E. SOIL AND DRAINAGE PATTERNS

Andropogon Associates, Ltd.

The University of Michigan lies within the middle Huron River watershed. The following maps, pictures and diagrams explore this watershed at two scales: first, the larger scale of the mid-portion of the Huron River Watershed and second, the smaller scale of the sub-watersheds of the main tributary creeks flowing into the Huron River through University property. The name of each of these sub-watersheds is derived from the primary creek that flows through them. There are four main subwatersheds within University property—Allen Creek, Malletts Creek, Millers Creek (North Campus Drain) and Fleming Creek. A large portion of Central Campus drains directly into the middle Huron River. North Campus includes a very small portion of the Travers Creek drainage area.

In general, pollutants from stormwater, scoured from paved surfaces, enter the stormwater conveyance system and are carried into streams. These non-point source pollutants represent the single greatest water quality problem nationwide. Most of this pollution occurs during periods of heavy runoff. The impact of non-point source pollutants varies in the five tributary watersheds and in the Huron River itself. Regional water quality goals include the reduction of phosphorous (*The Middle Huron Initiative: Phosphorus Reduction Strategy for the Middle Huron River Watershed*, Brenner and Rentschler,1996; *Physical and Biological Description of the Huron River, Its Watershed and Tributaries in the Ann Arbor-Ypsilanti Area,* Davis, 1994).

At present stormwater and wastewater systems are collected and conveyed separately at the University. Many of the University's existing stormwater management strategies consider how to modify the stormwater system to provide pollutant reduction measures. Other steps, such as control of erosion and sedimentation during construction, are required by regulation.

The Department of Occupational Safety and Environmental Health of the University of Michigan (OSEH) has applied for a permit under the National Pollution Discharge Elimination System (NPDES), still pending approval by the state. This permit would allow the University to discharge stormwater into the Huron River, its tributaries, highway storm drains and city storm drains. For the permit application, OSEH prepared a Stormwater Management Program for the University detailing specific guidelines for mitigating pollution impacts. Also, Plant Extension has developed and implemented a rigorous set of guidelines for all land disturbance at the University. Different offices of the University have made significant corrections to campus infrastructure to eliminate discharge of wastewater from buildings to the stormwater system.

The University also has a number of programs to reduce surface pollutants. These programs include: Grounds and OSEH working together to eliminate illegal dump sites and clean debris from wetland areas at North Campus; Grounds aggressively pursuing snow and ice control methods that minimize dependence on chlorides; carefully monitoring spraying activities; and putting in place an Integrated Pest Management program to reduce the use of fertilizers and herbicides, etc. Future growth will be served by this system and discharge of wastewater presents little constraint to University development.

Impervious surfaces -- roads, parking lots and building roofs -- have both a qualitative and quantitative impact on stream health. The OSEH Stormwater Management Plan is concerned primarily with qualitative effects of stormwater on stream condition, and with quantitative effects only as required by regulation.

One of the common impacts of traditional stormwater management systems is the loss of infiltration. In general, when rainfall is transformed into runoff, less water percolates into the ground water, which replenishes baseflow in the streams. During times of drought, when water has been conveyed away from the land

in pipes, there is little reservoir of ground water to replenish area streams. Stream flow is reduced and may even run dry. Streams are biological systems and these systems are damaged when perennial streams become intermittent ones. While the present University stormwater conveyance system serves to efficiently prevent flooding, there is potential impact on local streams from lack of recharge of water in the uplands.

A second issue raised by traditional stormwater management methods is the increase in water quantity in the streams at times of peak flow.

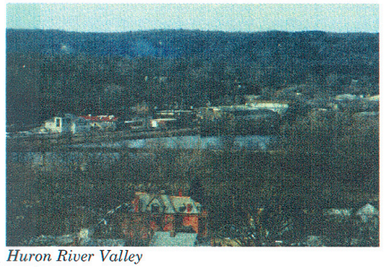
The older University campus areas fall largely into the sub-watersheds of Allen and Malletts Creek. Recently, Paul Rentschler, Executive Director of the Huron Valley Watershed Council, characterized these creeks as "severely degraded," and added, "As far as we can identify the source of these problems, degradation in Malletts Creek stems from heavy stormwater inputs and the resulting extremes in flow causing further erosion."

With recent developments, the University has constructed surface detention basins which hold increased runoff during and just after a storm. This method reduces the immediate impact of increased quantities and velocities of stormwater but does not address the issues of infiltration and groundwater recharge.

