January 4, 2010
Project No. G090014

Village of Stevensville
5768 St. Joseph Avenue
Stevensville, MI 49127

Re: Village of Stevensville - Assessment of Hickory Creek and Local Ponds

This letter is to report our findings and recommendations regarding the assessment of the condition of Hickory Creek and several ponds within the Village of Stevensville (Village). This report is based on discussions with you and Village staff during a meeting on January 8, 2009, as well as a site investigation on May 14, 2009. Photographs taken during that site investigation are enclosed. This report is divided into three sections: Observations, Recommendations, and Funding Strategies.

OBSERVATIONS

The Village is positioned in a unique and varied glacial environment as a result of its location relative to Lake Michigan. According to surficial geologic maps available from the Michigan Department of Environmental Quality (MDEQ) (Attachment 1), lacustrine (lake deposited) sands and gravels are predominate in the eastern portion of the Village, and coarse-grained glacial till, outwash, and dune deposits predominate to the west. The pronounced topographic elevation change (rise) to the west of the Village represents the transition between these different deposits.

According to mapping by the MDEQ, the water table in the Village mimics the topographic surface. As such, groundwater flows from the topographic high to the west of the Village to the east toward Hickory Creek, and to the west toward Lake Michigan. This is shown on the water table map provided in Attachment 1. Hickory Creek is the local discharge area for groundwater. The groundwater residence time (the time it takes for water to enter and exit the subsurface) in the Village area may be relatively short because the local groundwater does not flow far from the topographic high/ridge to the west before it discharges into Hickory Creek. This process may be part of the reason that the creek is cold enough to support coldwater fish.

The Hickory Creek watershed at Stevensville is approximately 29.6 square miles in size, based on data available at Purdue University's online watershed delineator. The watershed consists of a variety of land uses, including 36% cropland, 35% pasture, 22% forest, and 4% low density residential uses, with roughly 1% each of high density residential, commercial, and open water areas. Soils in the watershed are primarily moderately draining soils including loams and sandy loams, with smaller amounts of poorly draining silt loams and mucks.

Hickory Creek is on the Michigan Department of Natural Resources' (MDNR) list of designated coldwater trout streams. Based on discussions with the Village, we understand that brown trout are present in the creek but not in great numbers. Risks to the coldwater status of Hickory Creek have been investigated. The St. Joseph River Watershed Management Plan conducted a land cover analysis to determine the total percent imperviousness of the subwatersheds. A watershed with greater than 10% imperviousness was assumed to be impaired, while those with 5-10% were considered threatened. Hickory Creek was considered threatened with 7% impervious cover. An empirical nonpoint source model using land cover and average annual rainfall was run to determine the annual loading of total suspended solids and total phosphorus from the subwatersheds. Hickory Creek was determined to contribute the greatest sediment and phosphorus loading to the St. Joseph River basin. These data are due to the urban nature of these areas and the greater amount of rainfall at the western end of the St. Joseph River Watershed.

From our visual inspection of Hickory Creek through the Village, it is apparent that storm flows are very flashy, meaning they rise and fall quickly. This is due to large amounts of runoff being

ftch
engineers
scientists
architects
constructors

1515 Arboretum Dr., SE
Grand Rapids, MI
49546
ph: 616.575.3824
fax: 616.575.8155
www.ftch.com

directly discharged into Hickory Creek with little opportunity to infiltrate into the ground, as well as the relative straightening and deepening of the stream channel to improve drainage as was common in the past. This flashiness results in severe erosion on the stream banks, and downcutting of the stream bottom. Eventually, as is the case with Hickory Creek, steep banks and a deep channel prevent larger flows from spreading out into the floodplain, which further intensifies the storm flows and increases flashiness.

Local Ponds

Several small ponds are scattered throughout the Village. We were able to examine some of these ponds, most of which are located on private properties, during our May 14, 2009, site visit. These ponds are hydraulic expressions of the water-table surface (as compared to being "perched" above the groundwater). They are likely "flow-through" water bodies, that is, groundwater enters the ponds in the upgradient side the ponds, and exits the ponds on the downgradient side. Defined surface water outlets were identified at most of the ponds we observed. Groundwater enters the ponds and exits the ponds either as surface water or in the subsurface as groundwater. The volume of water entering/existing a pond (flux rate) is an indicator of how well the ponds are hydraulically "coupled" to the groundwater, and is often a predictor of the aquatic health of the ponds. Ponds exhibiting positive aquatic characteristics typically have higher flux rates.

Ponds like those found in the Village are susceptible to sediment input, and organic debris/nutrient loading. Fine sediments from erosion tend to "plug off" the pond walls, leading to a reduced flux of water through the ponds. As a result of this process, dissolved oxygen (DO) levels in the ponds are reduced. Fish and other aquatic organisms need oxygen to live. Oxygen also is needed by virtually all algae and all macrophytes, and for many chemical reactions that are important to pond functioning.

