Note on Stormwater: CARPC approval of the urban service adjustment set stormwater rate and stay-on performance standards that are more restrictive than those identified in this plan. See CARPC resolution 2009-15 for their standards. The most restrictive standards will apply.

McGaw Park Neighborhood Plan

City of Fitchburg, WI

June 9, 2009
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All appendices are available for review at:
http://www.city.fitchburg.wi.us/planning_zoning/NorthMcGaw.php

Chapter 1: Executive Summary

In the Spring of 2007, the City of Fitchburg commenced the planning process for the McGaw Park Neighborhood. As required, by Appendix H of the 1995 General Land Use Plan, the McGaw Park Neighborhood planning initiative provides land use, transportation, infrastructure, and environmental guidelines for the extension of the urban service boundary. The McGaw Park Neighborhood Plan was developed as an amendment to the City's Comprehensive Plan and as such is fully compliant with the Comprehensive Plan. It was completed as part of the comprehensive planning process including guidance from a Steering Committee, elected officials, the public, staff, and consultants.

The McGaw Park Neighborhood planning process began with an understanding of the environmental resources. Once environmental resources were identified and the boundaries of the environmentally sensitive lands were defined, land use, transportation, infrastructure, and environmental goals and policies were formulated in order to conserve and respect the sites natural resources. The goals and polices of the future development of the study area reflect a desire to preserve the existing natural resources and plan development around the most environmentally sensitive areas.

Chapter 2: Introduction

With its location in central Fitchburg, and along the southern edge of urban Fitchburg, the McGaw Park Neighborhood is situated in a logical location for urban service expansion. Furthermore, due to its location directly adjacent to the Fitchburg Technology Campus and southwest of the planned U.S. Highway 14 interchange, the McGaw Park Neighborhood is already experiencing development pressure.

Figure 1.1: McGaw Park Neighborhood

The McGaw Park Neighborhood Study Area is located in the 12th ward of the City of Fitchburg and is approximately bounded by:

- South: Utility easement north of Irish Lane
- North: Lacy Road
- East: South Branch of Swan Creek
- West: Fish Hatchery Road

The McGaw Park Neighborhood Study Area encompasses approximately 712 acres or 1.1 sq/miles and is over 80% existing farmland and/or environmentally sensitive area. The Study Area is bisected north/south by Syene Road; however it is not bisected by an east/west road. A US-Highway 14 interchange is planned to connect to Lacy Road northeast of the existing Syene Road / Lacy Road intersection. In addition, a dormant freight rail line runs along the entire length of Syene Road within the Study Area.

LEED-ND

The McGaw Park Neighborhood seeks to become a benchmark example of a sustainable neighborhood, aiming to be a participant in the U.S. Green Building Council's LEED-Neighborhood Development (LEED-ND) program. The LEED-ND Rating System integrates principles of "green", mixed-used, transit-oriented development by utilizing a point system. Seeking LEED-ND for the McGaw Park Neighborhood was a priority of the City and the McGaw Park Neighborhood Steering Committee. The Plan is not being driven by seeking LEED-ND status; rather the established goals and objectives of the Plan lend itself to seeking certification under LEED-ND.

LEED-ND emphasizes the creation of compact, walkable, vibrant, mixed-use neighborhoods with good connections to nearby communities and encourages compact development patterns and the selection of sites that are within or adjacent to existing development in order to minimize habitat fragmentation and preserve areas for recreation. In addition, LEED-ND encourages convenient and efficient transportation options such as buses, trains, car pools, bicycle lanes and sidewalks. LEED-ND is currently in the pilot program nationally. In order to obtain LEED-ND certification, a neighborhood must meet a number of points based upon a rating system. Points are given based on "smart location and linkage," "neighborhood pattern and design," "green construction & technology," and "innovation and design process."

Chapter 3: Site Characterization

Agricultural use and parklands, accounting for over 91% of total acreage, highlight the land use composition for the McGaw Park Neighborhood. The neighborhood includes its namesake 49-acre McGaw Park, which includes both active and passive recreation. The remaining 9% is a mix of agricultural processing (Hartung corn processing plant), rural residential (subdivision of Tarpleywick Hills), and a scattering of large lot residential uses.

Table 1.1: Existing Land Uses

Land Use	sq ft	acres	% of total
Agricultural	24,711,723.3	567.3	83.3%
Park & Open Space	2,373,535.8	54.5	8.0%
Agricultural Processing	1,288,545.5	29.6	4.3%
Rural Residential	1,231,484.8	28.3	4.2%
Residential	68,832.8	1.6	0.2%
Study Area(TOTAL)	29,674,122.1	681.2	100.0%

Threatened, Endangered and Special Concern Species

Endangered and threatened species are provided protection under the Wisconsin Endangered Species Law (29.604 State Stats.) and their presence can be a significant constraint to development. A preliminary screening was completed in coordination with WDNR to determine rare species most likely to occur within the vicinity of the study area. Subsequent field surveys and habitat assessments were completed targeted towards those rare species most likely to occur. Based on the evaluations no rare species were identified and habitat suitable to support such rare species was very limited. Therefore, rare species are not a constraint to the McGaw Park Neighborhood Plan.

Cultural Resources

Historic structures, archaeological sites, and cemeteries/burial sites may be subject to local, state or federal laws and regulations, such as Section 106 of the National Historic Preservation Act related to historic properties and archaeological sites and the Wis. Stat 157.70 Disposition of Human Remains associated with cemetery/burial sites. A cultural resource screening was completed for the study area and immediately adjacent or contiguous properties utilizing the Wisconsin Historic Preservation Database (WHPD) maintained by the Wisconsin Historic Society. Local cultural resources were identified through coordination with the City of Fitchburg. No cultural resources were identified within the study area through the WHPD. One City of Fitchburg designated local landmark, the Rueden Farmhouse is located along Lacy Road within the study area (Figure 1.2).

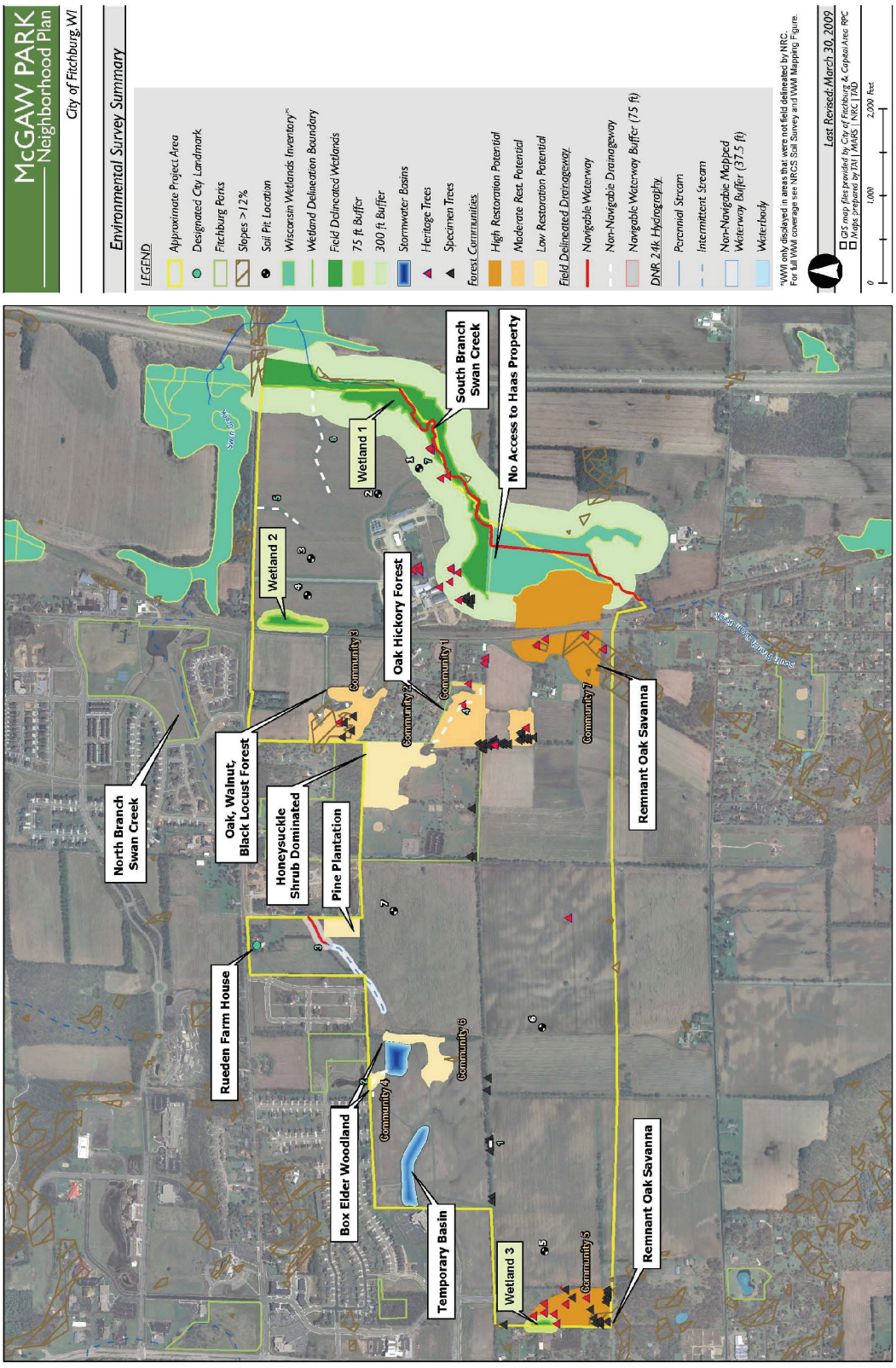


Figure 1.2: Field Collected Data

Wetlands

Wetland determinations within the study area were completed in the field. All wetland boundaries were delineated and mapped (Figure 1.2). Three wetlands were identified (W-1 – W-3). W-1 lies adjacent to the S. Branch of Swan Creek and contains relatively high wetland functional values due primarily to wildlife habitat, water quality protection, and stormwater attenuation functions. As such, there is a 300 foot wetland buffer from the delineated boundary of W-1 identified. W-2 is a highly degraded wetland comprised of agricultural land; W-3 is also highly degraded and comprised mostly of open water. Both wetlands contain limited functional values primarily due to the limited wildlife habitat and isolation from surface water streams. A 75-foot buffer is designated around W-2 and W-3.

Waterways

All waterways and drainage features were field surveyed and mapped throughout the study area (Figure 1.2). Subsequently, the WDNR completed navigability determinations of each drainage feature. Of the seven drainage features identified within the study area, two were determined to be navigable, the North and South Branches of Swan Creek. Land disturbing activities within close proximity to these waterways may be subject to review and authorization by the WDNR.

In addition to regulatory evaluations of waterways, ecological assessments were completed both within the study area (South Branch of Swan Creek) and outside but down stream of the study area (Swan Creek and Murphy's Creek). Ecological assessments consisted of in-stream habitat assessments, fish surveys, and aquatic macro-invertebrate surveys. The objective of the evaluation was to document baseline conditions; evaluate aquatic habitat; and develop a better understanding of species composition and diversity within these waterways. Potential impacts or enhancements of the waterways following implementation of the neighborhood plan can be measured and compared to these baseline conditions in the future.

Natural Communities

The study area is primary active agricultural land. However, there are several moderately sized woodlands scattered within the study area (Figure 1.2). Each of these communities were field evaluated to determine floristic composition and diversity and wildlife habitat value. Generally, the woodlands are dominated by moderately sized oak trees with varying degrees of disturbance. Two remnant oak savannas were identified as higher quality woodlands with excellent enhancement potential, as well as a mature oak/hickory forest. Moderate quality woodlands identified include younger growth oak/hickory forests, with fairly heavy infestations of non-native invasive species. Heavily degraded woodlands include box elder and honeysuckle dominated woodlots.

Heritage and Specimen Tree Assessment

"Heritage Oaks" and "Specimen Trees" were investigated as defined by the City of Fitchburg's Parks, Recreation & Forestry Department, (described below). Thirty-three Heritage Oaks and 56

Specimen Trees were identified and surveyed in the study area and are illustrated on Figure 1.2.

Soil Evaluations

A preliminary site soil evaluation was conducted throughout the study area within select locations (Figure 1.2). The primary objective was to assess the range of soil types across the site in order to evaluate stormwater infiltration suitability. The soils in the study area generally consist of loess underlain by several meters of gravelly sandy loam till deposited by the Green Bay Lobe during the last part of the Wisconsin Glaciation. The soils that have formed from these glacial deposits are typically well-drained and fertile. In the study area, these glacial sediments were deposited over sandstone bedrock, which is typically at relatively substantial depths across the site (greater than 10 feet). As a result, the soils across the site are highly suitable for natural infiltration of stormwater with some exceptions. Somewhat poorly and poorly drained soils, mostly limited to the wetlands and wetland margins are much less permeable and contain seasonally high groundwater tables making these areas less suitable for natural infiltration. Additionally, some select areas of the site contain shallow bedrock, also limiting natural infiltration.

Chapter 4. Plan Goals and Policies

Neighborhood Plan Vision

Develop an urban, green, sustainable, transit-oriented, mixed use, and economically vibrant neighborhood that offers a variety of land uses to serve everyday living needs, as well as a housing stock to serve all levels of age and income, which will not affect the existing on-site natural resources.

Through a series of Steering Committee meetings and input from the public through a Neighborhood Summit, the following goals were defined to guide the plan:

Environmental goals:

1. Protect and rehabilitate the natural environment
2. Provide public access to unique natural areas.
3. Design the neighborhood to compliment environmental protection.

Agricultural Resource Goals:

1. To protect and maintain agriculture as a significant resource within Fitchburg.
2. Through orderly planning of McGaw Park, preserve agricultural land beyond the area as a resource for the use and benefit of current and future generations.

Economic Development Goals:

1. Encourage economic development opportunities appropriate to the resources, character, and service levels in the City.
2. Provide that retail and service areas are adequately sized and appropriately placed within neighborhoods and the community.
3. Recognize and support the changing needs and preserve agricultural based businesses as an economic opportunity.
4. Preserve and enhance resources when developing economic opportunities.

Community Character (Cultural):

1. Promote and preserve the City's cultural resource base.
2. Actively seek to strengthen strong cultural and social history and community identity.

Land Use Goals:

1. Preserve and enhance the natural and agricultural resources and features of the city.
2. Develop a compact urban community that is visually and functionally distinct from its rural and agricultural community.

Housing Goals:

1. To provide for balanced residential growth in the City with a variety of housing types, to promote decent housing and suitable living environment for all residents, regardless of age, income or family size, and to encourage an adequate supply of affordable housing in each new urban neighborhood.
2. Promote the efficient use of land for housing.

Transportation Goals:

1. Promote development in areas that encourages options to alternative transit modes.
2. Promote transit-friendly design of healthy neighborhoods with walkable, short blocks.
3. Design complete streets that promote pedestrian and bicycle movement as well as cars.
4. Carefully plan additional road capacity.
5. Consider extensions of transit including bus and rail/bus rapid transit to make neighborhood transit accessible.
6. Minimize impact on existing roadways and infrastructure by planning for multiple modes of transportation.

Chapter 5. Systems Analysis: Sanitary, Water and Stormwater

Streams

The McGaw Park Neighborhood (MPN) is located near the headwaters of three streams: Nine Springs Creek, Swan Creek, and Murphy's Creek. Nine Springs Creek is located north of the Neighborhood, near the southern edge of Madison's developed urban area. This watershed is primarily to the north of the project area. This stream is therefore unlikely to be significantly affected by runoff from the study area. Swan Creek originates in the study area and flows eastward through the Waubesa Wetlands to Lake Waubesa. The vast majority of the MPN is located in the Swan Creek surface watershed. Murphy's Creek is located approximately 1.5 miles south of the study area, and the MPN is entirely outside the Murphy's Creek surface watershed.

Wetlands

Two of the wetlands described above (W-1 and W-2) appear to be seasonally saturated or inundated, indicating that groundwater inflow to them is significant during part of the year. Priorities for water management are to maintain groundwater supply to the wetlands and to minimize changes in runoff volume and frequency. Wetland W-3, near the western boundary of the MPN, appears to be permanently inundated due to surface runoff. Minimizing changes in runoff volume to this closed depression wetland will be a primary management objective. The management implications are that (1) baseflow in Swan Creek could be affected by land use change in the MPN, (2) baseflow of Swan Creek, Murphy's Creek and local springs could be affected by land use changes far away from the MPN, and (3) these features could be affected by changes in groundwater pumping throughout the region.

Floodplains

The regulatory floodplain boundaries were updated by the Federal Emergency Management Agency (FEMA) in 2008. The new Flood Insurance Rate Maps (FIRMs) were adopted into City of Fitchburg zoning codes in 2008 and took effect on January 2, 2009. The FIRM shows floodplains only in the northeastern corner of the McGaw Park Neighborhood Plan area along the South Branch of Swan Creek.

Steep Slopes

Small areas with slopes steeper than 12% are present in three parts of the study area: the southwest corner, the southeast corner immediately west of Syene Road, and adjacent to the eastern boundary of McGaw Park. These slopes are all wooded and designated as environmentally sensitive areas with no development in the growth model.

Woodlands

Most woodlands in the MPN have been included as environmentally sensitive areas with no development in the growth model. Maintaining natural vegetation cover in these forest areas complements the use of engineered facilities to maintain groundwater recharge and reduce runoff volume.

Chapter 6: Systems Analysis – Other Infrastructure

The McGaw Neighborhood is divided into the Madison and Oregon School Districts. Currently, all Fitchburg students are bused to existing schools in the two districts. Area 5 in the McGaw Park Growth Model is shown as a 10 acre Institutional Use, intended as a new school. Both school districts have expressed interest in building a new school in Fitchburg or a nearby area.

A total of 1,903 residential units are planned for the McGaw Neighborhood. Of these units, 301 are within the current boundaries of the Madison School District, and 1,602 are within Oregon School District. A new school located in McGaw Park would serve not only the immediate neighborhood, but surrounding areas within Fitchburg. Development in the McGaw Park Neighborhood, plus other planned neighborhoods in Fitchburg, creates the demand for a new neighborhood school in the City.

The area is well served by telecommunications carriers, including Cable, DSL, and close proximity to fiber available in the Fitchburg Technology Campus. The proximity to Fitchburg Technology Campus and Fitchburg Center, make the area a desirable location for employers and residents who require high speed and secure broadband connections. The City should ensure that the construction of Nobel Drive includes the laying of a fiber connection from Fish Hatchery to the TOD and planned Business Park east of Syene Road.

Chapter 7. Environmental, Open Space and Recreation Plan

Wetland Restoration and Enhancement

Wetland 1 along the South Branch of Swan Creek has the greatest potential for wetland restoration (Figure 1.2). In order to protect the wetland and the quality of the South Branch of Swan Creek, stormwater detention and treatment needs to be engineered with the following in mind. The creek, with its relatively cool water characteristics, should be protected from the thermal impacts of stormwater inputs. Stormwater outfalls which concentrate flows in one location could contribute to scouring within the channel during large rain events. Stormwater practices that may help meet this objective include stormwater infiltration, which could reduce the volume of stormwater inputs into the creek, and which may help maintain groundwater baseflow to the wetland and creek. Distributed stormwater outfalls into the wetland and creek may reduce scouring flows.

Woodland and Savanna Restoration and Enhancement

The identified remnant oak savannas have excellent prospects for savanna restoration (Figure 1.2). The eastern oak savanna (Community 7) is overgrown with invasive trees and shrubs, including the invasive black locust, common buckthorn, and multiflora rose. While the western oak savanna (Community 5) has a more open canopy, and less shrub cover but contains an herbaceous layer dominate by non-native species. Restoration of these areas could be accomplished by preserving the large oak trees, removing non-native, invasive species, and reestablishing a native savanna prairie understory.

Open Space and Recreation

The City of Fitchburg requires a park and open space dedication of 2,900 square feet per new residential unit. Based on this factor, 126.7 acres of park and open space is required. This may be a combination of both on-site open space or public plazas, as well as public parks being planned both within the Neighborhood (such as the expansion of McGaw Park), and beyond (such as the planned Moraine Edge Park just south of the Neighborhood). Based on the Plan, 87 acres is set aside as parks, which includes the existing McGaw Park and Johnson Park (49-acres), a 32-acre expansion to McGaw Park, and a new 6-acre park south of Nobel Drive. Therefore, 38 acres of *new* Park and Open Space are specifically shown as land uses within the Plan. The remaining 88.7 acre requirement can be fulfilled with additional neighborhood parks and other public spaces likely to be required within the neighborhood, parks outside the neighborhood boundary, as well as Fee-in-lieu-of Parkland Dedication provision. In addition to this open space, 100 acres of Environmentally Sensitive land is not buildable, which includes wetlands, environmental corridors, and areas with large concentrations of heritage and specimen trees. The planned Moraine Edge Park would be 174 acres, just beyond the neighborhood boundary to the south. Specific implementation recommendations regarding Parks are included on page 4-7.

Chapter 8. Land Use Plan

Following the goals of the Plan, public participation, input from the Common Council and Plan Commission, the Steering Committee developed consensus for the Growth Model that guides the Land Use Plan. Over twelve conceptual growth models were developed prior to arriving at the Growth Model. The Growth Model was developed to protect and enhance the natural environment of the area prior to planning for development and transportation enhancements.

The land use plan divides the neighborhood into three distinct sectors, 1) a higher density, transit-oriented development node to the east, 2) a mixed-use and business park node to the west, 3) and a lower-density single-family residential and institutional use sector between the east and west nodes. Figure 1.3 shows the Growth Model that guides the Land Use Plan.

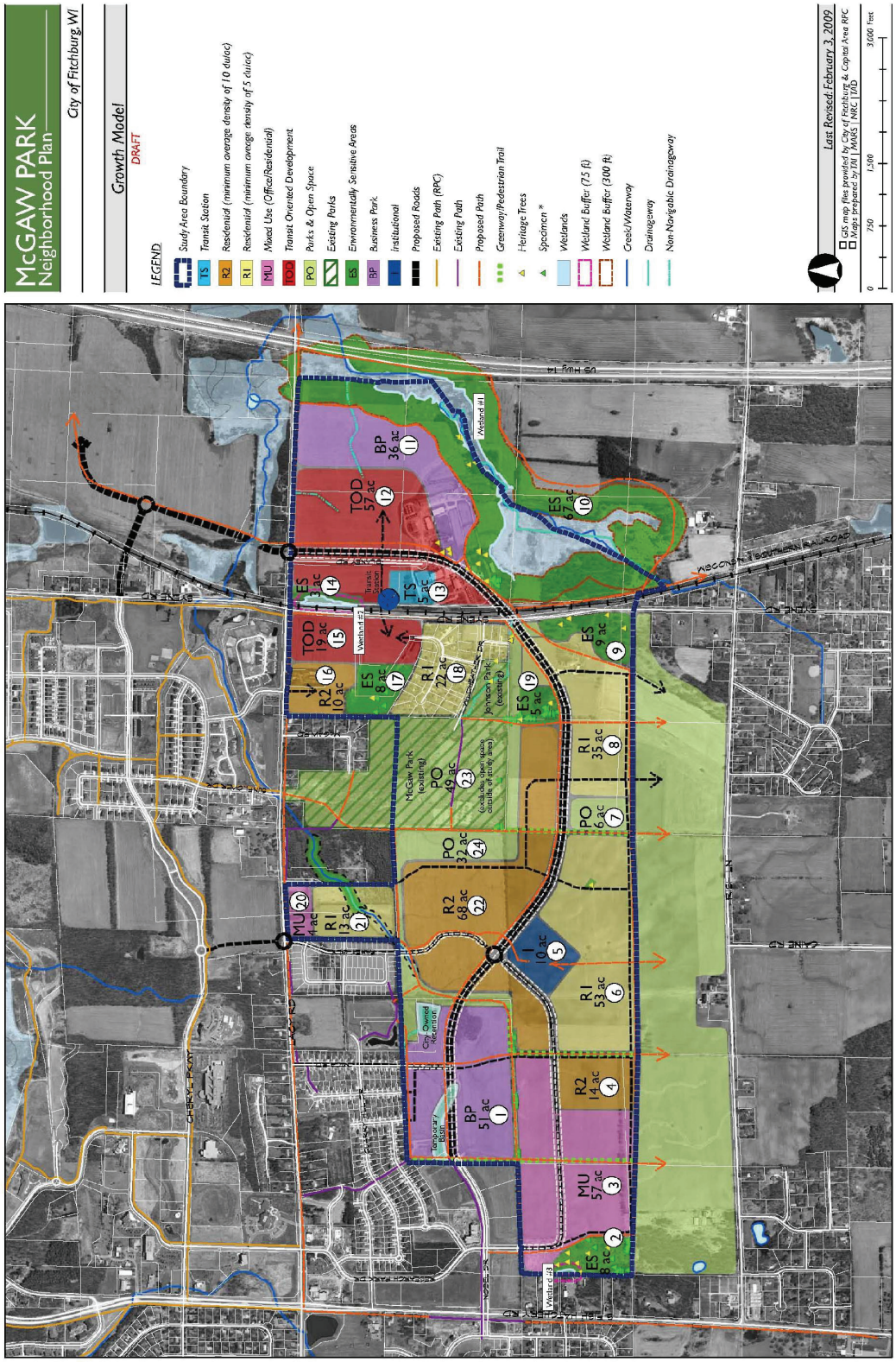


Figure 1.3: Growth Model

Environmentally Sensitive Areas – Dark Green (Areas 2, 9, 10, 14, 17, and 19)

Environmentally sensitive areas including waterways, wetlands, steep slopes and floodplains account for over 100-acres of the 712-acre McGaw Park neighborhood. The location of those environmentally sensitive areas predicated the specific locations and types of other land uses described in this plan. There should not be any impervious development allowed within identified environmentally sensitive areas, except as specified in the Comprehensive Plan, and all efforts should be made to restore and maintain these areas in their natural state. The boundaries of the environmentally sensitive areas include the regulatory landscape buffers to ensure their protection and the 300 foot environmental corridors from wetlands that are required by the City of Fitchburg.

Transit Oriented Development – Red (Area 12, 13, and 15)

A 76-acre Transit Oriented Development (TOD) area, located in the northeast corner of the neighborhood just south of Lacy Road, forms the eastern node of the McGaw Park neighborhood. Designating the TOD on both sides of Syene Road, is necessary to create a corridor of higher intensity commercial activity. The Transit Oriented Development area is proposed to be highlighted by a transit center, which would be ringed by higher density and mixed use development. The transit center could either be served by light-rail or bus-rapid transit or both. The proposed TOD will include up to 596 residential units, 92,000 sq/ft of retail, and 360,000 sq/ft of office.

Business Park – Light Purple (Areas 1 and 11)

A 36-acre business park is planned in the northeast corner of the neighborhood, just south of Lacy Road. A business park is an ideal use for this location because it will serve as a complementary use to the employment planned in the TOD and offers good access and visibility from the US Highway 14. A 51-acre business park is located east of the existing Fitchburg Technology Campus. The Campus should allow office and other commercial land uses compatible with performance standards yet to be determined. Access to this business park would be through an extension of Nobel Road, which currently bisects the existing Fitchburg Technology Campus.

Mixed-Use – Pink (Areas 3 and 20)

Two areas are designated for mixed-use development which includes office, residential, and retail. One 4-acre mixed use area is targeted just south of Lacy Road and just east of the existing Waterford Glen Subdivision. Ideal uses include neighborhood service uses such as coffee shop, personal services, convenience or grocery store, carry-out restaurant, and boutique retail. This does not preclude any Business Park type uses. A 57-acre mixed use area is designated for the western most boundary of the neighborhood, just south of the existing Fitchburg Technology Campus. The 57-acre area should balance employment and residential uses.

Residential (Minimum Average of 5 units/acre) - Light Yellow (Areas 6, 8, 18, and 21)

Three separate areas, which are centrally located within the McGaw Park neighborhood, have been designated for low-density residential. The low-density residential areas are strategically located to mitigate impacts upon such uses and provide buffers to environmentally sensitive areas. The three low density residential areas constitute 88 acres of buildable area (123 acres minus area for infrastructure and stormwater detention), which would allow for approximately 437 units.

Medium-Density Residential (Minimum Average of 10 units per acre) – Orange (Areas 4, 16, and 22)

Three separate areas have been designated for medium-density residential, which can function as a means of enhancing housing options. The medium density residential areas are primarily located in the center of the McGaw neighborhood, and the largest designated area frames the northern portion of the Nobel Road extension. The medium-density residential will serve as a buffer between the more intense commercial, industrial, and transit land uses in the TOD, mixed-use and Business Park land use sections and the low-density single family residential.

Chapter 9: Transportation Plan

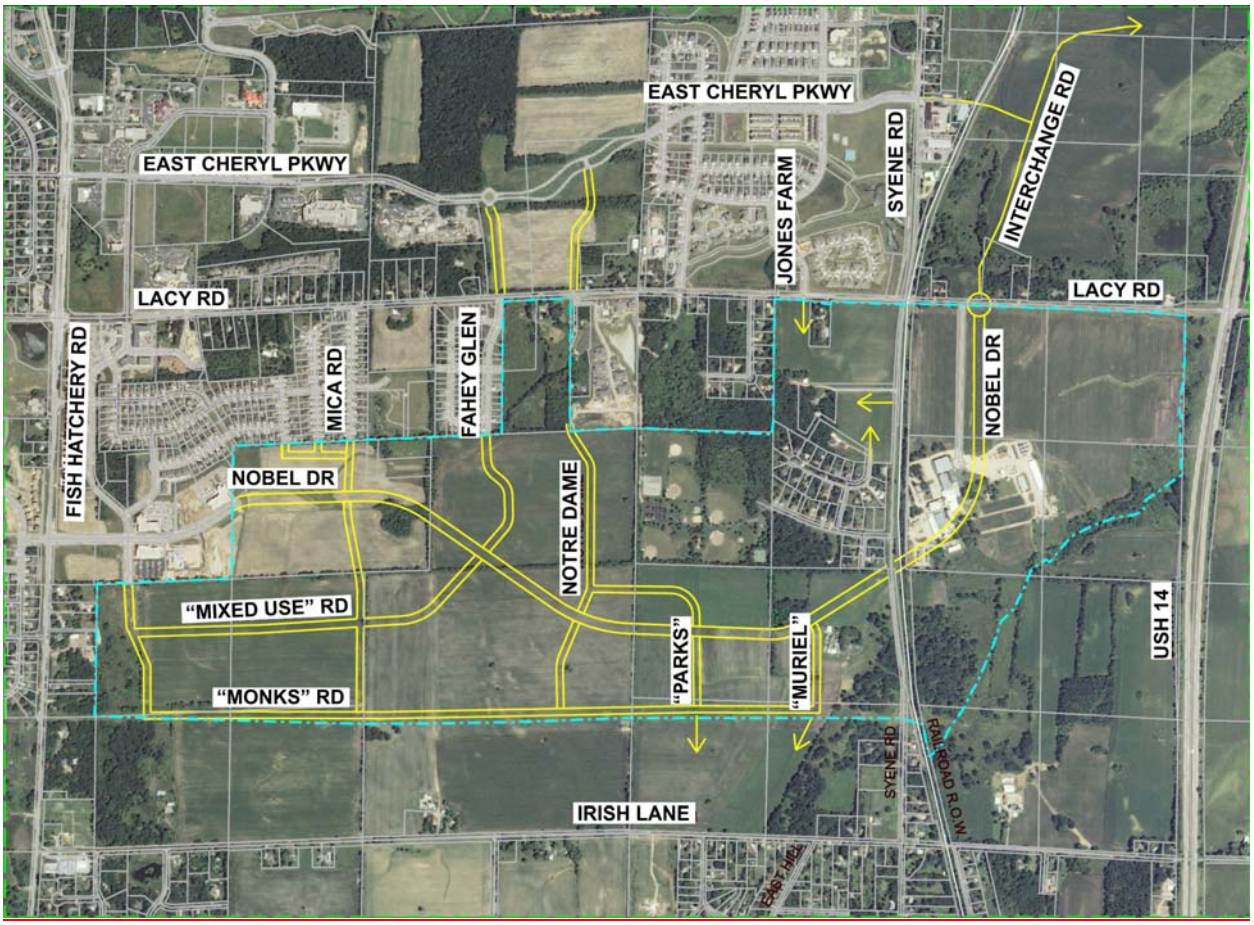


Figure 1.4: Roadway Recommendations

Nobel Drive

Nobel Drive has an existing 95-foot ROW east of Fish Hatchery Road. Provide a 100-foot ROW through the MPN to Lacy Road. This cross-section includes: an 18-foot wide median, an 11-foot through travel lane in either direction, a 5-foot bicycle lane in either direction, an 8-foot parking lane on either side of the street, a 9-foot edge/furnishing zone on either side of the street, a 10-foot multi-use trail on the north side of the street, a 5-foot sidewalk on the south side of the street, and a 0.5-foot frontage zone between the multi-use trail/sidewalk and adjacent property.

Research Park Drive, "Mixed Use Road" and Primary TOD Roadways

Provide an 80-foot ROW south on Research Park Drive to "Mixed Use Road", on "Mixed Use Road" from Research Park Drive to Nobel Drive, and on primary TOD roadways. This cross-section includes: an 11-foot through travel lane in either direction, a 5-foot bicycle lane in either direction, an 8-foot parking lane on either side of the street, a 7.5-foot edge/furnishing zone on either side of the street, an 8-foot sidewalk on the either side of the street, and a 0.5-foot frontage zone between the sidewalk and adjacent property. This sidewalk is wider to accommodate commercial foot traffic.

Fahey Glen Extended

Provide an 80-foot ROW on Fahey Glen extended. The 80-foot cross-section includes a 20-foot travel/parking/bicycle lane in either direction, a 14-foot edge/furnishing zone on either side of the street, a 5-foot sidewalk on the either side of the street, and a 1-foot frontage zone between the sidewalk and adjacent property. This matches the existing cross-section of Fahey Glen south of Lacy Road.

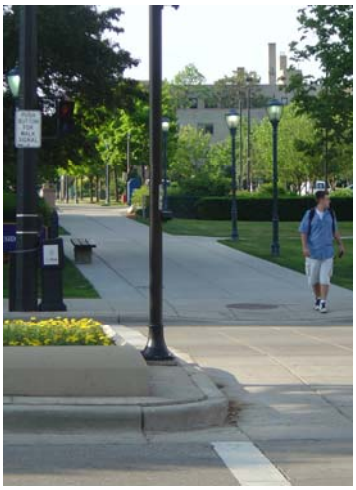
Mica Road and Other MPN Roadways

Provide a 66-foot ROW on Mica Road and the remaining MPN roadways. Smaller ROW may be considered on a case by case basis on the local residential streets as development occurs. The 66-foot cross-section includes a 14-foot to 19-foot travel/parking/bicycle lane in either direction, an 8-foot to 13-foot edge/furnishing zone on either side of the street, a 5-foot sidewalk on the either side of the street, and a 1-foot frontage zone between the sidewalk and adjacent property.

Alleys

Provide a 20-foot ROW on alleys within the MPN. The 20-foot cross-section includes 8-foot travel lanes in either direction with a 2-foot frontage zone between the travel way and adjacent property.

Dedicated Pedestrian Facilities



With development of the MPN, sidewalks along Lacy Road should be extended to the Neighborhood's east boundary. Pedestrian sidewalks should also be provided along both sides of all roadways within the MPN borders. If a multi-use facility is provided along one side of a roadway, a sidewalk is not needed on that side of the roadway but should be provided along the other side. In any cases where multi-use trails are located along both sides of a roadway, sidewalks need not be provided.

Note that consideration is being given to light rail transit (LRT) or bus rapid transit (BRT) on the existing dormant rail line that runs parallel to and on the east side of Syene Road. The primary difference between the two forms of transit is LRT uses rails while BRT uses rubber-tire vehicles primarily in dedicated lanes. Both forms of transit minimize commute time compared to typical bus transit by use of greater spacing between stops and technologies such as transit priority signalization. The MPNP includes a station within the TOD land use area east of Syene Road between Lacy Road and Nobel Drive. If LRT is chosen over BRT, consideration should be given to providing a pedestrian bridge over the rail corridor and Syene Road to link the east and west TOD areas. If BRT is chosen over LRT, an at-grade crossing should be sufficient.

LEED-ND Certification Prerequisite for Transit

A goal of the MPNP is to meet LEED-ND certification. Increased transit service is one of two options to meet the Smart Location & Linkage Prerequisite One: Smart Location (the other being Nearby Neighborhood Assets).

To obtain the LEED-ND certification under the transit option of Smart Location & Linkage Prerequisite, 56 buses may be needed per weekday if the transit service prerequisite is chosen. Options include rerouting routes 44 and 48 and increasing frequency of service and/or providing a new route with service from the South Transfer Station with stops at the Northeast Neighborhood and Green Tech Village. Even if the transit service option for the prerequisite is not chosen, increased service will provide additional points to meeting LEED-ND certification.

Light Rail Transit (LRT) or Bus Rapid Transit (BRT)

The MPNP includes a transit station east of Syene Road between Lacy Road and the Nobel Drive extension. The station should provide comfortable and efficient multi-modal connections between transit, motor vehicle, bicycle and pedestrian modes. LRT or BRT can be used to meet the LEED-ND definition of "adequate transit service" for the MPN.

Chapter 10: Economic and Fiscal Impact Analysis

Retail Opportunities

A retail leakage analysis was conducted to determine the demand and supply for retail goods and identify the potential gaps that could be filled with new retail development. The area is a net attraction for retail stores, likely attracting shoppers from Madison to the north, and more rural areas to the south. As a result, there is a 63% retail surplus, or a total of $194 million net surplus over a demand of $308 million. Yet, the entire surplus is accounted for by a very large auto vehicle surplus of $250 million.

The result is that many categories show a retail opportunity gap, including the following categories: furniture, electronics and appliances, lawn, garden equipment, grocery stores, clothing stores, shoe stores, jewelry & luggage, general merchandise, and office supplies.

McGaw Park Neighborhood Commercial and Office Employment Nodes

Due to the current success of Fitchburg Technology Campus and Fitchburg Center, additional office, light manufacturing, lab space, and supportive commercial is expected to be attracted to the area. The absorption of additional demand will depend on the availability of both of these office parks, as well as pending development at Green Tech Village. Additional access to the site through the construction of the intersection with US 14, as well as planned light rail, will only make the area more attractive for office development.

Fiscal Impact

There are many variables that will affect the outcome of the fiscal impact, including inflation of expenses, appreciation of existing property values, the total amount of commercial development, the rate / phasing of the development, and rise or fall in expected value of the units. Market appreciation of housing values greatly affects the development. As a result, longer phased build-outs are more greatly affected by market appreciation fluctuation. Note that all values are based are upon 2009 dollars. Neither inflation of costs nor appreciation of equalized assessed values was accounted for. Based upon current market values, the McGaw Park build-out will have a **positive** fiscal impact on the city of Fitchburg:

Phase 1: positive $974,000 impact on the City of Fitchburg.

Phase 2: positive $1,286,000 impact on the City of Fitchburg.

Phase 3: positive $783,000 impact on the City of Fitchburg.

Because the levy cap indirectly causes a yearly reduction to the City-wide tax rate, there is a tipping point in the rate / phasing of developments where any new development may become a fiscal burden on the municipality. Due to various levels of service costs for different land uses, a strong mix of uses, including residential and non-residential is planned, in order to assure a positive economic situation.

Chapter 11: Implementation

All phasing will need to be consistent with the Comprehensive Plan. Decisions by city policy makers relative to other neighborhoods and current urban service area development may affect the phasing of the neighborhood.

Phase 1:

The first phase will begin with extensions of sanitary and water supply from the northern portion of the area toward the south, and from the eastern and western portions of the neighborhood toward the center. Development will proceed in concert with planned developments, plus progress toward the expansion of park space around the perimeter of McGaw Park.

Phase 2

By the end of this phase, all of the northern portions of the neighborhood are expected to be completed, with infrastructure extended to serve all of these areas, including the completion of Nobel Drive through the area.

Phase 3

It will primarily consist of developing the southern sections of the neighborhood. All infrastructure would be completed by the end of Phase 3, including roads, water, sanitary, telecom, and transit.

Chapter 2: Introduction and Background

In the Spring of 2007, the City of Fitchburg commenced the planning process for the McGaw Park Neighborhood. As required, by Appendix H of the 1995 General Land Use Plan, the McGaw Park Neighborhood planning initiative provides land use, transportation, infrastructure, and environmental guidelines for the extension of the urban service boundary. The McGaw Park Neighborhood Plan was completed as part of a comprehensive planning process including guidance from a Steering Committee, elected officials, the public, staff, and consultants. The McGaw Park Neighborhood Plan will be adopted as a section of the Fitchburg Comprehensive Plan. The format and outline of the Fitchburg Comprehensive Plan has guided the McGaw Park Neighborhood planning process, and ensures that the future plan will be in compliance with the Comprehensive Plan.

Recognizing the unique environmental sensitivity of the Study Area, the McGaw Park Neighborhood planning process begins with an understanding of the environmental resources. Prior to setting the goals and policies for the future development of the neighborhood, a detailed environmental study and natural resources inventory was completed. Once environmental resources were identified and the boundaries of the environmentally sensitive lands were defined, land use, transportation, infrastructure, and environmental goals and policies were formulated in order to conserve and respect the natural resources. The goals and polices of the future development of the study area reflect a desire to preserve the existing natural resources and plan development around the most environmentally sensitive areas.

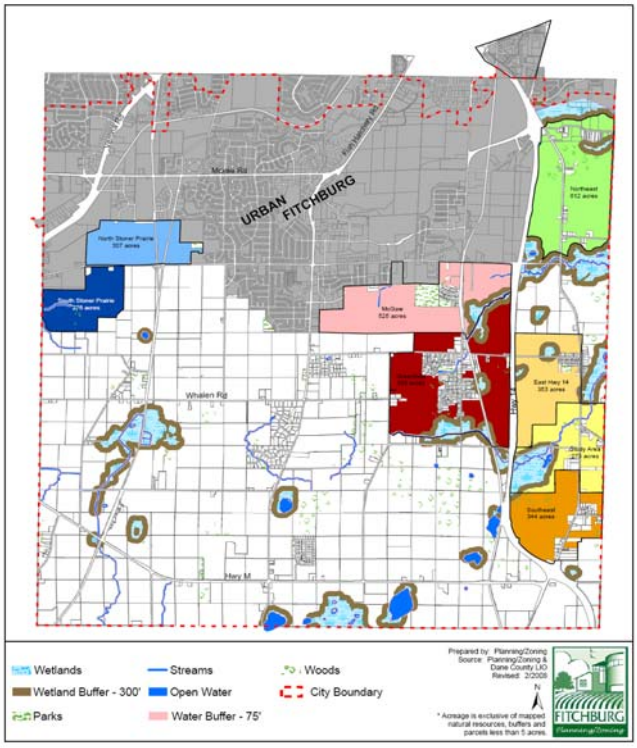
The general purpose of the Plan is to provide a rational basis for decision-making by the City when the private sector proposes a development/redevelopment opportunity within the Study Area after or concurrent with the expansion of the Urban Service Boundary. The plan is also a guide for public infrastructure planning and investment, including transportation, sanitary service, water supply, and park and educational facilities. It is anticipated by this Plan that full build-out of the 712-acre McGaw Park Neighborhood will be over 25 to 30 years.

City of Fitchburg Future Urban Development Area Boundary

In order to provide for managed and orderly growth the City of Fitchburg adopted Resolution R-30-07 and R-89-07, which established the City's future urban development area (FUDA) boundary. The FUDA study provides guidance for Urban Service Area (USA) expansions into specific neighborhoods that were not identified on the 1995 General Land Use Plan Map. All neighborhoods identified in the FUDA are adjacent to existing urban services boundaries so to provide the most reasonable and cost-effective provision of urban services.

The goal of the FUDA was to identify areas with the development potential to expand the USA and also establish a planning process to guide growth in those areas. Guiding growth and development to those neighborhoods will protect the remainder of the City from unnecessary and unplanned growth and retain the community character, agricultural lands, and the rural nature of Fitchburg. As noted in the City of Fitchburg General Land Use Plan, any expansion of the USA shall occur within one of the four identified FUDA neighborhoods and shall satisfy the FUDA Goal and Policies. McGaw Park was one of the neighborhoods identified in the FUDA study. The extension of urban services into the McGaw Park neighborhood can not occur prior to the completion of a Neighborhood Plan, which includes a comprehensive study of the impact of the provision of urban services and provides guidance for future build-out and development of the neighborhood. The Neighborhood Plan will be used to determine the extent, economic opportunities, feasibility, timing, and impacts of the proposed USA expansion and potential development including the capacity and extension of sanitary sewers, storm sewers, and a public water supply. The Neighborhood Plan provides direction on land use, park and school sites, environmental protection, and transportation analysis and improvements.

FUTURE URBAN GROWTH AREA NEIGHBORHOODS



Map 2.1: Future Urban Development Boundary

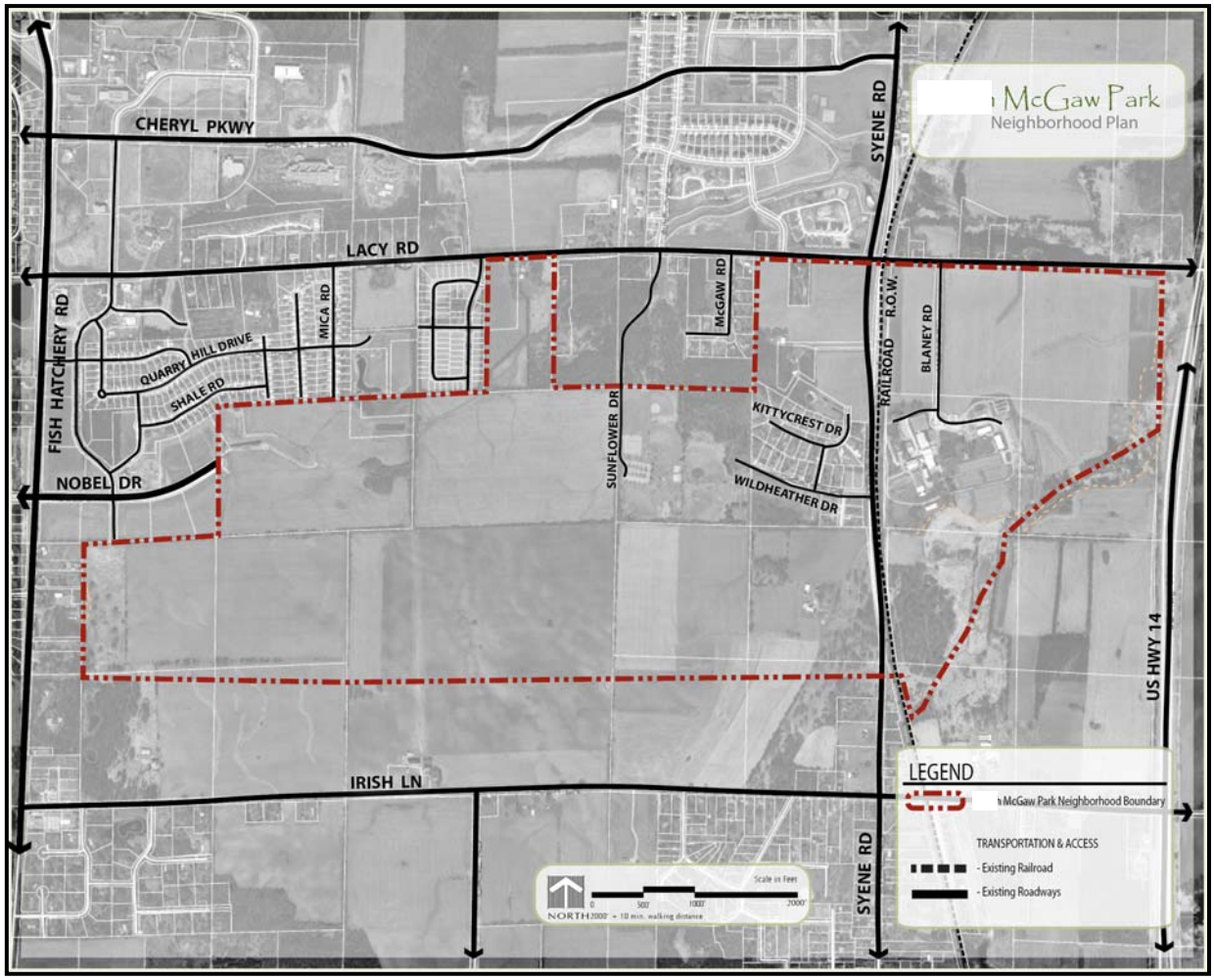
This plan will serve as a guide for the extension of the USA into the McGaw Park neighborhood, as required under the City of Fitchburg's Comprehensive Plan.

McGaw Park Neighborhood Study Area

With its location in central Fitchburg, and along the southern edge of urban Fitchburg, the McGaw Park Neighborhood is situated in a logical location for urban service expansion. Furthermore, due to its location directly adjacent to the Fitchburg Technology Campus and southwest of the planned U.S. Highway 14 interchange, the McGaw Park neighborhood is already experiencing development pressure.

The McGaw Park Neighborhood Study Area is located in the 12th ward of the City of Fitchburg and is approximately bounded by:

- South: Utility easement north of Irish Lane
- North: Lacy Road
- East: South Branch of Swan Creek
- West: Fish Hatchery Road



Map 2.2 McGaw Neighborhood Boundary

The McGaw Park Neighborhood Study Area encompasses approximately 712 acre or 1.1 sq/miles and is over 80% existing farmland and/or environmentally sensitive area. The neighborhood is characterized by an extensive waterway and drainage system that is part of the regional Lake Waubesa and the Waubesa Wetlands State Natural Area water system. In addition, there are various wetlands, woodlands, and habitat communities that are interspersed throughout the Study Area.

The Study Area is bisected north/south by Syene Road; however it is not bisected by an east/west road. A US-Highway 14 interchange is planned to connect to Lacy Road at the Syene Road / Lacy

Road intersection. In addition, a non-operational former freight rail line runs along the entire length of Syene Road, within the Study Area.

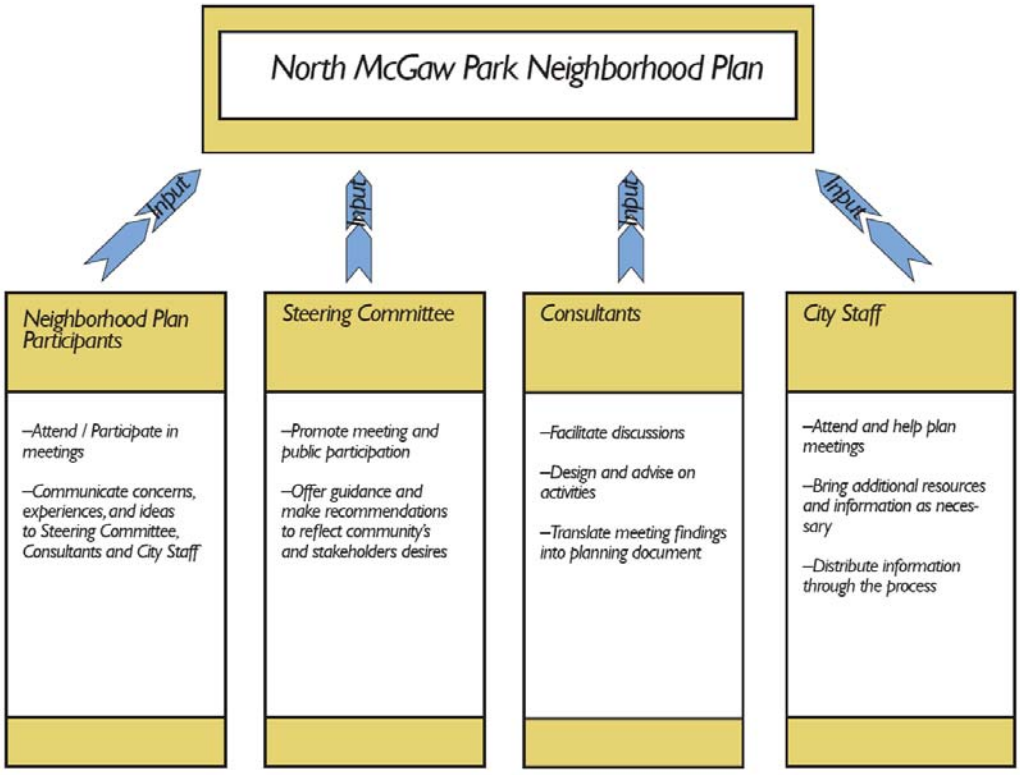
See the Appendix for more detailed information regarding neighborhood profile.

Neighborhood Planning Process and Team

The McGaw Park Neighborhood Plan is intended to serve as a dynamic and living document that will be used by the City to implement the strategies outlined. Due to its unique characteristics, urban service expansion, land use classifications, and transportation options were considered in a holistic approach. These decisions were guided through a comprehensive planning process that sought and included a variety of stakeholders consisting of property owners, residents, City Staff, and consultants. The primary objectives of the Planning Team were to:

- Create a collaborative and inclusive environment that fosters community building in determining the growth strategy for the neighborhood.
- Identify key issues, opportunities, and goals for the expansion of urban services to the neighborhood; and
- Determine the optimal growth strategy for the neighborhood.

The neighborhood planning process included Steering Committee meetings, neighborhood summits, a project website, and public hearings.



Steering Committee

The 10-member Steering Committee was comprised of local residents, neighborhood representatives, property owners, elected officials, and other stakeholders. Holding 18 meetings in one year, the Steering Committee was instrumental in ensuring the planning process was inclusive and best reflected the community's needs. The Steering Committee was responsible for:

- Promotion of public interest and facilitation of public participation;
- Guidance regarding stakeholder's and community's interests;
- Guidance of growth strategies; and
- Review of the Neighborhood Plan prior to official adoption.

Committee members are listed in the Acknowledgements.

Consultant Team

The Consultant Team included:

- Teska Associates, Inc., an urban planning and design firm, located in Evanston, IL, facilitated the neighborhood planning process, projected economic and market feasibility, and outlined land-use and design considerations.
- Montgomery Associates Resource Solutions, LLC, a water resource engineering firm, located in Madison, WI, provided expertise in hydrology and hydraulics applied to the environmental and land use management of the Neighborhood Plan.
- Natural Resources Consulting, Inc., a biological and natural resources firm, headquartered in Cottage Grove, WI, provided technical natural resource services, and regulatory consultation that addressed the neighborhood's environmental and natural resource issues.
- Traffic Analysis & Design, Inc., a traffic engineering firm, located in Cedarburg, WI, provided traffic engineering service, traffic analysis, TIAs, intersection design, and road cross-sections for the Neighborhood Plan.

Additional Public Participation

The community participation measures taken through this planning process were essential in establishing public support for the policies within the document and to ensure the plan can and will be implemented. The public process included four Neighborhood Summits and two Public Information Sessions at various points in the Plan's creation, which were used to present information and solicit community feedback in regards to various plan elements and studies. The feedback collected from the neighborhood summits was used to shape the guiding principles of the McGaw Park Neighborhood Plan.

A comprehensive document including meeting notes from the four Neighborhood Summits, the two Public Information Sessions, and all 15 Steering Committee Meetings is included in Appendix 2A.

Summary* of Steering Committee and Neighborhood Summit Meetings			
Meeting	**Date**	**Items Presented / Discussed**	**Action**
Steering Committee	May 8, 2008	City department heads presented background information.	The Committee visited various places within the study area.
Steering Committee	May 22, 2008	Steve Steinhoff of the Neighborhood Design Center lead a three part exercise, including site assessment, principles of design, and a model block exercise.	The Committee identified context, assets and issues, infrastructure, and phasing, and designed a model neighborhood using wood blocks and markers.
Steering Committee	June 5, 2008	City and Consultant Team: -outlined the Steering Committees roles and responsibility. -led a visioning exercise to help shape the goals and policies regarding the future development of the neighborhood.	One-word visioning exercise helps Steering Committee, City, and Consulting Team in formulating goals and policies for the future development of the neighborhood.
Steering Committee	June 19, 2008	City and Consultant Team: -presented City-wide park, open space, bike trail, and pedestrian plan, and the possible impacts on the neighborhood planning process. -presented environmental issues and opportunities, and led discussion on the potential impact such resources will have on future neighborhood development.	Identifying existing City plans and environmental resources will shape goals and policies for the future development of the neighborhood.
Steering Committee	July 10, 2008	City and Consultant Team presented transportation issues and opportunities, environmental issues and opportunities, and examples of various density levels.	Steering Committee identified neighborhood issues, opportunities, and constraints that will shape future development within neighborhood.
Steering Committee	July 24, 2008	City and Consultant Team: -presented existing City Comprehensive Planning actions. -Led discussion on future neighborhood density and LEED-ND certification status.	Steering Committee guidance on the targeted neighborhood density and LEED-ND certification status is reflected in Plan.
Steering Committee	August 7, 2008	City and Consultant Team: -provided an overview of the major elements shaping the plan: environmental resources, stormwater capacity, and transportation.	Steering Committee offered the following feedback regarding land uses that will impact the Growth Models: -the major mixed use and transit node for the plan should surround the wetland at the corner of Lacy and Syene. -a second, smaller Mixed Use node should be at the western most part of the study area. -an extension of the Business Park is appropriate. -a school, or a park should be located at neighborhood's major north-south and east-west road intersect.

Steering Committee	August 21, 2008	City and Consultant Team presented the three Growth Models for Committee discussion.	The Steering Committee offered specific feedback for each Growth Model.
Steering Committee	September 4, 2008	City and Consultant Team presented two revised Growth Models based upon the recommendations of the Steering Committee	The Steering Committee offered additional feedback on the revised Growth Models.
Steering Committee	September 18, 2008	City and Consultant Team: -presented a more detailed analysis of the existing neighborhood natural resources. -led a discussion regarding park land dedication and parking requirements.	The Steering Committee discussed the possibility of reducing the parking standards, and/or the city building a city parking structure.
Steering Committee	October 2, 2008	City and Consultant Team: -presented Transportation Impact Analysis. -presented phasing and build-out analysis. -led a discussion regarding various land use issues.	Steering Committee guidance on the targeted transportation, and land use issues is reflected in Plan
Steering Committee	October 16, 2008	City and Consultant Team: -presented additional traffic and transportation issues. -presented final phasing and build-out analysis -led a discussion with the Park Commission regarding various park and open space issues in the plan.	The Steering Committee refined the final phasing and build-out plan.
Steering Committee	October 30, 2008	City and Consultant Team: -led a discussion regarding land uses and density in the Mixed-use and Transit Oriented Development areas. -presented Trip Generation tables -led a discussion regarding parking requirements and standards	The Steering Committee identified contradictions between goals of the neighborhood plan and some existing city policies and codes.
Steering Committee	January 15, 2009	City and Consultant Team: -reviewed 2nd draft of plan	The Steering Committee refined the plan draft and offered recommendations for the final draft.
Steering Committee	February 19, 2009	City and Consultant Team: -reviewed stormwater requirements and performance -outlined the expected fiscal impact at full build-out -led a discussion on LEED-ND certification -outlined final transportation/traffic recommendations	The Steering Committee offered additional guidance on seeking LEED-ND certification.
Steering Committee	March 5, 2009	City and Consultant Team: Reviewed remaining issues with February Draft, including: -phasing -the definition used for Mixed-Use and Business Park, including needed performance standards. -the LEED-ND based formula for calculating FAR. -use of the term Light Rail. -Chris Armstong (Avante Properties) presented a fly-over video model of Fitchburg Technology Campus Phase II.	The Steering Committee decided to soften phasing dates, eliminate specific levels of residential and commercial uses in the mixed-use area, rejected proposed performance standards but recommended they be developed, included a reference to the LEED-ND FAR formula, and eliminated use of the term 'light-rail'

Steering Committee	March 17, 2009	City and Consultant Team: -reviewed recent changes in the March Draft, and addressed the following issues: -road connections south -a conservation design incentive system -LEED-ND Analysis -a 'land-use disclaimer' -the Implementation of Plan Through Policy Updates document	The Steering Committee decided against additional road connections south, Requested further study of conservation design incentive system, Tabled action on LEED-ND Analysis, Approved land-use disclaimer, Approved Implementation of Plan Through Policy Updates document, and Postponed final approval of plan and scheduled April 2 meeting.
Steering Committee	April 2, 2009	City and Consultant Team: Reviewed all comments and proposed changes to Plan, including changes regarding: -development parameters -the conservation design incentive system - LEED-ND Analysis Reviewed final language to satisfy motions passed at March 17 meeting, regarding: -FAR calculation formula -the Implementation of Plan Through Policy Updates amendment -road connections south	The Steering Committee made voted on all Agenda Items and final language to be used in the Plan, and voted to recommend approval of the Plan to the Plan Commission.
Public Information Session	June 19, 2008	City and Consultant Team: -outlined neighborhood planning process and introduced planning team -led discussion seeking public input regarding goals for future neighborhood development. -presented a brief overview of the environmental resources in the area.	City and consultant team obtained public comments regarding goals for future neighborhood development
Neighborhood Summit	July 10, 2008	City and Consultant Team highlighted and identified neighborhood issues, opportunities, and constraints that shape future development within neighborhood.	Residents ranked neighborhood goals based upon specific categories (environmental, housing,, land use, economic development, and transportation) to be addressed through the plan.
Neighborhood Summit	August 21, 2008	City and Consultant Team: -highlighted goals that were addressed by residents during the July 10th Neighborhood Summit. -presented a detailed report of the existing water resources identified in the neighborhood. -presented three different growth models based upon neighborhood planning goals and principles.	Residents ranked growth models to guide city and consultant team on final growth model that will guide the future development of the neighborhood.
Public Information Session	September 18, 2008	City and Consultant Team: - reviewed on-site natural resources -led discussion regarding future land use elements	City and consultant team obtained public comments regarding preservation of natural resources and future land use elements.
Neighborhood Summit	January 26, 2009	City and Consultant Team presented the draft Neighborhood Plan, including: -growth model and a model of the TOD -field collected data of natural resources -stormwater management and water supply plans -transportation recommendations	Residents commented on the draft Neighborhood Plan in three breakout sessions: land use, environmental, transportation. Each with a specialist consultant.

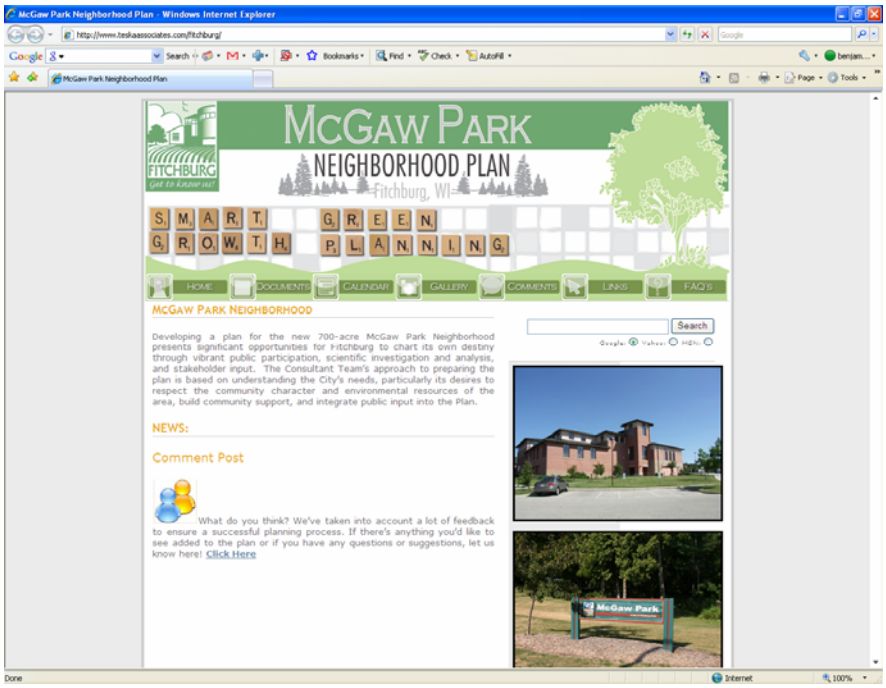
Neighborhood Summit	February 19, 2009	City and Consultant Team reviewed 2nd draft Plan: -recent changes -a more detailed stormwater management plan and expected results -process to obtain LEED-ND -review of transportation recommendations	Residents commented on the draft Neighborhood Plan, including a discussion of LEED-ND and roadways.
			*More detailed minutes can be found in Appendix 2A.

Stakeholder Interviews

One-on-one input was sought through stakeholder interviews. Stakeholders interviewed included representatives of the neighborhood, nearby residents, landowners, elected officials, business owners, non-profit organizations, realtors/brokers, and developers. The purpose of these interviews was to understand the various interest areas, seek input on issues and opportunities, understand environmental resources, and undertake an initial assessment of market viability. A list of the individuals interviewed is available in Appendix 2B.

Website

A project website was developed to provide the Steering Committee, City, and the entire community with an on-line forum to download interim reports, e-mail comments and questions, and check the overall progress of the planning process. The website became an integral part of the planning process, providing a complete set of documents for the community throughout the project, and opportunities for the public to comment, learn the next meeting date, and participate in discussion groups.



A project website was developed to solicit community input and distribute documents

Neighborhood Perspective

Over the course of the planning process, and as a result of the analysis of community conditions and input provided by residents and other stakeholders, there emerges a picture of the McGaw Park Neighborhood Plan that validates the many assets on which to build, issues for which solutions need to be found, and opportunities to advance the Plan.

Environmental and Agriculture Heritage

Fitchburg residents feel a strong connection to the land, rural and agricultural character, and history of the area. As such, there was a strong desire to ensure that any future development protects these identities. Residents expressed encouragement at the Plan's goal of identifying those environmentally sensitive areas first and planning around them. Residents recognized that strategically locating increased density and providing a variety of land uses within the neighborhood will allow protection of these lands. Residents expressed a desire to ensure that future residents had the option of growing their own food including community gardens and community supported agriculture.

Density

In order to protect those stated natural resources and environmentally sensitive lands, many interviewees expressed a desire for increased density. There was a common theme of trading increased density for the preservation of more green space. An increase in vertical density was also desired.

Quality of Life

Residents of Fitchburg strongly value their high quality of life including quality schools, rural character, agricultural history, legacy of park system, and affordability and variety of housing stock. Preservation of this quality of life was strongly desired.

School Districts

The neighborhood is bisected by the Oregon and Madison School Districts. The Madison School District has expressed a desire to add an elementary school in Fitchburg, preferably in or near the McGaw Park neighborhood. Oregon School District has noted that they would consider adding a school if the density in and around the McGaw Park Neighborhood increases. Due to the current State of Wisconsin school funding perimeters, both districts added that it would be in their best interest to add a limited amount of students to their respective district every year.

Transportation

Lacy Road is preserved as a heavily traveled road for traffic going east / west. Nearby residents have expressed concern that any density increase in the surrounding area will exacerbate existing traffic congestion on Lacy road, especially when the Route 14 interchange is completed. There was a desire to provide a complete transportation plan including automobile, pedestrian, bicycling and transit in order to alleviate traffic pressure on surrounding roads.

Vision of Developed McGaw Park Neighborhood

Many residents had a vision of the final built-out of the McGaw Park Neighborhood. This vision included:

- Integration of development with nature;
- Density for the preservation of environmentally sensitive lands and natural resources;
- Traditional neighborhood design (grid street system, short blocks, alleys, smaller homes, limited setbacks);
- Variety of uses including retail, business park, and housing;
- Various retail options including neighborhood convenience within walking distance;
- Mixed-use and transit oriented development;
- Diverse and affordable housing stock that can provide housing options for all income and age levels;
- Large pockets of open space and preservation of park legacy;
- Natural environmental corridors to separate various neighborhoods;
- Green technology and infrastructure; and
- Various transportation options including pedestrian, bicycles, and transit.

Leadership in Energy and Environmental Design-Neighborhood Development

The McGaw Park Neighborhood seeks to become a benchmark example of a sustainable neighborhood, aiming to be a participant in the U.S. Green Building Council's LEED-Neighborhood Development program. The LEED for Neighborhood Development Rating System integrates principles of "green", mixed-used, transit-oriented development by utilizing a point system. Seeking LEED-ND for the McGaw Park Neighborhood was a priority of the City and the McGaw Park Neighborhood Steering Committee. The Plan is not being driven by seeking LEED-ND status; rather the established goals and objectives of the Plan lend itself to seeking certification under LEED-ND.

LEED-ND emphasizes the creation of compact, walkable, vibrant, mixed-use neighborhoods with good connections to nearby communities and encourages compact development patterns and the selection of sites that are within or adjacent to existing development in order to minimize habitat fragmentation and preserve areas for recreation. In addition, LEED encourages convenient and efficient transportation options such as buses, trains, car pools, bicycle lanes and sidewalks. LEED-ND is currently in the pilot program nationally. In order to obtain LEED-ND certification, a neighborhood must meet a number of points based upon a rating system. Points are given based on "smart location and linkage," "neighborhood pattern and design," "green construction & technology," and "innovation and design process."

For each section of the plan, LEED-ND credits, steps to be implemented, strategies, and target points will be highlighted so as to guide development to ensure the neighborhood obtains LEED-ND status. All references to LEED-ND, throughout the Plan, refer to the October 31, 2008 Draft. A detailed LEED-ND analysis can be found in Appendix 2C.

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Chapter 3: Site Characterization

Land Uses and Ownership

Existing Land Uses

Agricultural use and parklands, accounting for over 91% of total acreage, highlight the land use composition for the McGaw Park Neighborhood. The neighborhood includes its namesake 49-acre McGaw Park, which includes both active and passive recreation. The remaining 9% is a mix of agricultural processing (Hartung corn processing plant), rural residential (subdivision of Tarpleywick Hills), and a scattering of large lot residential uses.

Table 3.1: Existing Land Uses

Land Use	sq ft	acres	% of total
Agricultural	24,711,723.3	567.3	83.3%
Park & Open Space	2,373,535.8	54.5	8.0%
Agricultural Processing	1,288,545.5	29.6	4.3%
Rural Residential	1,231,484.8	28.3	4.2%
Residential	68,832.8	1.6	0.2%
Study Area(TOTAL)	29,674,122.1	681.2	100.0%

Surrounding Land Uses

The surrounding land uses and development type to the south and east are similar to the McGaw Park Neighborhood. The land use to the north includes pockets of denser development; however, it is still dominated by agricultural, park & open space, or rural residential uses. The land uses to the west are more densely developed and includes the Fitchburg Technology Campus and denser residential.

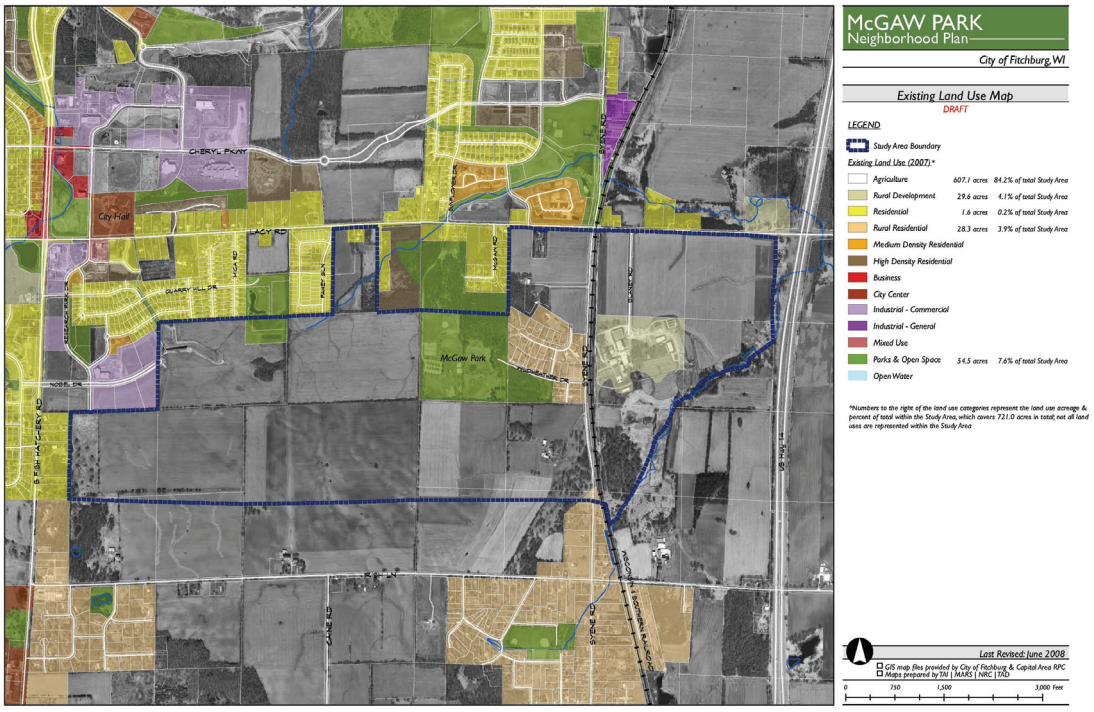


Figure 3.1: Existing Land Use Map

Property Ownership

The entire 712 acres, is controlled by only 15 separate land owners, including many very large parcels. The largest property owners include Fahey (155 acres), East Prairie Commons LLC (143 acres) Bowman Farms (85 acres), Stoneman Farm (79 acres), City of Fitchburg (55 acres), and the Fitchburg Technology Campus LLC (53 acres). The large parcels and consolidated property ownership of the Neighborhood will allow for potential future development in a cohesive and consistent manner.

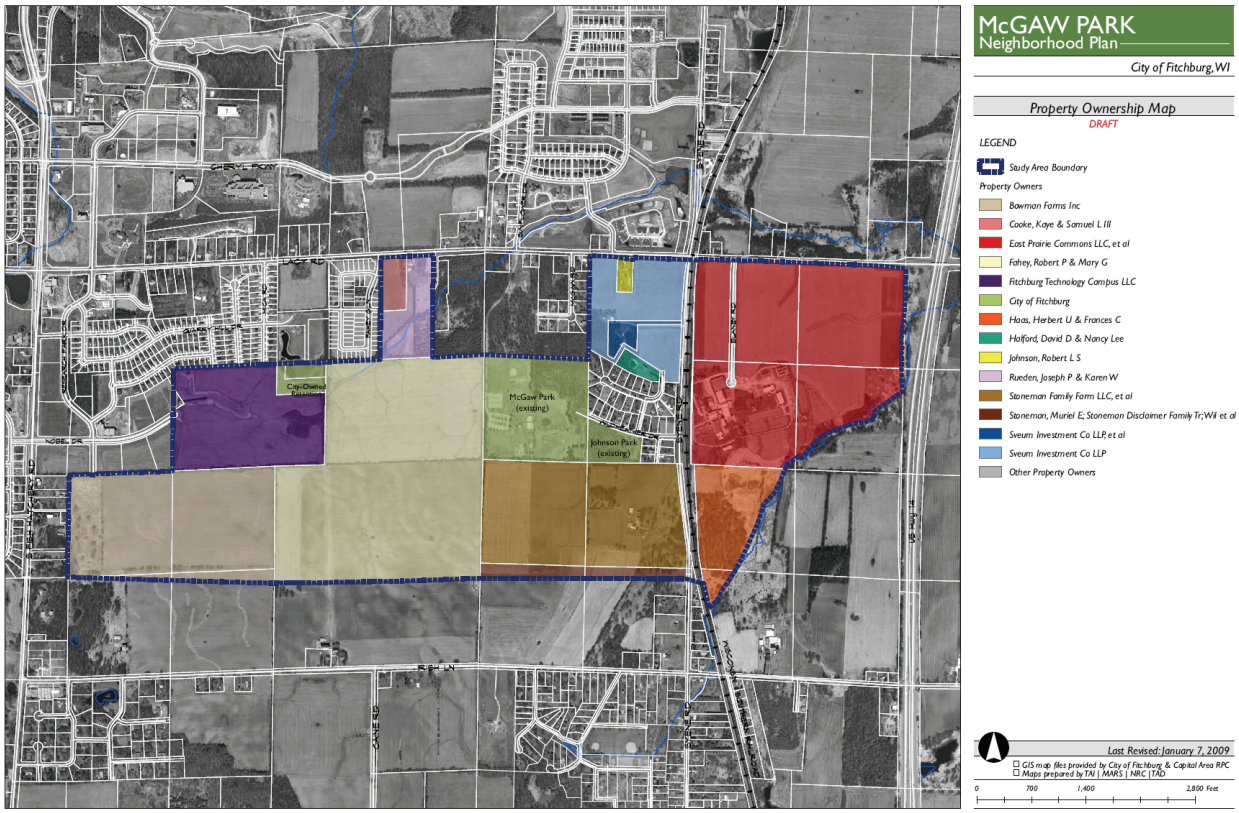


Figure 3.2: Existing Property Ownership Map

Environmental

Threatened, Endangered and Special Concern Species

Endangered and threatened species are provided protection under the Wisconsin Endangered Species Law (29.604 State Stats.). Special concern (Watch) species are those about which some problem of abundance or distribution is suspected but not yet proven. The main purpose of this category is to focus attention on certain species before they become endangered or threatened. The Natural Heritage Inventory (NHI) contains information about listed species and high quality natural communities that have been previously located by surveyors. The Wisconsin Department

of Natural Resources (WDNR) Bureau of Endangered Resources (BER) administers the Endangered Species Law and provides information about listed species from the NHI for parties considering or pursuing regulated activities that may affect listed species.

Natural Heritage Inventory Screening

National Resource Consultants (NRC), on behalf of the City of Fitchburg, requested a WDNR - BER NHI screening review for the study area in May 2008. A response letter dated June 11, 2008 from WDNR-BER, provided specific information regarding the potential presence of endangered resources within one mile of the study area (and two miles for aquatic species). The NHI information received by NRC guided subsequent detailed survey efforts of listed species.

