The pages in this document were taken from the “Millers Creek Watershed Improvement Plan” published in April 2004. The entire document can be found at http://www.aamillerscreek.org/Findings.htm.

Millers Creek Watershed Improvement Plan

Excerpt Showing an Example of an Implementation Program Design

April 2004

8. IMPROVEMENT PLAN IMPLEMENTATION

The Millers Creek Improvement Plan is an effort to improve the water quality, habitat, and recreational value of Millers Creek and Middle Huron River through resource protection, source control, and pollution prevention activities. The implementation approach described below is intended to leverage existing Huron River initiatives and available funding sources to ensure that the Millers Creek Improvement Plan is effectively and efficiently implemented.

Implementing the Millers Watershed Improvement Plan will require the concerted efforts of the City of Ann Arbor, Washtenaw County, Ann Arbor Township, and the University of Michigan, the four regulated storm water communities under Phase I and II NPDES permits. These communities are responsible for ensuring that water quality and water use impairments are addressed. However, a committed public-private-corporate partnership, much like the one that initiated this project, will ultimately be the key to success. All individual landowners, institutions, industries, business owners, and local units of governments have a stake in the improvement of Millers Creek, and all can contribute to the successful implementation of the plan.

8.1 ROLE OF MCAT

The Millers Creek Action Team (MCAT) is an informal partnership that formed with the purpose of completing the Millers Creek Improvement Plan. Its members include representatives from each of the stakeholder groups mentioned above, among others. The MCAT has been effective and successful in steering the Millers Creek study and fostering development of the improvement plan.

Once the Millers Creek Improvement Plan is complete, MCAT will have met its original purpose. However, the members want to remain active through the implementation process. MCAT may be slightly restructured and will adopt a new purpose and common goal – ensuring the successful implementation of the plan. While the explicit roles of the members and group at large is still in flux, MCAT will likely play a key role in directing the implementation process. This partnership of stakeholders will be instrumental in maintaining project momentum, developing accountability, encouraging compliance, fostering stewardship, involving and educating the public, and providing project oversight.

8.2 THE MIDDLE HURON INITIATIVE

Many of the existing MCAT members are already partners in the Middle Huron Initiative and currently support or serve an implementation role for that initiative. Regardless of how the Millers Creek Improvement Plan will be implemented, it will be an integral part of the Middle Huron Initiative. Currently, subwatershed management plans are complete and approved for the Malletts Creek, Ford Lake, Fleming Creek and the Mill Creek subwatersheds. Subwatershed management plans are underway for the Allens Creek, Belleville Lake, and Traver Creek subwatersheds. Completing watershed management plans for all of the sub-basins has been supported by the Middle Huron Initiative because reducing runoff and pollutants from these sub-basins is fundamental to meeting the overall goals of the Middle Huron Initiative – reducing phosphorus and *E. coli* bacteria loads. The Millers Creek Improvement Plan is now complete and will be adopted into the Middle Huron watershed plan. The year 2000 version of the "Watershed Plan for the Huron River in the Ann Arbor – Ypsilanti Metropolitan Area" will be updated to incorporate the recommendations for Millers Creek. The updated plan will be submitted to the Michigan Department of Environmental Quality for approval as a certified management plan, reflecting recommendations of the Millers Creek Improvement Plan. This process will make the Millers Creek watershed eligible for State non-point source funding (e.g., Clean Michigan Initiative and Section 319).

8.3 IMPLEMENTATION ACTIVITIES, SCHEDULE AND COSTS

The proposed ten-year schedule for the Millers Creek Improvement Plan begins in 2004. The budget estimate for the plan has been divided into 45 activities spread out over ten years (See **Table 8.1.** Cost back-up is included in **Appendix N**). These 45 activities summarize the 112 different improvement opportunities previously identified and some of the representative, on-going activities of the Middle Huron Initiative, phosphorus and *E. coli* TMDL implementation plans, and various stewardship programs. The recommended, site-specific BMPs are summarized in **Appendix L** by key stakeholder and drainage area. The stakeholders are identified based on property ownership. Sixteen focus areas (See **Figure 8.1**) have been outlined to help organize the main structural implementation activities. Descriptions of the focus areas and activities follow in Section 8.3.2. The Middle Huron Initiative, ongoing TMDL implementation activities, and recommended monitoring activities are described in more detail in Section 8.3.2.