Oxygen is also decreased as a result of oxygen-demanding organic matter (like sewage, leaf and/or lawn clippings) entering the ponds, or the input of nutrients that stimulate growth of organic matter that consume available oxygen. If the organic matter is formed in the lake, for example by algal growth, oxygen produced during growth will offset the eventual loss of oxygen during decomposition processes. In lakes/ponds where a large portion of the organic matter is brought in from outside the system, oxygen production and oxygen consumption are not balanced and low DO conditions ultimately develop.

The general aquatic health of the local ponds varied from good to poor when we observed them last May. Some ponds appeared to have minimal vegetation and clear water, while others appeared to be exhibiting signs of stress, such as early growth of nuisance aquatic vegetation. Minimizing sediment, organic matter and nutrient loading (primarily phosphorus), is important to the long-term sustainability of the ponds.

RECOMMENDATIONS

Our recommendations seek to provide the Village with options it can consider to pursue its goals. Those goals, as we understand them, include:

- Environmental Stewardship – Improvement and preservation/protection of local water quality and habitats.
- Recreation – Development of a linear public park, improvement of stream aesthetics, and greater recreational opportunities.
- Responsible Development – Development and enforcement of good stormwater management practices.

By aligning the Village's goals and the observed conditions of the surface water features in the Village, we have developed several recommendations for consideration, many of which build on activities that the Village has already initiated. Timelines provided are based on a combination of factors including complexity of the task, priorities, and prerequisite projects, and are contingent upon securing funding. Financial investment amounts are provided as an order-of-magnitude estimate for planning purposes only, and can vary widely depending on the desired scope and goals of the project. Finally, a priority level is assigned with 1 being highest priority and 3 being lowest. The following recommendations are listed by timeline, then priority.

Community Clean-up Days – Organization of routinely scheduled community clean-up days to assemble volunteers and conduct clean-up work in Hickory Creek as well as other public spaces in the community. Removal of trash and debris, whether from Hickory Creek, parks, or elsewhere will visibly improve the conditions of the Village's surface waters.
Target Goal(s): Environmental Stewardship
Timeline: Immediate (1-2 years)
Financial Investment: $2,500-5,000
Priority Level: 1

Invasive Species Removal – Invasive plant species were identified along the creek during site observations. These species are typically an indicator of land disturbances, which is consistent with the history of the creek corridor. Invasive species can have impacts on recreational activities such as fishing, hunting, hiking, wildlife viewing, and water-based recreation. They negatively affect a wide array of environmental attributes that are important to support recreation, including but not limited to water quality and quantity, and plant and animal diversity. Costs can be reduced by coordinating the efforts of trained volunteers for this task.
Target Goal(s): Environmental Stewardship
Timeline: Immediate (1-2 years)
Financial Investment: $75-100,000
Priority Level: 1

Friends of Hickory Creek – Many watersheds have a non-profit "Friends of" group to sponsor clean-ups, organize public awareness campaigns, and other work to preserve and protect a natural feature such as Hickory Creek. It would serve to promote cooperation between all stakeholders, including municipal entities, businesses, and residents. This type of group, if it gains a formal non-profit status, can also be an entity eligible for receiving grant funding.
Target Goal(s): Environmental Stewardship
Timeline: Immediate (1-2 years)
Financial Investment: $5,000-10,000
Priority Level: 2

Public Awareness Campaign – A campaign to raise local public awareness regarding the condition of Hickory Creek as well as the Village's ponds, and the need for improvement, will enable the community to garner support for improvement projects.
Target Goal(s): Environmental Stewardship
Timeline: Immediate (1-2 years)
Financial Investment: $10-15,000
Priority Level: 2

Water Quality Monitoring – Water quality monitoring is a way to obtain quantitative information to assess the quality of local surface water bodies. If such samples are collected on a routine basis, temporal changes in quality can be observed. Such information can be useful in identifying undesirable changes, or improvements made as a result of management strategies that have been implemented.

Target Goal(s): Environmental Stewardship
Timeline: Immediate (1-2 years)
Financial Investment: $20-25,000
Priority Level: 2

Storm Sewer Mapping – An inventory of the Village storm sewer system, including location of all storm sewer structures and outfalls and the drainage area for each outfall, will prove useful in evaluating contamination issues and sources. It will also be beneficial in developing spill containment and response plans.
Target Goal(s): Environmental Stewardship, Responsible Development
Timeline: Immediate (1-2 years)
Financial Investment: $30-35,000
Priority Level: 2

Update Storm Water Ordinance/Develop Storm Water Management Standards/Review Policies and Regulations for Resource Protection – A storm water ordinance is required as part of the Phase II storm water permit. A model ordinance is in development, which will assist the Village in managing rates and volumes of storm water for minimal impact to the stream system. Furthermore, the Village can develop storm water management standards based on Low Impact Development practices that will minimize the negative impacts of development on the surface waters in the Village. Reviewing other policies and regulations that shape how development happens in the Village can identify gaps in protection measures and limits for flexibility to adopt resource protection principles, which can then be adjusted.
Target Goal(s): Responsible Development
Timeline: Immediate (1-2 years)
Financial Investment: $10-15,000
Priority Level: 2

