CHAPTER TWO

Inventory and Analysis

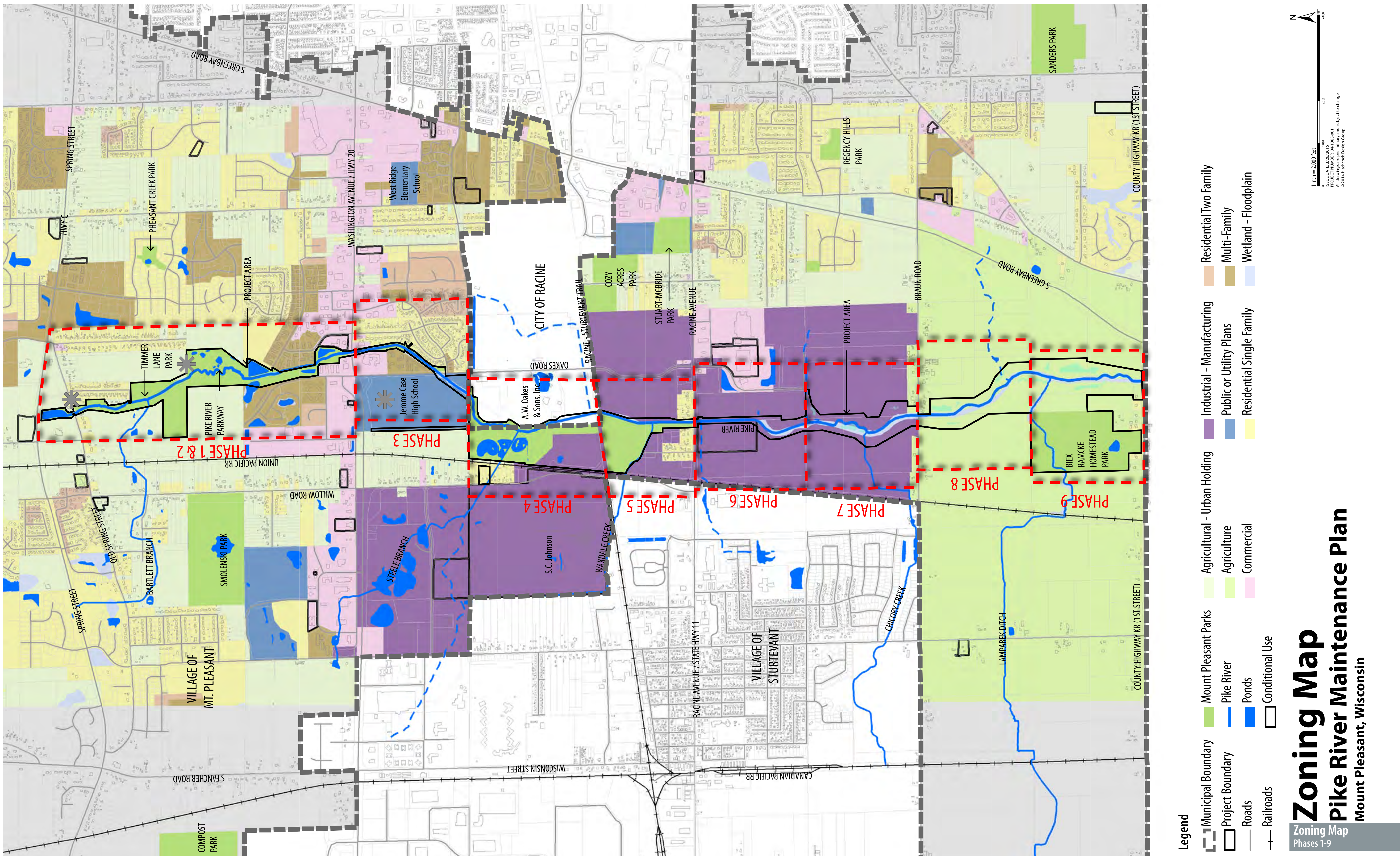
Overview

The Inventory & Analysis Chapter of the report describes and illustrates the existing conditions of the Pike River Corridor. The information in this chapter is used to develop a base-line understanding of the Pike River Corridor.

GENERAL CONDITIONS AND DESCRIPTION

Zoning and Land Use

The land within and adjacent to the project area falls into several zoning categories which include residential, parks, industrial, agriculture and public or utility (which includes Village of Mount Pleasant stormwater basin and utility easements). The Pike River Corridor (PRC) shares borders with several local businesses including: S.C. Johnson, A.W. Oakes & Sons, Graham Packaging Co., CNH America, LLC, The Promotions Partnership, Case New Holland and several others not directly adjacent but within a half mile. Phase 3 is easily accessed from Jerome Case High School to the west and West Ridge Elementary is within about a mile of the corridor. Commercial big box stores, including Menards, Goodwill and Walmart are east of Phase 6. (See Zoning Map)


Zoning Map
Pike River Maintenance Plan
Mount Pleasant, Wisconsin
Zoning Map
Phases 1-9
Legend
Municipal Boundary
Project Boundary
Roads
Railroads
Mount Pleasant Parks
Pike River
Ponds
Conditional Use
Agricultural - Urban Holding
Agriculture
Commercial
Industrial - Manufacturing
Public or Utility Plans
Residential Single Family
Residential Two Family
Multi-Family
Wetland - Floodplain
1 inch = 2,000 feet
PHASE 1 & 2
PHASE 3
PHASE 4
PHASE 5
PHASE 6
PHASE 7
PHASE 8
PHASE 9
PIKE RIVER
PROJECT AREA
CITY OF RACINE
VILLAGE OF MT. PLEASANT
VILLAGE OF STURTEVANT
S GREENBAY ROAD
SPRING STREET
HWY C
PLEASANT CREEK PARK
WASHINGTON AVENUE / HWY 20
West Ridge Elementary School
TIMMER LANE PARK
PIKE RIVER PARKWAY
Jerome Case High School
UNION PACIFIC RR
WILLOW ROAD
OLD SPRING STREET
BARTLETT BRANCH
SMOLENSKI PARK
STEEL BRANCH
OAKES ROAD
A. W. Oakes & Sons, Inc.
RACINE - STURTEVANT TRAIL
COZY ACRES PARK
STUART-MCBRIDE PARK
RACINE AVENUE
S.C. Johnson
WAXDALE CREEK
REGENCY HILLS PARK
BRAUN ROAD
SANDERS PARK
COUNTY HIGHWAY KR (1ST STREET)
BIEX RAMCKE HOMESTEAD PARK
CHICORY CREEK
LAMPAREK DITCH
RACINE AVENUE / STATE HWY 11
WISCONSIN STREET
CANADIAN PACIFIC RR
S FANCHER ROAD
COMPOST PARK

This Page Intentionally Left Blank

Utility Inventory

Stormwater culvert from Hwy 20 draining into Phase 3, showing erosion where rip-rap and boulders were blown out by high flows.

This section provides an overview of the utility structures present in the study area.

UTILITY INVENTORY

Storm water runoff consisting of precipitation events and snow/ice melt is a vital resource to the Pike River. Some of the runoff reaches the river via overland flow and some is discharged directly to the river through storm sewer outfalls. Other structures on the river allow pedestrian and/or vehicle traffic to safely cross over the river. It is important for these storm structures to function properly. Therefore, a database of the storm water structures was created for use by the Village as presented in this chapter. A detailed recommended maintenance plan for the flood control and storm water infrastructure is shown in Chapter 5.

Purpose and Description

Since the construction of the Pike River Improvements project began in 2002, exactly ninety-eight storm water structures have been installed or modified within the Village of Mount Pleasant's Pike River corridor to manage runoff prior to discharging into the river. These structures are owned and maintained by the Village of Mount Pleasant. Because these structure are assets to the Village, a complete inventory and analysis was done to field assess the current condition of pond outfalls, pond weirs, bridge and culvert crossings, channel outfalls, trail crossings, pond-to-pond connections, pond outlet structures, pond-to-channel connections, emergency spillways, retaining walls, headwalls, rock dams, slope reinforcement, and stone core filters. Pond observation was also included in the utility inventory and vegetation encroachment, if evident, was noted; however, pond sediment depths were not measured.

Review of Existing GIS and As-Built Plans

The Village of Mount Pleasant's Geographic Information Systems database along with construction as-built drawings for Phases 1 through 6 were obtained and reviewed prior to going out in the field to be sure that all structures would be accounted for in the inventory.

Field Conditions

Eighty-eight of the existing structures were field assessed from October 7 through October 9, 2014; and the remaining ten structures were assessed on December 2, 2014. In October, the weather conditions were partly sunny, 60 degrees Fahrenheit, and dry all three days with the exception of trace rainfall on the morning of October 7th. In December, the weather conditions were partly sunny, 18 degrees Fahrenheit, and dry. During the assessment, various forms of wildlife were observed throughout the corridor such as mallard ducks, skunks, salmon, trout, hawks, great blue heron, and gulls. A trail walker even mentioned seeing salmon north of Wendi Court Bridge during the fall salmon run.

Structures Not Included In The Inventory

The existing structures (e.g. drain tile outfalls) and stream banks located in the future Phases 7 through 9 area were not included in the inventory because they will be modified during construction. Those phases are scheduled to be completed over the next few years, including the Phase 8 Braun Road storm sewer outfall that was installed just a few years ago.The Highways 11 and 20 bridges were also not included in the inventory because they are both owned and operated by the State of Wisconsin, and two outfalls owned by the County as part of the Highway C right-of-way drainage system. Therefore these bridges and outfalls were not considered Village assets.