The NHI review detailed four plant species which have the potential to occur within the study area if appropriate habitat exists. Information collected on each species was obtained from a variety of sources, including: the WDNR Endangered and Threatened species website (WDNR, 2008), Atlas of Wisconsin Prairie and Savanna Flora (T. Cochrane and H. Iltis, 2000), A Great Lakes Wetland Flora (S. Chadde, 2002), the PLANTS Database (USDA, NRCS, 2008) and the Wisconsin State Herbarium Website. Detailed habitat preferences and optimal identification period for each species is provided below:

- Giant yellow hyssop (*Agastache nepetoides*) is a plant listed as Threatened in the State of Wisconsin. This species prefers woodlands and forest edges, thickets, and river margins. Flowering occurs from early June through mid-October. Optimal identification period is from mid-July to late September.
- Pale-purple coneflower (*Echinacea pallida*) is a plant listed as Threatened in the State of Wisconsin. This species can be found in mesic prairies, railroad right-of-ways and roadsides, less frequently in dry open habitats such as gravelly slopes and gravel pits. Flowering occurs from late June to August and then fruiting from August onward.
- Slim-stem small-reedgrass (*Calamagrostis stricta*) is a plant listed as Special Concern in the State of Wisconsin. This species prefers dry to moist dunes, barrens, and dolomite or sandstone ledges, mostly near the Great Lakes, and also calcareous wetlands. Blooming occurs throughout the month of June, with July and August being the optimal identification period.
- Small white lady's slipper (*Cypripedium candidum*) is a plant listed as Threatened in the State of Wisconsin. This species prefers calcareous wet fens and prairies. Blooming occurs from mid-May through mid-June, with optimal identification from mid-May through mid-June.

The information gathered from the NHI screening results was evaluated and a subsequent field evaluation plan was developed to focus field survey efforts on these specific species. The field survey methods and results are discussed below.

Detailed Rare Species Habitat Assessments and Species Specific Surveys

Methods

Detailed information on the specific habitat and ecosystem requirements, along with flowering period, was collected for each of the species listed within the NHI review. This information was then used to maximize the likelihood of detection by surveying appropriate habitat during the optimal identification period. Based on this information, it was determined two rare plant investigations (spring and late summer) would sufficiently cover the optimal identification periods of all the species listed in the NHI review. As a result NRC conducted the spring rare plant investigations during various times in early June 2008 and the subsequent late summer investigation in September 2008 following the methodology outlined below.

A systematic approach using a controlled, meander survey was used to ensure adequate coverage of the site variations present within each community. This approach is particularly suited for detecting rare and significant plant assemblages or community types within the designated survey area. The methodology entails a thorough search of potentially suitable habitat based on a species' known characteristics, historic records of species occurrences, and existing site conditions. Each woodland community, railroad right-of-way, tree line, and wetland community was investigated for rare plants.

Results

No rare plants were found within the proposed McGaw Park Neighborhood. Many of the rare plants listed in the NHI review require specialized habitats which are often unique to an area because of severe habitat rarity or habitat loss and/or degradation caused by various anthropogenic influences. In addition to habitat requirements, rare plants can also remain dormant for many years, which is often the case for many rare orchid species. For these reasons, rare plants will often be found in very localized areas, and in the case of rare orchids, may not flower for many years at a time.

Some of the specialized habitats required by the rare plants listed in the NHI review include: exposed bedrock, unique wetland types (i.e. fen), prairie remnants, sand barrens and/or sandstone ledges. None of these habitats were observed within the study area. Specific habitats required by the small white lady's

slipper and the slim-stem small-reedgrass are not present within the study area. Potential habitat exists for the giant yellow hyssop along woodland edges within the study area; however, this species was not observed during the 2008 investigations. In addition, potential habitat exists for the pale-purple coneflower along the old railroad right-of-way within the study area. This species was also not observed during the 2008 investigations.

Summary

Although the NHI screening information listed four historical occurrences of threatened or special concern species within the general vicinity of the study area, during NRC's field surveys no current occurrences of these species or any other listed species were found within the study area. Based on no positive identification of such species and the lack of adequate habitat, rare species are not a constraint to the development of the neighborhood plan.

Cultural Resource Screening

Historic structures, archaeological sites, and cemeteries/burial sites may be subject to local, state or federal laws and regulations, such as Section 106 of the National Historic Preservation Act related to historic properties and archaeological sites and the Wis. Stat 157.70 Disposition of Human Remains associated with cemetery/burial sites. NRC conducted a cultural resource screening for the study area and immediately adjacent or contiguous properties utilizing the Wisconsin Historic Preservation Database (WHPD) maintained by the Wisconsin Historic Society. The following categories of WHPD were evaluated:

- Archeological Site Inventory (ASI)
- Architectural Historic Inventory (AHI)
- Bibliography of Archeological Reports

The cultural resource screening conducted by NRC is for planning purposes only and solely identifies documented cultural resources within the WHPD. Unknown and/or undocumented significant cultural resources may be present within the study area. Screening may not fulfill the requirements set forth under Section 106 of the National Historic Preservation Act which may be necessary in order to comply with Section 404 of the Clean Water Act or other federal programs. Although unlikely based on the screening results, field archeological investigations may be required through these regulatory programs prior to development.

Archaeological Site Inventory (ASI)

NRC reviewed known cultural resources within a one-mile radius of the study area. Two literature searches were conducted to review known cultural resources in the study area and within a one-mile radius. The first record search reviewed records of the Office of State Archaeologist, State Historical Society Archaeological Site Inventory Database (ASI) for archaeological and burial sites listed as of May 20, 2008. The inclusion of these cultural resources in the ASI may require additional investigation and are subject to Wis. Stat. 157.70 if it is a cemetery/burial site.

The results of the ASI search indicate no cultural resource sites within the study area and one cultural resource site recorded within a one-mile radius of the study area. The FRPA Site 47-DA-1075 is located approximately ¾ mile north of the study area in Section 10. The site is described as an isolated find (a secondary reduction flake) of lithic material. The cultural affiliation of this artifact is probably of unknown Prehistoric culture. The status, in relation, to eligibility and inclusion to the National Register of Historic Places is currently unknown.

Architectural Historic Inventory

The second search reviewed the records of the Wisconsin State Historic Preservation Office (SHPO) Architecture and History Inventory Database (AHI) for historic properties listed as of May 20, 2008. The inclusion of these sites in the AHI conveys no special status or advantage, the listing is merely a record of the property.

The results of the AHI search indicate no listed historic properties in the study area. Three historic properties are recorded within a one-mile radius of the study area. The first historic property is the McCoy Farmhouse, located approximately ¾ of a mile north of the study area in Section 11. The McCoy Farmhouse is registered as an historic structure of Italianate style built in 1852. The site was listed on the National Register of Historic Places (NRHP) in 1980. The second historic property is Spooner's 1852 Swan Creek Farm and is Fitchburg's most recent addition to the National Register. The farm is located along Lacy Road, close to County Highway MM in Section 13. The Swan Creek Farm is actually registered under the name "Nichols Haight Farmstead". The third historic property is known as AHI #4638 (Lake View Stagecoach Hotel), located approximately ¾ of a mile SE of the study area in Section 24. The structure is of the Greek Revival style with no known date. This historic property has not been evaluated for inclusion to the State Register and the NRHP.

An additional search of anthropological / archaeological material using the Atlas of Wisconsin Archaeology compiled by C. E. Brown and W.W. Hixon & Co. in 1924, revealed two Indian Trails approximately ¼ of a mile outside the study area tracking parallel with the eastern and western boundaries of the Study area (Map 2.2). The Indian Trails marked by Brown and Hixon & Co. in 1924 is an approximate estimate for the location of a pedestrian path noted by individuals and recorded by Brown and Hixon & Co. Brown and Hixon & Co. recorded hundreds of trails throughout Wisconsin from conversations and historical recollection of numerous Wisconsin citizens. It should be noted that the "Indian Trails" are approximate locations that are rarely intact due to systematical agriculture and timber activities.

Local historic resources not designated on federal or state lists include the Rueden farmhouse which is a designated City landmark located within the study area at 5329 Lacy Road. Additionally, the Old Fitchburg School lies just outside of the study area near Syene and Lacy Roads which is now a residence. A map of cultural resources can be found on page 7-2 of the Comprehensive Plan.

Other historical properties and archaeological sites may be present in or near the study area but have not been discovered or reported to the State Historic Preservation Office and the Office of State Archaeologist of Wisconsin. This literature review is intended to assist with fulfilling any local, state or federal laws and regulations, such as Section 106 of the National Historic Preservation Act related to historic properties and archaeological sites and the Wis. Stat 157.70 Disposition of Human Remains associated with cemetery/burial sites located in the study area.

Wetlands

Wetland Determination and Delineation

NRC performed a wetland determination and delineation of the McGaw Park Neighborhood study area. The purpose and objective of the wetland determination and delineation was to identify the extent and spatial arrangement of wetlands within the study area. The wetland delineation was completed by Jeff Kraemer and Stacy J. Steinke of NRC and Eric Heggelund of J.D. Knowles and Associates, Inc. on July 2, 2008.

Three wetland areas were identified in the study area. Wetland 1 (W-1) is a diverse wetland complex located along the eastern boundary of the study area. Wetland 2 (W-2) is a narrow wetland located between a railroad corridor and a farmed upland in the north-central portion of the study area. Wetland 3 (W-3) is an excavated pond located along the western study area boundary. Summaries of the characteristics of each wetland can be found below. A complete wetland delineation report was prepared; the report and supporting documentation are available separately.

Wetlands that are considered waters of the U.S. are subject to regulation under Section 404 of the Clean Water Act (CWA) and the jurisdictional regulatory authority lies with the United States Army Corps of Engineers (USACE). Additionally, the WDNR has regulatory authority over wetlands, navigable waters, and adjacent lands under Chapter 30 Wisconsin State Statutes, Act 6, and Wisconsin Administrative Code NR 103. Isolated wetlands no longer protected by federal law are also protected by NR 117.

Methods

Wetland determinations were based on the criteria and methods outlined in the *United States Corps of Engineers Wetlands Delineation Manual,* Technical Report Y-87-1 (1987) and subsequent guidance documents (USACE 1991, 1992), Guidelines for Submitting Wetland Delineations in Wisconsin to the St. Paul District Corps of Engineers (USACE 1996), and the *Basic Guide to Wisconsin's Wetlands and their Boundaries* (Wisconsin Department of Administration Coastal Management Program 1995).

The wetland determination involved the use of available resources to assist in the assessment such as USGS topographic maps, Natural Resources Conservation Service (NRCS) soil survey, Wisconsin Wetland Inventory (WWI) mapping and aerial photography.

On-site wetland determinations were made using the three criteria (vegetation, soil and hydrology) and the technical approach defined in the USACE 1987 Manual. According to procedures described in the 1987 Manual, areas that under normal circumstances reflect a predominance of hydrophytic vegetation, hydric soils, and wetland hydrology (e.g., inundated or saturated soils) are considered wetlands.

The uppermost wetland boundary was identified with consecutively numbered delineation flagging. The wetland boundary was surveyed with a Global Positioning System (GPS) capable of sub-meter accuracy and mapped using Geographical Information System (GIS) software. Subject to weathering, the flagging will remain in the field for use during a USACE / WDNR site review and as a guide during construction.

Wetland 1 (W-1)

Wetland 1 is comprised of four communities including wet meadow, shrub-carr, floodplain forest, and farmed wetland. The wetland is located adjacent to the southeastern boundary of the study area and appears to continue off-site to the east and south. W-1 is directly connected to an unnamed intermittent tributary that flows through the wetland. The intermittent tributary is likely to be considered a relatively permanent waterway (RPW) and is identified on the 24k hydro layer mapped by USGS (Figure 3.3 NRCS Soil Survey and WWI Mapping). The S. Branch of Swan Creek ("South Branch of Swan Creek") associated with W-1 flows from southwest to northeast through the wetland and discharges into Swan Creek approximately 700 feet east of the Property. The South Branch of Swan Creek is considered navigable within Wetland 1 (see Figure 3.4). Swan Creek is designated an Area of Special Natural Resource Interest (ASNRI) by the WDNR. Swan Creek then flows into Lake Waubesa, which flows into the Yahara River, both of which are also ASNRI waterways. The Yahara ultimately flows into the Rock River, which is a Section 10 Navigable Water of the United States.

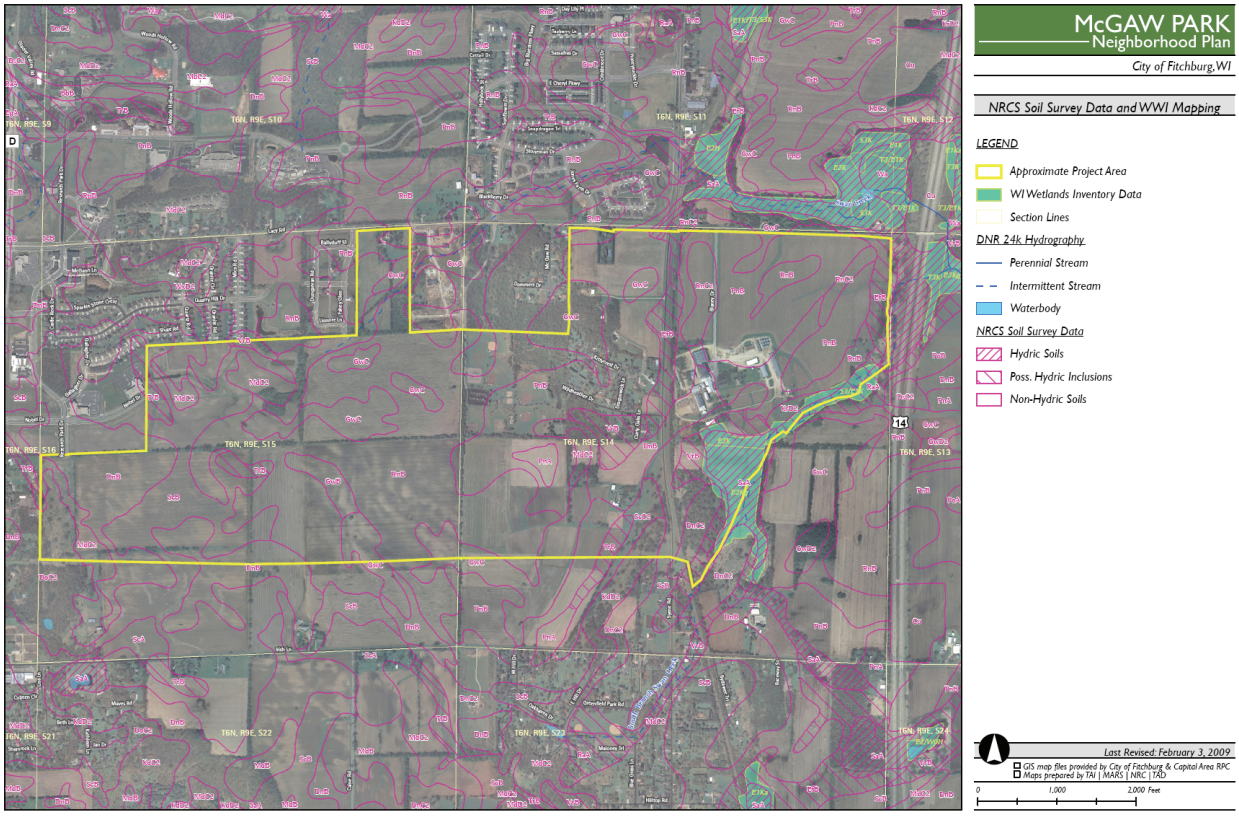


Figure 3.3 NRCS Soil Survey Data and WW1 Mapping

Photo 3.1 Wetland 1 is a wet meadow containing the headwaters to the South Branch of Swan Creek.

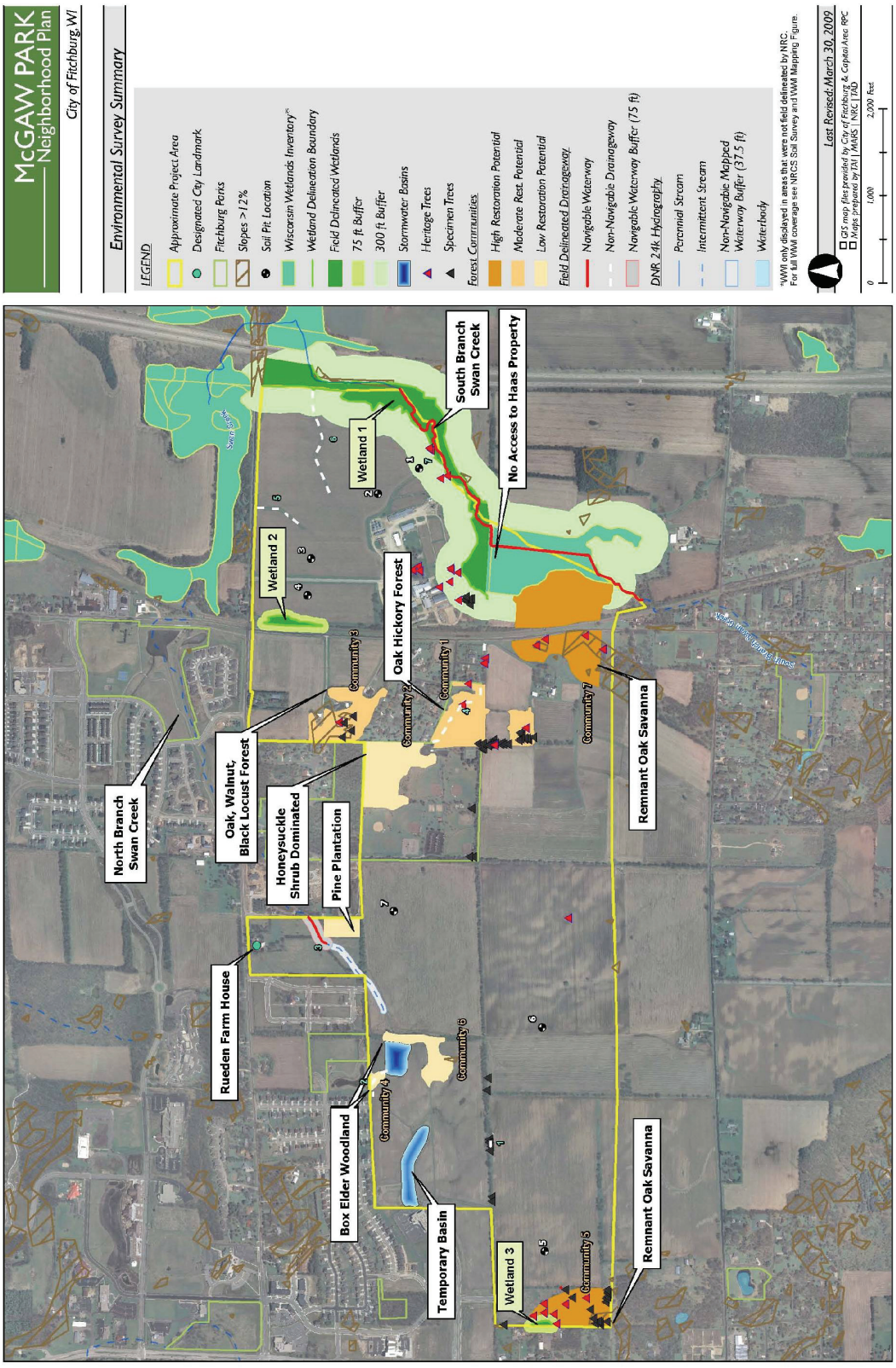


Figure 3.4: Field Collected Data

Vegetation

Dominant plant species within the wet meadow portion of W-1 consist of reed canary grass (*Phalaris arundinacea*). The shrub-carr portion of W-1 is dominated by sandbar willow (*Salix exigua*) and red osier dogwood (*Cornus stolonifera*). The floodplain forest is dominated by box elder (*Acer negundo*). The dominant species within the wetland are principally hydrophytic vegetation (OBL, FACW, and/or FAC) and meet the hydrophytic vegetation criterion.

Hydrology

W-1 appears to have a seasonally inundated/saturated hydroperiod within the central portion along the waterway and a seasonally saturated hydroperiod along the outer margins supported by local surface water runoff, seasonally high groundwater, and potential overbank flooding. Inundation and/or saturation within the upper 12 inches along with drift lines and sediment deposits were observed as primary indicators of wetland hydrology at the W-1 sample points. Secondary indicators of wetland hydrology included local soil survey data and the FAC-neutral test. Therefore, the wetland hydrology criterion was met within W-1.

Soils

Soils within the wetland are mapped by the NRCS as Elburn silt loam, Radford silt loam, Sable silty clay loam, and Virgil silt loam (Figure 3.3-A NRCS Soil Survey and WWI Mapping). The soils observed at the majority of sample points were generally consistent with these soil series characteristics. Field indicators of hydric soil identified consisted of NRCS field Indicators A11 – Depleted Below Dark Surface, F3-Depleted Matrix and F6-Redox Dark surface. Therefore, the hydric soil criterion was satisfied within W-1.

Wetland Boundary

The wetland boundary was determined based on distinct differences in vegetation, hydrology, soils and topography consisting of the following: 1) Transition from a wet meadow, shrub-carr, floodplain forest, or farmed wetland community to an old field or agricultural field upland community; 2) transition from inundated and saturated soils within the wetland to lack of wetland hydrology indicators within the adjacent upland; and 3) transition from poorly drained hydric soils to somewhat poorly drained and moderately well drained non-hydric soils. The transition from wetland to upland characteristics generally correlated with a well-defined topographic break.

Wetland 2 (W-2)

Wetland 2 is a wet meadow and shrub-carr community with a farmed wetland component located in the north central portion of the study area along a railroad corridor. W-2 drains to the west via a culvert under the railroad tracks to an upland roadside ditch that does not connect to any waterway. W-2 is an isolated wetland.

Vegetation

Dominant plant species within the wet meadow portion of W-2 consist of reed canary grass. Species identified within the farmed wetland portion include duckweed (Lemna sp.), curly dock (*Rumex crispus*), and Lady's thumb (*Polygonum persicaria*) along with drowned and water stressed corn (*Zea mays*). Although no formal sampling was conducted within the shrub-carr portion of W-2, the dominant plant species is gray dogwood (*Cornus racemosa*). The dominant species within the wetland are principally hydrophytic vegetation (OBL, FACW, and/or FAC) and meet the hydrophytic vegetation criterion.

Hydrology

W-2 appears to have a seasonally inundated/saturated hydroperiod. The main source of hydrology for W-2 appears to be runoff from the adjacent agricultural field which ponds on a seasonal basis due to an ineffective drainage system. Inundation was observed as primary indicator of wetland hydrology at the W-2 sample points. Secondary indicators of wetland hydrology included passing the FAC-neutral test. Therefore, the wetland hydrology criterion was met within W-2.

Soils

Soils within the wetland are mapped by the NRCS as Elburn silt loam (Figure 3.3-A NRCS Soil Survey and WWI Mapping). The soil observed at the sample points was not consistent with characteristics of the mapped series primarily due to thick sediment deposits from upslope erosion. The field indicators of hydric soil identified consisted of meeting the low chroma criteria set forth in the 1987 Corps Manual and NRCS Field Indicator F6-Redox Dark Surface. Therefore, the hydric soil criterion was satisfied within W-2.

Wetland Boundary

The wetland boundary was determined based on distinct differences in vegetation, hydrology, soils and topography consisting of the following: 1) Transition from a wet meadow, shrub-carr, or farmed wetland community to a mowed railroad right-of-way or an agricultural field upland community; 2) transition from inundated and saturated soils within the wetland to lack of wetland hydrology indicators within the adjacent upland; and 3) transition from hydric soils to non-hydric soils. The transition from wetland to upland characteristics generally correlated with a well-defined topographic break.

Wetland 3 (W-3)

Wetland 3 is an excavated pond surrounded by a narrow emergent community fringe located along the western boundary of the study area. W-3 is an isolated depression with no inlet or outlet, created by excavation. It is not associated with any permanent or intermittent waterway or drainage.

Vegetation

W-3 is primarily comprised of open water and contains an emergent wetland margin dominated by hybrid cattail (*Typha* x *glauca*) and reed canary grass. Duckweed is also present on the pond surface. The dominant plant species within the wetland are hydrophytic (OBL, FACW, and/or FAC) and meet the hydrophytic vegetation criterion.

Hydrology

W-3 appears to have a permanently inundated hydroperiod, with the primary source of hydrology being overland flow into W-3 from the uplands immediately adjacent and perhaps seasonally high groundwater. Inundation was observed as primary indicator of wetland hydrology at W-3. Therefore, the wetland hydrology criterion was met within W-3.

Soils

Soils within the wetland are mapped by the NRCS as Troxel silt loam (Figure 3.3 -A NRCS Soil Survey and WWI Mapping). Soils were not observed within W-3 as the majority of the wetland was permanently inundated and meet the hydric soils criteria by definition. Therefore, the hydric soil criterion was satisfied within W-3.

Wetland Boundary

The wetland boundary was determined based on distinct differences in vegetation, hydrology, and topography consisting of the following: 1) Transition from an emergent community to an old field community; and 2) transition from inundated and saturated soils within the wetland to lack of wetland hydrology indicators within the adjacent upland. The transition from wetland to upland characteristics generally correlated with a well-defined topographic break.

Off-site Wetland Boundaries

Mapping

The WWI shows wetlands just beyond the boundaries of the northeast corner of the site. Wetlands are mapped north of Lacy Road both east and west of State Trunk Highway 14, and also southeast of the intersection of Lacy Road and the highway (Figure III.3 NRCS Soil Survey and WWI Mapping). A portion of Wetland W-1 is located on the Haas Property, to which access was denied during wetland delineation field work. The WWI indicates that the wetland continues onto the Hass Property and also further south beyond the boundary of the site. At the north end of Wetland W-1, the wetland boundary was delineated and mapped past the site boundary up to the edge of the highway. No further wetlands are mapped within the immediate environs of the site.

Visual Assessment

During the course of the site assessment by NRC, the off-site wetlands were visually confirmed by NRC staff. Additional analysis of 2008 aerial photos confirms the location and approximate extent of the off-site wetlands. Both the visual assessment and the aerial photos suggest that the WWI mapping of off-site wetlands is representative of their approximate location and extent.

Wetland Functional Value Assessment

Functional value assessments of Wetland 1 and Wetlands 2 and 3 were completed utilizing the "WDNR RAPID ASSESSMENT METHODOLOGY FOR EVALUATING WETLAND FUNCTIONAL VALUES". The worksheets are included in the Appendix (Chapter 3).

Wetland 1

In general, Wetland 1 contains significant functional values due primarily to the water quality protection, stormwater storage functions, wildlife habitat, and direct hydrologic connection to Swan Creek. Swan Creek is identified as an area of special natural resource interest by the WDNR. A brief summary of each functional value follows; the detailed assessment is contained in Appendix (WDNR RAMS FORMS)

Floristic Diversity: This received a low ranking due to the predominance of reed canary grass.

Wildlife Habitat: This received a high ranking because of the wetland's direct association with the S. Branch of Swan Creek and the habitat value in comparison to the surrounding agricultural and developed areas. This wetland complex provides a relatively continuous wildlife corridor beginning within the Haas Property to Swan Creek.

Flood/Stormwater Attenuation: Flood and stormwater attenuation received a medium ranking for this wetland primarily due to its dense vegetation, landscape position surrounded by agricultural fields, and location in the lower reaches of the watershed.

Water Quality Protection: This received a high ranking, due to the ability of the wetland to store and filter stormwater runoff prior to entering the S. Branch of Swan Creek.

Shoreline Protection: This received a medium ranking because the wetland contains dense herbaceous vegetation and moderate shrub and tree cover that increase stream bank stability and prevent erosion of the S. Branch of Swan Creek.

Groundwater Protection: This ranked as high because the wetland is a site of groundwater discharge.

Aesthetics/Recreation/Education: This ranked as medium due primarily to the wetland's location within an area of potential development and environmental corridor, in which it would offer some recreational and/or scientific opportunities within an urban setting.

Wetlands 2 and 3

In general, Wetlands 2 and 3 contain minimal functional values due primarily to their small size and degraded states. Their primary functional value is stormwater storage, as they are situated in the lower extents of their respective watersheds. A brief summary of each functional value follows; the detailed assessment is contained in the Appendix (WDNR RAMS FORMS).

Floristic Diversity: Both wetlands received a low ranking due to the predominance of reed canary grass.

Wildlife Habitat: This received a medium ranking because of the habitat value in comparison to the surrounding agricultural areas (Wetland 2) and the presence of open water in a forested setting (Wetland 3).

Fishery Habitat: This is not applicable because the appropriate hydrology was not present in either wetland to support a fishery.

Flood/Stormwater Attenuation: Flood and stormwater attenuation ranked as medium for both wetlands primarily due to their location in the mid to lower reaches of their respective watersheds.

Water Quality Protection: This received a low ranking because neither wetland is directly connected to surface waters or densely vegetated.

Shoreline Protection: This is not applicable because neither wetland occurs in a lake fringe or riverine setting.

Groundwater Protection: This ranked as low. No groundwater discharge was observed and likely does not occur based on the wetland community type of Wetland 2 and the excavated pond nature of Wetland 3.

Aesthetics/Recreation/Education: This ranked as low due primarily to the small size and relatively poor quality of both wetlands.

Waterway Identification and Assessments

Stream Habitat Assessment

A qualitative habitat assessment, electrofishing survey, and invertebrate samples were performed at three sites representing three distinct stream branches, each a tributary to Lake Waubesa. These streams are part of the Yahara River/Lake Monona watershed, which falls within the Mississippi River Drainage of Wisconsin. The first sampling site, S. Branch of Swan Creek lies adjacent to a commercial farming facility. This site is within the study area of the McGaw Neighborhood Plan, where the stream runs within Wetland 1 near the southeast corner of the building complex. The Swan Creek sampling site, Swan Creek 2, is located along a stretch of Lalor Road and was accessed

from Lalor Road. The Murphy's Creek site was also located along Lalor Road, just south of the Swan Creek site, and was also accessed from Lalor Road. Swan Creek and the Murphy's Creek sites are located east of the study area and represent downstream conditions potentially susceptible to land uses within the McGaw Neighborhood Plan study area.

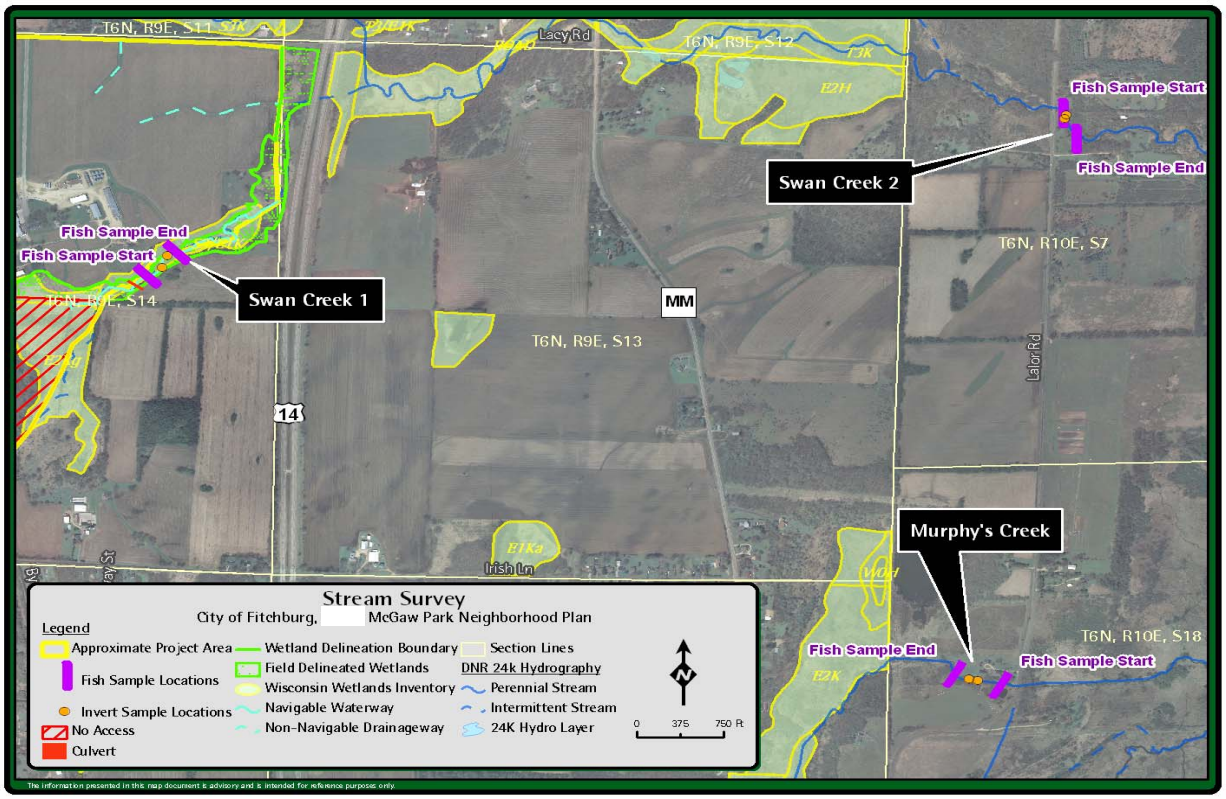


Figure 3.5: Stream Survey

The purpose of the evaluation was to document baseline conditions; evaluate aquatic habitat; and develop a better understanding of species composition and diversity within these waterways. The stream sampling was completed utilizing qualitative and reconnaissance level survey methods. Although this evaluation and the data compiled is useful for the objectives of this study, interpretation of the data results utilizing quantitative and empirical methodologies should be used with caution as the sampling techniques and efforts were not completed with the intent of such analyses.

Habitat Evaluation

The habitat at each site was visually surveyed. Both riparian and in-stream features were noted. Riparian conditions of special interest included the amount of canopy cover, the presence of undercut banks, bank stability, and bank vegetation. In-stream conditions examined were the type(s) of substrate, presence or absence of aquatic macrophytes, the amount of silt present at the site, and general fish habitat.

The habitat survey was strictly qualitative; aside from the width measurements to determine the reach lengths for the electrofishing surveys (see below), no measurements or counts of habitat characteristics were made during the course of this survey.

S. Branch of Swan Creek

At S. Branch of Swan Creek, the stream had some desirable characteristics typical of a small, headwater stream. The site was heavily wooded, allowing for a dense canopy of vegetation over the stream. Undercuts to the banks were typically small, though there were some areas of clear erosion and instability. The stream is susceptible to siltation and erosion due to the relatively steep slopes along the stream banks combined with adjacent agricultural activities. However, the riparian environment was generally appropriate and stable.

The in-stream habitat was a blend of desirable and undesirable features. The water was cool to the touch, and, when and where flowing, seemed to be of appropriate velocity. Based on temperature and flow monitoring completed by Montgomery Associates: Resource Solutions (MARS) this waterway is several degrees colder than the downstream portion of Swan Creek and slightly cooler than Murphy Creek. The mean summer temperature was approximately 57° F (max: 63° F). The flow velocity was approximately 0.51 ft/s.

The substrates were generally what would be expected of such a headwater stream: a mix of substrate sizes, dominated by gravels and cobbles, with some boulders. Also, there were no aquatic macrophytes, and only minimal coverage of algae and mosses, both signs of a healthy headwater stream. On the other hand, there was a high degree of siltation throughout this site. Walking in the stream released plumes of silt that seemed to take about 15 to 20 minutes to settle. Also, there were some areas of the stream in which flow was interrupted by overabundances of boulders or treefalls, creating stagnant, somewhat isolated pockets of standing waters. These pockets also had subjectively warmer water temperatures that are undesirable in a headwater stream.

Swan Creek

At Swan Creek, the overall condition of the stream gives the impression of a high degree of degradation. The riparian vegetation is dominated by mowed lawn and other grasses, with evidence of tree removal. There is very little canopy cover present at this site. The banks show a high potential for erosion and instability.

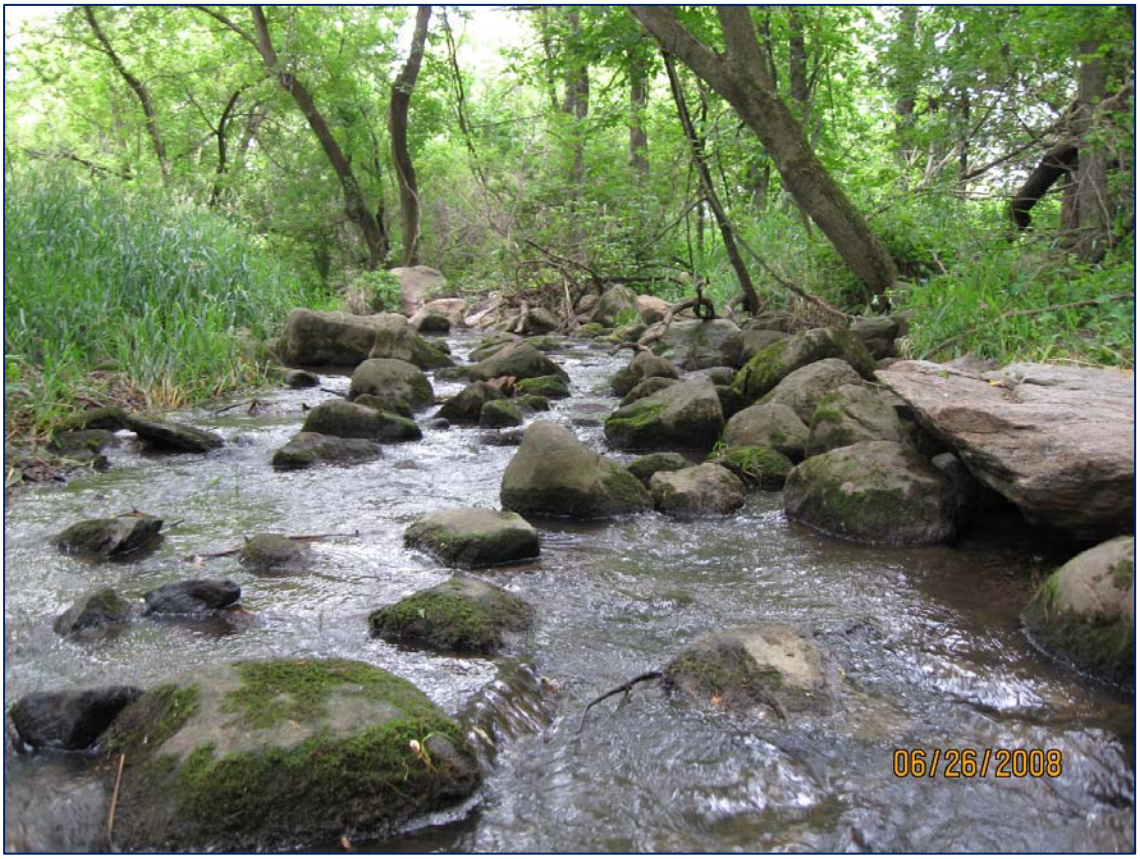


Photo 3.2: The South Branch of Swan Creek, with navigable waterway designation

The in-stream habitat also seems to indicate high levels of disturbance and disruption. The water is very silty and murky, and, in many places, stagnant and deep. The sediments are predominantly silts and clays with little to no riffle habitat. This would seem to indicate that most gravel and cobble sediments are regularly scoured out of this site by stormwater runoff that floods this system as a result of poor riparian vegetation and habitat. Based on temperature and flow measurements completed by MARS this stretch of Swan Creek contains a mean summer temperature of approximately 59° F (max: 66° F), slightly warmer than the S. Branch of Swan Creek. The upper reaches of Swan Creek, after the confluence of the two branches, contains mean summer water temperatures nearly 7° F warmer than downstream portions due to the proximity of online detention basins. Flow velocity was also lower than the other streams with an approximate velocity of 0.25 ft/s.

Murphy's Creek

Murphy's Creek appeared to have good habitat characteristics. The survey area was narrow, with cool water traveling at a swift pace. Velocity measurements completed by MARS indicated that the flow velocity was nearly twice that of Swan Creek and slightly greater than the S. Branch of Swan Creek (0.64ft/s). The average summer water temperature was approximately 61° F (max: 69° F) at this stretch.

While one bank, the north bank, seemed to have had many trees, shrubs, and other natural vegetation cut down and replaced by lawn and other grasses (there was a house and a farm on this bank), the riparian habitat, as a whole, seemed to be stable and appropriate for a headwater stream.

The in-stream habitat was also in generally good condition. The substrate largely consisted of gravels, with a mix of cobbles and boulders as well, and no aquatic macrophytes were present. There seemed to be a healthy, stable, pool-riffle-run stream structure, much more so than at the other two sites. Overall, this site seemed to have the best overall habitat characteristics.

Benthic Invertebrate Sampling

Benthic invertebrate communities were evaluated by collecting samples of riffle-dwelling invertebrates at each site. Riffle habitats (a type of in-stream habitat identified by relatively shallow water, fast current, and a gravel-based substrate) were identified within each stream stretch, and a kick-net procedure was used to dislodge the invertebrates from the substrate. A kick-net (or D-frame net) was held in the stream such that the current of the stream expanded the net. The collector kicked the substrate in front of the mouth of the net for thirty seconds, allowed the current to rinse and settle the sample, and then kicked for another thirty seconds. The contents of the net were immediately placed into a preservative solution (70% ethanol) to allow for identification and enumeration of the collected invertebrates at a later date. Two replicates were taken at each site, yielding a total of six individual samples.

Once the samples were collected, they were stored for later laboratory identification. The invertebrates were identified to family (or the appropriate taxon) and the numbers of individuals of each family counted. These data were used to calculate a Shannon Diversity Index, which is a measure not only of the number of species (or, in this case, families) present in the sample, but also of the distribution of individuals among species/families; as well as a Family-level Biotic Index (FBI), which is an indication of the degree of disturbance or organic pollution based upon the abilities of each family to tolerate different degrees of organic contaminants (Hilsenhoff 1987).

S. Branch Swan Creek

At S. Branch of Swan Creek, representatives of 11 families (464 individuals) were found in the two samples of invertebrates taken at this site. These samples were dominated by gammarids, a type of freshwater shrimp common to cold, headwater streams, and simuliids, the aquatic larvae of blackflies, also common to headwater streams.

Both samples at this site were very similar in terms of organismal diversity and the tolerance levels of the animals in the samples. The average Shannon diversity values of the two samples was 1.19, which would indicate a moderate level of diversity and evenness. The FBI calculations for each sample, when averaged, yield a value of 4.82, which, according to

Hilsenhoff (1987), indicates a potentially small level of organic pollution, but an overall good quality of habitat.

Swan Creek

Seven invertebrate families (or taxa) were found within Swan Creek, however 85% of the 215 individuals identified were comprised of gammarids, indicating a very low level of biological diversity. As expected, the Shannon diversity of these samples was very low; the average was 0.40, which indicates a very low level of organismal diversity. Furthermore, because these samples were dominated by one taxon, the gammarids, there is a very low level of evenness, or distribution of individuals among taxa.

The average FBI value was 4.09, which indicates "very good" water quality (Hilsenhoff 1987). However, based on the habitat evaluation completed indicating poor habitat quality, the FBI value is likely artificially high due to the unevenness of the species, comprised almost entirely of grammarids. While these are relatively intolerant species, a truly healthy stream would feature a diverse community of relatively intolerant organisms. Additionally, there was only one riffle habitat found at Swan Creek; the predominant habitat at this site was deep, somewhat stagnant pools with a silt or clay substrate. Such habitats are typically dominated by populations of very tolerant organisms, like crayfish, leeches, oligochaete worms, and nematodes; indeed, many pinktip crayfish (*Orconectes propinquus*) were captured or observed during the electrofishing survey. Thus, without performing more complex dredge sampling in these habitats it may be that the current FBI values are misleading, and that a more involved sampling regime would yield a different result that would be more indicative of the habitat observed at Swan Creek.

Murphy's Creek

Murphy's Creek hosted the most diverse and evenly-distributed invertebrate community of the three sites, and had an assortment of somewhat intolerant invertebrates. Eleven families (or taxa), comprised of 130 individuals were found in the samples taken at this site. The predominant invertebrates in these samples were gammarids, and asellids, which are aquatic isopods (like the terrestrial "pillbugs" or "sowbugs" common in basements and gardens).

The average Shannon diversity values of the two samples taken at Murphy's Creek was 1.62, which indicates a moderate to moderately high level of diversity and, more importantly, evenness; neither of the samples taken here was dominated by any one taxon. The average FBI value of the two samples was 4.93, which indicates a low level of potential organic pollution and a generally "good" aquatic habitat (Hilsenhoff 1987). This value is the best of the three streams and correlated well with the good habitat quality observed. Overall, Murphy's Creek appeared to have the healthiest invertebrate community.

Table 3.2: Benthic Invertebrate Sampling Results: Number of individuals caught per family (or appropriate taxonomic rank).			
Family (or taxon)	**Murphy Creek**	**S. Branch Swan Creek**	**Swan Creek**
Sphaeriidae	1	0	0
Nematoda	5	2	0
Hirudinea	1	0	0
Oligochaeta	1	1	0
Gammaridae	43	220	189
Asellidae	34	22	0
Baetidae	15	65	10
Hydropsychidae	0	5	2
Chironomidae	3	1	1
Blood Red Chironomid	7	0	3
Simuliidae	3	143	2
Tipulidae	17	1	0
Tabanidae	0	1	0
Elmidae	0	13	8
TOTALS	**130**	**464**	**215**

Electrofishing Surveys

To assess the fish communities present at each of these sites, an electrofishing survey was performed. This unit introduces pulses of DC electricity into the stream that momentarily stun the fish, causing them to float to the surface where they can easily be collected with dipnets. Once collected, the fishes were transferred to buckets of water taken from the stream until the entire reach (see below) had been sampled. After the entire reach was sampled, the fish were identified, counted, and released unharmed back to the stream.

To determine sampling effort, a reach was defined by taking ten measurements of stream width, calculating the average stream width from these measurements, and multiplying this average by 35 (Barbour et al. 1999). At S. Branch of Swan Creek, the mean width was 9.1', yielding a reach length of 318'. Swan Creek was very similar, with a mean width of 9.3', and a resultant reach length of 320'. Murphy's Creek was considerably narrower than either of the Swan Creek sites, with a mean width of 6.26', which yielded a shorter reach length of 220'. A further measure of sampling effort was provided by the backpack electrofishing unit, which recorded the number of seconds electricity was introduced to the water. This was used to compute the total amount of shocking time at each site, which was then used to determine the Catch per Unit Effort (CPUE) for each fish species at each site. Indices of Biotic Integrity (IBIs) were calculated for the fish communities at each site based on the Coldwater version.

S. Branch of Swan Creek

At S. Branch of Swan Creek, five species of fish were caught in a 318' reach during an 18.9 minute electrofishing survey. A total of 153 individual fish were caught, the highest total

catch of any of the streams. These were predominantly brook stickleback (*Culea inconstans*), a generally cool water fish, but also a very opportunistic species, capable of rapidly proliferating in species-poor streams (Becker 1983).

The Shannon diversity of the fish community was very low, 0.88, which is not unusual for a headwater stream. The assortment of species, however, was unusual for such a stream, which included a number of warm water species such as sunfish species, like bluegill, pumpkinseed, and warmouth. The resulting Coldwater IBI score was 20 (or Poor). Typically these species are not found in such headwater streams, and their presence suggests a shift from a less tolerant coolwater community to a more tolerant, warmwater fish community.

Swan Creek

At Swan Creek, six species of fish were captured during the electrofishing survey. This survey was conducted throughout a reach of 320' and took 21.42 minutes to complete. 38 individual fishes were caught, and no one species was dominant in this sample. This made for a somewhat diverse but very even sample, yielding a Shannon diversity value of 1.71, a moderately high diversity. Like S. Branch of Swan Creek, this site had an unusual mix of species representative of both warm and coolwater streams. As such, the Coldwater IBI values were 0, or very poor quality.

Murphy Creek

The electrofishing survey at Murphy's Creek yielded 31 individuals distributed among 5 species. The dominant species was the bluntnose minnow (*Pimephales notatus*), which made up 71% of the sample. Since this one species made up a very large percentage of the catch, the Shannon diversity value was a low 0.89; the community does not have an even distribution of individuals among species.

This preponderance of bluntnose minnows also caused very poor values of the Coldwater IBI (0). These species are very tolerant organisms, capable of existing in a wide range of disturbed habitats, and their presence in such high proportions indicates a somewhat disturbed aquatic habitat.

Table 3.3: Electrofishing Survey Results: Species, numbers caught, and total survey time			
Species (common name)	**Murphy's Creek**	**S. Branch of Swan Creek**	**Swan Creek**
Black Bullhead	1	0	0
Bluegill	0	1	5
Bluntnose Minnow	22	0	9
Brook Stickleback	0	110	4
Central Mudminnow	1	0	0
Fathead Minnow	1	13	9
Johnny Darter	6	0	8
Pumpkinseed	0	24	3
Warmouth	0	5	0
TOTALS	**31**	**153**	**38**
Survey Time (min)	**17.26**	**18.9**	**21.41**

Navigable and Non-Navigable Waterways

On June 26, 2008, NRC met Donna Sefton of the WDNR to determine the status of navigability for seven waterways and drainage features identified on-site. At the time of the meeting each waterway was jointly inspected by Charles Bauer, NRC and Donna Sefton. Summaries for each waterway are below. The official letter of navigability is found in the Appendix (Correspondence Letter). Photos of the waterways are found in the Appendix (Waterway Photos). Figure 3.4 includes the location and labels of each waterway.

Waterways 1 & 2 (Non-Navigable)

This is a small drainage that is likely the result of surface run-off from the surrounding agricultural fields. Bed and bank were not defined, and the area is typically plowed through as part of the farming practices. In addition, vegetation (both crops and natural weeds) were absent from the drainage area. Neither flowing nor stagnant water was present.

Waterway 3 – North Branch of Swan Creek (Navigable)

Waterway 3 is the North Branch of Swan Creek and is mapped as an intermittent stream by USGS which begins within the northern portion of the study area. However, based on field assessments, it was determined that drainage features are not developed within the full extent of the mapped waterway. As such WDNR determined the point of navigability begins approximately 1000 ft north of the USGS mapped waterway. Navigibility continues north to Swan Creek.

Waterway 4 (Non-Navigable)

This is a narrow stream channel with a poorly defined bed and bank primarily as a result of erosional activities. The waterway does not contain base flow and was therefore determined to be non-navigable.

Waterway 5 (Non-Navigable)

This is a wide, grassy drainage that conveys surface water from the surrounding agricultural fields into a roadside ditch running along the south side of Lacy Road. The bed and bank were not defined, and the vegetation was mowed. The drainage is likely a permanent water conveyance feature. Water was not present within the swale at the time of the observation. In addition, wetland vegetation was not observed.

Waterway 6 (Non-Navigable)

This is a wide, grassy drainage that conveys surface water from the surrounding agricultural fields into the wetland and waterway located to the east. The bed and bank were not defined. The drainage is a permanent constructed conveyance feature. The swale contained stagnant water, and some wetland vegetation was observed.

Waterway 7 – South Branch of Swan Creek (Navigable)

Waterway 7 is the South Branch of Swan Creek and contains well defined bed and banks. Water was flowing at the time of the site visit. The waterway is mapped on USGS mapping as a permanent waterway and is a tributary to Swan Creek. Vegetation was not growing within the stream channel.

Natural Community Identification and Assessments

Wildlife Habitat

As part of the overall environmental review an effort was made to identify wildlife species that are likely to inhabit the study area. This evaluation was made by comparing the habitat present within the study area to the habitat requirements for species known to reside in or frequent this geographic range. Also, species observed while conducting the wildlife habitat assessment site were documented. Descriptions of the existing habitat are presented in the preceding sections of this document. Based on the primarily agricultural land use present within the study area the list of species potentially present is somewhat limited to those species having an affinity to such habitat. Anecdotal observations of wildlife species and/or indications of their presence include: white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*) raccoon (*Procyon lotor*), gray squirrel (*Sciurus carolinensis*), American robin (*Turdus migratorius*), gray catbird (*Dumetella carolinensis*), wild turkey (*Meleagris gallopavo*), common crow, (*Corvus brachryhynochos*) blue jay (*Cyanocitta cristata*), white-breasted nuthatch (*Sitta carolinensis*), and downy woodpecker (*Picoides pubescens*). A list of additional species that could potentially reside in or seasonally inhabit the study area can be found in the Appendix (Wildlife Species).

The wildlife habitat and wildlife species composition within the study area is not unique to this geographic area. However, within this rapidly developing landscape, the study area provides several natural communities ranging from fairly good quality hardwood forest habitat to degraded wood lots and wetlands. As a result, there are a number of white-tailed deer, coyotes, wild turkey,

squirrels and a variety of other species occupying this area. For example, vegetation Communities 1 and 3 poses higher diversity in plant species and vegetation structure. As a result, these two areas would typically provide habitat for a larger variety of wildlife species. Vegetation Communities 5 and 7, although somewhat less diverse than the previous communities, provide a structure more suited to a subset of wildlife species that prefer a semi-open tree canopy and a grassland-type understory. Due to the prevalence of non-native plant species and lack of diversity growing within Communities 2, 4, 6, and the pine plantation, the wildlife habitat value is somewhat limited. These areas provide optional concealment cover when more suitable habitat is substantially occupied but lacks in sources of food. Although Wetland 1 is comprised primarily of non-native species, the variety of vegetation community types, the overall size of the area and its connectivity to adjacent habitat makes this corridor a valuable wildlife feature. Likewise, the habitat continuum provided by a combination of existing forested areas located in the north-central portion of the park, and Communities 1, 2, and 3 comprise the majority of wildlife habitat within the Project area.

Photo 3.3: Old field grassland habitat adjacent to Wetland 1

Vegetation corridors in the form of tree lines/fence rows are comprised primarily of non-native, low wildlife value trees and shrubs and are not substantial enough to provide significant wildlife habitat. Although wildlife may use these as travel corridors between more suitable habitat areas they are not essential in this landscape and connected habitat patches are limited.

Deterioration of the existing habitat by encroachment of non-native species has, and will continue to reduce the existing habitat diversity and ultimately the numbers of each species this habitat can support. Restoration and maintenance of the woodland and savanna communities would help to maintain, and potentially increase the diversity of species and number of wildlife occupying the study area. However, regardless of the habitat quality, these areas provide a network of connected habitat complexes that run through the eastern portion of the study area and along the western edge of the neighborhood footprint and extend beyond its boundary. It is this habitat continuum that currently provides the most benefit to local wildlife populations and provides the necessary habitat elements that support local wildlife populations. Through strategic planning, these contiguous habitat complexes can be maintained and even enhanced to maintain a compatible mix of development and wildlife habitat suitable to support a variety of wildlife species. Also, strategically locating and developing quality travel corridors between larger habitat complexes will help promote healthy wildlife populations and provide genetic diversity within the local wildlife population.

Natural Communities Ecology Type and Quality

NRC investigated the natural communities within the study area, collecting data on plant species diversity, floristic quality, and plant community inventories. Seven upland plant communities were identified and described, ranging from disturbed honeysuckle shrub dominated communities to oak savanna remnants.

Plant Species Diversity Survey Methods

An initial review of the study area yielded distinct areas of more natural vegetation which were not currently in agricultural production, residential or commercial development. A preliminary floristic inventory of these areas identified the dominant and co-dominant vegetation. Community names were assigned to these areas based on species composition and spatial distribution of the dominant vegetation (i.e., oak woodland, box elder woodland, or oak savanna). In general, each community was identified based on general uniformity in density, size distribution and species composition. Community boundaries were determined and mapped, and representative photographs for each plant community can be found in the Appendix (Photos). The mapped community unit boundaries were digitized onto aerial photography using GIS technology.

In order to measure plant species diversity, and quantify floristic quality, a comprehensive species list was compiled for each community. Methodology included using a meander survey technique, where the investigator conducted surveys on a controlled intuitive or meander basis. This methodology ensures adequate coverage of the site variations present within each community. The meander surveys were conducted during the months of June and September 2008.

A Floristic Quality Assessment was performed for each community using methodology developed by Floyd Swink and Gerald Wilhelm of the Morton Arboretum (Swink and Wilhelm 1994). This method is based on calculating an average Coefficient of Conservatism (C) and a Floristic Quality

Index (FQI) for each community. A predetermined C value was assigned to each identifiable native plant species using locally appropriate values assigned by a panel of botanical expertise. Each native species is assigned a C value which ranges from 0 to 10 and represents an estimated probability that a plant is likely to occur in a landscape relatively unaltered from what is believed to be a pre-settlement condition. C of 0 is applied to a species that demonstrates little fidelity to any remnant natural community; whereas C of 10 is applied to plants that are almost always restricted to pre-settlement remnants. Values lower than 4 generally represent weedy species and values closer to 10 represent more "conservative", rare or disturbance intolerant species (Swink and Wilhelm 1994).

FQI values were developed for each community within the study area using the formula:

FQI = Mean C($\sqrt{}$N)

C= Coefficient of Conservatism

N= species richness (Identifiable Native & Non-native)

FQI has traditionally been calculated using C values and species richness of only native species. However; more recently, scientists have been including the non-native species in the calculations, giving all non-native species a C value of "0". This is done because disregarding the non-native species can often give sites falsely elevated mean C and FQI values that do not reflect the presence or abundance of these less desirable species, which influences the overall floristic quality of an area. This methodology better reflects the actual integrity of a site, rather than simply using native species for the FQI analysis, particularly in highly disturbed conditions dominated by non-native taxa.

Because it utilizes measures of floristic diversity and quality, the FQI values can be used as one tool to evaluate the biological integrity and lack of disturbance in a particular site. FQI values, however, should be used in conjunction with other tools (such as functional assessments, assessments of wildlife habitat, etc.) to evaluate the integrity, quality, and value of a site. While FQI results must be carefully interpreted, especially in small sites or stands, which usually result in lower FQI values regardless of species composition, it is generally accepted that an FQI value of 35 and/or a mean C value of 4.0 indicates a site with very high floristic quality and integrity, while an FQI value of less than 20 and a mean C value of less than 2.5 indicates that the site is degraded (Swink and Wilhelm 1994).

Community Inventory Survey Methods

A resource inventory and analysis was performed at select sample plot locations throughout each community. At each sample plot, species specific information such as percent cover and density of tree species was recorded. Methodology of plot placement was separated into two general categories, subjective and objective. The category used depended mainly on the size and integrity of each community unit. In areas where only a few plots were needed, subjective plot placement was used. That is to say, the plots were placed at a carefully chosen site within the community so that the data collected from the plots represents the attributes of the community as a whole. The purpose of this methodology is to characterize the integrity of the community, which sometimes

requires deliberately placing plots away from field edges, clearcuts, roadsides, or other anthropogenic disturbances. In communities where more than a few plots were selected, objective plot placement was used. Here the plots were placed at regular intervals along transects across the entire community. The resource inventory was conducted on June 5-7, June 10, June 26, June 27 and September 3, 2008. At each sample plot, tree, shrub and herbaceous inventories were conducted following the methodology outlined below.

The tree inventory was conducted during the June 2008 monitoring event. The size of each sample plot varied depending on the density of trees within each community. The ideal plot size was estimated by following the zigzag methodology, where the average distance between ten trees was used to determine the appropriate plot radius. Once the ideal plot size was established, it remained the same throughout the community. The following table (Table 3.4) provides a summary of the different plot sizes used within each community.

Table 3.4: Plot sizes within each community

Community Numbers	Plot Radius (feet and inches)	Plot Size (acre)
1, 3, 4, 6	16'8"	1/50
2, 5, 7	26'4"	1/20

All trees over 4" diameter at breast height (dbh) were recorded (4.5' feet above grade) within the sample plot radius. Data collected from each sample plot was used to determine the relative abundance of each species within the sample plots, average dbh, trees per plot, trees per acre and basal area. Basal area is the total cross sectional area of the woody vegetation measured in square feet. Basal area and trees per acre are used to determine the density of trees within each community.

Shrub and herbaceous inventories took place during the June and September, 2008 field investigation. An approximate percent cover of all shrub species located within the sample plots was recorded.

A quadrat sampling methodology was used to evaluate the herbaceous understory vegetation. The quadrat sampling methodology involved centering four equally positioned square meter quadrats around the sample plot center. Quadrats were placed along each cardinal direction (i.e. north, south, east and west) approximately 10 feet from the plot center. The percent cover of each species in addition to bare ground was estimated using 5 % increments. The average percent cover for each plant species identified was computed for each community. The relative frequency for each plant species identified was determined based on the number of quadrats in which the plant was identified.

Vegetation Corridors (Tree Lines, Fencerows) Survey Methods

A number of vegetation corridors, separating agricultural fields and land parcels, are present within the study area. These areas function mostly as habitat and migratory corridors for a variety of bird and mammal species. They also serve as aesthetic resources by providing contrasting scenery from

other land uses, like residential and commercial lots. The composition and quality of these vegetation corridors were investigated by conducting a meander survey of all tree lines located within the study area.

Results by Community

Detailed information including the species, health, crown class, and dbh were recorded. Completed data sheets are presented in the Appendix (Plant Survey Data Sheets). Comprehensive species lists, with subsequent FQI calculations, were created for seven distinct communities within the proposed McGaw Park Neighborhood. The communities identified include remnant oak savanna, box elder woodland, honeysuckle shrub dominated, oak, walnut and black locust forested and oak hickory forest. Representative community photographs are found in the Appendix (Plant Community Photos) and a discussion of the community composition and floristic quality for each community is provided below.

Community 1: Oak Hickory Forest

Community 1 is an oak hickory forest located in the central portion of the study area. This community is a wooded portion of the City of Fitchburg's S. Johnson Park, and is bordered to the north and east by residential development, to the west by adjacent open park land and to the south by agricultural crop land. Community 1 is dominated by large canopy red and bur oaks (*Quercus rubra* and *Q. macrocarpa*) ranging in size from 20 to 45 inches diameter at breast height (dbh). A diverse sub-canopy layer is comprised of the same species present in the canopy, in addition to mulberry (*Morus alba*), box elder (*Acer negundo*), black cherry (*Prunus serotina*), aspen (*Populus tremuloides* and *P. grandidentata*), red pine (*Pinus resinosa*), butternut (*Juglans cinerea*), and shagbark hickory (*Carya ovata*). The dense shrub layer is comprised of mostly black cherry, common buckthorn (*Rhamnus cathartica*) and box elder; with common occurrences of red elm (*Ulmus rubra*), American elm (*Ulmus americana*), dogberry (*Ribes cynosbati*), quaking aspen (*Populus tremuloides*), bush honeysuckle (*Lonicera X bella*), shagbark hickory, raspberries (*Rubus* spp.), and multiflora rose (*Rosa multiflora*). The most abundant herbaceous plants include garlic mustard (*Alliaria petiolata*), white avens (*Geum canadense*), broad-leaf enchanter's-nightshade (*Circaea lutetiana*), Virginia creeper (*Parthenocissus quinquefolia*), and Jack-in-the-pulpit (*Arisaema triphyllum*).

A small woodlot south of Community 1 is separated from the main forest community by an agricultural field. This woodlot contains an open canopy dominated by 20 to 30 inches dbh white and bur oak species, with scattered shagbark hickory. Shrubby buckthorn, mulberry and honeysuckle species are present, particularity along the northern community boundary. The herbaceous understory is dominated by smooth brome, burdock, and black raspberry.

Overall a total of 48 species were noted in this community with 39 species considered native to Wisconsin. The mean C value for all species is 3.0, and the mean C value for just native species is 3.7. The calculated FQI value for all species is 21.1, and the FQI value for just native species is 23.4. Based on Swink and Wilhelm's range of FQI values and relative

community quality these values generally indicate a moderate quality floristic community. This community contains the highest FQI values of any of the communities analyzed within the proposed McGaw Park Neighborhood. This is a direct result of the density and diversity of species within this small woodlot. Although considered moderate in quality, this community maintains a very high diversity of desirable tree species within the canopy and subcanopy layers.

Table 3.5 below provides a summary of the tree density by size class within Community 1. The majority of trees fall within the 4.0-14.9 inch dbh class, with an estimated trees-per-acre average value of approximately 157. However, an average of only 14 trees per acre can be found within the 15.0-31.9 inch dbh class. No trees greater than 32 inches dbh were recorded within the sample plots, however, two trees greater than 32 inches were recorded during the meander survey. It can therefore be estimated there are at least 0.26 trees per acre greater than 32 inches dbh within Community 1.

Table 3.5: Community 1 Tree Density by Size Class

Dbh class (inches)	Average Trees/Plot	Average Trees/Acre
4.0 - 14.9	3.1	157.1
15.0 - 31.9	0.3	14.3
>32	0	0.26[1]

[1] Total derived from the meander survey rather than the tree survey. Two trees greater than 32 inches dbh were recorded in the 7.64 acre community.

Table 3.6 below provides a summary of the total number of trees, average dbh, relative abundance, and average basal area for each tree species recorded within the sample plots. A total of 25 trees, representing nine different tree species, were recorded. A few trees to note include wild black cherry, bur oak and butternut. Wild black cherry, with a total of nine recorded individual trees and a relative abundance of 36%, represents the most abundant tree recorded. Bur oak has a relative abundance of 12%, but contributes to the largest average dbh of 27.0 inches. Butternut has a relative abundance of 4%, but contributes to the second largest average dbh at 14.9 inches. Many of the other tree species were recorded infrequently and contain smaller average dbh's ranging from 5.1 to 8.6 inches. It can therefore be inferred that bur oak and butternut represent the larger subcanopy species, black cherry is the most abundant intermediate sized trees, and all others can be found occasionally throughout Community 1.

Table 3.6: Community 1 Characteristics by Species					
Species Name	**Common Name**	**Total Number of Trees**	**Average Dbh (in.)**	**Relative Abundance**	**Average Basal Area (sq ft)**
Prunus serotina	wild black cherry	9	8.7	36%	0.42
Ulmus americana	American elm	1	5.5	4%	0.16
Quercus macrocarpa	bur oak	3	27.0	12%	3.98
MORUS ALBA	white mulberry	1	5.1	4%	0.14
Acer negundo	box elder	2	5.2	8%	0.15
Populus grandidentata	large-toothed aspen	1	8.6	4%	0.40
Populus tremuloides	quaking aspen	4	7.8	16%	0.33
Pinus resinosa	red pine	3	5.9	12%	0.19
Juglans cinerea	butternut	1	14.9	4%	1.21

Table 3.7 below details the number of live trees and basal area on a per plot basis. Averages for all sample plots list the number of live trees at 4 per plot and 179 per acre. Average basal area per plot is 2.97 and average basal area per acre is 148.

Table 3.7. Community 1 Number of Trees and Basal Area by Sample Plot				
Plot Number	**Number of Live Trees/Plot**	**Basal Area/Plot (sq ft)**	**Number of Trees/Acre**	**Total Basal Area/Acre (sq ft)**
1-1	0	0	0	0
1-2	7	10.16	350	508
1-3	4	1.04	200	52
1-4	1	0.40	50	20
1-5	8	3.16	400	158
1-6	2	1.56	100	78
1-7	3	4.44	150	222
Average:	**4**	**2.97**	**179**	**148**

Community 2: Honeysuckle shrub dominated

Community 2 is a honeysuckle shrub dominated community located in the north-central portion of the study area. This community is a wooded portion of the City of Fitchburg's McGaw Park, and is bordered to the north by adjacent wooded park land, to the east by residential development and to the south and west by adjacent open park land. The dominant vegetation within this community is an abundance of non-native bush honeysuckle. Tree cover is sparse, but occasionally small trees ranging in size from 5 to 16 inches dbh of black cherry, black locust (*Robinia pseudoacacia*), Norway spruce (*Picea abies*), box elder and mulberry (*Morus alba*) were noted. Black locust was present primarily in the northern portion of the community, and is likely encroaching from the north, where it is very abundant within the adjacent wooded portion of McGaw Park. Norway spruce seems to occur primarily along the recreational trails meandering through the community, and were likely planted as a visual barrier as they often occur in straight lines. Box elder and mulberry are early successional species which commonly encroach on disturbed sites such as Community 2. They can be found in scattered locations throughout the community.

The shrub component reaches an average density of approximately 76% cover of mostly bush honeysuckle and very occasionally common buckthorn and box elder. The percent cover of understory vegetation is significantly compromised due largely to the shading effect of the dense shrub layer. As a result, bare ground represents the highest percent cover, and honeysuckle shrub and buckthorn seedlings were noted only occasionally in the herbaceous layer.

Overall a total of 52 species were noted in this community with 31 species considered native to Wisconsin. The mean C value for all species is 2.1, and the mean C value for just native is 3.5. The calculated FQI value for all species is 15.3, and the FQI value for just natives is 19.8. Based on Swink and Wilhelm's range of FQI values and relative community quality these values generally indicate a low quality floristic community.

Table 3.8 below provides a summary of the tree density by size class within Community 2. The majority of recorded trees fall within the 4.0-14.9 inch dbh class, with an estimated trees-per-acre value of approximately 97, whereas an average of only 3 trees per acre can be found within the 15.0-31.9 inch dbh class. No trees greater than 32 inches dbh were recorded within the sample plots or observed during the meander survey.

Table 3.8: Community 2 Tree Density by Size Class

Dbh class (inches)	Average Trees/Plot	Average Trees/Acre
4.0 - 14.9	4.8	97
15.0 - 31.9	0.2	3
>32	0	0

Table 3.9 below provides a summary of the total number of trees, average dbh, relative abundance, and average basal area for each tree species recorded within the sample plots. A total of 30 trees, representing six different tree species, were recorded. A few of the species, most notably smooth sumac and white mulberry, are generally considered shrubs/small trees. This is particularly evident when you look at their average dbh, which ranges from 4.1 to 4.7. Wild black cherry and Norway spruce are the most abundant species, with a relative abundance of 37% and 30% respectively. Black locust contributes to 17% of the total trees recorded, but is restricted to the northern portion of the community.

Table 3.9. Community 2 Characteristics by Species

Species Name	Common Name	Number of Trees	Average Dbh (in.)	Relative Abundance	Average Basal Area (sq ft)
Prunus serotina	wild black cherry	11	8.9	37%	0.43
PICEA ABIES	Norway spruce	9	8.7	30%	0.41
Acer negundo	box elder	3	4.5	10%	0.11
Rhus glabra	smooth sumac	1	4.1	3%	0.09
ROBINIA PSEUDOACACIA	black locust	5	7.8	17%	0.33
MORUS ALBA	white mulberry	1	4.7	3%	0.12

Table 3.10 below details the number of live trees and basal area on a per plot basis. Averages for all sample plots list the number of live trees at 5 per plot and 100 per acre. Average basal area per plot is 1.96 and average basal area per acre is 39.

Table 3.10 Community 2 Number of Trees and Basal Area by Sample Plot

Plot Number	Number of live trees/plot	Basal Area/Plot (sq ft)	Number of trees/acre	Total basal area/acre (sq ft)
2-1	1	0.34	20	7
2-2	7	3.24	140	65
2-3	1	0.15	20	3
2-4	4	1.49	80	30
2-5	3	0.41	60	8
2-6	14	6.12	280	122
Average:	**5**	**1.96**	**100**	**39**

Community 3: Oak, Walnut, and Black Locust Forest

Community 3 is an oak, walnut, and black locust-dominated forest located in the north-central portion of the study area. This community is bordered to the north and east by agricultural crop land, and to the south and west by residential development and is contiguous to the northeast woods of McGaw City Park. This community is dominated by a canopy of large 20 to 40 inches dbh red, bur and white oak trees (*Quercus rubra, Q. macrocarpa* and *Q. alba*). The subcanopy is comprised of mostly black locust, box elder, walnut and white mulberry with some additional red oak, bur oaks and wild black cherry. Shrub cover varies considerably throughout the community and is comprised of mostly bush honeysuckle and common buckthorn, with other occurrences of mulberry, black cherry, shagbark hickory, and dogberry. Herbaceous vegetation is largely represented by garlic mustard, white avens, broad-leaf enchanter's-nightshade and Jack-in-the-pulpit. Other herbaceous associates are found only infrequently.

Overall a total of 36 species were noted in this community with 24 species considered native to Wisconsin. The mean C value for all species is 2.4, and the mean C value for just native is 3.6. The calculated FQI value for all species is 14.3, and the FQI value for just natives is 17.6. Based on Swink and Wilhelm's range of FQI values and relative community quality these values generally indicate a low quality floristic community.

Table 3.11 below provides a summary of the tree density by size class within Community 3. The majority of trees fall within the 4.0-14.9 inch dbh class, with an estimated trees-per-acre value of approximately 208, whereas an average of only 33 trees per acre can be found within the 15.0-31.9 inch dbh class. No trees greater than 32 inches dbh were recorded within the sample plots; however, five trees greater than 32 inches were recorded during the meander survey. It can therefore be estimated there are at least 0.67 trees per acre greater than 32 inches dbh within Community 3.

Table 3.11. Community 3 Tree Density by Size Class

Dbh class (inches)	Average Trees/Plot	Average Trees/Acre
4.0 - 14.9	4.2	208.3
15.0 - 31.9	0.7	33.3
>32	0	0.67[1]

[1] Total derived from the meander survey rather than the tree survey. Five trees greater than 32 inches dbh were recorded in the 7.49 acre community.

Table 3.12 below provides a summary of the total number of trees, average dbh, relative abundance, and average basal area for each tree species recorded within the sample plots. A

total of 29 trees, representing seven different tree species were recorded. Black locust, red oak and walnut represent a moderately sized dbh class ranging from 11.1 to 14 inches dbh, and dominate the subcanopy layer with relative abundances of 34%, 3% and 14% respectively. Box elder and mulberry are frequently found with relative abundances of 17%, but belong to a smaller dbh class ranging from 5.2 to 10.4 inches. These species are common intermediate size species, along with black cherry and bur oak.

Table 3.12: Community 3 Characteristics by Species

Species Name	Common Name	Number of Trees	Average Dbh (in.)	Relative Abundance	Average Basal Area (sq ft)
Prunus serotina	wild black cherry	3	9.8	10%	0.52
ROBINIA PSEUDOACACIA	black locust	10	11.1	34%	0.67
Acer negundo	box elder	5	10.4	17%	0.59
Juglans cinerea	white walnut	4	14	14%	1.07
Quercus macrocarpa	bur oak	1	5.2	3%	0.15
Quercus rubra	northern red oak	1	11.9	3%	0.77
MORUS ALBA	white mulberry	5	5.2	17%	0.15

Table 3.13 below details the number of live trees and basal area on a per plot basis. Averages for all sample plots list the number of live trees at 5 per plot and 242 per acre. Average basal area per plot is 3.03 and average basal area per acre is 151.

Table 3.13: Community 3 Number of Trees and Basal Area by Sample Plot

Plot Number	Number of live trees/plot	Basal Area/Plot (sq ft)	Number of trees/acre	Total basal area/acre (sq ft)
3-1	4	2.55	200	127
3-2	2	1.87	100	93
3-3	8	2.16	400	108
3-4	8	7.01	400	350
3-5	4	2.78	200	139
3-6	3	1.80	150	90
Average:	**5**	**3.03**	**242**	**151**

Community 4: Box Elder Forest

Community 4 is a box elder dominated woodland located in the northwestern portion of the study area. This community is bordered to the north by a neighborhood park, to the east, south and west by agricultural crop land. The dominant tree species within this community is box elder, which ranges in size from 6 to 12 inches dbh. The shrub component is minimal, but smaller bush honeysuckle, dogberry and Allegheny blackberry (*Rubus allegheniensis*) were noted in the herbaceous layer. The dominant herbaceous plants include garlic mustard, white avens, common burdock (*Arctium minus*), and Virginia creeper.

Overall a total of 23 species were noted in this community with 15 species considered native to Wisconsin. The mean C value for all species is 1.8, and the mean C value for just native is 2.7. The calculated FQI value for all species is 8.5, and the FQI value for just natives is 10.6. Based on Swink and Wilhelm's range of FQI values and relative community quality these values generally indicate a very low quality floristic community.

Table 3.14 below provides a summary of the tree density by size class within Community 4. All 21 trees, representing just one species (box elder) fell within the 4.0-14.9 inch dbh class, with an average dbh of 9.4 inches. Based on a sample plot size of one fiftieth of an acre, this translates to an average tree per acre of 1050. The total basal area is 10.55 sq ft, which translates to an estimated 527.5 sq ft in basal area on a per acre basis.

Table 3.14: Community 4 Tree Density by Size Class

Dbh class (inches)	Average Trees/Plot	Average Trees/Acre
4.0 - 14.9	21	1050
15.0 - 31.9	0	0
>32	0	0

Community 5: Remnant Oak Savanna

Community 5 is a remnant oak savanna located in the south-west corner of the study area. This community is bordered to the north and east by agricultural crop land, to the south by a utility right-of-way and to the west by residential development. This open canopy community is dominated by large, open grown red, bur and white oak trees (*Quercus rubra, Q. macrocarpa* and *Q. alba*). Many of the oaks range in size from 22 to 47 inches dbh, and are scattered throughout the savanna-like community. This community is designated as remnant oak savanna given the size and age of the overstory tree species. There is considerably less than 50% tree canopy, which is commonly used to describe a savanna community. Shrubs represent less than 5% cover and are comprised of oak seedlings, common buckthorn,

mulberry, and bush honeysuckle. The herbaceous community is dominated by graminoid species such as Kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*), and other weedy forb species such as Queen Anne's lace (*Daucus carota*) and creeping-Charlie (*Glechoma hederacea*).

Overall a total of 50 species were noted in this community with 29 species considered native to Wisconsin. The mean C value for all species is 1.8, and the mean C value for just native is 3.0. The calculated FQI value for all species is 12.4, and the FQI value for just natives is 16.3. Based on Swink and Wilhelm's range of FQI values and relative community quality these values generally indicate a low quality floristic community.