8.3.1 Costs and Schedule

Table 8.1 summarizes the estimated costs, in 2003 dollars, and the recommended implementation schedule for the proposed activities. The first primary activity is to develop the county drainage district for Millers Creek. This cost will kick in after one or more of the major stakeholders petition the Washtenaw County Drain Commissioner for the creation of the drainage district. It is expected that some of the typical costs for developing the drainage district will be offset by the data and analysis already provided by this study.

New detention basin and off-line floodplain storage costs are based on City of Ann Arbor total calculated cost of $12 per cubic foot of detention storage (Hupy, 2003). This includes engineering and construction costs. The water quality BMP costs were estimated assuming installation of a Stormceptor unit (only as a basis for cost, not as the required BMP for installation). Installation costs were considered to be equivalent to the cost of the BMP unit, while engineering and the contingency are a combined 30% of the BMP and installation cost. Other structural BMP costs were estimated assuming a construction/installation cost plus 30% for engineering and contingencies. Due to the large uncertainty associated with property values, costs for easements and property purchase were not included with any of the BMP construction cost estimates.

Some on-going activities, such as the Middle Huron Initiative and passing/enforcing a new fertilizer ordinance (or state law) are included in the cost and schedule table with no associated costs. This is to emphasize that these activities are critical to the Millers Creek Improvement Plan, but have and will continue to be pursued by stakeholders without the need for additional funding specifically set aside for this project.

Other activities, such as upgrading City of Ann Arbor street sweeping equipment and adding staff for soil erosion and soil control enforcement, have been estimated as approximately $1/7^{th}$ of the total cost to the city. This is to reflect the fact that for both of these activities, the additional staff and capitol expenditures will benefit, and the costs should therefore be shouldered by, the entire city.

An annual average maintenance cost, assessed as a 3% of estimated capitol costs was included for new detention/floodplain basins and BMPs that will require sediment removal. This cost is based on cumulative annual needs and reaches a total annual maximum on the tenth year of the plan of $317,000.

Assuming that all the WCDC projects, except the illicit discharge elimination plan, are financed with loans having a ten-year term and an annual interest rate of 6%, the WCDC would pay an

additional $2.2 million in interest on $7.3 million worth of work. The interest cost is not included in Table 8.1 because the interest payments would essentially start in Year 2 of the implementation schedule and continue for seven years beyond the end of the 10-year plan. The loan repayment schedule is included in **Appendix N**.

8.3.2 Implementation Focus Areas

This section includes a summary of improvement "focus areas." These are areas of critical improvement recommendations grouped together by spatial proximity to help focus implementation activities (See **Figure 8.1**). These focus areas represent a subset of all recommended improvement opportunities.