Inventory And Key Findings

The location of each structure that was assessed in the field is numerically-identified on the attached Storm Structures Phase Maps, which also correspond to the Storm Structure Summary Table found in the Appendix. The summary table includes the following information for each structure:

- Structure identification number
- Structure type and function
- Size, material and shape
- Presence of end walls, wing walls, grates and trash racks
- Presence of rock reinforcement and slope stability
- Field observations
- Maintenance recommendations (see Chapter 4.1)

A general list of the observations made in the field is summarized below. Detailed observations are shown in the Summary Table.

1. Minor signs of steel pipe corrosion or concrete pipe/box deterioration were visible, which do not appear to be negatively impacting the structural integrity. An example is shown in photo 1.
2. Many of the trash racks that were shown on the as-built plans were either missing or were not installed during construction. An example is shown in photo 2.
3. Most of the side slopes downstream of end sections (flared outflow of culvert pipe) are stable. Only a few were observed to show signs of erosion and gully formation. An example is shown in photo 3.
4. Several channel outfalls (the visible portion of the storm sewer pipes that discharge directly into the Pike River through the channel side slopes), especially in the upper reaches (Phases 1-3), have vegetation, sediment and/or riprap within and around the end section. One end section in Phase 2 has been disconnected from the pipe. An example is shown in photos 4 and 5.
5. Several end sections are obstructed by small diameter trees and brush growing just downstream of (in front of) the discharge points. This woody vegetation is obstructing free flow discharge and causing sediment to build up inside of the pipes and end sections. An example is shown in photo 6.
6. The channel outfall structures were difficult to find because they were hidden from plain view either because of topography or they were obstructed by vegetation. As time goes on, these structures will become increasingly more difficult to find.
7. Several channel outfalls are showing signs of undermining beneath the end sections. An example is shown in photo 7.
8. One small diameter pipe in Phase 3 may have illicit discharges (Structure 52) that needs to be investigated further. An example is shown in photo 8.
9. The Oakes Road culverts (Structure 61) are set too high and impede fish passage, which is discussed in more detail in Chapter 2.4. An example is shown in photo 9

Photo 1: The end section edges of Structure 19 are spalling and are exposing the rebar reinforcement.

Photo 2: The as-built plan for Structure 41 shows that a trash rack was installed; however, no trash rack is present.

Photo 3: Gully erosion has formed around the west end of Structure 29 from the shoreline to approximately ten feet landward over the top of the pipe.

Photo 4: The channel end section of Structure 31 is approximately half-full of riprap.

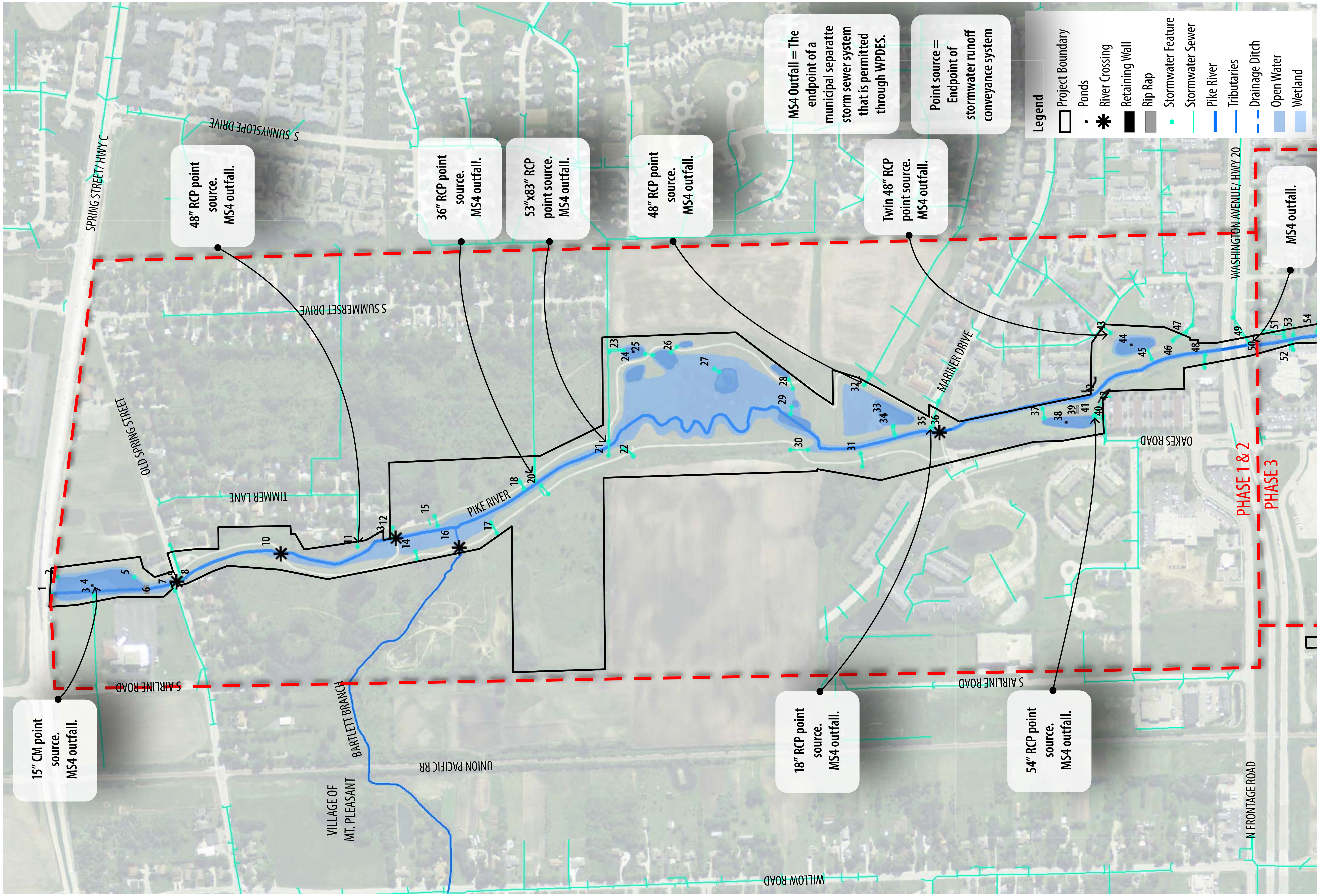
Photo 5: The channel end section of Structure 45 is detached from the pipe.

Photo 6: The end section of Structure 26 is obstructed by woody vegetation.

Photo 7: The end section of Structure 94 is undermined by approximately twelve inches.

Photo 8: Suds were observed at the channel outfall of Structure 52 indicating a possible illicit discharge.

Photo 9: The downstream inverts of Structure 61 (three parallel pipes) sit at least twelve inches above the water surface.

