Loureiro Engineering Associates, Inc.

VIA ELECTRONIC MAIL

April 9, 2007

Ms. Anna Krasko, Project Manager
United States Environmental Protection Agency
Region 1
One Congress Street
Boston, Massachusetts 02114

RE: Audubon Society of Rhode Island Questions - Dam Removal Options
Centredale Manor Restoration Project, North Providence, Rhode Island

Dear Ms. Krasko:

As requested, this correspondence provides our suggested responses to the questions raised by Ms. Eugenia Marks of the Audubon Society of Rhode Island in her October 2, 2006, correspondence concerning the dam removal alternative proposed by LEA at the Centredale Site Dialogue Meeting held in Providence in July 2006. We understand that you have requested our suggested responses to Ms. Marks' correspondence to assist Battelle in preparing its presentation for the upcoming Dialogue Meeting on April 23, 2007. Each of Ms. Marks' questions is restated below in italics, followed by our suggested response to the question.

1. *The proposal would require potential removal and capping areas where actionable concentrations of dioxins have been found. In order to preserve the integrity of the capping over the lifetime of the risk concentration of the dioxins and other contaminants, how will prevention of woody growth, particularly tress, be accomplished to avoid the situation in 25 – 30 years when any tree that would grow over capped areas might be up-rooted, exposing contaminants or decreasing the depth of the cap and subsequent erosion.*

   The final remedy would include a monitoring and maintenance program. The monitoring and maintenance program would include a routine inspection component pursuant to which woody growth would be identified and removed from areas that are capped. The details of the monitoring and maintenance program would be developed during the design phase of the selected remedy.

2. *The proposal would create a flow regime different from that of the current pond. What would be the projected flood elevations, for 25, 50 and 100 year storms, across the elevation of any created river bed and flood plain? How would the edges of capping materials be protected to prevent erosion and impact to contaminant "hot spots?" How would floods of various intensity without a dam affect the forested swamp where dioxin concentrations of concern have been found?*

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A hydrodynamic analysis of various channel designs in the Allendale Pond and Lyman Mill Pond areas is being performed to support the detailed evaluation of dam removal alternatives in the Feasibility Study. The results of the analysis will be used to assess the extent of inundation in the floodplain areas of Allendale Pond and Lyman Mill Pond after dam removal. The protection of flood storage and flood plain will be factored into the final remedy design. The results of the hydrodynamic analysis would also be used to design the channel such that it is protective of the capped sediments. The design of the final remedy would also be protective of the Oxbow area and any other environmentally sensitive areas.

3. *What would be the difference in abundance and diversity of aquatic life in a free flowing Woonasquatucket River at this site assuming that no shrub nor tree protection along the bank were allowed to grow and that the water would thus be exposed to full sunlight? In addition, what changes in aquatic life would have a cascading affect on animals that may use current configuration of Allendale Pond life for forage (tree swallows, river otter)?*

The question presupposes that trees and/or shrubs would not be allowed to grow on the banks of the restored river. However, it may be plausible to engineer a clean bank that would act as a barrier between the water course and any capped sediment. The clean bank barrier could be constructed of clean soil in which shrubs and/or tress would grow and provide shading for the flowing water, aid in erosion prevention and provide habitat for a variety of birds and mammals. The clean barrier option may be viable along much of the full length of the floodplain area to be capped. The consideration of the details regarding this option would occur in the latter stages of the Feasibility Study, which is still in progress. If a clean barrier option is viable then shading of sunlight would occur, which would promote a cooler water system.

Even if the presupposition were true that shrubs and/or trees would not be allowed to grow on the river's edge, it is likely that the water temperature of the flowing river would be lower than that currently experienced in the ponds and in free flowing sections of the Woonasquatucket River. Under current conditions, the edges of the ponds are shaded, but these edges represent only a very small percentage of the overall surface area of the ponds. The remainder of the open water is exposed to full sunlight. Additionally, the reduced water velocity resulting from the impoundments and dams, equates to a longer residence time of the water in the ponds, thereby increasing the potential for warming via solar radiation. Moreover, the current dam structures allow water to pass by overtopping the dam. The water that flows over the dams is likely the warmest water in the water column. As a result, the free flowing sections of the river below the dams are receiving the warmest possible water.