Focus Area #1

Thurston Pond

a) Currently, Clague Middle School has two storm sewer outlets, one of which discharges to a manhole in front of the school. The lower outlet from this manhole discharges to storm sewer on Renfrew Street. The other, higher (overflow) outlet discharges to Thurston Pond. An opportunity exists to disconnect the Clague storm sewer connection to Renfrew Street at the manhole, install a Stormceptor or equivalent structural BMP and re-direct all treated storm water (not just the overflow) into Thurston Pond.
b) The sump pump disconnect program has disconnected several homes immediately adjacent to Thurston Pond and re-directed the sump pump discharge to Thurston Pond. In addition, at least two of the sump pumps appear to be tapping a spring. Recorded pumping rates have reached 30 gpm or more and the pumps have run continuously throughout the spring (Hupy, personal communication, 2003). Typical sump pump pumping rates are on the order of 3-5 gpm. It is likely this spring originally fed Thurston Pond and Millers Creek. It appears the discharge for many of these pumps currently outlets on the high side of the walking path around the pond. They should be re-directed to discharge on the low side (closest to the pond) of the path.
c) Take out the small concrete weir in the inlet pipes in Georgetown Boulevard. There is still a sump below the pipes to trap solids. Investigate the connection between the 48-inch storm drain in the street and the inlet connection and determine if taking more storm water from this pipe is feasible and/or required. We believe the additional re-direction of storm water and the sump pump discharge will help rejuvenate Thurston Pond.
d) A target water surface elevation for the pond should be set and the pond outlet structure revised. The target water surface elevation and revised structure characteristics should be based on a long-term hydrologic balance and the desired future ecological end point, e.g., wetland versus pond. The current outlet opening (inside the berm) should be significantly reduced and the overflow elevation lowered. The pond would overflow more frequently but the outflow rate would be very low. This provides more periods of low flow to Millers Creek and a higher turnover rate of pond water. The future habitat end point, weather extremes notwithstanding, would then be primarily a function of the proposed pond bottom elevation and the new overflow elevation.
e) Other activities recommended for the Thurston Pond area include tree plantings and Thurston School roof drain disconnects. The disconnected roof drains and school grounds yard drainage should be directed via open channel to Thurston Pond.
f) This project, in conjunction with other restoration efforts by the Thurston Pond Group, is a strong candidate for outside funding.

Focus Area #2

Ave Maria – Although this project is on private land, implementation of the proposed recommendations is a cost-effective opportunity. Some of these options should be explored with the new owner when the property changes hands (at the time of this writing, the property is for sale).

a) An opportunity exists to re-direct the storm sewer from Commonwealth to an outlet at the wetland complex in front of Ave Maria.
b) An extended detention structure could be built in front of the culvert that drains this wetland and discharges to Millers Creek. Modeling demonstrated smaller rain events can be detained and larger events passed without flooding existing structures. Approximately 150,000 CF of excavation would be necessary to maximize storage. The increase in wetland area due to the increase in flooded area could provide mitigation wetland opportunity for any area considered to be "lost" to high flood water levels in the lowest areas of the wetland. Wetland could be lost over areas where the water depths reach five or six feet periodically.
c) A Stormceptor or equivalent structural BMP should be used in the Ave Maria parking lot and at each of the properties along Commonwealth to catch solids and other pollutants before runoff reaches the wetland.
d) A large open, very gradual swale runs from north to south along the west side of the Ave Maria building. The hydrologic function of this swale could be enhanced by conversion to a bio-swale planted with native vegetation.
e) An excellent reforestation opportunity exists on the east side of this property.

Focus Area #3

Pfizer

a) If land is still available on the Pfizer property adjacent to the 1600 Huron Parkway campus after all required storm water management practices are in place, additional off-line floodplain storage along the east side of Millers Creek could be created. This off-line storage will help reduce the frequency of flooding on the east side of the creek (ponds B/B1) and reduce shear stress and peak velocities. The proposed design re-directs flows in the creek equal to and greater than the first flush event into a created riparian wetland. Inlet and outlet weirs control inflows, outflows and water level.
b) Some reforestation and natural area preservation is also recommended for this area.
c) In addition, some stream bank stabilization along this reach of the creek is necessary, but should be preceded by re-grading the creek to put some meander back into the channel.

Focus Area #4

Pfizer – Additional off-line floodplain storage along the east side of Millers Creek on the former ERIM property could be created if land is available after Pfizer has met its stormwater management obligations on this site. This flood plain storage will help reduce peak flows, water surface elevations, shear stress and peak velocities. The planning level design re-directs flows in the creek equal to and greater than the first flush event into a created riparian wetland. Inlet and outlet weirs would control inflows, outflows and water level.