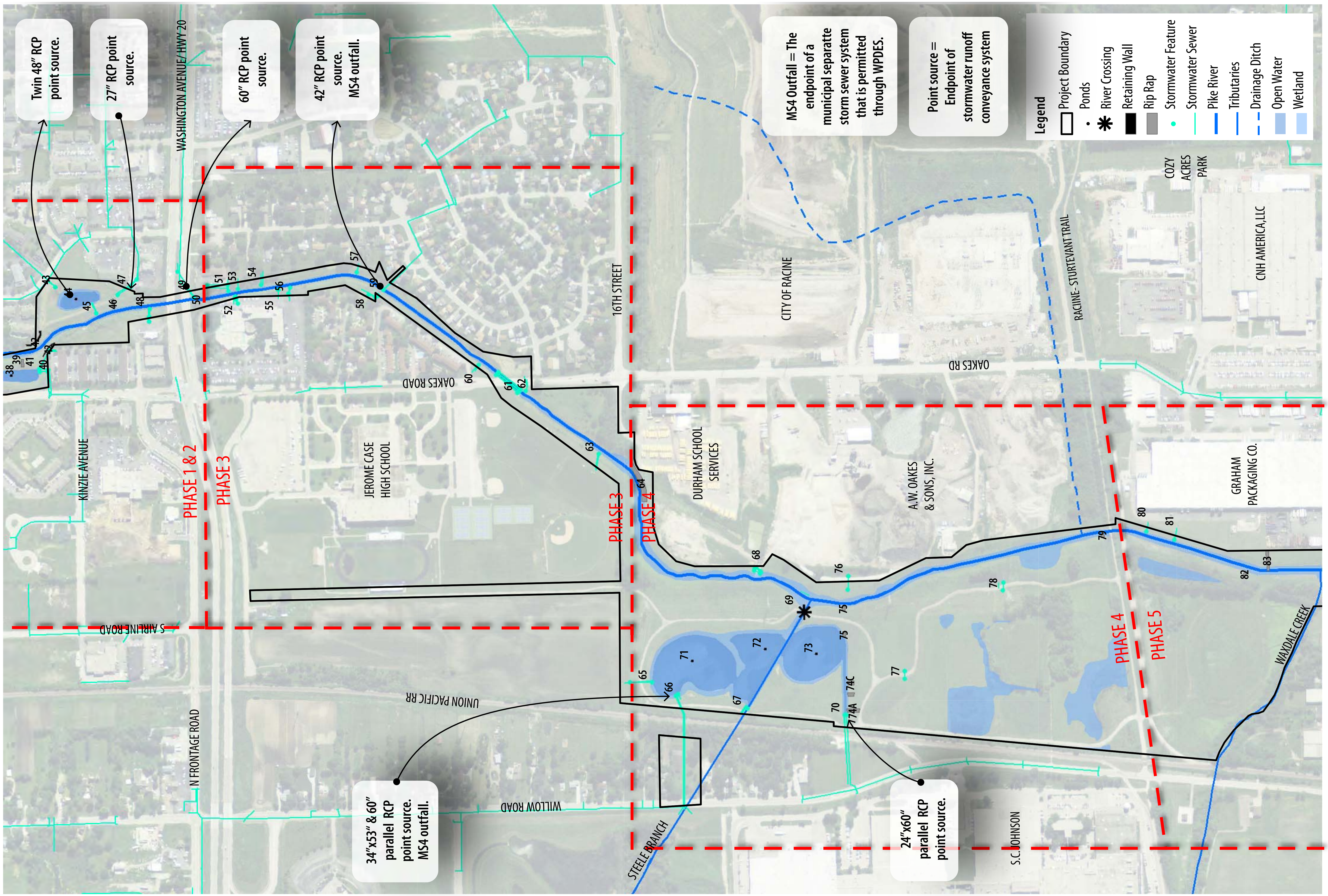


Storm Structures Phase 1 & 2

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

This Page Intentionally Left Blank



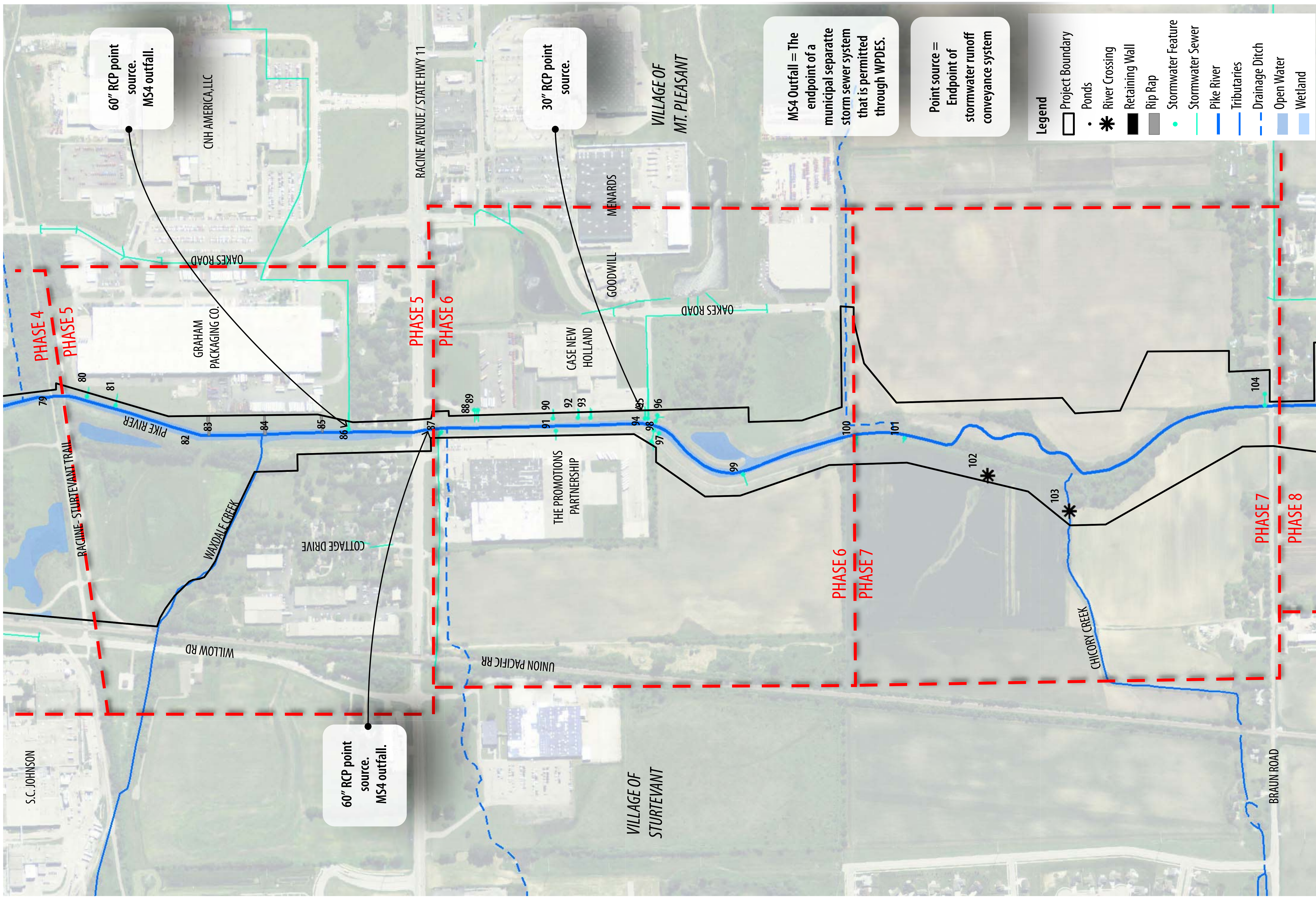
Storm Structures Phase 3 & 4

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

Storm Structures Phase 3 & 4

This Page Intentionally Left Blank



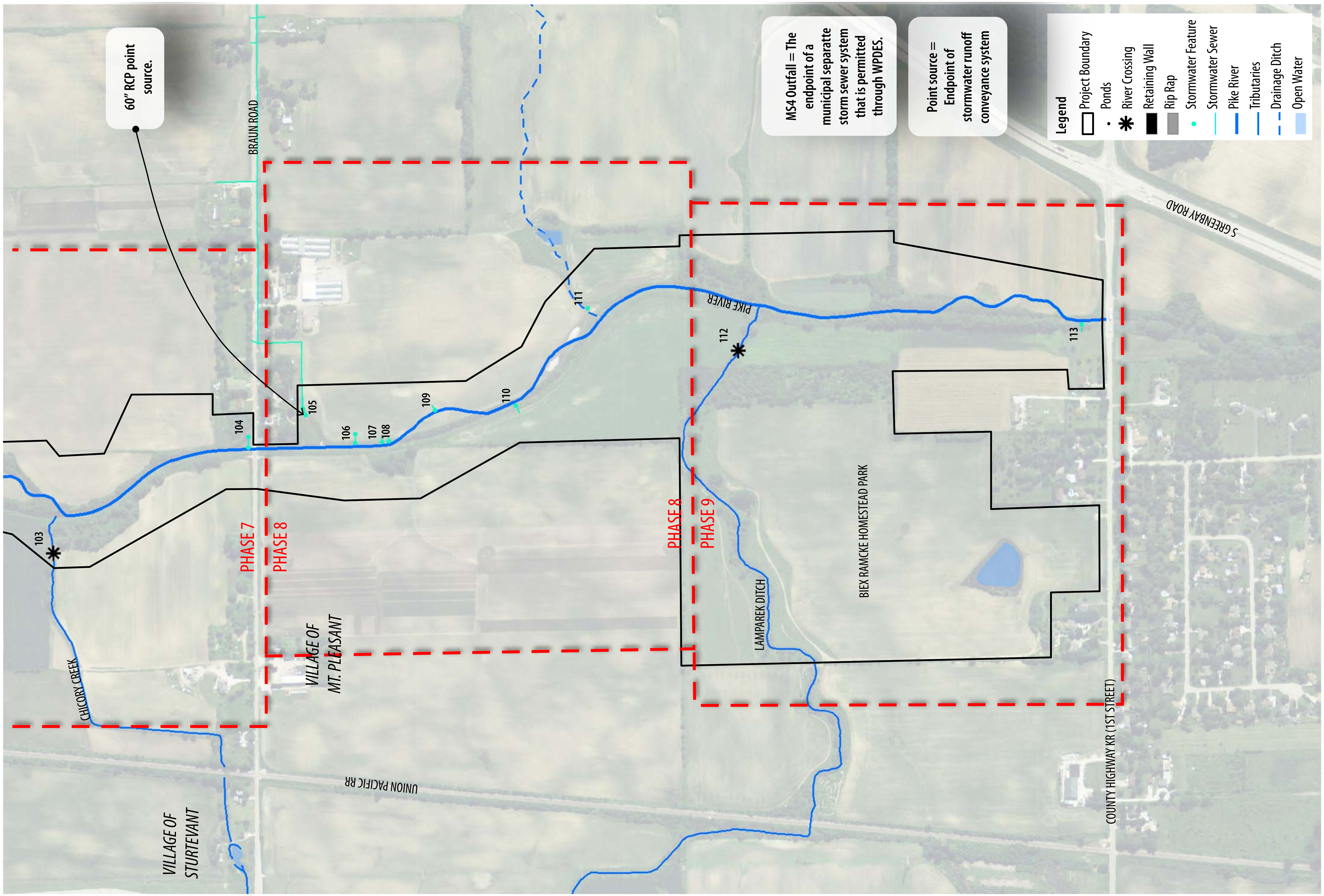
Storm Structures Phase 5, 6 & 7

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

Storm Structures
Phase 5,6 & 7

This Page Intentionally Left Blank



N

1 inch = 550 feet

Storm Structures Phase 8 & 9

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

Storm Structures
Phase 8 & 9

This Page Intentionally Left Blank

Waxdale Creek southwest of S.C. Johnson Waxdale plant. Photo by A. Thompson 2014

Vegetation, Prairie and Wetland Resources

A core objective of the Pike River Corridor Restoration is to re-establish a mixture of wet and dry prairie vegetation communities, similar to those that existed in the watershed prior to European settlement.

