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Comments provided to Kalamazoo District Office for the Parkview Hills/Willow Lake Inlet and Mann Drain/Indian Lake filtration projects by DEQ staff in the Surface Water Assessment Section (SWAS).

Comments provided by:

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The following comments apply to both the Parkview Hills/Willow Lake Inlet and Mann Drain/Indian Lake filtration projects

Aquatic Organisms

- The obstruction of the natural flow of the streams will likely increase water temperature and thus decrease dissolved oxygen behind the filtration structures and downstream. These physical changes will have an impact on the macroinvertebrate and fish community assemblage.
- Specific to the Mann Drain project, the addition of material directly to the stream bed is of concern as it is covering the natural habitat and limiting its use by fish and invertebrates.
- Nutrizorb and zeolites are proposed for use to reduce nutrient loading by absorption of phosphorus, ammonia and nitrogen. Nutrizorb and zeolites may adsorb other anions and cations (e.g., iron, magnesium) that may be essential to aquatic life.
- Specific to Mann Drain project: the addition of Nutrizorb material directly to the stream bed is of concern because the product contains aluminum silicates which may be a toxicity concern for aquatic organisms.

The following comments apply to the Parkview Hills/Willow Lake Inlet project

Channel Impacts

- The placement of the filter socks in the proposed configuration has more than a minimal potential to create localized channel instability by obstructing the flow in such a way that erosion of the stream banks adjacent to the structure is likely to occur. The flow will try to go around the obstruction in the water which acts similarly to a small dam. This situation could be exacerbated by the location of the structure directly downstream of a culvert outlet where water velocities may be unnaturally increased due to the channel constriction of the culvert especially during higher flow events.
- The filter sock structure will obstruct the natural flow of water and disrupt sediment transport within the channel. The structure will slow water velocities and cause sediment to drop out of the water column upstream of the filter sock structure. This sediment being deposited may cover important instream habitat essential to fish and aquatic macroinvertebrates, and also

promotes the need to dredge ("clean out") the channel upstream of the structure further disturbing the channel bottom and any habitat present.

- During a certain range of flows, water will likely fill up behind the filter sock structure and may pour over the top, and down the downstream face of the structure creating scour at the base of the structure. This may lead to undermining and failure of the structure, resulting in erosion and damage to the stream channel.
- Should the filter sock material become compromised and fail, this would allow the contents of the filter sock to spill out into the stream, which could cover essential habitat for fish and aquatic macroinvertebrates, and result in dredging of the channel to clean up the spilled material.
- Channel cross-sectional area is approximately 38.5 square feet (14' channel width X 2.75' channel depth). The filter sock structure at 2.25' high and 14' long occupies approximately 82% of the channel cross-sectional area. DEQ typically becomes concerned with an increased potential for channel instability to occur when a structure occupies greater than 20% of the channel cross-sectional area.

Fish and Aquatic Organism Passage

- According to DNR Fish Division policy, the ability of fish to travel freely within the stream should be protected for all species and all life stages over the full range of expected flows. To achieve this, velocities at and around in-stream structures must be within the range of 2-3 feet per second (fps) or less. The filter sock configuration includes a 2' wide by 1.5' tall opening intended to allow for fish passage. In practice, this opening will act as a funnel for stream flows with velocities through the opening likely to be higher than 2-3 fps, potentially blocking or impeding upstream movement of fish and other aquatic organisms.
- As designed, DEQ is concerned that parts of the structure may be mobile under higher flows, and that the concrete blocks cannot hold the filter socks in place against the stream flows likely to be encountered. If parts of the structure are mobilized it could result in erosion and/or collapse of the structure, which could also block the movement of fish and other aquatic organisms.

The following comments apply to the Mann Drain/Indian Lake project

Channel Impacts

- The nutrient barrier filtration sock structures (barriers) will obstruct the natural flow of water and disrupt sediment transport within the channel. The existing and proposed barriers will slow water velocities and cause sediment to drop out of the water column upstream of the barriers. These barriers are essentially acting as dams within the stream channel.
    - This accumulated sediment may cover important instream habitat features such as riffles, pools, and substrates that are essential to fish and aquatic macroinvertebrates. This reduces the habitat available for fish spawning, which was already listed as limited for Northern Pike according to the 2015 Michigan DNR Status of the Fisheries Resource Report for Indian Lake.

- Accumulated sediments can have a direct effect on aquatic macroinvertebrates or fish eggs that may be present in the substrate by depriving them of oxygen.
- The barriers also promote the need to dredge or "clean out" the channel upstream of the structure due to the accumulated sediment, further disturbing the channel bottom and any habitat present.
- As can be seen from photographs of the currently installed barriers, there is emergent wetland vegetation that has established within the stream channel directly upstream of the barriers. This demonstrates an undesirable change from a free-flowing stream type ecosystem to a relatively still-water pond or wetland type ecosystem within the stream channel, which is a direct result of the installation of these barrier structures and is an adverse environmental impact to the stream resource.
- Location of these structures upstream of the Lakeview Avenue road crossing is a concern due to the potential for movement of the components of these structures especially during flood events. DEQ is concerned that the components of the structures (filter socks and nutrient barrier curtains) may become dislodged and carried downstream with the potential to obstruct the opening of the culvert under Lakeview Avenue. If this occurs, it could result in excessive stream bank erosion in the area of the culvert, and/or possible flooding and damage to the road.
- A further concern is that, should these barriers become dislodged during a flood event, the accumulated sediment and granular Nutrizorb material stored behind these barriers would flush downstream all at once potentially blanketing downstream substrate and habitat, and ultimately ending up in Indian Lake. This could result in a significant volume of sediment, and phosphorus, entering the lake during a single flood event. This may result in significantly different impacts to the lake than this same volume of sediment entering the lake gradually over a longer time period.

Fish and Aquatic Organism Passage

- The nutrient barrier filtration sock structures (barriers) obstruct the natural flow of water and create a series of impediments, if not a series of complete barriers, to movement of fish and other aquatic organisms within the stream channel. DNR Fisheries has voiced concern over barriers in place during the March-April Northern Pike spawning season. These barriers would prevent Northern Pike from reaching important spawning habitats. DEQ is also concerned about the negative impacts, resulting from the placement of these barriers, to non-game fish species and other aquatic organisms from restricted movement within Mann Drain and its tributary, and between these waterbodies and Indian Lake during other time periods as well.