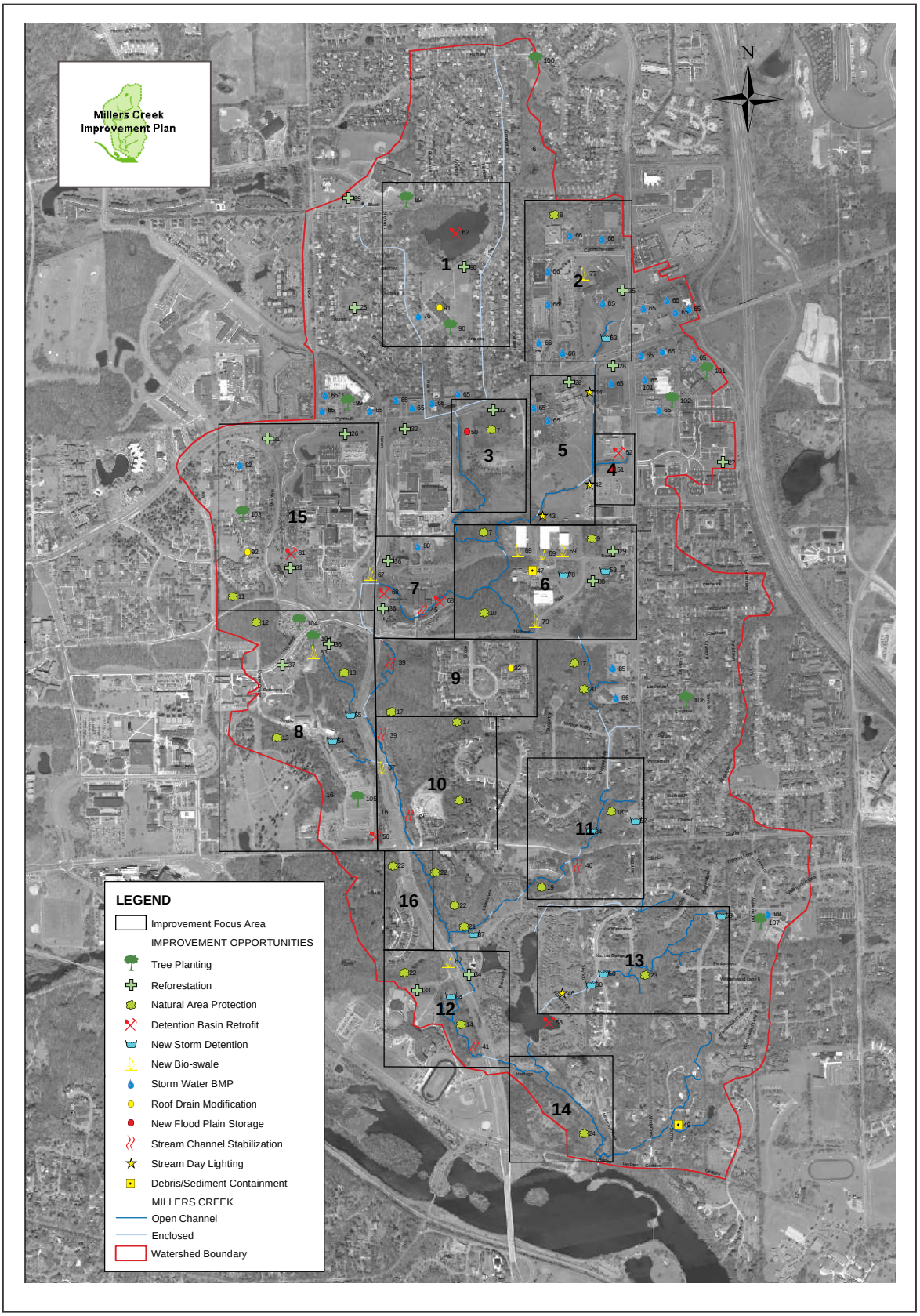

Figure 8.1 Improvement Opportunities and Focus Areas

Focus Area #5

Pfizer – An opportunity exists to daylight three existing culverts on the former ERIM property. This will improve stream habitat and aesthetics in this area. The culvert on UM's facility on Green Road could be daylighted as well.