Thirteen trees greater than 32 inched dbh were recorded in the 7.699 acre community.

Community 6: Box Elder Forest

Community 6 is a box elder dominated woodland located in the northwestern portion of the study area, just south of Community 4. This community is bordered on all sides by agricultural crop land. Part of the community extends north along an existing tree line, but the bulk of the community is a wooded portion which extends west of the tree line. The dominant tree species within this community are box elder, which ranges from 5 to 20 inches dbh, and black locust, which ranges from 4 to 15 inches dbh. Other subcanopy tree species include American elm, mulberry and green ash (*Fraxinus pennsylvanica*). The shrub component varies throughout the community and is comprised of bush honeysuckle, mulberry, and hackberry (*Celtis occidentalis*). The dominant herbaceous plants include garlic mustard, yellow avens, and reed canary grass (*Phalaris arundinacea*).

Overall a total of 29 species were noted in this community with 17 species considered native to Wisconsin. The mean C value for all species is 1.4, and the mean C value for just native is 2.4. The calculated FQI value for all species is 7.6, and the FQI value for just natives is 9.9. Based on Swink and Wilhelm's range of FQI values and relative community quality these values generally indicate a very low quality floristic community.

Table 3.15 below provides a summary of the tree density by size class within Community 6. The majority of trees fall within the 4.0-14.9 inch dbh class, with an estimated trees-per-acre value of approximately 267, whereas an average of only 17 trees per acre can be found within the 15.0-31.9 inch dbh class. No trees greater than 32 inches dbh were recorded within the sample plots.

Table 3.15: Community 6 Tree Density by Size Class

Dbh class (inches)	Average Trees/Plot	Average Trees/Acre
4.0 - 14.9	5	267
15.0 - 31.9	0.3	17
>32	0	0

Table 3.16 below provides a summary of the total number of trees, average dbh, relative abundance, and average basal area for each tree species recorded within the sample plots. A total of 17 trees, representing four different tree species were recorded. Box elder represents the most abundant species and contributes to the largest average dbh class, with a relative abundance of 59% and an average dbh of 11.3 inches. Black locust is the second most common species, at 24% relative abundance, with an average dbh of 6.1 inches. Slippery elm and American elm were found only occasionally and represent a smaller dbh class ranging from 4.4 to 4.9 inches.

Table 3.16 Community 6 Character by Species

Species Name	Common Name	Number of Trees	Average Dbh (in.)	Relative Abundance	Average Basal Area (sq ft)
ROBINIA PSEUDOACACIA	black locust	4	6.1	24%	0.20
Ulmus rubra	slippery elm	1	4.4	6%	0.11
Acer negundo	box elder	10	11.3	59%	0.70
Ulmus americana	American elm	2	4.9	12%	0.13

Table 3.17 below details the number of live trees and basal area on a per plot basis. Averages for all sample plots list the number of live trees at 6 per plot and 283 per acre. Average basal area per plot is 2.98 and average basal area per acre is 149.

Table 3.17: Community 6 Number of Trees and Basal Area by Sample Plot

Plot Number	Number of live trees/plot	Basal Area/Plot (sq ft)	Number of trees/acre	Total basal area/acre (sq ft)
6-1	6	1.97	300	98.5
6-2	4	3.41	200	170.5
6-3	7	3.56	350	178
Average:	**6**	**2.98**	**283**	**149**

Community 7: Remnant Oak Savanna

Community 7 is a remnant oak savanna located in the south-east corner of the study area. This community is bordered to the east by South Syene Road, to the south by a utility right-of-way, and to the west and north by agricultural crop land and residential development. This community continues on the other side of South Syene Road, but access to that area was restricted and no data was collected in that area. This open canopy community is dominated by large, open grown red, bur and white oak trees (*Quercus rubra, Q. macrocarpa* and *Q. alba)* and shagbark hickory. Many of the oaks range in size from 22 to 45 inches dbh, and are scattered throughout the savanna-like community. There is a small cohort of very dense black locust, ranging in size from 4 to 6 inches dbh located in the central portion of the community. The northern half is currently in active pasture land, which significantly reduces the encroaching woody vegetation, thus reinforcing the savanna-like community characteristic. The southern portion contains some smaller oak and elm in-growth, however, the community still remains relatively open. Shrubs cover varies between dense areas of black locust seedlings, multiflora rose and buckthorn, to areas with little to no shrub cover. The herbaceous community is dominated mostly by Kentucky bluegrass, with common occurrences of multiflora rose, garlic mustard, white avens, common dandelion (*Taraxacum officinale*), broad-leaf enchanter's nightshade, and black raspberry.

Overall a total of 51 species were noted in this community with 26 species considered native to Wisconsin. The mean C value for all species is 1.5, and the mean C value for just native is 3.0. The calculated FQI value for all species is 10.8, and the FQI value for just natives is 15.1. Based on Swink and Wilhelm's range of FQI values and relative community quality these values generally indicate a low quality floristic community.

Table 3.18 below provides a summary of the tree density by size class within Community 7. The majority of trees fall within the 4.0-14.9 inch dbh class, with an estimated trees-per-acre value of approximately 47, whereas an average of only 20 trees per acre can be found within the 15.0-31.9 inch dbh class. One tree greater than 32 inches dbh was recorded within the

Photo 3.4: Remnant Oak Savanna

sample plots. This translates to an average trees-per-acre value of approximately 6.7 trees.

Table 3.18: Community 7 Tree Density by Size Class

Dbh class (inches)	Average Trees/Plot	Average Trees/Acre
4.0 - 14.9	2.3	46.7
15.0 - 31.9	1	20
>32	0.3	6.7

Table 3.19 below provides a summary of the total number of trees, average dbh, relative abundance, and average basal area for each tree species recorded within the sample plots. A total of 11 trees, representing six different tree species were recorded. Black locust is the most dominant with a relative abundance of 55%; however, this species is primarily located in the central portion of the community. Here you find a small cohort of evenly aged, dense, black locust trees. The relative abundance of black locust as shown in Table 3.18 is the direct result of the sample plot being located within the cohort of black locust. Black locust is not commonly found throughout the majority of the community. The oak species, along with American elm and mulberry are commonly observed throughout the community in roughly the same proportions as shown in Table 3.19.

Table 3.19: Community 7 Characteristics by Species

Species Name	Common Name	Number of Trees	Average Dbh (in.)	Relative Abundance	Average Basal Area
Quercus alba	white oak	1	45	9%	11.04
ROBINIA PSEUDOACACIA	black locust	6	4.7	55%	0.12
Ulmus americana	American elm	1	15.5	9%	1.31
MORUS ALBA	white mulberry	1	11	9%	0.66
Quercus rubra	northern red oak	1	26.5	9%	3.83
Quercus macrocarpa	bur oak	1	17	9%	1.58

Table 3.20 below details the number of live trees and basal area on a per plot basis. Averages for all sample plots list the number of live trees at 4 per plot and 73 per acre. Average basal area per plot is 6.38 and average basal area per acre is 127.

Table 3.20: Community 7 Number of Trees and Basal Area by Sample Plot

Plot Number	Number of live trees/plot	Basal Area/Plot (sq ft)	Number of trees/acre	Total basal area/acre (sq ft)
7-1	1	11.04	20	220
7-2	6	0.72	120	14
7-3	4	7.38	80	147
Average:	**4**	**6.38**	**73**	**127**

Vegetation Corridors (Tree Lines, Fencerows)

A number of vegetation corridors, separating agricultural fields and land parcels are present within the study area. The longest vegetation corridor runs east-west through the central portion of the study area. A number of smaller vegetation corridors with east-west and north-south orientations can be found within the study area. Due to their small size and linear distribution, all vegetation corridors contain limited floristic diversity. Most are dominated by larger box elder, with common occurrences of white oak, bur oak, and hackberry (*Celtis occidentalis*) species. Smaller mulberry and black cherry species are also quite frequent. The herbaceous understory is generally dominated by non-native species such as burdock, smooth brome, and Queen Anne's lace. Heritage and specimen trees were recorded in the vegetation corridors. These are discussed in more detail in the Heritage and Specimen Tree section.

Heritage and Specimen Tree Assessment

NRC investigated the study area for "Heritage" and "Specimen" trees, as defined by the The City of Fitchburg's Parks, Recreation & Forestry Department, (described below). NRC located 33 Heritage Trees and 56 Specimen Trees in the study area, illustrated on Figure 3.4.

Methods

NRC identified and recorded all Heritage Trees within each community and vegetation corridors. The City of Fitchburg's Parks, Recreation & Forestry Department has defined Heritage Oaks as possessing a dbh of at least 38 inches (10-ft circumference) for white and bur oaks and at least 42 inches diameter (11-ft circumference) for pine, black, and red oaks. A meander survey technique was used to locate these trees.

In addition to locating and recording all Heritage Trees, NRC investigated Specimen Trees in good health within the vegetation corridors and wooded communities. The City of Fitchburg's Parks, Recreation & Forestry Department has defined Specimen Trees as trees which display superior quality and characteristics when compared to trees of the same species. All Specimen Trees greater than 15 inches dbh were located and recorded with GPS in the forested vegetation corridors and larger Specimen Trees with a dbh of 32 inches or greater were located and recorded within the wooded communities. The density of trees 15" dbh or greater within the woodlands was estimated based on the quantitative plot sampling.

Photo 3.5. A Heritage oak.

Results

The Park and Open Space Proposal for the McGaw Park Neighborhood, created by the Fitchburg Parks, Recreation and Forestry Department, dated June 19, 2008, detailed the location of five heritage oaks known to be within the study area. In the proposal, it was stated two bur and one white oak are located in S. Johnson park in the central portion of the study area. The largest has a 56.2-inch diameter and is estimated to be over 275 years. Just off of Syene Road, less than a half mile south of Wildheather Drive, there is a red oak believed to be about 200 years old. The fifth heritage oak is a bur oak (~230 years) that can be found at the south end of Curly Oaks Lane in the central portion of the study area. Only approximate locations were provided for these five heritage oaks.

During the course of field investigations, NRC located three of the known heritage oaks, recorded the locations with a GPS, and collected notes on health and current diameter. Two large bur oaks with dbh's of 45 and 39 inches were recorded in the southeast portion of Johnson Park. These are believed to be two of the heritage oaks previously noted in this general vicinity. A very large, recently deceased (windfall damage) oak was noted in the southern portion of Johnson Park, and is believed to be one of the three recorded heritage oaks in Johnson Park. Several heritage oaks were recorded in the vicinity of the known red oak just off Syene Road, but they are white and bur oak species. In total three white oaks and one bur oak ranging in size from 38 to 45inches dbh were recorded near the previously mentioned red oak. The fifth heritage oak, located at the south end of Curly Oak Lane was found to be a 46 inch bur oak tree. An additional heritage oak, located roughly

50 feet to the west of the fifth heritage oak mentioned above, was found to be a 39.8 inch bur oak tree in poor condition (although further examination is required).

In total 33 Heritage oaks ranging from 37 to 67 inches dbh were recorded in the study area. Figure 3.4 illustrates the location of all Heritage Trees and Table B-8 in the Appendix provides information on each recorded tree. The average dbh for the recorded Heritage Trees is approximately 43 inches. Many can be found in the eastern portion of the study area in addition to the far south-western portion.

NRC recorded 56 Specimen Trees ranging from 20 to 38 inch dbh within the study area. Figure 3.4 illustrates the location of Specimen Trees and Table B-8 in the Appendix provides information on each recorded tree. The average dbh for the recorded Specimen Trees is approximately 28 inches. The majority of the recorded Specimen Trees are found in the vegetation corridors.

Soil Evaluation

General Soil Types & Characteristics

The soils in the study area generally consist of loess underlain by approximately several meters of gravelly sandy loam till deposited by the Green Bay Lobe during the last part of the Wisconsin Glaciation (Clayton and Attig, 1997). Loess is wind-blown sediment and therefore consists of fine particles, typically silt-sized, that were small enough to be transported by wind. Till is generally unsorted glacial material and contains a mixture of soil textures and rock fragment sizes. Within the glacial till deposits are inclusions of sand and gravel sediment that were deposited by braided streams carrying glacial meltwater. The soils that have formed from these glacial deposits are typically well-drained and fertile. In the study area, these glacial sediments were deposited over sandstone bedrock, which is typically at relatively substantial depths across the site (greater than 10 feet).

The soils on the site are mapped by NRCS, and illustrated on Figure 3.3 and consist of the following soil series and general characteristics.

- The Dodge series consists of deep, well-drained, gently sloping and sloping soils on glaciated uplands. These soils formed under mixed hardwoods in 26 to 36 inches of loess over sandy loam glacial till. These soils have high fertility. The available water capacity is high, and permeability is moderate. The seasonal high water table is at a depth of more than 5 feet.
- The Elburn series contains possible hydric inclusions and consists of deep, somewhat poorly drained, nearly level and gently sloping soils in glaciated stream valleys. These soils formed in moderately deep loess and glacial drift under prairie grass. The loess is 40 to 60 inches thick and is underlain by glacial till or sand and gravel outwash. These soils have high fertility. The available water capacity is high, and permeability is moderately slow in the subsoil. The water table is at a depth of 1 to 3 feet in the spring.
- The Griswold series consists of very deep, well drained, gently sloping to moderately steep soils on glaciated uplands. These soils formed in thick glacial till under prairie grasses.

These soils have medium fertility. The available water capacity is medium, and permeability is moderate. The organic matter content is high and the water table is below a depth of 5 feet.

- The Kidder series consists of deep, well-drained, gently sloping to very steep soils on glaciated uplands. These soils formed in glacial till under mixed hardwoods. The depth to calcareous glacial till is 24 to 40 inches. These soils have medium fertility. The available water capacity is medium, and permeability is moderate.
- The McHenry soil series consist of deep, well-drained gently sloping to moderately steep soils on glacial uplands. These soils formed in thin loess and sandy loam glacial till under thin stands of mixed hardwoods. The loess is 10 to 15 inches thick over till that is 5 to 20 feet or more thick. The depth to calcareous till is 24 to 40 inches. These soils have a medium level of fertility. The available water capacity is medium, and permeability is moderate. The water table is at a depth of more than 5 feet.
- The Plano soil series consists of deep, well drained and moderately well drained, nearly level to sloping soils on glaciated uplands. These soils formed in 40 to 60 inches of loess and sandy loam glacial till or sand and gravel outwash under prairie grasses. These soils have high fertility. Available water capacity is high, and permeability is moderate. The water table is generally below a depth of 5 feet but at times rises to a depth of 3 feet in some places.
- The Radford series contains possible hydric inclusions and consists of deep, somewhat poorly drained, nearly level and gently undulating alluvial soils in low drainageways and stream channels. These soils formed under prairie grasses in moderately deep, recent, silty alluvium overlying a buried, poorly drained, silty soil. The recent silty alluvium, which overlies the dark-colored soil, has come from nearby eroded uplands. Radford soils have high fertility. Available water capacity is very high or high, and permeability is moderate. The water table is at a depth of 1 to 3 feet in spring.
- The Ringwood series consists of deep, well-drained, gently sloping and sloping soils on glaciated upland. These soils formed in 15-30 inches of loess and sandy loam glacial till under prairie grasses. These soils have high fertility. The available water capacity is also high and permeability is moderate. The water table is below a depth of 5 feet.
- The Sable series is a hydric soil that consists of deep, nearly level and gently sloping, poorly drained soils on low benches in stream valleys. These soils formed under sedges in deep silty material more than 4 feet thick. Neutral sandy outwash underlies the silt in most places. Sable soils have high fertility. The available water capacity is high, and permeability is moderate. The seasonal high water table is between the surface and a depth of 1 foot.
- The St. Charles series consist of deep, nearly level to moderately steep, well drained and moderately well drained soils on glaciated uplands. These soils formed in deep loess and loamy glacial till under mixed hardwoods. They formed in 40 to 60 inches of loess and in

the underlying loamy outwash or sandy loam till. Slope commonly is 0 to 15 percent but ranges from 0 to 30 percent. These soils have high fertility. The available water capacity is high and permeability is moderate. The seasonal high water table is below a depth of 3 feet, and usually is below a depth of 5 feet.

- The Troxel series contains possible hydric inclusions and consists of deep, gently sloping well drained and moderately well drained soils in draws, on fans, and in drainageways. They are below steeper, silty soils. Troxel soils have high fertility. The available water capacity is very high, and permeability is moderate. The soils are strongly acid to neutral. The water table is below a depth of 3 feet, and it is generally below a depth of 5 feet though flooding is frequent.

Site Soil Evaluation for Stormwater Infiltration

Methods

A preliminary site soil evaluation was conducted in the proposed McGaw Park Neighborhood on December 31, 2008, by Lindsey Moritz of NRC. The primary objective was to assess the range of soil types across the site in order to evaluate for stormwater infiltration suitability. Pending site specific development, a more-detailed infiltration study will be necessary.

Soil pit locations were selected based on geographic location, mapped soil units, and topographic position within the landscape, with a goal of maximizing the variability of soils surveyed across the site. The selected soil pit locations encompassed several landscape positions with varying aspects, and several non-hydric soil series. Hydric soil components were avoided during the selection process due to their constraints on infiltration.

During the field investigation, the selected soil pits were evaluated for general site characteristics and the soil profiles were described and parent material identified. General site characteristics that were documented include aspect, percent slope, and landscape position.
Soil pits were dug to a depth of approximately 10 feet, which is typically adequate to characterize subsurface conditions in the area, including infiltration capacity characteristics and depth to seasonal high groundwater. Soil profile descriptions were written in accordance with the descriptive procedures, terminology, and interpretations as described by the USDA-NRCS Field Book for Describing and Sampling Soils, v.2.0 2002. Infiltration rates were derived using general values based on soil texture (see Table 2 of WDNR "Site Evaluation for Stormwater Infiltration" [Design Standard 1002]).

Results

A total of seven backhoe pits were evaluated during the field investigation and their locations are illustrated on Figure 3.4. The soil profile descriptions of each test pit are included in the Appendix (Soil Evaluation Data Sheets).

The project area has nearly level to sloping relief, with evaluated slopes ranging from 1-11%. Generally, all soil pits were silt loam loess over sandy loam till parent material, and sandstone bedrock was encountered at one location (Pit 2). Four soil pits (Pits 1, 2, 6, 7) were located on Ringwood silt loam, 2-6% slopes, which is the most common soil map unit in the project area. Generally, these pits had 26-31 inches of loess over yellowish brown to brown colored sandy loam till parent material. Three of these pits had sandy loam parent material to the bottom depth of the pit (9-10 feet), while sandstone bedrock was encountered at 65 inches in one pit occupying a shoulder position (Pit 2). Soils at Pits 1 and 7 are well suited for natural infiltration, given their coarsely-textured subsoils and the depth of their profiles. Soils at Pit 6 had evidence of a seasonal high water table from 26-95 inches. As such, soils at both Pits 6 and 2 present limitations to natural infiltration. However, appropriate engineering practices may be applied to improve the infiltration system within these areas.

Pits 3, 4, and 5 were located on Plano silt loam, 2-6% slopes; Ringwood silt loam, 6-12% slopes, eroded; and Dodge silt loam, 2-6% slopes, respectively. Generally, these three pits had deeper loess layers, with 51-61 inches of fine-textured deposits over yellowish brown to brown colored sandy loam till parent material. Soils at Pits 3 and 4 are suitable for natural infiltration, given their coarsely-textured subsoils and the depth of their profiles. Soils at Pit 5 had evidence of a seasonal high water table from 45-61 inches, which presents limitations to natural infiltration.

Chapter 4: Plan Goals and Policies

Neighborhood Plan Vision

Develop an urban, green, sustainable, transit-oriented, mixed-use, and economically vibrant neighborhood that offers a variety of land uses to serve everyday living needs, as well as a housing stock to serve all levels of age and income, which will not affect the existing on-site natural resources.

Plan Goals and Policies

Pursing the goals of sustainability as expressed by local stakeholders, elected officials, and community leaders of Fitchburg, the aim of the Plan is to create a neighborhood with a strong sense of community that expands on the identity of Fitchburg while promoting the protection and restoration of the legacy features of the land. Important elements include protecting and enhancing on-site natural resources and environmentally sensitive lands, promoting higher-density, mixed-use development, and transit-oriented development. The Plan proposes higher intensity land uses and scale-appropriate infrastructure extensions, rather than low-density development that would require far greater auto-dependence. The planning goals are designed to protect agriculture beyond the McGaw Park Neighborhood by pursuing compact development utilizing far less agricultural land than a typical suburban subdivision.

Through a series of Steering Committee meetings and input from the public through a Neighborhood Summit, the following goals were defined to guide the plan. *Note: Italicized goals are the same as the Fitchburg Draft Comprehensive Plan. The Comprehensive Plan's goals and objectives are based on a large survey conducted by the City with assistance of the Survey Research Center at the University of Wisconsin-River Falls and results tabulated with UW Extension. 1,444 households and 32 businesses returned surveys, including 3,025 individual comments.*

Environmental goals:

1. Protect and rehabilitate the natural environment

- Minimize adverse affects on neighborhood assets (water quality, wildlife habitat, natural plant communities).
- Seek opportunities to restore environmental resources and restore legacy features of the land.
- Assure that groundwater budget is unimpaired and hydrologically neutral.
- Preserve heritage and specimen trees.
- Protect air and limit noise pollution.

2. Provide public access to unique natural areas.

- Provide a green natural place within a short walk of every place in the neighborhood.
- Promote both active and passive recreation.

3. Design the neighborhood to compliment environmental protection.

- Design a neighborhood in which basic needs can be achieved with minimal driving.
- Promote green building techniques.
- Promote carbon neutral development.
- Minimize use of land for surface parking.
- Promote biking and walking.

Agricultural Resource Goals:

1. To protect and maintain agriculture as a significant resource within Fitchburg.

2. Through orderly planning of McGaw Park, preserve agricultural land beyond the area as a *resource for the use and benefit of current and future generations.*

Economic Development Goals:

1. Encourage economic development opportunities appropriate to the resources, character, and service levels in the City.

- Ensure that development raises tax revenue to pay for its own services.
- Promote diverse uses to meet a variety of needs.
- Promote policies that are marketable and financially viable.
- Design flexibility and balance in land uses.
- Provide high quality office space to support jobs and housing.

2. Provide that retail and service areas are adequately sized and appropriately placed within neighborhoods and the community.

- Provide services for neighborhood.
- Develop commercial uses to fit into a larger market and community.

3. Recognize and support the changing needs and preserve agricultural based businesses as an economic opportunity.

- Build on agricultural roots, food production, and buying food through local sources.

4. Preserve and enhance resources when developing economic opportunities.

- Promote economic integration / diverse housing prices and housing stock.
- Provide land uses that support jobs for entry level through executives.
- Provide financial incentives for socially desirable goals.

Community Character (Cultural):

1. Promote and preserve the City's cultural resource base.

- Promote sense of place/sensitivity to the land.
- Design development to fit the land and topographical features.

2. Actively seek to strengthen strong cultural and social history and community identity

- Foster the identity of McGaw Park at the core of the neighborhood, and a foundation of the Fitchburg park system.
- Seek education resources and a neighborhood school.
- Promote diversity of design to support a range of opportunities.

Land Use Goals:

1. Preserve and enhance the natural and agricultural resources and features of the city.

- *Follow a pattern for development consistent with the long term urban growth map and its related phasing plan.*
- *Protect environmental resources from development by promoting sustainable development and revitalization.*

2. Develop a compact urban community that is visually and functionally distinct from its rural and agricultural community.

- *Promote infill, reinvestment and redevelopment of land and uses.*
- *Restore underutilized, blighted, or underdeveloped properties within current commercial and residential neighborhoods.*
- *Preserve open space, natural areas, and rural and agricultural land by promoting compact development that contains a logical and sustainable mix of use and building types.*
- *Extend utilities and infrastructure in a way that balances market demand with an average annual growth rate not to exceed 75 acres per year, and using existing and proposed infrastructure in an efficient manner.*

Housing Goals:

1. To provide for balanced residential growth in the City with a variety of housing types, to promote decent housing and suitable living environment for all residents, regardless of age, income or family size, and to encourage an adequate supply of affordable housing in each new urban neighborhood.

- *Promote development of housing to meet forecasted needs.*
- *Promote the development and preservation of long-term entry level housing for low-moderate income residents.*

- *Recognize the value of existing housing and established neighborhoods, and support rehabilitation efforts, both public and private, while maintaining the historic, cultural and aesthetic values of the community.*

2. Promote the efficient use of land for housing

- *Encourage compact neighborhood and development patterns.*

Transportation Goals:

1. Promote development in areas that encourages options to alternative transit modes.

2. Promote transit-friendly design of healthy neighborhoods with walkable, short blocks.

3. Design complete streets that promote pedestrian and bicycle movement as well as cars.

4. Carefully plan additional road capacity.

5. Consider extensions of transit including bus and rail/bus rapid transit to make neighborhood transit accessible.

6. Minimize impact on existing roadways and infrastructure by planning for multiple modes of transportation.

Implementation of Goals Through Land Use

Protection of Natural Resources and Environmentally Sensitive Lands

The McGaw Park neighborhood is home to an abundance of environmentally sensitive lands including wetlands, navigable and non-navigable waterways, heritage and specimen trees, and native forest communities. In order to protect these valuable resources, the Plan introduces best management practices and land use elements aimed at ensuring the legacy of these lands. In order to protect natural areas and agricultural lands, more intense land uses are planned on non-environmentally sensitive lands. Land uses, transportation, and infrastructure allocations are designed to ***minimize*** the impact on natural resources.

Transit Friendly Development through Transit-Oriented and Mixed-Use Development

The Plan encourages land use policies, and transportation and infrastructure locations that require the overall development of the McGaw Park neighborhood be transit-friendly, referring to an average of 8 development units (D.U.) or more per acre. Neighborhood densities of at least 8 units per acre and higher in strategic locations, provide a building and land use infrastructure that encourages multiple modes of transportation including bicycling, walking, and public transportation. Transit friendly neighborhoods are achieved through the creation of Transit Oriented and mixed-use development.

Transit Oriented Development

Often transit lines are located in areas that do not have enough proximity to residential population, employment, and opportunities for development around transit stations. Newer transit stations throughout suburban areas often are used more as park and ride, rather than establishing supporting uses around them. In order to support transit stations and build-in a ready supply of users, design areas around transit stations with residential development and employment bases. These elements are the main principle behind Transit Oriented Development (TOD). Transit Oriented Development is defined as a compact, walkable, mixed-use community centered around a high-quality transit system that makes it convenient to travel by public transportation instead of by car. TODs generally are located within a radius of one-quarter to one-half mile from a transit stop, as this is an easy walking distance for pedestrians. Benefits of Transit Oriented Development include:

- Greater mobility, particularly for young and aging populations;
- Various housing options;
- Reduced traffic congestion and driving;
- Easier access to goods and services;
- Reduced pollution and environmental degradation;
- Promotion of walking and bicycling which leads to a healthier lifestyle;
- Increased foot traffic and customers for area businesses;
- Reduced dependence on foreign oil; and
- Reduced infrastructure costs.

Transit Oriented Development is highlighted by higher density and mixed-use buildings centered around a transit station

Mixed-use Development

Transit oriented development is most successful with the inclusion of mixed-use development. Mixed-use development refers to the practice of allowing more than one type of use in a building or set of buildings and typically includes a grouping of higher density residential and commercial uses. Mixed-use development frees up the development potential of land by allowing a number of

different uses, rather than conventional single-use zoning that precluded allowing commercial and residential uses within the same area. The Plan advances land-use elements which promote development that offers the amenities of a neighborhood either within individual developments or within a short distance, while recognizing and minimizing potential conflicts between uses. The desired neighborhood mix of uses includes residential, commercial and office. Benefits of mixed-use development include:

- Encourages high quality design by allowing greater flexibility in the permitted uses;
- Provides for a diversified job mix ranging from entry-level to executive;
- Offers a diversity of renter and owner housing stock at a range of prices;
- May increase affordable housing opportunities;
- Creates an area's identity and development potential (e.g., town centers, "gateway" areas);
- Promotes pedestrian & bicycle travel;
- Reduces auto dependency, roadway congestion, and air pollution by co-locating multiple destinations;
- Reduces infrastructure;
- Promotes a sense of community;
- Promotes a sense of place; and
- Encourages economic investment.

Conservation Design

The Plan encourages additional land preservation and enviornmentally-friendly design through the practice of Conservation Design, a land division system that takes into account the natural landscape and ecology of a site, while allowing the same number of units as conventional development. Wisconsin's "Smart Growth" law defines a "conservation subdivision" as "a housing development in a rural setting that is characterized by compact lots and common open space, and where the natural features of land are maintained to the greatest extent possible." Conservation Design focuses on planning development so that buildings are grouped together in a less land-consumptive manner in order to maintain open space and natural features. The main principles of Conservation Design are:

- Thoughtful protection and management of natural areas; and
- Reduction in impervious surface areas; and
- Sustainable stormwater management

Benefits include protection of natural features, preservation of open space and natural habitat, decreased infrastructure, increased pervious surface, protection of water resources, and naturalized storm water management. Compact development can include building homes on smaller lots, building attached homes (rowhouses or townhomes) or building multifamily structures.

In regards to the McGaw Park Neighborhood land uses, conservation design is most applicable to single family land subdivisions and business park layouts.

Implementation of Plan through Policy Updates

This plan is the first neighborhood plan completed for the City of Fitchburg under the new criteria created for the Smart Growth Comprehensive Plan. As such, implementation may require changes in existing City policies. Some of these are being addressed within the text of the Comprehensive Plan, while others will be left to various committees. The Steering Committee and several other City committees recognize the following areas that will require action outside the scope of this Plan, but are necessary for implementation of the Plan:

Park Dedication and Compact Development

- With compact development, particularly TOD areas, it is not possible to dedicate the amount of land currently required within the neighborhood. The City's fee-in-lieu-of provision can accommodate this, however the City should evaluate other options to help facilitate the compact development the City is looking for.

- The City should establish guidelines for potential uses, such as park uses, within the 300' wetland corridor and determine whether and under what circumstances property within the corridor can be counted as parkland dedication. These guidelines should be established around the principles of education, public access, and the protection of natural resources.

- The City should examine new park and recreation requirements for new zoning classifications such as TOD or mixed-use.

City Assistance for Compact Development

- The City should evaluate its current policies regarding assistance for development (primarily TID funding) to determine if they provide adequate flexibility to handle new styles of development.

- Compact development will require structured parking. The City should pursue options available to it in order to increase the financial feasibility of structured parking, particularly at the early stages of the Plan. In particular, TID financing and the formation of a municipal parking utility should be pursued.

- In order for compact development and the related LEED-ND requirements as outlined in this Plan to succeed in the early stages (and possibly beyond), it is recognized that public assistance funding may be necessary for development projects. Early stage development projects should be afforded some flexibility in order to transition into the full implementation of the Plan.

- The City should consider options available to it to specifically attract users who are most suited to more compact development. The need for the City to use incentives for users who are naturally inclined to be in compact development will likely be less.

- The City will be rewriting its zoning code starting in 2009. It will be important within this code to provide for expedited approval for projects that meet a set of predetermined criteria. The sometimes protracted approval process adds significant cost, both monetarily and in time, and a more efficient process will assist in reaching the compact development goals that the City has.

Transit

- The feasibility of a TOD neighborhood depends on the feasibility of the transit associated with it. As soon as possible, the City should undertake a feasibility study of light rail, as it relates to this plan, Green Tech Village, the Southdale Neighborhood, and connections to downtown Madison and the airport.

- The City should develop a broad transit plan for the City, which would identify potential routes and connectivity. This should build on the plan currently under development, as this plan presupposes transit accessibility.

- The City should develop policies for encouraging alternative transportation. This should include bicycle friendly inlet grates, bicycle actuated detection at traffic signals, encouraging business owners to install showers and storage lockers, subsidizing bus passes for city employees, and building new developments around the ped-shed concept.

Other City Assistance

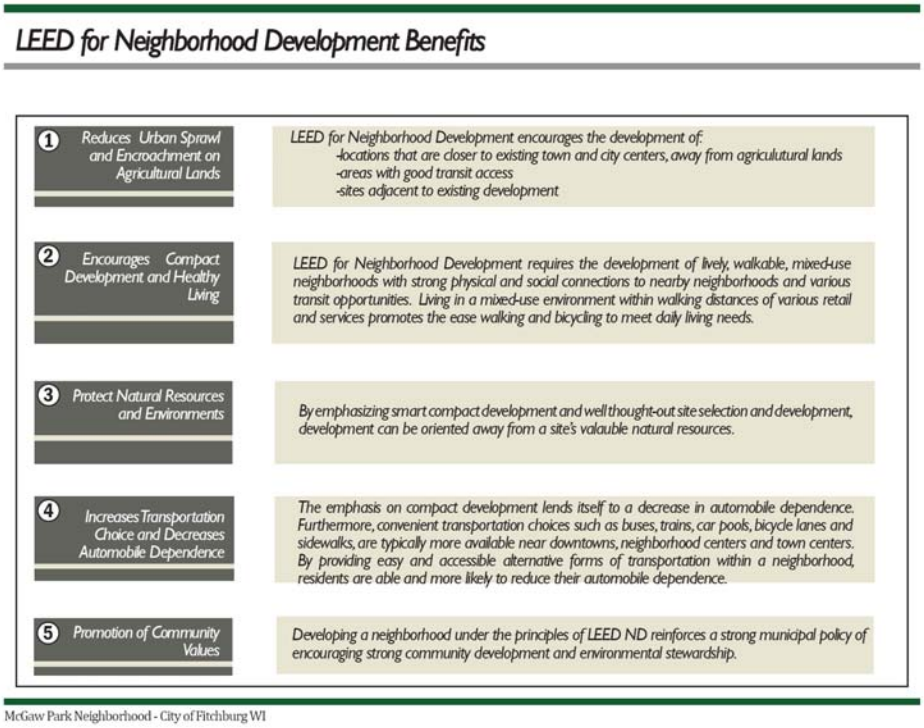
- Developing in a LEED-ND style may have some short-term costs, but long-term benefits. For example, within this neighborhood, municipal water usage could be decreased by 50% if certain sustainability practices are used. These practices and features can come with significant costs, but the long-term benefits to the City are great. The City should build on the encouraging LEED-ND analysis included as Appendix 2C to this plan and evaluate the long-term implications and environmental impacts of the LEED-ND requirements, to determine the level of assistance it will provide to realize those benefits.

- Mixed-use neighborhoods have special challenges, in that the proximity of residences to commercial users increases the likelihood of certain conflicts. Some of these include noise, lighting, and traffic. The City has previously been willing to provide financial assistance to mitigate these conflicts. The City should further examine this issue, and develop guidelines for this assistance.

LEADER in ENERGY AND ENVIRONMENTAL DESIGN- NEIGHBORHOOD DEVELOPMENT (LEED-ND)

The McGaw Park Neighborhood seeks to become a benchmark example of a sustainable neighborhood, aiming to be a participant in the U.S. Green Building Council's LEED-Neighborhood Development program. The LEED for Neighborhood Development Rating System integrates principles of "green", mixed-used, transit-oriented development by utilizing a point system.

LEED-ND is a joint venture between the United States Green Building Council, the Congress for New Urbanism, and the Natural Resources Defense Council. It is the first neighborhood development system that uses points and benchmarks to declare a neighborhood as "green." LEED-ND moves beyond the individual building envelope to the neighborhood scale by focusing on smart location and neighborhood design. LEED-ND emphasizes the creation of compact, walkable, vibrant, mixed-use neighborhoods with good connections to nearby communities and encourages compact development patterns and the selection of sites that are within or adjacent to existing development in order to minimize habitat fragmentation and preserve areas for recreation. In addition, LEED encourages convenient and efficient transportation options such as buses, trains, car pools, bicycle lanes and sidewalks. LEED-ND is currently in the pilot program nationally.



McGaw Park Neighborhood - City of Fitchburg WI

In order to obtain LEED-ND certification, a neighborhood must meet a number of points based upon a rating system. Points are given based on "smart location and linkage," "neighborhood pattern and design," "green construction & technology," and "innovation and design process." See Appendix 2C for detailed LEED-ND Rating requirements.

LEED-ND requirements that will be reflected in the Plan goals, policies, and land use implementation include:

Transportation

Transportation, particularly automobile use, is the second biggest consumer of energy, after buildings. The Plan addresses the availability of quality public transit service, the creation of redundancy and connectivity in road networks, and the provision of connectivity between modes of transportation specifically through the encouragement of the creation of a transit oriented development along the existing rail line, which will be ringed by high density residential and mixed use development. In addition to a centralized transit station, an increased number of bus stops and bus routes are designed within the neighborhood.

Creation of a Compact, Viable, and Sustainable Neighborhood Pattern

In order to conserve land, preserve environmentally sensitive areas, and promote community livability, transportation efficiency, and walkability, the Plan calls for the creation of compact and sustainable neighborhood patterns. Elements of a compact neighborhood pattern include a diverse and affordable housing stock, diversity of uses, walkable streets, interconnected street network, walkablity to school, and access to open space and parks. Details regarding these elements are outlined in the Land Use Plan.

Employment of Green Construction and Technology

Developing by means of "green construction" techniques and employing "green technology" products is an organized effort to design and construct buildings using a process and materials that promote environmental sustainability. Green construction and technology is designed to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environmental degradation

The Plan calls for the encouragement of using "green construction" techniques and employing "green technology" products through the adoption of codes and design standards.

Chapter 5: System Analysis Plan – Sanitary, Water, and Stormwater

Key Water Resource Issues

A systems approach was taken to development plans for stormwater, sanitary sewer and potable water supply services for the McGaw Park Neighborhood. This included an assessment of the current condition of surface and groundwater resources in the Neighborhood and in the region, as well as their sensitivity to development-related changes. Information on important hydrologic processes supporting the aquatic ecosystems, and their vulnerability to change, were used to develop performance standards for stormwater management.

Streams

Description

The McGaw Park Neighborhood (MPN) is located near the headwaters of three streams: Nine Springs Creek, Swan Creek, and Murphy's Creek (**Figure 5.1**). Information on their current condition is limited, and no U.S. Geological Survey gauging stations are located on these streams. The Yahara-Monona Priority Watershed Project Plan (PWPP) qualitatively assessed the conditions of streams and water bodies within the watershed in 1992.

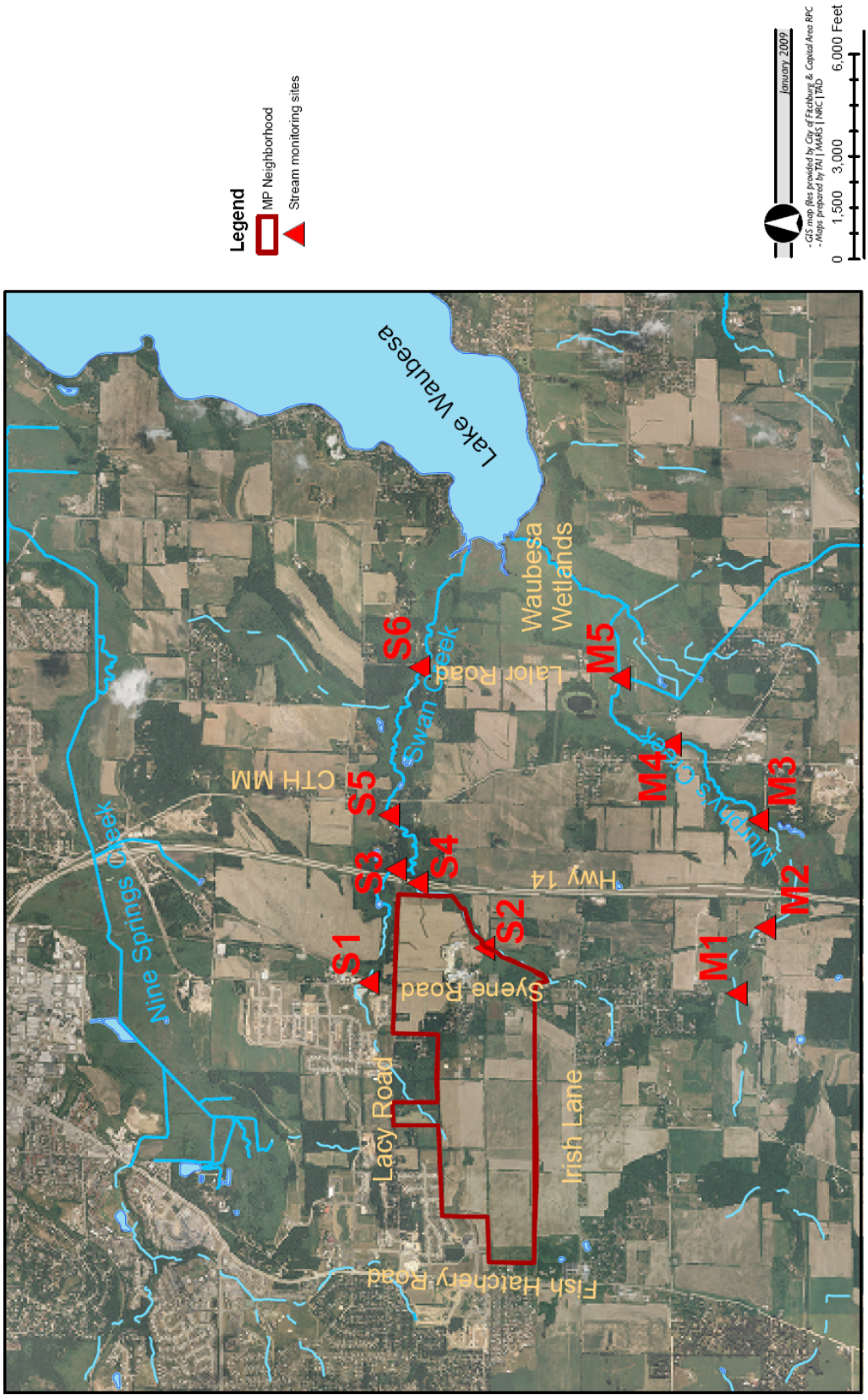


Figure 5.1: Monitory Site Map

Nine Springs Creek is located north of the Neighborhood, near the southern edge of Madison's developed urban area. The Dane County Waterbody Classification Study lists Nine Springs Creek as degraded, with the goals of restoration and enhancement. The PWPP labels the Creek as a warm water sport fishery and notes issues of sedimentation, marginal habitat, low dissolved oxygen, high temperatures, high nutrient content, and invasive vegetation. Water samples were tested within Nine Springs Creek, however the PWPP does not indicate location or time of sampling. This watershed is primarily to the north of the project area; only a small area at the west end of the McGaw Park Neighborhood drains to Nine Springs Creek. This stream is therefore unlikely to be significantly affected by runoff from the study area, however changes in groundwater pumping or recharge could affect the dry-weather flow (or baseflow) of the stream.

Swan Creek originates in the study area and flows eastward through the Waubesa Wetlands to Lake Waubesa. The vast majority of the McGaw Park Neighborhood is located in the Swan Creek surface watershed. The Wisconsin Department of Natural Resources (WDNR) considers Swan Creek to be a Warm Water Forage Fishery. The PWPP notes that although the fishery has good dissolved oxygen levels and a high biotic index classification, it is limited by natural low-flow conditions and that marginal habitat and sedimentation are problems affecting the water resources in Swan Creek. The 1992 study also found 400 acres of wetlands in the Swan Creek subwatershed, 79 of which were classified as exceptional quality wetlands that should be protected from detrimental land use impacts. The North Branch of Swan Creek begins west of McGaw Park and flows through the Swan Creek subdivision north of Lacy Road. During the summer of 2008, base flow in the North Branch was observed to begin at the detention ponds in the Swan Creek development at the northwest corner of the Lacy Road and Syene Road intersection. The South Branch begins near the intersection of Syene Road and Irish Lane and forms the southeastern boundary of the project area. Perennial flow in the South Branch appears to begin in the wetlands in the southeast corner of the McGaw Park Neighborhood, however access to this property was not granted. Headwater channels of Swan Creek in the study area have intermittent flow and are typically vegetated swales.

Murphy's Creek is located approximately 1.5 miles south of the study area, and the McGaw Park Neighborhood is entirely outside the Murphy's Creek surface watershed. Therefore, stormwater runoff from the Neighborhood will not flow to Murphy's Creek. However, it is possible that land use and groundwater withdrawals in or near the study area could impact its baseflow. WDNR lists Murphy's Creek as a Warm Water Forage Fishery. Low flow and sedimentation also negatively affect the water resources of the Creek, according to the PWPP. As of the 1992 study, the watershed maintained good dissolved oxygen levels, had low levels of aquatic plants, high numbers of aquatic insects, and 600 acres of wetlands. Over half of those wetlands are part of the Waubesa Wetlands and, at the time of the study, were considered exceptional quality that merit protection. Observations immediately after the large floods of June 2008 indicate that the water level in the headwaters of Murphy's Creek at Syene Road rose several feet above typical low-flow levels. This is consistent with anecdotal observations that the Murphy's Creek watershed has considerable drainage problems and roadway flooding.

Both Swan and Murphy's Creeks are designated Areas of Special Natural Resource Interest by WDNR due to the presence of threatened, endangered or other special interest flora and fauna identified in the State's Natural Heritage Inventory.

Stream Baseflow

In dry periods, the dominant source of flow to these streams is groundwater inflow, and possibly discharges from the detention ponds in the Swan Creek development at the intersection of Syene and Lacy Roads and discharge from agricultural drain tiles. Groundwater has a cooling effect in summer because it is typically about 50°F. This dry-weather flow, or baseflow, is important for supporting water quality and maintaining water temperature in streams.

Baseflow was measured at four locations on Swan and Murphy's Creeks to provide information on habitat conditions and groundwater inflow to the streams. Measurement sites were the North and South Branches of Swan Creek at Highway 14, and at Swan Creek and Murphy's Creek at Lalor Road (**Figure 5.1).** Measurements were conducted on September 26 and November 5, 2008 (**Table 5.1**), at least four days after any substantial rainfall to avoid the influence of stormwater runoff. Measurements were conducted by wading in the streams with a mechanical "pygmy" type flow meter using standard USGS methods (Buchanan and Sommers, 1969).

Table 5.1: Average baseflow survey results for September 26 and November 5, 2008

Site	Streamflow (cfs)	Average Velocity (ft/s)
North Br. at Hwy. 14 (S3)	0.4	0.25
South Br. at Hwy. 14 (S4)	1.0	0.51
Swan Cr. at Lalor Rd. (S6)	2.8	0.39
Murphy's Cr. at Lalor Rd. (M5)	6.1	0.64

This flow data provides a benchmark for comparison in the future to determine the effectiveness of stormwater and water supply management measures for maintaining groundwater flow to these streams. Note that these flow measurements were conducted during a very wet year, and regional streamflow conditions may be considerably different when future flow measurements are made. Future comparisons with additional flow measurements would benefit from a statistical method to account for this wet/dry year variability, such as an indexing method using a representative stream gage in the region (e.g. Potter and Gaffield, 2001).

Temperature

Chapter 3 describes that both warm water and coldwater fish were caught in Swan and Murphy's Creeks. Monitoring of the temperature of these streams provides an explanation for that mix of species; the groundwater-fed headwaters are cold, and the streams warm downstream as they approach Lake Waubesa. Based on continuous temperature monitoring at 11 locations (**Figure 5.1**) from June and November 2008, both streams have average summer temperatures near 60°F (**Figure 5.2)**.

During the summer, streams are warmed by interaction with the atmosphere and cooled by inflowing groundwater. Generally, streams get warmer downstream as flowing water is exposed to the atmosphere longer. The downstream cooling trend in the headwaters of the North Branch and South Branch (Figure 5.2) indicates rapid influx of cold groundwater in these reaches. The very warm temperature of Swan Creek at Syene Road (site S1) is apparently caused by the warming influence of the detention ponds immediately upstream, which retain water and expose it to the atmosphere (e.g. direct sunlight).

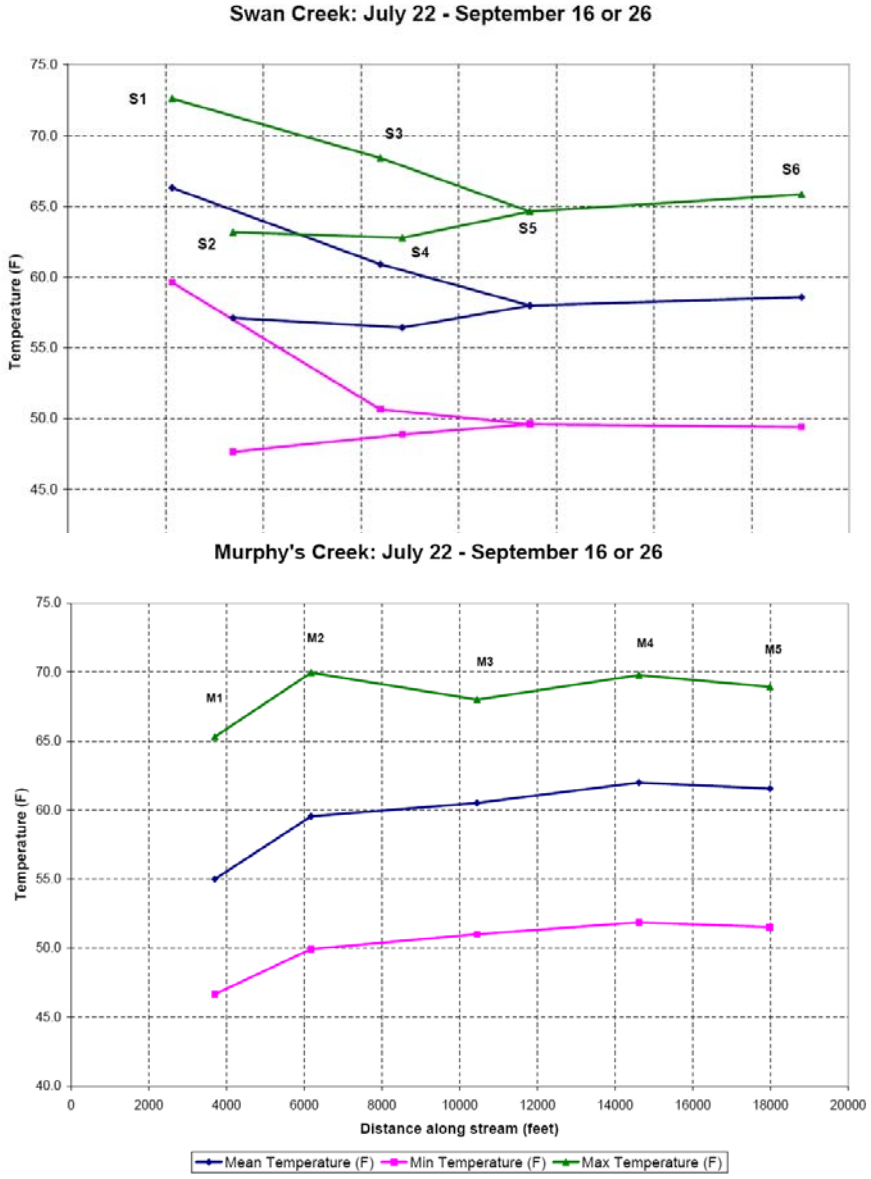


Figure 5.2a and 5.2b: Water Temperature Plots

Swan Creek is generally cooler than Murphy's Creek; however the available data are not sufficient to explain this difference. In addition to groundwater inflow rates, stream temperature is affected by stream width, which increases the surface area exposed to the atmosphere, yet shade provided by riparian vegetation reduces the potential temperature increase caused by atmospheric exposure.

Water Quality

Water chemistry is also an important factor in aquatic ecosystem health. Dissolved oxygen (DO) is especially critical for fish, and the US EPA sets a standard of 6.0 mg/L, below which detrimental effects on warm water fisheries are expected. Limited measurements of DO, pH and specific conductance were made using hand-held probes. Due to its expense, automated water quality monitoring was beyond the scope of this project. However, the spot measurements provide insights into the condition of Swan Creek and Murphy's Creek.

DO concentrations measured throughout this project were generally between 7 – 10 mg/L (**Table 5.2**). Lower DO values were recorded immediately downstream of the detention ponds on Swan Creek at Syene Road and in Murphy's Creek downstream of the large wetland south of Byrne Road. Low dissolved oxygen is common in natural wetlands due to the decomposition of vegetation and microorganisms in bottom sediments (Kadlec and Knight, 1996). It is plausible that the same explanation applies to the low DO downstream of the detention ponds, given the abundant wetland vegetation around the perimeter of the ponds and immediately downstream of their overflow structures.

Dissolved oxygen, pH and specific conductance can fluctuate substantially during the day depending on the activity of algae and aquatic plants. High algal growth, which can be related to nutrient loading, typically results in large fluctuations in these parameters. This makes interpretation of spot measurements taken at different times of day problematic. To assess diurnal fluctuations, a survey of approximate minimum and maximum values was conducted on August 1, 2008. Measurements of DO, pH and specific conductance were taken at times typical of the daily minima (sun rise) and maxima (late afternoon) at four sites on Swan Creek (S1 and S6) and Murphy's Creek (M1 and M5). Morning to afternoon differences ranged from -1.4 to +0.6 mg/L for DO, and pH fluctuated no more than 0.5 pH units. This small variability indicates only a small effect from plant and algae respiration, suggesting that these streams receive only modest nutrient loads from watershed runoff and have flow adequate to maintain stable DO levels. Note that algal levels are affected by hydrologic conditions, and flood events can flush algae downstream and temporarily reduce algal concentrations. These measurements were collected after a prolonged dry period to avoid such influences; however additional data would be needed to draw firm conclusions about algal activity in these streams.

Specific conductance was consistent, ranging from 825 to 956 µS/cm. These values are typical of local groundwater which has a high dissolved mineral content, leading to higher specific conductance than that of precipitation or surface runoff. This indicates that the primary source of baseflow in these streams is groundwater, as expected.

Table 5.2: Water quality data collected with hand-held probes

Date	Site	DO (mg/L)	Temperature (Degrees F)	Conductivity (µS/cm)	pH
6/17/08 5:15 PM	S6	7.1	63.86	N/A	N/A
6/17/08 5:20 PM	M5	8.4	64.04	N/A	N/A
6/17/08 2:55 PM	M4	8.7	63.68	N/A	N/A
6/17/08 3:20 PM	M3	5.8	64.94	N/A	N/A
6/17/08 3:30 PM	M1	6.7	58.64	N/A	N/A
6/17/08 3:55 PM	S1	6.5	67.28	N/A	N/A
6/17/08 2:25 PM	S2	6.8	61.88	N/A	N/A
6/17/08 4:56 PM	S5	8.5	61.16	N/A	N/A
8/1/08 5:34 AM	S6	9.7	58.28	897	7.58
8/1/08 4:30 PM	S6	8.3	63.86	913	8.05
8/1/08 5:40 AM	M5	8.5	63.32	825	7.90
8/1/08 4:25 PM	M5	8.8	67.10	825	8.08
8/1/08 5:51 AM	M1	7.6	55.58	830	7.60
8/1/08 4:15 PM	M1	7.6	59.72	821	7.71
8/1/08 5:58 AM	S1	3.7	71.96	829	7.58
8/1/08 4:07 PM	S1	4.3	75.92	865	7.71
9/26/08 12:58 PM	S6	10.5	57.20	905	8.00
9/26/08 2:40 PM	M5	9.8	58.64	855	8.00
9/26/08 3:04 PM	S5	9.9	57.56	950	8.00
9/26/08 3:45 PM	M3	6.4	61.16	862	7.70
9/26/08 4:30 PM	S4	9.6	56.84	956	7.80
9/26/08 5:08 PM	S3	8.1	61.16	924	8.00
11/5/08 1:00 PM	S6	10.8	53.42	914	8.18
11/5/08 1:45 PM	M5	10.6	53.96	845	8.19
11/5/08 2:30 PM	M4	9.7	55.22	844	8.10
11/5/08 3:00 PM	S4	9.96	53.78	950	7.95
11/5/08 4:00 PM	S3	7.1	55.40	947	7.81

Stream Channel Stability

Stream channel habitat is shaped by erosion and sedimentation processes that determine the form the stream channel and materials present on the streambed. These are important habitat characteristics for fish and invertebrates, influencing the food web, spawning areas, and the availability of protective cover. Watershed hydrology drives these geomorphic processes, and urbanization can drastically change the flows experienced by a stream. Urban streams typically have a more rapid, or "flashy", response than undeveloped watersheds, leading to increased streambank erosion, stream incision and/or increased sedimentation.

Qualitative observations of several reaches of Swan Creek and Murphy's Creek indicate that their stream channels are relatively stable with densely vegetated banks and do not show obvious signs of typical urban impacts. It should be noted that some gully erosion was observed after the heavy rains

of June and July 2008 in the agricultural headwaters of Swan Creek east of the Fitchburg Technology campus.

A topographic survey in December 2008 (**Figure 5.3)** included several channel cross sections within the Neighborhood boundary to provide a baseline for future comparison. Three sections on the South Branch and two sections in the headwaters of the North Branch were surveyed (**Figures 5.4** and **5.5).** Periodic surveys at these locations as the area develops will provide an indication if channel widening or incision is occurring in response to the development.

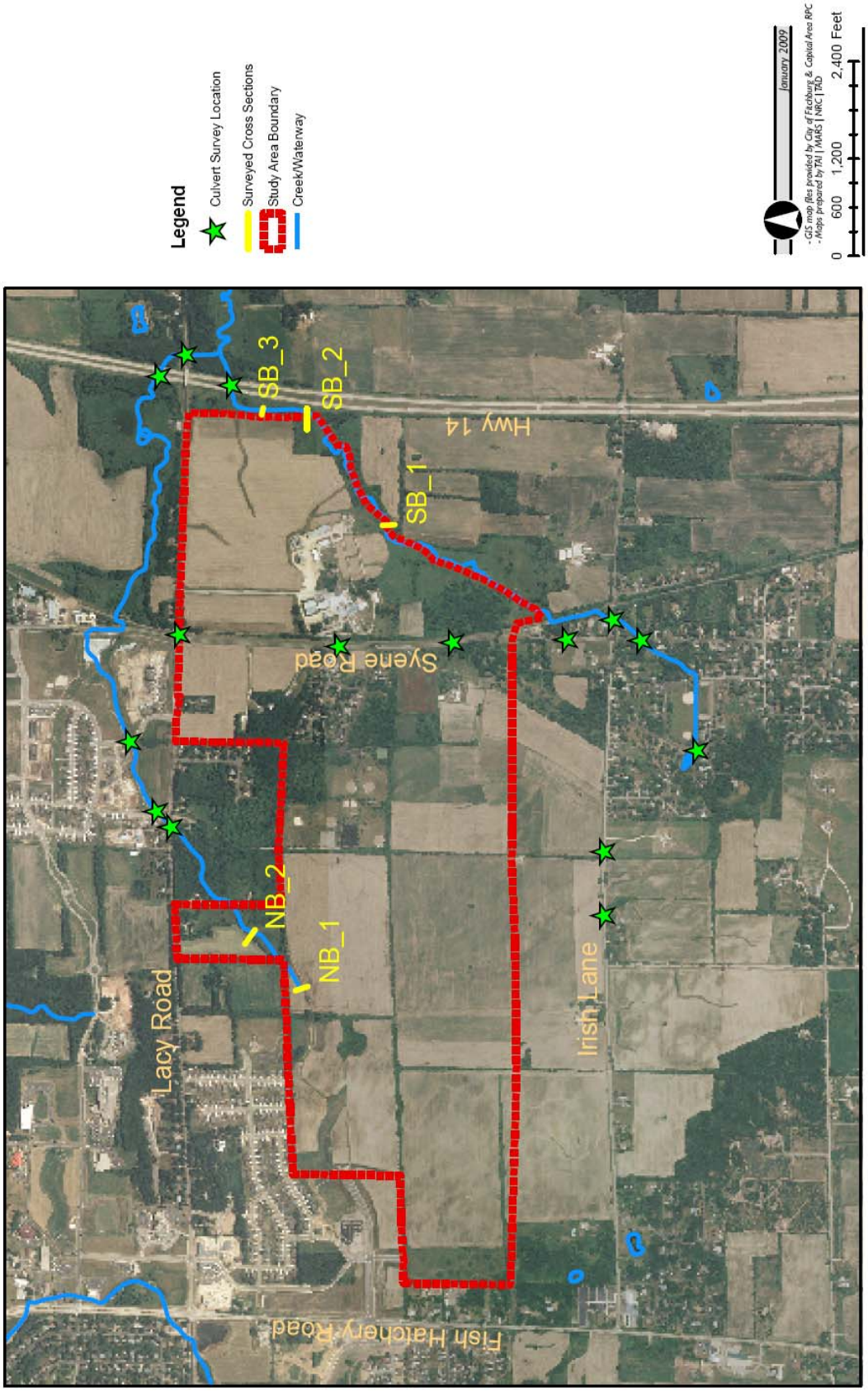
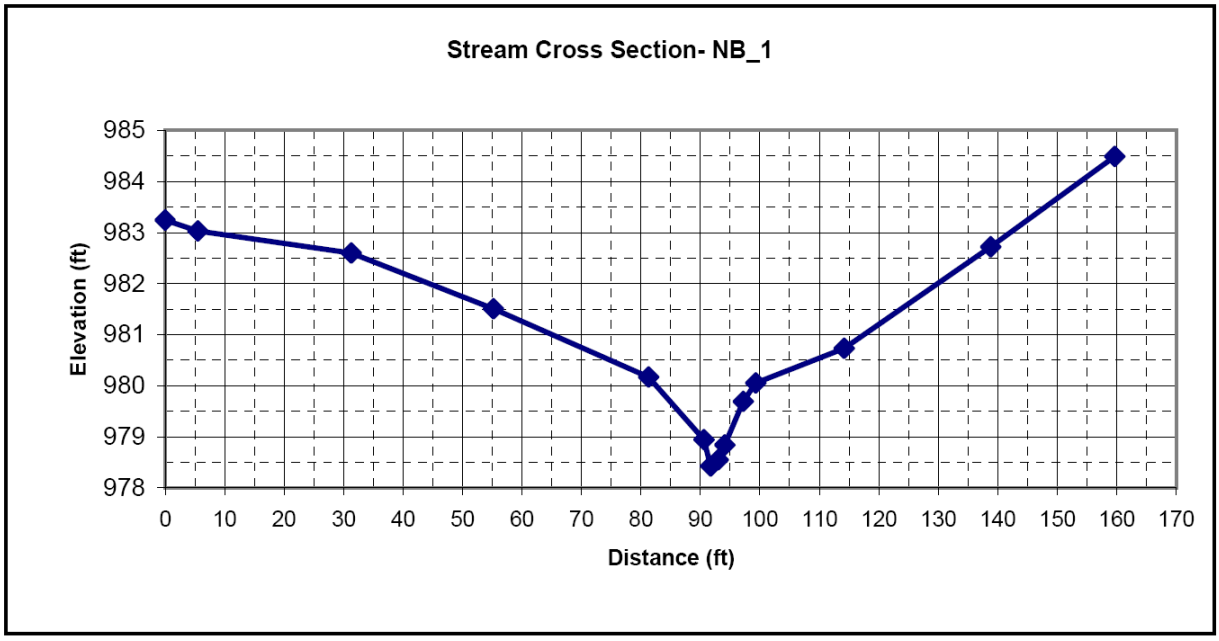


Figure 5.3: Survey Location Map



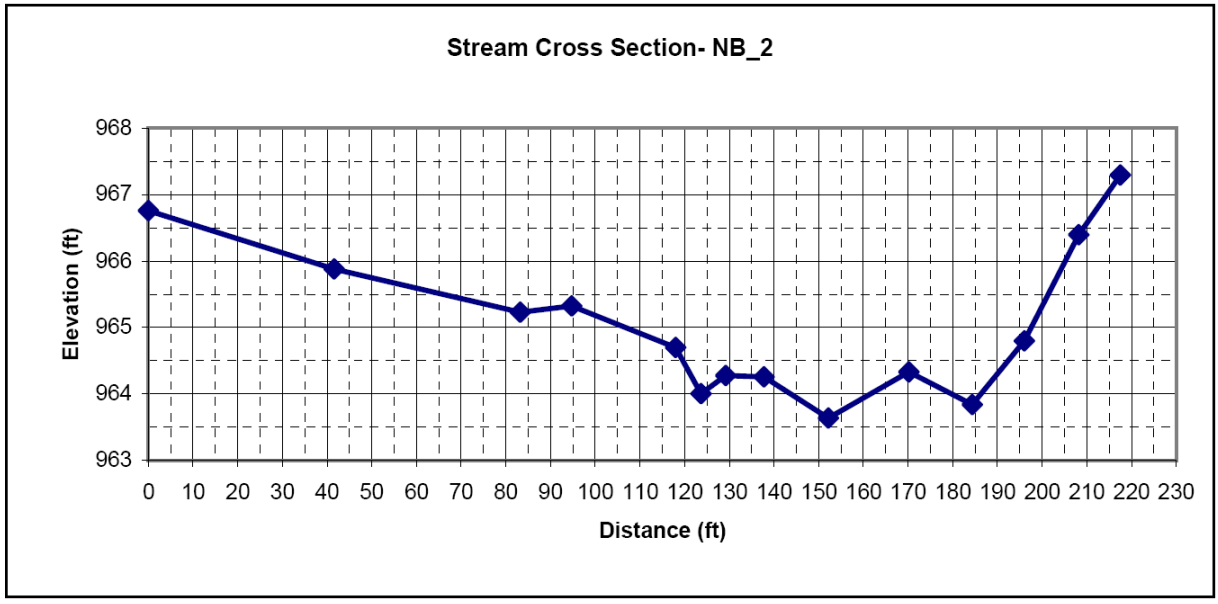
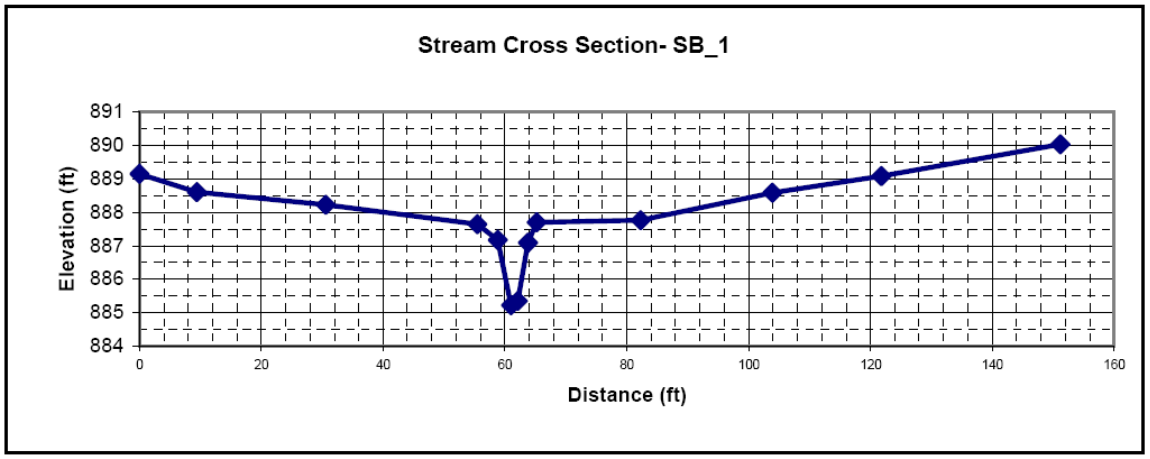
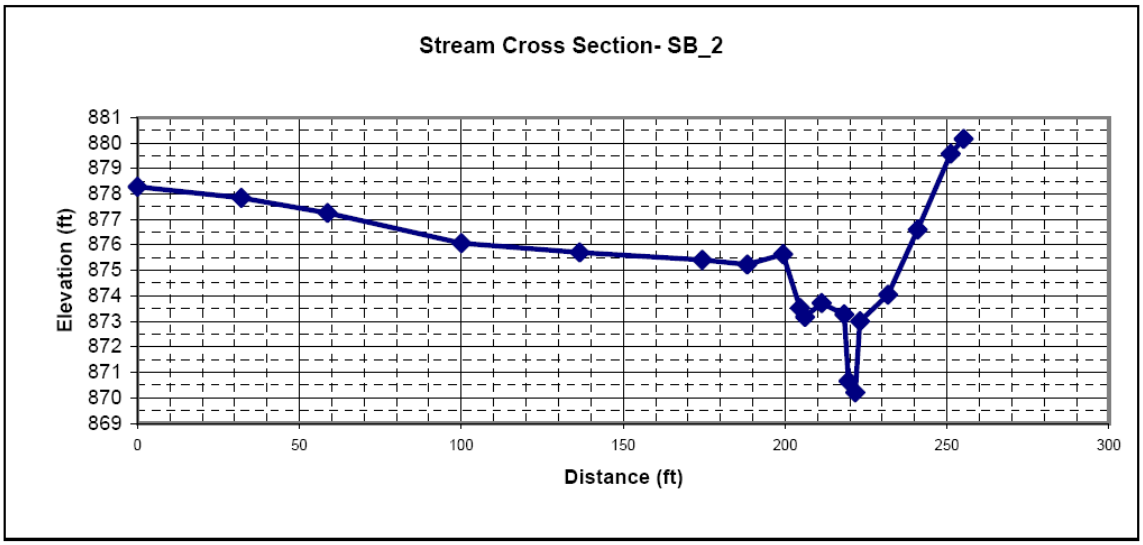
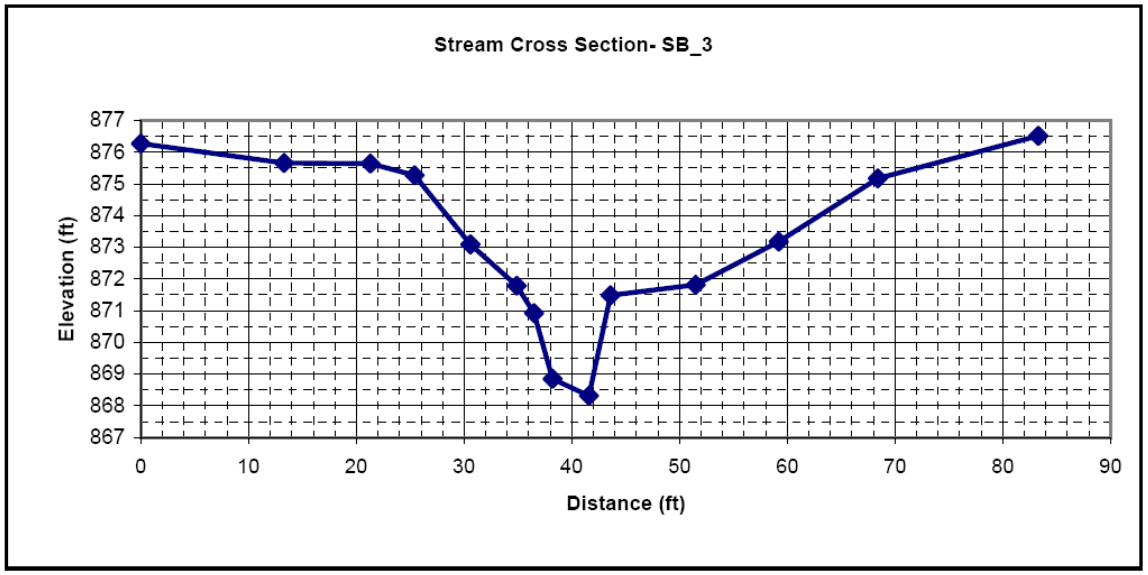


Figure 5.4: Stream Cross Sections from the North Branch of Swan Creek measured on 12/02/2008

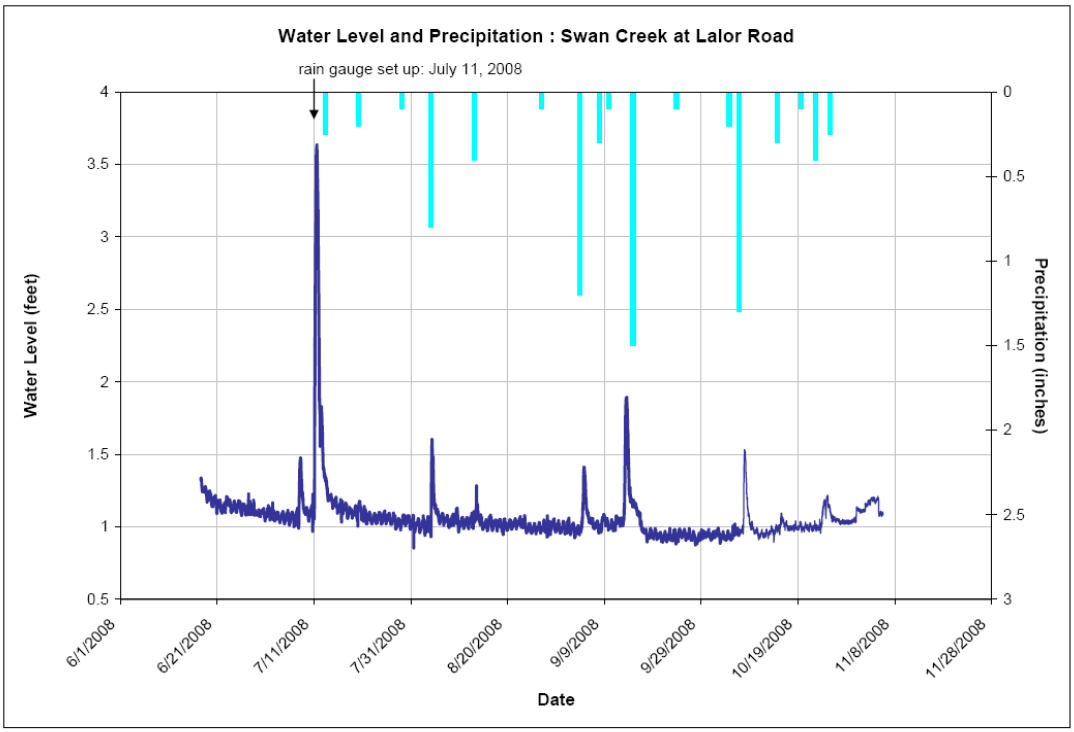




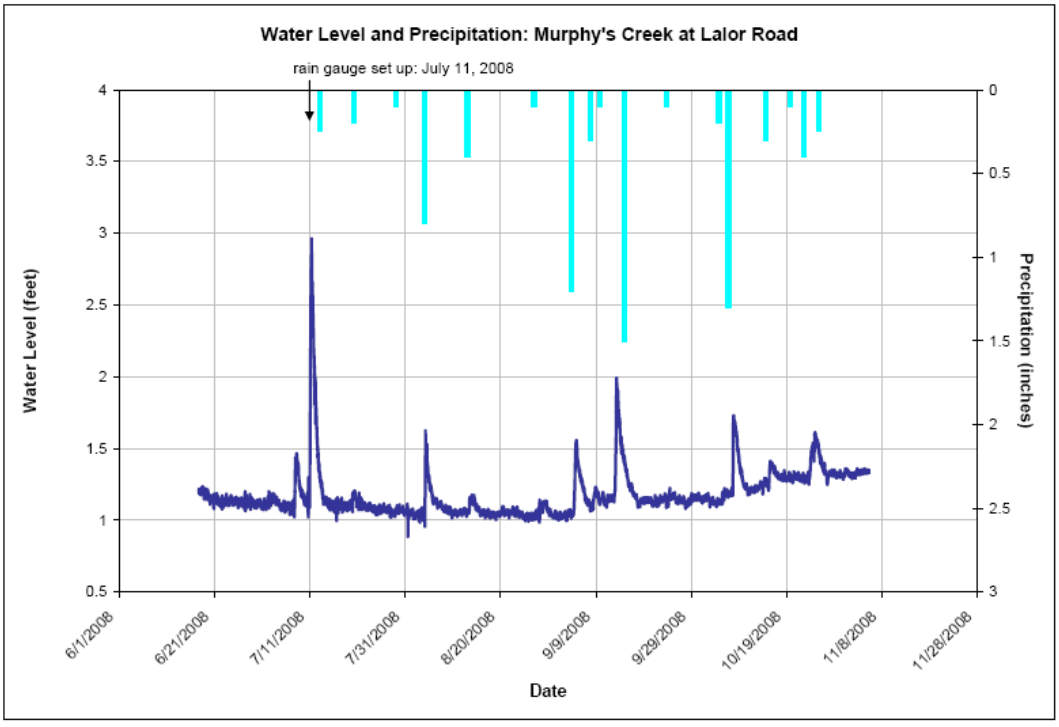


5.5: Stream Cross Sections from the South Branch of Swan Creek measured on 12/02/2008

Continuous monitoring of stream water level, or stage, was also conducted in Swan and Murphy's Creeks to provide information on how the streams respond to rainfall events. Stage recorders were installed in Swan and Murphy's Creeks at the Lalor Road sites from June through November 2008 (**Figures 5.6** and **5.7**). Current research by the U.S. Geological Survey has correlated various statistics describing this response with the ecological condition of streams (Steuer et al., in prep). These hydrologic condition metrics (HCMs) have the best correlation with ecological condition when characterized using streamflow data (e.g. Baker et al, 2004), however stage data has also proven to be useful (McMahon et al, 2003) and is much less expensive to collect.



Water Level Data: Montgomery Associates Resources Solutions
Precipitation Data: Fitchburg City Hall Rain Gauge



Water Level Data: Montgomery Associates Resources Solutions
Precipitation Data: Fitchburg City Hall Rain Gauge

Figure 5.6 and 5.7: Water Level and Precipitation

Metrics that have been found to be useful for analysis of stage data (Steuer et al., in prep) were calculated using the continuous stage records for Swan and Murphy's Creeks (**Table 5.3**). These statistical parameters describe general flow characteristics, flashiness, and duration of high flows. The statistics calculated are quite similar for Swan and Murphy's Creeks. Swan Creek is somewhat less flashy than Murphy's Creek and a little longer peak duration. Because the Swan Creek watershed is expected to urbanize more rapidly than the Murphy's Creek watershed, comparing these streams in the future could provide an indication of development-related hydrologic alteration of Swan Creek. For conventional development, it would be expected that Swan Creek would become flashier and that its peak duration would decrease relative to Murphy's Creek. An objective of the low-impact development methods proposed for the McGaw Park Neighborhood is to minimize such hydrologic changes. Monitoring the stage of Swan and Murphy's Creeks in the future and computing flashiness statistics will provide feedback on the success of these methods.

