeling was performed more recently to update the initial evaluations based on new data that was provided to Anchor QEA. The extents of the marine mattress were updated based on diver verification data locating the as-built toe of the mattress, which extended further into the river than what was initially envisioned. In addition, geotechnical information along the slope was updated utilizing recent borings advanced within the river near the toe of the slope. The revised evaluation indicated that although a reduced dredge prism might be anticipated due to the mattress extending further into the river than previously anticipated, the low-strength clay strata was found to be thicker than what upland borings previously had illustrated. These changes resulted in an overall result similar to preliminary model predictions, indicating that slope stability is still a concern at the site if dredging is conducted as envisioned.

Because the previously envisioned techniques of dredging, toe sheeting or cofferdam installation were found to have technical, economic and feasibility concerns, Honeywell requested Anchor QEA evaluate best management practices (BMPs) to try and minimize the potential for slope stability issues during and following dredging. Given the fact that the property owner South Buffalo Development Company (SBD) has signed a liability waiver with Honeywell and USEPA, releasing these entities and their consultants from any future liabilities resulting from potential instabilities (and resulting reconstruction/remediation of the slopes and adjacent river sections), the concept of using BMPs during dredging could be one of the means to try and minimize slope issues during dredging.

Accordingly, the following concepts are currently being considered for this area (note that these require additional evaluation for effectiveness, cost and implementability):

1. Vertical Cut with Dredge Prism offset – dredging utilizing a vertical cut adjacent to the toe of mattress. An assumed 5-foot offset would be incorporated to help protect the mattress from encroachment damage during dredging.
2. Sloped Dredge Prism – alternative dredge prisms would incorporate a 2:1 or 3:1 slope from the 5-foot offset to reduce the removal of material from the toe of slope. This would reduce the overall removal volume but reduce the impact to the slope stability.
3. Slot Dredge and Backfill – dredging would be controlled to remove smaller segments at a time followed by backfill. This would limit the time the slope was left unsupported but would reduce production and increase cost for implementation.

Anchor QEA will evaluate the slope stability conditions associated with the above mentioned BMP's and will issue an update to this memorandum following that analysis.