Focus Area #6

UM Along Baxter and Hubbard Woods

a) There is a small ephemeral tributary to Millers Creek in Hubbard Woods that carries drainage from Hubbard to the creek. At the head of the tributary is an opportunity for a bio-swale planted with native vegetation.
b) The tributary is badly eroding in some spots and would benefit from bank stabilization and energy dissipation devices, such as the boulder drops recently installed at School Girls Glen in Nichols Arboretum.
c) The small pond just north of Hubbard and west of Green Road was apparently formed when a culvert under Hubbard was blocked. The culvert should be cleaned out and an extended detention outlet installed to reliably control outflows.
d) As much as possible, Hubbard Woods should be preserved. This is a hydrologically intact area covered with mature oaks and deserves preservation.

Focus Area #7

University Of Michigan Hospitals and Health Centers North Campus Administration Complex (2901 Hubbard)

a) The existing pond to the west of the administration building could be enlarged to provide off-line floodplain storage in the same manner as recommended above. This floodplain storage will help reduce peak flows, water surface elevations, shear stress and peak velocities. The proposed design re-directs flows in the creek equal to and greater than the first flush event into a created riparian wetland. Inlet and outlet weirs would control inflows, outflows and water level.
b) Another proposed floodplain storage wetland could be created on the west side of the 2901 Hubbard, just before the culvert under Huron Parkway. This flood plain storage will help reduce downstream peak flows, water surface elevations, shear stress and peak velocities. The planning level design and model implementation re-directs flows in the creek equal to and greater than the first flush event into a created riparian wetland. Inlet and outlet weirs would control inflows, outflows and water level.
c) There are opportunities in this reach for some low-intensity effort streambank stabilization. This would be a good area to focus volunteer effort.
d) There are also opportunities for native re-vegetation, including bio-swales to capture roof drain runoff.

Focus Area #8

UM Hayward Parking Lot and Grounds Facilities

a) The woodland just north of the lot should be preserved to the extent possible (See **Figure 8.2**).
b) A small detention wetland could be created on the south side of the lot to receive part of the runoff from the lot.
c) The outflow from this basin can still be directed to an existing ephemeral tributary to Millers Creek. However, this tributary is experiencing extreme downcutting and contributing solids downstream. Bank stabilization and energy dissipation, such as the boulder drops recently installed at School Girls Glen in Nichols Arboretum could be used to stabilize this area.
d) This tributary runs via a culvert underneath Huron Parkway to Millers Creek. An extended detention outlet could be installed at this culvert. This outlet structure will back up water into the existing wetland and during storm events create a backwater effect that will help slow some of the energy of the runoff coming from the Hayward Parking Lot.

Figure 8.2 Woodland North of the UM Hayward Parking Lot

e) A second ephemeral tributary runs south of the UM Grounds Facilities and is drained by a culvert that runs under Huron Parkway. This tributary is also experiencing downcutting and erosion. An extended detention outlet installed at this culvert would help back up water during storm events and reduce some of the energy of the runoff coming from the Hayward Parking Lot.
f) This ephemeral tributary could also be stabilized with energy dissipation devices, such as boulder drops, riprap and bank plantings.

Focus Area #9

Hubbard 84-inch Culvert Outlet – The recommendations detailed below will require a massive effort. Access will be difficult and the repairs and stabilization work will be expensive. At present, no infrastructure is under any immediate threat (See **Figure 8.3**). However, the retaining walls will likely fail completely over the next ten years, and significant amounts of sediment will continue to be lost downstream. Note, this reach has previously been identified as a Rosgen G-type stream. Based on the incised channel evolution model, the next phase in this reach is to build a floodplain within the incised channel. This channel within a

Figure 8.3 Hubbard 84-inch Culvert Outlet

channel will develop its own sinuosity and overbank vegetation and naturally reduce high flow shear stress. With a rebuilt floodplain inside the enlarged channel, high flows will be overbank flows again. In this reach, it is difficult to say how long it will take before the channel stabilizes itself without any outside effort. This is one of the most active geomorphic sites on Millers, and regardless of the type of efforts expended or not expended to improve its conditions, should be monitored regularly.