Habitat Surveys – Like water quality monitoring, habitat surveys are another way to obtain quantitative information to assess the quality of local surface water bodies. If conducted and collected on a routine basis, temporal changes in quality can be observed. Such information can be useful in identifying undesirable changes, or improvements made as a result of management strategies that have been implemented.
Target Goal(s): Environmental Stewardship
Timeline: Immediate (1-2 years)
Financial Investment: $20-25,000
Priority Level: 3

Streambank Stabilization – A variety of bio-engineering techniques can be applied in Hickory Creek to stabilize its eroding banks and minimize future erosion. Portions of this work, such as installation of tree revetments and j-hooks, are typically done by a contractor due to their specialized nature. Other tasks, such as installation of live stakes, can be done by a team of volunteers with appropriate training to minimize cost. Flood control measures may need to be implemented along with this work to be most effective.
Target Goal(s): Environmental Stewardship, Recreation
Timeline: Near Future (3-5 years)
Financial Investment: $200-250,000
Priority Level: 1

Flood Control – Flood control measures would significantly reduce the flashiness and erosion occurring in Hickory Creek. In addition to diverting flows into a constructed wetland as noted above, flood shelving is a recommended procedure that involves constructing low lying areas adjacent to the creek that will intentionally flood during high flows. By providing a place for excess water to go, peak flows and velocities in the creek are reduced.

Target Goal(s): Environmental Stewardship, Responsible Development
Timeline: Near Future (3-5 years)
Financial Investment: $300-500,000
Priority Level: 1

Constructed Wetlands – The natural area at Johnson Road provides an ideal location for an off-line constructed wetland. Storm sewer outfalls coming from the west could be routed through the wetland to provide water quality treatment, detention, and temperature reduction. In addition, flood storage capacity could be built into the project to divert higher flows from Hickory Creek into the wetland, reducing the overall peak flow. This wetland could become a primary feature of the public park. Smaller wetland features, or storm water treatment devices, could also be constructed at other storm sewer outfalls in the Village to serve similar purposes.
Target Goal(s): Environmental Stewardship, Recreation
Timeline: Near Future (3-5 years)
Financial Investment: $300-500,000
Priority Level: 2

Hickory Creek Park Pond Improvements – The two small ponds in Hickory Creek Park are interconnected, with a discharge to Hickory Creek. Elimination of the berm in between the ponds would be feasible, while reconstructing the outlet to draw water from the bottom of the pond will minimize clogging and reduce the temperature of the discharge.
Target Goal(s): Environmental Stewardship, Recreation
Timeline: Near Future (3-5 years)
Financial Investment: $10-15,000
Priority Level: 3

Greenway Park – A linear, greenway park adjacent to Hickory Creek throughout the Village would provide boundless educational and recreation opportunities, and would provide a means of protecting and enhancing the greenway area. These trails could connect with areas upstream and downstream of the Village that already have land preserved for recreational use.
Target Goal(s): Recreation
Timeline: Distant Future (5-10 years)
Financial Investment: $1-1.5 million
Priority Level: 3

FUNDING STRATEGIES

Funding sources are available to implement the activities outlined above to meet the Village's goals of environmental stewardship, recreation, and responsible development. Today, however, the economic climate makes the acquisition of those funds increasingly competitive. To develop a funding strategy, it is necessary to prioritize the activities, define the goals and objectives, estimate costs for implementation, and identify any partnerships that would contribute to a more robust and effective project. Several major funding sources could be targeted for these projects. For example, a local organization, the Berrien Community Foundation, targets funds for 'Building a Spirit of Community" through development of recreational spaces. State funding focuses on linear trails and access sites through the MDNR Recreation and Trust Funds, and MDEQ monies focus on water quality improvement and monitoring. Federal funding is offered through the US Environmental Protection Agency's Clean Water Act Section 319 funds to develop and implement watershed management plans. These and many other funding opportunities would be incorporated into the funding strategy to best align the Village's projects with the funding as it becomes available.

The natural features in the Village, including Hickory Creek and the local ponds, are unique and important community assets. The Village recognizes the significance of these features, and has

expressed a desire to preserve and protect them as the Village grows and develops. The recommendations made in this letter represent a cross-section of ideas we have determined to be appropriate for the Village based on our limited reviews and field observations. We would be glad to help the Village continue with pursuing the recommendations outlined, or explore further ideas you may have once you have reviewed this document. In the interim, if you have any questions, require additional information or would like additional input from us, please feel free to contact our office.

Sincerely,

FISHBECK, THOMPSON, CARR & HUBER, INC.

John M. Tenpas, P.E., CFM

James W. Brode, Jr., CPG

E. Wendy Ogilvie, LEED AP

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Enclosure