Table 5.3: Stage-based hydrologic conditions metrics for Swan and Murphy's Creeks

Metric	Swan	Murphy's	Relevance
Day percent change	5.8	5.7	General flow characteristics
Skew	7.7	3.6	
Periodr9/mths	1.7	3.0	Flashiness
Periodf9/mths	2.	3.2	
MXH_95	65	41	Duration of high flows
MDH_95	14	12	

Parameter explanation:	
day_pctchg	Sum of the absolute value of the relative change in daily values
SKEW	Skew of values for all hours in period of record
Periodr9/mths	Frequency of rising events, where total rise is greater than or equal to 9 times the median total rise over length of period of record (number of rises per month)
Periodf9/mths	Frequency of falling events, where total rise is greater than or equal to 9 times the median total fall over length of period of record (number of falls per month)
MXH_95	Duration of longest pulse greater than the 95th percentile value, for period of record
MDH_95	Median duration of high pulses grater than the 95th percentile value, for period of record
(From Steuer et al., in prep)	

Stage data can be leveraged to provide more information simply by conducting a topographic survey of the stream channel cross section and developing a stage-area relationship for the monitoring site, because cross sectional area is more closely related to ecological condition than stage alone (Steuer et al., in prep). Access was not obtained to conduct surveys of the monitoring sites during development of this neighborhood plan; however they could be performed in the future and applied to analysis of this stage data. Calculation of cross sectional area would allow comparison of HCMs

for Swan and Murphy's Creeks with area-based statistics developed by the U.S. Geological Survey for other streams in Wisconsin to understand how these streams fit into a gradient from agricultural to urban behavior.

Groundwater

Considerable information is available regarding the local groundwater system. The Dane County Regional Groundwater Model (DCRM) developed by the Wisconsin Geological and Natural History Survey in cooperation with U.S. Geological Survey and the Dane County Regional Planning Commission (Krohelski et al., 2000) includes all of Fitchburg. The model is a finite-difference numerical model that includes four layers to represent a lower sandstone bedrock aquifer, the Eau Claire shale confining unit, an upper dolomite and sandstone bedrock aquifer and a surficial unconfined, glacial deposits aquifer.

This model has been refined to include more detail by Susan Swanson of Beloit College (an advisor to the consultant team) to study the Nine Springs watershed. The refined model, the Nine Springs Inset Model (NSIM), includes the McGaw Park Neighborhood, Nine Springs Creek, Swan Creek, Murphy's Creek, and Lake Waubesa. It is most detailed in the Nine Springs watershed but can provide useful insights in the MPN area as well. Swanson's work also includes flow measurements of numerous springs in the City of Fitchburg and Town of Dunn, geologic observations and hydraulic measurements in deep bedrock monitoring wells.

Swanson's work indicates local springs are primarily fed by groundwater flow from the shallow sandstone aquifer, particularly highly permeable layers in the Tunnel City Formation. Historical loss of spring flow in the area appears to be primarily related to land use changes that have affected recharge of the shallow aquifer. Groundwater pumping has caused widespread lowering of groundwater levels throughout the region, and this has also affected spring flow in the long-term. However the effects of pumping on local springs have been muted, because pumping in Fitchburg primarily occurs in the deep sandstone aquifer below the Eau Claire Shale.

Wetland Hydrology

The composition and quality of wetlands within the McGaw Park Neighborhood are described in detail in Chapter 3. This section addresses hydrologic considerations relevant for future development, for wetlands both within the neighborhood and downstream.

Two of the wetlands in the McGaw Park Neighborhood described in Chapter 3 (W-1 and W-2) appear to be seasonally saturated or inundated; indicating that groundwater inflow to them is significant during part of the year. Priorities for water management are to maintain groundwater supply to the wetlands and to minimize changes in runoff volume and frequency. Wetland W-3, near the western boundary of the McGaw Park Neighborhood, appears to be permanently inundated due to surface runoff. Minimizing changes in runoff volume to this closed depression wetland will be a primary management priority.

Beyond the McGaw Park Neighborhood boundary, a diverse, high quality sedge meadow wetland is present along Swan Creek downstream of CTH MM. This 16 acre wetland is also reported to contain low prairie and calcareous fen vegetation (Biologic Environmental Consulting, 2006). Invasion by reed canary grass and brush is the primary threat to this wetland. Minimizing hydrologic alteration of Swan Creek due to development in the McGaw Park Neighborhood will be important for maintaining the health of such downstream wetlands.

The Waubesa Wetlands State Natural Area, located approximately 2 miles east of the Neighborhood near the southwestern tip of Lake Waubesa (**Figure 5.1**), also is supported by hydrologic processes that could be affected by land use in the McGaw Park Neighborhood and elsewhere across the City of Fitchburg and Town of Dunn region. The wetlands are fed by both Swan and Murphy's Creeks and can be affected by activities upstream in those watersheds. The area includes some of the highest quality and most diverse wetlands in southern Wisconsin, including sedge meadow, fen, and shrub-carr communities, and it supports diverse bird life, the state-threatened Blanding's turtle, and northern pike spawning.

Groundwater flow is very important to the Waubesa Wetlands. Nine major springs and numerous smaller springs are present, with several deep spring cones lined with filamentous algae and purple-colored bacteria. On August 11, 2008 City of Fitchburg staff and members of the MPNP consulting team visited springs in the Waubesa Wetlands by canoe to observe hydrologic conditions and wetland plant communities. Several springs in the wetland emanate from the bed of Lake Waubesa in approximately 10-foot deep water. Handheld temperature probe measurements found that the ambient temperature of Lake Waubesa was approximately 30° C, while the water temperature near the surface of the springs was typically 10 to 11 ° C indicating substantial groundwater mixing with the lake water. Electrical conductivity measurements were also indicative of groundwater discharge, with values recorded at springs of approximately 650 to 950 □S/cm, compared with approximately 500 □S/cm for Lake Waubesa. The limited measurements provided some suggestion of different groundwater source areas for springs in different parts of the wetland. Springs in Swan Creek had conductivity readings between 900 and 950 □S/cm, while "Deep Purple Spring" and adjacent springs approximately one-quarter mile south had conductivity values of approximately 650 to 750 □S/cm. However, a much more detailed study would be necessary to draw conclusions regarding source areas for these springs.

Floodplains

The Federal Emergency Management Agency (FEMA) recently revised the regulatory floodplains, including the area of the McGaw Park Neighborhood. The new Flood Insurance Rate Maps (FIRMs) have been approved by the City of Fitchburg and became effective on January 2, 2009.

Floodplain locations in the McGaw Park Neighborhood shown on the new and old FIRMs are very similar, with the only regulatory floodplains in the Neighborhood occurring in the northeastern corner of the planning area along the South Branch (**Figure 5.8**). These areas are designated as Zone A, meaning no base flood elevation has been established.

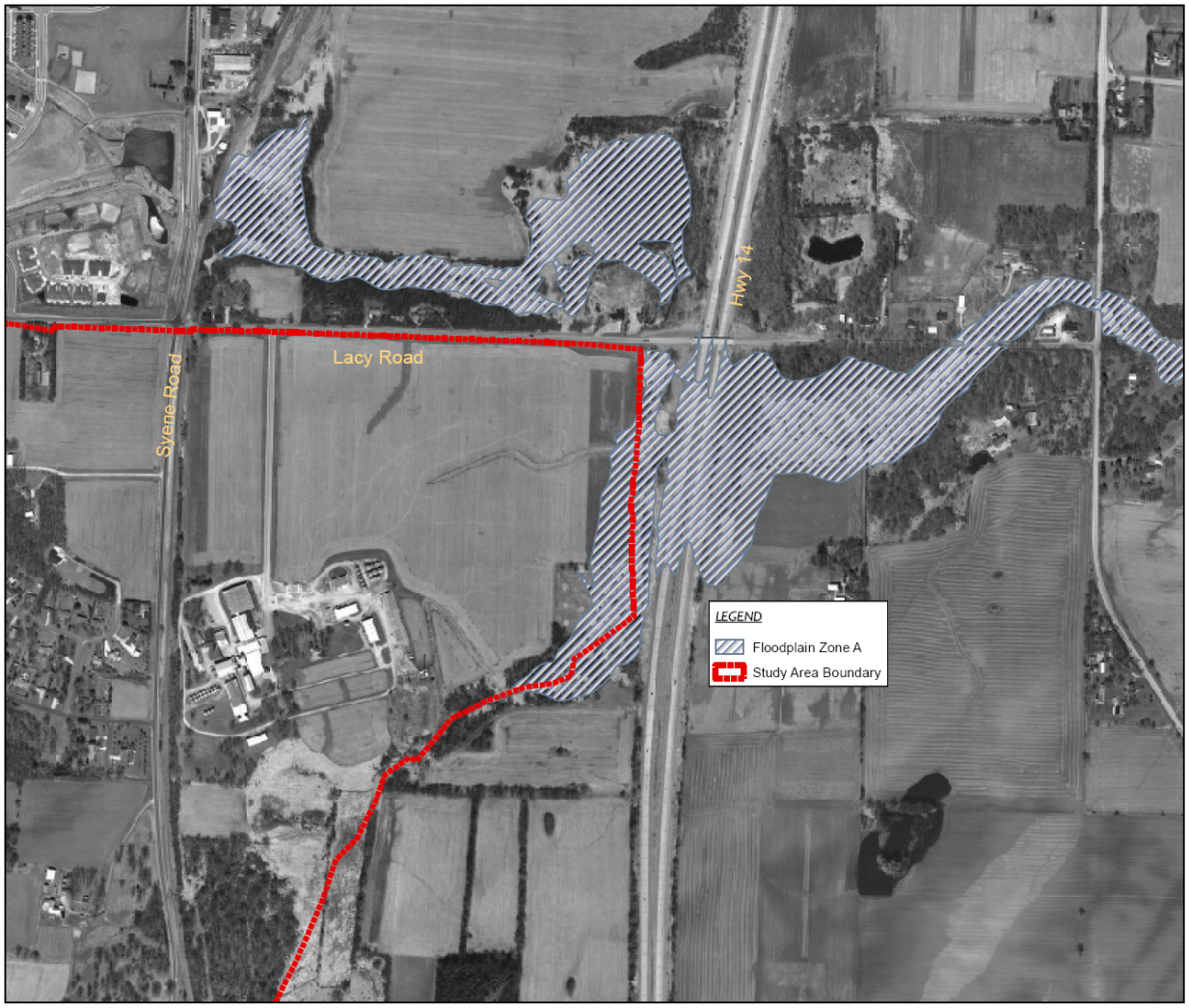


Figure 5.8 Floodplain Location

The Capitol Area Regional Planning Commission (CARPC) has recently adopted criteria for environmental corridors that include the 100-year floodplain. In this location, a 300-foot buffer will extend from the wetland boundary, following City of Fitchburg policy. This wetland buffer is more extensive than the floodplain and will be the primary factor in determining the location of the environmental corridor.

Steep Slopes

The Capitol Area Regional Planning Commission considers areas of slopes steeper than 12% to be unsuitable for inclusion in Urban Service Areas and dictates that these slopes should be included in environmental corridors. Small areas with slopes steeper than 12% are present in three parts of the study area: the southwest corner, the southeast corner immediately west of Syene Road, and adjacent to the eastern boundary of McGaw Park. These slopes are all wooded and designated as environmentally sensitive areas with no development in the growth model.

Woodlands

In addition to providing valuable upland habitat, woodlands can have high groundwater recharge rates due to the structure of typical forest soils. Most woodlands in the McGaw Park Neighborhood have been included as environmentally sensitive areas with no development in the growth model. Maintaining natural vegetation cover in these forest areas complements the use of engineered facilities to maintain groundwater recharge and reduce runoff volume.

Summary of Water Resource Issues

Swan and Murphy's Creeks

- Classified as warm water forage fisheries by the Wisconsin Department of Natural Resources, however their headwaters are cold due to groundwater inflow.
- Moderate dissolved oxygen levels, with no observation of excessive algae activity.
- Channels appear to be relatively stable.
- Both streams have similar "flashiness" or runoff response. Comparison in the future would be useful as the Swan Creek watershed develops.

Groundwater

- Springs are fed primarily by the shallow sandstone aquifer, especially high permeability zones in the Tunnel City Formation.
- Loss of spring flow has been caused by land use changes that have decreased recharge.
- Pumping has caused widespread lowering of groundwater levels, with long-term affects on springs and streams.
- The Eau Claire shale reduces the impacts of pumping in the immediate vicinity of wells and distributes the impact over a wider area.

Wetlands

- Minimizing runoff volume changes and maintaining recharge rates is important for wetlands in the McGaw Park Neighborhood.
- High quality wetlands are present downstream in the Swan Creek watershed, including the Waubesa Wetlands State Natural Area.
- Downstream wetlands can be affected both by increases in runoff and decreases in groundwater levels.

Floodplains

- The only regulatory floodplains present in the McGaw Park Neighborhood are along the North Branch of Swan Creek in the far northeast part of the Neighborhood.
- This floodplain is mapped as Zone A, meaning no base flood elevation has been established.

Steep Slopes and Woodlands

- Slopes steeper than 12% are uncommon in the Neighborhood and are generally wooded and not planned for development.

Stormwater Management Plan

The conceptual stormwater management plan for the McGaw Park Neighborhood is based on the analysis of water and natural resources described above. It is designed to address the key water and natural resource issues identified in the planning area and surrounding region. Neighborhood-specific performance standards were developed to support key hydrologic processes that impact aquatic ecosystem health. Stormwater models were used to evaluate the expected performance of stormwater control practices and to develop recommendations that balance resource protection with engineering feasibility.

Performance Criteria

See note on front cover for CARPC approved stormwater performance standards.

The individual development parcels within the McGaw Park Neighborhood will exceed the thresholds for stormwater management and erosion control permit applicability from both the City and the State. Therefore, the entire Neighborhood will be subject to the criteria outlined in the City's ordinance and State's Administrative Code.

In addition to meeting these criteria on both the City and State level, in order to preserve the habitat function in the North and South Branches of Swan Creek, Neighborhood-specific design objectives will also be necessary that go above and beyond the City's and State's standard ordinance criteria.

State Criteria

The State performance standards outlined in State Administrative Code, Sections NR 216 and NR 151 are as follows:

- Maintain peak discharge rates such that the post-development peak runoff rate does not exceed the pre-development peak runoff rate for the 2-year, 24-hour design storm event;
- Reduce the Total Suspended Solids (TSS) load by 80%, based on an average annual rainfall, as compared to no controls.
- For residential land use, infiltrate a sufficient volume of runoff such that:
    a. The post-development annual stay-on volume is at least 90% of the pre-development annual stay-on volume, or
    b. Infiltrate at least 25% of the 2-year, 24-hour storm.
    c. No more than 1% of the project site (entire area) is required to be used as effective infiltration area.
- For commercial, industrial, or mixed land uses, infiltrate a sufficient volume of runoff such that:
    a. The post-development annual infiltration (stay-on) volume is at least 60% of the pre-development annual stay-on volume, or
    b. Infiltrate at least 10% of the 2-year, 24-hour storm.

c. No more than 2% of the project site (impervious area only) is required to be used as effective infiltration area.

City Criteria

The City performance standards outlined in Chapter 27 of the City's ordinances are as follows (where different):

- Maintain peak discharge rates such that the post-development peak runoff rate does not exceed the pre-development peak runoff rate for the 2-year (2.9 inches), 10-year (4.2 inches) and 100-year (6.0 inches) 24-hour design storm events;
- Treat the first 0.5 inches of runoff for oil and grease using the best removal technology available;
- Safely pass storm events in excess of the 100-year, 24-hour storm event;
- If the effective infiltration area reaches the State "cap" prior to meeting the infiltration goal, then designers have the option of meeting either the infiltration goal or an alternative goal of meeting a recharge rate of 7.6 inches/year; and
- Deep tilling or similar practices shall be implemented to restore soil structure to pre-developed conditions.

McGaw Park Neighborhood-Specific Standards

The natural resource inventory and analyses described above indicate that the local streams and wetlands warrant protection, are likely to be sensitive to changes in stormwater runoff volume and groundwater recharge, and can provide significant natural amenities to the McGaw Park Neighborhood. Based on the need to further protect downstream natural resources, and the hydrologic modeling described below, the following additional criteria are recommended for the McGaw Park Neighborhood for all land use types:

1. Post-development peak runoff rate shall not exceed the pre-development peak runoff rate for the 2-year (2.9 inches), 10-year (4.2 inches) and 100-year (6.0 inches) 24-hour design storm events.
2. Development sites shall maintain a recharge rate of 7.6 inches/year under post-development conditions, and maintain a post-development annual stay-on volume of at least 90% of the pre-development annual stay-on volume. This criterion is based on the desire to maintain base flow discharge to streams and wetlands.
3. The exclusions and exemptions defined in State and County standards shall apply, except that no exemption from infiltration requirements for areas where the soil infiltration rate is less than 0.6 in/hr will apply. This criteria is based on recognition that water quality treatment and runoff volume reduction through evapotranspiration may be feasible with biofiltration systems even in areas of low-permeability soil. The maximum size of effective infiltration areas where soil infiltration rate is less than 0.6 in/hr is 4% of the total development site.
4. Stormwater infiltration and treatment BMP designs shall limit ponding duration to 24 to 48 hours, a time period deemed appropriate for plant survival. This criterion is based on the

importance of vegetation survival to sustainable infiltration area performance, and the importance of not directing too much runoff to individual biofiltration areas.

5. Total Suspended Solids (TSS) load shall be reduced by 80%, based on an average annual rainfall, as compared to no controls, and the first 0.5 inches of runoff shall be treated for oil and grease using the best removal technology available.
6. Management of phosphorus loading to receiving waters should be coordinated with studies currently in progress to set phosphorus criteria. The U.S. Environmental Protection Agency has required development of a Total Maximum Daily Load for phosphorus throughout the Rock River Basin in Wisconsin, and a more detailed study of pollutant loading to the Yahara chain of lakes has been initiated by a memorandum of understanding between Dane County, the City of Madison, the Wisconsin Department of Natural Resources, the Wisconsin Department of Agriculture, and Trade and Consumer Protection. These studies will determine phosphorus load targets for different land uses throughout the Rock River Basin, including the Fitchburg area.
7. Thermal protection of streams during runoff events will be accomplished through the stormwater infiltration standards described above and the 300-foot wetland buffer along the South Branch. Stormwater infiltration facilities will provide considerable thermal benefit by capturing heated "first flush" runoff.
8. "In-line" wet ponds in areas of perennial streamflow or spring flow should be avoided, to provide thermal protection for streams during dry weather (baseflow) conditions. Baseflow augmentation through stormwater infiltration practices will also provide dry weather thermal benefits.
9. Conveyance of stormwater through stream and wetland buffers shall be accomplished by open, vegetated drainage swales to the extent practicable. Outfalls to water bodies shall be designed to disperse water and avoid concentrated discharges.
10. City staff shall have flexibility in reviewing and approving stormwater management plans to address site-specific challenges, such as the potential for groundwater-driven flooding, unsuitable soil conditions, or limited space for stormwater management facilities.

Plan review procedures used by the City should allow for variance from the criteria listed above due to unique site-specific issues, and also allow for the evolution of design practices and regulatory programs in the future. An example of a variance that may be appropriate is in situations where maintaining 90% of the pre-development stay-on volume results in groundwater recharge rates in excess of 7.6 inches per year that may cause concerns about groundwater-driven flooding down gradient, in which case the City may conclude that maintaining the 7.6 in/yr recharge rate, alone, is the appropriate criterion.

See note on front cover for CARPC approved stormwater performance standards.

See note on front cover for CARPC approved stormwater performance standards.

Table 5.4: Recommended stormwater management performance standards.

Issue	McGaw Park Neighborhood Recommendation
Peak discharge	Maintain pre-development peak discharge for the 2-, 10-, and 100-year, 24-hour design storms
Infiltration	Maintain at least 90% of the pre-development infiltration volume.
Groundwater recharge	Maintain an average recharge rate of at least 7.6 inches per year
Water quality: TSS	Remove 80% total suspended solids for the 1-year, 24-hour design storm.
Water quality: oil and grease	Treat the first 0.5 inches of runoff for oil and grease.
Water quality: phosphorus	Develop phosphorus loading criteria in coordination with the U.S.E.P.A. Total Maximum Daily Load study of the Rock River basin, and the more detailed assessment of the Yahara Lakes underway by Dane County, City of Madison, Department of Natural Resources, and Department of Agriculture, Trade and Consumer Protection.
Thermal mitigation	Accomplished through stormwater infiltration and vegetated buffers. No in-line wet ponds in areas of perennial flow.

Summary of Infrastructure Plan

The conceptual stormwater management plan for the Neighborhood uses a combination of infiltration and detention to meet the criteria described above. The conceptual geometries of the infiltration and detention features are outlined in the following sections. On average, approximately four percent of the Neighborhood area would be needed for stormwater management features (not including associated grading for embankments, etc.).

The infiltration features could be located close to the runoff source areas or located in more regional facilities. There are pro's and con's to each approach. Close proximity to the source area allows for treatment of smaller areas, which often poses less risk from a failure standpoint and can be implemented incrementally as areas develop. A distributed approach also provides groundwater recharge closer to where it occurred before development. However, these smaller scale features often preclude extensive pre-treatment, and ownership and maintenance can be problematic on the smaller scale. On a regional scale, the feature could be owned by the City in a City-dedicated outlot, which potentially provides a more reliable maintenance program than would be offered by a private entity. However, regional facilities can present implementation challenges; where watersheds are developed incrementally; construction-site runoff must bypass the facility to avoid clogging the infiltration surface with sediment. Failure of a regional feature can negate stormwater control benefits for a large area. This conceptual plan does not preclude either approach.

The detention facilities would likely be implemented on a regional scale and dedicated to the City as outlots. Detention ponds could be wet or dry, depending on the arrangement of detention and infiltration facilities. Infiltration facilities may provide enough water quality treatment that wet

detention would not be necessary; site-specific analysis will be required to confirm stormwater management performance when site development plans are proposed.

Analysis Methods

The performance of the Neighborhood stormwater management plan was analyzed in XP-SWMM (peak discharge), P8 (water quality), and RECARGA (infiltration / stay-on and recharge).

Peak Discharge

XP-SWMM was used to evaluate the peak discharge control performance of the Neighborhood stormwater management plan, as well as peak discharge and hydrograph volume impacts downstream in Swan Creek. XP-SWMM is a computationally and graphically enhanced version of the US EPA stormwater management model (SWMM), distributed by XP software. XP-SWMM analyzes rainfall-runoff performance using watershed characteristics and input rainfall distributions or time series, and calculates runoff hydraulics using hydrodynamic routing procedures. The model has been extensively reviewed by regulatory agencies and has been accepted by Wisconsin DNR for stormwater and floodplain analyses, and is accepted by the Federal Emergency Management Agency for definition of regulatory floodplains. For ease of regulatory review, and also for conformance with ordinance criteria, rainfall-runoff was analyzed using Soil Conservation Service procedures including Curve Numbers (CN) and Time of Concentration (Tc) data for each subwatershed. CN values were computed using ArcGIS, and Tc values were computed using a spreadsheet version of TR-55. However, both rainfall-runoff and hydraulic routing modeling were computed using XP-SWMM.

Soil Conservation Service (SCS, now NRCS), 24-hour, Type II rainfall distribution was used in the analysis. Rainfall depths were taken from SCS Technical Paper 40 (TP-40), which are summarized in **Table 5.5,** below. It is expected that standard engineering methods will evolve to reflect climatic trends in rainfall patterns in the future. Stormwater management designs for specific parcels should use hydrologic methods and data that reflect standard engineering practice at the time of development.

Table 5.5: Summary of Rainfall Depths Used in Analysis

	Recurrence Interval and Depth (inches)		
Storm Duration	**2-year**	**10-year**	**100-year**
24 Hours	2.9	4.2	6.0

Water Quality

The ability of the stormwater management plan to meet water quality standards was evaluated using the model P8. This model was developed in 1990 to simulate the generation and transport of pollutants in stormwater runoff though user-defined watersheds and treatment devices. Watersheds are defined by total area, impervious fraction, impervious depression storage, impervious runoff coefficient, street sweeping frequency, and SCS runoff curve number for pervious

portions. Treatment devices are defined with stage-area relationships and outlet types, including infiltration. The model runs continuously with hourly precipitation and daily average temperature data. The National Urban Runoff Program (NURP) 50th percentile particle file was used for pollution generation. Treatment is calculated using particle settling velocity and specified pond geometry. Continual mass balance calculations are tracked between devices. Hourly rainfall data from Madison, Wisconsin was run between March 12, 1981 and December 2, 1981 as specified in NR 151, which is an annual rainfall of 28.81 inches.

Infiltration, Stay-on, and Recharge

Stormwater infiltration performance was evaluated using the computer model RECARGA. This analysis considered several hydrologic parameters related to rainfall-runoff response and the applicable ordinance requirements (**Figure 5.9**).

- *Infiltration*. The entry and movement of precipitation or runoff into or through soil *(from NR 151)*. Any precipitation that does not leave the site as surface runoff *(from Dane County Chap. 14 and Fitchburg Chap. 27)*. Infiltration is usually expressed as a depth in inches of water over the area of a site.
- *Evapotranspiration*. The processes of evaporation from the soil surface and transpiration by plants. Some water that infiltrates the soil is returned to the atmosphere by evapotranspiration.
- *Recharge*. The portion of the average annual rainfall that infiltrates the soil and becomes groundwater. Recharge does not include evaporation, transpiration, or runoff from the site *(from Dane County Chap. 14 and Fitchburg Chap. 27)*. Recharge is typically expressed as a depth in inches per year. Recharge is smaller than infiltration, due to evapotranspiration losses.
- *Stay*-on. The amount of infiltration required on an average annual basis. It is the portion of the annual rainfall (inches) on the development site that must be infiltrated on an annual basis to meet the infiltration goal *(from DNR's Conservation Practice Standards 1003 and 1004)*. Stay-on is the sum of recharge, evapotranspiration, and storage of water in depressions on the ground surface or in the soil.

RECARGA was developed at the University of Wisconsin-Madison from 2002 through 2005, with a recent update by Montgomery Associates: Resource Solutions, LLC in 2008. This program evaluates the hydrologic budget on focused infiltration areas, considering surface infiltration, soil moisture storage, evapotranspiration, and recharge groundwater. It has been adopted for use in design of stormwater infiltration systems, both as a general design aid, and as a tool to substantiate design conformance with regulatory requirements, including those of NR 151. The model runs continuously performing mass-balance of calculations throughout the infiltration or bioretention facility. Similar to the water quality analysis, hourly rainfall data from Madison, Wisconsin was run between March 12, 1981 and December 2, 1981 as specified in NR 151, representing an annual rainfall of 28.81 inches.

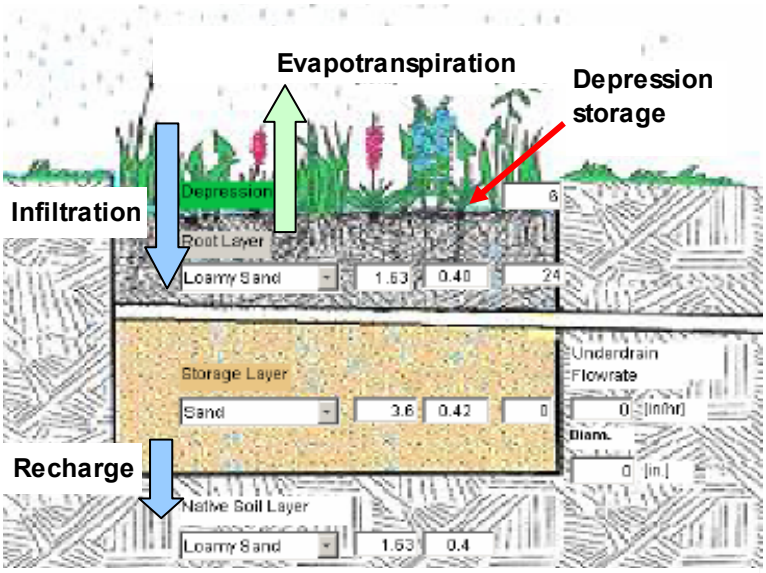


Figure 5.9. Soil infiltration and groundwater recharge, as calculated by the RECARGA model.

Performance

Existing Conditions

Hydrologic Parameters

The runoff conditions from the neighborhood were analyzed using several subwatersheds for the neighborhood as shown in **Figure 5.10** and summarized in **Table 5.6**. For the purposes of determining compliance with regulatory criteria, watershed boundaries were set generally based on the Neighborhood Plan boundary rather than natural subwatershed divides (e.g. southern boundary of subwatershed McGaw_SW2). For the peak discharge control analysis, agricultural CN values were based on NR 151 and Chapter 27 rather than the NRCS-recommended values (**Table 5.7**).

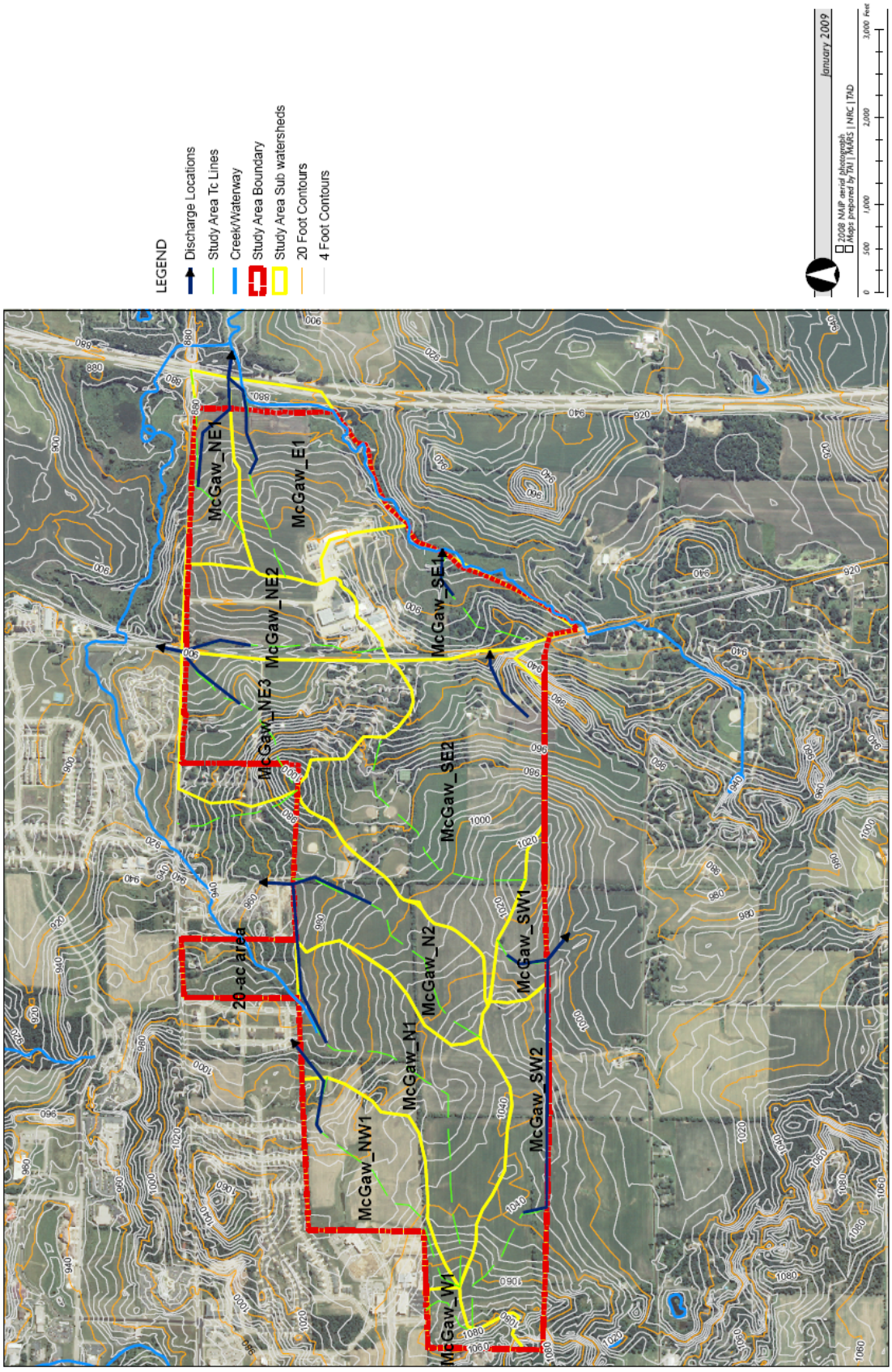


Figure 5.10: Existing Neighborhood Subwatersheds

Table 5.6: Model Subwatershed in Relation to Growth Model Parcels

		Subwatershed Name														
		McGaw_SW2	McGaw_SW1	McGaw_SE2	McGaw_SE1	McGaw_NW1	McGaw_NE3	McGaw_NE2	McGaw_NE1	McGaw_N2	McGaw_N1	McGaw_E1	D-S_N6	D-S_N6.1	D-S_N7	not modeled*
Parcels	1 - BP					x					x					
	2 - ES	x														x
	3 - MU	x				x					x					x
	4 - R2	x									x					
	5 - I	x								x	x					
	6 - R1	x	x	x						x	x					
	7 - PO		x	x												
	8 - R1		x	x												
	9 - ES			x												
	10 - ES				x				x			x				
	11 - BP				x				x			x				
	12 - TOD				x			x	x			x				
	13 - TS							x								
	14 - ES							x								
	15 - TOD						x									
	16 - R2						x									
	17 - ES						x									
	18 - R1			x			x									
	19 - ES			x												
	20 - MU												x			
	21 - R1												x	x		
	22 - R2			x						x	x					
	23 - PO			x			x			x					x	
	24 - PO			x		x				x	x					

* drains to Nine Springs Watershed

Abbreviations: BP = business park; ES = environmentally sensitive area; MU = mixed use; I = institutional; R1 and R2 = residential; TOD = transit-oriented development; PO = parks and open space.

Table 5.7: Summary of Existing Conditions SCS Parameters

Subwatershed Name	Subwatershed Area (acres)	Impervious Area (acres)	Pervious Area (acres)	Pervious Curve Number	Time of Concentration (min.)
McGaw_SW2	59.3	0.0	59.3	67	21
McGaw_SW1	17.7	0.0	17.7	68	20
McGaw_SE2	139.6	4.1	135.5	65	27
McGaw_SE1	58.3	8.6	49.7	66	31
McGaw_NW1	51.1	0.0	51.1	68	28
McGaw_NE3	79.8	9.2	70.6	64	29
McGaw_NE2	46.1	8.0	38.1	65	40
McGaw_NE1	26.4	0.0	26.4	69	22
McGaw_N2	61.4	2.4	59.0	67	33
McGaw_N1	97.5	0.0	97.5	68	38
McGaw_E1	71.8	3.4	68.4	67	28
Total	**709.0**	**35.7**	**673.3**	**N / A**	**N / A**

Peak Discharge Analysis

The Neighborhood existing conditions XP-SWMM model schematic (for peak discharge control evaluation) is shown in **Figure 5.11**. Note that in the existing conditions analysis, the existing detention facilities located in the northwest portion of the Neighborhood were ignored as these facilities were designed to some extent to provide stormwater management for the Neighborhood and would likely be reconfigured to some extent when the Neighborhood develops.

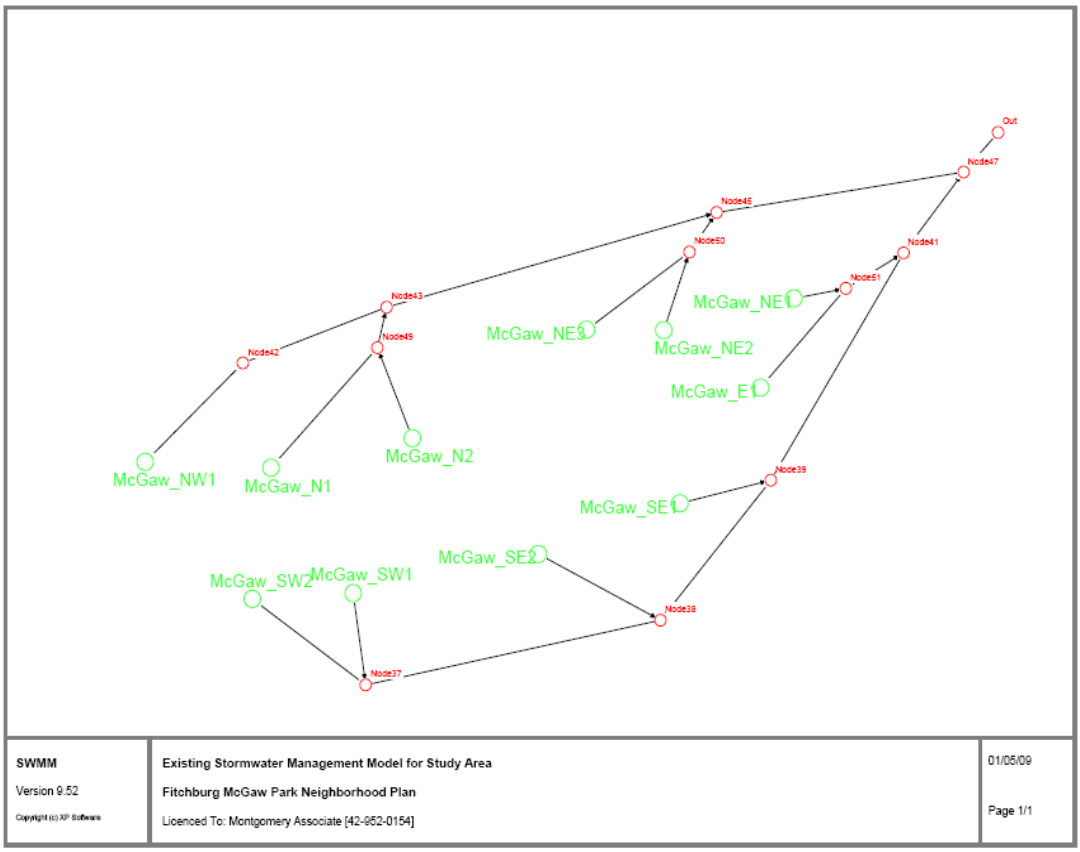


Figure 5.11 Existing Neighborhood XP-SWMM Model Schematic

Existing conditions peak runoff rates for each subwatershed are summarized in **Table 5.8** for the 2-, 10-, and 100-year recurrence intervals. Note that the total discharge from the Neighborhood is in general not equal to the sum of the subwatershed discharges due to timing differences in the runoff hydrographs.

Detailed XP-SWMM output is included in the Appendix (Chapter 5) for the 2- and 100-year events.

Table 5.8: Summary of Existing Peak Runoff Rates for McGaw Park Neighborhood

	Recurrence Interval and Peak Runoff (cfs)		
Subwatershed	**2-year**	**10-year**	**100-year**
McGaw_NW1	18	48	91
McGaw_N1 & N2	49	131	249
McGaw_NE2 & NE3	50	109	191
McGaw_NE1 & E1	38	89	154
McGaw_SE1	29	62	114
McGaw_SE2	43	120	245
McGaw_SW1 & SW2	30	78	112
Total	**249**	**591**	**1026**

Neighborhood Build-Out Conditions

Hydrologic Parameters

For the build-out conditions analysis, the same Neighborhood subwatersheds were used as for the existing conditions, but with increased impervious area. Percent impervious area for the different planned land uses are summarized in **Table 5.9**. Percent impervious for each land use is also listed for a potential "conservation" development layout, which illustrates the marked reduction in percent impervious area that a conservation-style development could realize, which would reduce the amount of detention and infiltration required to meet the same level of performance. However, for the purposes of this conceptual stormwater management plan, the "conventional" development style was assumed.

Table 5.9: Typical Impervious Surface Ratios

Land Use Type	Percent Impervious Area (Conventional Development)	Percent Impervious Area (Conservation Development)
Residential (R1)	62%	42%
Residential (R2)	68%	42%
Transit-Oriented Development (TOD)	84%	68%
Mixed Use (MU)	85%	69%
Business Park (BP)	90%	75%

Subwatershed impervious estimates within the Neighborhood were developed based on the percentage of each land use type within the subwatershed (**Figure 5.12**). **Table 5.10** summarizes the proposed subwatershed parameters within the Neighborhood. Note that subwatersheds "McGaw_W1" and the 20-acre area west of The Crossings were not included in the existing conditions analysis. The 20-acre area west of The Crossings already has regional detention facilities designed for this area to develop located within The Crossings subdivision. Subwatershed "McGaw_W1" drains to the west under existing conditions unlike the rest of the entire Neighborhood, which drains to the east. This subwatershed could be redirected to drain to the east, if appropriate, or have detention / infiltration facilities designed for this small area.

Pervious CN values for all Neighborhood subwatersheds were assumed to be 61, except for subwatershed "McGaw_SE1", which will remain largely unchanged and therefore assigned the same pervious CN value as in existing conditions. A curve number of 61 corresponds to open space (lawns, parks, etc) in good condition with B soils. The vast majority of the site is underlain by B soils, except for a small area of D soil which will remain undeveloped in watershed McGaw_SE1. It was also assumed that soil compaction mitigation will be completed post-construction to remediate the compaction of the soil resulting from construction equipment. Time of concentration for each proposed subwatershed was assumed to be half the existing time of concentration, except for "McGaw_SE1", which was assigned the same Tc as in existing conditions.

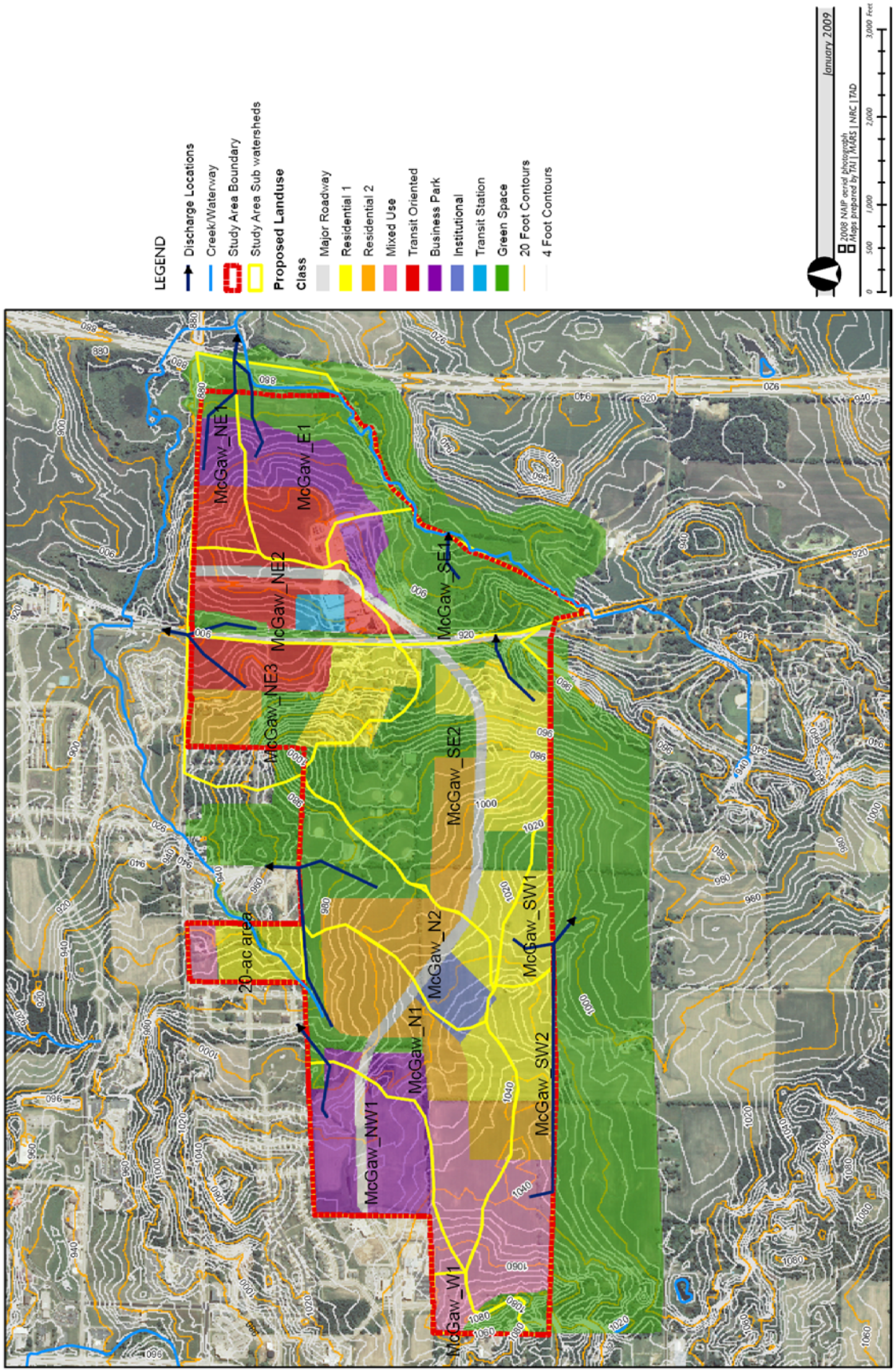


Figure 5.12: Proposed Land Use

Table 5.10: Summary of Percent Impervious Area for Growth Model

Subwatershed Name	Subwatershed Area (acres)	Percent Impervious Area (%)
McGaw_SW2	59.4	69%
McGaw_SW1	17.1	54%
McGaw_SE2	139.7	37%
McGaw_SE1	58.2	21%
McGaw_NW1	51.0	88%
McGaw_NE3	79.6	53%
McGaw_NE2	46.3	76%
McGaw_NE1	26.3	65%
McGaw_N2	61.4	45%
McGaw_N1	97.5	67%
McGaw_E1	67.5	49%
McGaw_W1	11.0*	40%
20-acre area west of The Crossing	20.5*	68%
Total	**704.2 / 735.7***	**54%**

(Conventional development patterns assumed to be conservative.)

Stay-on and Recharge

RECARGA was used to evaluate infiltration area size for a wide range of watershed runoff characteristics and soil types. Within the Neighborhood area, the infiltration capacity of the soils is generally appropriate for designing infiltration measures. According to the NRCS soil survey and the soil test pits described in Chapter 3, soils at depth (approximately 5 feet) within the Neighborhood are generally sandy loam or loamy sand. Infiltration rates mapped by the NRCS range from 1 to 4 in/hr, with the lower rates more common in the western and southeastern portions of the Neighborhood (**Figure 5.13**). To be conservative, rates assumed in the analysis were reduced significantly. Where a rate of 1.3 in/hr was listed by the soil survey, a rate of 0.5 inches/hour was assumed, where a rate equaling 3 in/hr or more was listed in the soil survey, a rate of 1.63 inches/hour was assumed. These values correspond with infiltration rates listed in the WDNR Conservation Practice Standard 1002 for sandy loam and loamy sand, respectively.

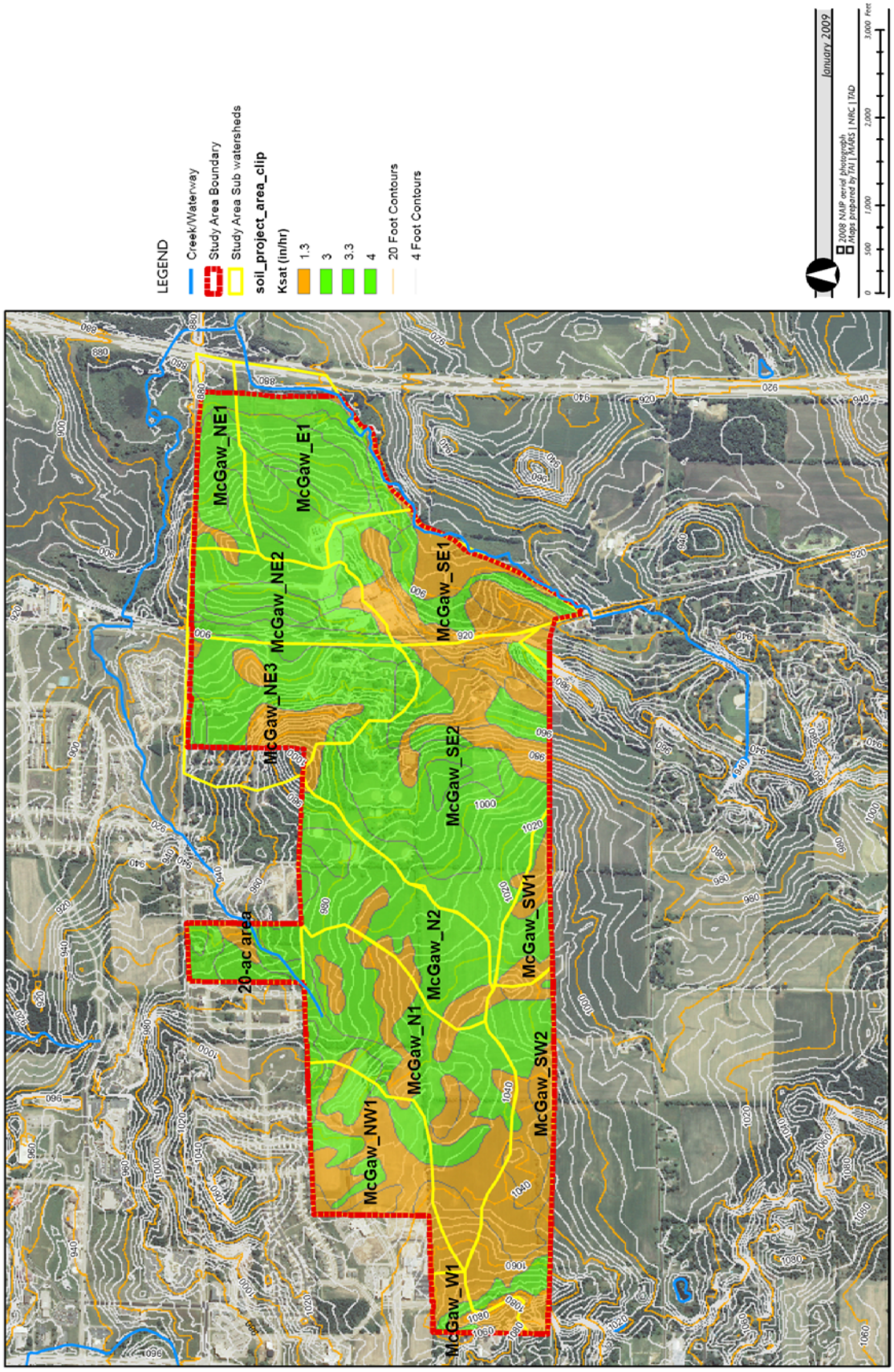


Figure 5.13: Soil Infiltration Rates

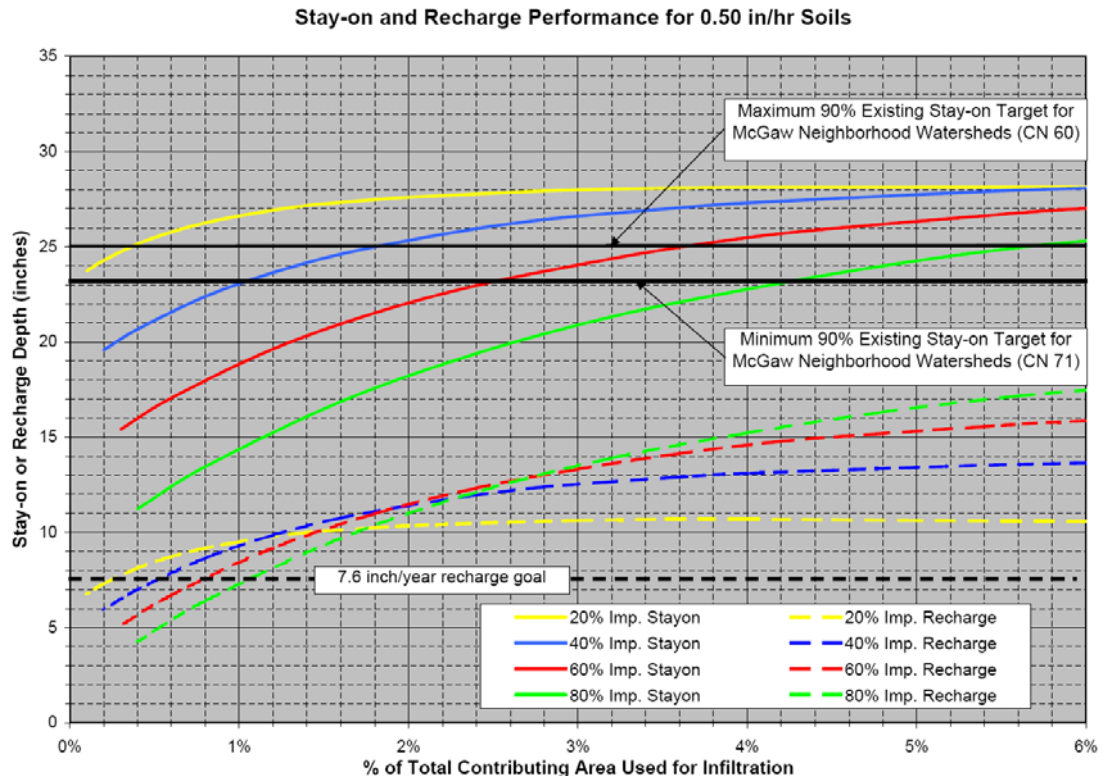
Infiltration features were assumed to have a ponding depth of 6 inches. Numerous scenarios were evaluated in RECARGA to evaluate the percent of the site that would be needed for various watershed percent impervious areas and soil infiltration rates to meet both 90% stay-on and 7.6 inches/year recharge.

Figures 5.14 and **5.15** display the results of these RECARGA simulations for soil infiltration rates of 0.5 in/hr and 1.63 in/hr, respectively. The solid lines indicate the stay-on performance for a given percent imperviousness based on the percent of the total development area dedicated to infiltration. The dashed lines indicate the groundwater recharge performance. Different colored lines represent various percent imperviousness on the site. The graphs indicate that except for low impervious percentages (20% or less), the stay-on goal is more difficult to meet (i.e. requires a larger percentage of the development area to be dedicated to stormwater infiltration).

Using the percent impervious surface ratio estimates for each subwatershed (**Table 5.9**), the anticipated infiltration area size (expressed as a percentage of the site) needed to meet the stay-on and recharge targets was computed (**Table 5.11**). Infiltration areas needed to meet the 90% stay-on target are generally predicted to be 2 to 4% of development sites, with higher values in subwatersheds "McGaw_SW2" and "McGaw_NW1". These subwatersheds have high percent impervious areas and modest infiltration rates. In these areas, it may be advisable to use source area controls such as green roofs to provide additional stay-on. Designing infiltration practices with storage layers can increase their effectiveness and somewhat decrease the size predicted here.

The average recharge rate for each land use category in the growth model estimated from Figures SW10 and SW11 was used to compute a weighted average recharge rate over the entire Neighborhood after build-out equal to 10 to 11 in/yr (**Table 5.12**).

See note on front cover for CARPC approved stormwater performance standards.



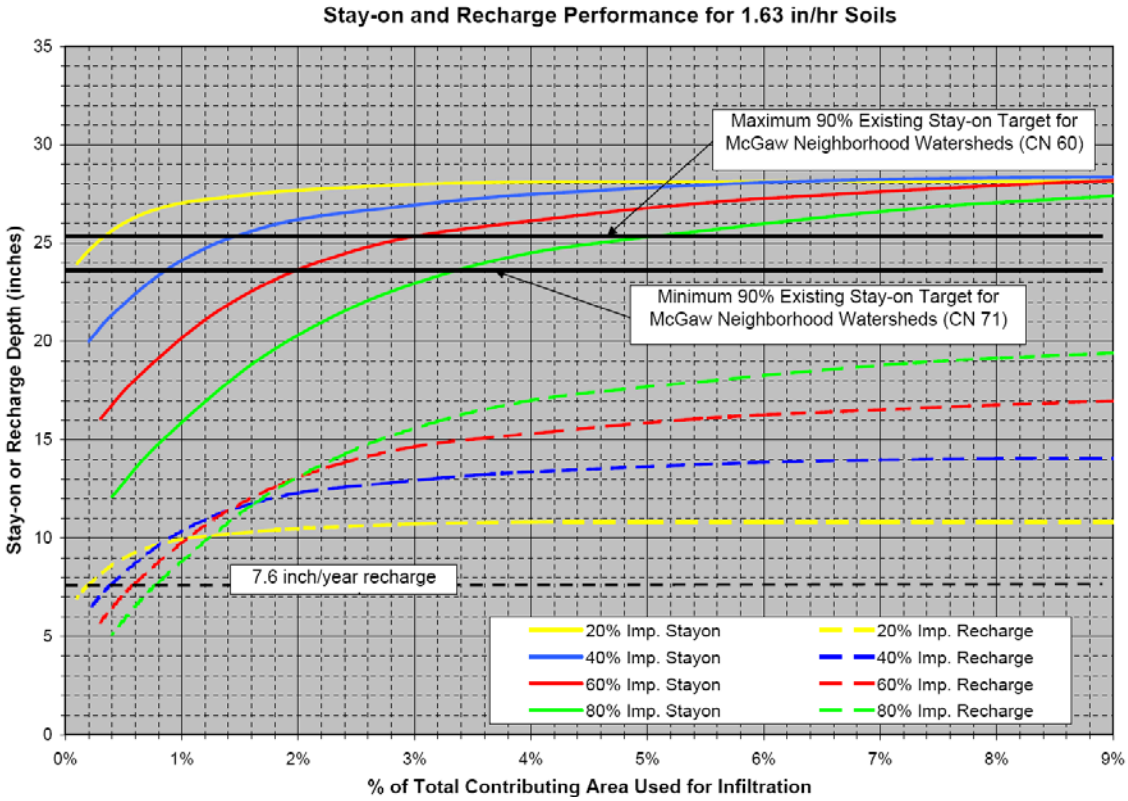


Figure 5.14 and 5.15: Infiltration Model Results

See note on front cover for CARPC approved stormwater performance standards.

Table 5.11: Infiltration Area Size to Meet 90% Stay-On

Subwatershed Name	Percent of Subwatershed Required for Infiltration Features	Required Area for Infiltration Features (acres)	Assumed Infiltration Rate (in/hr)
McGaw_SW2	4.3%	2.56	0.50
McGaw_SW1	2.1%	0.35	1.63
McGaw_SE2	1.4%	1.96	0.50
McGaw_SE1	0.2%	0.12	0.50
McGaw_NW1	6.0%	3.06	0.50
McGaw_NE3	1.4%	1.12	1.63
McGaw_NE2	3.2%	1.48	1.63
McGaw_NE1	2.7%	0.71	1.63
McGaw_N2	1.3%	0.80	1.63
McGaw_N1	4.0%	3.90	0.50
McGaw_E1	1.6%	1.08	1.63
20-acre area west of The Crossings	2.4%	0.49	1.63
McGaw_W1	1.6%	0.17	0.50
Total	**N / A**	**17.80**	**N / A**

(Assumes loamy sand subsoil.)

Table 5.12: Predicted Recharge Rate for McGaw Park Neighborhood

Land Use Type	Percent Impervious Area	Predicted Annual Recharge Depth (inches)	Acreage at 100% Build-out (acres)
Residential (R1)	42%	9.5	93.9
Residential (R2)	42%	9.5	47.4
Transit-Oriented Development (TOD)	68%	13.5	36.2
Mixed Use (MU)	69%	13.5	46.6
Business Park (BP)	75%	14.5	87
Institutional	70%	13.5	10
Green Space	0%	7.6	312.9
Transit Station	90%	17.0	5
ROW	90%	17.0	73
Total			**712**
Average Predicted Recharge Depth for McGaw Neighborhood		**10 - 11 Inches**	

(Assumes existing average recharge rate of 7.6 inches per year and pervious area CN of 61. Impervious surface ratios reflect conservation development to be conservative.)

Peak Discharge Analysis

Storage within stormwater management basins (either detention or infiltration) were distributed on a subwatershed scale, i.e. peak discharge control will be provided at each of the main discharge points from the Neighborhood area. Note that a portion of subwatershed "McGaw_N1" and the Neighborhood area west of The Crossings subdivision have already-constructed regional detention provided downstream (portion of subwatersheds "A" and "B" in Mayo Corporation's Stormwater Management Report for McGaw Park Regional Detention Basin). Therefore, the Neighborhood area west of The Crossings was not included in the peak discharge analysis; however, the portion of subwatershed "McGaw_N1" that The Crossings provides detention for is relatively small compared to the subwatershed, so in the conceptual analysis, it was assumed that "McGaw_N1" needed to meet the peak discharge control requirements of the City and State within the Neighborhood boundaries.

The following assumptions were made in analyzing the conceptual ponds:

- All detention ponds were assumed to have 5 feet of active storage and vertical side walls (for simplicity). Ponds could be designed more aesthetically with a shallower depth and larger surface area to provide the same storage volume.
- All detention ponds were assumed to be designed such that re-suspension of sediment was negligible. Traditionally, this means that the ponds would be designed as wet detention ponds with 3 to 5 feet of dead storage; however, wetland or prairie ponds could be designed to serve a similar function provided they are designed appropriately. Further, wetland ponds would be more appropriate for areas draining to the South Branch given the cool stream temperatures currently present.
- The primary outlet structure for each detention pond was assumed to be a 90-degree V-notch weir.
- A 20-foot emergency overflow weir was assumed to be present 4 feet above the bottom of the pond.

Table 5.13 displays the required detention areas for each subwatershed using the assumptions above to meet the peak discharge control requirements outlined by the City and State.

Table 5.13: Approximate Detention Areas

Subwatershed	Detention Pond Area (acres)
McGaw_SW2	1.7
McGaw_SW1	0.3
McGaw_SE2	2.0
McGaw_SE1	0.6
McGaw_NW1	1.3
McGaw_NE3	1.8
McGaw_NE2	1.6
McGaw_NE1	1.0
McGaw_N2	0.9
McGaw_N1	2.0

McGaw_E1	1.5
20-acre area west of The Crossings	N / A
McGaw_W1	N / A
Total	**14.7**

Infiltration areas were conceptually designed based on the RECARGA analysis. Infiltration ponds placed downstream of detention ponds will function more efficiently to the flow attenuation benefit provided by the detention ponds. In the conceptual stormwater management plan analysis, infiltration ponds were assumed to be upstream the detention ponds to be conservative. This conceptual stormwater management plan does not preclude placing regional infiltration ponds downstream of regional detention ponds, provided that soils and water table conditions are amenable to infiltration when specific stormwater management features are designed for the Neighborhood as it develops.

Table 5.14 summarizes the required total area required for stormwater management features by subwatershed. When expressed as a percentage of the watershed, it indicates that it will likely be necessary or appropriate to reduce the effective impervious area in some of the areas (such as subwatershed "McGaw_NW1") via use of green roofs, pervious pavement systems, or other low impact development approaches.

Table 5.14: Total Stormwater Management Areas

Subwatershed	Infiltration Area (acres)	Detention Pond Area (acres)	Total Stormwater Management Area (acres)	Percent of Subwatershed
McGaw_SW2	2.56	1.7	4.26	7.17%
McGaw_SW1	0.35	0.3	0.65	3.80%
McGaw_SE2	1.96	2.0	3.96	2.83%
McGaw_SE1	0.12	0.6	0.72	1.24%
McGaw_NW1	3.06	1.3	4.36	8.55%
McGaw_NE3	1.12	1.8	2.92	3.67%
McGaw_NE2	1.48	1.6	3.08	6.65%
McGaw_NE1	0.71	1.0	1.71	6.50%
McGaw_N2	0.80	0.9	1.7	2.77%
McGaw_N1	3.90	2.0	5.9	6.05%
McGaw_E1	1.08	1.5	2.58	3.82%
20-acre area west of The Crossings	0.49	N / A	0.49	4.45%
McGaw_W1	0.17	N / A	0.17	0.83%
Total	**17.80**	**14.7**	**32.5**	**4.62%**

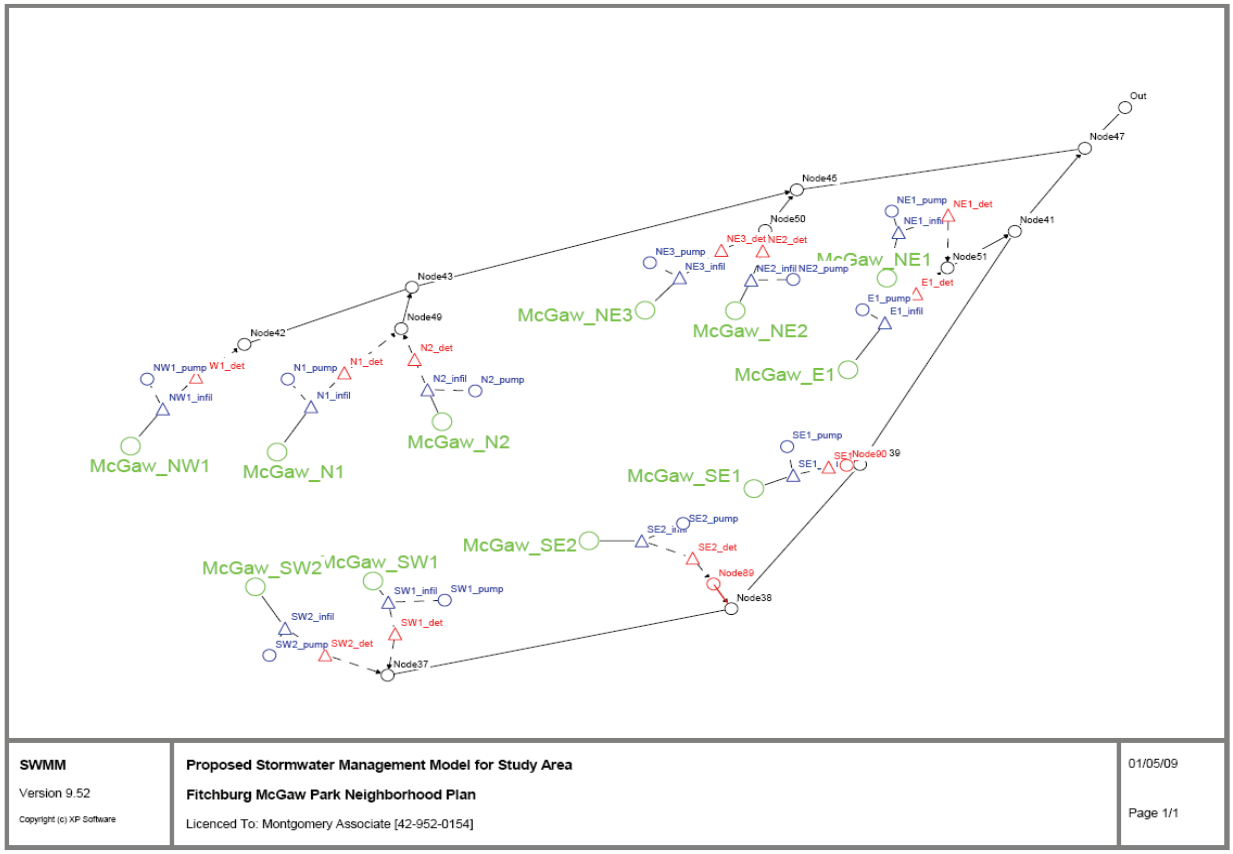


Figure 5.16: Proposed (Neighborhood Only) XP-SWMM Model Schematic

Figure 5.16 displays the build-out XP-SWMM model schematic for the Neighborhood, which was used for purpose of evaluating compliance with the peak discharge requirements of the City and State. **Table 5.15** compares the predicted existing and build-out peak discharges for each subwatershed for the 2-, 10-, and 100-year events, which indicates that the peak discharge criterion is met for all recurrence intervals and all subwatersheds. Detailed XP-SWMM output for the 2- and 100-year events is included in the Appendix (Chapter 5).

Table 5.15: Summary of Existing and Proposed Peak Runoff Rates for Neighborhood

	Recurrence Interval and Peak Runoff (cfs)					
	2-year		10-year		100-year	
Subwatershed	**Existing**	**Proposed**	**Existing**	**Proposed**	**Existing**	**Proposed**
McGaw_NW1	18	13	48	36	91	83
McGaw_N1 & N2	49	35	131	101	249	246
McGaw_NE2 & NE3	50	25	109	72	191	179
McGaw_NE1 & E1	38	17	89	53	154	139
McGaw_SE1	29	19	62	51	114	103
McGaw_SE2	43	24	120	76	245	239
McGaw_SW1 & SW2	30	16	78	47	112	107
Total	**257**	**149**	**637**	**436**	**1156**	**1096**

Water Quality

A P8 model was constructed using the same model input parameters used in the XP-SWMM model. The results show that by designing the stormwater requirements for peak control and stay-on/recharge, the Neighborhood stormwater plan will easily meet the 80% TSS water quality requirements. In fact, the infiltration features alone are typically sufficient to meet the water quality criterion.

Table 5.16 shows the results from the water quality analysis using P8. The table shows the percent removal of total suspended solids (TSS) for each of the devices. The detention ponds have lower removal efficiency because they are downstream of the infiltration ponds in the analysis and therefore have finer suspended solids to remove from the water.

Table 5.16: TSS Removal Efficiency (%)

Infiltration Device		Detention Device	
SW2_Infil	95%	SW2_Det	47%
NW1_Infil	96%	NW1_Det	35%
N1_Infil	95%	N1_Det	44%
N2_Infil	86%	N2_Det	49%
NE3_Infil	85%	NE3_Det	62%
NE2_Infil	94%	NE2_Det	53%
E1_Infil	90%	E1_Det	66%
SE1_Infil	54%	SE1_Det	59%
SE2_Infil	87%	SE2_Det	55%
SW1_Infil	95%	SW1_Det	30%
NE1_Infil	93%	NE1_Det	54%
OVERALL	**95.5**	**%**	

Cost, Timing and Staging

Stormwater management features will generally be constructed and paid for by developers. Their cost will depend on design details (e.g. distributed versus regional practices; vegetation planting). Because the McGaw Park Neighborhood does not receive off-site drainage from large developed areas, it will not be necessary for the City to construct and pay for regional ponds before individual parcels are developed.

As the McGaw Park Neighborhood is developed, agricultural activities will continue in portions of the planning area. In particular, the southern part of the area may be actively farmed for the next 25 years until Phase 3 is implemented. This includes areas upstream of parcels west of McGaw Park that drain to the North Branch and will be developed during Phase 2. Designers of these Phase 2 developments will need to consider the water quantity and quality implications of this off-site runoff. In addition, it is recommended that the City work with farmers to develop a transition plan from agricultural to urban land uses that addresses runoff water quality during the build-out period.

Water Supply Plan

Facility and Infrastructure Upgrades

Water Demand

Future water demand for the McGaw Park Neighborhood was estimated for build-out using current water usage rates for Fitchburg for different land use types. Residential estimates are based on projected dwelling units, occupants per unit, and consumption per person. Commercial use estimates are based on projected building square footage. Estimates of future water demand for the Neighborhood range from approximately 350,000 to 550,000 gallons per day (**Table 5.17**), based on current usage patterns. There is considerable uncertainty in this number, in particular because different commercial uses have varying water needs. In addition, water conservation has begun to lower the per-capita residential water use in Fitchburg (currently at approximately 80 gallons per day per person), and this trend is likely to continue. If LEED-ND credits for water efficiency, reduced irrigation, and water reuse are pursued, water use would decrease more sharply.

Table 5.17: Estimated Water Demand for McGaw Park Neighborhood at Build-Out (gal/day)

Land Use Category	Low Demand	Moderate Demand	High Demand
Institutional (School)	2,686	2,686	2,686
Residential	362,688	362,688	362,688
Commercial	4,013	103,363	149,105
Total	**369,386**	**468,736**	**514,478**

(Range of estimates reflects high variability in typical commercial water demand.)

The McGaw Park Neighborhood is located in three pressure zones of the Fitchburg water distribution system: the West, East and Northeast Zones (**Figure 5.17**), and it will eventually be served by existing wells 10 and 11, as well as a new well to replace existing wells 7 and 8 (**Table 5.18**). This new well will likely be located in the Greenfield Neighborhood, and it will be a deep aquifer well cased to the Eau Claire shale. It appears that these existing and future wells will have adequate capacity to meet the expected water demand.

Table 5.18: Wells supplying distribution system at build-out

Well	Water Zone
10 (existing)	West
11 (existing)	Northeast
Greenfield (future)	East

Connections to the water distribution system will be primarily on the north side of the McGaw Park Neighborhood, via extensions of existing water mains along new roadways (**Figure 5.17).** A new reservoir is planned for the high ground near the south-central portion of the Neighborhood. One possible location is shown in **Figure 5.17**, however a specific site has not yet been determined.

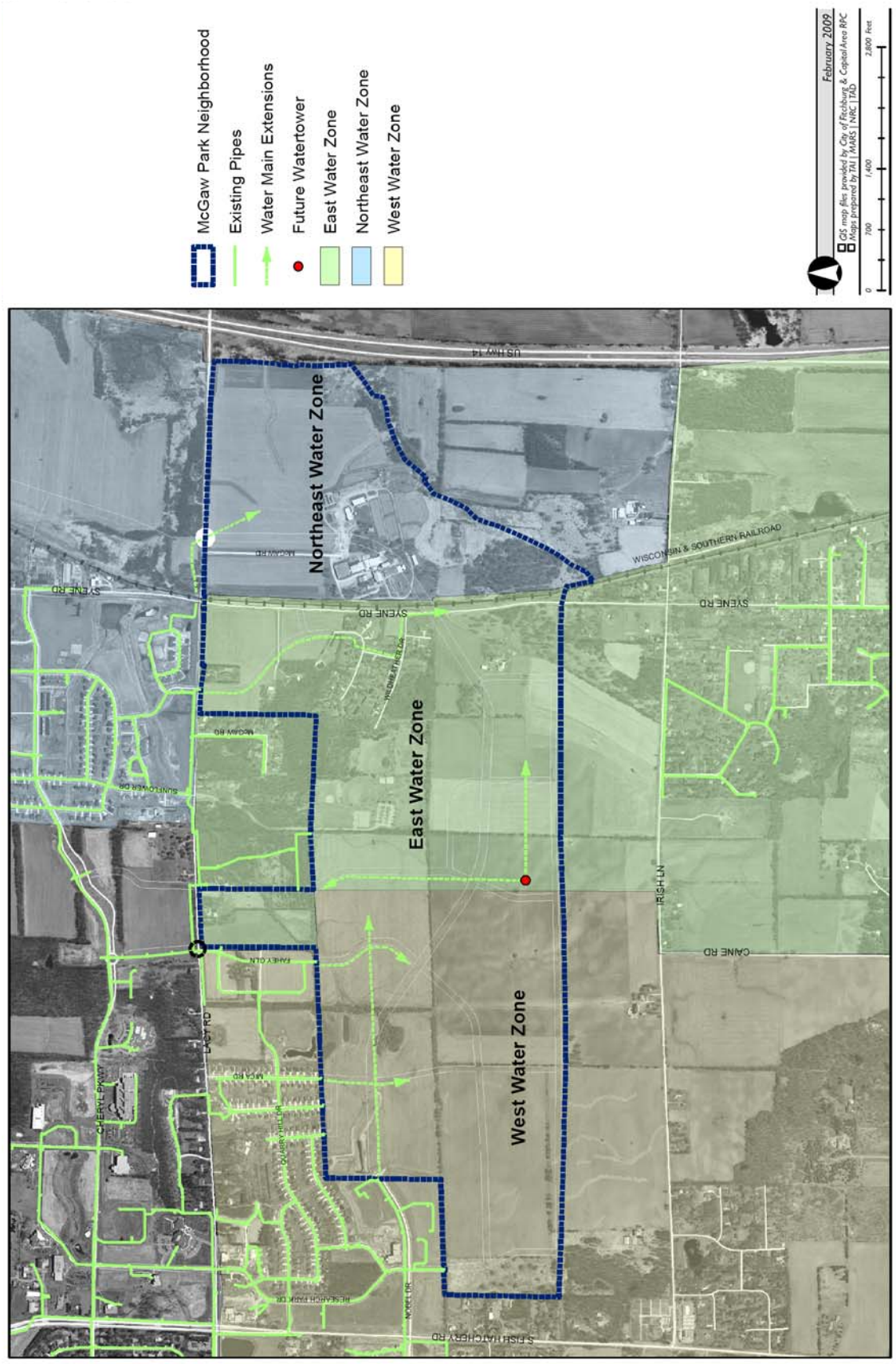


Figure 5.17: Water Supply Distribution System

Cost, timing, and staging

Connection to the existing distribution system on the north side of the Neighborhood is consistent with the built-out phasing from north to south (**Figure 5.18**). Water mains can be incrementally extended southward as Phases 1, 2 and 3 are constructed. The timing of the new well construction to serve the East water zone is uncertain; in the interim, well 10 or 11 will serve the East zone. The new reservoir will likely be needed to supply the residential development in southeast portion of the Neighborhood west of Syene Road, so it will need to be in-place at least before Phase 3 is constructed.