a) The force of the flows out of this outlet need to be better controlled. We recommend a series of massive boulder drop pools to dissipate energy from this culvert.
b) The retaining walls should be repaired.
c) The 18-inch culvert from Northwood IV needs to be stabilized. This culvert should also empty into a riprap stabilized pool.
d) While some bank stabilization is recommended in this area, cutting the flow energy will hasten the return to the sediment transport equilibrium this transitional area needs. Cutting the flow energy will decrease the flow's erosive power and likely enhance deposition in the area.
e) The stream valley in this area is fairly steep and covered by mature oak-hickory forest. The mature forest and steep slopes make this a good candidate for preservation.

Focus Area #10

Baffle Box and Hubbard to Glazier Streambank Stabilization Areas

The concrete support for the baffle box apron has voids, the downstream scour hole is relatively shallow, and the scour energy is still actively eroding the banks (See **Figure 8.4**). This reach has created some of the most serious threats to Huron Parkway and associated sidewalk. Despite some difficult access issues and high cost of stabilization work, some effort here is critical. Recommended bank stabilization efforts in this area are directed only at the banks closest to the Parkway. This stream channel reach is in a transitional state. The Rosgen stream types are F and G throughout the reach. This channel will eventually build a new floodplain within the incised channel. It is difficult to say how long this transition will take: the channel is still actively widening. It is also likely that the sediment trapped in the baffle box and later removed by the City of Ann Arbor is robbing the creek downstream of bed load. Bed loads help with the floodplain rebuilding work that should be taking place in this area. The recommended improvements in this area include:

Figure 8.4 Baffle Box Structure Near Huron Parkway

a) The baffle box could be dismantled, and the energy blocks removed to feed sediment downstream in a more natural manner. The outlet will then need to be stabilized with a series of massive boulder drop pools. The boulder drop pools will reach their own equilibrium with the upstream sediment supply. The bank closest to the Parkway should also be stabilized with toe boulders, synthetic erosion control blanket and plantings.

b) There is another area of bank approximately 1000 feet downstream of this structure that should also be stabilized on the Parkway side. This location is the outside of a bend and is now approximately 11 feet away from the sidewalk. This location is actively eroding and likely to experience additional bank mass failure in the coming years. This area should be stabilized with toe boulders and planted, deformable banks. Deformable banks constructed of soil wrapped in synthetic geotextile are able to absorb high shear stress without simply redistributing flows downstream in the manner that hard armor solutions do (See **Figure 8.5**).

c) There is also some opportunity here for bank stabilization with a modest effort. In this reach a small mid-channel bar has formed and been vegetated. There is however, a small channel cut on the bank-side that has the potential to act as a high flow cut-off and bank de-stabilizing factor. This small channel should be filled with stone and dirt and vegetated with woody cuttings. This technique should help re-direct flows to the opposite bank and away from the Parkway.

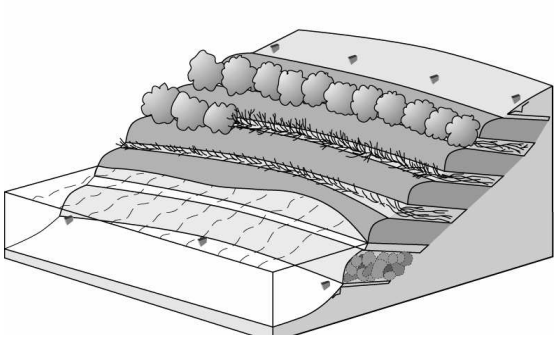

Figure 8.5 Vegetated Geogrid (deformable bank)

d) The toe of the slope along the bike pathway fence is eroding. Placement of log revetments and/or coir log with live plantings could be used to keep further erosion from peeling back the slope.

e) At the Glazier sampling site, there is an opportunity to stabilize the Parkway-side streambank with toe armor and planted deformable banks. The areas around the headwalls of the culvert running under Glazier also need to be filled, planted and stabilized to prevent further flanking.

f) Some of the stream valley in this area is also fairly steep and covered by mature oak-hickory forest. The mature forest and steep slopes make this area a good candidate for preservation.