A free flowing river with no trees or shrubs along its banks may still result in a cooler water system than that experienced today for the following reasons:

- the surface area of the water that would be in direct exposure to sunlight would be less than that experienced with the ponds;

- residence time of the water through the non-shaded section of river would be reduced in comparison to today; and

- the overtopping of dams with warm water would be eliminated; therefore, the water temperature throughout the system (both laterally, vertically, and longitudinally) should be a relatively constant temperature.

The specific species and habitats that would be sustained as part of a final design have not been determined. The list of targeted sustainable species is likely to be developed in concert with stakeholder input if and when the final design for such a remedy is in process. During this process, there are species that would likely be targeted for introduction or reintroduction. For example, a non-impounded river could restore habitat which would be suitable for the reintroduction of American Shad, Blue Herring, and Alewife. These species were historically present on rivers like the Woonasquatucket, but the local populations were extirpated when the need for generating power resulted in the construction of mill ponds and low head dams. Reintroduction of anadromous species to the river could represent a significant net benefit to the river from an ecological and historical perspective.

The effect of dam removal on mammalian populations is likely to be positive. For example, mammalian species such as River Otter will range over an area that provides a suitable habitat for food and reproduction. Such an area likely would be much larger than Allendale Pond and Lyman Mill Pond. It is possible that a River Otter's range could extend the full length of the Woonesquatucket River. According to the USEPA Wildlife Exposure Factors Handbook (EPA, 1993), the River Otter may prefer flowing water habitats over stationary water habitats such as mill ponds. Therefore, it is possible that the restoration of the river without the dams would improve the habitat for mammals such as River Otter. Moreover, to the extent that alewife, shad and herring are reintroduced to the upper sections of the Woonasquatucket River, the prey base for piscivorous mammals would be improved over current conditions.

Riffle areas created by river restoration would also provide habitat for fish spawning and some fish nest-building areas. Additionally, habitat for semi-aquatic insect species such as mayfly, stonefly, caddisfly, and black fly should improve. These types of improvements have been noted in other river environments, such as the Manatawny Creek in Pennsylvania (Heinz Center, 2003) and the Souadabscook River in Hampden, Maine (American Rivers, et. al., 1999).

The dam removal alternatives being considered include those that plan for the construction of smaller ponds that would support the same variety of species that are present in the existing ponds. These ponds would provide habitat for fish spawning and fish nest-building areas, and also provide soft sediment substrate for macrophytes. The macrophyte populations would serve as food (e.g., for macroinvertebrates and waterfowl) or substrates for food items for macroinvertebrates. Finally, the ponds would continue to support the existing warm water fishery (e.g., bass, sunfish, etc).

Removal of the Allendale and Lyman Mill Pond Dams and restoration of the river as illustrated in the conceptual plan presented at the last Dialogue Meeting would also create a large flood plain area on the banks of the river. These flood plain areas would significantly augment the existing emergent wetlands. Increasing the size of the emergent wetland habitat would have the positive effect of increasing the ecological diversity and abundance when compared to the existing emergent wetlands. During high water events (i.e., spring), the large emergent wetlands would provide nursery areas and food items for fish species. During this same time of year, these areas could provide additional habitat for fish spawning and fish nest-building areas. Also, insectivorous birds would benefit from an enlarged emergent wetland area that would support diverse populations of insects that would serve as a prey base for insectivorous birds.

4. *What would be the designed depth and width of the engineered river based on what U.S.G.S. flow data? How will the tendency of a stream to meander be controlled? Since wildlife depend on particular substrates, seasonal variation in flow, water temperature, and other factors for optimum breeding and other life cycle considerations, what target species will the design accommodate?*

   The depth and width of the channel and pond areas will be identified during the detailed evaluation of the no dam alternatives. One of the primary objectives of the hydrodynamic analysis is to evaluate various no dam channel and pond designs in the Allendale and Lyman Mill Pond areas. For the channel designs that are to be considered, four flow conditions will be modeled: low flow (e.g., 7Q10 discharge), average flow, two-year flood, and 100-year flood. The results of the model will be used to design a stable channel/pond configuration.