The campus has the opportunity to become a greater part of the solution in the future. Fleming Creek and its tributaries, which is of relatively high quality (Davis 1994) can be either sustained or degraded by future development. Such development has the opportunity to incorporate infiltration strategies within the network of paved surfaces, to preserve the integrity of the stream channel and to provide a minimum 100 foot riparian buffer on either side of the channel.

Existing paved surfaces in South and Central Campus can be retrofitted to provide infiltration basins underneath the paving. These innovative methods and others could allow the University to have paved surfaces that are permeable and help infiltrate stormwater.

Huron River Watershed



Huron River Valley

The Huron River at Riverside Park

Summary Opportunities

Several opportunities are presented to preserve the Huron River. Floodplain preservation and protection will provide a large scale example of an indigenous plant community. A buffer of lowland forest along the floodplain will filter stormwater runoff, improve water quality. The porous nature of soils under forests will encourage infiltration, helping to reduce downstream flooding. Preservation of the Huron River provides an aesthetic and recreational resource for the city. Finally, the Huron River can become important biological corridor, encouraging a diversity of plant and animal life.

Huron River Watershed

Length: 136 miles
- Total Drainage Area: 900 square miles

Physical Assessment

Below Barton Pond, few remnants of the original Huron River channel exist as it flows through Ann Arbor and Ypsilanti. This section contains the largest portion of steep gradient on the entire river. The channel is currently almost entirely impounded with only a few fragments of free flowing reaches interspersed between dams. Only three of the dams (Barton, Superior, and Ford) that were constructed to produce hydroelectric power are currently in operation.

Areas of the Huron River watershed within University boundaries are the middle Huron River watershed, and five sub-watersheds within it: Allen Creek, Fleming Creek, Mallets Creek, and Miller's Creek.

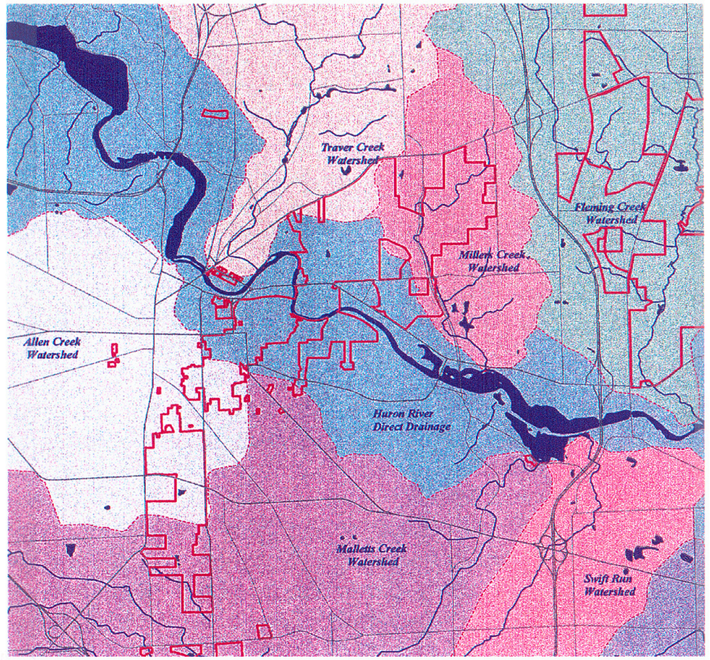
Biological Assessment

The Huron River is a high quality river for one so urbanized, and supports a wide diversity of biological life. Excess phosphorus and bacteria levels from nonpoint sources are a concern and limit recreational use of the Huron River during summer months. Projected population increases in southeast Michigan and the loss of agricultural lands, wooded areas, and open spaces from urbanization will impact the Huron River watershed.

Political Jurisdiction

Originating in Big Lake and the Huron Swamp in Central Oakland County, The Huron River drains 900 square miles before flowing into the Northwest corner of Lake Erie south of Detroit and Lake St. Clair. The Huron River is subject to policies of Ingham, Jackson, Livingston, Monroe, Oakland, Washtenaw, and Wayne Counties, as well as the cities of Ann Arbor and Ypsilanti.

Middle Huron River Sub-Watershed



Summary Opportunities

Opportunities are present to encourage a holistic approach to water resources management that integrates governmental, non-profit, and university stakeholders in the policy making process. This could result in improvements in this stretch of the Huron River, despite the projected increased development in this region.