VEGETATION, PRAIRIE AND WETLAND RESOURCES

During the field season of 2014, Alice Thompson and Heather Patti visited each Phase and major tributary (Bartlett Branch, Steele Branch, Waxdale Creek, Chicory Creek and Lamparek Ditch) to collect data on existing vegetation, community types and invasive species (see Vegetation Data Summary in the Appendix). Because Alice Thompson has been involved with the project since the construction of Phase 1 in 2002, historic vegetation monitoring data and Thompson and Patti's deep-rooted knowledge of the corridor were also used to assess the vegetation within each phase.

All vascular plant species (native and non-native) observed during the site visits were recorded on the data forms (see Appendix for a sample form). Vegetation management needs and opportunities were also noted, along with specific observations of birds, waterfowl, invertebrates, insects and other wildlife. Invasive species, debris piles, ATV usage areas and areas receiving fishing pressure were also mapped with a handheld GPS unit with sub-foot accuracy.

The five major tributaries along the corridor – Bartlett Branch, Steele Branch, Waxdale Creek, Chickory Creek and Lamparek Ditch were walked on foot where there was public access or visited at areas accessible to the public (e.g. road crossings). Native and non-native/invasive vegetation data were taken along each tributary, eroded areas/incised channels areas were mapped, debris piles were noted, and observations where buffering and restoration opportunities could occur were mapped. A summary of the tributary data can be found in the Appendix.

A SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis was created for each Phase. The tributaries were included with the SWOT analysis of the Phase that they are confluent to. These nine SWOT tables are intended to provide a snapshot of current conditions and to aid in long-term management of the corridor.

In the following narrative, plant names will be presented as follows: for the first mention of the plant, the common name will be provided following with the scientific name in parentheses. Afterwards, the plant's common name will be utilized. The plant names are taken from the State of Wisconsin 2014 Wetland Plant List (USACE, 2014) for scientific names, and the plant community classification utilized Eggers & Reed's Wetland Plant Communities of Minnesota and Wisconsin (USACE, 1997) and WDNR Ecological Landscapes for this region (WDNR, 2015).

Phase 1 and the Bartlett Branch

This is the oldest phase, constructed in 2002 and 2003. Plantings included native seedings in 2002 and 2003 and aquatic and prairie plantings installed from "plugs" or pots. Trees and shrubs were planted as bare root stock, and ball and burlap shrubs were planted from 2003 to 2006. Today the corridor consists of well-established dry prairie, mesic to wet-mesic prairie, sedge meadow, fresh (wet) meadow and emergent wetland plant communities (refer to map in appendix). The most dominant prairie species include side oats grama (*Bouteloua curtipendula*), big bluestem (*Andropogon gerardii*), stiff goldenrod (*Solidago rigida*), Canada wild rye (*Elymus canadensis*), switch grass (*Panicum virgatum*), Indian grass (*Sorghastrum nutans*), and New England aster (*Aster novae-angliae*). Many of the trees and shrubs that were planted in 2003 have shown good survivability and now range from 3' – 10' tall.

There are native prairie species adjacent to the restored prairie in Mount Pleasant Park to the west, and ecologically it would be ideal to expand the prairie buffer and manage that prairie with other Phase 1 management activities, including control of invasive species and prescribed burns.

The Phase 1 wetland complex is composed of emergent aquatic, southern sedge meadow, wet prairie and wet-mesic prairie community types. The plant species diversity attracts wildlife and waterfowl. A large spring fed marsh feeds into the Pike River surrounded by cattail (*Typha spp.*) and soft stemmed bulrush (*Scirpus atrovirens*). There is open water (3-18 inches) within the marsh year-round.

The continued planting of this phase from 2002 to 2006 was instrumental in developing the current plant diversity.

The current trail system and three parking lots attracts many visitors. Racine Hoyt Audubon birders (local birding organization) regularly visit the Phase, and report back on management concerns, including the location of a new invasive plant, hairy willow herb this year. There is a good potential to generate active volunteers who have valued this open space.

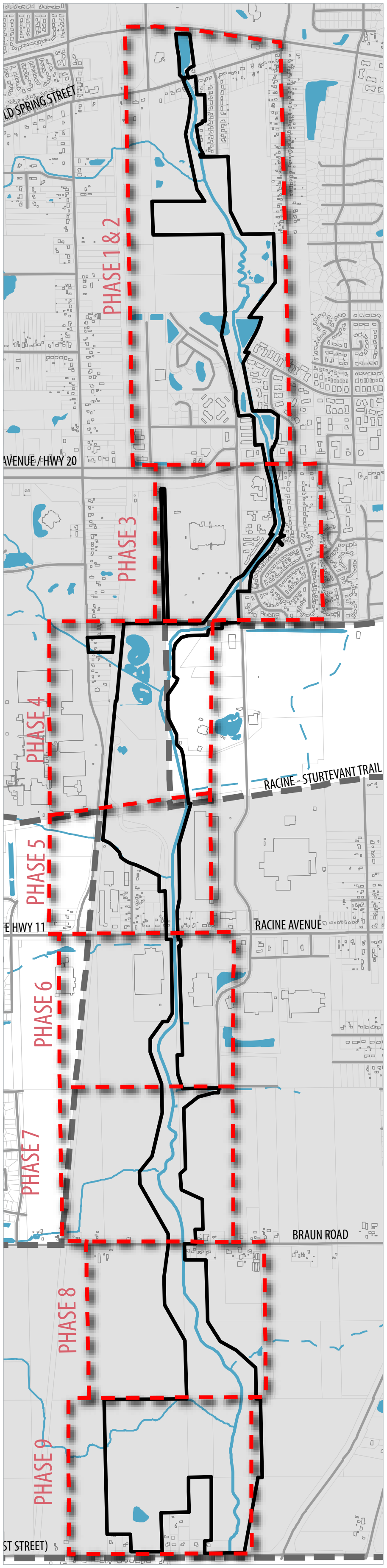
The native seed naturally generated each year could be collected by volunteers or consultants performing monitoring and management, and used to re-seed bare areas in other phases. For example, the bare areas south of Phase 1 which recently had a persistent beaver dam (removed in 2014) could be re seeded with seed collected adjacent to it.

A major management issue of this Phase is the invasion of reed mannagrass (*Glyceria maxima*) that occurred immediately following restoration at the mouth of the Bartlett Branch. This invasive plant is a relatively recent arrival into southeastern Wisconsin. Field work on the Bartlett Branch in 2014 established that a monoculture of reed mannagrass extends from the Union Pacific railroad tracks east to the confluence of the Pike, suggesting that the railroad may be a vector in the spread of this invasive plant (see Tributary Maps in the Appendix). Reed mannagrass appears to be expanding onto the Pike stream shelf especially where there are stormwater inputs. As it spreads, it creates a mono-culture with a strong root bed that outcompetes other vegetation, even cattails. Attempts at control via herbicide have been minimally successful, as repeated visits and re-plantings within the treated areas is critical. Because the existing reed mannagrass population now literally covers acres along the Pike in Phase 1, it is our opinion that management of this species should focus on the prevention of new, smaller "satellite" populations from becoming established downstream in Phases 2-9. The patches of reed mannagrass further downstream (except for Phase 4) are currently smaller and more manageable.

Native prairie vegetation communities provide a diverse suite of habitats for insect pollinators, birds and mammals. The deep-rooted plants help to improve water quality by filtering out pollution and promoting groundwater infiltration. By shading the stream channel, tall grasses and shrubs help to maintain conditions suitable for native stream fishes.

Strengths of this phase include the robust wildlife habitat, especially utilized by birds, amphibians, invertebrates and butterflies. The wet-mesic prairie buffers the restored river and spring fed marsh. Overhanging vegetation that cools the stream and provides plant debris includes cattail, prairie cord grass and shrubs including red osier dogwood and sandbar willow.

Hairy willow herb (*Epilobium hirsutum*) is also a recent invasive in the county and was present in 2014 in three isolated locations in Phase 1. It has the ability to spread rapidly, also outcompeting cattails, and cutting/herbiciding control was initiated in 2014. Grant funding may be available due as it is a targeted plant by the WDNR under NR 40 (the Invasive Species Rule).



Another threat is the over-mowing into restored prairie by adjacent landowners north of Spring Street. Better signage and community involvement may be required to end over-mowing.

A rotating prescribed burn regime of both wetland and prairie will encourage native forb and grass development and deter the establishment of aggressive shrubs and trees (e.g., cottonwoods, mulberry and honeysuckle saplings). One prescribed burn did occur on Phase 1 in the spring of 2009 (EC3 provided burn services), and as a result woody invasive species are not as well developed as on other phases. A prescribed burning schedule is proposed in the Maintenance Plan section of this document.

Ongoing vegetation management activities (primarily herbicide application) has occurred each year on Phase 1, including the control of white sweet clover (*Melilotus alba*), hairy willow herb, reed canary grass (*Phalaris arundinacea*), crown vetch (*Coronilla varia*), bird's foot trefoil (*Lotus corniculatus*), reed mannagrass and giant reed grass (*Phragmites australis*). Prescribed burning and the ongoing management of these invasives are key vegetation management goals (to be discussed in the Maintenance Plan section). *Phragmites* has been chemically controlled yearly since 2004 and is in very low numbers although it persists likely due to constant colonization from stormwater ponds and ditches feeding into the corridor.

