

# ENVIRONMENTAL IMPACT METRIC BY HDR ENGINEERING, INC.



## Memo

To: Diana Kelley, Columbia Association	
From: Carey Burch, AICP	Project: Lake Restoration
CC:	
Date: April 3, 2007	Job No: 47225

This memo responds to your request for information on the following issues regarding the proposed lake restoration of Lake Kittamaqundi and Lake Elkhorn.

1. Metric for wildlife disturbance, what is the environmental impact
2. How much CO2 is not in the atmosphere if 50% of the silt is not hauled away
3. A spreadsheet that shows all the issues and disturbances
4. How many potential breakdowns, and
5. Noise in decibels

At this point, most of these issues can only be addressed in generic or qualitative terms – primarily because the final staging and dredging options have not yet been selected or designed. The choice of a contractor, their experience and their specific equipment, as well as the selection of a placement site will be determining factors in the level of impacts of the project.

The dredging operations are designed to restore the lake ecosystems to health. Currently the lakes are undergoing eutrophication. Sediment buildup combined with heavy nutrient loads from non-point sources are combining to adversely affect the water quality and aquatic ecosystem of the lakes, leading to adverse effects on fish and other aquatic organisms. Recreation is impacted by unsightly algal blooms, excessive submerged aquatic vegetation and odor. Removing the sediment by dredging will help to restore the health and function of the lakes. Adverse impacts from the dredging operation are short-term and temporary. The proposed project plans are the product of several design iterations that reduced adverse impacts to both neighborhoods and the natural community to the extent practicable. However, the proposed dredging, like any other large construction project, does create unavoidable short-term temporary adverse effects on the local environment. The project will be carried out under the approval and authority of permits issued by the U.S. Army Corps of Engineers, Maryland State Department of Environmental Quality, Howard County Soil Conservation District, and other involved agencies. These permits will contain requirements designed to protect natural resources and mitigate adverse environmental impacts.

### Impacts to Aquatic Systems

Dredging in general creates impacts to aquatic systems. Short-term temporary impacts to water quality will occur during the dredging operation. The primary short-term water quality impact will be an increase in turbidity in the immediate area due to sediment being re-suspended in the water column. The extent of the turbidity plume will be dependent upon environmental conditions (winds, lake currents in the vicinity, grain size of sediment being disturbed) as well as the operation of the dredge. The short-term nature of the turbidity plume is not anticipated to have an adverse effect on aquatic biota. Project plans will require a turbidity curtain be placed downstream of the dredge, limiting the turbidity plume within the lake and reducing the discharge of turbid waters to the receiving streams from each lake. Test results from sediment sampling have not identified any contaminants of concern within the sediments, and no adverse impacts from toxic substances are anticipated. Biological and chemical oxygen demand is not anticipated

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to be a significant impact, although local changes to dissolved oxygen may occur during the dredging process – particularly during the summer months.

The dredging will disturb shallow water and bottom habitat for fish, submerged aquatic vegetation, and benthic communities in the areas being dredged. Mobile fish species are expected to avoid the dredging operations and will relocate to other areas of the lake until dredging operations cease. Some juvenile, larval, and less mobile species may be adversely and permanently impacted by the operation of the dredge. The removal of the bottom silt and sediment will also remove the benthic community and submerged aquatic vegetation within the area being dredged. However, the removal of the existing benthic community and submerged aquatic vegetation will not have a significant effect on the lake ecosystems, as: (1) the silt and mud being removed does not provide a productive benthic habitat; and (2) adjacent benthic organisms and vegetation will re-colonize the dredged areas after dredging ceases.

## Impacts to Terrestrial Systems

The dredging operations will temporarily disturb nearby wildlife and waterfowl species due to noise generated by the dredging equipment, dewatering operations, and loading of the sediment for transport. This is a short-term, temporary impact, with no long-term effects on wildlife or waterfowl. In addition, the waterfowl and wildlife in the immediate vicinity of the lakes are adapted to urban conditions, are used to frequent disturbances caused by recreational use of the areas around the lakes, and are therefore less sensitive to man-made disturbances.

If preparation of the selected staging areas requires clearing of trees or brush, there will be some physical loss of habitat. Clearing/grading of turf grass areas will have minimal impact as these areas offer little habitat value. The long-term effects of clearing and grading activities will depend on the level of site restoration. If the staging area and/or access road are left for future maintenance use, there will be some minor long-term impact. If the staging area and access road are removed and the site fully restored, there will be no long-term impact to habitat.

Areas that are cleared and graded have an increased risk of erosion. Project plans will therefore include sediment and erosion control measures to manage the risk. These plans will be reviewed by various permitting agencies, including the Howard County Soil Conservation District.

## Impacts to Air Quality

Dredging, construction and placement activities will create short-term temporary impacts to air quality in the vicinity of the project. The primary source of air emissions will be the various motors and equipment used to run the dredge, the dewatering equipment, and transport the sediment to the placement site. Diesel engines are common on dredges and the dump trucks used to transport sediment. Four factors contribute to carbon emissions from the trucks and other equipment: (1) amount of fuel used; (2) type of fuel used; (3) engine maintenance and condition; and (4) number of vehicle miles traveled. There are a few management tools available to Columbia Association to reduce carbon emissions on the proposed project.