Biological Assessment

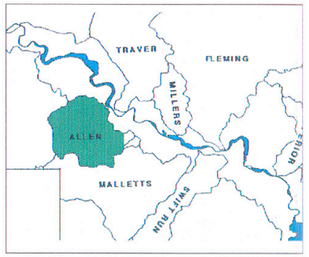
Stream assessment studies indicate that patterns found in the middle Huron River Watershed are typical of moderately urbanized watersheds in the United States. Tributary creeks in less developed watersheds for the most part exhibit an overall higher quality, as indicated by cooler and more stable flows, rich diversity of benthic macroinvertabrates and fish populations, and stream channels generally show less erosion on the banks than those that have been straightened, channelized, or partially piped. In areas of more intense development, watersheds with a greater proportion of development are characterized by more degraded streams and stream corridors.

Political Jurisdiction

The Middle Huron River sub-watershed is located downstream of Barton Pond. It is subject to the policies of Washtenaw County, Ann Arbor, Pittsfield, Scio, Superior, and Ypsilanti Townships, and the Cities of Ann Arbor, and Ypsilanti. The Huron River divides the University of Michigan campus.

Allen Creek Sub-Watershed

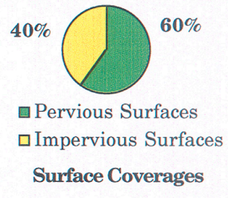
Traces of Allen Creek valley can be seen in the topography of Ann Arbor



Allen Sub-Watershed

Summary Opportunities

Opportunities are present to daylight the Allen Creek channel. The creek can then serve as a biological corridor, greenway, and pedestrian pathway which will enhance water quality and reduce volumes of stormwater discharge into the Huron River.



Physical Assessment

Allen Creek is the most developed of the Universities four sub-watersheds. Although the entire length of Allen Creek was buried in 1920 to prevent flooding, remnants of the previous drainage patterns in this area is visible in the topography. Allen Creek drains through South and Central Campus. Runoff from both South and Central Campuses contributes to the Allen Sub-Watershed.

Biological Assessment

Piping Allen Creek removes air and sunlight from the water which is vital for most aquatic life. This factor in combination with polluted water has reduced aquatic habitat for benthic organisms.

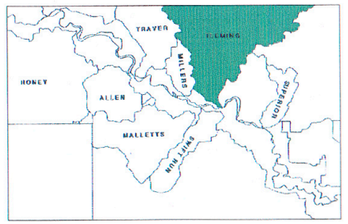
Political Jurisdiction

Allen Creek flows through the University of Michigan's Athletic Campus and the City of Ann Arbor.

Fleming Creek Sub-Watershed

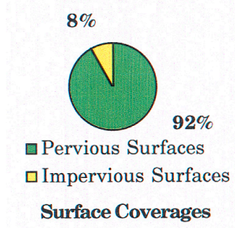
Fleming Creek at Paper Mill

Fleming Creek at Radrick Fen



Fleming Sub-Watershed

- Length of main stem: 12.6 miles
- Total Drainage Area: 30.8 square miles, extending out to Wayne and Oakland counties



Summary Opportunities

Fleming Creek is currently in a relatively healthy state with natural conditions along most of its length. Sensitive development will create opportunities to preserve the stream corridor through the East Territories of the University with a riparian buffer and infiltrate stormwater in the uplands. Such a development might provide a model for the larger watershed outside of university properties.

Physical Assessment

Land-use is predominantly rural/agricultural in the upper portions of the Fleming Creek watershed. Fleming Creek is in good condition with most of the creek's length in a natural state. Ground water from springs and seeps are located along the creek. Water temperatures in the creek are moderate while dams across its channel affect flow function. Fleming Creek is the least developed of the four sub-watersheds in the study area.

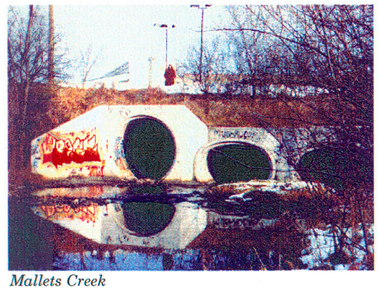
Biological Assessment

Except in areas downstream of Geddes Road, a good diversity of biota is found along the course of Fleming Creek. Overall, stream habitat quality is good with limited sedimentation and bank erosion. Wetlands adjacent to Fleming Creek include a rare calcareous fen.

Political Jurisdiction

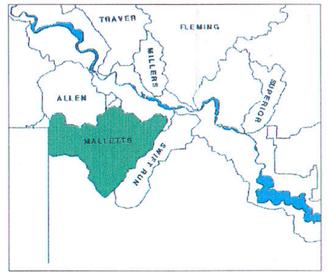
The Fleming Creek watershed is located in Superior, Salem, Northfield and Ann Arbor Townships. The bottom portion of the Fleming Creek Watershed (15-20%) flows through the University in the East Territory.