Focus Area #11

Lakehaven Tributary – Upper Reach

There are some areas of significant bank erosion in this reach that could be stabilized. The installation of additional storm water detention in this area is also recommended. One possible area of detention is along the tributary itself. However, this area was not surveyed during this project and better topographic information would be required in this area before making a final determination on suitability of this option.

Focus Area # 12

Huron High School Wetland Reach

This improvement area is a critical location. As demonstrated earlier in the Existing Conditions chapter, with the active stream downcutting and channel widening from Hubbard to Glazier, significant amounts of stream bank and stream bed material in this reach are settling out in the Huron High School area. The highly mobile but extensive deposits at the High School, in the culvert under Huron Parkway and at the Huron High School sampling site corroborate this picture (**See Figure 8.6**). The culvert under the Parkway is nearly half-full. However, the deposits cannot simply be jetted out because these sediments are also

the stream bed. Sediments could be captured at three possible locations upstream of the Huron Parkway culvert. This should help to "starve" the stream of sediment in this area. At a minimum, it should keep the culvert from filling in further. It is possible that this starving technique could naturally displace some of the sediment in the culvert and the reach downstream. The improvements in this area include:

a) Installation of a new baffle box at the inlet to the Huron High School channel reach. This structure will have a weir that directs low flows to the existing channel. High flows will be partially re-directed in the northwesterly direction up and through the existing wetland and some would continue to be directed down the main channel.
b) The wetland itself could be slightly re-contoured to effectively deal with the higher flows and sediment loads and enhanced with additional native plantings.
c) A downstream sediment trap could also be installed just above the culvert under Huron Parkway.

Figure 8.6 Sediment Deposition near the Huron High School Sampling Site

Focus Area #13

Geddes Lake Ponds

a) Two additional areas of new storm water detention are recommended for the lower reach of the stream tributary to the Geddes Lake ponds. In this area are two emergent wetlands, one upstream and one downstream of the Green Road crossing. Both wetlands are disturbed systems with extensive colonization by invasive species. The wetlands offer opportunity to create wetland detention for storm water storage and treatment.
b) Parking lot and roof drain wetland detention is recommended for the United Methodist Church on Green Road. The Methodist Church on Green Road near Glazier Way currently does not have any storm water detention. There is room on the south end of the parking lot to create detention. The parking lot and the roof drains could be routed to discharge to this detention basin.
c) Tree planting is recommended at the Windmere Road subdivision. The subdivision contains many open turf grass areas with low-density tree coverage.
d) This tributary eventually enters a culvert in the Geddes Lake community. This culvert could be "daylighted," restoring open-channel hydraulics and macroinvertebrate habitat and creating an amenity out of the storm sewer.
e) Just off Narrow Gauge Way there is a mature oak forest that has been identified by the Natural Area Preservation (NAP) group of the Ann Arbor Parks and Recreation Department as a very high quality natural area. NAP and the NE Area Plan have identified this as a parcel worth preserving. This plan strongly concurs. A visit to the site is usually enough to establish the same conviction for many.

Focus Area #14

Ruthven Park

Ruthven Park is a wonderful recreational opportunity that almost no one knows about. This situation is representative of Millers Creek in general. Getting people to the park to experience its merits will first require improving access. The park also lacks a master plan. Improving access and signage will build more interest in the park. Future improvements could include trail enhancement and the design and installation of a boardwalk adjacent to the wetland complex. In fact, hydraulic modeling for this project found that entire wetland complex in Ruthven and immediately to the east of the park is within the Millers Creek/Huron River 100-year floodplain. This area of 100-year floodplain is effectively un-developable. **Figure 7.1** shows the recommended area for parkland acquisition (the area is shown as recreation and as Ann Arbor Township property immediately adjacent to Ruthven Park). The City should explore acquiring this land to expand Ruthven Park. Two alternative recommendations for improving access to Ruthven Park are:

- Alternative One: Acquire a public easement on the parcel to the immediate north of Ruthven Park (parcel ID: 01-26-200-028). This would make an excellent access area for the park and possibly enhance the value of any developments that might be built on that site.
- Alternative Two: Widen Geddes Road between Gallup Park and Ruthven Park and install a pedestrian island between the two lanes. Provide other traffic calming measures, including signage.