The Bartlett Branch has decent vegetative buffers, considering heavy residential development. However, reed canary grass is dominant along the branch, and reed mannagrass is dominant east of the railroad tracks. The Bartlett headwaters has an established prairie west of Tallgrass Lane and south of Spring Street that provides significant vegetative buffer. There is additional buffer opportunity on farmland adjacent the Bartlett south and west of Suzanne Lane (referred to as site "W02" in the 2013 Pike River Watershed Plan). The current shrub cover over portions of the Bartlett Branch west of the Union Pacific Railroad provide important ecosystem services, including shading the stream and overshadowing potential invasive plants.

Phase 2

Phase 2 was constructed in 2004 and is a narrow, steeply sloped linear phase surrounded by residential and commercial development. The prairie and wetland plantings provide a continuation of diverse native habitat on the slopes of the river. The species list for Phase 2 is found in the Appendix.

The weakness of this portion of the project from a management perspective is the lack of a trail south of the Oakes Road parking lot, making it difficult to monitor and manage. There is also less public access directly along the river and thus less community engagement as well, although it is well visualized at the STH 20 bridge and sidewalk crossing, and visible to Dairy Queen and Knight's Inn clientele. We recommend a management trail in this phase (yearly mowed, possible use of wood chips in bare areas) to facilitate better monitoring and management.

Young willows and other woody invasives (including conifers seeding in from adjacent conifer stands) are at the point that either a prescribed burn or cutting is needed to prevent them from shading the prairie.

The threats to this phase include trash from surrounding businesses and STH 20, and dog waste east of the Knights Inn in the mowed grassy area. This area could be restored to prairie or just un-mowed, allowing it to revert to old field vegetation as it appears to be owned by the Village (Parcel 14-051-080). Alternately, the area could be provided with signage and dog waste stations.

The stormwater pond east of the river is also owned by the Village (Parcel 14-051-003). A stand of *Phragmites* (giant reed grass) in the pond should be controlled to minimize continued inputs into the river. The mowed pond edge is a potential site to plant prairie buffer and enhance the Pike River buffer in this location (refer to the Phase 2 map on page 47).

The human connection between Phase 2 and 3 is across STH 20, which is at a stoplight adjacent Case High School. Improved signage for trail connections from Phase 1- 4 is needed here.

Phalaris arundinacae reed canary grass in center of photo (tall white stems above leafy grass). Insert is the long white membrane where the leaf meets the stalk very diagnostic of reed canary grass

Glyceria maxima reed mannagrass on bank of Pike River in Phase 1

Lythrum salicaria Purple loosestrife

Phragmites australis, giant reed grass - an agressive grass capable of puncturing asphalt on Phase 6!

Dipsacus laciniatus cut-leaved teasel in center - bristly seed head visible - green rosettes underneath that will flower in the second year

Securigera veria Crown vetch invades prairie plantings on Phase 6.

Phase 3

Phase 3 was constructed in 2005, and is also a narrow corridor constrained by adjacent development. Phases 2 and 3 provide continuity and connection to the river corridor, however this phase also lacks a trail that impedes monitoring and management. The native vegetation is providing habitat and shade along the river, however current threats to the native vegetation include reed mannagrass, *Phragmites*, and woody vegetation particularly on the north end adjacent to the Marriott Hotel parking lot. In the last five years the woody vegetation has grown from sapling to tree size, particularly the inappropriately named "tree of heaven" (*Ailanthus altissima*). This invasive tree is a very fast growing native of China that is currently taking over the planted prairie. It is also known to manufacture an allelopathic chemical that kills surrounding vegetation. Large weeping willows (*Salix babylonica*) are also creating blockage and overhanging the stream in Phase 3, particularly the north end. The Marriott hotel and Knights Inn in Phase 2 are possible vectors of out of state seed into the river corridor. They are at the size that cutting with herbicide or girdling with herbicide are necessary. Smaller whips could be cut or set back with a prescribed burn.

Other threats to vegetation include reed mannagrass on the stream shelf, cut-leaved teasel (small, controllable stands first arrived in 2014), and *Phragmites*. Trash is collecting from STH 20 and nearby apartments. Some over-mowing appears to be occurring at the northeast corner of the river and Oakes Road. There is erosion and bare stream areas north of the Oakes Road culvert, and this area has been an ongoing source of *Phragmites*. Inputs along the banks from stormwater pipes and culverts appear to be accelerating the growth of reed mannagrass on the stream banks.

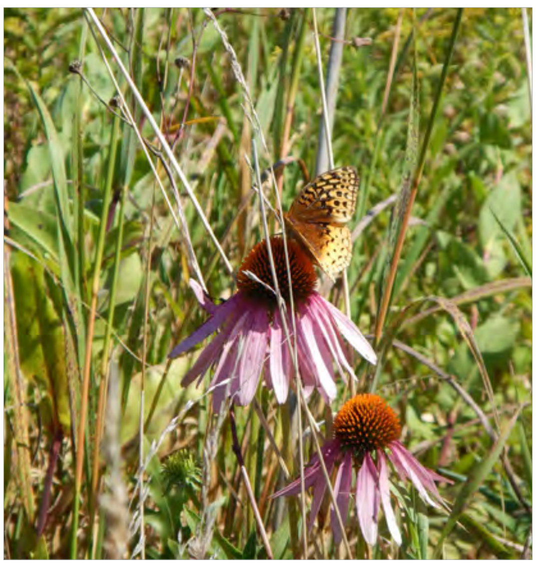
The adjacent prairie planting south of Oakes Road that was planted by Case High School is an opportunity to include in management, particularly prescribed burns. The stream shelf adjacent Case High School is being used by High School teachers and students, however they have worn an eroded path down the prairie slope. A trail for student use, using log stairs or some kind of material to stabilize the slope and allow access would be an opportunity to involve the high school and promote the educational use of the restored river. We also envision a path on the top of the bank on the high school grounds that would overlook the project and provide recreational and educational opportunities as well.

Phase 4 and the Steele Branch

Phase 4 was constructed in multiple years. The ponds were constructed in 2006, the sections of off-line stream were constructed in 2008 and the final stream connection and south end were constructed in 2010. Restored areas were seeded with native vegetation during construction. In addition, in May of 2011 wetland rootstock including prairie cord grass, bull rush and other emergent wetland species were planted on the Phase 4 stream banks, particularly in areas with bare areas.

Because there was a persistent stand of the invasive *Phragmites* on the Phase 4

Overview of Phase 4 ponds facing north. Prairie plantings in foreground. (Photo by A. Thompson 2014)



left:
Purple coneflower in Phase 4 attracts butterflies.
(Photo by A. Thompson)

right:
Prairie grass - big bluestem (turkey foot) in bloom

False aster - a native prairie plant - on Pike River streambank (Phase 4).

Prescribed burn at Phase 1 maintains prairie and sets back woody vegetation.
(Photo by A. Thompson, Spring 2009)

left:
A wetland native - Joe-pye weed (purple flower) on edge of Pike River ponds at Phase 4.

right:
Dragonfly rests on soft-stemmed bulrush.

Compass plants - a native prairie plant - on Phase 4 prairie (tall lobed leaves).

streambank prior to construction in 2007, the grass was treated with herbicide. There are scattered stands of *Phragmites* within Phase 4 that have been repeatedly sprayed with 3% Aquaneet or Habitat herbicide every year since 2007. The invasive biennial forb cut-leaved teasel (*Dipsacus laciniatus*) first occurred in 2011 on the entire project in Phase 4 in the southwest corner of Phase 4 adjacent the railroad tracks. The teasel has been yearly actively managed starting in 2011 and remains an ongoing concern. Reed canary grass is present in the central portion of the stream, south of the junction of Steele Branch, and in upland planted prairie areas. The reed canary areas on the stream shelf has been spot sprayed during the control of *Phragmites*. Dame's rocket was controlled (pull and bag) on the Phase 4 pond areas in 2012. Reed mannagrass has begun to invade Phase 4 and was spot controlled on the stream banks in 2012, 2013 and 2014.

Phase 4 vegetation consists of dry prairie, mesic to wet-mesic prairie, mixed hardwood forest, sedge meadow, fresh (wet) meadow, ponds, oxbow wetland and emergent aquatic wetland plant communities (refer to map on page 51). The diversity of plant community types provides diversity and excellent bird, fish and wildlife habitat. The river is also well buffered from surrounding industrial development.

The 2014 vegetation inventory of upland prairie areas revealed that the most prevalent plant species (found in multiple locations) included the non-natives: Reed canary grass (*Phalaris arundinacea*), white sweet clover (*Melilotus alba*), Kentucky bluegrass (*Poa pratensis*) and native prairie plants including: Canada goldenrod (*Solidago conadensis*), big bluestem (*Andropogon gerardii*), Indian grass, New England aster, yellow coneflower, box elder saplings, cup plant, side oats grama, Canada wild rye, cottonwood saplings, black eyed Susan, Indian hemp, purple coneflower, bergamot and stiff goldenrod. Less prevalent non-natives included Canada thistle, *Phragmites*, crown vetch and birdsfoot trefoil.