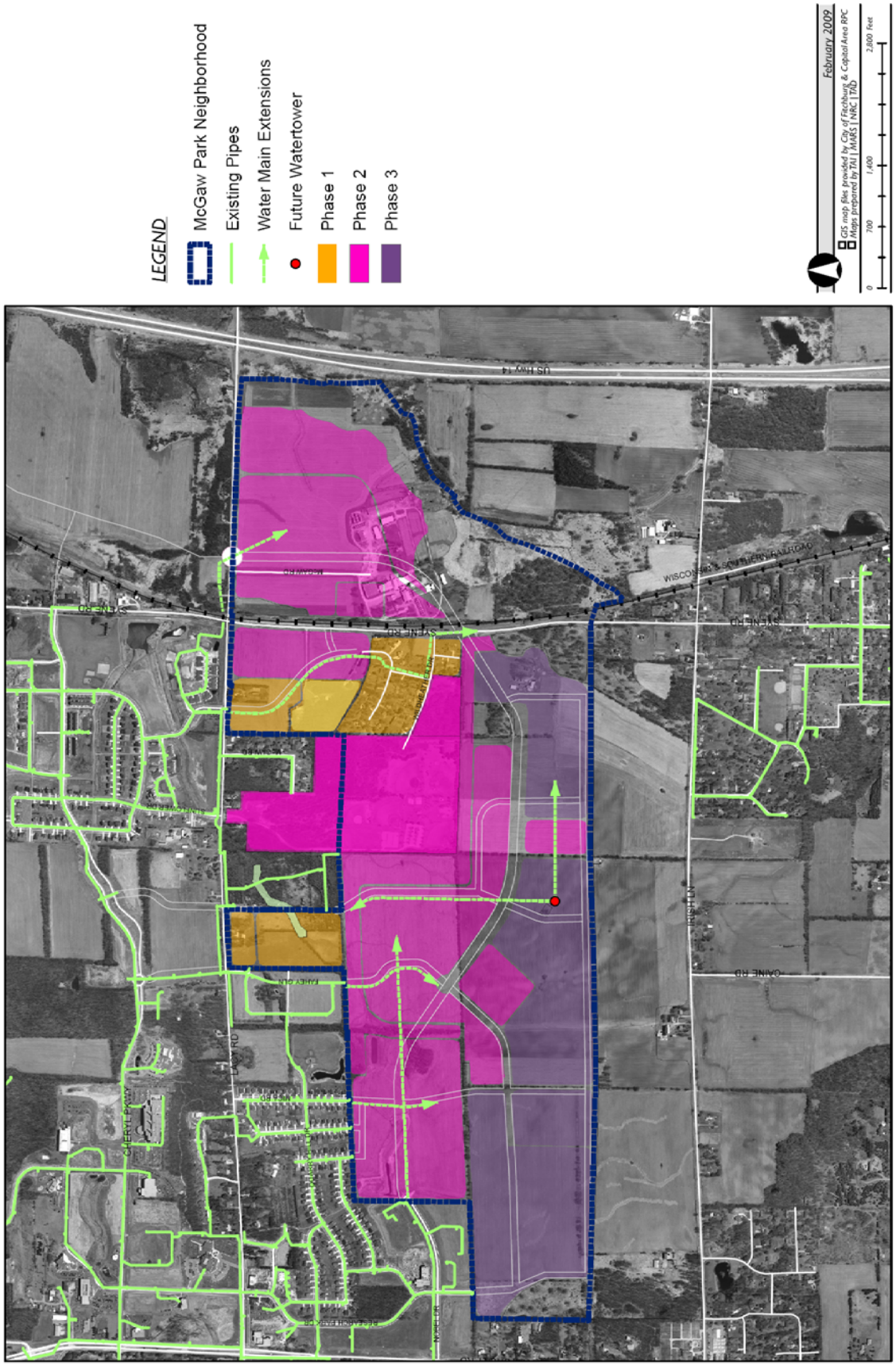


Figure 5.18: Water Supply Phasing

Sanitary Sewer Plan

Routing and service territory of interceptors

Three sanitary sewer interceptors serve the City of Fitchburg in the vicinity of the McGaw Park Neighborhood: the McKee, Woods Hollow, and Syene interceptors (**Figure 5.19**). The Woods Hollow and Syene interceptors will serve the McGaw Park Neighborhood. The Woods Hollow interceptor drains northward from the western end of the Neighborhood, including a substantial distance through the Nine Springs E-way owned by the Wisconsin Department of Natural Resources. The Syene interceptor is located along Syene Road and currently begins near Lacy Road, and a sub interceptor extends westward and serves areas along Lacy Road.

The existing Syene interceptor has a 36-inch diameter with adequate capacity to serve the development density planned for the McGaw Park Neighborhood. A planned extension of this interceptor (**Figure 5.19**) can also be sized to accommodate the planned density. The Syene sub interceptor and Woods Hollow interceptor are smaller sewers with more limited capacity. As a result, the existing sanitary sewer system can support gross densities of only 3 to 4 dwelling units per acre in much of the western portion of the McGaw Park Neighborhood. The exact locations of zones with limited capacity depend on the details of how the neighborhood is built out; some of the southern part of the neighborhood may be served by the Syene interceptor, providing additional capacity.

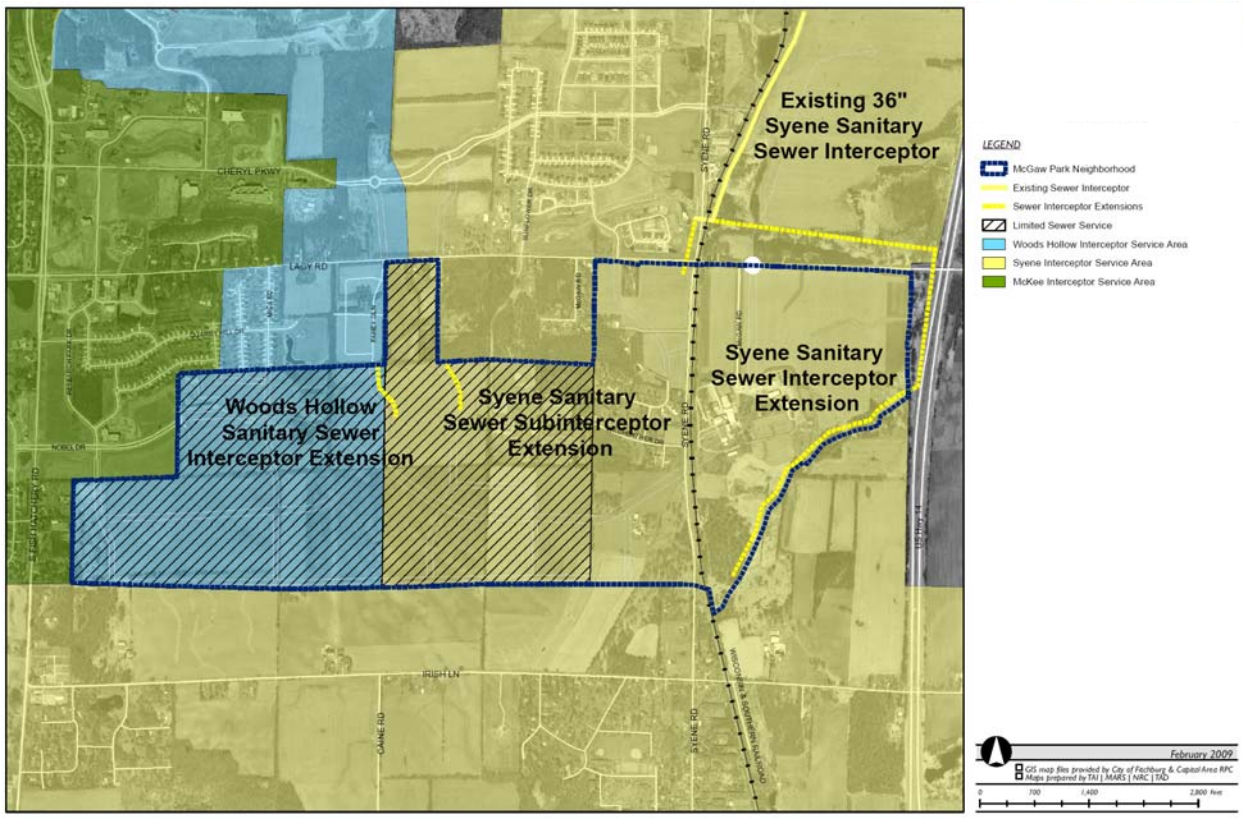


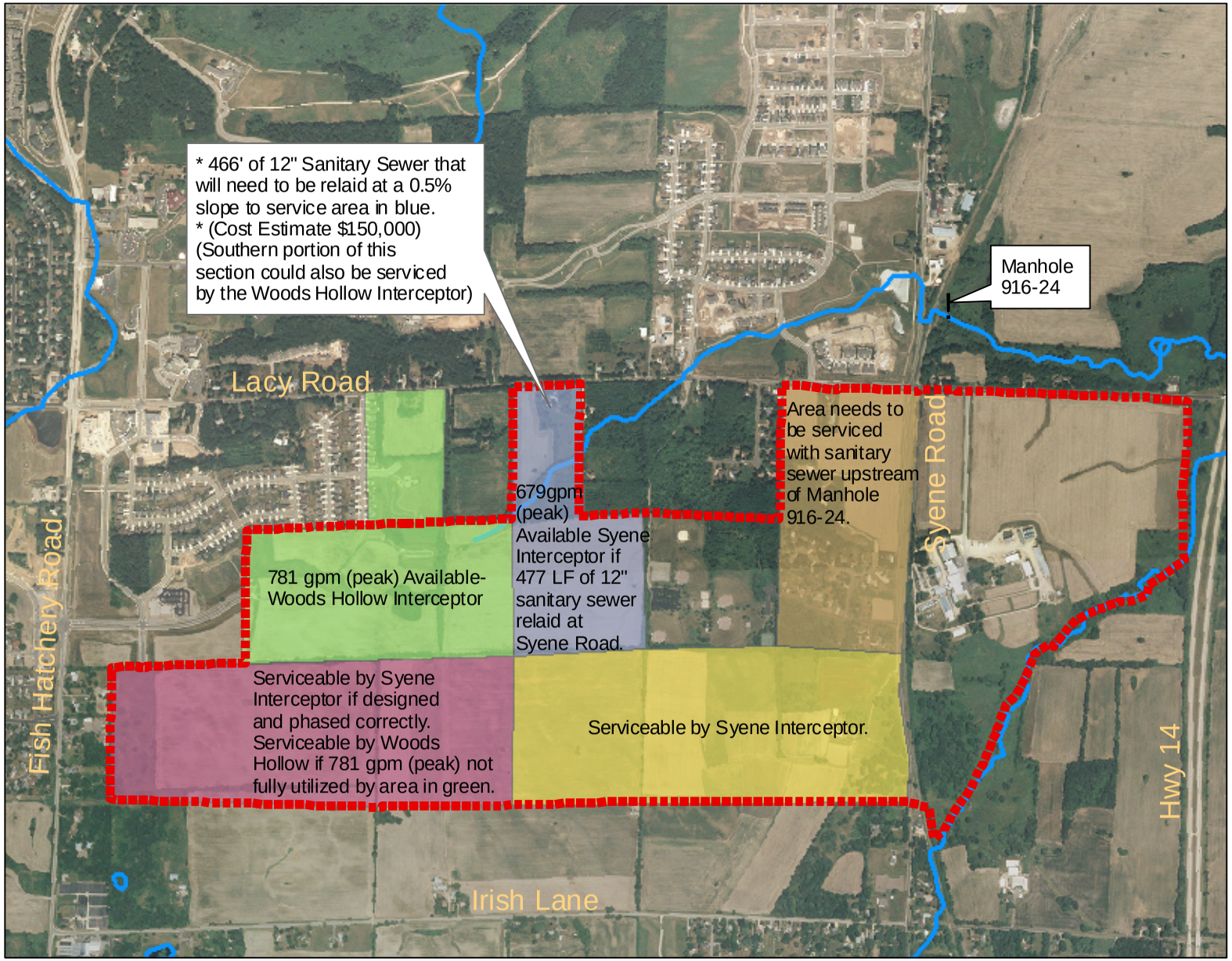
Figure 5.19: Existing and Approximate Future Sanitary Sewer Sheds

Two options have been considered to provide the necessary capacity to support the planned development density in the McGaw Park Neighborhood.

1. Construct relief sewer parallel to Woods Hollow interceptor. This would be logistically challenging, due to the distance from paved roads, and it would be difficult to obtain permits from the State of Wisconsin for additional sewer construction in the Nine Springs E-way.

2. Construct a short section (477 ft) of relief sewer near the intersection of Lacy and Syene Roads to increase capacity for the north-central part of the McGaw Park Neighborhood via the Syene sub interceptor, and route sewer flows in the southern half of the Neighborhood eastward to the Syene interceptor.

Based on analysis by the City of Fitchburg staff, the second option appears to be more cost effective and capable of meeting the anticipated capacity requirements for the Neighborhood. Details of future sanitary service connections and capacities are shown in **Figure 5.20.** Adding these MPN areas to the Syene interceptor would reduce its additional capacity to serve future development areas to the south, however this is not an immediate concern because a large portion of the projected Syene interceptor service area is beyond the City's 50-year growth boundary (Paul Woodard, written communication August 18, 2008).



McGAW PARK
Neighborhood Plan
City of Fitchburg, WI

Sanitary Sewer Availability

Legend

Study Area Boundary

Creek/Waterway

January 2009

-GIS map files provided by City of Fitchburg & Capital Area RPC
-Maps prepared by TAI | MARS | NRC | TAD

0 500 1,000 2,000 Feet

Figure 5.20: Sanitary Sewer Service Areas and Capabilities

Cost, timing, and staging

The cost to upgrade the sewer system will depend on numerous factors, including materials selected and material and installation costs at the time of replacement. Typical costs for 8-inch and 10-inch sewer pipe installation in Fitchburg in 2007 were $63 per lineal foot and $91 per lineal foot, respectively. Based on an approximate unit cost of $100 per lineal foot, the 477 feet of 12-inch relief sewer pipe near Syene Road would cost in the range of $50,000. By contrast, a relief interceptor for the Woods Hollow system could cost approximately $1,000,000 or more (Paul Woodard, written communication August 18, 2008).

The primary need for enhanced sewer capacity will begin with construction of Phase 2 of the MPNP (**Figure 5.21**). Areas in the southern part of the Neighborhood planned for connection to the Syene interceptor will develop during Phase 3. The southwestern portion of the Neighborhood cannot be connected to the Syene interceptor until the residential area to the east is developed and the sewer is extended westward into this area.

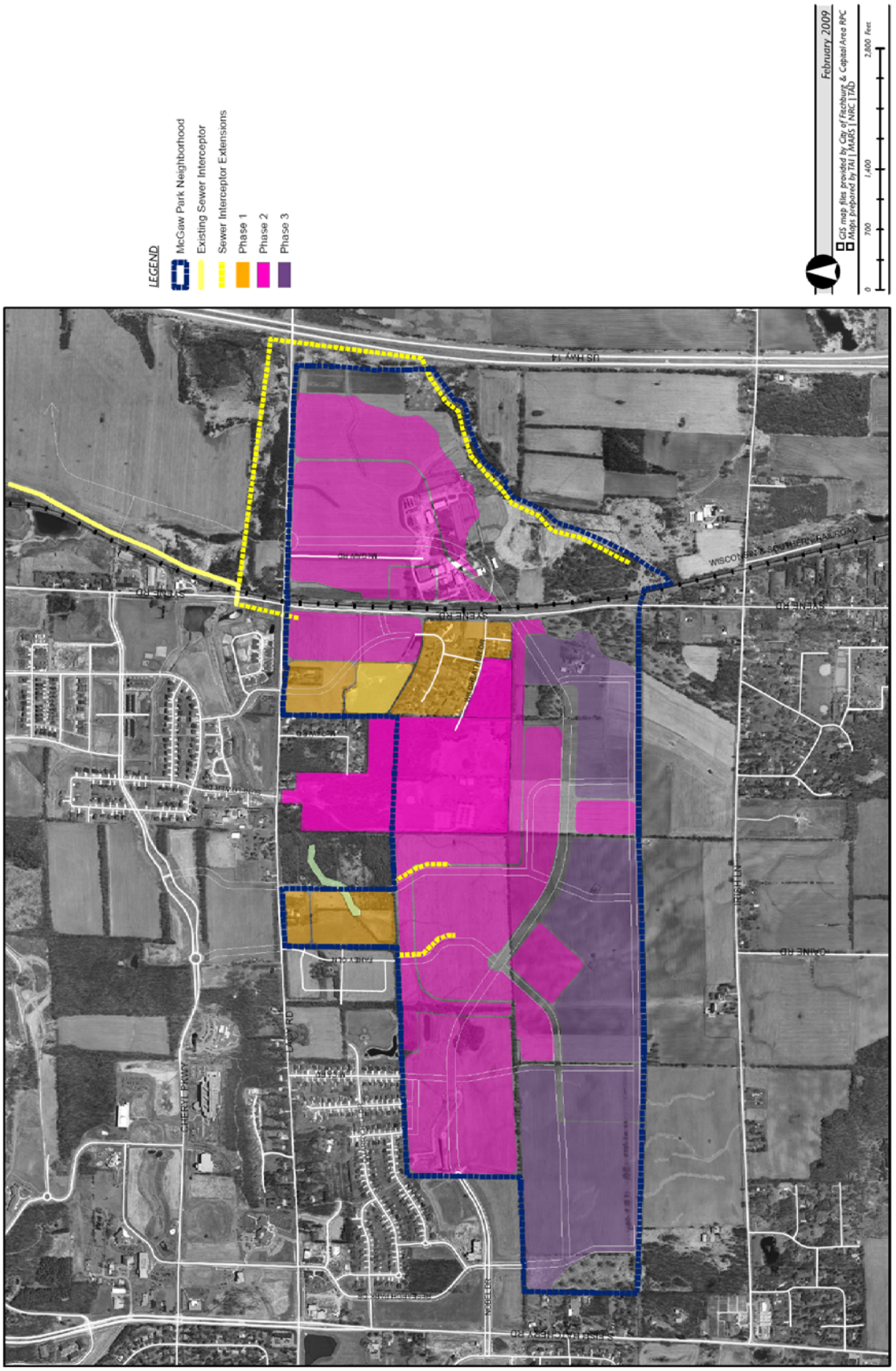


Figure 5.21: Sanitary Sewer Phasing

Although upgrading the sanitary sewer system will require capital expenditures to support the planned density in the McGaw Park Neighborhood, this should result in a long-term cost savings for the City of Fitchburg, because planned high density development results in lower per-capita costs for water supply and sanitary sewer service (**Table 5.19**; Burchell and Mukherji, 2003).

Table 5.19: Projected Water and Sewer Infrastructure Under Conventional Development and Managed Growth Scenarios, by Region: United States, 2000 – 2025

	Total Water and Sewer Demand, gal/d (Millions)			Total Water and Sewer Laterals (Thousands)			Total Infrastructure Costs, $ (Millions)		
Region	Conventional Development	Managed Growth	Demand Savings	Conventional Development	Managed Growth	Lateral Savings	Conventional Development	Managed Growth	Cost Savings
Northeast	1,451	1,444	7	3,406	3,068	338	16,015	14,751	1,264
Midwest	2,935	2,915	21	7,110	6,604	505	30,393	29,839	1,556
South	7,942	7,870	72	21,243	19,116	2,126	84,573	79,026	5,547
West	5,794	5,730	56	14,108	12,456	1,652	58,786	54,544	4,242
Total	**18,121**	**17,965**	**156**	**45,867**	**41,245**	**4,621**	**189,767**	**177,160**	**12,609**

(From Burchell and Mukherji, 2003.)

Surface Water and Groundwater Implications of the Water Infrastructure Plans

Surface Water

Stormwater Quantity and Swan Creek

Demonstration of conformance with the applicable stormwater performance standards, as described above does not necessarily provide sufficient information to evaluate downstream resource impacts. Swan Creek can be affected by hydrologic alteration in its watershed, including the McGaw Park Neighborhood. Typical urbanization impacts include increased magnitude and volume of frequent runoff events, leading to stream channel habitat erosion and sedimentation.

The overall performance of the stormwater management system in a watershed context was evaluated using an expanded XP-SWMM stormwater model. This resource-impact model differs from the ordinance compliance model in the following ways.

- The model includes the entire watershed upstream of Swan Creek at CTH MM (**Figure 5.22, Table 5.20**).
- Runoff curve numbers for existing conditions were taken to represent actual current land use, based on values recommended by the NRCS, rather than the curve number values mandated by the City stormwater ordinance for predevelopment conditions, to more closely simulate current hydrologic conditions.
- Existing temporary detention ponds are included in the existing conditions model. (They were not included in the analysis for regulatory compliance, because developers would not be required to include them in predevelopment calculations.)

Computation time was also a factor in modeling a smaller geographic area for ordinance compliance. The expanded model runs much more slowly, and would require excessive time for the iterative simulations approach needed to determine detention pond sizes.

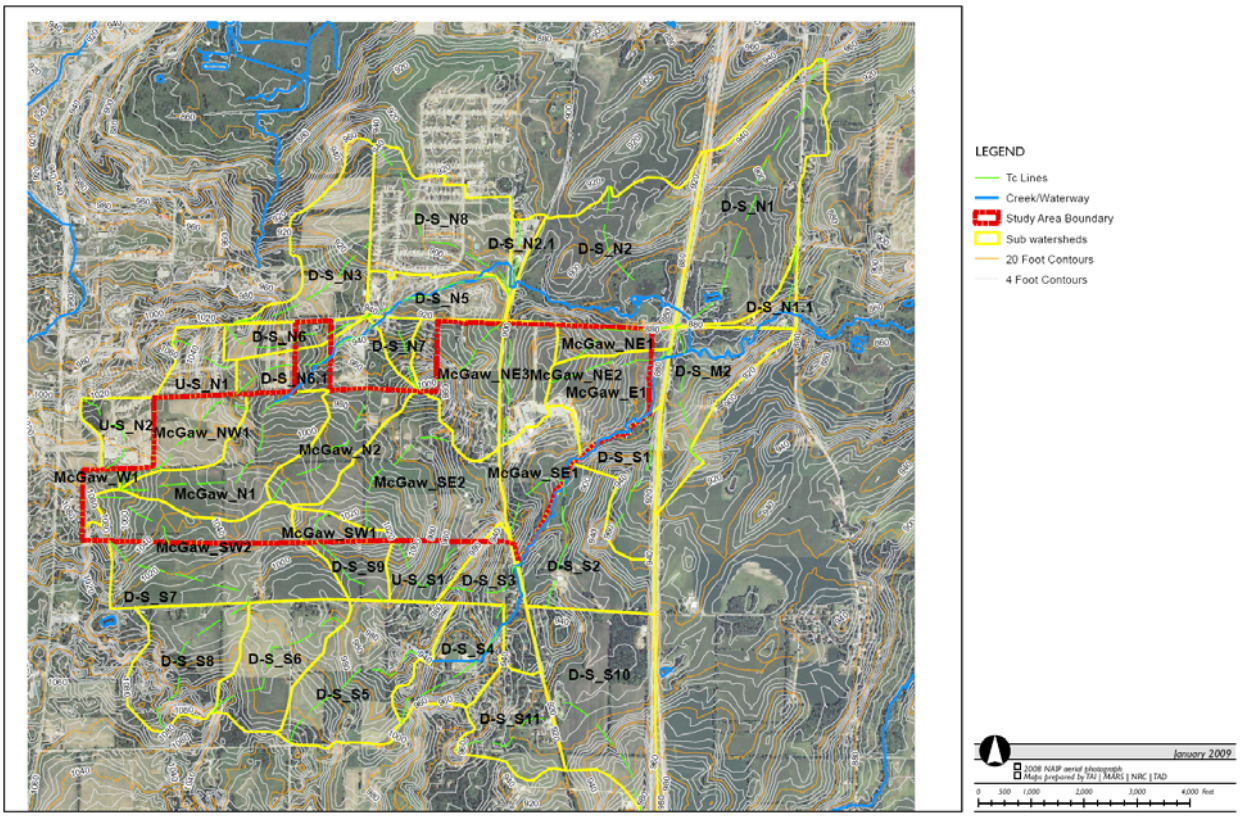


Figure 5.22: Model Watersheds Map

In expanding the model, several subwatersheds outside the Neighborhood area were added (**Figure 5.22** and **Table 5.20)**. These subwatersheds were labeled based on the following naming convention:

- Subwatersheds draining into Swan Creek not within the Neighborhood boundary but upstream of the limits of the model study area were labeled beginning with "D-S" (e.g. "D-S_N1") if the subwatershed drained into Swan Creek downstream of the Neighborhood Plan boundaries;
- Subwatersheds draining into Swan Creek not within the Neighborhood boundary but upstream of the limits of the model study area were labeled beginning with "U-S" (e.g. "U-S_N1") if the subwatershed drained through the Neighborhood prior to flowing into Swan Creek;
- Subwatersheds draining into Swan Creek not within the Neighborhood boundary but upstream of the limits of the model study area were labeled ending with the branch of Swan Creek that the subwatershed drained to (e.g. "D-S_N1" for the north branch, "D-S_S1" for the south branch, and "D-S_M1" for the main branch).

Table 5.20: Summary of Existing SCS Parameters

Subwatershed Name	Subwatershed Area (acres)	Impervious Area (acres)	Pervious Area (acres)	Pervious Curve Number	Time of Concentration (min.)
U-S_S1	35.9	0.1	35.9	69	18
McGaw_W1	11.0	0.1	10.9	61	15
U-S_N2	35.6	21.8	13.8	61	14
U-S_N1	34.6	11.1	23.5	60	16
McGaw_SW2	59.3	0.0	59.3	70	21
McGaw_SW1	17.7	0.0	17.7	71	20
McGaw_SE2	139.6	4.1	135.5	67	27
McGaw_SE1	58.3	8.6	49.7	67	31
McGaw_NW1	51.1	0.0	51.1	71	28
McGaw_NE3	79.8	9.2	70.6	65	29
McGaw_NE2	46.1	8.0	38.1	67	40
McGaw_NE1	26.4	0.0	26.4	71	22
McGaw_N2	61.4	2.4	59.0	69	33
McGaw_N1	97.5	0.0	97.5	71	38
McGaw_E1	71.8	3.4	68.4	69	28
D-S_S9	28.2	0.0	28.2	71	26
D-S_S8	91.9	5.1	86.8	65	61
D-S_S7	110.9	0.0	110.9	70	48
D-S_S6	84.2	0.0	84.2	70	36
D-S_S5	126.4	7.8	118.7	68	41
D-S_S4	59.9	7.8	52.1	61	57
D-S_S3	48.8	4.7	44.0	61	27
D-S_S2	103.9	0.1	103.7	70	30
D-S_S11	63.6	11.7	51.9	63	36
D-S_S10	155.4	1.7	153.7	69	44
D-S_S1	57.9	0.0	57.9	70	22
D-S_N8	111.8	26.9	84.9	59	86
D-S_N7	15.2	0.5	14.6	60	22
D-S_N6.1	63.0	16.5	46.5	61	26
D-S_N6	28.5	5.5	23.0	66	29
D-S_N5	50.6	17.0	33.6	59	63
D-S_N3	94.2	0.9	93.3	68	26
D-S_N2.1	11.1	6.6	4.4	64	12

Table 5.20: Summary of Existing SCS Parameters

D-S_N2	200.7	0.1	200.6	65	30
D-S_N1.1	15.8	2.5	13.4	65	33
D-S_N1	185.4	1.1	184.4	70	55
D-S_M2	85.0	0.0	85.0	68	33
Total	**2618.5**	**185.3**	**2433.2**	**N / A**	**N / A**

Figure 5.23 displays the XP-SWMM existing conditions model schematic for the Swan Creek watershed draining to CTH MM. Downstream hydraulic structures (culverts, detention ponds, etc.) were input based on either field-collected data or data obtained from the City. **Figures 5.24 and 5.25** show the stream discharge hydrographs for the North and South Branches and for Swan Creek below the confluence at CTH MM.

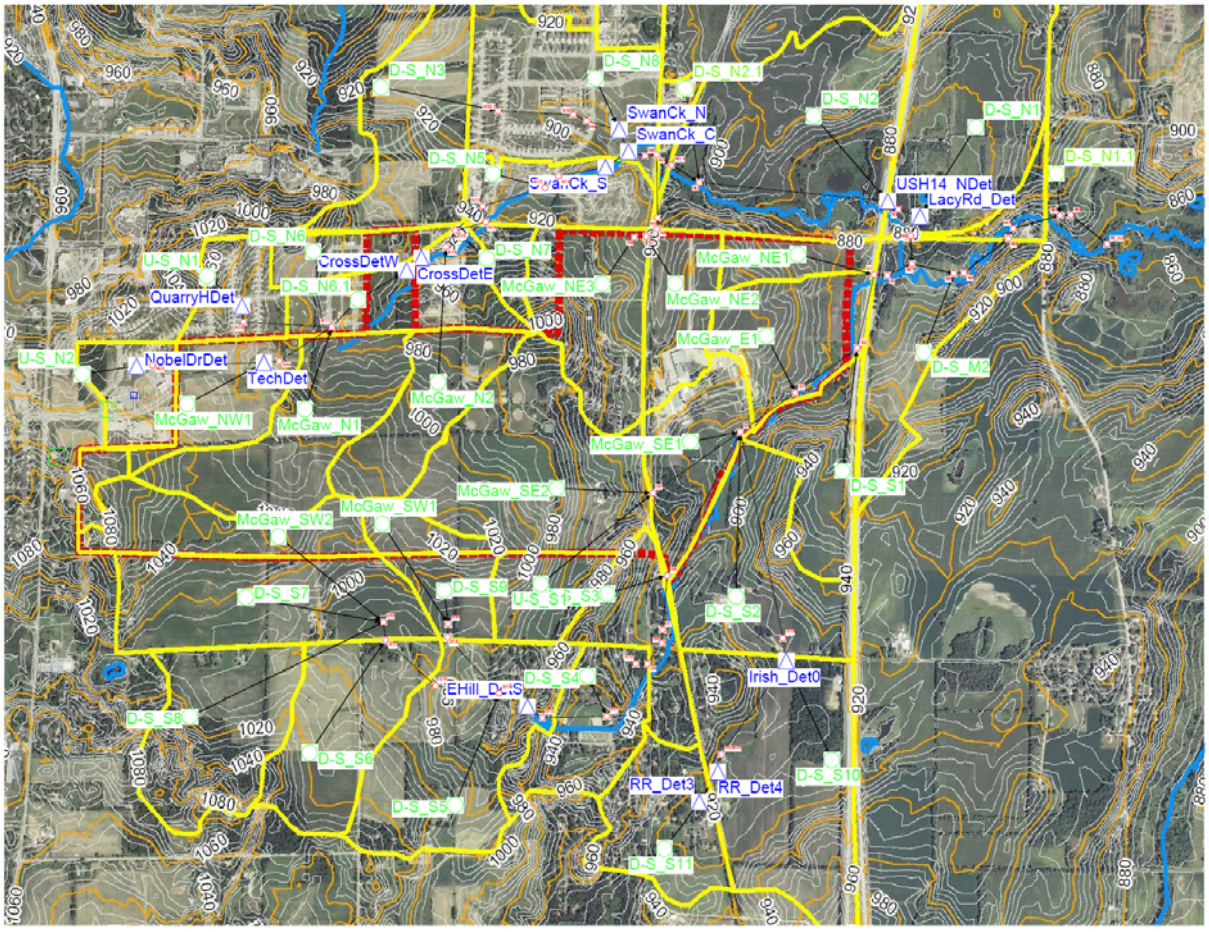
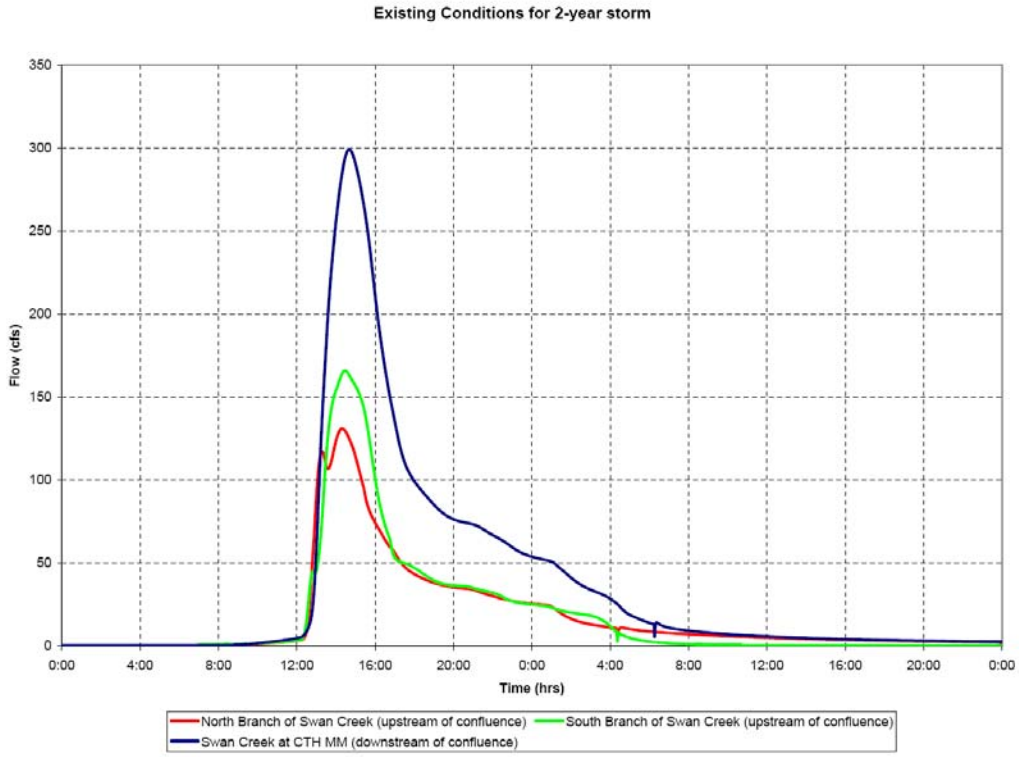
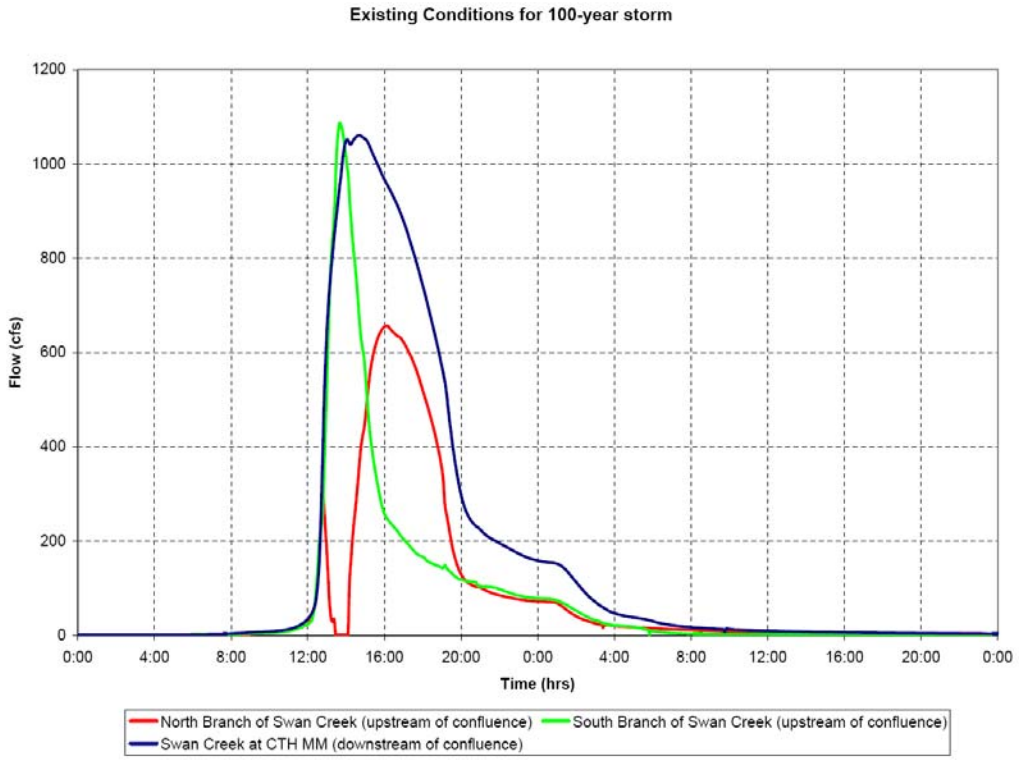


Figure 5.23 Existing Swan Creek Watershed Model Schematic





Figures 5.24 and 5.25: Swan Creek Hydrographs

The runoff volumes from the two Swan Creek branches are similar for each of the 2- and 100-year events; however the shapes of the hydrographs for each branch are noticeably different. The North Branch has a more attenuated hydrograph, likely due to the substantial natural and man-made storage in the watershed. The North Branch hydrograph has a dip in it, which is a result of the modeling framework. The model predicts that the floodwaters from the South Branch will reach the confluence before those from the North Branch, causing a backwater effect. The duration of high flows during the 100-year event is longer for the North Branch than the South Branch, presumably due to delayed release of water from detention storage.

To simulate build-out conditions in the McGaw Park Neighborhood, subwatersheds within the Neighborhood were modeled in the same manner as for the ordinance compliance model. The watersheds outside the Neighborhood boundary were not changed from the existing conditions model (i.e. only new development within the McGaw Park Neighborhood was simulated). **Figure 5.26** displays the XP-SWMM model schematic for the build-out model.

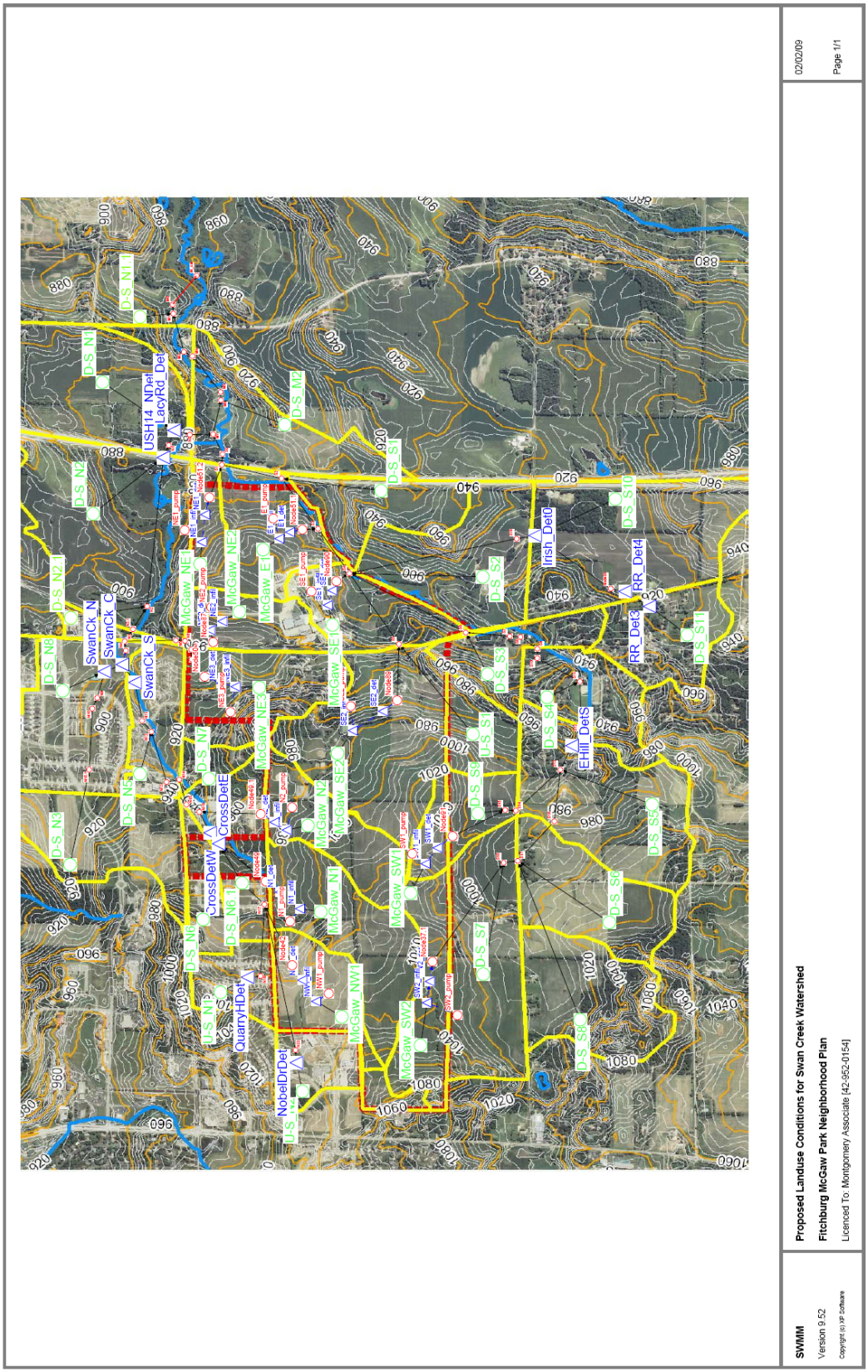
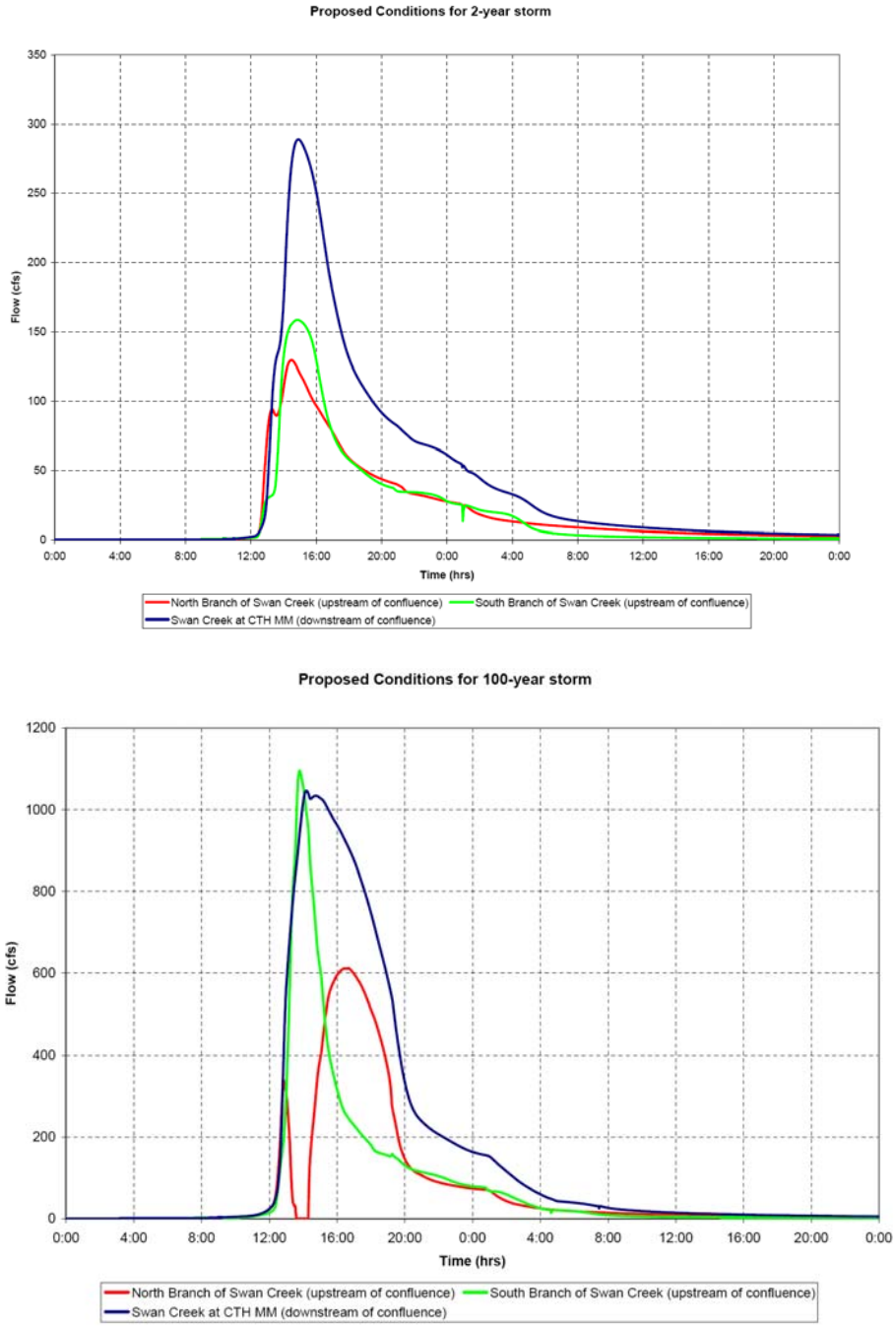


Figure 5.26: Build-out XP-SWMM Model Schematic

Comparing the Swan Creek hydrographs for build-out conditions (**Figures 5.27** and **5.28)** with existing conditions hydrographs (**Figures 5.24 and 5.25**) illustrates that the MPNP development and associated stormwater management plan would produce slight decreases in peak discharge in Swan Creek for the 2-year and 100-yearw storms. The shape of the hydrographs suggests a slightly extended duration of high flows for post-development conditions, reflecting a slight increase in runoff volume.



Figures 5.27 and 5.28: Swan Creek Hydrographs

Stormwater Quality and Lake Waubesa

Swan Creek empties into Lake Waubesa, an important regional resource that supports a warm water fishery and is popular for recreation. The lake has a history of eutrophication problems related to excessive phosphorus loading from agricultural and urban runoff. Although a detailed study of nutrient loading to Lake Waubesa is beyond the scope of this neighborhood plan, it is relevant to consider how the transition of the McGaw Park Neighborhood from agricultural to urban land use may affect eutrophication of the Lake.

It is commonly stated that phosphorus (P) loading decreases as agricultural land is converted to urban development. A study of soil P in Dane County found that agricultural lands had higher P concentrations than urban lands, and that prairie soils had even lower P levels (Bennet et all, 2005). Average reported P values were 168 mg/kg (cash grain), 76 mg/kg (dairy), 56 mg/kg (lawns) and 17 mg/kg (prairies). Bennett et al. (2005) also concluded that much of the P delivery from both agricultural and urban soils is generated from critical source areas, or "hot spots", with high P concentrations and high runoff potential. This underscores the importance of nutrient management in any setting.

The City of Fitchburg conducted a modeling comparison of current and post-development P loading for the Northeast Neighborhood (City of Fitchburg, 2008). Post-development P loads calculated using the Source Loading and Management Model (SLAMM) were compared with agricultural loads estimated with the model SNAP+. Agricultural simulations with SNAP+ require extensive input data on agricultural land management practices (e.g. nutrient application, tillage practices, crop rotation) that is not typically available to the public. A farmer in the Northeast Neighborhood voluntarily provided the City with the information necessary to conduct the SNAP+ analysis. Comparison of the models indicated urban P delivery to be 50% of agricultural values, however caution must be applied in interpreting these results because the models (SLAMM and SNAP+) use very different calculation schemes and because agricultural P loadings are highly variable.

Phosphorus delivery from agricultural lands can vary widely depending on land management practices (John Panuska, UW Extension, written communication January 23, 2009). Soil P data for the McGaw Park Neighborhood is unavailable; however, data for the Neighborhood's zip code (53711) indicates a mean soil P concentration of 78 mg/kg, with a range of 2 – 307 mg/kg (Dane County, written communication February 5, 2009). Due to this high variability, it is difficult to quantify how P loading will change during the agricultural to urban transition in the McGaw Park Neighborhood. It is reasonable to expect that P delivery to downstream aquatic ecosystems will decrease post-development, however appropriate erosion control measures will be very important to minimize delivery of sediment and attached phosphorus downstream during construction.

Groundwater

Development of the MPN will result in alterations in the existing water balance of the area as additional groundwater from the lower aquifer is pumped for water supply, treated at MMSD, and transported out of the basin, and as recharge rates are altered as described above. By pumping more groundwater, thus drawing down the potentiometric surface and by altering existing recharge rates, baseflow to Swan Creek, Murphy's Creek and local springs is likely to be diminished (or potentially increased). To better understand the degree of water quantity impacts to Swan Creek, Murphy's Creek and local springs and to suggest management strategies, groundwater modeling was conducted.

Modeling Approach

We used the Nine Springs Inset Model (Swanson, 2001) to assess the potential water quantity impacts of development of the MPN. The model was modified to add a more detailed representation of the streams and springs near the MPN. Modifications included the extension of Swan Creek to the west of Highway 14, the addition of a southwest branch of Swan Creek and the addition of seven spring pools. The location of four of the spring pools are based on field observations as described above. One of the spring pools is known to exist on the southwest branch of Swan Creek but could not be verified and two of the spring pools were inserted in the model at random locations near Lake Waubesa. Input values such as stage, width, thickness of sediments and hydraulic conductivity required for the extension of Swan Creek in the model were estimated based on the field survey, observations, and Swanson's model inputs for the eastern part of Swan Creek. Properties required for the spring pools, such as head, hydraulic conductivity of the sediments, spring pool area and sediment thickness were unknown so only rough estimates could be made based on the water table map and the properties of the springs included in Swanson's model. Additional field work would be required to more accurately represent these features in the model.

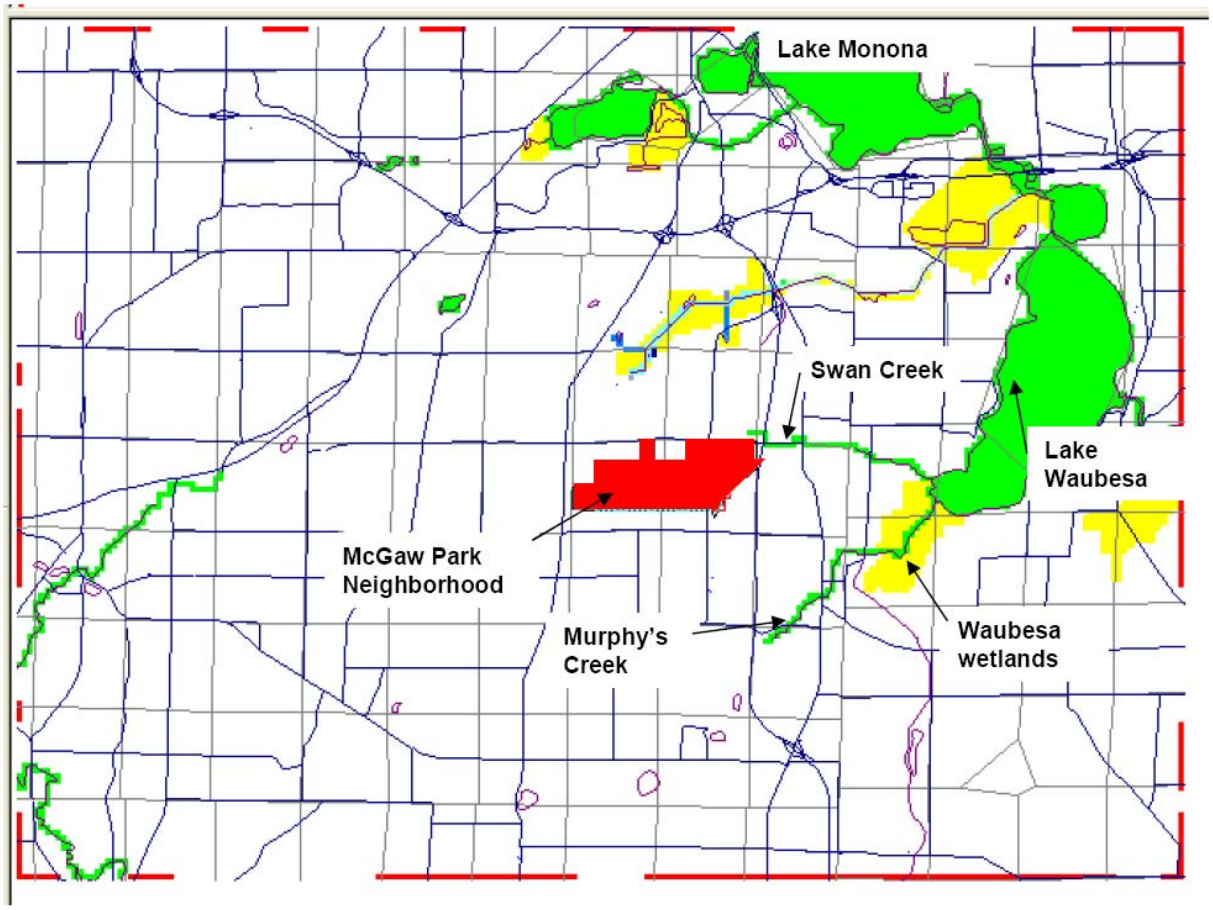


Figure 5.29: Area included in Swanson's (2001) Groundwater Model

We used the model to test the sensitivity of groundwater flow to the streams and springs to changes in recharge related to land use, increases in groundwater pumping to supply water to the MPN, and uncertainty in the properties of the Eau Claire Shale. Four scenarios were simulated that represented:

1) Existing conditions in which the Fitchburg wells FI 4, FI5, FI7, FI8, FI9 and FI10 were updated with 2007 pumping rates and well FI 11, which went on line in April of 2008, was pumped using an average pumping rate for this period;
2) Changes in recharge rates from the existing conditions by +/- 4 inches, +/-2inches, +/-1 inch and +/-0.5 inch;
3) Increases in pumping rates based on low, moderate and high water supply requirements for the McGaw Park development; and
4) Leakance in the Eau Claire shale confining unit and more connectivity between the upper and lower aquifers.

Additionally, the model was run to evaluate the impacts from two new municipal wells pumping at rates of 1,200 gpm and 1,500 gpm.

The model was run for steady state conditions in which input parameters do not change over time.

The initial model simulations produced very little or no flow to the western and southwestern branch of Swan Creek, contrary to observations and measurements. To more closely match simulated to observed groundwater flow into Swan Creek the bottom elevation of the top layer was lowered which decreased hydraulic conductivity in the top layer in the area of McGaw Park to allow for more flow from the aquifer into Swan Creek. Similarly, south of Murphy Creek, the bottom elevation of the top layer was lowered and hydraulic conductivity decreased to allow for flow into the spring pools.

Results and Conclusions

Existing Conditions

The model was run for existing conditions to simulate hydraulic head (e.g. water table elevation) and discharge to streams and springs (**Figure 5.30**). Simulated groundwater flow was compared to average measured flows in Swan Creek at three locations and in Murphy's Creek at one location (**Figure 5.31**).

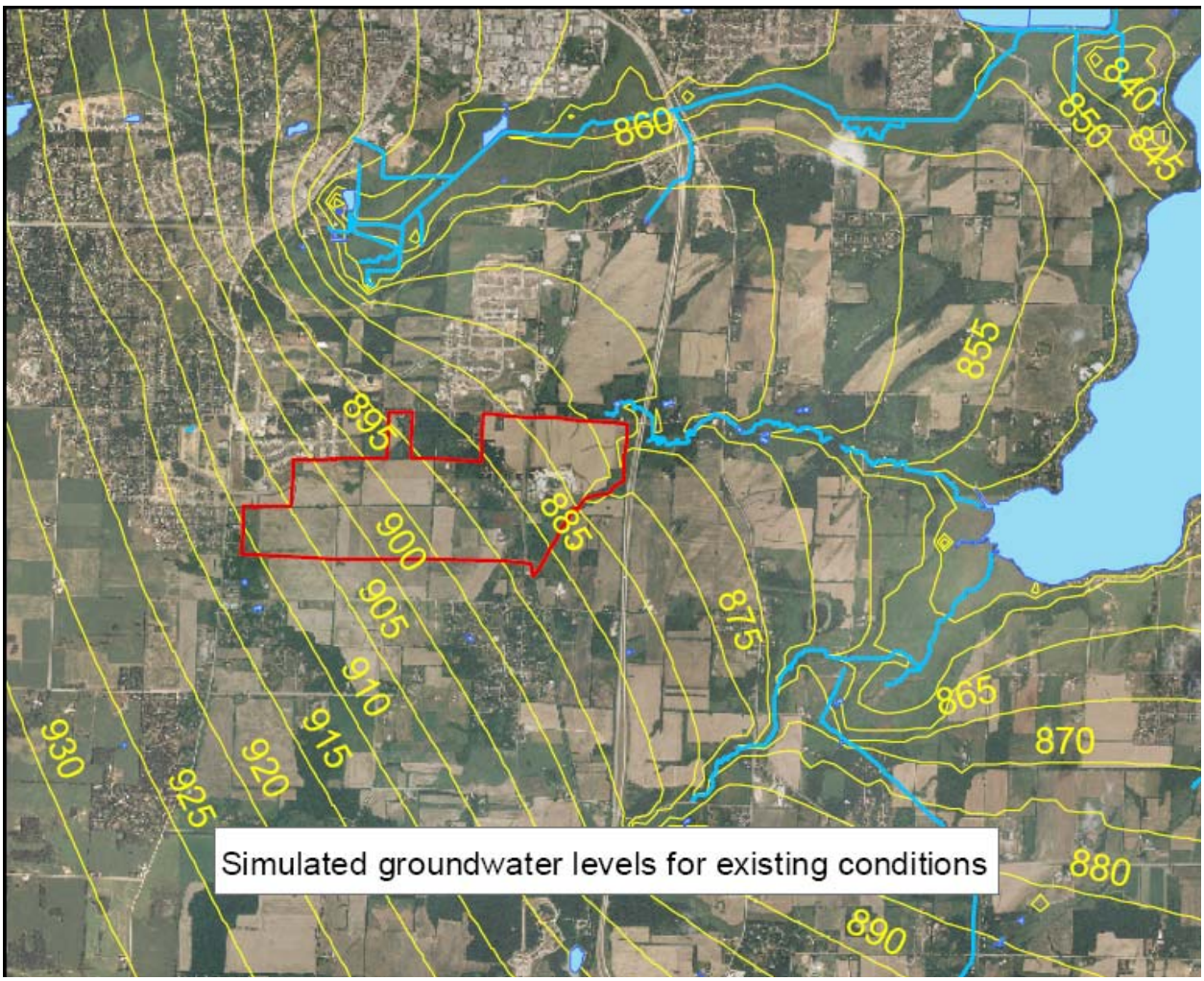


Figure 5.30: Simulated Water Table

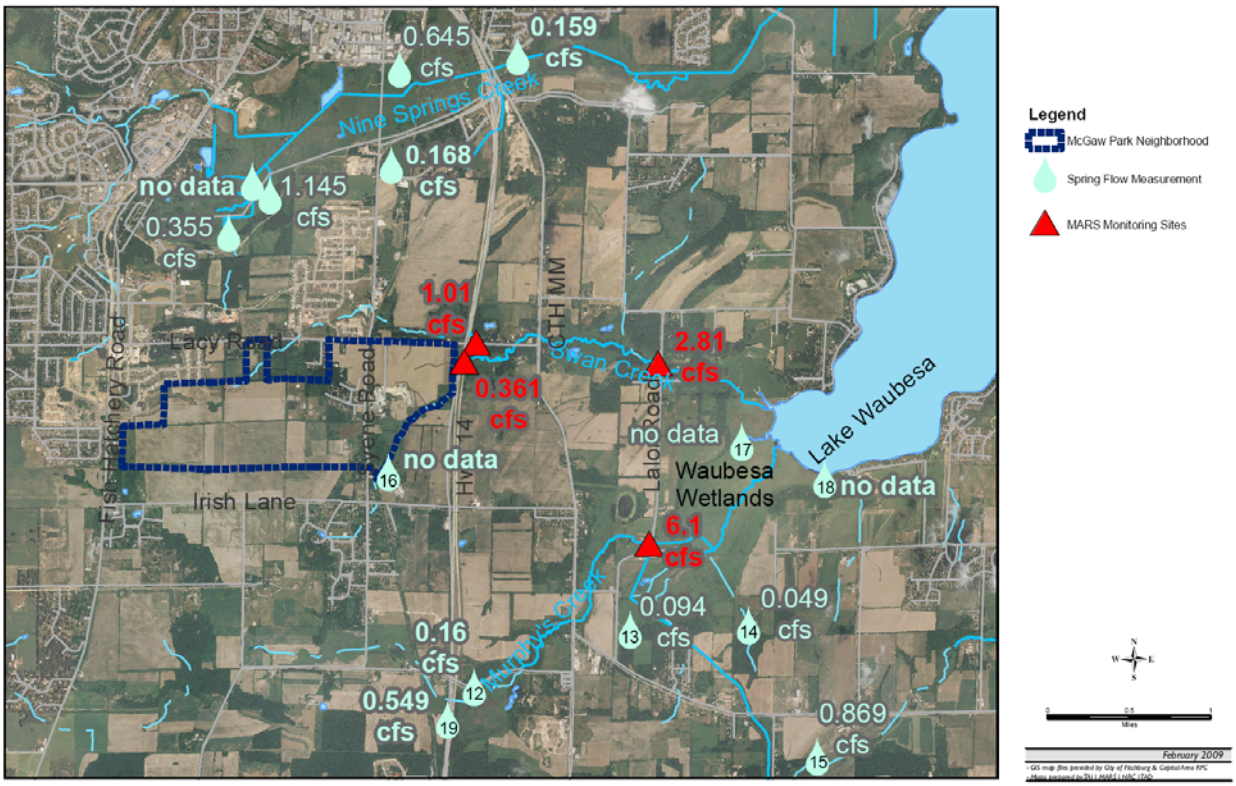


Figure 5.31: Spring and Stream Flow Monitoring Locations

The results of the modeling indicate that the model under estimates the 2008 streamflow measurements by approximately one-third to one-half (**Table 5.21**). However, the NSIM was calibrated to average groundwater levels, and the modified model for the McGaw Park Neighborhood Plan matches assumed average streamflow conditions in Swan Creek and Murphy's Creek reasonably well. The lower simulated flows are reasonable because 2007 and 2008 recorded discharges at area streams (Badger Mill Creek at Verona, and Pheasant Branch at Middleton) are approximately twice the median discharge.

Table 5.21. Simulated and Observed Baseflow to Swan Creek and Murphy's Creek

Spring Name		Simulated Baseflow	Measured Baseflow	Difference
Swan Creek				
	S3	0.27 cfs	0.40 cfs	0.13 (33%)
	S4	0.60 cfs	1.0 cfs	0.40 (40%)
	S6	1.35 cfs	2.8 cfs	1.45 (52%)
Murphy's Creek				
	M5	3.2 cfs	6.1 cfs	2.9 (48%)

The model underestimates the 2003 measured spring flow at the Waubesa springs (**Table 5.21**); the difference between the simulated spring flow and measured spring flow was least for the low

flowing springs and greatest for the high flowing springs. Except for spring S15, the range of simulated spring flows (0.08 cfs – 0.35 cfs) was similar to the range of measured spring flows (0.09 cfs – 0.55 cfs). The simulated flow at the southernmost spring S15 (0.08 cfs), was much lower than the measured flow (0.869 cfs) indicating that the spring pool input properties at this location are not accurate estimates. Since this spring is located next to a drainage way, the measured flow may include additional surface water flow that is not accounted for in the groundwater model. To accurately account for spring flow in the model, a more detailed study of the geology and spring properties will be required. For subsequent simulations, spring 15 is not evaluated.

Table 5.22. Simulated and Observed Baseflow to Springs

Spring Name	Simulated Baseflow	Measured Baseflow (2003)	Difference
S12	0.110 cfs	0.160 cfs	0.05 (31%)
S13	0.076 cfs	0.094 cfs	0.018 (19%)
S14	0.046 cfs	0.049 cfs	0.0033 (6%)
S15	0.080 cfs	0.869 cfs	0.789 (91%)
S16	0.039 cfs	unknown	N/A
S17	0.177 cfs	unknown	N/A
S18	0.100 cfs	unknown	N/A
S19	0.350 cfs	0.549 cfs	0.199 (36%)

Source: Swanson 2003 Measured Flows

The existing model results were used to compare the results for the following simulations in which recharge rates, pumping rates, and Eau Claire shale properties were altered. The approach is considered conservative in that the reductions in groundwater flows into Swan Creek, Murphy's Creek and the Waubesa springs are impacted at a higher percentage because they are compared to lower flows.

Calibration of the NSIM included matching observed and simulated head measurements and measured and simulated Nine Springs spring flows. The McGaw Park model produces a similar match to head and flux targets as the NSIM. The Residual Mean Square error, the root mean square difference between all measured and simulated water levels, for the NSIM was 26.9 ft and for the McGaw model it was similar, 27.08 ft. Spring flow residuals, the observed flow minus the simulated flow, for the 6 springs (in the Nine Springs area) for the NSIM ranged from 0 to 6 L/sec. These were slightly less than the residuals in the McGaw model which ranged from 0.7 to 8.1 L/sec. Additionally, the overall model error, 0.48%, was approximately the same for both models.

Recharge Scenarios

Estimates of recharge in Dane County range from 6 to 11 inches per year and occur primarily in the spring and late fall (Swanson, 1996, Drips et al. 2000).

An areal recharge rate of 8 inches per year was used in the calibrated NSIM and in the McGaw model. This recharge rate was increased and decreased up to 4 inches to evaluate the impacts of

land use changes. The results of the simulations (**Table 5.23**) indicate that groundwater inflow to Swan Creek could be reduced or increased by up to approximately 13 % by decreasing or increasing recharge by 4 inches with the greatest changes at Highway 14. The changes in baseflow at Swan Creek and at Murphy's Creek downstream at Lake Waubesa were approximately 2.5 % and less than 1 %, respectively.

Simulated changes in spring flow were less, with a flow reduction or increase of up to approximately 7% with the greatest change in the spring (16) located closest to the McGaw Park Neighborhood.

Table 5.23: Simulated Changes in Baseflow with Changes in Recharge

Simulated Percent Increase/Decrease (from Existing Conditions) in Groundwater Flow into Swan Creek, Murphy's Creek and Springs with Increase/Decrease in Recharge

	Recharge Difference from Existing Conditions (inches/year)							
	-4.0	-2.0	-1.0	-0.5	0.5	1.0	2.0	4.0
Swan Creek								
S3	-13.11%	-6.72%	-3.62%	-1.76%	-1.33%	-2.93%	-6.30%	-12.55%
S4	-4.90%	-2.54%	-1.41%	-0.69%	-0.43%	-1.08%	-2.32%	4.61%
S32	-4.09%	-2.10%	-1.14%	-0.56%	-0.40%	-0.91%	-1.95%	3.89%
Total Baseflow at Lake Waubesa	-2.55%	-1.31%	-0.71%	-0.35%	-0.25%	-0.57%	-1.21%	2.42%
Murphy's Creek								
M5	-0.87%	-0.44%	-0.24%	-0.12%	-0.09%	-0.20%	-0.41%	0.81%
Total Baseflow at Lake Waubesa	-0.86%	-0.43%	-0.23%	-0.12%	-0.09%	-0.20%	-0.41%	0.80%
Springs								
12	-0.75%	-0.38%	-0.20%	-0.09%	0.08%	0.19%	0.37%	0.71%
13	-0.52%	-0.26%	-0.15%	-0.08%	0.05%	0.12%	0.24%	0.47%
14	-0.58%	-0.30%	-0.18%	-0.10%	1.30%	0.10%	0.25%	0.51%
17	-0.59%	-0.59%	-0.00%	-0.00%	0.00%	0.00%	0.00%	0.00%
18	-0.07%	-0.00%	-0.00%	-0.00%	0.00%	0.06%	0.06%	0.06%
19	-1.35%	-0.66%	-0.36%	-0.16%	0.16%	0.33%	0.66%	1.25%
16	-7.26%	-3.70%	-2.06%	-1.04%	0.72%	1.62%	3.40%	6.71%

Note: a negative value indicates a decrease in flow; a positive value indicates an increase in flow

The MPNP stormwater analysis predicted that an additional recharge rate of approximately 2 inches per year is possible. Stormwater infiltration and potential to increase recharge rates has raised concerns about exacerbating groundwater driven flooding in some areas in close proximity to the MPNP area, particularly in wet years, such as was the case in 2008. Potential increases in water levels corresponding to a 2 inch per year increase in recharge near the Neighborhood north of the

Technology Campus extension, at Lacy Road immediately west of Syene Road and at the southern boundary of the neighborhood at Syene Road was evaluated with the groundwater model.

Results of the modeling indicated that water levels would increase less than 3 inches at the surrounding properties and would not produce significantly high water levels. These results should be verified, however, by site-specific analyses and designs that consider the potential for groundwater mounding, for infiltration system performance, and off-site impacts.

Water Supply Requirements

The water supply requirements for the McGaw Park Neighborhood were estimated based on recent water use data from the City, as described above. To simulate the impacts of this future demand, the pumping rates of two wells, FI 11 and a replacement well for FI 7 & 8, were each increased by 24,700 cu ft/day (low requirement), 31,300 cu ft/day (moderate requirement) or 34,390 cu ft/day (high requirement). The low, moderate, and high water supply requirements correspond to 15%, 20% and 21%, of the total average pumping rates for the City for years 2006 – 2008, respectively. The results of these runs indicated that reduction in stream flow and spring flow for the low, moderate and high water supply requirements range from approximately 1 to 3 %, 1 to 4 %, and 1 to 5 %, respectively (**Tables 5.24** and **5.25**).

A review of the increase in simulated baseflow to Swan Creek as a result of an increase in recharge in the MPNP area over existing conditions indicates that approximately 2 inches of additional recharge may potentially offset the reduction in baseflow as a result of pumping for the moderate water supply requirement. However, an increase in recharge of approximately 2 inches does not offset the reduction in baseflow to Murphy's Creek or to the springs, primarily because the additional recharge at the MPNP area primarily enhances baseflow to Swan Creek and not to Murphy's Creek or to the southern springs.

Table 5.24: McGaw Park Water Supply and Water Balance Summary

McGaw Park Water Supply Estimates (gal/day)	Low Demand	Moderate Demand	High Demand
Total Water Supply Requirement	369,386	468,736	514,478
Historic Groundwater Flow to Lake Waubesa -10.3 cfs (Source: Lathrop et al., 2005)	6.66 million	6.66 million	6.66 million
Current Groundwater Flow to Lake Waubesa – 5 cfs (Source: Lathrop et al., 2005)	4.2 million	4.2 million	4.2 million
Water Supply as Percent of Historic Groundwater Flow	5.5%	7.0%	7.7%
Water Supply as Percent of Current Groundwater Flow	8.8%	11.2%	12.2%
Water Supply as Percent of Average 2006 - 2008 Groundwater Pumped (2,400,743 Gal/day)	15.4%	19.5%	21.4%
Groundwater Supply (cu ft/day)	49,383.19	62,665.25	68,780.48
Well FI #11 (58,673 cu ft/day)	83,364.60	90,005.63	93,063.24
Well FI #7 & 8 (4,313 cu ft/day)	29,004.60	35,645.63	38,703.24

Table 5.25: Simulated reductions in baseflow with low, moderate, and high water supply requirements for the McGaw Park Neighborhood

Simulated Reduction (Percent Difference from Existing Conditions) in Groundwater Flow to Swan Creek, Murphy's Creek and Springs for Low, Moderate, and High Water Supply Requirements

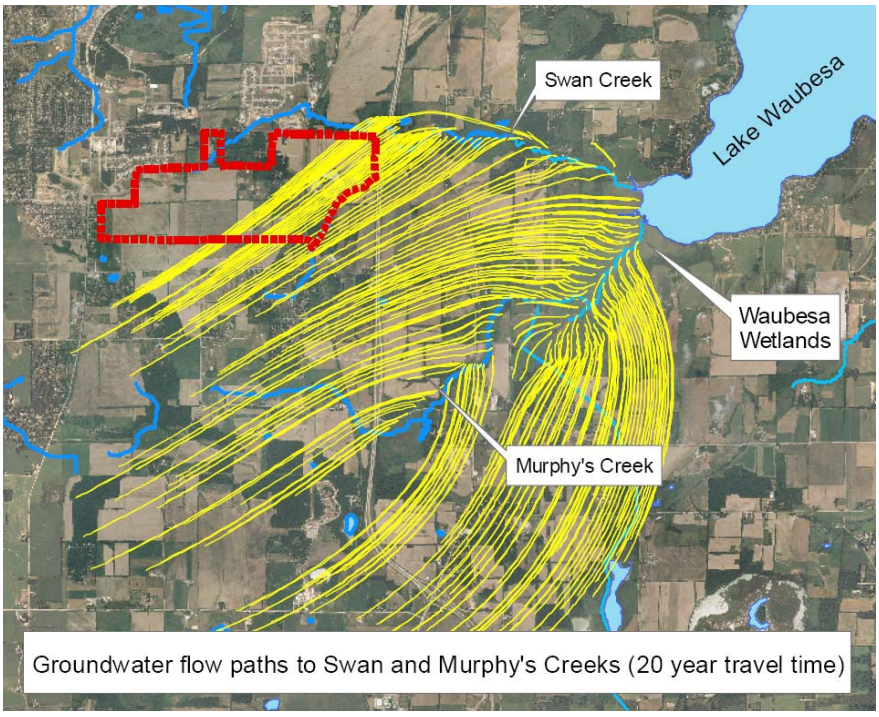
	Pumping Scenarios		
	Low Demand	Moderate Demand	High Demand
Swan Creek			
S3	3.40%	4.37%	4.81%
S4	1.41%	1.81%	1.99%
S32	1.19%	1.53%	1.69%
Total groundwater flow at Lake Waubesa	0.97%	1.25%	1.37%
Murphy's Creek			
M5	1.06%	1.36%	1.50%
Total groundwater flow at Lake Waubesa	1.02%	1.31%	1.44%
Springs			
12	0.84%	1.07%	1.18%
13	1.23%	1.58%	1.73%
14	2.48%	3.16%	3.46%
16	1.78%	2.31%	2.56%
17	0.59%	0.59%	0.59%
18	0.42%	0.55%	0.61%
19	1.50%	1.93%	2.12%

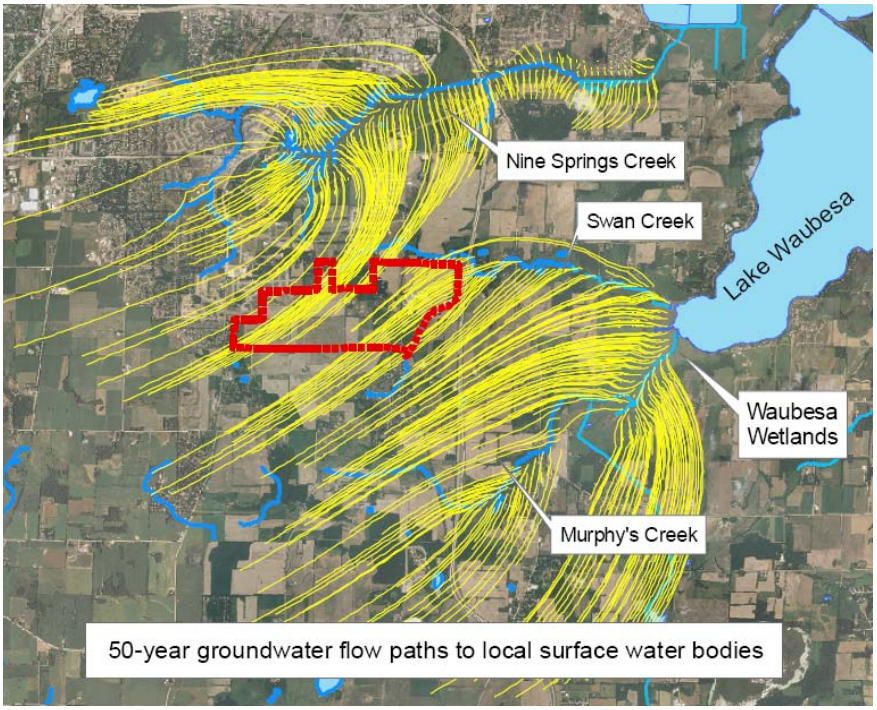
Pumping at the proposed two Fitchburg wells, the Greenfield well which replaces FI 7 and FI8, and the West Clayton Road well, was modeled and reduction in spring flow in the Nine Springs wetland was simulated as well as reductions in baseflow to Swan Creek, Murphy's Creek and the local springs. The continuous pumping rates at the proposed Greenfield well of 1,500 gpm (288,700 cu ft/day) and at the West Clayton Road well of 1,200 gpm (231,016 cu ft/day) total approximately 3.9 MGD or about 1.6x the average rate for 2006 to 2008 (2.4 MGD). The results of the simulation indicate a reduction of flow from the aquifer to Nine Springs wetlands of approximately 3 to 9 percent, to Swan Creek and Murphy Creek of approximately 10 percent and to the seven springs of approximately 2 to 20 percent.

Particle Tracking

The U.S. Geological Survey particle tracking post-processing package, MODPATH (Pollock, 1994), was used with the MODFLOW results to delineate the likely source areas for Swan Creek, Murphy's Creek, and Waubesa wetlands by computing particle paths and travel times. The particles move in response to the average linear velocity as computed by the model.

Particles were inserted in layers one or two at the approximate locations of Swan Creek, Murphy Creek, Waubesa wetlands and the Nine Springs area and tracked in reverse to delineate the approximate source areas where precipitation recharges the groundwater system and eventually discharges to the surface water bodies (**Figures 5.32** and **5.33**).





Figures 5.32 and 5.33: Groundwater Flow Paths

The results of particle tracking indicate that precipitation that recharges the groundwater system and eventually discharges to a local surface water body occurs over large areas. The groundwater

particles occur in a broad band in areas that are south/southwest of Swan Creek and originate in areas that are near, such as in the McGaw Park Neighborhood, or that are a farther distance from Swan Creek to the southwest. Likewise, the source areas for Murphy's Creek, and the Waubesa wetlands occur as broad bands covering large areas to the southwest.