Focus Area #15

Pfizer Campus – 2800 Plymouth Road and UM's Northwood V Residential Housing

a) Additional reforestation opportunities exist both in Northwood V and on Pfizer's campus.
b) The directly-connected roof drains at Northwood V could be disconnected from the storm sewer and re-routed as overland flow to roof gardens or drywells (see **Figure 8.7** below).
c) The 48-inch storm sewer that runs under Pfizer's parking lot on 2800 Plymouth Road carries most of the runoff from Northwood V. Northwood V has no detention storage. Possible re-routing of storm water from Northwood V to Pfizer's storm water management system was investigated. However, re-routing storm water from the 48-inch line to existing Pfizer ponds does not appear feasible because the pipe appears to be too low. However, Pfizer staff have noted that pond 5B rarely holds water and thus may have intercepted a sand lens. Pfizer is investigating the possibility that this pond has a high infiltration capacity.

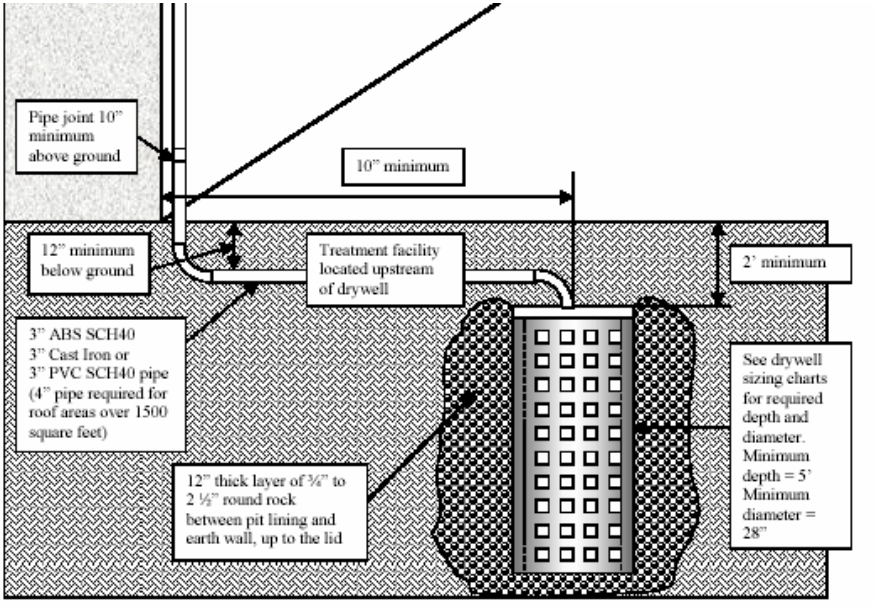

Figure 8.7 Example Drywell

Focus Area #16

Huron Parkway Median

Much of the Huron Parkway median is a thriving native prairie community. However, there are areas of turf grass and opportunities for utilizing more of the median for storm water management. Strategic curb cuts along the entire median could help capture Parkway runoff. A meandering low-flow channel with a shallow floodplain could be excavated in the median. Overflows could be directed to one of the many culverts that run under the Parkway. The two subareas identified with high infiltration capacities are Huron HS and Geddes. This idea would be particularly effective for application at the low end of the median near the High School. This work should be designed in close coordination with the NAP group in order to preserve the existing prairie communities they have worked so hard to create. Another possibility in conjunction with this work would be the installation of infiltration gutter pans along the outside curbs of the Parkway.