The vegetation most prevalent for the wetland areas in the stream shelf and pond shelves included the invasive reed canary grass, followed by the natives: Dark-green bulrush, New England Aster, cottonwood saplings, Torrey's rush, false aster, sneezeweed, Canada goldenrod, switchgrass, cattail, big bluestem, Indian grass, prairie cord grass, frost aster, common beggers ticks, grass leaved goldenrod, hairy-fruit sedge, brown fox sedge, Dudley's rush, swamp milkweed and woolgrass. Saplings included cottonwood, box elder, common buckthorn and sandbar willow.

The site appears to be a stopover for migrant birds, and a haven for waterfowl in winter because the outflow into the south pond from the SC Johnson plant is cooling water and typically does not freeze. Hoyt Audubon established bird nesting boxes on Phase 4, that continue to be utilized by swallows and other birds. Common summer bird use includes great blue heron, great egret, Canada geese, gulls, and red tailed hawk. Uncommon grassland birds including a dickcissel and bobolink have been spotted in Phase 4.

The ponds have attracted fisherman as well as birds, and although they are a potential partner, the trash and worn foot trails around the ponds need attention. A fishing platform, trash cans and signage are needed. The areas fished also need to be closely watched for invasive species that are tracked in. For example, the invasive purple loosestrife (*Lythrum salicaria*) was observed at fishing areas in 2014. The Racine County bike trail on south end of the project will create another group of potential users and partners as the Phase 4 and 5 trails are finalized in the near future.

All-terrain-vehicle (ATV) damage to native vegetation was observed during our site visits this year. ATVs are entering the corridor from the bike path to the south, from under the railroad culvert at the Steele Branch west of the ponds, and from the gravel access road west of Case High School. ATV activity is not permitted along this corridor, so better signage and a paved walking trail is expected to help alleviate the issue in the future. Increased trail usage from walkers, bikers and joggers is expected when the trail is paved in the near future which will overall lesson ATV damage as experienced in Phase 1.

Other threats are two areas of dumping of brush on the north end of the project; the area of brush adjacent to Case High School was extensive in 2014. Fishing on the pond edges and on the culverts have created some areas of trash, trampled vegetation and other invasives may be introduced including a new area of the invasive purple loosestrife, first noted in 2014 (need to locate and control in 2015).

Like the other phases, a prescribed burning regime will encourage native forb and grass development and deter the establishment of aggressive shrubs and trees (e.g., cottonwoods and box elder). Currently, Mount Pleasant is requesting bids to

Located in a major transportation corridor, the sheer volume of traffic moving into and through the Pike River watershed every day – people, trucks, trains and automobiles – creates an ongoing threat for invasive species to enter and establish. Monitoring and management of invasive species, especially entering from upstream tributaries will be an ongoing priority for the maintenance of native vegetation in the corridor.

conduct a prescribed burn on Phase 4 in the spring of 2015. A prescribed burning schedule for all the Phases is provided in the Maintenance Plan section of this document.

Ongoing vegetation management activities that have occurred each year include the control of cut-leaved teasel, crown vetch, bird's foot trefoil, purple loosestrife, reed canary grass, reed manna grass and giant reed grass. The ongoing management of these invasives has become a key vegetation management concern (to be discussed in the Maintenance Plan section).

There are stands of *Phragmites* on the AW Oakes quarry pond that can potentially input into the restoration area. *Phragmites* is treated yearly adjacent the Oakes lot on the prairie slopes. We have also observed herbicide damage under the ATC transmission lines (deliberate herbiciding to control vegetation under the lines). We recommend working with ATC to utilize burn management instead of herbicide to limit woody vegetation under the wires. ATC might partner on management with the Village in this phase.

The Steele Branch enters the Pike River system under the Union Pacific railroad tracks at the Phase 4 ponds. As found on the Bartlett Branch in Phase 1, reed mannagrass is entering the river system from the railroad tracks.

The Steele Branch is also a conduit for ATV traffic, through a very large culvert under the railroad. The Steele Branch grate west of Willow Road is clogged with debris and impounding water.

The Steele Branch is a fairly short tributary and winds through the SC Johnson - Waxdale and Sealed Air sites. Although the tributary is well buffered by significant green space and developing prairie, there are patches of *Phragmites* in on-line ponds that will provide continual inputs into the corridor. It will also continue to be a vector of reed mannagrass as discussed above.

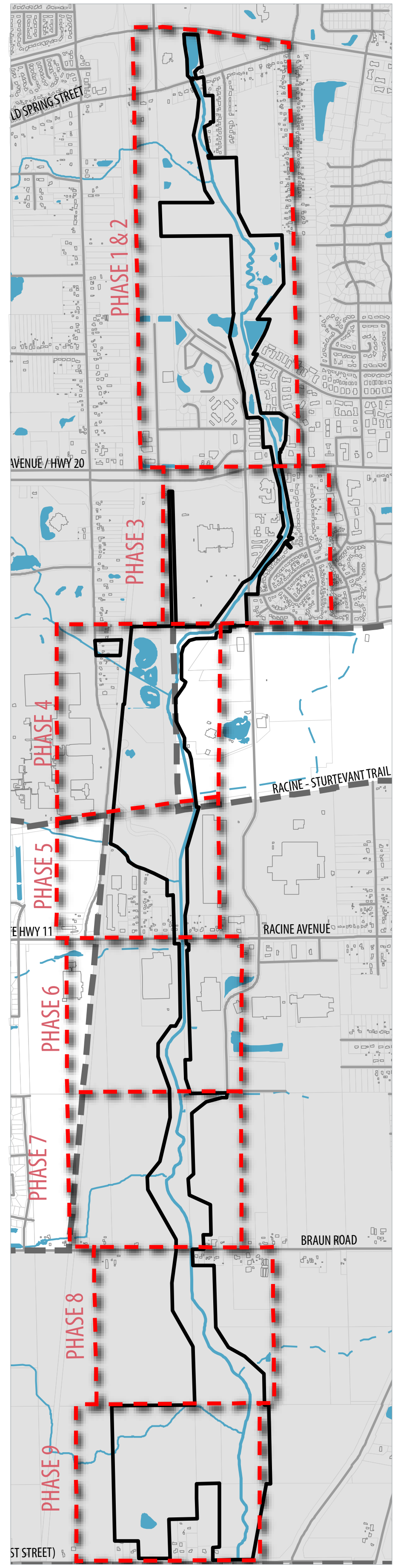
Phase 5 and Waxdale Creek

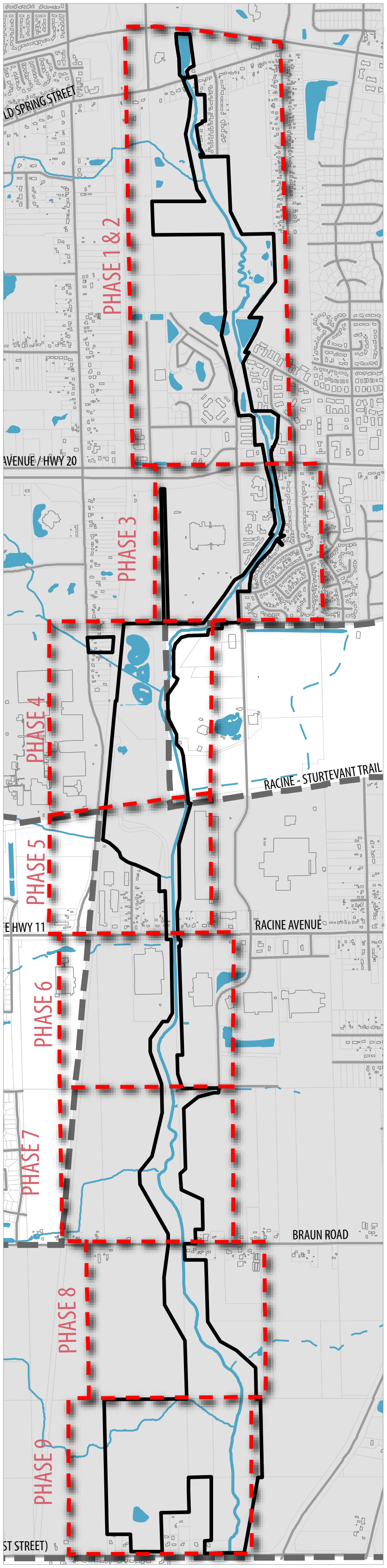
Phase 5 was constructed in 2010 concurrent with the south end of Phase 4. The native vegetation was set back by significant drought in the first two years (2010-2012). The annual rye died back very quickly multiple times and it took two full years for the corridor to green up. The consequence of the drought may have been the invasion of crown vetch and birdsfoot trefoil on the prairie slopes. There is a railroad spur that ends at tracks on the north end of Phase 5 that serves Graham Packaging Company which is a large industrial operation directly east of the restored corridor. The railroad spur slopes contain crown vetch and birdsfoot trefoil, which is a likely vector of invasive species onto the corridor. Woody plants under the railroad spur will need management, or they will spread southward into the project.

The wetland stream shelf has significant native plant diversity and it is particularly interesting that the native rice cut grass (*Leersia oryzoides*) is a large component of the wetland in Phase 5 (more so than any other phase, although it is planted in each). False aster (*Boltonia asteroides*) is also colonizing in Phase 5, as well as Phase 4, a native forb not seeded but evidentially in the seed bank.

The vegetation is attracting butterflies, grassland birds and great blue herons. The woods that were undisturbed by the restoration provide a good buffer to the river to the west, including a wooded ephemeral wetland that was preserved during construction.