Eau Claire Shale Analysis

The Eau Claire Formation contains a shale and siltstone facies that acts as a regional aquitard, or leaky confining layer, between the upper and lower aquifers. The Eau Claire shale layer is thin and discontinuous in the Madison area and absent in areas where the upper bedrock has been eroded, (Bradbury et al., 1999). A review of geologic logs for the Fitchburg wells indicates that approximately 10 to 40 ft of the Eau Claire shale is present. Additional information regarding the properties of the Eau Claire unit was collected by Swanson (2001). Two wells, one shallow open to the upper aquifer and one deep cased through the Eau Claire shale (approximately 15 ft thick) open to the lower aquifer, were installed south of Nine Springs Creek to evaluate the geology and hydraulic properties. The head drop across the Eau Claire shale was approximately 60 ft with the head in the upper aquifer higher than that in the lower aquifer. These wells were monitored in 2000 during the aquifer performance testing of well FI 10, located 4,500 ft to the south. The water level in the shallow well showed no response, while the head in the deep well was drawn down during the test, indicating that the Eau Claire shale was acting as a confining layer.

Based on this information, the model was used to evaluate the likelihood that the confining layer is more leaky in the area of and surrounding the McGaw Park Neighborhood between wells FI10 and FI 7 & 8. In the NSIM, a value of 2×10^{-8} cm/sec (6×10^{-5} ft/day) was used for average vertical hydraulic conductivity for the shale. This value was increased by two orders of magnitude to simulate the shale as being more leaky. This simulation produced lower water table elevations, and reduced flows to the streams, such that portions of the streams were losing water to the groundwater system. Heads in the lower aquifer increased significantly, about 50 ft, such that the head drop across the Eau Claire unit was reduced to less than 30 ft. Although the value of vertical hydraulic conductivity of the Eau Claire unit likely varies spatially, the results of the modeling indicate that the lower average value of the vertical hydraulic conductivity produces model results that are more consistent with steam and spring flows.

Results from a stratigraphic study of the Eau Claire formation conducted by Aswasereelert et al., (2008) provide information on the nature and hydraulic properties of the formation. They identified five lithofacies in western and south-central Wisconsin based on sedimentary structures, lithology, and bedding characteristics Lithofacies A, deposited in a quiet water environment, and lithofacies B, deposited during periods of storms interspersed with quieter weather, consist of shale and silstones (lithofacies A) and sandstone with shale and siltstone (lithofacies B). The confining nature of the Eau Claire Formation is due to the thickness of the low permeability shale and siltstone and the lateral continuity of these layers. Although the distribution of lithofacies A is discontinuous, distribution of lithofacies B appears to be more continuous because it was present in all of the Dane County wells reviewed for their study, including well DN 1467 located at Nine Springs where head drop across the Eau Claire Formation was 30 ft.

In conclusion, although uncertainty regarding the Eau Claire Formation still exists because of the sparse geologic data from the lower aquifer for the Fitchburg area, the presence of the Eau Claire shale and siltstone at Fitchburg wells including well DN 1441 drilled for Swanson's study and well DN 1467 tested for the Eau Claire Formation stratigraphic study, Swanson's (2001) modeling results, and modeling results for development of the MPNP suggest that the Eau Claire Formation is present and acts as an aquitard to restrict flow between the upper and lower aquifers in most of the Fitchburg area.

Conclusions:

The conclusions of the groundwater modeling include the following:

1. Groundwater recharge in the McGaw Park Neighborhood appears to supply baseflow to the headwaters of Swan Creek and to Lake Waubesa. The eastern portion of the MPNP area appears to be a more significant source of recharge to Swan Creek.
2. Pumping from the lower aquifer to supply the MPNP area may reduce baseflow to Swan Creek, Murphy's Creek and springs by less than 5 %. Most impacted was the simulated baseflow in Swan Creek at Highway 14. Reductions in baseflow downstream where Swan Creek enters into Lake Waubesa were less, approximately 1 %.
3. Decreases/increases in recharge of up to 4 inches at the MPNP area resulted in greater simulated decreases/increases in baseflow to Swan Creek, up to approximately 13 %. Decreases in recharge at the MPNP area resulted in only minimal decreases of less than 1 % in simulated baseflow to Murphy's Creek and the springs, except for Spring 16.
4. The recharge areas for local springs, including those in the Waubesa Wetlands, and for Swan Creek and Murphy's Creek likely extend farther west and south than the McGaw Park Neighborhood area. These features are supplied in part by regional groundwater flow through the highly permeable Tunnel City Sandstone. The areas contributing groundwater recharge to Swan Creek, Murphy's Creek and the Waubesa Wetlands cover large areas including areas outside of the City of Fitchburg.
5. The Eau Claire shale and siltstone unit appears to be confining the lower aquifer and limits impacts of pumping from the lower aquifer on the surface water bodies. However, a significant increase in pumping rates from two new wells open to the lower aquifer may result in adverse reductions in baseflow.
6. Pumping at continuous rates of 1,500 gpm and 1,200 gpm at two new wells (Greenfield and West Clayton Road locations) could substantially reduce baseflow (5 % - 10 %) of some area surface waters.

Management Implications for Maintaining the Water Balance

(1) Maintaining or enhancing recharge in the McGaw Park Neighborhood is important for baseflow in Swan Creek.

(2) Continued periodic monitoring of Swan Creek, Murphy's Creek and local springs is recommended to evaluate the success of water management goals for the protection/restoration of these natural features.

(3) Baseflow of Swan Creek, Murphy's Creek and local springs could be affected by land use changes outside of the McGaw Park Neighborhood.

(4) Increasing groundwater withdrawal approximately 20% over existing groundwater withdrawal rates, as could be required to supply the McGaw Park Neighborhood, may result in decreases in baseflow of less than 5%. However the cumulative withdrawal from additional planned wells in the City could further reduce stream baseflow.

(5) Placement of future wells should consider potential baseflow impacts.

(6) These water balance issues are regional issues and largely beyond the scope of a neighborhood plan. To adequately address them would require a regional approach to water management in cooperation with adjacent municipalities, agencies, and the Madison Metropolitan Sewerage District.

LEED-ND Action Steps

In order to ensure LEED-ND certification the following actions/steps should be taken:

- Ensure water and wastewater lines do not pass through open space, for areas that are to serve land beyond the neighborhood.
- Ensure that no imperiled species and ecological communities exist.
- Ensure protection of sites with wetlands and water bodies.
- Ensure restoration of 10% of the development footprint.
- Create a long-term management plan for the conservation of important habitat and wetlands.
- Implement a stormwater management plan that targets 85% of the events to be retained.
- Ensure 25% of wastewater retained on site replaces potable water.
- Agree to use specific recycled content in infrastructure.
- Implement the necessary waste management infrastructure

Please see Appendix 2C for detailed LEED-ND implementation steps and actions.

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Chapter 6: System Analysis Plan – Other Infrastructure

School District Capacity

The McGaw Neighborhood is divided into the Madison and Oregon School Districts, as shown in Figure 6.1. Currently, all Fitchburg students are bused to existing schools in the two districts.
All of the planned new residential growth in the McGaw Neighborhood in Phases 1 and 2 will be located in the Oregon School District. Area 1 will be a Business Park during Phase 1 in the Madison School District. In Phase 3, Area 3, Mixed Use, and Area 4, R2 will be developed in the Madison School District. See phasing diagram, map, for more details.

Area 5 is shown as a 10 acre Institutional Use and is intended as a new school. Both school districts have expressed interest in building a new school in Fitchburg or a nearby area. While the planned school site is located within the Oregon School District, there is precedent for a land swap between the two districts.

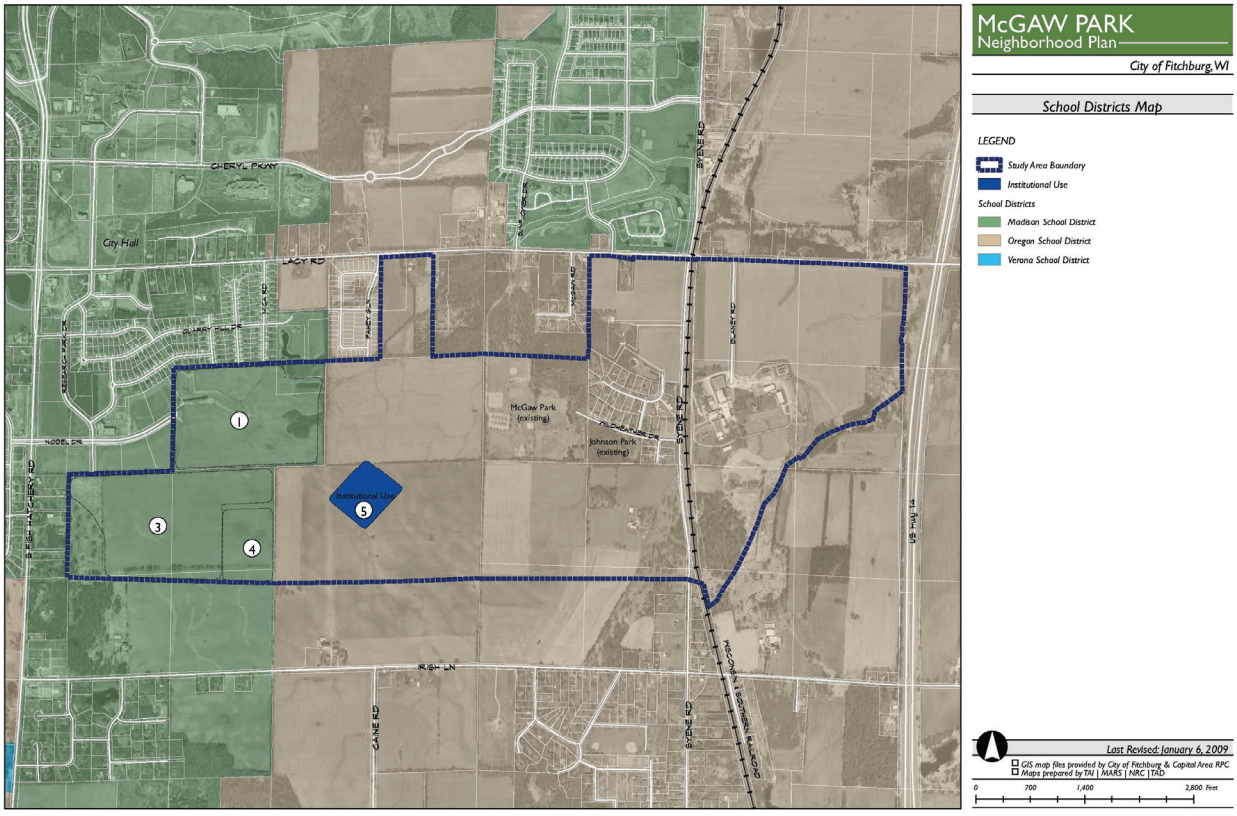

Figure 6.1: School/Institutional Use Site

Student Generation

A total of 1903 residential units are planned for the McGaw Neighborhood. Of these units, 301 are within the current boundaries of the Madison School District, and 1,602 are within Oregon School District. Table 6.1 shows the projected number of students that would result from this residential development. A total of 1,022 new students are projected due to development in the McGaw Park Neighborhood.

Table 6.1: Projected Students

		Projected Students			
	Residential Units	Elementary	Middle	High School	**Total**
Madison School District	301	51	53	58	162
Oregon School District	1602	271	281	308	860
Total	1903	322	334	366	1022

Source: Arthur Nelson, FAICP, "Planner's Estimating Guide: Projecting Land-Use and Facility Needs," American Planning Association, 2004

A new school located in McGaw Park would serve not only the immediate neighborhood, but also surrounding areas of the school districts within Fitchburg. A neighborhood school is something that the City of Fitchburg has desired for a number of years. Development in the McGaw Park Neighborhood, plus other planned new neighborhoods in Fitchburg, creates the demand for a new neighborhood school in the City.

Area 5 is planned as the location of this school. Connected by new multi-use paths and sidewalks, the area would be easy to walk or bike to for all new students that will live west of Syene Road. The extension of Nobel Drive would make it convenient for school buses to bring students from the TOD area and other portions of Fitchburg and the school district. The site would include playfields within the ten acres, but also offer close access to McGaw Park and the new Moraine Edge Park to the south.

Madison

Madison Metropolitan School District currently has 24,792 students (or members). It currently receives $56,433,511 in equalization aid, equal to $2,276 per member, the lowest level in Dane County, and only 23% of shared cost. It has the second highest equalized value per member in Dane County, at $783,212 per member, and a Mill Rate of $10.02. Its tax levy per member is the highest in Dane County at $8,399. Due to revenue limits, relatively high Mill Rates, and concerns over state funding, officials have expressed that development in the McGaw Neighborhood may benefit the school district. Students from this area attend Leopold Elementary School, Cherokee Middle School, and Madison West High School. The District has been looking for an appropriate site for a new elementary school in the southern area of Fitchburg, either within the District's

current boundaries, or through a possible land swap with the Oregon School District. Currently, there are 1300 elementary students south of the Beltline in the Fitchburg area. It projects building a 650 student, LEED certified, elementary school in the southern portion of Fitchburg and is very interested in obtaining a site for a school in the McGaw Park Neighborhood.

Oregon

Oregon School District currently has 3,610 members. It currently receives $20,650,696 in equalization aid, equal to $5,720 per member, and 58% of shared costs. Its education costs are $9,661 per member. Its equalized value per member are $434,139, just over half of Madison's, and has a Mill Rate of $10.12, very similar to the Madison District. Its tax levy per member is $4,986, about average for the County. The Oregon School District also expressed interest in the possible need for a new school in the area.

Telecommunications

The area is well served by various telecommunication carriers providing cable, DSL, and wireless technologies.

The proximity to Fitchburg Technology Campus and Fitchburg Center, make the area a desirable location for employers and residents who require high speed and secure broadband connections. Employers including CDW Berbee, Promega and Team Companies already have high speed connections in place. The City should ensure that the construction of Nobel Drive includes the laying of a fiber connection from Fish Hatchery to the TOD and planned Business Park east of Syene Road. This could be done either by working with an individual private carrier to lay the fiber during road construction, or installing municipal conduit that multiple carriers can use to lay fiber, either during construction, or in the future. The TOD area may also be a prime location for a public WiFi hot spot, particularly with the rail/bus rapid transit station, and the possible construction of a public plaza adjacent to the station.

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Chapter 7- Environmental, Open Space, and Recreation Plan

Core Natural Resources

Wetlands and Waterways

Wetland 1 is a valuable wetland within the study area and the broader surrounding landscape context (Figure 3.4). Although the wetland is dominated by invasive vegetation, such as reed canary grass and sandbar willow, the wetland functions in many ways within the landscape. The wetland serves as a relatively large patch of wildlife habitat that is continuous to wildlife habitat outside of the study area associated with Swan Creek. The wetland is adjacent to the headwaters of a high quality groundwater-fed stream, the South Branch of Swan Creek. Groundwater from within the wetland provides a baseflow source for the stream. The wetland provides a buffer between the stream and the surrounding agricultural fields, intercepting flows of nutrient-rich sediment. During stream flood events, the wetland provides valuable flood storage functions.

The South Branch of Swan Creek within the study area is a groundwater-fed headwater stream. This part of the stream is high quality and shows little signs of disturbance. The substrate is a mix of gravel and cobbles, and the stream has a riffle and pool structure, providing good in-stream habitat. The water is relatively clear and cool. The stream is bordered in many places in the study area by a forested riparian area, and where the channel is bordered by grasses, the channel is narrow enough that it is shaded by the overhanging grasses. The channel appears to be stable, with few erosion features.

The South Branch is important within the broader landscape context as well. The North Branch of Swan Creek originates in some detention ponds within a residential subdivision north of the study area, resulting in warmer in-stream temperatures. The South Branch contributes cool water to the downstream system, maintaining stream quality within the North Branch watershed.

Swan Creek runs through the north end of the Waubesa Wetlands State Natural Area, a high quality wetland complex owned by WDNR and the Nature Conservancy. This wetland complex contains communities of concern, including southern sedge meadow, calcareous fens, as well as rare wildlife species.

Natural Communities

There are two oak savanna remnants in the study area that are important natural resources: Community 5, in the southwest corner, and Community 7 in the southeast corner (Figure 3.4). Each of these communities contains several Heritage oaks, which are invaluable structural elements of oak savannas. Although the groundlayer vegetation is dominated by non-native species, the structures of the oak savanna remnants are relatively intact, with scattered open-grown oaks in the

canopy, and a herbaceous understory with few shrubs. These oak savanna remnants appear to have been historically pastured, and the composition of the herbaceous layer reflects this: brome and other pastures grasses, and old field vegetation.

Across Syene Road from Community 7, there is a large oak-hickory forest within the study area to which field survey access was not granted. However, observations from the road and from current aerial photos indicate that the forest contains many mature oak and hickory trees and may be an overgrown oak savanna. The forest patch is fairly large for this area, and is in a key location for wildlife habitat and movement corridors, being immediately adjacent to Wetland 1 and its riparian corridor.

Heritage and Specimen Trees

Thirty-three Heritage trees were located in the study area, thirty of which were oaks. Fifty-six specimen trees were located (Figure 3.4). In general, these trees tended to be clustered together in significant groupings which should be preserved. The most significant groupings are within Community 5, one of the remnant oak savannas, and in Community 1, an oak-hickory forest. Community 1 occurs as two separate patches of woods, with a treeline connecting the patches. Many of the specimen trees, and one of the Heritage trees, occur within that connecting treeline. This treeline, with its heavy cover contributed by the mature trees, is an important wildlife movement corridor between the two forest patches.

Environmental Corridor

Mapping and Identification

The environmental corridors designated within the neighborhood plan consist of wetlands, wetland buffers, waterways, woodlands, and clusters of heritage and specimen trees. These areas are identified within the neighborhood plan as environmentally sensitive areas (ES). Additionally, existing and proposed parks and open space are included as environmental corridor and identified as PO within the neighborhood plan.

Constraints

Woodland and tree preservation

All woodlands identified with the exception of the small boxelder woodlots (Communities 4 and 6, Figure 3.4) within the neighborhood plan shall be preserved and opportunities for enhancement and restoration shall be explored. Cutting of Heritage and specimen trees shall be avoided with all practical measures. Development and infrastructure planning shall comply with all City policy and ordinances with respect to woodland and tree preservation requirements including the pending Tree Preservation Ordinance and the existing Tree and Shrub Ordinance.

Wetland Buffers

Definition

The wetland buffer is the area of land that commences at the field delineated boundary of wetlands as measured horizontally to the nearest impervious surface. Wetland boundaries shall be identified following the procedures set forth in the 1987 Corps of Engineers Wetland Delineation Manual and subsequent guidance documents and supplements. Identified wetlands shall contain wetland buffers as determined by the following wetland categories:

Category 1 Wetlands – 300 feet buffer

-Category 1 wetlands are wetlands in areas of special natural resource interest as defined in Wis. Adm. Code NR 103.04.

-Category 1 wetlands include wetlands within the boundary of designated areas of special natural resource interest and those wetlands which are in proximity to or have a direct hydrologic connection to designated areas of special natural resource interest.

Category 2 Wetlands – 100 feet buffer

-Category 2 wetlands include the following wetland community types:

- -Fens
- -Sedge Meadows
- -Bogs;
- -Low prairies;
- -Conifer swamps;
- -Shrub swamps;
- -Forested wetlands;
- -Wet meadows;
- -Shallow marshes;
- -Deep marshes; and
- -Seasonally flooded basins

-Wetland plant community types shall be determined based on "Wetland Plants and Plant Communities of Minnesota & Wisconsin", 1997, U.S. Army Corps of Engineers, Eggers and Reed.

-Wetlands containing intact native plant communities but are located within a monotypic stand of invasive plant species shall by identified as Category 2 wetlands.

Category 3 Wetlands – 75 feet buffer

-Category 3 wetlands include significantly degraded wetlands that are dominated by invasive plant species such as reed canary grass and boxelder or lack native vegetation due to on-going farming practices (e.g. farmed wetlands).

-Category 3 wetlands must be comprised of more than 90% invasive species as measured by percent cover or lack vegetation due to on-going farming practices.

-Invasive species can include both native and non-native plant species and must be identified on the Wisconsin Department of Natural Resources list of invasive plant species which can be found online at http://dnr.wi.gov/invasives/plants.htm

Wetland Buffer Restrictions

-Impervious surfaces shall be kept out of the wetland buffer area to the maximum extent practicable and must comply with all applicable Dane County shoreland wetland and inland wetland ordinances and area-wide water quality protection plans. The storm water management plan shall contain a written site specific explanation for any parts of the wetland buffer area that are disturbed during construction.

-Where land disturbing construction activity occurs within a protective area, and where no impervious surface is present, adequate sod or self sustaining vegetative cover of 70% or greater shall be established and maintained. Nonvegetative materials, such as rock riprap, may be employed as necessary to prevent erosion such as on steep slopes or where high velocity flows occur.

-A minimum of 50% of the distance of the wetland buffer measured horizontally from the delineated wetland boundary shall be established to a native plant community.

-Best management practices such as filter strips, swales or wet detention basins that are designed to control pollutants from non−point sources may be located in the wetland buffer area. However, all stormwater management devices located within the wetland buffer area shall be established to a native plant community and designed to be compatible with the natural landscape.

Opportunities

Wetland Restoration and Enhancement

The highest priority wetland area for restoration is Wetland 1, along the South Branch of Swan Creek (Figure 3.4) and indeed the area as a whole will benefit from restoration and enhancement actions.

Aerial photo reviews suggest that there may be other wetland types (possibly remnants of high quality wetland communities) within the wetland area that was not surveyed because access was not granted. Some areas of the stream also appear to have been channelized. Before beginning any restoration planning, a complete survey of this area should be performed, including surveys for rare species. In addition, the hydrologic regime should be investigated further, particularly the groundwater flow patterns and discharge points. If the stream has indeed been channelized, a

potential restoration activity may involve remeandering the stream, or damming the stream to let it re-establish a more natural channel.

The soils in the wetland should also be evaluated for overlying agricultural sediment. The depth and extent of agricultural sediment, and the location, condition and seed bank presence of the original wetland soil surface, if applicable, should also be determined. With this information, it can be determined if it is appropriate to scrape parts of the wetland to remove sediment and the root mass of the invasive species, reed canary grass.

In order to protect the wetland and the quality of the South Branch of Swan Creek, stormwater detention and treatment needs to be engineered with the following in mind. The creek, with its relatively cool water characteristics, should be protected from the thermal impacts of stormwater inputs. Stormwater outfalls which concentrate flows in one location could contribute to scouring within the channel during large rain events. Stormwater practices that may help meet this objective include stormwater infiltration, which could reduce the volume of stormwater inputs into the creek, and which may help maintain groundwater baseflow to the wetland and creek. Distributed stormwater outfalls into the wetland and creek may reduce scouring flows.

The main work of restoration and enhancement within the wetland should focus on increasing the diversity of the wetland plant community. Reducing populations of non-native invasive species, particularly reed canary grass, will involve substantial herbicide treatments, potentially regular prescribed burning, and replanting with native species.

Some of the factors that contribute to the increase and maintenance of reed canary grass should also be addressed. Inputs of sediment and nutrients into the system from the adjoining agricultural fields should be mitigated with substantial upland environmental corridors of dense native herbaceous plantings, such as prairie. As mentioned above, if accumulated agricultural sediments are present which may be changing the hydrologic regime by making the wetland drier, these deposits should be removed and the areas replanted with native species.

Woodland and Savanna Restoration and Enhancement

Communities 5 and 7 are remnant oak savannas, and have excellent prospects for savanna restoration (Figure 3.4). Community 7, in the eastern half of the study area, is overgrown in several areas with trees and shrubs, including the invasive black locust, common buckthorn, and multiflora rose. The groundlayer is dominated by weedy non-native cool season grasses and forbs, and is sparse in several areas under the existing shrubs. Community 5 has a more open canopy, and less shrub cover. Restoration of these areas should start with the removal of inappropriate trees and shrubs, preferably through cutting and treating the stumps with herbicide. Efforts should then be made to increase the fuel load of the ground layer by planting grassy cover crops, such as annual rye and oats. Once a fuel load has been established, prescribed burning should be used to suppress cool season and weedy species and shrub and tree seedlings. Herbicide can also be used to control non-native species, and once control has been achieved, native oak savanna species can be planted.

The restored savanna communities will need to be maintained in the long term with periodic prescribed burning and spot treatments of herbicide.

Other wooded areas within the study area that have restoration potential include Communities 1 and 3. These are oak-dominated forests with populations of invasive shrubs and groundlayer plants. The primary focus of restoration work in these areas should include the removal of the invasive species and the addition of appropriate native species. Other actions that may assist with restoration include increasing the size of the forests by adding native species buffers to reduce the negative effect of the adjacent land uses, and increasing the connectivity of the forest patches throughout the landscape.

Other wooded areas within the study area that have restoration potential include Communities 1 and 3. These are oak-dominated forests with populations of invasive shrubs and groundlayer plants. The primary focus of restoration work in these areas should include the removal of the invasive species and the addition of appropriate native species. Other actions that may assist with restoration include increasing the size of the forests by adding native species environmental corridors to reduce the negative effect of the adjacent land uses, and increasing the connectivity of the forest patches throughout the landscape.

Community 2, the area dominated by honeysuckle shrubs, is also an area of concern. This large population of invasive shrubs may serve as a seed source for other areas in the study area through bird dispersal. These shrubs should be removed and replaced with native species. The target community for this area would depend on the intended use of the area as determined by the City of Fitchburg.

<u>Prairie Restoration</u>

The restoration of prairie vegetation is appropriate in several areas of the study area. The highest priority areas are the wetland and waterway environmental corridors, where the dense native prairie vegetation will assist with capturing sediment and runoff as well as providing habitat. The savanna restoration areas should also be buffered with prairie plantings. The default plantings around stormwater features, particularly in and around infiltration features, should also consist of native prairie vegetation where possible. The additions to McGaw Park could also contain selected areas of prairie plantings for habitat creation and educational purposes. In each of these areas, the existing vegetation should be evaluated for weediness and invasive species, and appropriate treatments should be used to prepare the sites for prairie plantings.

Parks and Recreation

Parks and Recreation

Simultaneous to the McGaw Park Neighborhood Plan, the City of Fitchburg has been working on a Conceptual Park and Open Space Proposal: 2010-2015 Comprehensive Park, Open Space, and Recreation Plan. This Proposal was presented to the McGaw Park Neighborhood Plan Steering Committee. The open space proposals included an expansion of McGaw Park itself to the south and west, the creation of a large band of green just south of the neighborhood, called Moraine Edge Park, protecting specific 300' environmental corridors along designated wetlands, and establishing a number of open space connections between the current City urban area through this neighborhood to the area to the south. Where possible street frontage along parks is encouraged. Additional paths should be considered including along an existing swale on the current Hartung site to connect the Transit Oriented Development area with the Environmentally Sensitive area to the east. As seen in the Growth Model, McGaw Park extends west and curves south over woodland community 6. The purpose for this extension is to preserve the branch of Swan Creek that runs between the existing Waterford Glen subdivision and the planned R2 subdivision (area 22), as well as provide an environmental corridor between the Business Park (area 1) use and the R2 neighborhood (area 22).

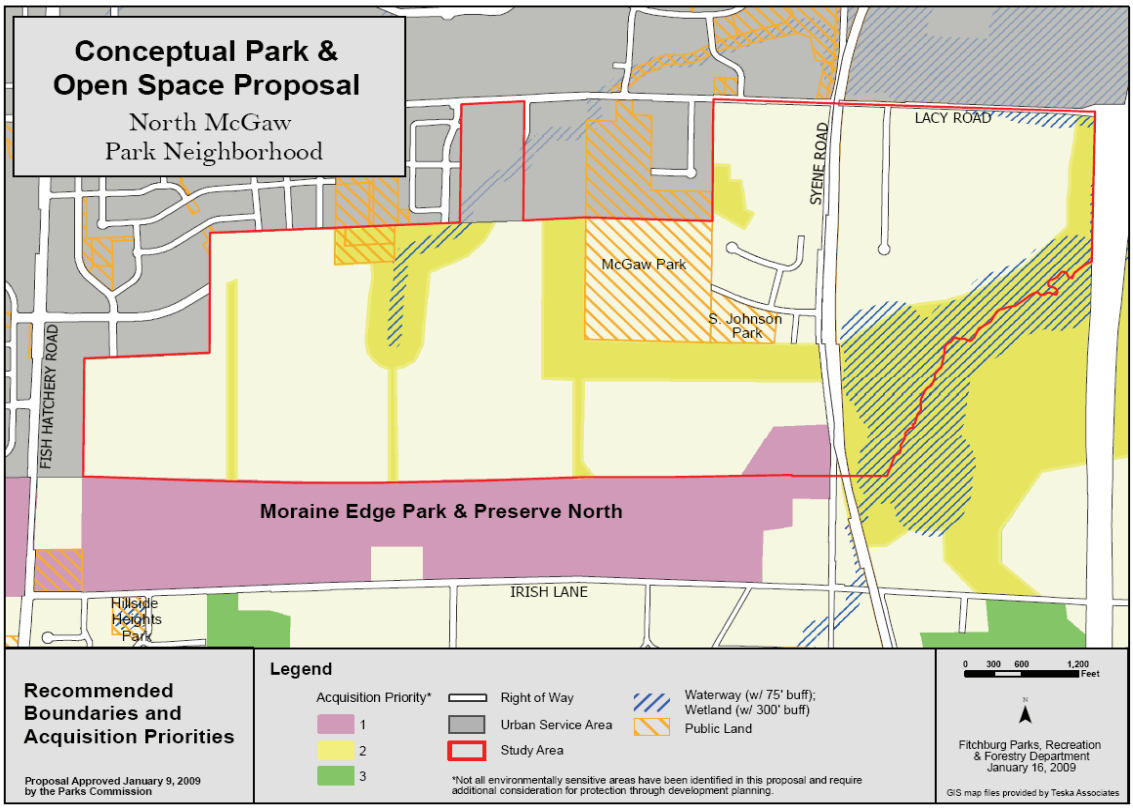


Figure 7.1: Conceptual Park & Open Space Proposal

The Steering Committee reviewed the Park and Open Space Proposal and developed a number of Concept Plans that began with the specific locations identified in the Park and Open Space Proposal, and made refinements over time based on more focused field evaluations of the environmental resources. The Environmental Features Map shown below was the basis of this analysis. The recommended environmentally sensitive areas include a 300' foot buffer along the wetland adjacent to South Branch of Swan Creek; a 75 foot buffer around a wetland near the southeast corner of Syene and Lacy Roads; a 75 foot buffer around a wetland pond at the western edge of the study area; a buffer around the stream on the Rueden property in the northern section of the neighborhood; moderate quality woodlands; and clusters of specimen and heritage trees located throughout the site. The plan also identifies connections through the neighborhood; McGaw Park and the proposed expansion areas; as well as the Moraine Edge Park to the south of the southern boundary of the neighborhood.

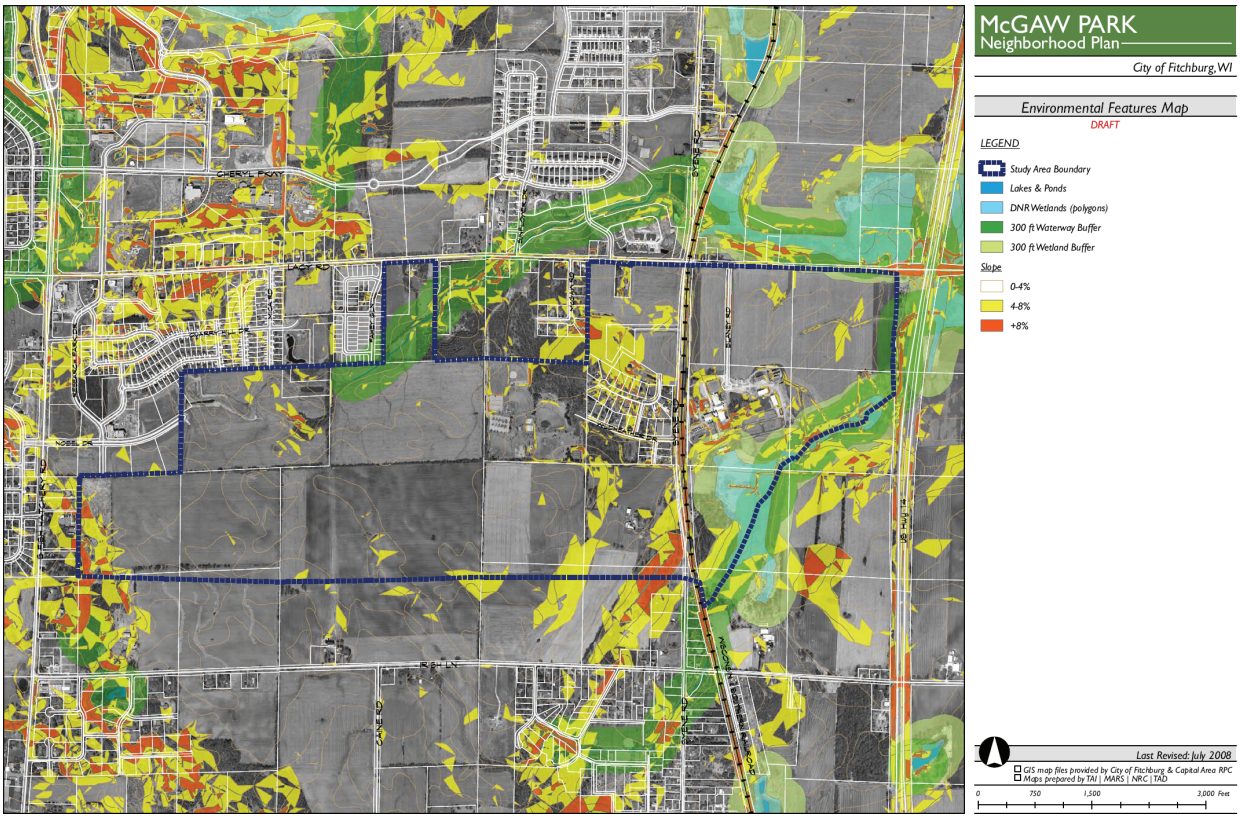


Figure 7.2: Environmental Features Map

Table 7.1: Park and Open Space Dedication Requirement

	Total Acreage	ROW (acres) (25%)	Stormwater (acres) (4%)	Net Area (acres)	Residential Units	Open Space Requirements
R1 (5 du/acre)	**123.0**	30.8	4.9	87.3	**437**	**29.1**
R2 (10 du/acre	**92.0**	23.0	3.7	65.3	**653**	**43.5**
BP	**87.0**	21.8	3.5	61.8		
TOD	**76.0**					
- Retail	6.0	1.5	0.2	4.3		
- Office	23.3	5.8	0.9	16.6		
- Residential (18 du/acre)	46.7	11.7	1.9	33.1	**596**	**39.7**
MU	**61.0**					
- Office	30.5	7.6	1.2	21.7		
- Residential (10 du/acre)	30.5	7.6	1.2	21.7	**217**	**14.4**
Institutional	**10.0**	2.5	0.4	7.1		
Environmentally Sensitive	**100.0**					
Parks and Open Space	**87.0**					
Transit Station	**5.0**		0.2			
ROW	**71.0**	71.0				
TOTAL	**712.0**	**183.3**	**18.2**	**318.8**	**1,903**	

The City of Fitchburg requires a park and open space dedication of 2,900 square feet per new residential unit. Based on this factor, 126.7 acres of park and open space is required. This may be a combination of both on-site open space or public plazas, as well as public parks being planned both within the Neighborhood (such as the expansion of McGaw Park), and beyond (such as the planned Moraine Edge Park just south of the Neighborhood). Based on the Plan, 87 acres is set aside as parks, which includes the existing McGaw Park and Johnson Park (49-acres), a 32-acre expansion to McGaw Park, and a new 6-acre park south of Nobel Drive. Therefore, 38 acres of *new* Park and Open Space are specifically shown as land uses within the Plan. The remaining 88.7 acre requirement can be fulfilled with additional neighborhood parks and other public spaces likely to be required within the neighborhood, parks outside the neighborhood boundary, as well as Fee-in-lieu-of Parkland Dedication provision. In addition to this open space, 100 acres of Environmentally Sensitive land is not buildable (except as specified in the Comprehensive Plan), which includes wetlands, environmental corridors, and areas with large concentrations of heritage

and specimen trees. The planned Moraine Edge Park would be 174 acres, just beyond the neighborhood boundary to the south. Specific implementation recommendations regarding Parks are included on page 4-7.

LEED-ND Action Steps

In order to ensure LEED-ND certification the following actions/steps should be taken:

- Ensure that no imperiled species and ecological communities exist.
- Ensure protection of sites with wetlands and water bodies.
- Ensure restoration of 10% of the development footprint.
- Create a long-term management plan for the conservation of important habitat and wetlands.
- Implement a stormwater management plan that targets 85% of the events to be retained.
- Ensure 25% of wastewater retained on site replaces potable water.
- Ensure no development within 100 feet of wetland or water bodies.
- Ensure no development within 100 year floodplain.
- Ensure no development in steep slope areas.
- Ensure that public open space of at least 1 acre is accessible within ¼ mile to 90% of residents.
- Allow for dedicated community garden and growing space
- Complete necessary construction activity pollution prevention plan.

Please see Appendix 2C for detailed LEED-ND implementation steps and actions.

Chapter 8: Land Use Plan

Land Uses

Following the goals of the Plan, public participation, input from the Common Council and Plan Commission, the Steering Committee developed consensus for the Growth Model that guides the Land Use Plan. Over twelve conceptual growth models were developed prior to arriving at the Growth Model. The Growth Model was developed to protect and enhance the natural environment of the area prior to planning for development and transportation enhancements.

The 712-acre neighborhood was divided into sections by land-use type. The determination of each land use section and boundary was determined by a myriad of factors including impact upon the neighborhood's environmentally sensitive lands, access to transportation, and context of and impact upon surrounding land uses. The types of land use being promoted in this plan, will allow for the preservation of on-site environmental resources, mitigate impact upon surrounding lands and environmental resources, and preserve the agricultural uses in surrounding neighborhoods.

The land use plan divides the neighborhood into three distinct sectors, 1) a higher density, transit-oriented development node to the east, 2) a mixed-use and business park node to the west, 3) and a lower-density single-family residential and institutional use sector between the east and west nodes.

For ease of understanding, the number next to each land use sector corresponds to the number listed on the Growth Model Map. Land uses shown on the Growth Model may see their location, size, and/or configuration altered as a result of more detailed engineering and planning, such as, but not limited to, final park dedication area determinations, storm water facilities, or road engineering. It is not the intent to require an amendment to the neighborhood plan for minor alterations that result from technical necessities. Each land use sector includes a description and guiding development parameters. These development parameters are not zoning regulations; however, give guidance to the establishment of regulations to determine the physical form of each land use type.

It is recognized that neighborhood build out will occur over 30 or more years. Therefore certain existing uses may be allowed to continue and possibly expand even though that use may be inconsistent with the outlined use district within this plan. New uses that establish, particularly if they involve building construction, are to be consistent with the plan or accomplished in such a way as to not inhibit the realization of the projected land use pattern.

Figure 8.1 shows the Growth Model that guides the Land Use Plan.

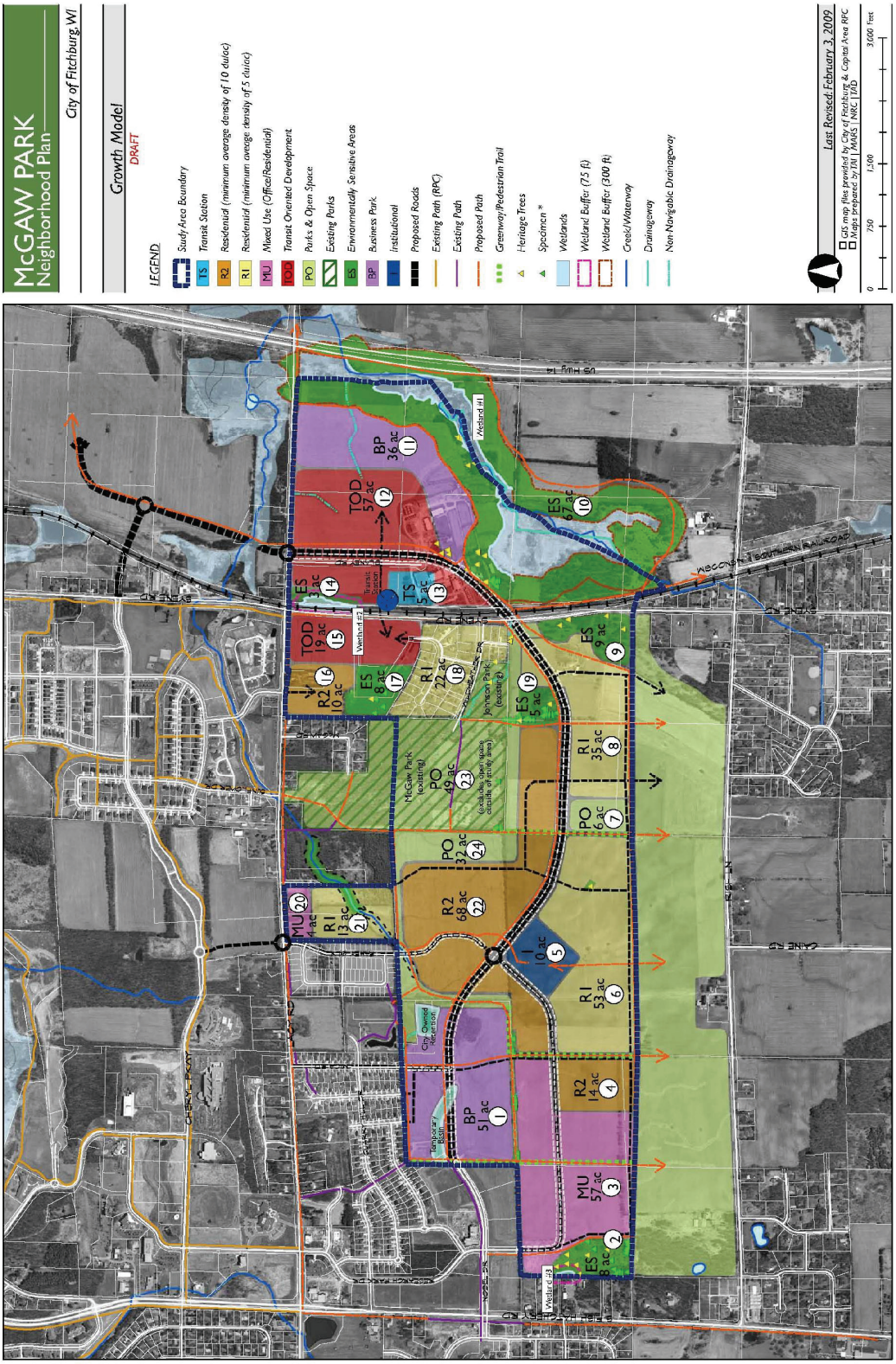


Figure 8.1: Growth Model

Areas 2, 9, 10, 14, 17, and 19: Environmentally Sensitive Areas

Environmentally sensitive areas including waterways, wetlands, steep slopes and floodplains account for over 100-acres of the 712-acre McGaw Park neighborhood. The location of those environmentally sensitive areas predicated the specific locations and types of other land uses described in this plan.

There should not be any development allowed within identified environmentally sensitive areas and all efforts should be made to restore and maintain these areas in their natural state. In the Growth Model, the boundaries of the environmentally sensitive areas include the regulatory landscape environmental corridors to ensure their protection and the appropriate environmental protection corridors from wetlands that are required by the City of Fitchburg.

Any uses in the environmental corridor or buffer area will have to be consistent with the City's comprehensive plan requirements, subject to approval by relevant city committees and commissions and consistent with Capital Area Regional Planning Commission or other requirements.

Area 12, 13, and 15: Transit Oriented Development

A 76-acre Transit Oriented Development (TOD) area, located in the northeast corner of the neighborhood just south of Lacy Road, forms the eastern node of the McGaw Park neighborhood. Designating the TOD on both sides of Syene Road is necessary to create a corridor of higher intensity commercial activity.

The Transit Oriented Development area is proposed to be highlighted by a transit center which would be ringed by higher density and mixed use development. The transit center could be served by rail/bus rapid transit. The proposed TOD will include up to 596 residential units, 92,000 sq/ft of retail, and 360,000 sq/ft of office.

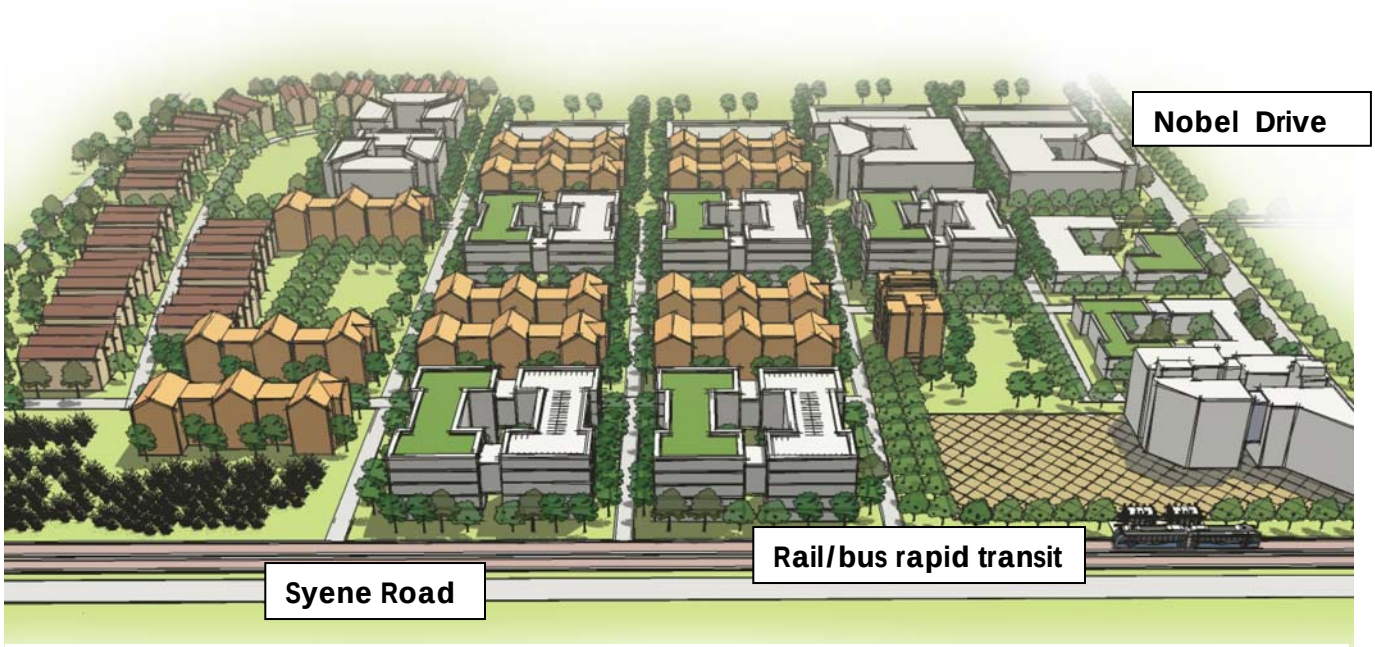
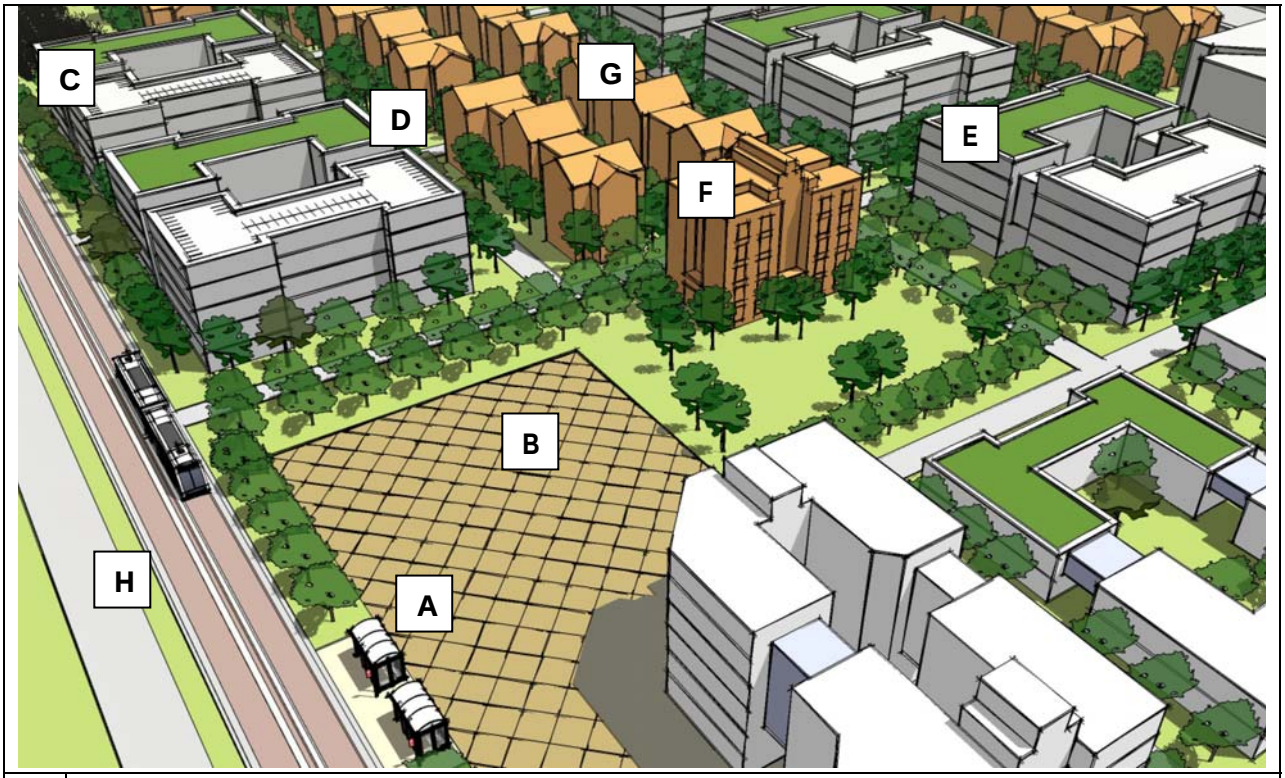


Figure 8.2: Conceptual Plan for TOD – Area 12

In order to illustrate the principles of transit oriented development (TOD), a conceptual plan was created for the TOD area at the southeast corner of Syene Road and Lacy Road. A conceptual drawing of the area, shown in Figure 8.2 shows a mix of uses – from residential to office to neighborhood retail to structured parking. It also includes an urban plaza adjacent to the proposed transit station. A zoom-in of the drawing is shown in Figure 8.3. These conceptual ideas illustrate the types of facilities that may be appropriate for the area; the drawings are not meant to be specific plans for the area. The TOD area would involve a mix of uses, from attached housing to multi-family housing, to parking structures, and a transit station. The area is to be designed to be easily walkable and accessible to the transit station. A pedestrian bridge or crossing should be designed to connect the TOD area across Syene toward the west. A public plaza (with possible underground parking) could be designed at the light rail station to provide a civic gathering space for the TOD area. Additional pocket parks should be designed to provide open space for the residential units throughout the TOD area.

Figure 8.3: Conceptual Plan for Transit Center within Area 12



A.	Transit station which provides shelter for users, convenient drop off area, covered bike storage, and area for light retail activity (coffee shop, newspaper stand).
B.	Urban plaza for local events and pedestrian activity (with possible underground parking)
C.	Green roofs above parking and commercial development.
D.	Shared and managed parking around transit center and commercial uses.
E.	Mixed-uses in close proximity to transit includes office, residential, retail, and civic uses
F.	Residential development within walking distance of the transit center
G.	Townhomes or condominiums within transit area.
H.	Syene Road

Table 8.1 TOD Development Parameters:	
Uses	Residential, Retail, Office, Civic, and Institutional
Desired Use Mix	6 acre retail site (8%), 30% office, 62% residential, 5 to 10 acre transit station
Minimum Residential Density	An average of at least eighteen units per acre
Commercial Floor Area Ratio (FAR)	Minimum of 0.50
~~**Residential Floor Area Ratio (FAR)**~~	~~Minimum of .62~~
Height	Allow for a range of heights and mixed use buildings to accommodate both residential and commercial to create an urban environment.
Parking	Allow for parking reductions for shared use and transit accessible sites.
	Encourage structured and underground parking.
	Limit surface parking. (Specific implementation recommendations regarding Parking are included on page 4-7).
Design Standards	Material Use
	Corner Elements
	Colors
	Windows / Transparency
	Building Mechanicals
	Awnings/ Shutters
	Location of Doors
	Lighting
	Signage
	Architectural Style and Details

Areas I and II: Business Park

A 36-acre business park is planned in the northeast corner of the neighborhood, just south of Lacy Road. The park is bordered by the TOD to the west and environmentally sensitive lands to the east. A business park is an ideal use for this location because it will serve as a complementary use to the employment planned in the TOD and offers good access and visibility from the US Highway 14. Furthermore, if the business park is developed under the principles of sustainable development, such use will serve as an effective environmental corridor between the higher intensity use of the TOD and the environmentally sensitive location to the east and south.

A 51-acre business park is located east of the existing Fitchburg Technology Campus. The park should allow office and other commercial land uses within the parameters of the performance standards yet to be developed. Access to this business park would be through an extension of Nobel Road, which currently bisects the existing Fitchburg Technology Campus.

The layout of the business parks should not mirror the typical business park layout highlighted by one story buildings on large lots surrounded by vast areas of surface parking. The layout should

provide a mix of building heights that accommodate market demands ~~and achieve the .5 FAR~~. The proximity of the business parks to transit and a mix of uses make them ideal for green/sustainable development and should develop under the principles of LEED-ND. Design of the business park should take into account the environmental corridor and integrate that corridor in the planned use. The principles of conservation design are encouraged in the business park areas.

In addition, in areas where the business park is adjacent to less intense uses, appropriate transitional methods should be considered. Development of the Business Parks should consider the following objectives in order to ensure compatible transitions between less and more intense uses:

Table 8.2 Business Park Development Parameters:		
Uses	Office, light manufacturing, lab space, supportive commercial.	
LEED-ND / Sustainable Development Practices	Reduction in infrastructure through compact development, ~~which constitutes a density of at least 0.5 FAR,~~ and might require underground, roof, or shared structure parking	
	Reduction in impervious surface through the use of pervious materials, narrower streets, increased open space, and reduced parking areas	
	Reduced automobile dependence by developing with a mix of uses including office, residential, and retail	
	Providing an open community by promoting connectivity and providing physical linkages, including pedestrian, bike paths, and automobiles, to surrounding areas	
	Encourage LEED certified buildings or other green sustainable building programs.	
	Incorporation of green construction and technology	
	Encourage Conservation Design practices where practical	
	Design in harmony and integration with adjacent Environmentally Sensitive Area and Environmental Corridors	
	Incorporation of innovative stormwater management.	
Site Practices to Reduce Impact upon Adjacent Properties	<u>Site Orientation</u>	Orient site layout and design toward freeways or thoroughfare streets. Solar orientation is encouraged.
	<u>Building Orientation</u>	Light industrial/business park activities, pedestrian access, and main building entrances should be oriented toward the street.
		Parking and loading facilities should not be oriented towards adjacent districts
		The height and bulk of an industrial building and accessory structures (parking garages, satellite dishes, etc.) should be oriented away from residential neighborhoods to avoid creating a negative visual effect.

		Elements such as generators, HVAC systems and other similar uses that may impact adjacent properties should be sensitively sited and selected.
	Lighting	Lighting used to illuminate an off-street parking area, sign or other structure shall be arranged as to deflect light away from any adjoining property or from public streets through fixture type, height and location.
	Landscaping and Buffering	Where possible, use existing topography to naturally separate light industrial/business park and residential areas.
		Streets may be used as boundaries between light industrial/business park and commercial, office or higher-density residential land uses.
		Encourage the creative and extensive use of landscaping and berming techniques for effective buffering of residential and light industrial/business park land uses.
		Fences should not be the sole means of providing screening or buffering.
		Promote natural buffers including existing land features, vegetation such as stands of trees and hedgerows, wetlands, environmentally sensitive areas, and stream corridors.
		Encourage the use of high quality materials in the construction of fencing and landscaping to decrease long-term maintenance costs and to decrease the likelihood that neglected, unsightly areas will occur.

Areas 3 and 20: Mixed-Use

Mixed-use can include either a horizontal mix of uses, with single uses in separate but adjacent buildings or a vertical mix of uses, with a multitude of uses in one building. In order to create a sustainable community, a mixed use district should include a balanced and vibrant mix of compatible uses. An appropriate mix of uses is important in order to address site-related issues such as market demand, compatibility to adjacent and surrounding land uses, infrastructure, transit service, and accessibility. Mixed use districts should allow attached single family and multi-family housing, as well as retail, restaurants, offices, civic and other appropriate commercial uses. Other uses may include housing for the elderly, personal services shops, child care facilities, recreation, and municipal uses.

Conventional zoning laws focus on buffering and protecting incompatible uses from each other. However, successful mixed use districts require connectivity among uses, which encourages pedestrian activity and utilization of common open space. Specific design features can promote this interconnectedness including the layout and orientation of buildings, the network of sidewalks and pathways, the location of parking relative to structures and walkways, and the amount and placement of green space, landscaping, benches, and other amenities. Adoption of design guidelines will direct interconnected, quality development, while accounting for operational needs such as deliveries and snow and refuse removal.

Two areas are designated for mixed-use development which includes office, residential, and retail. One 4-acre mixed use area is targeted just south of Lacy Road and just east of the existing

Waterford Glen subdivision. Due to the proximity to adjacent residential uses, and the relatively small size of the site, tenants would be limited; however a small retail development, with office or residential on the second or third floor, could be sought. Ideal uses include neighborhood service uses such as coffee shop, personal services, convenience or grocery store, carry-out restaurant, and boutique retail. This small retail area would serve the surrounding residential area and business park employees; however, it would not draw from a regional area.

A 57-acre mixed use area is designated for the western most boundary of the neighborhood, just south of the existing Fitchburg Technology Campus. The 57-acre area should allow residential, office, and other commercial uses compatible with performance standards to be developed. Mixed-use development is targeted for this area due to its proximity to the business park uses. Strictly commercial uses for this site would not be ideal because visibility and access to the site is limited. The 57-acre mixed-use area should balance employment and residential uses.

Table 8.3: Mixed-Use Area Development Parameters:

Uses	Residential, Commercial Office, Civic, and Institutional
Desired Use Mix	Balanced mix of employment and residential uses
Commercial Floor Area Ratio (FAR)	Minimum of 0.50
~~**Residential Floor Area Ratio (FAR)**~~	~~Minimum of 0.57~~
Height	2 story buildings are encouraged~~, 1 story buildings are allowed if the development meets the .5 far requirement.~~
Parking	Allow for parking reductions for shared use Structured or underground parking should be encouraged.
Design Standards	Material Use
	Corner Elements
	Colors
	Windows / Transparency
	Building Mechanicals
	Awnings/ Shutters
	Location of Doors
	Lighting
	Signage
	Architectural Style and Details

Areas 6, 8, 18 and 21(R1): Residential (Minimum average of 5 units/acre)

The lower-density residential is characterized by single-family residential uses, developed at a density similar to the cluster residential subdivisions of five dwelling units per acre. The main dwelling type would be detached single-family residential on small lots, attached single-family and rental. Known as row, cluster, or zero-lot line homes, these attached single-family homes allow for more innovative land design to preserve natural resources in addition to reducing building and infrastructure costs.

Three separate areas, which are centrally located within the McGaw Park neighborhood, have been designated for low-density residential. The low-density residential areas are strategically located to mitigate impacts upon such uses and provide buffers to environmentally sensitive areas. The three low density residential areas constitute 88 acres of buildable area (minus area for infrastructure and stormwater detention), which would allow for approximately 437 units. When applying the final subdivision layout, Conservation Design practices should be applied where practical.

Table 8.4 Low-Density Development Parameters:	
Density	Average of five units per acre
~~**Minimum F.A.R**~~	~~0.34~~
Garage	Attached or detached
Front yard encroachments	Porches and decks
Driveway Width	Narrow and/or pervious surfaces
	Allowed shared driveways to reduce impervious surface
Design	Architectural elements, such as dormers, bay windows, porches, and decks, are encouraged. Varying rooflines, including multiple peaks and slopes, are encouraged

Areas 4, 16, and 22 (R2): Medium-Density Residential (Minimum average of 10 units/acre)

Three separate areas have been designated for medium-density residential, which can function as a means of enhancing housing options. The medium density residential areas are primarily located in the center of the McGaw neighborhood, and the largest designated area frames the northern portion of Nobel Road extension. The medium-density residential will serve as a buffer between

residential will serve as a buffer between the more intense commercial, industrial, and transit uses in the TOD, mixed-use and Business Park land use sections and the low-density single family residential.

The medium-density residential is characterized as single-family and multiple-family residential developed at a density averaging at least ten dwelling units per acre. The main dwelling type would be attached single-family residential and multi-stored housing developments. The medium-density residential areas should take the form of a dense urban area, including multiple story buildings, elimination of front yard parking, and introduction of alleys, especially in areas served by attached-single family housing. By introducing alleys to serve as access points to rear-loaded unit parking, the need for multiple curb cuts and front yard is eliminated, which allows for guest on-street parking, increased landscape area, or building set closer to the street. The implementation of alleys can greatly improve the image of the street frontage. When applying the final subdivision layout, Conservation Design practices should be applied where practical.

Development Parameters (Tables 8.5 and 8.6):

Single-Family Home Attached

Minimum Lot Width	Narrow lots and stacked units
Height	Two to four stories
Minimum F.A.R	0.57
Parking	1.5 to 2 car off-street per unit, encourage use of alleys
Garage	Individual rear garages for units or shared garage for all units
Front yard encroachments	Porches and decks
Driveway Width	Narrow
	Allowed shared driveways to reduce impervious surface
Design	Architectural elements, such as dormers, bay windows, porches, and decks, are encouraged. Varying rooflines, including multiple peaks and slopes, are encouraged

Multiple-Family

Minimum Lot Width	100 feet
Minimum lot area	10,000 sq. ft
Minimum F.A.R	0.57
Height	Three to five stories
Parking	1.0 to 2.0 per unit off-street, encourage access from alley
Garage	Individual rear garages for units or shared garage for all units
Front yard encroachments	Porches and decks
Driveway Width	12-16 feet Allowed shared driveways to reduce impervious surface

Area 5: Institutional

A 10-acre area located in the center of the McGaw Park neighborhood, just south of the Nobel Road extension, has been dedicated for institutional uses. The preferable use for this area is an elementary school. A flexible use facility may be appropriate here, with some office or retail space phased out as the school expands. Both the Madison and Oregon school district have expressed an interest in building an elementary school in the McGaw Park neighborhood. This location would be ideal for an elementary school due to its proximity to the neighborhood's residential areas. All the school age children will not be entirely new children as it is expected that children within the existing school system will move into the new MPN housing. In order to limit busing and build community cohesion, it is recommended that the borders of the two school districts be amended so that all of the children attend the same school district.

Areas 7, 23, and 24: Park and Open Space

As its namesake, the McGaw Park neighborhood is highlighted by the existing 49-acre McGaw Park. The land use plan provides for a 32-acre extension to the western and southern edge of the park, which would provide direct access for the high density residential and provide a buffer for sensitive wetland areas. Simultaneous to the McGaw Park Neighborhood Plan, the City of Fitchburg has been working on a Conceptual Park and Open Space Proposal: 2010-2015 Comprehensive Park, Open Space, and Recreation Plan. This Proposal was presented to the McGaw Park Neighborhood Plan Steering Committee. The open space proposals included an expansion of McGaw Park itself to the south and west, the creation of a large band of green just south of the neighborhood, called Moraine Edge Park, protecting specific 300' environmental corridors along designated wetlands, and establishing a number of open space connections between the current City urban area through this neighborhood to the area to the south.

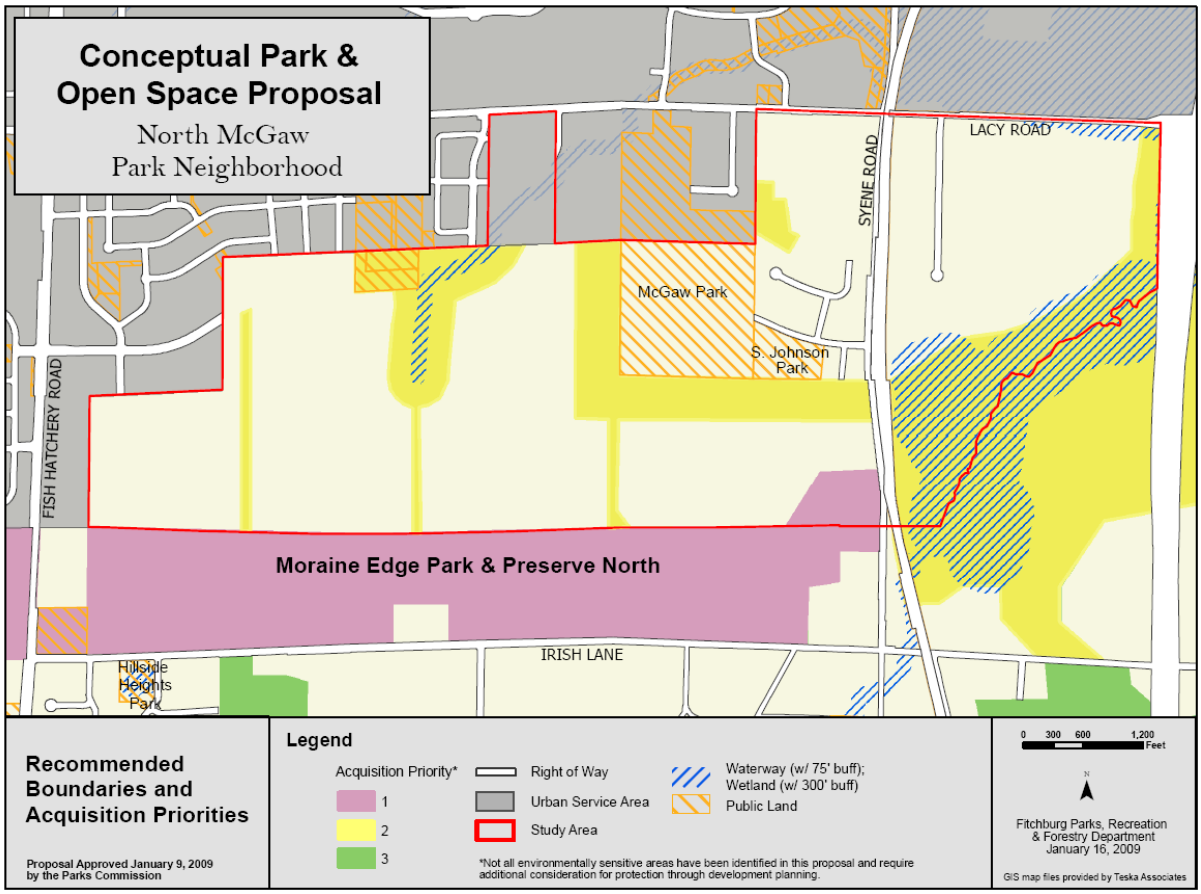


Figure 8.4: Park and Open Space Proposal

The Steering Committee reviewed the Park and Open Space Proposal and developed a number of Concept Plans that began with the specific locations identified in the Park and Open Space Proposal, and made refinements over time based on a more focused look into the environmental resources. The environmentally sensitive areas include the 300' foot buffer from wetland boundaries adjacent to the South Branch of Swan Creek, a 75 foot buffer from other wetland areas at the southeast corner of Syene and Lacy and at the western boundary of the study area, as well as along the eastern portion of the stream on the Rueden property in the northern section of the neighborhood, a narrower buffer as the stream tapers to the southwest, designated woodland areas, and several clusters of specimen and heritage trees located throughout the site. The plan also identifies connections through the neighborhood, as well as the Moraine Edge Park to the south of the southern boundary of the property.

Table 8.7: Park and Open Space Dedication Requirement

	Total Acreage	ROW (acres) (25%)	Stormwater (acres) (4%)	Net Area (acres)	Residential Units	Open Space Requirements	Commercial and Institutional Floor Area (sq. ft.)
R1 (5 du/acre)	**123.0**	30.8	4.9	87.3	**437**	**29.1**	
R2 (10 du/acre	**92.0**	23.0	3.7	65.3	**653**	**43.5**	
BP	**87.0**	21.8	3.5	61.8			**1,345,350.6**
TOD	**76.0**						
- Retail	6.0	1.5	0.2	4.3			**92,782.8**
- Office	23.3	5.8	0.9	16.6			**360,822.0**
- Residential (18 du/acre)	46.7	11.7	1.9	33.1	**596**	**39.7**	
MU	**61.0**						
- Office	30.5	7.6	1.2	21.7			**471,645.9**
- Residential (10 du/acre)	30.5	7.6	1.2	21.7	**217**	**14.4**	
Institutional	**10.0**	2.5	0.4	7.1			**154,638.0**
Environmentally Sensitive	**100.0**						
Parks and Open Space	**87.0**						
Transit Station	**5.0**		0.2				
ROW	**71.0**	71.0					
TOTAL	**712.0**	**183.3**	**18.2**	**318.8**	**1,903**		**2,425,239.3**

The City of Fitchburg requires a park and open space dedication of 2,900 square feet per new residential unit. Based on this factor, 126.7 acres of park and open space is required. This may be a combination of both on-site open space or public plazas, as well as public parks being planned both within the Neighborhood (such as the expansion of McGaw Park), and beyond (such as the planned Moraine Edge Park just south of the Neighborhood). Based on the Plan, 87 acres is set aside as parks, which includes the existing McGaw Park and Johnson Park (49-acres), a 32-acre expansion to McGaw Park, and a new 6-acre park south of Nobel Drive. Therefore, 38 acres of *new* Park and Open Space are specifically shown as land uses within the Plan. The remaining 88.7

acre requirement can be fulfilled with additional neighborhood parks and other public spaces likely to be required with then neighborhood, parks outside the neighborhood boundary, as well as Fee-in-lieu-of Parkland Dedication provision. In addition to this open space, 100 acres of Environmentally Sensitive land is not buildable (except as specified in the Comprehensive Plan), which includes wetlands, environmental corridors, and areas with large concentrations of heritage and specimen trees. The planned Moraine Edge Park would be 174 acres, just beyond the neighborhood boundary to the south. Specific implementation recommendations regarding Parks are included on page 4-7.

In 2007, a capstone project was completed for Fitchburg Parks and Recreation by Ryan Bachmeier at the University of Wisconsin-Madison Landscape Architecture Program. The project analyzed current conditions and provided conceptual ideas for expanded programming and improvements both to the existing McGaw Park and the planned expansion to the Park. It also looked at the facilities at McGaw Park in relation to other parklands in Fitchburg.

An unapproved conceptual plan for McGaw Park was developed as a part of Ryan Bachmeier's capstone project. Please note that the findings of Ryan Bachmeier's project do not necessarily reflect the policies of the Fitchburg Park Department nor the City of Fitchburg. These ideas have not been adopted by the City, but illustrate the type of programming that could provide improvements to the Park as well as benefits for all of Fitchburg. The plan included the following elements: new shelter with concession stand; 18 hole championship disc golf course; updated trail network; additional soccer/multi-use fields; additional tennis courts (lighted); 2 full basketball courts (lighted)' volleyball courts; additional softball field; larger playground; new horseshoe pits; expanded prairie natural area; and additional parking and a new Central Park Drive that would extend southward and connect to potential new development being considered as a part of the Urban Service Area expansion. The MPNP does not recommend a car connection through McGaw Park from Lacy Road to the south.

Figure 8.5: Existing Condition – McGaw Park[1]

Figure 8.6: Proposed Conceptual Plan – McGaw Park[2]

The project developed the drawing below showing how these improvements could be envisioned once they are developed.

Figure 8.7: Perspective Drawing of Proposed Conceptual Plan for McGaw Park[3]

The McGaw Park Neighborhood Plan proposes minor streets to ring the Park and a connection to the south. The Plan proposes a new Park located at the highpoint of the area at the southern boundary, and the neighborhood parks and public plazas designed in concert with new development would also count toward the park and open space dedication requirement of 2,900 square feet of open space per residential unit.

[1] Ryan Bachmeier, "McGaw Park, Fitchburg, Wisconsin," University of Wisconsin – Madison, 2007, page 16

[2] Ibid., page 17

[3] Ibid., page 17

Growth Model Build-Out Analysis: Phase 1-3

	Total Acreage	ROW (acres) (25%)	Stormwater (acres) (4%)	Net Area (acres)	Residential Units	Residential FAR	Commercial and Institutional Floor Area (sq. ft.)
R1 (5 du/acre)	123.0	30.8	4.9	87.3	437	0.34	
R2 (10 du/acre	92.0	23.0	3.7	65.3	653	0.69	
BP	87.0	21.8	3.5	61.8			1,345,350.6
TOD	76.0						
- Retail	6.0	1.5	0.2	4.3			92,782.8
- Office	23.3	5.8	0.9	16.6			360,822.0
- Residential (18 du/acre)	46.7	11.7	1.9	33.1	596	0.83	
MU	61.0						
- Office	30.5	7.6	1.2	21.7			471,645.9
- Residential (10 du/acre)	30.5	7.6	1.2	21.7	217	0.69	
Institutional	10.0	2.5	0.4	7.1			154,638.0
Environmentally Sensitive	100.0						
Parks and Open Space	87.0						
Transit Station	5.0		0.2				
ROW	71.0	71.0					
TOTAL	712.0	183.3	18.2	318.8	1,903		2,425,239.3

Floor Area Ratio is defined here, as amount of floor area (not including basements) divided by amount of buildable land. Buildable land is the portion of the site where construction can occur, and land voluntarily set aside and not constructed upon. When used in density calculations, the calculation for buildable land excludes: public streets and public rights of way, and land excluded from development by codified law or LEED for Neighborhood Development prerequisites.

Mixed-Use Setting

Sensitivity to a Mixed-Use Setting

This Neighborhood Plan places a strong emphasis on mixed-use development. If not properly designed and planned for, mixed use has the potential of creating a number of conflicts, particularly between certain types of commercial uses and residential uses. Examples of these potential conflicts are noise from commercial HVAC equipment, noise from delivery and shipping vehicles, headlights from cars in parking lots and particulate emissions from certain types of machinery.

The City of Fitchburg should develop standards that recognize the benefits of mixed-use neighborhoods while minimizing potential conflicts. It is also important to recognize the impact of a mixed-use or business park development being placed adjacent to existing, established single-family neighborhoods. Areas the City should explore as it develops these standards include:

1. Mechanical noise from HVAC equipment, back-up generators, and other equipment;
2. Offensive odors that may be generated;
3. Additional traffic, particularly truck traffic;
4. External lighting in buildings and in parking lots, as well as light from vehicle headlights in parking lots;
5. Vibrations;
6. Locations of refuse containers;
7. Outdoor storage of materials or equipment;
8. Heat or unnatural air movements; and
9. Particulate emissions and other pollutants.

The City could elect to draft specific standards or examine projects on a case by case basis, but it will be important for the City to examine the issue and make a decision about how standards will be handled.

Conservation Design Incentive System

The reduction in infrastructure costs, increased lot design flexibility, and real estate appreciation value are incentives enough for developers to apply conservation design principles to site development. That being said, the goal of the McGaw Park Neighborhood Plan is to reach lower impervious surface ratios through conservation development. Applicants can use a variety of means to meet these goals and incentives from the City can include: smaller minimum lot area, increased FAR, and increased density per acre in those areas to be developed. Lower impervious ratios can be reached through clustering development, smaller lot sizes, use of pervious materials, and design

of buildings (e.g. two or three story single-family homes rather than large single-story ranch homes). Driveways, patios, and parking areas can be minimized and/or use pervious materials such as properly designed pavers.

It is the intent of this Plan to generate dense uses while providing for common open space and environmental protection measures. Therefore, this Plan recommends that the City zoning code include incentives for the conservation design principles of clustered development and shared open space, public or private, to protect environmental resources. Additional conservation design principles include:

- Design of development to compliment natural features, viewsheds, and access to environmental resources

- Smaller lot size in exchange for larger common open spaces

- Long-term land management plan

- Natural stormwater design wherever possible

- Native landscaping

- Shorter, narrower residential streets to minimize infrastructure and impervious surfaces

- Pervious pavers and green roofs to minimize impact of development footprint

Developers are encouraged to include these principles in CDPs.

The Steering Committee recommends that the Conservation Design Incentive System proposed by Teska Associates be studied further, especially as development pressure in this area increases and higher density projects are proposed. The system is spelled out in Appendix 8A.

Model Design Guidelines

Design guidelines are adopted by communities to more clearly state the goals and policies of development and are intended as a useful tool for design professionals, property owners, builders, government officials and other interested parties. Design guidelines address such issues as building materials, siting, height, architectural styles, parking location, details and character, building compatibility and transition, and design consistency.

General Design Guidelines

- Site plans should achieve efficient traffic flow, while providing the minimum number of off-street parking spaces necessary.
- Off-street parking should not dominate the visual image of any site. Where practical, parking should be located in side and rear yards. Parking located in any yard should be screened with landscaping.

- Sidewalks should be incorporated into the site plan along all sides of a lot that abut a public street and along all sides of a building visible from a public right-of-way or accessible from an off-street parking area.
- Crosswalks, designated by striping or alternate paving material, should be inserted across vehicular driveways to connect off-street parking with building entrances. To enhance pedestrian safety and comfort, and increase the attractiveness of the walkway, pedestrian paths should be clearly distinguished from vehicular drives with landscaping, paving materials, or architectural elements.