   As mentioned above, the specific species and habitats that would be targeted as part of a final design have not been determined. The final list of targeted sustainable species is likely to be developed through stakeholder input if and when the final design for such a remedy is in process. The substrates, flows, water temperatures, and other factors would be determined during the final design process. For a listing of habitats that could be created and some of the species that could be supported with the dam removal option, please see the response to question 3, above.

5. *In the proposed "pool" that was highlighted as part of this design, (a) how would the pool be maintained over the depositional patterns of time and current? (b) what species would be expected to use pool? (c) have the dimensions of the pool been taken into account for these species? (d) what temperature considerations would go into the design of such a pool?*

   Again, the results of the hydrodynamic analysis being performed to further evaluate no dam alternatives during the Feasibility Study will be used to properly design a stable channel/pond configuration. The composition of the species employing any pools, the pool dimensions and the water temperatures have not yet been determined because the final design of a dam removal option has not yet begun. However, as stated above, if a dam removal option were employed that included the use of pools or small ponds, the goal of these pools would be to

provide an environment that could be used by many of the same species that use the existing ponds. For fish, this could include bass, trout, white sucker, and American eel.

6. *What would be the effect of a large area of capping on water recharge. I realize that recharge occurs throughout the watershed. However, the bedrock in the Centerdale area forms a narrow valley with Quaternary [sic] sand and gravel and alluvial [sic] deposits. The immediate effect would seem to be runoff contributing to the flow and volume of the river. Other effects that might be reviewed are effects to the immediate water table to any existing trees between the edge of the cap and the beginning of the till deposits. Riverine wetlands would be restricted to emergent vegetation in the engineered areas. Would the proposed capping have an adverse effect on water levels of saturation in the forested swamp on the west bank immediately below the subject Allendale dam?*

   The sediment caps would not be impervious and would be designed for the infiltration of precipitation. Thus, there should be no effect as is suggested on the flow and discharge of the river. Similarly, there should be no effect on any existing vegetation between the edge of the cap and the beginning of any alluvial deposits, and there would be no adverse effect on water levels in the forested swamp on the west bank immediately below the area of Allendale dam after it is removed.

If you have any questions or comments regarding the proposed responses to Ms. Marks' questions, please contact either one of us.

Sincerely,

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To: Stacy Greendlinger, Project Coordinator CMRP
U. S. EPA, Region I
From: Eugenia Marks, Senior Director for Policy, Audubon Society of R I
Member Woonasquatucket River Watershed Council Board
Representative to Centredale Manor Superfund site advisory committee
RE: Centredale Manor Superfund Site
Remarks to QEA Report/ Ecological Assessment

Dear Ms. Greendlinger:

Thank you for the opportunity to comment on the Ecological Assessment provided by QEA for the Woonasquatucket Restoration. Additional sources of biological field information follow to give a more realistic forecast to likely outcomes of dam removal. I think the report suffers from a lack of field knowledge of Rhode Island beyond the general references. In addition I suggest some clarifications to the report. We trust that EPA's staff biologist Cornell Rosciu who has conducted much fieldwork on the river will review this document to assess the probability of outcomes.

In addition, we urge you to require analysis of the effects downstream (from superfund site to mouth of river) which may result in dam removal.

1. "Rainbow trout" (pg. 2) exist in the river because they are stocked by RI Department of Environmental Management, per email from Alan Libby, RI DEM, Division of Fisheries and Wildlife. They are not native species. I attach herewith a complete list of fish from surveys by RIDEM sent by Mr. Libby.

Woonasquatucket Fish Species.xls

2. Dyerville is omitted from list of dams: Dyerville has been breached but still impounds water.
3. Is there any data on abundance of species?
4. Cite the source for various fish species, since apparently no field observations were gathered on 10/17,18/06.
5. Section 2.1. Residential use of the river should be explained in the document and the concern for long-term impacts to residents.
6. The listing of terrestrial species in the riparian zone is inadequate. (p. 4, cites only heard record of American crow and nest of Gray Squirrel.)
7. p. 5 Characterization of the water as moderately clear is minimally useful in determining ecological assessment.
8. Section 2.3. It should be pointed out that the "Oxbow Area" lies within the Town of Johnston.
9. Section 3. U. S. F& W S, *Wetlands and Deep Water Habitats of the United States,* and the Services *Wetlands of Rhode Island* are the standard for wetland habitat types and would be better resources for identifying habitat types than the 1976 publication QEA references.
10. The birds on GCN list that QEA suggests use the riparian zone do not appear to be fully supported by local records, habitat types and timing.