Mallets Creek Sub-Watershed



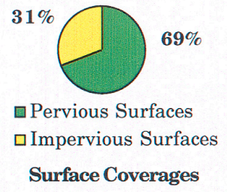
Mallets Creek

Mallets Creek



Mallets Sub-Watershed

- Length of main stem: 4.7 miles
- Total Drainage Area: 11 square miles



Summary Opportunities

Opportunities are present to reduce flash flooding and perhaps increase biological diversity in the creek by reducing velocities and quantities of stormwater runoff from South Campus.

Physical Assessment

Mallets Creek receives some drainage from Briarwood Medical Facility and Wolverine Towers. The creek can be described as a narrow corridor of shrubs and trees with some portions of it piped while others sections are open but seriously eroded. Water temperatures are higher than Fleming Creek. Before entering south (Signor) Pond the final section of Mallets Creek is almost completely silted.

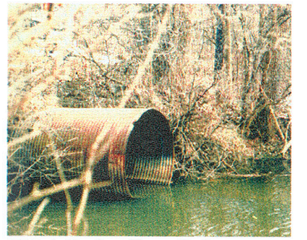
Biological Assessment

The physical characteristics of Mallets Creek appear to be capable of supporting a wide diversity of macroinvertabrae. The creek is presently in poor condition and has a lower variety of benthic macroinvertabrae than most of the other creeks. Flash floods may be the cause of low macroinvertabrae diversity.

Political Jurisdiction

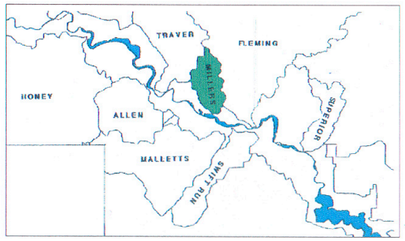
The entire length of Mallets Creek falls within the jurisdiction of the Township of Ann Arbor. Mallets Creek is a designated county drain.

Miller's Creek (North Campus) Sub-Watershed



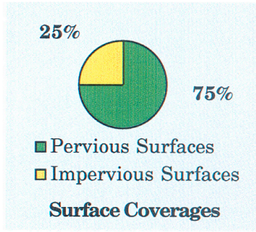
Miller's Creek at Huron Parkway

Mouth of Miller's Creek



Miller's Creek Sub-Watershed

- Length of main stem: 3 miles
- Total Drainage Area: 3 square miles



Summary Opportunities

The small scale of the Miller's Creek Sub-Watershed presents opportunities for a basin wide comprehensive watershed management program. Specific changes to the present treatment of the creek might include the replacement of structural features (concrete sidewalls) with natural systems such as vegetated banks and natural stream meanders.

Physical Assessment

Located on steep topography, Miller's Creek is the smallest named tributary to the Huron River within University properties. During construction of the Huron River Parkway Miller's Creek was relocated. Today, Miller's Creek is subject to flash flooding from runoff from impervious surfaces (parking lots, roofs, and streets) on North Campus. The Creek's channel is subject to scouring and erosion while several structural features along the creek's channel are in need of either repair or replacement.

Biological Assessment

Benthic community populations are of an average diversity for a small tributary such as Miller Creek.

Political Jurisdiction

Miller's Creek is entirely in the City of Ann Arbor. No portion of Miller's Creek is designated a county drain.

Sources:

Andrew Brenner, Paul Rentschler, September 1996. The Middle Huron Initiative: Phosphorus Reduction Strategy for the Middle Huron River Watershed.