The most ecologically significant weakness of this phase is the large patches of crown vetch and birdsfoot trefoil. A lesson learned for future phases is to control the plants before construction and to immediately herbicide both species in the first and second year of restoration. A prescribed burn will aid the prairie grasses in competing with these invasives, but chemical treatment will have to continue in concert with a prescribed burn schedule. Re-seeding hardy prairie plants into the dead areas that were crown vetch or birdsfoot trefoil patches may be necessary as well). A burn schedule will be helpful in controlling woody invasives from the adjacent treeline. The cottonwood whips on the stream shelf are still quite thin. Based on our experience in Phase 3, woody invasives were beyond simple





cut, mow or burn by year eight or nine following construction and thus if not burned, then cutting will be necessary on this phase within the next two years. The newly built trails will greatly facilitate management.

The on-going issue of people crossing STH 11 to reach Phase 6 needs resolution as traffic impedes safe movement across the highway in this location.

Waxdale Creek enters the Pike River in Phase 5. The creek is the most wooded (shaded) of all the tributaries, and thus contributing cool water to the river. However, the shade also facilitates bare banks that could potentially erode. There is no agriculture on this creek, it is contained with private, primarily industrial facilities west of Willow Road. The entire stretch of the creek is referred to as a critical riparian area in the 2013 Pike River Management Plan. A weakness of the tributary is that concrete abutments just west of the Pike River confluence trap debris. There are areas of steep and incised banks, and areas of riprap east of Willow Road (refer to Phase 5 map). The grate on the east side of Willow Road also has trash and debris collecting.

There are potential and current partners that could be developed on this tributary to buffer Waxdale Creek. Arbor Glen Wood Recycling is just west of the stream. There is a buffer opportunity at an SC Johnson owned segment and a segment owned by We Energies on 2610 Willow Road. The Village of Mount Pleasant land west of the river and north of Waxdale Creek is also a potential buffer opportunity.

Because large areas of this tributary were inaccessible (private, industrial land) we could not evaluate the invasive species thoroughly, however from the areas we were able to view the creek we believe that common buckthorn is the more prevalent invasive, and there was no reed mannagrass or *Phragmites* observed on this creek. Because buckthorn is primarily spread by birds, not water, Waxdale is unlikely to be a direct source of invasive species on Phase 5. The railroad spur is of greater concern as discussed above.

Phase 6

Phase 6 was constructed in 2011 (6A) and 2012 (6B). The northern portion (6A) is a narrow, straight corridor between two large industrial sites: Promotions, Inc. on the west side of the river and a large tractor/truck yard on the east side. Phase 6B contains a larger footprint including an oxbow wetland created to back water and pond seasonally adjacent the river. This feature was restored after a similar feature on Phase 4 was successful. There is active agriculture surrounding the southern portion of Phase 6.

The vegetation is developing diversity, especially on the wetland shelf and within the oxbow wetland. Wildlife includes birds including the great blue heron, amphibians in the oxbow wetland, and butterflies.

Phragmites is developing along the industrial yard edge on the east side of the river and has been chemically controlled since 2013. There is a potential for crown vetch and birdsfoot trefoil to crowd out native prairie as well. These areas were chemically controlled in 2014 and need additional control in 2015 is needed, preferably earlier in the year before flowering. A prescribed burn will aid the prairie grasses in competing with these invasives, but chemical treatment will have to continue in concert with a prescribed burn schedule. A burn or cutting will be required by 2017 to avoid woody invasives from reaching a size that cannot be easily controlled.

There are steep areas where Class III Type A matting was used during construction because the slopes are steep. This dense green mat has suppressed seed germination, so possibly re-seeding on top of the matting (using peat moss in the seed mix) could jump start these bare areas.

There are bare areas on the streambank where there was inadequate seeding due to the matting on the stream shelf being laid beyond the toe of the streambank. This area could benefit from root stock such as prairie cordgrass or sandbar willow, both of which successfully established in upstream Phases. The sections constructed downstream need a modified seeding/

matting on the stream banks to facilitate vegetation.

Although there is not a direct tributary to this phase, there are off line stormwater ponds adjacent to Oakes Road that have populations of *Phragmites* that enter into the stream system via pipes. These ponds present a constant source of *Phragmites* into this phase. Invasive inputs and trash from STH 11 and inputs from stormwater pipes as well as industrial yard inputs are all concerns. Ongoing treatment of *Phragmites* and reed mannagrass is vital to the diversity of the plantings.

In the times prior to European settlement, fires ignited by lightning would burn intermittent through the prairies – killing back woody shrubs and trees while improving conditions for the rapid regrowth prairie vegetation.

There is a trail that facilitates management, however the crossing of STH 11 is very dangerous by foot. Another issue is that there is no safe parking area adjacent Phase 6. We have been using the tractor yard however we this may not remain an option. It might be possible to discuss parking with Promotions, Inc. either for monitoring and maintenance and eventually visitors, but currently their lot is posted. We have observed persons (likely from Promotions) using the newly constructed trail over the lunch hour, and they are a potential partner in this phase.

Phase 7 and Chickory Creek

Phase 7 is scheduled to be constructed in 2015. This phase is primarily surrounded by agriculture and features several ponds, a restored confluence with Chickory Creek and a wide wetland stream shelf with prairie slopes. The final restoration will provide significant buffer and wildlife habitat adjacent the river.

The anticipated weaknesses of this phase, based on our experience, is that birdsfoot trefoil, already present in Chickory Creek could readily re-colonize the site. We recommend treating existing birdsfoot trefoil with herbicide prior to construction in 2015. We also recommend that contractors keep equipment clean before and during construction to avoid tracking invasives. The other long term weakness is that there is significant ATV damage adjacent Lamperek Ditch and the 2009 prairie plantings at Biex-Ramcke. Without signage, enforcement and communication with adjacent landowners, this problem is likely in Phases 7-9 until the bike path is established and local users take ownership and call police when trespassers are noted.

The construction road on the west side shall remain as an eventual bike trail and will aid in monitoring and maintenance. The east side will be less accessible, and we recommend a management path to facilitate access, possibly a mowed trail on the east side of the prairie plantings.

Another potential problem is agricultural over-plowing into the Village owned plantings. Signage and boundary markers would be useful here to avoid future incursions into the site.

Chickory Creek is a tributary that begins as a drain tile outlet at 90th Street. The creek flows through a housing development outlot owned by Village of Sturtevant. The creek is well buffered in this location with un-mowed vegetation and a walking trail. There is an off-line pond listed in the 2013 Pike River Watershed Plan as Critical Area "28B" that the plan proposes could be retrofitted to native vegetation. The culvert west of Willow Road is blocked by trash (e.g., chair, box springs) impeding flow and an on-line pond is within the tributary corridor, possibly impounded by the trash blocking the culvert.

There is a patch of *Phragmites* in this outlot that is small enough to control and that provides input into the Creek and eventually the river.

The creek was not accessible to direct observation but from a distance we noted that agricultural impacts extend to the top of the bank east of Willow Road in the soybean/pumpkin fields. There are significant buffer opportunities in the farmland from Willow Road to the confluence with the Pike River.

East of Willow Road the flow is quite deep; we noted 14-16 inches of water in the fall of 2014 and portions of the creek appear to have incised banks.

Phase 8

Phase 8 and Phase 9 are being constructed by the US Army Corps of Engineers with federal funds including the Great Lakes Restoration Initiative in 2015. This follows an extensive feasibility study by the Corps of the project. This phase features five ponds and two new meanders with the old streambed left in place as a backwater oxbow. The wide corridor, surrounded by farmland, will be planted to native wetland and prairie similar to the northern Phases. The US Army Corps of Engineers is funding the restoration and five years of monitoring and maintenance. This section is intended to complement the Corps plans and assist the Village when they take eventual management over. Long term management will include a prescribed burn schedule and chemical control of persistent invasive plants.

The anticipated weaknesses of this phase, based on our experience, is that birdsfoot trefoil, already present in Chickory Creek could readily re-colonize downstream. We recommend treating existing birdsfoot trefoil with herbicide prior to construction in 2015. We also recommend that contractors keep equipment clean before and during construction to avoid tracking invasives.

The other long term weakness is that there is significant ATV damage adjacent Lamparek Ditch and the 2009 prairie plantings at Biex-Ramcke. Without signage, enforcement and communication with adjacent landowners, this problem is likely in Phases 7-9 until the bike path is established and local users take ownership and call police when ATVs are noted.

The construction road on the west side shall remain as an eventual bike trail and will aid in monitoring and maintenance. The east side will be less accessible, and we recommend a management path to facilitate access, possibly a mowed trail on the east side of the prairie plantings (refer to Phase 8 map).

Another potential problem is over plowing into the Village owned plantings. Signage and boundary markers would be tools to avoid future incursions into the site.

Phase 9 and Lamperek Ditch (including Biex-Ramcke Prairie)

Phase 9 is being constructed by the US Army Corps of Engineers along with Phase 8 with federal funds including the Great Lakes Restoration Initiative in 2015. This follows an extensive feasibility study by the Corps of the project. This phase features four ponds and three new meanders with the old streambed left in place as a backwater oxbow. The wide corridor, surrounded by farmland, will be planted to native wetland and prairie like the northern Phases. The US Army Corps of Engineers are funding the restoration and five years of monitoring and maintenance. This section is intended to complement the Corps plans and assist the Village when they take eventual management over. Long term management will include a prescribed burn schedule and chemical control of persistent invasive plants.