a. Black-throated Blue Warbler was not found to nest in Rhode Island in the last Breeding Bird Atlas, conducted by RI DEM (1982-7). They do migrate through Rhode Island
b. Chestnut-sided Warbler is known to nest in western Rhode Island but the habitat conditions in the Woonasquatucket do not seem to provide sufficient openings, not inhabited by humans, within the forested area.
c. Indigo Bunting generally requires drier open habitat.
d. Ovenbird is a ground-nesting bird that would not be successful in a flood zone.
e. Prairie Warbler appears potential but also prefers a drier habitat.
f. Scarlet Tanager is potential.
g. Prothonotary Warbler passes through in migration.
h. Habitat for Nighthawks is more often flat roofs and the species is in deep decline. Their foraging depends on abundance of night-flying insects, not addressed in the assessment.
i. The birds suggested as potential in deep marsh habitat have size of territory and structural habitat requirements that are not reflected in the assessment.
j. In general, someone with greater expertise in Rhode Island ornithology should review the potential list of birds.

11. Harry Pavulaan, U. S. G. S., Reston, Virginia, is the authority on butterflies in Rhode Island. Bronze copper would be a surprising find. Following are Harry's comments:

Bronze Copper - I believe this species could be introduced into a marsh area but Bronze Coppers are generally associated with drier portions of wet meadow complexes where Curly Dock is the hostplant. I know Water Dock is used as well, in Maryland and New Jersey, and this grows in standing water, I believe. The first step would be to establish the hosts (in respective drier and wet areas) and to get them to remain in place for at least two or three years to see if they will accept the created habitat. Once the plants do well and the habitat matures, Bronze Coppers could be introduced. The consultant would need to jump hurdles to obtain livestock from outside Rhode Island. Permits would need to be obtained from USDA and R.I. DEM. I can collect live females on the Delmarva Peninsula where the species is common in some areas and send them. Most likely, released females would flee the site, so they would need to be confined in netted enclosures over their hosts. Their offspring would likely remain.

Meadow Fritillary - These would require certain species of violets to be established. Possible. Founder females would need to be collected in some Rhode Island locations but they are getting more rare by the year. Same as Bronze Copper, the females would need to be enclosed over the host. By nature, these are fairly scarce even where a colony is established. Should there be an irruption of Meadow Fritillaries at the introduced site (a dozen at a time would be amazing) in a subsequent generation, some should be taken back to the location where the founder females were collected.

Mulberry Wing - Now this one would be easy. A considerable amount of Tussock Sedge (Carex stricta) would need to be established, as well as Swamp Milkweed. The Black Dash could be introduced with the Mulberry Wing, as both species are found together almost everywhere they occur and use the same host. Also Appalachian Brown! These can all be collected in many places of R.I.

Acadian Hairstreak - Not sure about this one. It is usually found in places where mature Black Willows (the host) occur around ponds. However, Black Willow should be introduced, regardless. This will attract Viceroys and Mourning Cloaks, which use the younger trees. Once the trees mature, the Hairstreaks will likely self-colonize.

There are some other associated plants in this specific type of habitat, including various wetland Cornus species (the consultant would need to determine which species are common in R.I. - I'm thinking C. racemosa, C. alternifolia, C. amomum). These would attract Summer Azures on their own.

Hope this helps,
Harry

12. Ginger Carpenter is the authority on Odonates in Rhode Island. She writes in response to request on Arrow Clubtail: "The habitats that we have found *Stylurus spiniceps* (aka Arrow Clubtail) include the Blackstone River below dams and the Branch at the confluence with the Blackstone, where the water is rapid and running over cobble/rock bottom. The species appears to be tolerant of some degradation. I do not have a record from the Woonasquatucket, and would not expect it there based on my recollection of the habitat."
13. Public use of the area is well-documented, although the public access is restricted to the dams, Allendale Avenue, and the end of Lyman Avenue.
14. Impacts of flooding to areas outside the superfund site need to be calculated. Anecdotal evidence shows river flooding under current conditions in Olneyville during heavy rains.