- Reduce engine idling - A diesel truck engine uses approximately one gallon of fuel to idle for one hour. Requiring the dredging contractor to turn off vehicles that are stopped for more than five minutes will reduce the amount of fuel used – if desired, this can be written into the project plans.
- It is not practical for the Columbia Association to attempt to mandate specific fuel use. Besides, USEPA mandates for ultra-low sulfur diesel fuel are now in place, and diesel engines will now be burning cleaner fuels than in prior years. Owners of 2007 and later model year diesel-powered highway vehicles must refuel only with ultra-low sulfur diesel fuel.\* Owners of 2006 and earlier model

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year diesel-powered highway engines and vehicles may use ultra-low sulfur or low sulfur diesel fuel during the transition period. The use of ultra-low sulfur diesel fuel enables the engines to be equipped with advanced emission control devices that reduce emissions of hydrocarbons and oxides of nitrogen (precursors of ozone), as well as particulate matter to near-zero levels.

- Although keeping engines well tuned and maintained helps reduce emissions, it is not practical for the Columbia Association to mandate engine maintenance. The engines are already required to meet applicable federal and state emission standards.
- Reduce number of vehicle miles – Carbon emissions from a diesel truck similar to those anticipated for use on the project are approximately 0.0054 lbs/mile<sup>1</sup>. Selecting a nearby placement site will reduce the number of vehicle miles required to transport the sediment from the lakes. Using Lake Elkhorn as an example, if standard 10-wheel dump trucks are used (assuming a 10 cy capacity), there would be approximately 5,314 loads of material removed. Transporting the material to a placement site 25 miles away (50 mile roundtrip) would yield 1,435 lbs of carbon emissions [0.0054 lbs/mile x 50 miles/trip x 5314 trips]. If the project is staged at Hopewell Park and half of the material is placed at Hopewell Park directly, carbon emissions from trucking are reduced by half, to 718 lbs.

## Noise Impacts

Short-term temporary impacts to noise in the vicinity of the dredging and dewatering area may occur.

Sources of potential elevated noise levels include the dredging and the trucks used to transport the dewatered material for placement. Noise levels generated by dredging operation will vary according to the size and type of the equipment used, and more importantly, the size and type of its engine.

Generally, hydraulic dredges generate noise at around 60 to 80 decibels<sup>2</sup> (dB) at about 50 feet. Sediment dewatering will be less noisy, operating at around 50 to 60 dB. The large dump trucks used to transport the sediment will be the primary source of noise, generating around 90 dB.

The attached U.S. Environmental Protection Agency Fact Sheet on Noise, generated for the dredging of the Hudson River PCBs Superfund Site, provides a useful comparison of noise from dredging and sediment dewatering activities to other routine noise levels.

The adverse impact of the noise generated by the project will be dependent upon the time of day (people are more sensitive to noise at night) and the distance from the source. Noise levels from a point source decrease in inverse proportion to the square of the distance from the sound source – e.g., at distances greater than 50 feet from the source, every doubling of the distance decreases the noise by approximately 6 dB. Therefore, a sound level of 70 dB at 50 feet would decrease to 64 dB at 100 feet and 58 dB at 200 feet. At a distance of 1,000 feet, noise levels would be about 26 dB less than near the source. There are also numerous environmental factors that determine the level of sound “heard”, including surrounding terrain, ambient sound level, wind direction, temperature gradient, relative humidity, and time of day. Controlling the hours of operation – e.g. limiting noise generating operations to daytime - is the best available method to avoid or reduce adverse noise effects from the dredging operation.

## Dredging Production and Breakdowns

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<sup>1</sup> Actual emissions will vary according to make and model of truck engine, engine maintenance, traffic conditions, engine load and speed, and other environmental factors.

<sup>2</sup> Noise levels are measured by decibels (dB), a logarithmic scale measuring pressure levels. An increase of 10 dB is equivalent to doubling the noise level, e.g. a 70 dB noise sounds twice as loud as a 60 dB noise. In addition, the total sound pressure created by multiple sound sources (such as several trucks) is not mathematically additive. For example, two trucks generating 90 dB each do not have a combined noise level of 180 dB; rather they have a combined noise level of 93dB.

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The dredging operation will have three process points that are subject to breakdowns, defined here as any unplanned work stoppage during normal operating hours. However, there is no way of determining beforehand the exact number or timing of the breakdowns.

Process points subject to breakdowns are the dredge itself, the sediment dewatering operation, and the placement site. A work stoppage event at any of these three process points could shut down the entire operation until the issue is resolved. Dredges cease operations or stop work when the suction head or pipeline becomes clogged with debris, when the dredge engine or pump unit fails, and when the dewatering system is unable to handle the flow from the dredge. Dewatering systems cease operations when they become clogged with debris, when their operating motor or controls fail, or when there is no longer room for on-site storage of sediment. Placement sites may cease accepting sediment due to inclement weather or failure of site sediment and erosion controls.