Non-Residential Building Design Guidelines

- Creative layout and design of the buildings within commercial, institutional, or civic development is encouraged. The architectural quality should be expressed on all four-sides of a building and the utilization of a campus-style layout is encouraged in large scale developments. Creative layout and design will help decrease the overall mass of the development, to prevent monotony, and to improve the aesthetic quality of the development.
- To improve the future use and adaptability of the commercial, institutional, and civic structures, buildings should not be designed in a manner that limits the ability of the building to be reused for other users.
- All commercial, institutional and civic buildings should consist of solid and durable facades on all sides of a building facing a public street and shall be compatible with the character and scale of the surrounding area. Any exterior building façade should incorporate a predominance of high quality materials including brick, sandstone, other native stone, or glass. Brick, sandstone or other native stones shall at a minimum extend from ground level to the top of windows with minor accents allowed in place of the predominant material.
- Any façade greater than 75 feet in length shall incorporate recesses, projections, windows or other ornamental/architectural devises (i.e. dormers, awnings, towers, etc) in an effort to break up the mass of the structure.
- Outlot buildings that are part of a planned commercial center should reflect the style, materials and/or design elements of the main building.
- Pedestrian scale features/amenities, such as solid-colored awnings, covered walkways, windows, street furniture, bicycle rack facilities, and clearly defined entranceways are encouraged.
- Common open space and outdoor seating areas are encouraged.
- The location of drive-through facilities, including drive-through lanes, bypass lanes, and service windows, adjacent to a public right-of-way are not desirable and discouraged.

- All roofs on a commercial structure shall have visually interesting features including overhanging eaves, various roof planes, and cornices.

Figure 8.8: Examples of Quality Design

<u>Multiple Family Residential Design Guidelines</u>

- Architectural elements, such as dormers, bay windows, porches, and decks, are encouraged.
- Varying rooflines, including multiple peaks and slopes, help to break the mass of the overall structure and add to the aesthetic quality of the development.
- Creative layout and design of the buildings within the multiple-family development should be encouraged. Parallel rows of similar buildings are discouraged. Creative layout and design will help to decrease the overall mass of the development and prevent monotony.
- Garages shall not dominate the front elevation of a multiple family structure. Garages located at the rear of a lot with access from an alley are preferred.
- Open space and pedestrian amenities, such as courtyards, common seating areas, recreational areas, gazebos, bike paths, and/or bicycle rack facilities are encouraged.
- Rear elevations that front onto a public right-of-way, or are highly visible within the development, should match the style, material, and design of the front elevation of the building.

LEED-ND Action Steps

In order to ensure LEED-ND certification the following actions/steps should be taken:

- Ensure no development within 100 feet of wetland or water bodies.
- Ensure no development within 100 year floodplain.
- Ensure no development in steep slope areas.
- Ensure that public open space of at least 1 acre is accessible within ¼ mile to 90% of residents.
- Allow for dedicated community garden and growing space.
- Determine if any sites within neighborhood are brownfields.
- Require bicycle network and storage.
- Provide housing with affordable component.
- Require that average density is at least 7 dwelling units an acre.
- Create a compact street grid network.
- Require at least one through street every 800 feet and in internal street connectivity of at least 150 intersections per square mile.
- Create walkable streets
- Allow for a variety of uses which includes at least 4 – 6 distinct uses in neighborhood.
- Provide for mixed-income housing.
- Reduce the total footprint of parking.
- Ensure 20% of all housing types comply with FHAA requirements.
- Create innovative community outreach and involvement.
- Create community garden and growing areas.
- Provide street trees on both sides of 70% of the streets.
- Ensure that at least one building in neighborhood is LEED certified.
- Ensure that 90% of the new building are 24% more energy efficient than required in ASHREA 90.1-2007.
- Ensure minimum building water efficiency.
- Ensure water efficient landscaping.
- Preserve all existing historic buildings within neighborhood.
- Ensure that at least 50 percent of the non-roof pavement have a shade, SRI of 29 or greater.
- Ensure energy efficient infrastructure.
- Ensure recycled content in infrastructure.
- Ensure the necessary waste management infrastructure.
- Reduce light pollution.

Please see Appendix 2C for detailed LEED-ND implementation steps and actions.

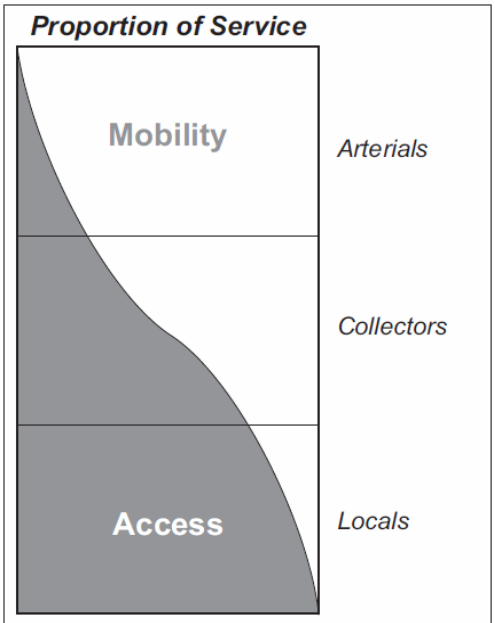
Chapter 9: Transportation Plan

Introduction

The McGaw Park Neighborhood Plan (MPNP) transportation plan element identifies a transportation functional classification network, describes multi-modal transportation opportunities, and provides strategies to move people and goods safely and efficiently in and around the Plan area. A separate traffic impact analysis (TIA) has been completed and provides the technical basis for the MPNP transportation plan element recommendations, as well as details on specific intersection recommendations for the study area (Appendix 9A).

Motor Vehicle Accommodations

The functional classification system is a system of hierarchy that compares roadway facilities based on their ability to provide mobility versus their ability to provide access. The primary purpose of arterial facilities (freeways or regional routes) is to provide for mobility between distant population centers while the primary purpose of local facilities (neighborhood streets) is to provide for direct land access in a localized area. Collectors provide a balance between mobility and access and provide a channel between arterial and local facilities.



Relationship of Functionally Classified Systems in Serving Traffic Mobility and Land Access

The following sections discuss the functional classification of roadways within and on the borders of the MPN. "Figure 11-3: Proposed City of Fitchburg Functional Roadway Classifications" from the City of Fitchburg Draft Comprehensive Plan, dated January 23, 2009, was utilized as a source for the functional classifications. Reference Figure 9.1 for a map of the study roadways.

Arterial Facilities

United States Highway (USH) 14

USH 14 borders the MPN on the east and is classified by the City of Fitchburg as a north-south primary arterial freeway connecting the City of Fitchburg to Madison (north), Oregon (south), and Janesville (southeast). The Madison Area Metropolitan Planning Organization (MPO) functional classification is the same. The speed limit on the four-lane divided facility is 65 mph. USH 14 is expected to be a heavily utilized route for the MPN, especially for commuters to/from the City of Madison.

Fish Hatchery Road

Fish Hatchery Road, also known as County Trunk Highway (CTH) D, borders the MPN on the west and is classified by the City of Fitchburg and the MPO as a north-south minor arterial facility connecting the City of Fitchburg to Madison. Fish Hatchery Road is posted at 40 mph from north of Lacy Road to north of Sparkle Stone Crescent, then transitions to a 50 mph speed limit to the south. It is a four-lane divided facility north of Lacy Road, will be widened in Year 2009 to a two-lane divided facility from Lacy Road to south of Nobel Drive, and will remain a two-lane undivided facility to the south. While USH 14 is expected to be a commuter route to/from the City of Madison, Fish Hatchery Road is expected to be used primarily for local north-south trips in the City of Fitchburg.

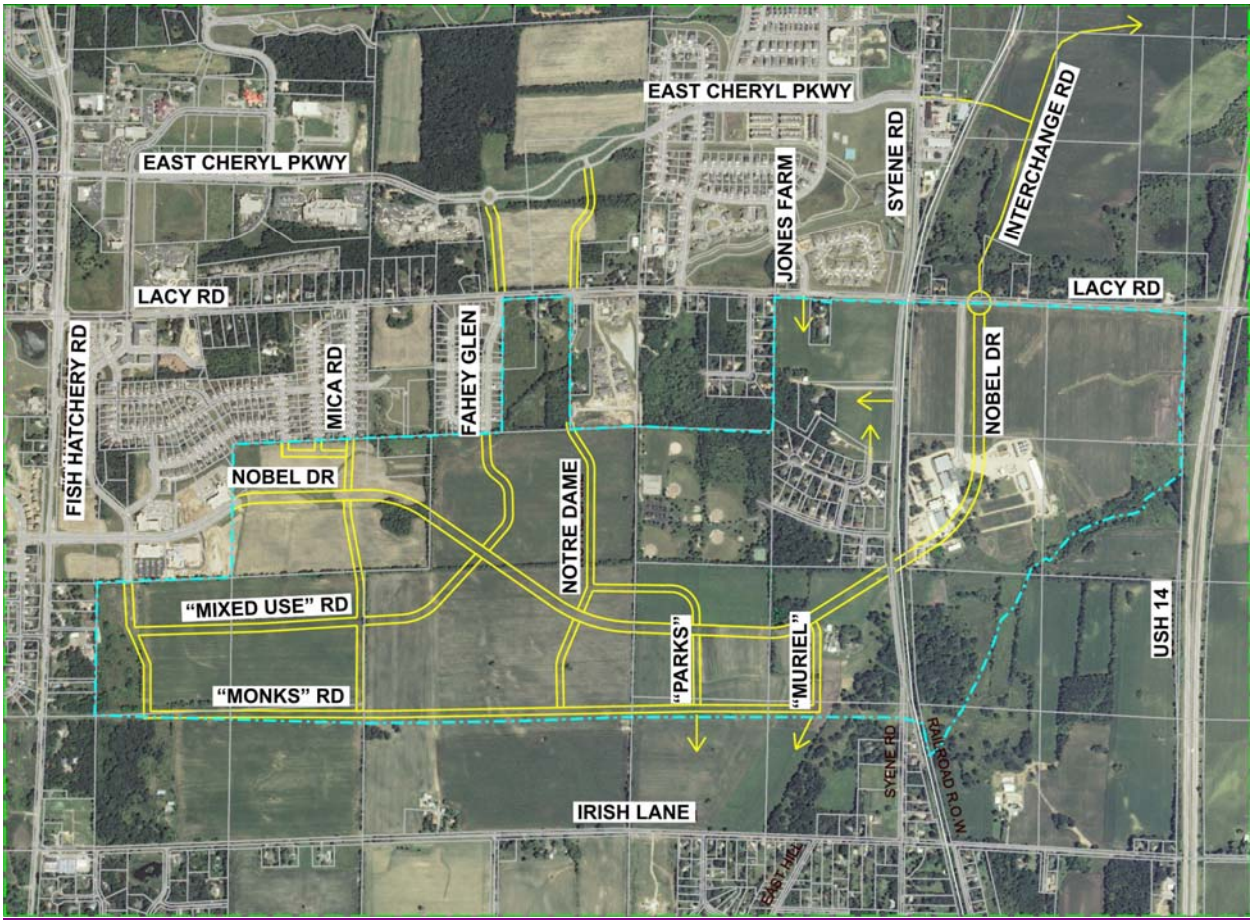


Figure 9.1: Study Area Roadways

Collector Facilities

Lacy Road

Lacy Road borders the MPN on the north and is classified by the City of Fitchburg as a major collector connecting the City of Fitchburg to USH 14 on the east and USH 18/151 and Verona to

the west. Note that the MPO classifies the facility as a minor arterial. Lacy Road, posted at 35 mph from the west to Syene Road and 50-mph east of Syene Road, is a two-lane divided facility from Fish Hatchery Road to Research Park Drive, transitions to a two-lane facility with center turn lanes in front of Fitchburg City Hall, then transitions to a two-lane undivided facility to the east. Design has not yet begun, but the City of Fitchburg indicates that the intent at this time is to design an improved two-lane cross-section similar to that which exists in front of City Hall, but with a center turn lane only at Mica Road, east to Fahey Glen in the Year 2011. The intent is to construct a roundabout at the Lacy Road intersection with Fahey Glen.

Photo 9.1: Lacy Road in front of City Hall

Lacy Road provides direct access to single family residences between City Hall and Syene Road, with the greatest density of housing situated between City Hall and Fahey Glen. Widening Lacy Road to a larger facility would affect the relatively small setback (in some cases about 50-feet) that exists between the arterial roadway and houses. The Steering Committee has indicated its desire to minimize the impact of MPN traffic on Lacy Road by use of direct routing, transit and other means into and through the Plan area.

A new USH 14 interchange is being planned by the City of Fitchburg. The plan is to maintain the existing Syene Road intersection with Lacy Road. East of the intersection, the plan is to realign Lacy Road north to a new interchange approximately 3,200-feet north of the existing Lacy Road overpass. This new roadway, referred to as "New Lacy Road" or "Interchange Road", is classified by the City of Fitchburg as a major collector between Lacy Road and East Cheryl Parkway and a minor arterial between East Cheryl Parkway and CTH MM. The interchange is planned to be situated in a diamond configuration. Due to spacing constraints, the plan is to eliminate the USH 14 northbound off-ramp and USH 14 southbound on-ramp at the existing McCoy Road interchange further north. Construction is anticipated in Year 2010.

The layout of the Lacy Road/Interchange Road intersection has not yet been determined. WisDOT has indicated the desire to tee the eastern leg of Lacy Road or the future MPN Nobel Drive extension into Interchange Road from the southeast. The City desires to create a traditional four-leg intersection where Lacy Road, Interchange Road, and future Nobel Drive meet. The latter is desirable to meet Steering Committee desires for moving traffic from the USH 14 interchange directly into the MPN while minimizing MPN traffic using Lacy Road west of Syene Road.

Irish Lane

Irish Lane exists approximately one-quarter mile south and about parallel to the MPN south border. The road, which is located south of the existing Fitchburg urban growth boundary, is classified by

the City of Fitchburg as an east-west minor collector facility connecting Fish Hatchery Road on the west to CTH MM on the east. The MPO classifies Irish Lane as a collector facility, but only between Fish Hatchery Road and Syene Road. The speed limit on the two-lane undivided facility is 45 mph in the vicinity of Fish Hatchery Road and 35-mph in the vicinity of Syene Road. No direct connections are planned between the MPN and Irish Lane and, therefore, Irish Lane is not anticipated to be a heavily utilized route to/from the Neighborhood.

Syene Road

Syene Road passes through the eastern portion of the MPN and is classified by the City of Fitchburg and MPO as a north-south major collector facility connecting Irish Lane on the south to the USH 12/14/18/151 Beltline on the north. The speed limit is 35-mph south of Irish Lane and 45-mph north of Irish Lane. With the construction of a USH 14 interchange at Interchange Road and the USH 14/McCoy Road interchange to the north, Syene Road north of Lacy Road is not expected to be heavily utilized by the MPN.

Photo 9.2: A Dormant Rail Corridor along the East Side of Syene Road

A dormant rail corridor right-of-way abuts the east side of the Syene Road right-of-way. When the rail corridor is returned for transit, the Syene Road intersections with Lacy Road, the future Nobel Drive-Extended, and Irish Lane will need to be properly designed for safe rail crossings. The TIA addresses these intersections.

Nobel Drive

Nobel Drive, located approximately half the distance between Lacy Road and Irish Lane, is an east-west facility that currently terminates east of Research Park Drive. The speed limit is 35-mph on this existing stretch of roadway. The plan is to extend Nobel Drive east through the MPN to Syene Road, then continue the route north-northeast to intersect with Lacy Road. The City of Fitchburg identifies Nobel Drive as a future minor collector route between Fish Hatchery Road and Lacy Road, while the MPO shows the route as a collector route between Fish Hatchery Road and Syene Road. MPO mapping should be updated to show Nobel Drive as a collector roadway to its intersection with Lacy Road.

As previously mentioned, the MPNP Steering Committee has indicated its desire to minimize the impact of MPN traffic on Lacy Road by use of direct routing, transit and other means into and through the Plan area. Nobel Drive will serve as the primary route to and through the MPN. The intersection of Syene Road with Nobel Drive will need to be carefully designed and constructed to minimize impacts to an existing neighborhood to the northwest of the intersection, environmentally

sensitive areas to the west and south of the intersection, wetland corridors and tree specimens east of the intersection, and the rail crossing along the east side of Syene Road.

Fahey Glen

Fahey Glen is a north-south street that currently terminates south of Lacy Road and has a speed limit of 35-mph. The plan is to extend Fahey Glen south into the MPN where it will intersect Nobel Drive from the north. The City of Fitchburg is planning to eventually make a connection of Fahey Glen between Lacy Road and East Cheryl Parkway. A two-leg roundabout is currently in place along East Cheryl Parkway where this connection would occur.

The City of Fitchburg identifies the future Fahey Glen as a minor collector roadway between East Cheryl Parkway and the MPN area. The MPO identifies the route as a collector roadway between East Cheryl Parkway and Irish Lane. Note that the MPN does not include a connection between the MPN south boundary and Irish Lane due to the Steering Committee desire to minimize connections between urban Fitchburg and rural Fitchburg. MPO mapping should to be updated to show Fahey Glen as a minor collector roadway between East Cheryl Parkway and Nobel Drive.

East Cheryl Parkway

East Cheryl Parkway is a two-lane east-west undivided collector street from west of Fish Hatchery Road to approximately 450-feet west of the future East Cheryl Parkway intersection with Fahey Glen. It then transitions to a two-lane divided collector street east to Syene Road. When the new USH 14 interchange with Lacy Road is built, East Cheryl Parkway will be extended east of Syene Road as a major collector, continue over the rail corridor and intersect with Interchange Road as a tee-intersection from the west. East Cheryl Parkway does not pass along or through the MPN area and is not anticipated to be a heavily utilized route for the Neighborhood.

Local Road Facilities

Research Park Drive

Research Park Drive is an existing north-south two-lane undivided local road with on–street parking and a 30-mph posted speed limit that extends from East Cheryl Parkway on the north to approximately 435-feet south of Nobel Drive. The plan is to extend Research Park Drive south to a future roadway, herein called "Monks Road", that will run east-west along the MPN south boundary.

Mica Road

Mica Road is an existing north-south two-lane undivided local road that extends south from Lacy Road approximately 1,320-feet. The speed limit is currently un-posted, but is assumed to be 25-mph due to the existing residential nature of the surrounding land use. The plan is to extend Mica Road south to the future "Monks Road" that will run east-west along the MPN south boundary. Approximately two-thirds of the road will pass through residential neighborhoods, with the middle one-third passing through a business park land use.

Notre Dame Drive

Notre Dame Drive is an existing north-south two-lane undivided local road that extends south from Lacy Road approximately 100-feet. The plan is to extend Notre Dame Drive south to Nobel Drive to the future "Monks Road" that will run east-west along the MPN south boundary. This stretch of roadway will accommodate residential land uses. The MPNP assumes the City will extend Notre Dame Drive north of Lacy Road to East Cheryl Parkway at a future date, but the connection north of Lacy Drive is not driven by the MPN. Consideration should be given to classifying Notre Dame Drive as a minor collector facility in the future.

Jones Farm Drive/Tarpleywick Drive

Jones Farm Drive, a two-lane undivided north-south road that currently intersects Lacy Road as a tee-intersection from the north, is planned to extend from Lacy Road south-southeast to the existing dead-end of Tarpleywick Drive. Tarpleywick Drive services land use area 18, an existing neighborhood immediately west of Syene Road approximately half-way between Lacy Road and Irish Lane. The Jones Farm Drive/Tarpleywick Drive extensions will service residential and transit-oriented development in the southwest corner of Lacy Road and Syene Road.

"Mixed Use Road"

"Mixed Use Road" is planned to be a primarily east-west two-lane local road with on-street parking and a center turn lane from Research Park Drive to the future intersection of Nobel Drive and Fahey Glen. "Mixed Use Road" will service a mixed use land use on its western extent, and residential and institutional land uses on its eastern extent.

"Monks Road"

"Monks Road" is planned to be an east-west two-lane undivided local road along the MPN south boundary and north of existing overhead utilities. The road will connect from the Research Park Drive extension to "Muriel Lane". "Monks Road" will pass along the south side of a multi-use land use on its far western extent, and will pass primarily along the south side of residential land uses on its remaining extent. Future connections from Monks Road to Irish Lane through Moraine Edge Park may be explored based upon future planning studies.

"Parks Road"

"Parks Road" is planned to be an east-west two-lane undivided local road along the east-west border of land use areas 22 (R2) and 24 (PO). The road will intersect Notre Dame Drive from the west. Approximately 850-feet east of Notre Dame Drive, the road will become a north-south two-lane undivided local road that continues south across Nobel Drive and terminates at "Monks Road". "Parks Road" will serve the residential land uses as well as parks and open space land uses.

"Muriel Lane"

"Muriel Lane" is planned to be a north-south two-lane undivided local road connecting Monks Road to Nobel Drive to the southwest of the Syene Road intersection with Nobel Drive.
"Muriel Lane" will pass along and service residential land use.

Roadway Right-of-Way and Cross-Section Recommendations

The anticipated volume, speed and functional classification on new roadways within the MPNP boundaries are important considerations in determining recommended rights-of-way (ROW) and cross-sections, as are pedestrian and bicycle accommodations. The desire for aesthetically pleasing roadways with storm water infiltration is also an important consideration to this Neighborhood. Finally, the principles of conservation design inform the cross-sections for the higher density areas of the neighborhood.

Figure 9.2 depicts daily traffic forecasts prepared by the MPO on several of the study area roadways. "Background" traffic assumes no MPN traffic, and "Build" traffic assumes phased completion of the MPN. The years of 2025 and 2035 shown in the table are approximate for the purpose of the traffic analysis. The forecasts are based on historical trends in trip generation characteristics and, therefore, the forecasts are approximate. Unknown social, economic and technological changes may cause the forecasts to fluctuate.

Location	Existing	(No MPNP) 2025 Back'd	(No MPNP) 2035 Back'd	(With MPNP) 2025 Build	(With MPNP) 2035 Build
Fish Hatchery, North of East Cheryl	*unk.*	24,750	24,270	25,970	28,410
Fish Hatchery, North of Lacy	12,900[A]	18,540	17,040	18,090	19,590
Fish Hatchery, South of Lacy	10,000[A]	12,380	13,400	15,050	17,930
Fish Hatchery, South of Nobel	*unk.*	12,990	14,180	13,360	15,250
Research Park, North of Lacy	*unk.*	1,780	2,640	1,800	1,960
Research Park, South of Lacy	*unk.*	3,470	3,960	3,110	3,580
Research Park, North of Nobel	*unk.*	610	780	640	1,020
Research Park, South of Nobel	*unk.*	*unk.*	*unk.*	1,510	3,240
Mica, South of Lacy	*unk.*	2,200	2,090	5,000	4,430
Mica, North of Nobel				2,280	2,650
Mica, South of Nobel				2,420	2,660
Fahey Glen, South of East Cheryl		*unk.*	*unk.*	4,740	6,250
Fahey Glen, North of Lacy		*unk.*	*unk.*	4,650	5,300
Fahey Glen, South of Lacy	*unk.*	470	150	1,960	2,260
Fahey Glen, North of Nobel				1,250	1,970
Fahey Glen, South of Nobel				890	1,990
Notre Dame, South of East Cheryl		*unk.*	*unk.*	2,170	2,680
Notre Dame, North of Lacy		*unk.*	*unk.*	2,170	2,660
Notre Dame, South of Lacy	*unk.*	*unk.*	*unk.*	310	330
Notre Dame, North of Nobel				160	350
Notre Dame, South of Nobel				750	870
Syene, North of Cheryl	5,480[A]	7,870	8,380	8,850	9,860
Syene, North of Lacy	4,900[B]	7,110	8,100	6,770	7,920
Syene, South of Lacy	2,340[C]	7,770	8,430	3,510	4,610
Syene, North of Irish	*unk.*	7,660	8,330	9,780	10,450
Interchange Rd, North of Lacy		3,920	4,190	6,990	7,700
Interchange Rd, South of East Cheryl		8,840	9,270	9,840	10,300
Interchange Rd, West of USH 14		21,330	25,950	23,560	26,840
East Cheryl, East of Fish Hatchery	4,940[B]	11,380	12,950	11,470	12,910
East Cheryl, between Fahey Glen & Notre Dame	3,130[D]	9,990	11,240	10,090	11,350
East Cheryl, West of Syene	*unk.*	10,580	12,210	12,160	13,310
East Cheryl, East of Syene		12,840	15,750	12,990	15,150
Lacy, East of Fish Hatchery	*unk.*	8,210	10,100	8,340	8,900
Lacy, between Fahey Glen & Notre Dame	4,780[B]	5,880	7,410	8,690	10,140
Lacy, West of Syene	*unk.*	6,370	7,930	7,390	8,390
Lacy, between Syene & Nobel	2,530[B]	7,640	8,690	5,980	8,070
Lacy, West of USH 14	2,530[B]	3,200	3,970	4,430	6,730
Nobel, East of Fish Hatchery	*unk.*	610	780	5,930	8,420
Nobel, West of Mica				4,000	4,810
Nobel, between Fahey Glen & Notre Dame				1,610	3,190
Nobel, West of Syene				2,590	4,530
Nobel, East of Syene				6,710	7,960
Nobel, South of Lacy				7,510	8,230
Irish, East of Fish Hatchery	1,200[E]	5,210	5,840	4,670	5,460
Irish, West of Syene	*unk.*	1,340	1,310	1,920	2,660

Notes: "Unk" is an unknown value; Blacked out values indicate a roadway section is not built.
"A" = 2005 Count; "B" = 2007 Count; "C" = 2006 Count; "D" = 2004 Count; "E" = 2002 Count
Existing values provided by City of Fitchburg; Future volume forecast estimates provided by MPO.

Figure 9.2: Average Traffic Volume Forecasts

Figures 9.3 and 9.4 depict the recommended rights-of-way and cross-sections within the MPNP boundaries. Additional ROW may be necessary at intersections and will need to be determined as development and subsequent engineering commences.

100-foot ROW

Nobel Drive has an existing 95-foot ROW east of Fish Hatchery Road. Provide a 100-foot ROW through the MPN to Lacy Road. This cross-section includes:

- An 18-foot wide median, including the curb and gutter pan. The median should be depressed to accommodate storm water infiltration.
- An 11-foot through travel lane in either direction.
- A 5-foot bicycle lane in either direction.
- An 8-foot parking lane on either side of the street.
- A 9-foot edge/furnishing zone on either side of the street. The edge and furnishing zone provides room for vehicle loading/unloading, installing lighting and signing, growing aesthetically pleasing plants and trees, providing other street furnishings as deemed necessary (e.g. mailboxes, bicycle racks, benches, etc.), and storing snow.
- A 10-foot multi-use trail on the north side of the street.
- A 5-foot sidewalk on the south side of the street.
- A 0.5-foot frontage zone between the multi-use trail/sidewalk and adjacent property.

80-foot ROW – Type A

Research Park Drive has an existing 80-foot ROW south of East Cheryl Parkway to south of Nobel Drive. Provide an 80-foot ROW south on Research Park Drive to "Mixed Use Road", on "Mixed Use Road" from Research Park Drive to Nobel Drive, and on primary TOD roadways. This cross-section includes:

- An 11-foot through travel lane in either direction.
- A 5-foot bicycle lane in either direction.
- An 8-foot parking lane on either side of the street.
- A 7.5-foot edge/furnishing zone on either side of the street. The edge and furnishing zone provides room for vehicle loading/unloading, installing lighting and signing, growing aesthetically pleasing plants and trees, providing other street furnishings as deemed necessary (e.g. mailboxes, bicycle racks, benches, etc.), and storing snow.
- An 8-foot sidewalk on the either side of the street. This sidewalk is wider to accommodate commercial foot traffic.
- A 0.5-foot frontage zone between the multi-use trail/sidewalk and adjacent property.

80-foot ROW – Type B

Fahey Glen currently has a ROW width of 80-feet. It is recommended that the Fahey Glen extension match this ROW. The cross-section includes:

- A 20-foot travel/parking/bicycle lane in either direction.

- A 14-foot edge/furnishing zone on either side of the street. The edge and furnishing zone provides room for vehicle loading/unloading, installing lighting and signing, growing aesthetically pleasing plants and trees, providing other street furnishings as deemed necessary (e.g. mailboxes, bicycle racks, benches, etc.), and storing snow.
- A 5-foot sidewalk on the either side of the street.
- A 1-foot frontage zone between the sidewalk and adjacent property.

66-foot ROW

Mica Road and Notre Dame Drive have an existing 66-foot ROW south of Lacy Road. Provide a 66-foot ROW on these and the remaining MPN roadways. Smaller ROW may be considered on a case by case basis on the local residential streets as development occurs. The 66-foot cross-section includes:

- A 14-foot to 19-foot travel/parking/bicycle lane in either direction.
    - The Mica Road extension will service business park and mixed use areas to "Mixed Use Road". The 19-foot lanes are more desirable in this setting to accommodate daytime parking and efficient two-way travel during business hours, or 14-foot lanes could be used if no on-street parking is permitted during business hours. South of "Mixed Use Road", Mica Road serves residential land use and 14-foot lanes will accommodate travel, parking and bicycling.
    - The remaining streets within the MPN are expected to be primarily local, residential and low-volume streets. The 14-foot lanes will accommodate travel, parking and bicycling in these settings.
- An 8-foot to 13-foot edge/furnishing zone on either side of the street. The edge and furnishing zone provides room for vehicle loading/unloading, installing lighting and signing, growing aesthetically pleasing plants and trees, providing other street furnishings as deemed necessary (e.g. mailboxes, bicycle racks, benches, etc.), and storing snow.
- A 5-foot sidewalk on the either side of the street.
- A 1-foot frontage zone between the sidewalk and adjacent property.

20-foot Alley ROW

Alleys may be considered as the MPN develops. If provided, alleys need only be 20-feet wide – 16-feet paved with 2-foot frontage zones on either side – to accommodate occasional two-way traffic and room, for example, for vehicles to back out of garages.

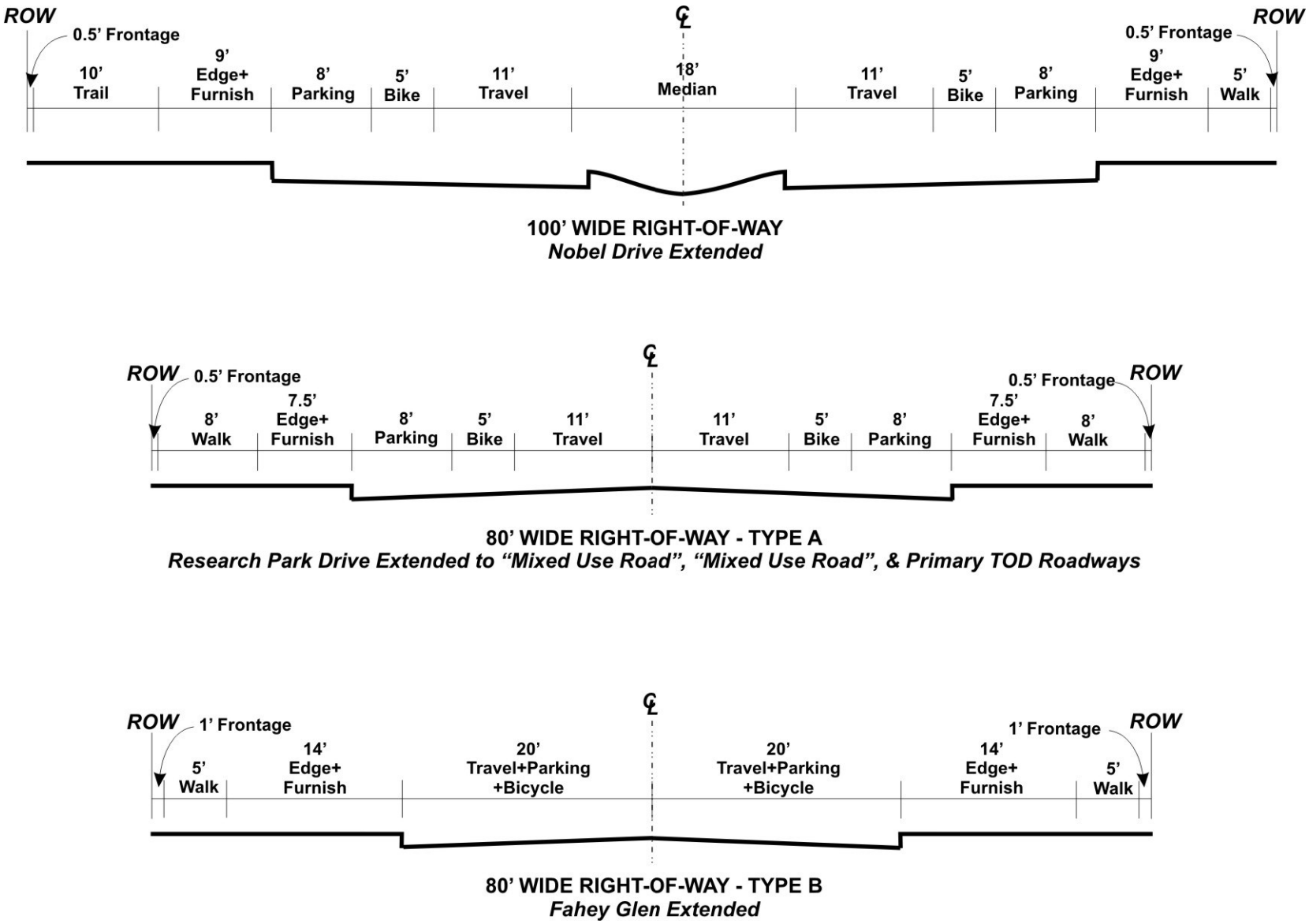


Figure 9.3: 100-foot ROW, 80-foot ROW Type A & 80-foot ROW Type B Cross-Sections

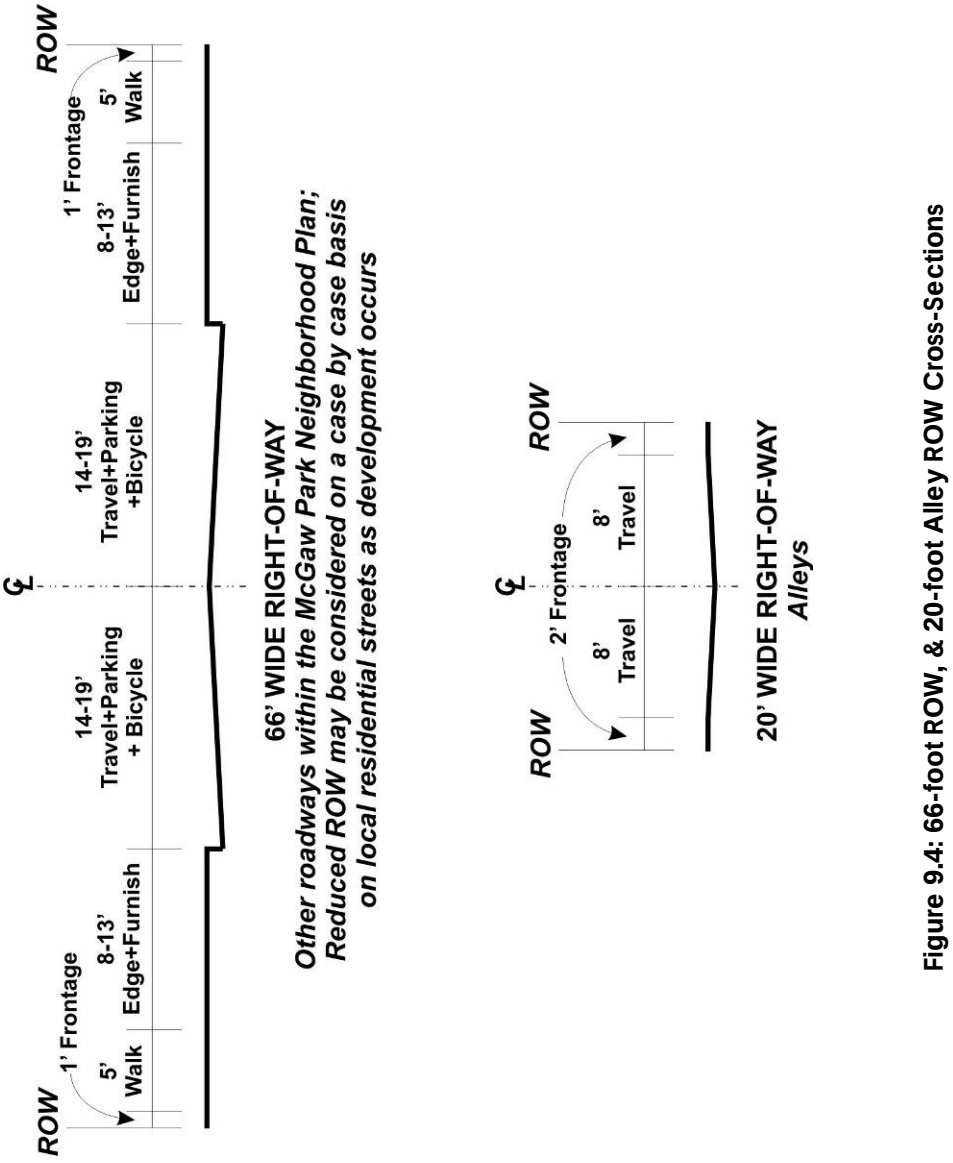


Figure 9.4: 66-foot ROW, & 20-foot Alley ROW Cross-Sections

Access Management Recommendations

"Access management seeks to limit and consolidate access along major roadways, while promoting a supporting street system and unified access and circulation systems for development. The result is a roadway that functions safely and efficiently for its useful life, and a more attractive corridor." (http://www.accessmanagement.info/, accessed December 17, 2008)

As development of the MPN occurs, the following access management guidelines are recommended:

- *Locate driveways out of the influence area of an intersection.* The goal of this guideline is to minimize the likelihood of a driveway being blocked by traffic queued at a downstream

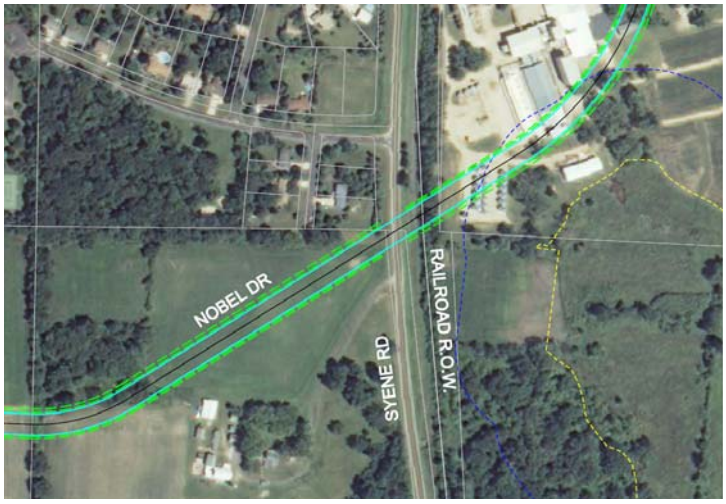
intersection, and to minimize the likelihood of an upstream intersection being blocked by a vehicle waiting to turn into a driveway.

- *Limit the number of driveways to the roadway system.* In addition to reducing the number of vehicle-to-vehicle conflict points, the goal of this guideline is to reduce vehicle-to-pedestrian conflicts. With regards to the MPNP, ideally no driveways and only public streets should intersect Lacy Road, Syene Road, and Nobel Drive.
- *Regulate the spacing between driveways.* The goal of this guideline is to reduce conflict points and driver confusion. Space driveways no closer than 150-feet. Specific development plans may dictate longer spacing depending on site orientation, trip generation, and queuing. Single-family residential driveways generate little traffic and may be placed closer than this recommended spacing.
- *Promote internal site connections and circulation between development areas.* The goal of this guideline is to minimize the number of driveways to the roadway system and to minimize motor vehicle demand on the public street system.
- *Encourage driveway alignment.* Where possible, driveways on opposing sides of a roadway should align. The goal of this guideline is to reduce conflict points and driver confusion. Single-family residential driveways generate little traffic and need not align.

Other Considerations

Syene Road intersection with Nobel Drive

As a guideline, all roadways within the MPN should intersect between 75 and 105 degrees of each other – the closer to perpendicular the better. Further, the curb-to-curb area of the roadways should be located outside the drip lines of identified heritage trees and tree specimens, or a distance of approximately 30-feet. Meeting these constraints poses an issue for the Syene Road intersection with Nobel Drive.



Due to the proximity of an existing neighborhood to the northwest of the intersection, environmentally sensitive areas to the west and south of the intersection, and wetland corridors and tree specimens east of the intersection, the 100-foot ROW of Nobel Drive (66-feet curb to curb) cannot intersect Syene Road at an angle between 75 and 100 degrees.

With superelevation, which is recommended for its ability to reduce curve radii and thus reduce intersection skew, the closest intersection angle to perpendicular at the Nobel Drive crossing of Syene Road is 65 degrees. The corner of a residential lot in the northwest corner of the

intersection may be clipped by the road making it necessary for a land purchase to accommodate the 100-foot ROW. Nobel Drive will also pass through the 300-foot environmental corridor, but not the 75-foot corridor, of a wetland on the east side of Syene Road.

While a skew is not ideal, the recommended placement of a traffic signal at this location in the future minimizes safety concerns typically found at skewed intersections. According to the American Association of State Highway and Transportation Officials' *Geometric Design of Highways and Streets 2004(GDHS),* "an angle of at least 60 degrees provides most of the benefits of a 90-degree intersection while reducing right-of-way takings and construction costs often associated with providing a right-angle intersection." (GDHS, 581)

Syene Road intersection with Wildheather Drive

Wildheather Drive is an existing residential street that intersects Syene Road approximately 350-feet north of the proposed Syene Road intersection with Nobel Drive. Every effort should be made to maintain full access at the intersection in the future. Access to the neighborhood can be made via Jones Farm Drive, or via a connection to Syene Road from the western TOD area.

Lacy Road intersection with Nobel Drive and Interchange Road

As mentioned previously in this chapter, WisDOT has indicated its desire to tee the eastern leg of Lacy Road or Nobel Drive into Interchange Road while the City desires to create a traditional four-leg intersection. Based on the traffic flows anticipated at the intersection, constructing a traditional four-leg intersection under roundabout control is recommended for its ability to efficiently and safely accommodate flows with few conflict points. Separating the intersection into two tee intersections would result in additional conflict points due to two intersections in close proximity, would result in reduced intersection safety, and would result in reduced overall system efficiency.

Widening of Existing Facilities

The traffic forecasts provided by the Madison Area MPO and the results of the TIA indicate that several existing facilities may require widening in the future. The forecasts and analyses were performed assuming Year 2025 and Year 2035 conditions without ("background traffic") and with ("build traffic") of the MPN. More specifically:

- Interchange Road is being planned as a four-lane roadway north of East Cheryl Parkway to east of the USH 14 interchange. Initially, only a two-lane roadway will be constructed east of the interchange. To accommodate Year 2025 background traffic (no MPN), continue the four-lane Interchange Road facility east to CTH MM. By approximately Year 2035 with the MPN in place, Interchange Road should also be continued south of East Cheryl Parkway as a four-lane roadway, but taper to a two-lane roadway prior to the wetland crossing north of the Lacy Road intersection with Nobel Drive and Interchange Road.
- East Cheryl Parkway should be constructed/widened to a four-lane roadway from Interchange Road to west of Syene Road to accommodate Year 2025 background traffic (no MPN). The roadway should also be widened to a four-lane roadway east of Fish Hatchery

Road to east of Research Park Drive. The Madison Area MPO daily traffic forecasts indicate that the stretch of roadway between these two widened areas will operate at the threshold between widening from a two-lane to four-lane roadway. That is, this section of roadway may operate as a two-lane roadway but may also require widening to four-lanes with or without the MPN.

- Widen Fish Hatchery Road to a four-lane divided highway south through Irish Lane to accommodate Year 2025 background traffic (no MPNP).
- Under Year 2025 build traffic (with MPN), improve Lacy Road from Fahey Glen to Syene Road as a two-lane cross-section with center turn lanes at Notre Dame Drive and with a median and center turn lanes at Jones Farm Drive.
- Under Year 2035 build traffic (with MPN), widen Lacy Road to a four-lane facility west of Research Park Drive to west of Fish Hatchery Road.
- Reserve the right-of-way along Syene Road to accommodate a future four-lane undivided cross-section from Nobel Drive to south of Irish Lane.
- Widening Lacy Road to a four-lane facility east of Research Park Drive is not anticipated to be necessary based on the MPO forecasts and the results of the TIA analysis.

Construction Phasing

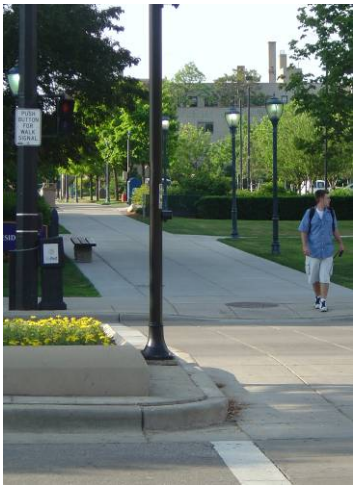
The costs associated with providing infrastructure prior to development may make constructing the entire extent of Nobel Drive at one time unfeasible. Construction will most likely need to be performed as development occurs. The initial phasing of the MPNP includes development west of Fahey Glen and east of Syene Road. To accommodate this phasing:

- It is recommended to construct Nobel Drive to Fahey Glen and Fahey Glen to Nobel Drive as part of the initial development of the western portion of the plan. This construction will provide development on the western portion of the MPN at least two points of access to the existing roadway system, which is desirable for emergency operations. The Steering Committee further recommends that Fahey Glen be extended north to East Cheryl Parkway at this time as well, to draw traffic away from Mica and Lacy.
- It is recommended to construct Nobel Drive between Syene Road and Lacy Road as part of the initial development of the eastern portion of the plan. Blaney Road should be removed when this construction occurs. Note that the existing processing facility (Hartung property) east of Syene Road at the proposed Nobel Drive crossing may not be relocated in time. If this relocation is not performed in time, it is recommended to construct a secondary access to Lacy Road approximately half the distance between the proposed Nobel Drive intersection and USH 14.
- Construction of the remaining extent of Nobel Drive, from Fahey Glen to Syene Road, can be phased in over time as development plans come to fruition in the middle of the Neighborhood.

Pedestrian & Bicycle Accommodations

The rights-of-way recommended in Part B – Motor Vehicle Accommodations incorporate pedestrian and bicycle travel ways. This part of the chapter discusses additional recommendations for the pedestrian and bicycle environments.

Dedicated Pedestrian Facilities



In addition to facilities that currently exist, the City of Fitchburg *2008 Pedestrian and Bicycle Plan*, adopted July 22, 2008 and downloaded from the City of Fitchburg website in December of 2008, recommends sidewalks along the north side of Lacy Road west of Syene Road, and along the north side of East Cheryl Parkway west of Syene Road. Reference Figure 9.5 was taken directly from the Plan. In addition to the Plan, sidewalks along East Cheryl Parkway should be extended east to Interchange Road and sidewalks should be provided along the west and north sides of Interchange Road as part of the planned USH 14 interchange construction.

With development of the MPN, sidewalks along Lacy Road should be extended to the Neighborhood's east boundary. Pedestrian sidewalks should also be provided along both sides of all roadways within the MPN borders. If a multi-use facility is provided along one side of a roadway, a sidewalk is not needed on that side of the roadway but should be provided along the other side. In any cases where multi-use trails are located along both sides of a roadway, sidewalks need not be provided. Reference Figures 9.3 and 9.4 for recommended rights-of-way and cross-sections.

All crosswalks and approaches to intersections within the MPN are to be ADA compliant. Where appropriate, curb extensions should be provided to minimize the distance which pedestrians must cross. Tactile surfaces on the ramps help persons with visual disabilities navigate and should be provided. Other design features, such as cross-walks of different

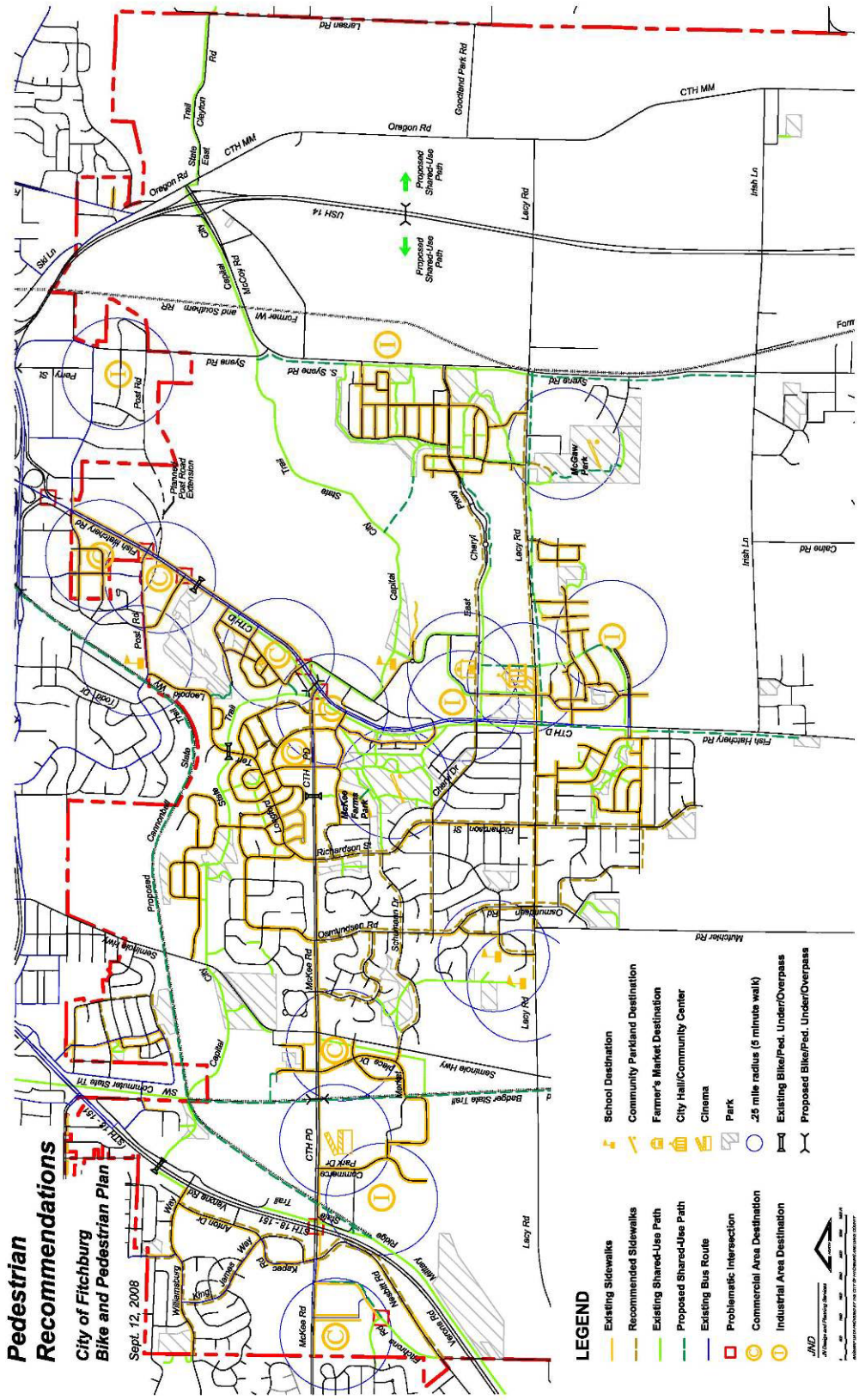


Figure 9.5: Pedestrian Recommendations from 2008 Bicycle & Pedestrian Plan

pavement color or texture, should be considered to further differentiate pedestrian travel ways from vehicular travel ways.

Pedestrian actuation is recommended where traffic signals are provided, preferably with the use of count-down signal heads. Walk and flashing-don't-walk timings should be determined such that pedestrians can cross the leg of an intersection in one stage. Where this is not feasible, and always at roundabout crossings, a median at least 10-feet wide with a median cut to accommodate wheelchairs are to be provided to afford two-stage pedestrian crossings.

Access management is desirable along arterials and collectors not only to minimize the number of vehicle-to-vehicle conflict points along the roadways, but to also minimize vehicle-to-pedestrian conflicts. Further, pedestrian connections from public sidewalks and multi-use trails to commercial properties are recommended. Buildings oriented along streets with entrances along streets, as opposed to orientations behind parking lots, aid pedestrian movement.

Note that consideration is being given to light rail transit (LRT) or bus rapid transit (BRT) on the existing dormant rail line that runs parallel to and on the east side of Syene Road. The primary difference between the two forms of transit is LRT uses rails while BRT uses rubber-tired vehicles primarily in dedicated lanes. Both forms of transit minimize commute time compared to typical bus transit by use of greater spacing between stops and technologies such as transit priority signalization. The MPNP includes a station within the TOD land use area east of Syene Road between Lacy Road and Nobel Drive. If LRT is chosen over BRT, consideration should be given to providing a pedestrian bridge over the rail corridor and Syene Road to link the east and west TOD areas. If BRT is chosen over LRT, an at-grade crossing should be sufficient.

On-Street Bicycle Facilities

The City of Fitchburg *2008 Pedestrian and Bicycle Plan* identifies on-street bicycle lanes in the following locations (see Figure 9.6):

- Fish Hatchery Road, north of Irish Lane
- Lacy Road, between Fish Hatchery Road and Syene Road

The City's *2008 Pedestrian and Bicycle Plan* also calls for on-street paved shoulders to accommodate bicycle traffic in the following locations:

- Fish Hatchery Road, south of Irish Lane
- Lacy Road, east of Syene Road
- Syene Road, through the study area
- Irish Lane

Figure 9.6: Bicycle Recommendations from 2008 Bicycle & Pedestrian Plan

In addition to the Plan, on-street bicycle lanes along Lacy Road should be extended east to Nobel Drive as well as along Interchange Road north through the USH 14 interchange. The objective is to connect bicycle commuters to GreenTech Village and the Northeast Neighborhood as part of the planned USH 14 interchange construction.

With development of the MPN, and as shown in the recommended rights-of-way and cross-sections in Figures 9.3 and 9.4, on-street bicycle lanes should be provided along both sides of Nobel Drive Extended, Research Drive to "Monks Road", and along "Mixed Use Road" and primary TOD roadways. The remaining roadways within the plan are expected to accommodate bicycles on-street without dedicated bicycle lanes.

Lacy Road is identified in the Pedestrian and Bicycle plan as a marked bicycle route west of Syene Road. Consideration should be given to extending the marked bicycle route east to Nobel Drive and south into the MPNP transit station, or extending it east to Nobel Drive and north through the USH 14 interchange with Interchange Road.

Source: walkinginfo.org, accessed Dec 18,

Nobel Drive will intersect Syene Road and the railroad corridor immediately east of Syene Road at a skew. To accommodate perpendicular bicycle crossings, bulb-outs ("loons") may be considered on Nobel Drive at the rail crossing.

Multi-Use Trails

Multi-use facilities accommodate both pedestrian and bicycle traffic and, as such, are recommended in City of Fitchburg Standard Detail Drawings to have a 10-foot wide travel surface. A number of multi-use facilities are planned for the MPN and the surrounding area. The City of Fitchburg *2008 Pedestrian and Bicycle Plan* identifies multi-use trails (i.e. shared-use paths) in the following locations (see Figure 9.6):

- West side of Fish Hatchery Road, north of Irish Lane
- South side of Lacy Road, between Fish Hatchery Road and Syene Road
- West side of Syene Road, north of Irish Lane
- East Cheryl Parkway
- North side of Nobel Drive.
- Other connections outside of roadway rights-of-way.

Multi-use trails along Lacy Road should be extended east to Nobel Drive and be provided along Interchange Road north through the USH 14 interchange. The objective is to connect bicycle commuters to GreenTech Village and the Northeast Neighborhood as part of the planned USH 14 interchange construction. The recommended cross-sections shown in Figures 9.3 and 9.4 include a multi-use trail along Nobel Drive. Figure 9.7 conceptually illustrates these and other multi-use trails that should be considered within the study area. Note that several of the trails are shown along

existing tree lines. If soil conditions are such that placing trails along the tree lines will result in substantial damage or taking of the trees, it is desirable to, where practical, shift the trails so as to save the trees.

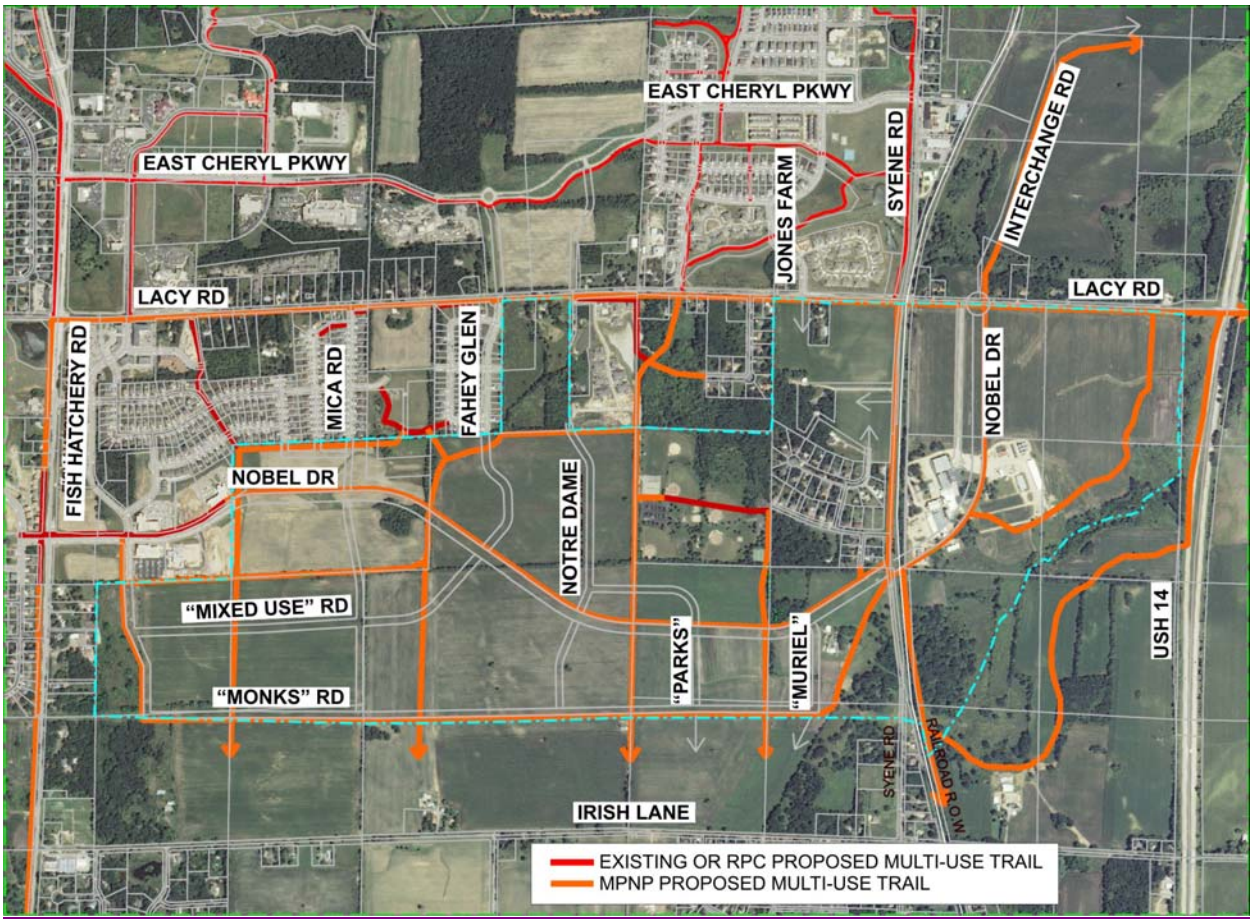


Figure 9.7: Existing and Proposed Multi-use Trails

Other Features

Motor vehicles are given street signs at intersections to help with wayfinding, and on-street and off-street parking at destinations. Similar amenities such as street signs and landmark signs should be provided on multi-use trails to aid non-motorized users. Reference the *2008 Bicycle and Pedestrian Plan* for further discussion and recommendations on these and other amenities, like street furniture and transit shelters. Bicycle racks and/or bicycle lockers should be provided to accommodate safe parking.

Leadership in Energy and Environmental Design for Neighborhood Design (LEED-ND) certification prerequisites and credits will be discussed further in *Part F – LEED-ND & Transportation*. It is important to note here that several points may be obtained for pedestrian and bicycle amenities.

Transit Accommodations

LEED-ND Certification Prerequisite for Transit

A goal of the MPNP is to meet LEED-ND certification prerequisites. Transit service may be an important element to meeting the Smart Linkage & Location Prerequisite 1: Smart Location, though other options for this prerequisite, such as the Nearby Neighborhood Assets option, are anticipated to be possible. Regardless, a high level of transit service is central to the Plan regardless of LEED-ND. To aid in the discussion of transit, the following discussion focuses on the transit service for Prerequisite 1. According to the *LEED for Neighborhood Design Rating System: 1st Public Comment Draft*, dated October 31, 2008:

> *Locate the project near existing or planned adequate transit service so that at least 50-percent of dwelling units and business entrances within the project are within 0.25 mile walk distance of bus or streetcar stops or within 0.5 mile walk distance of bus rapid transit stops, light or heavy rail passenger stations, ferry terminals, or tram terminals. In the case of planned service, the project must demonstrate that the relevant transit agency has a signed Full Funding Grant Agreement (FFGA) with the Federal Transit Administration (FTA) that includes a revenue operations date (ROD) for the start of transit service. The ROD must be no later than the occupancy date of 50-percent of total project building square footage. Planned transit service not using FTA funding must provide the legal and functional equivalent of an FFGA and ROD.*

Further, to define "adequate transit service":

> *Adequate Transit Service is the minimum number of daily trips in each direction that a stop must have to be counted: (1) on weekdays, at least 56 trips/day for buses (includes bus rapid transit), light rail transit (including streetcars/trams), or heavy rail transit (subways/elevated), or at least 28 trips/day for commuter/regional rail or ferries; and (2) on weekends, at least 14 trips/day for buses (includes bus rapid transit), light rail transit (including streetcars/trams), or heavy rail transit (subways/elevated), or at least 7 trips/day for commuter/regional rail or ferries. Commuter rail serves more than one MSA and/or the area surrounding the MSA.*

Note that it is unclear if LEED-ND requires service in both directions or if service in one direction is sufficient for a transit loop. Further definition is being sought out from LEED-ND practitioners. The discussion below assumes direction in one direction is sufficient for a transit loop.

On-Street Bus Transit

Existing On-Street Bus Service

Madison Metro ("Metro") operates on-street bus routes 44 and 48 between the Fish Hatchery Road intersection with Nobel Drive in Fitchburg, through the South Transfer Station of Madison, and north through the University of Wisconsin-Madison campus. The existing routes 44 and 48 are shown in Figure 9.8 (source: Madison Metro *Ride Guide*, effective Oct. 5, 2008).

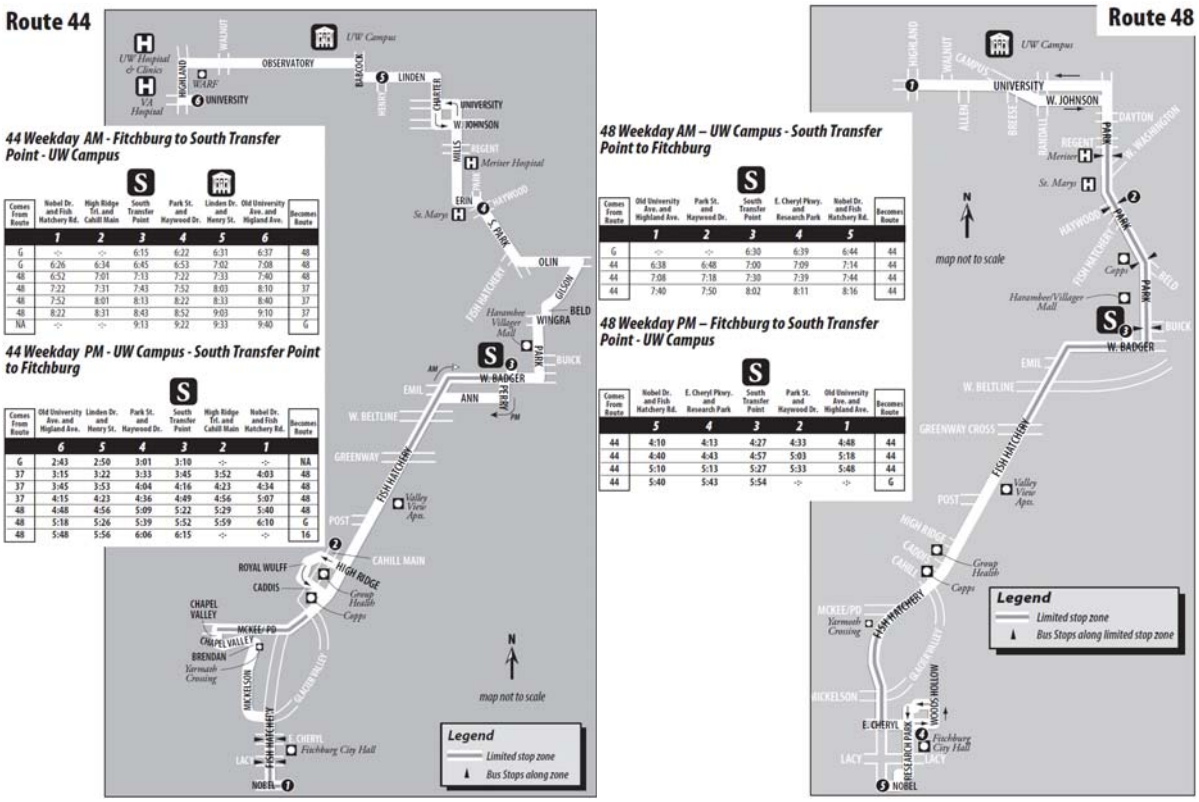


Figure 9.8: Maps of Existing Routes 44 and 48 taken from Metro Ride Guide

Based on conversations with the route coordinator for Madison Metro, routes 44 and 48 are part of the same 90-minute cycle and utilize three buses at a time to achieve 30-minute service headways – the target headway utilized by Metro. Route 44 operates in the northbound direction in the morning and the southbound direction in the evening. Route 48 operates in the southbound direction the morning and the northbound direction in the evening. With service in Fitchburg from 6:26 to 8:22am and from 4:03 to 6:10pm, the routes utilize approximately 55-minutes of time north of the South Transfer Station and 35-minutes of time south of the South Transfer Station. In combination there are 5 departures/4 arrivals during the weekday morning hours and 4 departures/5 arrivals during the weekday evening hours. This equates to 9 complete trips during weekdays and no trips during weekends.

On-Street Bus Transit for MPNP LEED-ND Certification

To provide the 30-minute headways within the MPN, which Madison Metro prefers, the following options should be explored. Note that other options may present themselves in the future if a transit transfer station is located in Green Tech Village (to the northeast) and/or Hatchery Hill (to the northwest). Reference Figure 9.9 for a map of potential routes.

A1. Extend routes 44 and 48 eastward to create a loop over to Syene Road and the MPN TOD areas (blue loop shown in Figure 9.9). To do this, existing service on the routes south of the South Transfer Station would need to be scaled back to maintain 30-minute headways.

- OR -

A2. Create a new route with service from the South Transfer Station with stops at the Northeast Neighborhood and GreenTech Village. The route would continue south to service Syene Road and the TOD areas then loop over to Fish Hatchery Road and back (violet loop shown in Figure 9.9). This new route would add at least two new buses to the Metro system to maintain 30-minute headways).

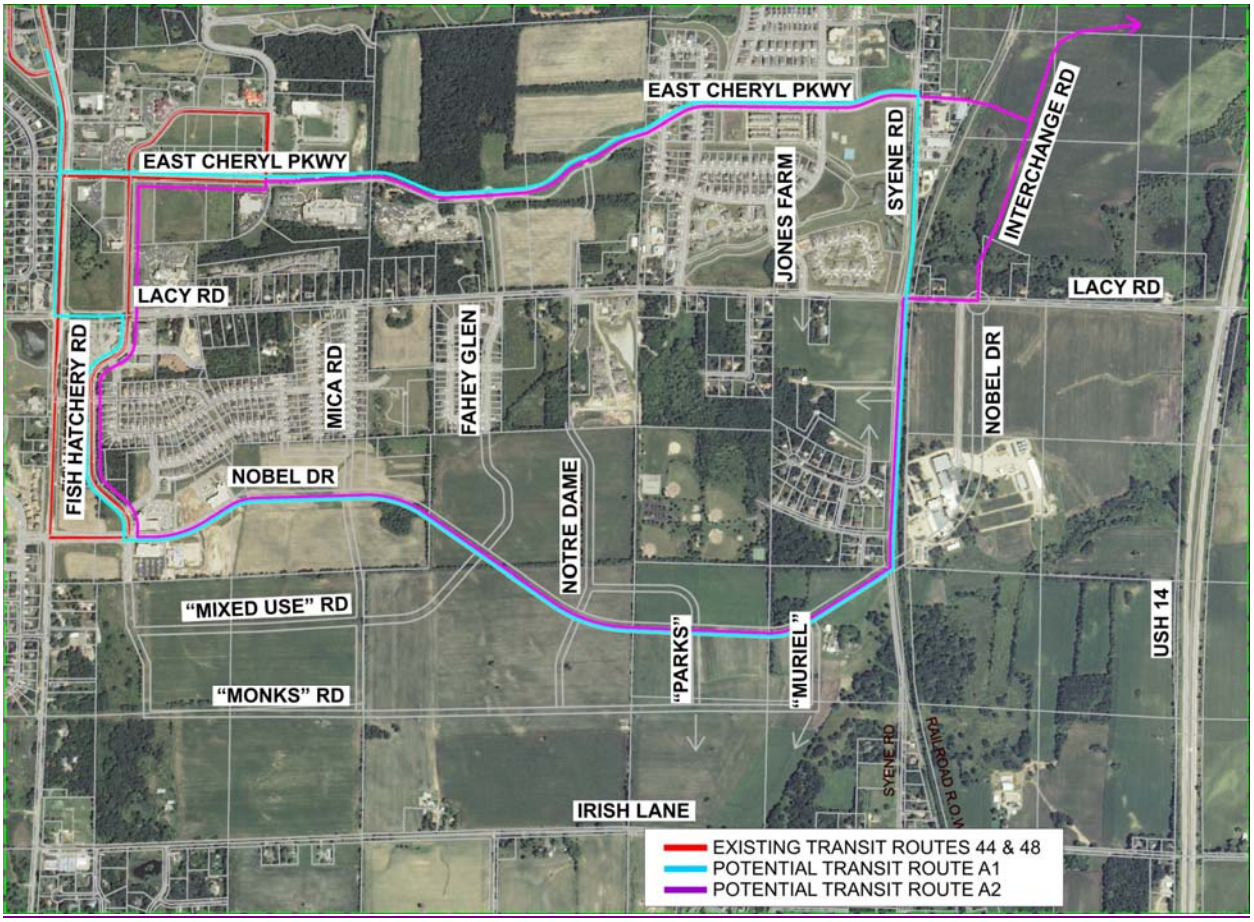


Figure 9.9: Potential On-Street Bus Transit Routes in Study Area

It is possible to achieve the 14 trips/day on weekends with 30 minute headways if the transit service operated for 7 hours. Unfortunately it is not possible to achieve the 56 trips/day desired on weekdays by the LEED-ND prerequisite with 30 minute headways unless there are two routes in simultaneous operation or shorter headways on one route. Doing the math, 56 trips/day divided by 2 trips/hour would require 28 hours/day. Shorter headways on weekdays are necessary for LEED-ND 'adequate transit service'.

The following 15-minute headway options with 14 hours of service on weekdays could be explored.

B1. Combine options A1 and A2 above. Since the MPN is on the south end of the service areas for the routes suggested, it may be possible to offset the bus under option A2 15-minutes later than the bus under option A1, resulting in 15-minute headways.

B2. Maintain the existing service of routes 44 and 48 (red loop shown in Figure 9.9). Provide a service similar to the route suggested under A2 but with four buses rather than two. As an alternate to providing the service under Metro, consideration could be given to hiring a private shuttle service for the City if the cost is less prohibitive.

Cost & Route Productivity Considerations

No matter the manner in which service is provided, the cost of transit for the City of Fitchburg in the MPN area will increase due to additional capitol costs, maintenance costs, and labor costs involved in providing service to this Neighborhood. Recall that the concepts could require increasing weekday transit trips from 9 trips/weekday to as much as 56 trips/weekday and no trips/weekend day to 14 trips/weekend day.

Metro desires route productivity, or the average number of trips per hour per bus on a route, to be at least approximately 60-percent of the system productivity average in order for the route to be maintained. For example, if the system average productivity is 30 trips per hour per bus, Metro desires routes to produce an average of 18 trips per hour per bus. Therefore, adding a new route under options A2 and B1 will require at least twice as much ridership as operating only one route. Maintaining routes 44 and 48 as-is and operating a new route with 15-minute headways under option B2 will require at least four times as much ridership unless the service is private shuttle.

Rail or Bus Rapid Transit (BRT)

An unutilized north-south rail corridor, owned partially by the City of Fitchburg and partially by the Village of Oregon, exists along the east side of Syene Road. The City of Fitchburg envisions an rail/bus rapid transit line along the existing rail corridor in the future that will connect Oregon and Fitchburg to Madison. The primary difference between the two forms of transit is rail uses rails while BRT uses rubber-tired vehicles primarily in dedicated lanes. Both forms of transit minimize commute time compared to typical bus transit by use of greater spacing between stops and technologies such as transit priority signalization.

The City of Madison is currently working with Dane County and WisDOT to initiate preliminary engineering of its Transport 2020 plan, which includes an east-west rail or bus transit line through the isthmus. It is recommended to consider long term transit along the Fitchburg/Oregon rail corridor to the City of Madison. The MPNP includes a transit station east of Syene Road between Lacy Road and the Nobel Drive extension. The station should provide comfortable and efficient multi-modal connections between transit, motor vehicle, bicycle and pedestrian modes.

Rail/bus rapid transit can be used to meet the LEED-ND definition of "adequate transit service" if need be. The same number of trips per day – 56 trips/weekday and 14 trips/weekend day – are required on the transit line. Since the on-street transit is shown as running north-south along Syene Road, it may be possible that the TOD area could meet LEED-ND requirements with less service if necessity presents itself. For example, if on-street transit provides only 40 trips/weekday and rail/bus rapid transit provides 16 trips/weekday, the summation of the two is 56 trips/weekday.

Other Considerations

- Coordinate with Madison Metro to determine route feasibility, cycle/headway constraints, and route productivity for the proposed transit service.
- When transit service is extended through the MPN it is suggested to post bus stops no closer than every one-eighth of a mile apart within the MPN boundaries. Stops should be located close to intersection corners and pedestrian/bicycle facilities, and should be placed wisely so as to meet the quarter mile walking distance requirements set forth by the LEED-ND prerequisites.
- Rail/bus rapid transit may not occur for some time into the future, as planning and engineering of the corridor has yet to fully commence. As an interim measure, consideration could be given to providing a Madison Metro line or private shuttle to/from the TOD areas until such time as rail/bus rapid transit comes to fruition.
- Bus shelters, lighting, and prominent displays of transit routes and times aid in making transit easier and more desirable for use and should be provided. *Part F – LEED-ND & Transportation* discusses LEED-ND points that can be obtained for such facilities.
- The TIA prepared for the MPNP identifies traffic signals in the future at the Syene Road intersection with Lacy Road and the Syene Road intersection with Nobel Drive. If LRT is the chosen mode along the rail corridor, railroad preemption should be installed at the intersections to aid in clearing and keeping clear the tracks during a crossing. Preemption may also be considered if BRT is chosen, though transit priority signal implementation may also be given consideration to clear the bus lanes a few seconds prior to servicing northbound/southbound traffic on Syene Road.
- Note that, with rail preemption, it is more cost effective and may be safer to keep the rail in close proximity to the intersection. It is best to keep at least 25-feet between the intersection stop line and the rail crossing. In general, shorter relative distance minimizes signal clearance timings and thus requires less upstream distance for preemption detection.
- City of Fitchburg staff has indicated that school buses currently stop between Syene Road and the rail corridor. The rail is also posted as being exempt. It is strongly recommended that bus stops be moved to the opposite side of Syene Road or the opposite side of the rail corridor.
- Future connections from Monks Road to Irish Lane through Moraine Edge Park may be explored based upon future planning studies.

Transportation Demand Management

Motor vehicle, pedestrian, bicycle and transit recommendations have been made to encourage the use of non-motorized modes and to encourage trip chaining. The following transportation demand management (TDM) strategies should also be considered to reduce or spread-out the demand for roadway capacity. *Part F – LEED-ND & Transportation* discusses LEED-ND points that can be obtained for implementation of TDM strategies.