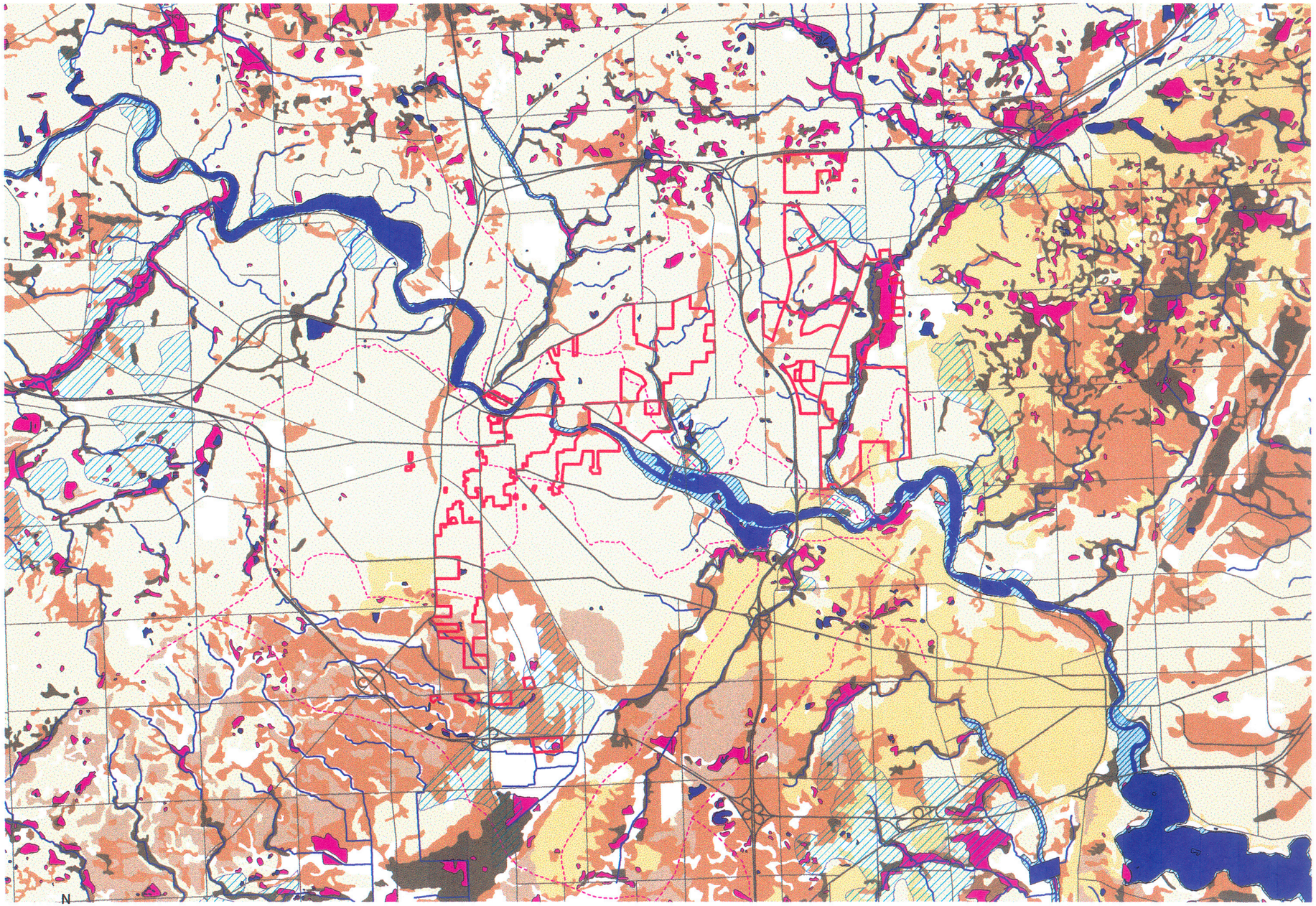
Florence Davis. September 1994. Physical and Biological Description of the Huron River, its Watershed and Tributaries in the Ann Arbor-Ypsilanti Area.

Joan Martin, Adopt a Stream Program Director of The Huron River Watershed Council, 1998. Deterioration of a Regional Treasure: Fleming Creek (Draft).

Paul Rentschler, Executive Director of the Huron River Watershed Council March 27, 1998. Letter to Andropogon Associates.

The drainage characteristics of soil directly effect infiltration rates. Soils which are well drained present opportunities for infiltration beds and groundwater recharge in stormwater management plans. However, Paul Spradlin points out, that actual conditions may vary. Many disturbed areas are covered with 1-3 feet of mixed clay fill. Areas of the campus, therfore, may drain slower than expected.

Floodplains and existing groundwater recharge areas fulfill an important role in flood control and water quality improvement in the natural landscape. These areas, therefore, present important opportunities for open space dedication.



KEY

- Well Drained
- Well-moderately Well Drained
- Moderately Well Drained
- Somewhat Poorly Drained
- Poorly Drained
- Poor-VeryPoorly Drained
- Very Poorly Drained
- University Boundary
- Rivers/Streams
- Highways
- County Roads
- Drainage Basins
- Lakes/Rivers
- Groundwater Recharge Areas
- Wetlands
- Floodplains

N

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SOIL DRAINAGE CHARACTERISTICS

University of Michigan Campus Plan, Phase I

Base Map Source: UM Facilities, Planning and Design

Information Source: School of Natural Resources & Environment, Geographic Information Systems Facility , University of Michigan.
Groundwater Recharge and Wetland Areas developed by Washtenaw County Metropolitan Planning Commission, 1992.

April 22, 1998

Cahill Associates

Andropogon Associates

Venturi, Scott Brown & Associates