Flexible Work Hours & Compressed Work Weeks

Encourage employers within the MPN area and within the City of Fitchburg to provide flexible work hours and compressed work weeks:

- Flexible work hours allow employees to arrive and depart work outside of the typical 8:00am and 5:00pm rushes, thus reducing the peak hour travel times, congestion and vehicle emissions. For example, some employees may wish to start work at 6:30am and leave at 3:30pm while others may wish to start at 9:30am and leave at 6:30pm.
- Compressed work weeks allow employees to work four days a week and have three days off. For example, a business may decide to operate Monday through Thursday only with 10-hour work shifts from 7:00am to 6:00pm. Like flexible work hours, this strategy reduces peak hour travel times, congestion and vehicle emissions. Added benefits include an extra weekend day for personal use and reduced energy consumption for businesses

Telework

Encourage employers within the MPN area and within the City of Fitchburg to provide telework programs:

- Telecommuting programs allow employees to work from home part or full time. In addition to eliminating trips and reducing parking demands at businesses, telecommuting can increase productivity due to reductions in non-business related office conversation and can increase employee job satisfaction due to the elimination of commute times.
- Video conferencing, on-line computer screen sharing, e-mail and other e-based business activity reduce the need to travel to share concepts and ideas.

Parking & Incentives for Alternative Modes

Parking is an expensive amenity to provide due to the cost of land and the environmental measures that must be taken for proper infiltration (ponds, sewer systems, etc.). There are several measures that could be taken to discourage motor vehicle use and encourage transit or other means of travel. The underlaying concept is that when the true cost of parking is made known by the user, alternative modes become more desirable economically.

- Manage and price parking. This can be found in central business districts where employees pay for monthly parking passes and parking meters are located along streets in commercial areas. Prices may vary by time of day and/or time of week, and on proximity to high-demand uses. Parking benefit districts could be established wherein individual districts could use the revenue to achieve neighborhood goals (park upkeep, special lighting, etc.). Note that managed parking should be done in a manner that does not burden businesses to the point where the business cannot be competitive in the market.
- Provide incentives for the use of alternative modes. Incentives could include free or reduced-price transit passes for employees, or perhaps free parking or a monthly stipend for ridesharing groups.
- Supply parking in a manner that accounts for fluctuations in parking demand. Different land uses have different peak parking demand hours, and providing parking in a manner that assumes the parking demands all occur at the same time results in wasted space. For example, professional services could use on-street parking in a mixed-use area during the work hours, and those same spaces could be used by residents in the mixed-use area when the professional services businesses close.

LEED-ND and Transportation

The following discussion is based on the *LEED for Neighborhood Design Rating System: 1st Public Comment Draft*, dated October 31, 2008.

LEED-ND Prerequisites

Assuming that Smart Linkage & Location Prerequisite 1: Smart Location can be met by means other than the transit option, which was described in this chapter and pertains to the necessity of adequate transit service, there are two LEED-ND prerequisites relating to transportation that must be met to obtain LEED-ND certification.

Neighborhood Pattern & Design Prerequisite 1: Walkable Streets

The first prerequisite is Neighborhood Pattern & Design Prerequisite 1: Walkable Streets. Much of this prerequisite pertains to the design, size, and orientation of buildings. As it relates to the transportation plan, and according to the *LEED for Neighborhood Design Rating System: 1st Public Comment Draft*, dated October 31, 2008, continuous sidewalks or equivalent provisions for walking must be provided along 90-percent of streets. Under LEED-ND, sidewalks must be at least 4-feet wide on residential blocks or 8-feet on non-residential or mixed-use blocks.

All streets within the MPN have recommended 5-foot sidewalks in residential areas, and 8-foot sidewalks have been recommended along "Mixed Use Road" and a portion of Research Park Drive. It is believed that the 10-foot recommended multi-use path along Nobel Drive would also qualify for this prerequisite.

Neighborhood Pattern & Design Prerequisite 3: Connected and Open Community

The second prerequisite is Neighborhood Pattern & Design Prerequisite 3: Connected and Open Community. According to the prerequisite, a project must be designed and built with at least one through-street and/or non-motorized right-of-way (may account for no more than 10 percent of the total) intersecting the project boundary at least every 800-feet, or at existing abutting street intervals, or whichever is less. LEED-ND states that this requirement does not apply to portions of the boundary where connections cannot be made because of physical boundaries such as existing buildings, parks, wetlands, rivers, railroads, extreme topography, utility lines, easements, and limited-access roads.

Further, the project must have an internal connectivity of at least 150 intersections/square mile and must not be gated. Connectivity is measured in intersections per mile. According to LEED-ND, eligible intersections include:

- Intersections of publicly accessible streets
- Intersections of such streets with alleys. Alley-to-alley intersections are not included in the intersection density calculation.
- Intersections of such streets with multi-use paths, which can account for up to 10-percent of the total intersections.
- A roundabout or traffic circle counts as one intersection.
- The number of dead-end nodes is subtracted from the total intersection count.

Depending on the implementation of the plan, it is anticipated that this prerequisite can be met.

Potential for LEED-ND Credits

SSL Credit 1: Preferred Locations

A project may earn up to 5 points for locating a project in an area that has the following connectivity within a one mile radius of the project perimeter:

- 400 or more intersections/square mile or greater (5 points)
- 300-400 intersections/square mile (3 points)
- 200-300 intersections/square mile (1 point).

LEED-ND states that areas excluded from this calculation include water bodies, parks larger than ½ acre, recreational facilities, public campuses, airports, rail yards, areas preserved from development by codified lay or prerequisites of the rating system, and land that cannot be developed due to unique topographic or geologic condition (such as steep slopes). Street rights-of-way may not be excluded.

The parks and open space to the south of the MPN would exclude the southern boundary from the connectivity calculation. However, it is unlikely that meeting these requirements will be possible due to the lack of development east of USH 14.

SSL Credit 3: Reduced Automobile Dependence

A project may earn up to 8 points by locating a project on a site with transit service of 40 or more easily accessible transit trips per week. According to LEED-ND, accessible trips available during weekdays are defined as:

- The number of buses or streetcars stopping at those stops that are within a ¼ mile walking distance of at least 50-percent of the projects dwelling units and business entrances, and
- The number of BRT buses, LRT trains at those stops that are within a ½ mile walk distance of at least 50-percent of the project dwelling units and business entrances.

Projects greater than 500 acres may meet 30-percent of the projects dwelling units and business entrances so long as:

- A minimum of 1400 dwelling units and four million square feet of non-residential uses, or four million square feet of mixed residential & non-residential, make up the 30-percent; and
- Any interior portion of the project beyond the ¼ or ½ mile walk distances must have planned transit service that complies with the transit prerequisite defined in this chapter under *Part D – Transit Accommodations*.

All transit trips to/from the MPN are proposed to be easily accessible. Obtaining points under this credit will depend upon the level of transit provided under the options discussed under *Part D – Transit Accommodations*.

SSL Credit 4: Bicycle Network and Storage

A project may earn up to 1 point by designing a project to one of the following three requirements and providing bicycle parking and storage as defined in LEED-ND:

- A bicycle network of at least five continuous miles in length is within a ¼ mile bicycling distance of the project boundary.
- If the project is 100% residential, provide a bicycle network that begins within ¼ mile bicycling distance of the project boundary, and connects to a school or major employment center within three miles bicycling distance.
- There is a connection to a bicycle network within ¼ mile bicycling distance of the project boundary that allows at least ten diverse uses to be reached within three miles bicycling distance from the project boundary. See LEED-ND for a definition of "diverse uses."

Bicycle parking and storage as defined in LEED-ND:

- Multifamily Residential: Provide at least one accessible, indoor, secure bicycle storage space per occupant for 30-percent of the planned occupancy but no less than one per unit. Provide secure visitor parking racks on-site, with at least one bicycle parking space per 10 dwelling units but no fewer than four spaces per project site.
- Retail: Provide at least one accessible, indoor, secure bicycle storage space per retail worker for 10-percent of retail worker planned occupancy. Provide secure visitor/customer bicycle racks on-site, with at least one bicycle parking space per 5,000 square feet of retail space, but no fewer than one bicycle space per business or four bicycle spaces per project site, whichever is greater.

- Commercial Non-Retail: provide at least one accessible, indoor, secure bicycle storage space per occupant for 10-percent of planned occupancy. Provide secure visitor bicycle racks on-site with at least one bicycle space per 10,000 square feet of commercial non-retail space but no fewer than four bicycle spaces per building.

Further, LEED-ND states that visitor and customer bicycle racks must be positioned in areas with active visual surveillance and night lighting, and protected from damage from nearby vehicles. Racks must be located within 50-feet of each building's primary entry. For retail buildings or other buildings with multiple primary entries, bicycle racks should be proportionately disbursed within 50-feet of business or other primary entries.

Obtaining the point under this credit is possible and will depend on the bicycle parking and storage policies established for the project.

NPD Credit 1: Walkable Streets

A project may earn up to 12 points by designing the project to meet at least 2 of 15 items of this credit. More points are given for meeting more items. Much of the credit pertains to building design and orientation, but the following could increase points as they relate to transportation planning:

- On-street parking must be provided on a minimum of 70-percent of both sides of all new and existing streets including the project side of bordering streets.
- Continuous sidewalks or equivalent walking provisions are provided along all streets within the project. New sidewalks must be 5-feet wide on residential blocks and 10-feet wide on non-residential or mixed-use blocks.
- 75-percent of new exclusively residential streets within the project are designed for a target speed of no more than 20 mph.
- 70-percent of new non-residential and mixed-use streets within the project are designed for a target speed of no more than 25-mph.

It is anticipated that the first and third bullets above are achievable. With the exception of Nobel Drive, which is proposed to operate at a 35-mph design speed, the majority of roadways within the study area are proposed to operate at or below 25-mph on non-residential and mixed-use streets. Meeting the third bullet will depend upon the use of on-street parking within the proposed 66-foot rights-of-way, as on-street parking minimizes the travel way and in doing so reduces the effective travel way for motor vehicles and decreases speeds.

The second bullet could also be achieved if the rights-of-way recommended in this plan are revised to include 10-foot sidewalks through all non-residential and mixed-use blocks. This would require greater right-of-way which is not desirable.

Note that the City standard speed limit for residential streets is 25-mph. As such it may be difficult to obtain points for the fourth bullet unless it could be proven that residential streets will be constructed with a 20-mph design speed in mind.

NPD Credit 5: Reduced Parking Footprint

A project may earn up to 1 point by designing the project to meet the following, per LEED-ND:

- For new non-residential buildings and multifamily residential buildings, do not build new off-street surface parking, or locate off-street parking lots at the side or rear of buildings, leaving building frontages and streetscapes free of surface parking lots; AND
- Use no more than 20-percent of the total development footprint area for all new off-street surface parking facilities, with no individual surface parking lot larger than 2 acres. Read the LEED-ND credit definition for definitions as they relate to ground-level garages, underground or multi-level parking; AND
- Bicycle parking and storage for a capacity as identified above under *SSL Credit 4: Bicycle Network and Storage*; AND
- For new non-residential and mixed use buildings, provide carpool parking spaces equivalent to 10-percent of the total automobile parking for each non-residential and mixed-use building on the site. Signage indicating carpool parking spots must be provided, and carpool parking must be within 200 feet of entrances to buildings served.

Obtaining the point under this credit is possible but will depend on policies established for the Neighborhood pertaining to parking, bicycle parking and storage, and carpool accommodations.

NPD Credit 6: Street Network

A project may earn up to 2 points by designing the project to meet the following, per LEED-ND:

- Include a pedestrian or bicycle through-connection in at least 90-percent of any cul-de-sacs, except where prohibited by topographical conditions; AND
- Location and/or design the project such that its internal connectivity, and/or the connectivity within a ¼ mile radius from the geographic center of the project, falls between 300 and 400 intersections per square mile (1 point earned) or greater than 400 intersections per square mile (2 points earned).
- Design and build projects with at least one through-street, and/or non-motorized right-of-way, entering and exiting the project boundary every 400-feet, or at existing abutting street intervals, whichever distance is smaller. This does not apply to portions of the boundary where connections cannot be made because of physical obstacles created by prior platting of property and construction of improvements that constitute barriers; slopes over 15 percent; water bodies and wetlands; railroad and utility rights-of-way; limited access motor vehicle rights-of-way; and parks and dedicated open space.

Obtaining points under this credit will depend heavily on design of the residential neighborhoods, as they lay within the geographic center of the plan. Providing an entry/exit through the project boundary every 400 feet may be a difficult goal to achieve – even with south boundary (parks and open space to the south) and east boundary (USH 14 to the east) excluded. New connections are not planned west to Fish Hatchery or north to Lacy Road. Even if they were, a connection to an

arterial street every 400-feet is not recommended, and a new connection to a collector like Lacy Road every 400-feet is not recommended either.

NPD Credit 7: Transit Facilities

A project may earn up to 1 point by designing the project to meet the following, per LEED-ND:

- Provide or identify covered and at least partially enclosed shelters, adequate to buffer wind and rain, with at least one bench, at each public transit stop. Shelters shall be illuminated as stipulated in the LEED-ND documentation. AND
- Provide kiosks, bulletin boards, and/or signs devoted to providing local public transit information as part of the project, including basic schedule and route information at each public transit stop within or bordering the project. AND
- Confirm that each public transit stop provides adequate transit service (see *Part D – Transit Accommodations* for this definition).

Obtaining points under this credit will depend upon the level of transit provided under the options discussed under *Part D – Transit Accommodations*. If "adequate transit service" is provided, this point may be readily obtained.

NPD Credit 8: Transportation Demand Management

A project may earn up to 2 points by designing the project to meet at least two of the following, per LEED-ND:

- Create and implement a comprehensive TDM program for the project that reduce the weekday peak period motor vehicle trips by at least 20-percent compared to a scenario without the TDM program. OR
- Provide transit passes for at least one year, subsidized to be half of regular price or cheaper, to each resident, employee, and student located within the project during the first three years of project occupancy (or longer). Publicize the subsidized transit passes. OR
- Provide year-round, developer sponsored transit service from at least one central point in the project to major transit facilities, and/or other major destinations such as retail or employment center, with service no less frequent than 75-percent of adequate transit service. The service must being when the project total square footage is 20-percent occupied or sooner and must be guaranteed for at least three years beyond project buildout. Covered and at least partially enclosed shelters, adequate to buffer wind and rain, with at least one bench, at each public transit stop. Shelters shall be illuminated as stipulated in the LEED-ND documentation. OR
- Locate the project such that 50 percent of the dwelling units and business entrances are within ¼ mile walk distance of at least one vehicle in a vehicle-sharing program, and publicize the availability and benefits of the program to project occupants. See LEED-ND for further definition of the vehicle-sharing vehicles required. OR
- For 100 percent of multifamily dwelling units, their associated parking spaces are sold or rented separately from the dwelling units.

Obtaining points under this credit is possible – especially under the second, fourth and fifth bullets.

NPD Credit 14: Tree-Lined and Shaded Streets

A project may earn up to 2 points by designing the project to meeting the following, per LEED-ND:

- Design and build the project to provide street trees on both sides of 70 percent of new and existing streets within the project and on the project-side of bordering streets, between the vehicle travel way and sidewalk, at intervals no greater than 40-feet (excluding driveways and utility vaults); AND/OR
- Trees or other structures provide shade over at least 40 percent of the length of sidewalks on streets included within or contiguous to the project. In the case of shade from trees, shade must be provided within five years of landscape installation. AND FOR ALL PROJECTS
- Where trees are planned along non-residential streets, install a root-friendly medium such as structural soil. Where trees are planted along residential streets, ensure the planter strips that are wide enough to provide a healthy growing area for each species of tree are used.

Obtaining points under this credit are certainly possible – especially under the first and third bullets.

GIB Credit 12: Infrastructure Energy Efficiency

This credit under the topic of Green Infrastructure & Buildings may earn up to 1 point by designing the project, per LEED-ND, with all new traffic lights, street lights, and water and wastewater pumps and treatment systems to achieve a 15 percent annual energy reduction below an estimated baseline energy use for this infrastructure. The baseline is calculated with the assumed use of lowest first-cost infrastructure items.

Obtaining this credit's point can be achieved for the MPNP by installing LED lighting at traffic signals and in street lights, and will depend more heavily on the energy reduction caused by water and wastewater pumps and treatment systems.

GIB Credit 14: Recycled Content in Infrastructure

This credit may earn up to 1 point by using recycled materials in the use of pavements. Reference LEED-ND for further definition of the stipulations.

Obtaining this point can be achieved by requiring pavements within the MPN to contain the recycled content percentages identified by LEED-ND.

Transportation Plan Summary

The transportation element of the MPNP meets the six goals set forth in the Fitchburg Draft Comprehensive Plan and by the MPNP Steering Committee. That is, this plan:

1. Promotes development in areas that encourages options to alternative transit modes.
2. Promotes transit-friendly design and fine grain texture of healthy neighborhoods with walkable, short blocks.
3. Incorporates complete streets that promote pedestrian and bicycle movement as well as cars.

4. Carefully plans additional road capacity.
5. Considers extensions of transit including bus and light rail to make the neighborhood transit accessible.
6. Minimizes the impact on existing roadways and infrastructure by planning for multiple modes of transportation.

The recommendations outlined here and summarized in the separate TIA document are anticipated to result in safe and efficient operations with the build-out of the MPNP Growth Model.

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Chapter 10: Economic and Fiscal Impact Analysis

Market Analysis

Trade Area

The McGaw Park Neighborhood is located at the southeast portion of Fitchburg's Urban Service Area. There are several nearby commercial corridors, including Fish Hatchery Road, McKee Road, and along the Beltline. Very little retail is located within one mile of the site, although there are large retail concentrations along the commercial corridors just beyond. Two large technology parks are located in this section of Fitchburg – the Fitchburg Technology Campus and Fitchburg Center, which includes Fitchburg City Hall. The trade areas are defined in this study as two concentric rings, with a one mile radius (which approximates a five minute drive), and a 2.5 mile ring (which approximates a ten minute drive). For the sake of defining the trade areas, the center is Lacy and Syene Roads due to its proximity to the planned retail at the new intersection to Highway

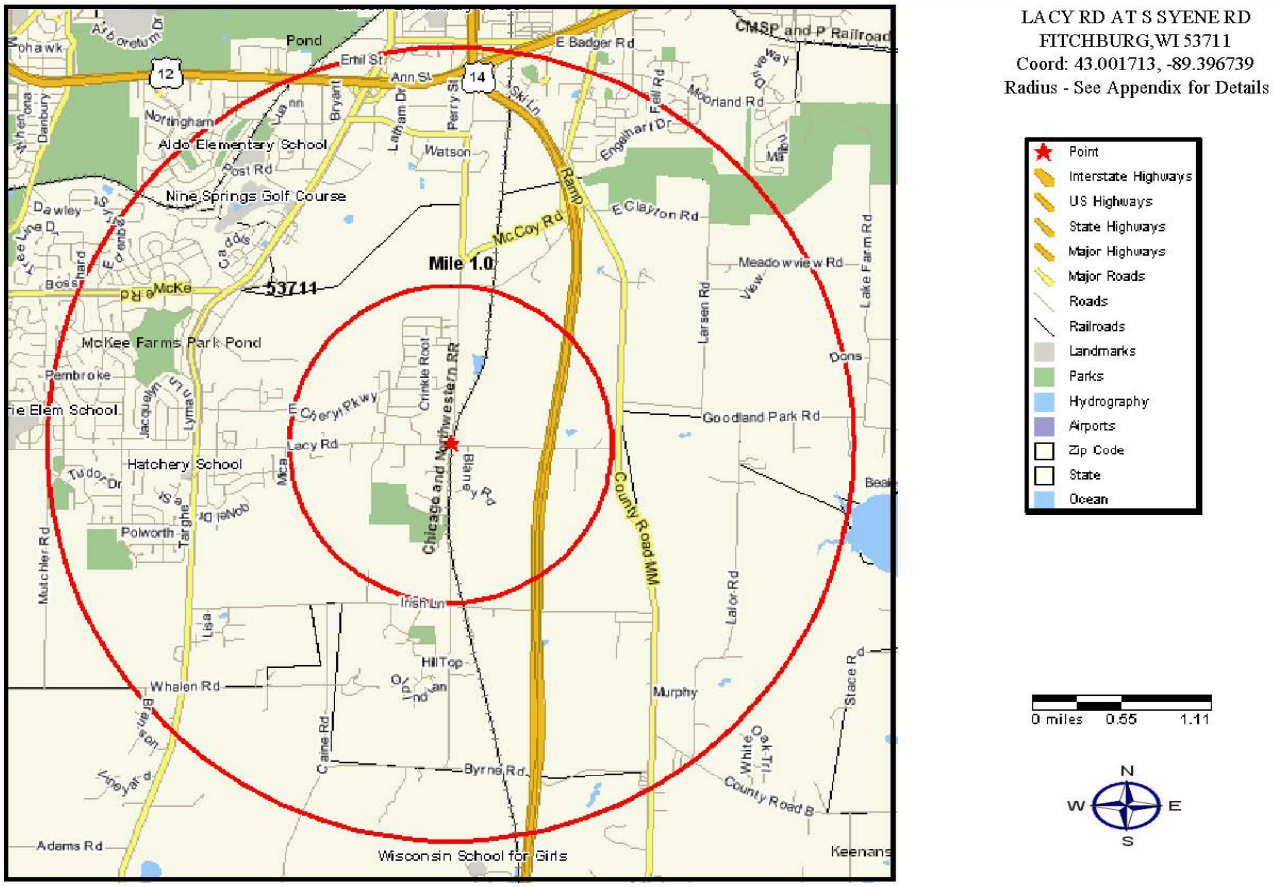

Figure 10.1: One Mile and 2.5 Mile Trade Area

14 and proposed light rail station transit oriented development site.

A larger, fifteen minute trade area, stretches all the way to downtown Madison. Because of the limited size of retail sites within the McGaw Park Neighborhood, and the large retail sites planned just north of the Neighborhood in Green Tech Village, this study does not support regional destination retailers, and therefore focuses exclusively on neighborhood and community supported retail within the 2.5 mile trade area. It should be noted, that the new Intersection with Highway 14 and destination draw of Green Tech Village will support additional visitors to the area. Complimentary uses to Green Tech Village will be explored in the market analysis below.

Retail Opportunities

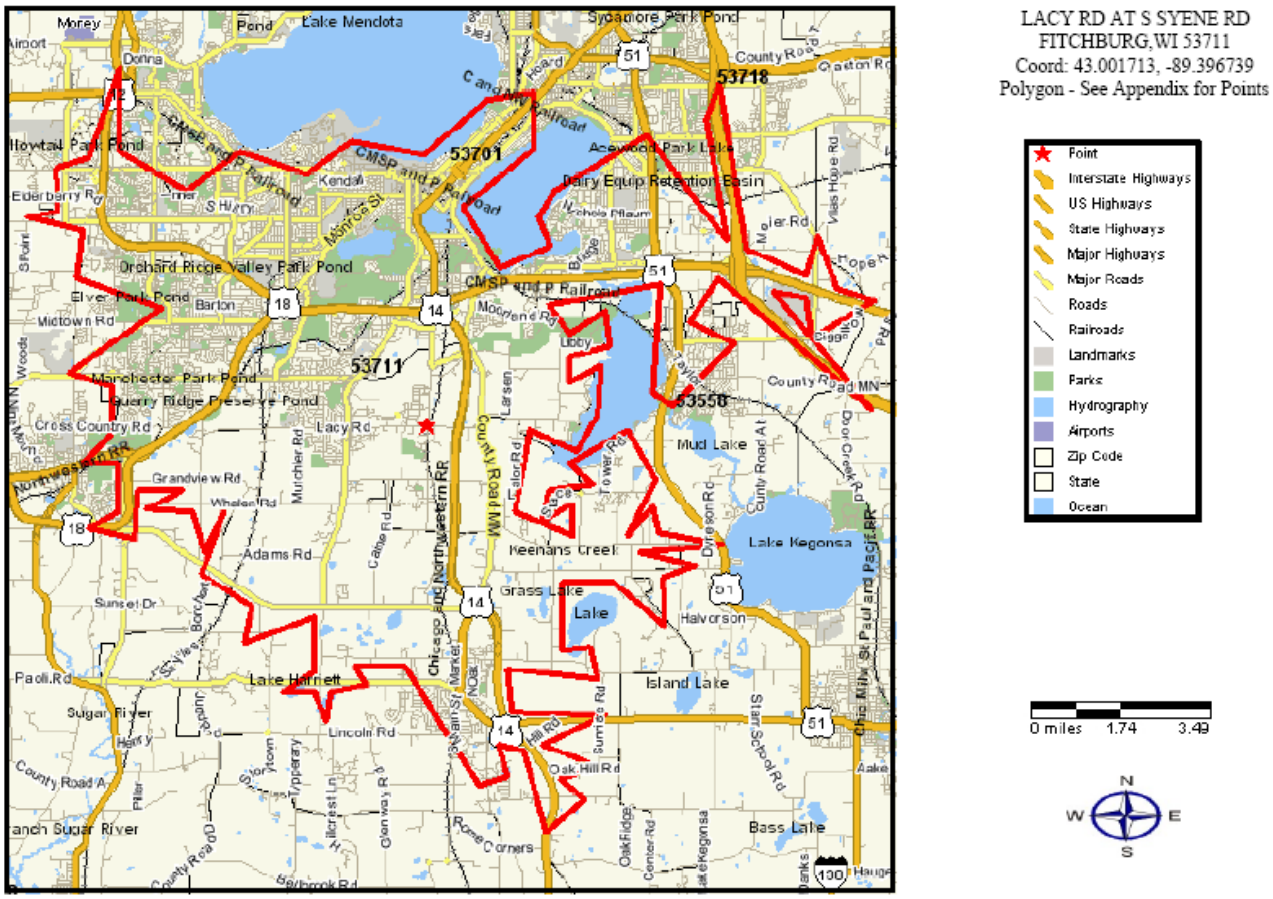

Figure 10.2: Fifteen Minute Drive Time Trade Area

A retail leakage analysis was conducted to determine the demand and supply for retail goods and identify the potential gaps that could be filled with new retail development. As noted above, there is very little retail available within one mile, with less than 50% of retail demand served within this area. The total retail gap within the one mile trade area is $5.3 million of a total demand of $9.4

million. There are retail gaps (shown as positive numbers in Table 1 below) in every category other than computer and software, gasoline, and sporting goods.

A concentration of retail is located within the 2.5 mile trade area. The area is a net attraction for retail stores, likely attracting shoppers from Madison to the north, and more rural areas to the south. As a result, there is a 63% retail surplus, or a total of $194 million net surplus over a demand of $308 million. Yet, all of this surplus is accounted for by a very large auto vehicle surplus of $250 million.

The result is that many categories show a retail opportunity gap, including the following categories:

- Furniture $1.8 million
- Electronics and appliances $2.5 million
- Lawn, garden equipment $2.5 million
- Grocery stores $7 million
- Clothing stores $14 million
    - Men's clothing $10 million
    - Family clothing $6 million
- Shoe stores $2 million
- Jewelry, luggage $2 million
- General merchandise $33 million
- Office supplies $1.7 million

The number that stands out is general merchandise demand at $33 million. While there are large general merchandise and warehouse stores along the Beltline and a new Target store, there may be demand for another large format store (provided it is consistent with the policies of the Comprehensive Plan), although the area necessary for such a store would most likely be more appropriate in Green Tech Village. Yet, smaller retailers that sell general merchandise could be accommodated within the planned transit oriented node within McGaw Park Neighborhood.

The demand for retail presented in Table 10.1 will only improve with residential growth planned within McGaw Park Neighborhood, Green Tech Village, and Northeast Neighborhood.

Table 10.1:						
	1 Mile Radius			2.5 Mile Radius		
Retail Stores	Demand (Consumer Expenditures)	Supply (Retail Sales)	Opportunity Gap/Surplus	Demand (Consumer Expenditures)	Supply (Retail Sales)	Opportunity Gap/Surplus
Total Retail Sales Incl Eating and Drinking Places	**9,446,401**	**4,116,056**	**5,330,345**	**308,665,884**	**503,487,429**	**(194,821,545)**
Motor Vehicle and Parts	1,905,811	133,726	1,772,085	63,914,977	314,418,398	(250,503,421)
Automotive Dealers	1,644,217	0	1,644,217	55,232,233	304,023,345	(248,791,112)
Other Motor Vehicle	120,393	133,726	(13,333)	4,119,015	6,793,658	(2,674,643)
Automotive Parts/Accsrs,	141,200	0	141,200	4,563,728	3,601,395	962,333
Furniture and Home Furnishings Stores	251,321	0	251,321	7,813,990	9,947,835	(2,133,845)
Furniture Stores	132,717	0	132,717	4,359,241	2,555,793	1,803,448
Home Furnishing Stores	118,604	0	118,604	3,454,750	7,392,042	(3,937,292)
Electronics and Appliance	225,946	79,462	146,484	7,704,669	5,158,764	2,545,905
Electronics	167,638	0	167,638	5,747,765	3,194,302	2,553,463
Household Appliances	37,456	0	37,456	1,147,692	0	1,147,692
Radio, TV, Electronics	130,182	0	130,182	4,600,073	3,194,302	1,405,771
Computer and Software	48,916	79,462	(30,546)	1,654,227	1,964,462	(310,235)
Camera and Photographic	9,392	0	9,392	302,676	0	302,676
Building Material, Garden Equip Stores	1,180,712	0	1,180,712	29,370,417	30,892,658	(1,522,241)
Building Material	1,088,401	0	1,088,401	26,812,168	30,828,484	(4,016,316)
Home Centers	424,800	0	424,800	10,777,460	0	10,777,460
Paint and Wallpaper	24,573	0	24,573	600,882	351,849	249,033
Hardware Stores	86,862	0	86,862	2,361,155	565,699	1,795,456
Lawn, Garden Equipment	92,311	0	92,311	2,558,249	64,174	2,494,075
Food and Beverage Stores	996,604	0	996,604	34,501,238	24,712,365	9,788,873
Grocery Stores	908,522	0	908,522	31,369,347	23,700,362	7,668,985
Supermarkets, Grocery	861,339	0	861,339	29,713,820	23,676,254	6,037,566
Convenience Stores	47,183	0	47,183	1,655,527	24,108	1,631,419
Specialty Food Stores	27,133	0	27,133	959,366	380,390	578,976
Beer, Wine and Liquor	60,949	0	60,949	2,172,525	631,613	1,540,912
Health and Personal Care Stores	453,868	0	453,868	14,616,361	27,753,184	(13,136,823)
Pharmancies and Drug	390,088	0	390,088	12,575,556	26,597,208	(14,021,652)
Cosmetics, Beauty	15,425	0	15,425	492,640	468,388	24,252
Optical Goods Stores	21,330	0	21,330	674,776	0	674,776
Gasoline Stations	1,045,090	3,370,682	(2,325,592)	33,999,048	40,595,152	(6,596,104)
Clothing and Clothing Accessories	438,489	23,917	414,572	15,828,797	1,813,018	14,015,779
Clothing Stores	313,066	23,917	289,149	11,340,462	1,371,219	9,969,243
Men's Clothing Stores	19,896	0	19,896	747,466	16,454	731,012
Women's Clothing	81,134	22,530	58,604	2,898,793	1,311,322	1,587,471
Childrens, Infants	15,860	0	15,860	600,753	0	600,753
Family Clothing Stores	168,226	0	168,226	6,089,397	0	6,089,397
Clothing Accessories	7,636	0	7,636	269,024	0	269,024
Shoe Stores	53,834	0	53,834	2,022,763	0	2,022,763
Jewelry, Luggage, Leather	71,589	0	71,589	2,465,572	441,800	2,023,772

Retail Stores	1 Mile Radius			2.5 Mile Radius		
	Demand (Consumer Expenditures)	Supply (Retail Sales)	Opportunity Gap/Surplus	Demand (Consumer Expenditures)	Supply (Retail Sales)	Opportunity Gap/Surplus
Sporting Goods Stores	70,245	90,375	(20,130)	2,503,965	3,503,996	(1,000,031)
Hobby, Toys and Games Stores	42,296	0	42,296	1,381,809	4,398,904	(3,017,095)
Musical Instrument and Supplies	11,268	0	11,268	424,482	0	424,482
Book, Periodical and Music Stores	55,353	0	55,353	2,137,085	1,781,738	355,347
Book Stores and News	38,549	0	38,549	1,481,268	1,781,738	(300,470)
Prerecorded Tapes, CDs	16,804	0	16,804	655,817	0	655,817
General Merchandise Stores	1,116,003	222,308	893,695	37,863,710	4,414,405	33,449,305
Department Stores	546,243	0	546,243	18,576,290	91,045	18,485,245
Other General Merchandise	569,761	222,308	347,453	19,287,419	4,323,360	14,964,059
Warehouse Clubs	482,696	222,308	260,388	16,450,419	4,316,642	12,133,777
Other General Merch.	87,064	0	87,064	2,837,000	6,719	2,830,281
Miscellaneous Store Retailers	255,627	7,244	248,383	8,046,116	3,481,367	4,564,749
Florists	19,446	0	19,446	545,364	587,910	(42,546)
Office Supplies& Gifts	102,142	0	102,142	3,258,225	1,551,838	1,706,387
Office Supplies and Stationery	57,842	0	57,842	1,841,447	0	1,841,447
Gift and Souvenir	44,300	0	44,300	1,416,778	1,551,838	(135,060)
Foodservice and Drinking	770,507	188,341	582,166	27,868,279	28,480,819	(612,540)
Full-Service Restaurants	354,345	0	354,345	12,802,993	11,998,527	804,466
Limited-Service Eating	313,729	188,341	125,388	11,410,517	12,721,221	(1,310,704)
Special Foodservices	64,974	0	64,974	2,349,320	1,171,848	1,177,472
Drinking Places	37,460	0	37,460	1,305,448	2,589,223	(1,283,775)

Source: Teska Associates, Inc. Analysis of Claritas, 2008

Workplace and Office Uses

Fitchburg and surroundings in the south Madison area have grown into a very vibrant employment location – both office and retail – along with some construction, manufacturing, and wholesale trade. In fact, there are over 1,000 establishments and over 17,000 employees, as shown in Table 10.2. Over 15,000 employees work for private firms. The top employment categories are:

Service	6,518 employees
Retail	3,224
Construction	2,236
Manufacturing	1,790
Finance	1,478

Table 10.2: Workplace and Employment in 2.5 Mile Trade Area, 2008

Business Description	Total Establishment	Total Employees	Employees Per Establishment
Industries (All)	1,061	17,856	17
Industries (Private Sector)	960	15,302	16
Industries (Government and Non-Profit)*	101	2,554	25
Agriculture (All)	22	138	6
Mining (All)	2	9	5
Construction (All)	122	2,236	18
Manufacturing (All)	76	1,790	24
Transportation, Communications/Public Utilities	34	782	23
Wholesale Trade (All)	57	1,191	21
Retail (All Retail)	160	3,224	20
Building Matls and Garden Supply	9	181	20
General Merchandise Stores	2	13	7
Food Stores	18	249	14
Auto Dealers and Gas Stations	25	1,308	52
Apparel and Accessory Stores	2	4	2
Home Furniture, Furnishings and Equipment	18	129	7
Eating and Drinking Places	48	1,034	22
Miscellaneous Retail Stores	38	306	8
Finance (All)	173	1,478	9
Bank, Savings and Lending Institutions	22	328	15
Security and Commodity Brokers	9	74	8
Insurance Carriers and Agencies	21	390	19
Real Estate	118	669	6
Trusts, Holdings and Other Investments	3	17	6
Service (All)	393	6,518	17
Hotel and Other Lodging	7	87	12
Personal Services	61	731	12
Business Services	134	2,444	18
Motion Picture and Amusement	20	103	5
Health Services	39	767	20
Legal Services	12	44	4
Educational Services	9	230	26
Social Services	39	1,636	42
Public Administration (All)	22	490	22

Prepared from Claritas Business-Facts which includes data from infoUSA.

The McGaw Park Neighorhood is part of the Fitchburg Technology Neighborhood which includes two business parks, Fitchburg Technology Campus, immediately adjacent and planning on expanding into the McGaw Neighborhood, and the other, Fitchburg Center, just north of Lacy and east of Fish Hatchery Roads. In addition, Nine Springs Green-Tech Village is being developed north of Lacy Road and east of Syene Road.

Fitchburg Technology Campus

Fitchburg Technology Campus is located on 120 acres of land. It is primarily a business park, along with a mixed-use development called Kinsale Place. Major employers include Gordon Fleisch, Tri North, Park Bank, CDW, the New Venture Center, and 16,000 feet of retail space in Kinsale Place. Fitchburg Technology Campus has plans to expand to the east into the McGaw Park Neighborhood. Extending Nobel Drive eastward, along with water and sewer services, would provide access to this expansion. There are also existing lots available for development, including at the intersection of Fish Hatchery Road and Nobel Drive.

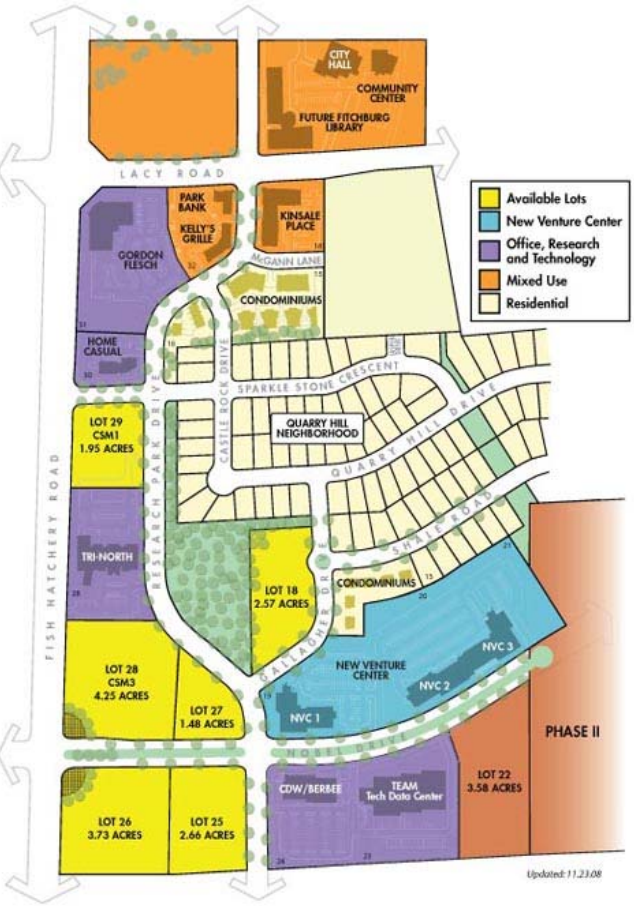

Figure 10.3: Fitchburg Technology Campus Land Use Map

Fitchburg Center

Fitchburg Center is located north of Lacy Road and east of Fish Hatchery Road. It includes office, civic, institutional, and residential uses. Promega's 70,000 square foot corporate headquarters anchors the development. The 200,000 square foot BioPharmacuetical Technology Center includes offices and laboratories for Promega, and other bio-technolgoy industries. Additional buildings include:

- Agora Town Center 87,500 square feet
- Fitchburg City Hall 57,000
- HospiceCare 51,000
- CDW Berbee 50,000
- Credit Union Executives Society 45,000
- Bruker-AXS, Inc. 42,000
- Locus Building 20,000
- UW Health 5,000

The Fitchburg Center development included the construction of Cheryl Drive that connects Fish Hatchery eastward through the Swan Creek Mixed Residential development and over to the planned intersection with US 14. Strict design standards control the development. A Wi Fi canopy covers the public spaces, and high-speed fiber is available.

Figure 10.4: Fitchburg Center Land Use Map

McGaw Park Neighborhood Commercial and Office Employment Nodes

Due to the current success of Fitchburg Technology Campus and Fitchburg Center, additional office, light manufacturing, lab space, and supportive commercial is expected to be attracted to the area. The absorption of additional demand will depend on the availability of both of these office parks, as well as pending development at Green Tech Village. Additional access to the site through the construction of the intersection with US 14, as well as planned rail/bus rapid transit, will only make the area more attractive for office development. The growth model shows two primary business areas within the McGaw Park Neighborhood:

The first major employment node is shown at the intersection of Lacy and Syene Roads. It is composed of two major areas:

- Parcels 12 and 15 make up the TOD area, covering a total of 76 acres, will be home to a variety of uses, including:
    - Retail 6 acres 92,782 square feet
    - Office 23.3 acres 360,822 square feet
    - Residential 46.7 acres 596 homes

- Parcel 11 is planned to be a Business Park. It is planned to allow:
    - Office, Lab Space 36 acres 566,696 square feet
      Supportive Commercial

The second major employment node is located in the western part of the neighborhood, just east of Fish Hatchery Road and the Fitchburg Technology Campus. It is composed of two areas:

- Parcel 1, Business Park
    - Office, Light Manufacturing 51 acres 788,653 square feet
      Supporting Commercial, Lab Space

- Parcel 3, Mixed Use
    - Office 28.5 acres 440,718 square feet (this may also include retail)
    - Residential 28.5 acres 202 homes

Fiscal Impact Analysis

Wisconsin municipalities derive a majority of their operating budget from the Tax Levy which is generated from property tax. The fiscal analysis only accounts for the direct fiscal impact of new development on the City of Fitchburg operating budget and does not account for other impacts including employment multiplier effects, increased traffic congestion, etc. Furthermore, the fiscal impact on considers the impact of residential and commercial development on police, fire, public works, and administrative. The purpose of the model is to determine the fiscal impact of the McGaw Park future build-out development as based upon McGaw Park Neighborhood Plan.

Development Phasing:

The Fiscal Analysis was based upon the development phasing as outlined in Chapter 11: Implementation. Due to the long course of the build-out the assumptions will change and should be adjusted periodically to more accurately predict the fiscal impact. Costs are based on 2009 dollars and will need to be adjusted for inflation and appreciation at build-out.

Wisconsin State Tax Statutes:

Wisconsin statutes limits the total amount that a local tax levy can increase. This is referred to as the "Levy Cap", because it does not directly cap the tax rate. The levy cap is equal to the greater of "a 3% annual increase in the total amount levied against the property tax base" or "a percentage increase in the levy not exceeding the percentage change in the total property tax base resulting from new construction for any fiscal year. See example on right for more detail.

Example:

If Fitchburg had a levy of $100,000 for the 2008 tax levy and new construction increased the total assessed value of the City by 4%. Fitchburg could increase its levy by 4%, which would allow for a 2009 tax levy of $104,000.

However, if Fitchburg only had 1.5% of new construction, the levy could only be increased by 3%, which would allow a 2009 tax levy of $103,000.

Capping tax levys hinders a municipality whenever the rate of increase of expenses (inflation in fuel costs or increased labor rates, etc.) exceeds the allowable increase in the levy. If tax levies are capped at 3%, any increase in costs above 3% digs a deeper hole for the municipality. If property values soar, the levy cap prevents the municipality from increasing the revenue available to pay expenses…and, as a result, the tax cap lowers the tax rate (tax rate equals the levy divided by the total assessed value of the community), and reduction in the municipalities abilities to pay its expenses. That lower tax rate is applied to both the existing tax base, and to new construction. Further, if property values soar, they increase the overall value of the existing tax base, thus diminishing the proportion that new construction increment is of the overall assessed value, and therefore diminishing the potential that new construction will allow the levy to increase

at a rate greater than 3% annually. Even if there was zero inflation or increases in providing existing public services, it is possible for the levy cap to hold the levy to the 3% annual increase, while new construction generates new costs that cannot be offset by new property tax base of the new buildings.

Methodology:

In order to determine the fiscal impact attributable to the proposed development, three separate models were run based upon the phases of development as outlined in Chapter 11. All of the underlying economic and fiscal data was provided by the City of Fitchburg as part of their yearly budgetary process and from actual City Budgets and Statement of Assessments. In all cases, where available, actual data provided by the City's sources was used. The number of residential units, types, square footage of various land uses, and miles of roads were based on the Plan's phases of development. The population, school children, and employment projections were based upon standardized population projections including the U.S. Census Bureau, and the American Planning Association's Planner's Estimating Guide Projecting Land-Use and Facility Needs 2004.

Due to funding structures and budgetary calculations, residential expenses were based upon current Fitchburg populations, and then projected based upon the forecasted increase in population as a result of the expected development. For different funding structure reasons, non-residential expenses for the development were based upon current Fitchburg expenses divided by non-residential land acreage. Based upon the existing City expenditure per non-residential acre, the non-residential expenses were projected by non-residential use acreage. As for development revenues, the largest portion of development revenue is due to property tax collections that are based upon Equalized Assessed Values, which were derived from comparables in the surrounding area as well as data provided by local property owners and real estate agents.

Assumptions:

*Equalized Assessed Values:
- -R1 = $235,152 per unit
- -R2 = $209,742 per unit
- -TOD/Mixed Use Housing = $192,024 per unit
- -Office = $150 per sq/ft
- -Retail = $125 per sq/ft
- -Business Park = $125 per sq/ft

*All housing was for sale
*Residential expenses were based upon population
*Non-Residential expenses were based upon land acreage
*All single-family residential averaged 3 bedrooms, TOD and Mixed-use housing averaged 2 bedrooms
*Police budget was evenly split between service calls and patrolling
*Police budget assumes 20,000 calls a year

Fiscal Impact-City of Fitchburg:

Phase 1:

Based on the aforementioned assumptions and development build-out, the first phase of build-out, with no other development in Fitchburg accounted for, will have a **positive $974,000** impact on the City of Fitchburg.

Details

Total Revenues: $1,577, 000
Total Expenses: $603,000
Post Phase 1 City of Fitchburg EAV: $2,584,865,200 (assuming no other development)
Post Phase 1 City of Fitchburg Tax Levy: $12,571,104 (assuming no other development)

Phase 2:

Based on the aforementioned assumptions and development build-out, the second phase of build-out, with no other development in Fitchburg accounted for, will have a **positive $1,286,000** impact on the City of Fitchburg.

Details

Total Revenues: $2,494,000
Total Expenses: $1,208,000
Post Phase 2 City of Fitchburg EAV: $ $2,849,223,556
Post Phase 2 City of Fitchburg Tax Levy: $13,526,152

Phase 3:

Based on the aforementioned assumptions and development build-out, the third phase of build-out, with no other development in Fitchburg accounted for, will have a **positive $783,000** impact on the City of Fitchburg.

Details

Total Revenues: $1,394,000
Total Expenses: $611,000
Post Phase 3 City of Fitchburg EAV: $3,120,534,537
Post Phase 3 City of Fitchburg Tax Levy: $14,458,412

Conclusion:

There are many variables that will affect the outcome of the fiscal impact, including inflation of expenses, appreciation of existing property values, the total amount of commercial development, the rate / phasing of the development, and rise or fall in expected value of the units. Market appreciation of housing values greatly affects the development. As a result, longer phased build-outs are more greatly affected by market appreciation fluctuation.

Because the levy cap indirectly causes a yearly reduction to the City-wide tax rate, there is a tipping point in the rate / phasing of developments where any new development may become a fiscal burden on the municipality. Due to various levels of service costs for different land uses, a strong mix of uses, including residential and non-residential is planned, in order to assure a positive economic situation.

Chapter 11: Implementation And Action Plan

Staging and Timing Plan

Spreadsheet Model

Phase 1:

The first phase of development is expected to begin with extensions of sanitary sewer and water supply from the northern portion of the area toward the south, and from the eastern and western portions of the neighborhood toward the center. Development will proceed in concert with planned developments, plus progress toward the expansion of park space around the perimeter of McGaw Park.

Timing and phasing of the MPNP will need to be consistent with the Comprehensive Plan. Decisions by city policy makers relative to other neighborhoods and current urban service area development may affect the timing or phasing of the neighborhood.

It is envisioned that progress toward the major TOD and BP nodes will begin during this period, but due to the large size of these areas, development will continue into the second phase. Smaller areas, such as 16, 20, and 21, along Lacy Road, may be completed in the first phase. In order to qualify for LEED-ND, rail/bus rapid transit funding will need to be secured for expansion of services (see Chapter 9 Transportation Plan for more details) in Phase 1.

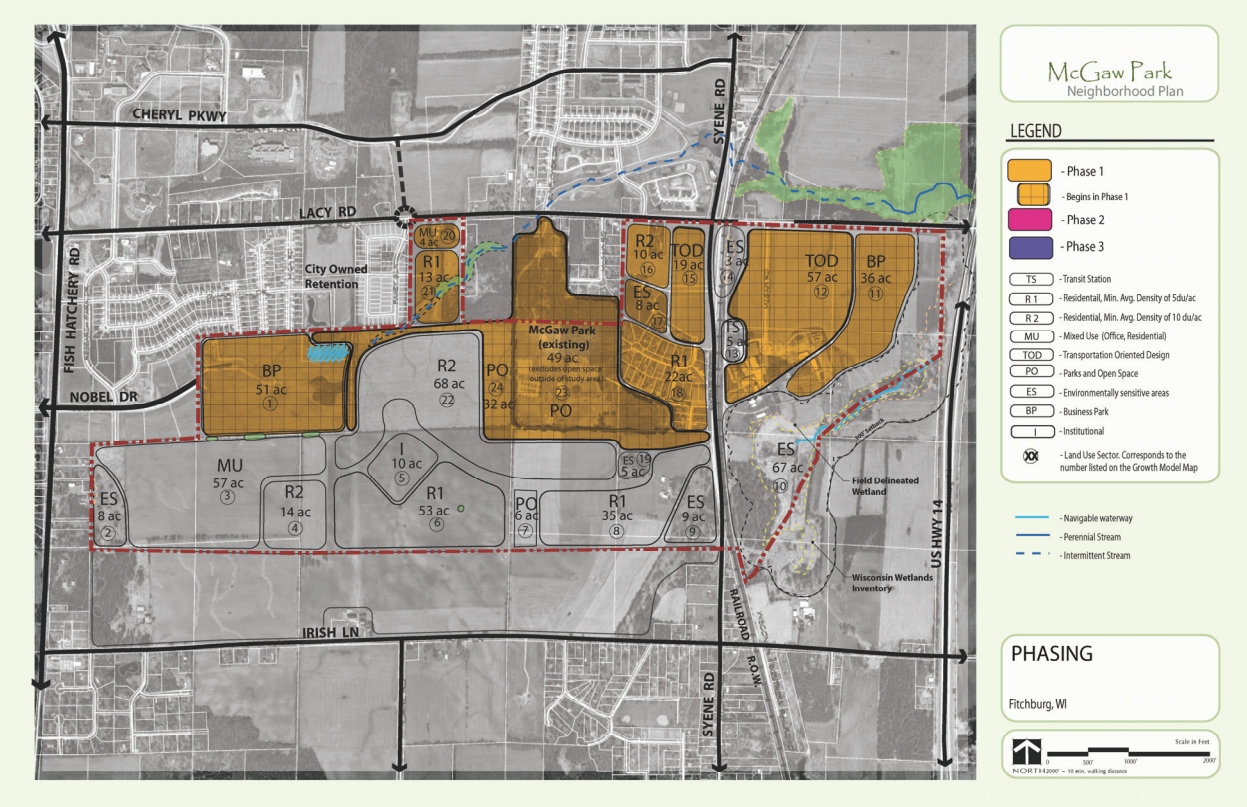

Figure 11.1: Phase 1

Nobel Drive would need to be extended through Area 1 on the western end and Area 12 in the northeastern section of the Neighborhood. Secondary roads would be planned based on development proposals to provide interior circulation and connections to existing roads such as Mica Road.

As Table 11.1 shows, 464 homes and over 640,000 square feet of commercial space, are envisioned in the first phase.

Table 11.1: Phase 1 Development Table

	Total Acreage	ROW (acres) (25%)	Stormwater (acres) (4%)	Net Area (acres)	Residential Units	Park and Open Space (on-site and regional)*	Commercial and Institutional Floor Area (sq. ft.)
R1 (5 du/acre)	35.0	8.8	1.4	24.9	124	8.3	
R2 (10 du/acre)	16.2	4.1	0.6	11.5	115	7.7	
BP	31.2	7.8	1.2	22.2			482,470.6
TOD	24.7						
- Retail	0.0	0.0	0.0	0.0			-
- Office	8.2	2.1	0.3	5.8			127,318.6
- Residential (18 du/acre)	16.5	4.1	0.7	11.7	210	14.0	
MU	4.0						
- Office	2.0	0.5	0.1	1.4			30,927.6
- Residential (10 du/acre)	2.0	0.5	0.1	1.4	14	0.9	
Institutional	0.0	0.0	0.0	0.0			-
Environmentally Sensitive	8.0						
Parks and Open Space	45.6						
Transit Station	0.0		0.0				
ROW	17.8	17.8					
TOTAL	182.5	45.5	4.4	78.9	464		640,716.8

Phase 2

By the end of Phase 2, all of the northern portions of the neighborhood are expected to be completed, with infrastructure extended to serve all of these areas, including the completion of Nobel Drive through the area. The southern portion of the neighborhood is not expected to begin development until the water infrastructure is fully extended. Multi-use paths should be extended during Phases 1 and 2 toward the south through this area, to allow trails to connect bikes and pedestrians to destinations in the neighborhood. A school or other civic institution would be developed by the end of Phase 2. Rail/bus rapid transit would be extended to the neighborhood in Phase 2.

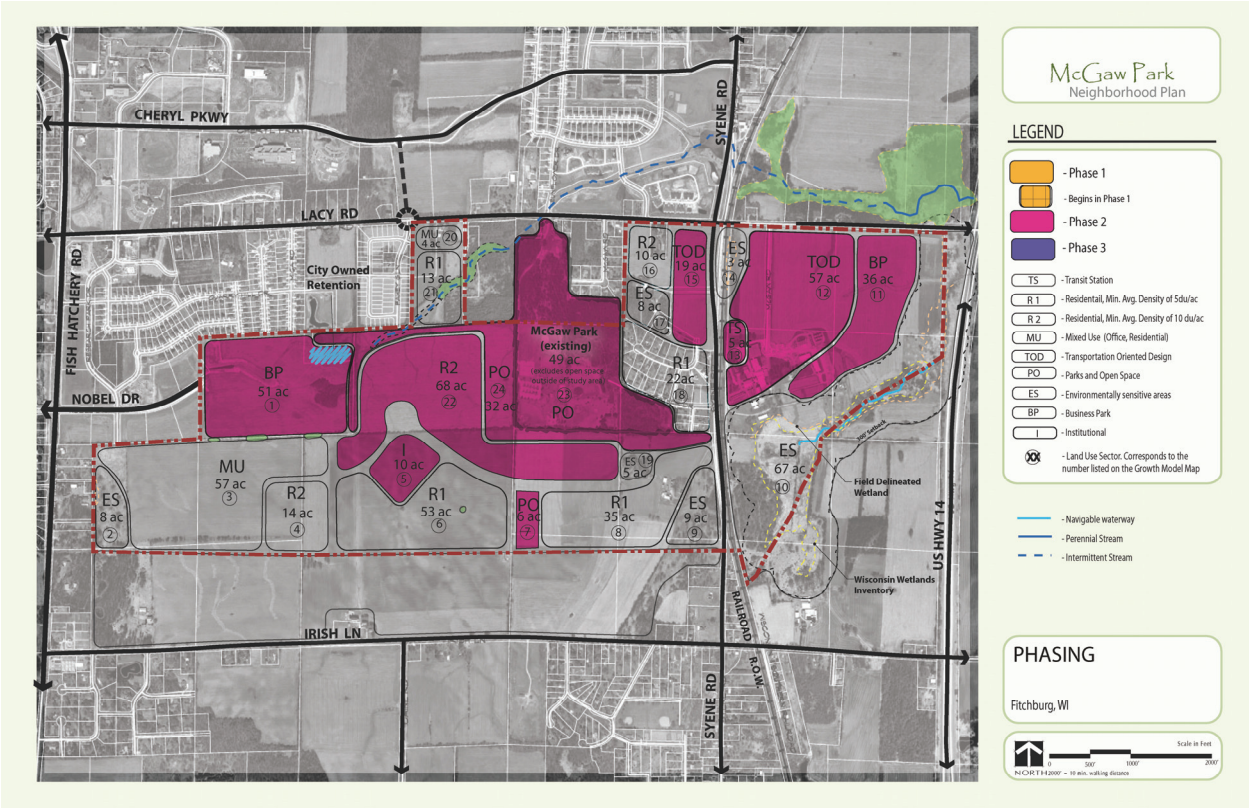

Figure 11.2: Phase 2

Table 11.2 shows the cumulative anticipated development through Phase 2. By the end of Phase 2, 1,266 units of housing are expected, along with over 2 million square feet of commercial development.

Table 11.2: Phase 2 Development Table

	Total Acreage	ROW (acres) (25%)	Stormwater (acres) (4%)	Net Area (acres)	Residential Units	Park and Open Space (on-site and regional)*	Commercial and Institutional Floor Area (sq. ft.)
R1 (5 du/acre)	64.9	16.2	2.6	46.1	230	15.4	
R2 (10 du/acre)	50.8	12.7	2.0	36.1	361	24.0	
BP	72.6	18.2	2.9	51.5			1,122,671.9
TOD	64.6						
- Retail	6.0	1.5	0.2	4.3			92,782.8
- Office	19.5	4.9	0.8	13.9			302,059.6
- Residential (18 du/acre)	39.1	9.8	1.6	27.7	499	33.3	
MU	49.6						
- Office	24.8	6.2	1.0	17.6			383,502.2
- Residential (10 du/acre)	24.8	6.2	1.0	17.6	176	11.7	
Institutional	10.0	2.5	0.4	7.1			154,638.0
Environmentally Sensitive	100.0						
Parks and Open Space	80.6						
Transit Station	5.0		0.2				
ROW	71.0	71.0					
TOTAL	569.1	149.1	12.7	221.9	1,266		2,055,654.5

Phase 3

Phase 3 will primarily consist of developing the southern sections of the neighborhood. These areas would include the Mixed Use Area 3 south of the Business Park, and three residential areas: 4, 6, and 8. All infrastructure would be completed by the end of Phase 3, including roads, water, sanitary, telecom, and transit.

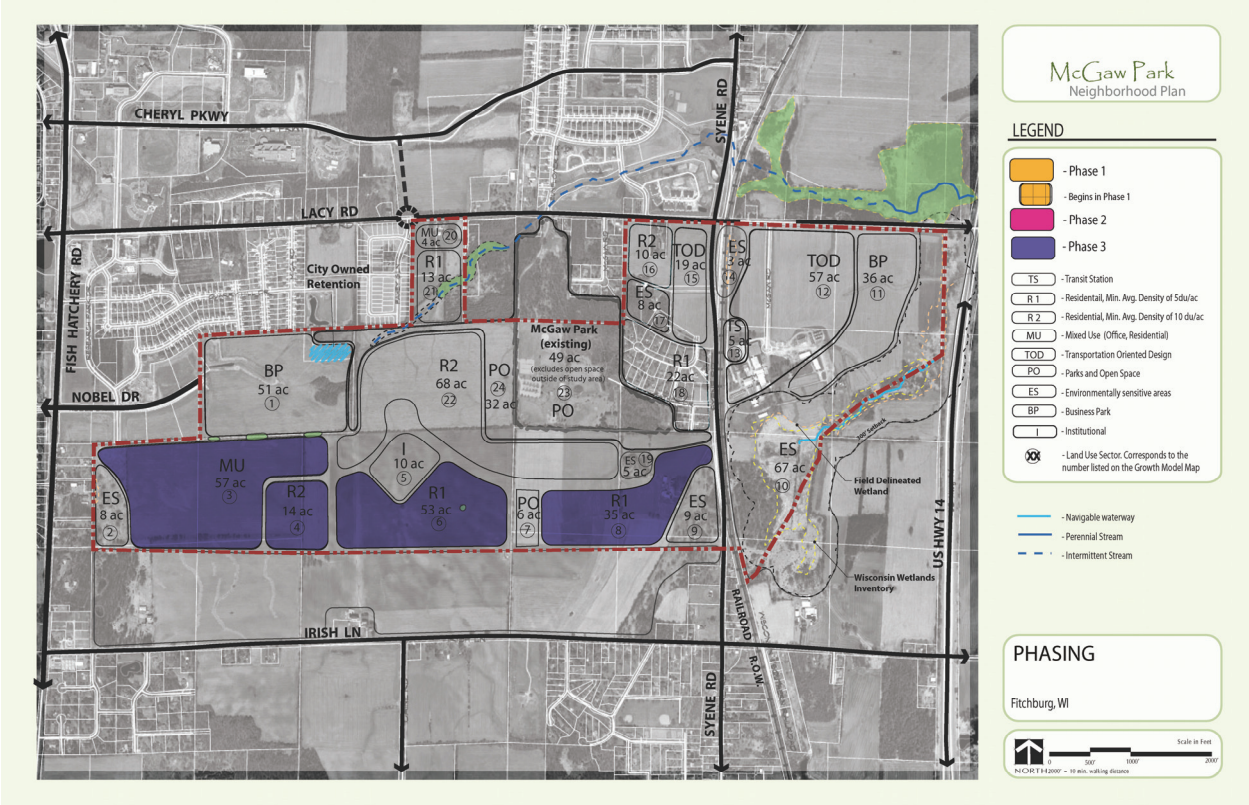

Figure 11.3: Phase 3

By the completion of all three phases: 1,903 homes, and over 2.4 million square feet of commercial development are expected, as shown in Table 11.3.

Table 11.3: Phase 3 Development Table

	Total Acreage	ROW (acres) (25%)	Stormwater (acres) (4%)	Net Area (acres)	Residential Units	Park and Open Space (on-site and regional)*	Commercial and Institutional Floor Area (sq. ft.)
R1 (5 du/acre)	123.0	30.8	4.9	87.3	437	29.1	
R2 (10 du/acre)	92.0	23.0	3.7	65.3	653	43.5	
BP	87.0	21.8	3.5	61.8			1,345,350.6
TOD	76.0						
- Retail	6.0	1.5	0.2	4.3			92,782.8
- Office	23.3	5.8	0.9	16.6			360,822.0
- Residential (18 du/acre)	46.7	11.7	1.9	33.1	596	39.8	
MU	61.0						
- Office	30.5	7.6	1.2	21.7			471,645.9
- Residential (10 du/acre)	30.5	7.6	1.2	21.7	217	14.4	
Institutional	10.0	2.5	0.4	7.1			154,638.0
Environmentally Sensitive	100.0						
Parks and Open Space	87.0						
Transit Station	5.0		0.2				
ROW	71.0	71.0					
TOTAL	712.0	183.3	18.2	318.8	1,903		2,425,239.3

The calculations in the above charts utilized the LEED-ND formula for FAR. All calculations should follow LEED-ND standards, including FAR. The LEED-ND formula for calculating FAR is contained in Neighborhood Pattern & Design Prerequisite 2: Compact Development (page 35 of October 31, 2008 draft). All references to LEED-ND refer to the October 31, 2008 Draft.

Phasing maps should only be used for reference purposes - they show phases in progress of development since many of the areas are large and will develop over time. The following table indicates the percentage build-out of each land-use area on the Growth Model, by phase of development.

Table 11.4: Percent Build-Out per Phase

Parcels		Phase 1		Phase 2		Phase 3	
	Total Acres	% Build-out	# of Acres	% Build-out	# of Acres	% Build-out	# of Acres
1 - BP	51	40%	20.4	100%	51	100%	51
2 - ES	8	0%	0	100%	8	100%	8
3 - MU	57	0%	0	80%	45.6	100%	57
4 - R2	14	0%	0	0%	0	100%	14
5 - I	10	0%	0	100%	10	100%	10
6 - R1	53	0%	0	30%	15.9	100%	53
7 - PO	6	0%	0	100%	6	100%	6
8 - R1	35	0%	0	40%	14	100%	35
9 - ES	9	0%	0	100%	9	100%	9
10 - ES	67	0%	0	100%	67	100%	67
11 - BP	36	30%	10.8	60%	21.6	100%	36
12 - TOD	57	30%	17.1	80%	45.6	100%	57
13 - TS	5	0%	0	100%	5	100%	5
14 - ES	3	0%	0	100%	3	100%	3
15 - TOD	19	40%	7.6	100%	19	100%	19
16 - R2	10	60%	6	100%	10	100%	10
17 - ES	8	100%	8	100%	8	100%	8
18 - R1	22	100%	22	100%	22	100%	22
19 - ES	5	0%	0	100%	5	100%	5
20 - MU	4	100%	4	100%	4	100%	4
21 - R1	13	100%	13	100%	13	100%	13
22 - R2	68	15%	10.2	60%	40.8	100%	68
23 - PO	49	80%	39.2	100%	49	100%	49
24- PO	32	20%	6.4	80%	25.6	100%	32
ROW	71	25%	17.75	70%	49.7	100%	71
Total	712		182.45		547.8		712

Land-use Transition

As development is expected to take place over a twenty-five year period of time, several issues will need to be handled during the transition time.

Transportation

As discussed above and in Chapter 9, the extension of Nobel Drive will be a critical east-west route and prevent the development of the McGaw Park Neighborhood from having undue impact on existing roads, particularly Lacy Road. Yet, since all of Nobel Drive will not be able to be completed in advance of development, it will need to proceed in stages, starting from the western and eastern ends and coming toward the center. Connections to north-south roads will be completed as Nobel Drive is extended.

Funding for transit connections and improvements will need to be secured prior to applying for LEED-ND. This will include a major expansion of transit accessibility to the neighborhood. It is likely that bus improvements will be needed in advance of the build-out of the proposed rail/bus rapid transit build-out.

Land Uses & Environmental corridors

The McGaw Park Neighborhood proposes greater intensity of land uses than many of the neighboring areas. Particular attention needs to be paid in site plan review to the environmental corridor areas between new and existing development. Options include:

- Utilizing public and private open spaces to provide transition areas and environmental corridors between areas.
- Lower intensities immediately adjacent to existing homes and development, stepping back heights of buildings and set-backs to be sensitive to existing neighbors.
- Ensuring that the elements such as generators, parking structure entrances, and other similar uses that may impact neighbors are sensitively sited in proposed new development.

Agricultural Uses

One of the premises of the McGaw Park Neighborhood is to preserve much larger agricultural uses in Fitchburg by planning greater intensity of uses within the expansion of the Urban Service Area. Even so, the design and character of the new development should be planned in a way to minimize impact on agricultural uses to the south, and relieve development pressure on these agricultural lands. For this reason, roads to the south through the neighborhood have not been included as a part of this plan. The creation of Moraine Park to the south of the neighborhood will provide a transition zone to protect agricultural uses that take place to the south.

Implementation

A Neighborhood Plan is a statement of policy, expressing the objectives and aspirations of the City to develop a well-planned community and maintain a high quality of life. The McGaw Neighborhood Plan should be treated as a fluid document and not an end unto itself, emphasizing its impact on sustaining Fitchburg's growth management process.

The Neighborhood Plan is based on a planning and review system that is needed to ensure effective management of development in the City. It is a systematic program intended to influence the rate, amount, type, location and/or quality of future development within the neighborhood. Effective growth management is the product of combining the objectives and policies outlined in this Plan with implementation tools described below. Decisions on funding and regulatory controls are typically made during the implementation phase of the comprehensive planning process.

Adoption of the McGaw Neighborhood Plan does not signal the end of the planning process for the neighborhood. Rather, it signals the beginning of a process of continuing implementation whereby the Plan serves as a guide for the City to make public and private decisions affecting the future of the community. This requires that City leaders and the community be familiar with and generally support the major tenets of the Plan. Therefore, it is important that the Plan be well publicized, understood and supported by the entire community for it to be recognized as a practical and effective guide for the neighborhood. It is also important to keep in mind that the Plan is not static. The City must periodically re-examine and update the Plan as conditions and neighborhood aspirations change.

Plan Implementation

Plan implementation consists of a variety of proactive and collaborative activities that will collectively ensure that the McGaw Neighborhood grows and develops into the well-planned community envisioned in this Plan. Proactive activities are those in which the City initiates actions through a proposal, plan, improvement or regulatory change. On the other hand, collaborative activities are those in which other parties approach the City with a proposal on which the City must act.

Implementation tools represent proactive activities which the City should undertake to generate the types and character of development that foster a well-planned neighborhood that respects environmental features and provides its residents with a high quality of life. In addition to devising a set of implementation tools, the City will also need to review and modify existing City regulations to implement the policies and recommendations outlined in this Plan. In order to ensure LEED-ND certification, each Comprehensive Development Plan should be required to meet the appropriate average density for that particular land use. Additionally, each Comprehensive Development Plan should indicate how it meets the LEED-ND targets.

Development parameters in the Land Use section of this Plan are more general than zoning standards, and it is recognized that as a new zoning code is developed some of the development parameters herein may be altered when reconciled with the zoning code. The zoning code rewrite will be more definitive in terms of building form and site development.

The plan implementation phase of the planning process begins when the Common Council adopts the Plan. Adoption of the Plan then initiates the implementation of the policies and recommendations outlined in the Plan. Since the implementation phase will require time and effort on the part of City staff as well as sensible allocation of the City's financial resources, the Common Council should prioritize all activities to be carried out. To facilitate the implementation of the Comprehensive Plan, the City should consider the following activities:

- **Adopt McGaw Park Neighborhood Plan as an Appendix of City's Comprehensive Plan.** As the City is currently updating their Comprehensive Plan, add the McGaw Park Neighborhood Plan as an Appendix. Adding this Neighborhood Plan as part of the City-Wide Comprehensive Plan adoption will streamline the neighborhoods plan implementation and add legitimacy to the Plans recommendations.

- **Update and revise the Zoning Ordinance and Land Subdivision Regulations.** The City should review and update its Zoning Ordinance and the Land Subdivision Regulations to ensure that they are consistent with the policies and recommendations outlined in this Plan. More specifically, the Zoning Map should be updated to reflect newly created zoning districts, and changes to existing zoning districts. Also, the standards contained in both the Zoning Ordinance and Land Subdivision Regulations should be reviewed and updated.

- **Adopt a 3 to 5-year McGaw Park Capital Improvements Program.** A capital improvements program relates the recommendations in the Comprehensive Plan with the financial capabilities of the City. A capital improvements program is generally defined as a prioritized record of public improvements to be provided over a certain period of time relating to the need for improvements such as streets, parks and open spaces, and other civic infrastructure. The Capital Improvement Program should be realistic in the current economic situation and based upon the McGaw Park Phasing. Prioritization of these improvements is based on the City's fiscal ability and resource capacity to support them, as well as build-out phasing. The value of a capital improvements program is its ability to provide citizens and public agencies a clear conception of the projects to be constructed and financed in the coming years. It is under these circumstances that the community may avoid duplicating wasteful services as well as call attention to any deficiencies that the City may have in order to stimulate action to promptly correct them. Over the course of the McGaw Park build-out, the CIP should be updated accordingly.

Monitoring & Updating the Comprehensive Plan

The Comprehensive Plan is based on dynamic variables whose future direction cannot always be accurately predicted. This Plan is based on currently available information regarding neighborhood conditions and desires, development trends, and an understanding of environmental issues. Over time, some of these assumptions will change. Accordingly, changes in variables such as population and development trends should be monitored periodically and compared with the Plan's assumptions and recommendations. Based on this periodic review, modifications to the Plan may be necessary to ensure that the Plan is kept current and accurately reflects the McGaw Park Neighborhood's needs and overall vision. The Plan should be updated in accordance with the Comprehensive Plan

Implementation Action Plan

An implementation action plan identifies and defines each planning and community development activity to be carried out during a particular fiscal year, the individual responsibilities of the City for each activity, and the specific involvement of the Plan Commission where appropriate. The table below is designed to provide a starting point for prioritization and budgeting of actions needed to implement strategies and recommendations outlined in this Plan. The action plan identifies several potential key organizations and governmental agencies that will take part in the implementation process. In order to provide for orderly development, CDP's should be consistent with the phasing and USA expansions. A timeframe for each activity is also specified to define general phasing for implementation. Further refinement of this table will be needed as details of costs and staff resources are verified and become available. In addition, the City should review and update the action plan on an annual basis to ensure that it stays within the City's financial ability and resource capacity.

Action Steps

Classification	Action Step	Responsibility	Timeframe
Resource Monitoring	Environmental corridor restoration and construction monitoring, documentation & approval.	City Public Works	Ongoing
Resource Monitoring	Visual observations & photographs of stream channel erosion & sedimentation conditions.	City Public Works	Ongoing
Resource Monitoring	Environmental monitoring: stream & spring baseflow, stream temperature, channel cross section resurvey, stage monitoring.	City Public Works	Ongoing
Planning	Adopt Plan as an Amendment to City-wide Comprehensive Plan	City of Fitchburg	Pre-Phase 1
Planning	Update Zoning Code to reflect policies and strategies in the Plan	City Planning & Zoning	Pre-Phase 1
Planning	Update Zoning Map to reflect newly created zoning classifications.	City Planning & Zoning	Pre-Phase 1
Planning	Create a Capital Improvement Plan to provide a record of public improvements to be provided over a certain period of time.	City of Fitchburg	Pre-Phase 1
Planning	Expand physical geography of McGaw Park as indicated in Phase 1 plan	City Planning & Zoning, Park District, Property Owners	Phase 1
Planning	Review and Update Plan as necessary	City of Fitchburg	Phase 1, Phase 2, Phase 3
Planning	Work with Fitchburg Technology Campus to expand their existing campus under the principals and policies outlined in the Plan.	City of Fitchburg	Phase 1
Planning	Work with appropriate school district(s) to establish an elementary school in the Neighborhood	City of Fitchburg, School Districts	Phase 2
Planning	Work with appropriate higher education institutions to determine if new facilities are needed in the Neighborhood.	City of Fitchburg, higher education institutions	Phase 2
Planning	Convene TID Advisory Committee for the creation of the Tax Incremental Districts	City Economic Development	Phase 1, Phase 2, Phase 3
Planning	Work with property owners and developers to implement land use and design elements of Neighborhood Plan	City Planning & Zoning, Property Owners, Builders, Developers	Phase 1, Phase 2, Phase 3
Planning	Adopt Design Guidelines for Neighborhood	City Planning & Zoning	Pre-Phase 1
Planning	Provide additional paths along an existing swale on the current Hartung site to connect the Transit Oriented Development area with the Environmentally Sensitive area to the east.	City Planning & Zoning, City Public Works,	Phase 2
Planning	Establish park and open space easement connections through the neighborhood, as indicated in Figure 7.1.	City of Fitchburg, Property Owners	Phase 1

Planning	Provide the necessary park and open space as outlined by the dedication requirements	City of Fitchburg, Property Owners, Developers	Ongoing
Planning	Ensure the preservation of the Environmentally Sensitive Area through easements, trusts, purchase of those lands, or other mechanisms.	City of Fitchburg, Property Owners	Pre-Phase 1
Planning	Establish land uses compatible with the proposed transit center including necessary parking (structure, surface, and /or underground) and public plaza	City of Fitchburg, Madison Metro	Phase 2
Planning	Discuss urban service area phase-in with CARPC to determine sizes & timing of future amendment areas	City of Fitchburg	Pre-Phase 1
Planning	Urban service area amendment application to CARPC for Phase 1 (May be multiple amendments pending discussion with CARPC.)	City of Fitchburg	Pre-Phase 1
Planning	Develop agricultural transition plan	City of Fitchburg	Pre-Phase 1
Planning	Urban service area amendment application to CARPC for Phase 2. (May be multiple amendments pending discussion with CARPC.)	City Planning & Zoning	Pre-Phase 2
Planning	Establish strategic market campaign for neighborhood.	City Economic Development	Phase 1
Planning	Urban service area amendment application to CARPC for Phase 3. (May be multiple amendments pending discussion with CARPC.)	City Planning & Zoning	Pre-Phase 3
Transportation	Modify the City of Fitchburg Draft Comprehensive Plan and the Madison Area MPO functional roadway classifications as recommended in the MPNP.	City Planning & Zoning, City Public Works, and MPO	Phase 1
Transportation	Modify the City of Fitchburg bicycle & pedestrian planning maps to incorporate the MPNP bicycle and pedestrian recommendations.	City Planning & Zoning, City Public Works	Phase 1
Transportation	Modify design plans for new USH 14 interchange, including plans for Interchange Road, the East Cheryl Parkway extension, and the Lacy Road & Interchange Road intersection, as identified in the MPNP.	City Planning & Zoning, City Public Works with WisDOT approval	Phase 1
Transportation	Obtain MPO acceptance for the anticipated skew at the proposed Syene Road & Nobel Drive intersection.	City Planning & Zoning, City Public Works with MPO approval	Phase 1

Transportation	Reserve rights-of-way for improvements to existing roadways and intersections, as well as for new roadways and intersections.	City Planning & Zoning, City Public Works, Dane County	Phases 1, 2 & 3
Transportation	Work with property owners, including owners of the Hartung facility, so that Nobel Drive from Research Park Drive through to Lacy Road can be constructed in stages as development pressures occur.	City Planning & Zoning, City Public Works	Phases 1 & 2
Transportation	Work with WisDOT, Madison Metro, the MPO, THRIVE, and RTA for the activation of the rail/bus rapid transit corridor on the east side of Syene Road.	City Planning & Zoning, City Public Works	Phase 1
Transportation	Expand and/or establish new transit routes to accommodate the MPNP – including the use of the dormant rail/bus rapid transit corridor.	City of Fitchburg, Madison Metro	Phases 1, 2 & 3
Transportation	Determine which transportation-related LEED credits will be sought and establish specific rules for the MPNP so that the credits may be obtained.	City Planning & Zoning, City Public Works	
Utilities	Update MPN stormwater performance standards to maintain conformance with evolving State, County and City requirements	City of Fitchburg	Ongoing
Utilities	Stormwater management design review	City of Fitchburg Public Works	Ongoing
Utilities	Explore ideas for onsite energy generation	City of Fitchburg Public Works	Ongoing
Utilities	Well siting study for well 7 & 8 replacement	City Public Works	Pre-Phase 1
Utilities	Construct new well to replace existing wells 7 & 8	City Public Works	Phase 1
Utilities	Construct relief interceptor at Syene Road		Pre-Phase 2
Utilities	Construct new water supply reservoir	City Public Works	Pre-Phase 3
Telecommunications	Include a fiber connection along the construction of Nobel Drive from Fish Hatchery to the TOD and planned Business Park east of Syene Road.	City of Fitchburg, private carriers	Phase 2
Telecommunications	Install a WiFI hot spot in the TOD area.	City of Fitchburg, private carriers	Phase 1