The two large wetland ponds are designed to eventually be used by northern pike for spawning and rearing of fry. The vegetation in these ponds should be grassy and allow for the eggs to attach. If cattails are aggressively colonizing these ponds, some maintenance may be necessary to allow thinner stemmed vegetation to be dominant.

The anticipated weaknesses of this phase, based on our experience, is that birdsfoot trefoil, already present in Chickory Creek could readily re-colonize downstream site. We recommend treating existing birdsfoot trefoil with herbicide prior to construction in 2015. We also recommend that contractors keep equipment clean before and during construction to avoid tracking invasives. The other long term weakness is that there is significant ATV damage adjacent to Lamparek Ditch and the 2009 prairie plantings at Biex-Ramcke. Without signage, enforcement and communication with adjacent landowners, this problem is likely in Phases 7-9 until the bike path is established and local users take ownership and call police when ATVs are noted.

The construction road on the west side shall remain as an eventual bike trail and will aid in monitoring and maintenance. The east side will be less accessible, and we recommend a management path to facilitate access, possibly a mowed trail on the east side of the prairie plantings (refer to Phase 9 map).

Another potential problem is agricultural over-plowing into the Village owned plantings. Signage and boundary markers would be tools to avoid future incursions into the Phase.

Lamperek Ditch is a major tributary winding through active agricultural land. The portion of the tributary adjacent the Phase 8/9 fill site was planted to a prairie buffer by the Village in 2009. Despite a lack of management to date, there are significant prairie plantings developing including big bluestem, Canada wild rye, Virginia wild rye, rattlesnake master and white wild indigo.
Lamperek begins as Chickory Creek begins: As a tile outlet at the CTH H crossing. The flow coming from the tile line enters a box culvert and flows through agricultural fields. Due to the active farmland there are significant buffer opportunities along most of the creek until it enters Village owned land. The creek was about a foot deep (fall 2014) at the Biex-Ramcke prairie site. The Village might explore partnering with NRCS or the County to promote agricultural buffers and explore the concept of a two stage ditch to buffer the stream.

The prairie plantings are really damaged by very wide, persistent ATV use. In addition, there are shot gun shells and trash in the site. It also appears that there is over-plowing on the south end, although that will end once the south field is used for Phase 8 and 9 fill.

As discussed above, signage, communication with neighbors and enforcement will lessen ATV trespassing and damaged areas could be re-seeded. The prairie also needs a prescribed burn in the near future (refer to Management Timeline in Chapter 5).

Vegetation SWOT Analysis

Phases 1 and 2

PHASE 1– Vegetation SWOT Analysis

HELPFUL *(positive)* — HARMFUL *(negative)*

INTERNAL *(current)*

Strengths

- Well established, diverse habitat
- Springs within marsh
- Good bird/amphibian/butterfly habitat
- Native seeding generally well buffered
- Large acreage
- Good access for management via 3 parking lots and trails

Weaknesses

- New invasive, hairy willow herb *(Epilobium hirsutum)* present but in small, manageable patches at this point
- *Phragmites australis* (giant reed grass) present in patches
- *Glyceria maxima* (reed mannagrass) becoming dominant along wetland shelf
- Fishing pressure in pond at north end - potential invasive inputs
- Beaver damage - need to repair wetland/prairie areas

EXTERNAL *(future)*

Opportunities

- Mt. Pleasant Park west of Phase 1: Prairie management
- Volunteers could collect native seed for use in project corridor
- Small grant funding available through SEWISC for hairy willow herb ($2,000)
- Partnerships: Hoyt Audubon, local Condo residents
- Trail system is generating positive public ownership, potential partners and volunteers

Bartlett Branch Tributary

- Shrub canopy cools water and overshadows invasive species
- Opportunity to partner with landowner of established prairie west of Tallgrass Lane
- Buffer (indicated in Pike River Watershed Plan - W02) on farmed edge of Bartlett

Threats

- Future development on farm fields will increase stormwater if not proactively managed
- Presence of invasive species: *Phragmites australis* and *Epilobium hirsutum*
- Over mowing north of Old Spring St.
- Project boundary is poorly defined and not marked

Bartlett Branch Tributary

- Upper tributary by railroad is source of *Glyceria maxima* (monoculture)
- Small patch of *Phragmites* in headwaters wetland north of Spring St.
- ATV damage on land buffering Bartlett Branch

PHASE 2– Vegetation SWOT Analysis

HELPFUL *(positive)* — HARMFUL *(negative)*

INTERNAL *(current)*

Strengths

- Provides continuation of habitat between Phase 1 and Phase 3
- Enjoyed by Condominium residents and Dairy Queen customers
- Easily viewed by public from sidewalk along STH 20
- Ready for a fire regime

Weaknesses

- Poor access for management activities; steep
- Needs a management trail (proposed location shown on maps)
- Young willows and other woody invasive species becoming small-tree size
- Tight - narrow, steep corridor

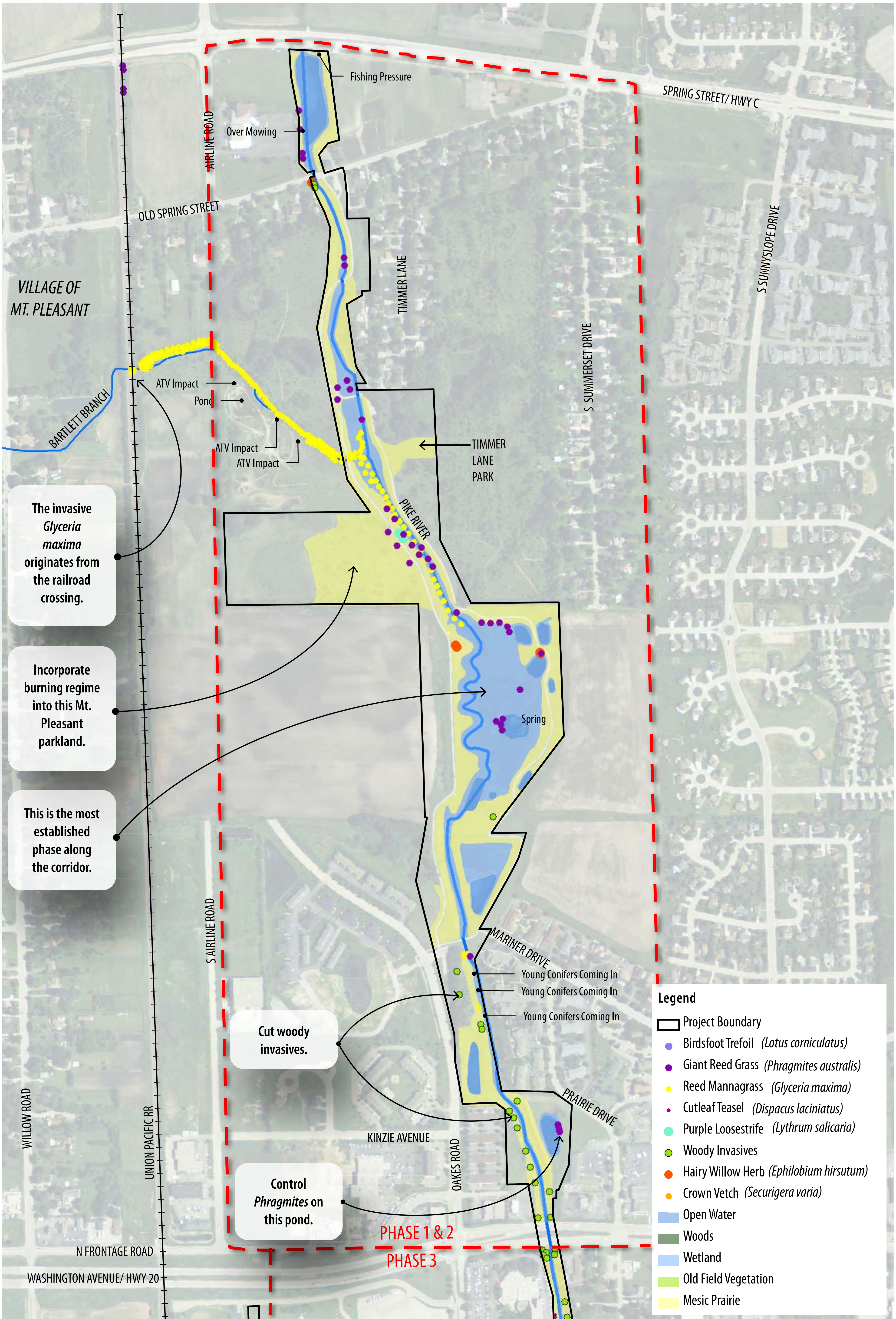
EXTERNAL *(future)*

Opportunities

- Needs ownership; opportunity for Condo "adoption"
- Buffer opportunity east of Knight's Inn and Dairy Queen and install dog waste stations/signage
- Stormwater pond on southeast corner could be buffered with native vegetation and managed for *Phragmites*

Threats

- Difficult crossing at STH 20 between Phase 2 and Phase 3
- Trash is blown in from STH 20/surrounding businesses
- Stormwater inputs from surrounding ponds may carry *Phragmites* (giant reed grass) and other invasive species
- Dog waste east of Knight's Inn and Dairy Queen in mowed grass area



Vegetation/Management Issues Phase 1 & 2

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

1 inch = 550 feet
0 275 550 1,100 FEET
N

ISSUE DATE: 3/19/2015

PROJECT NUMBER: 04-1083-001
All drawings are preliminary and subject to change.

This Page Intentionally Left Blank

Vegetation SWOT Analysis

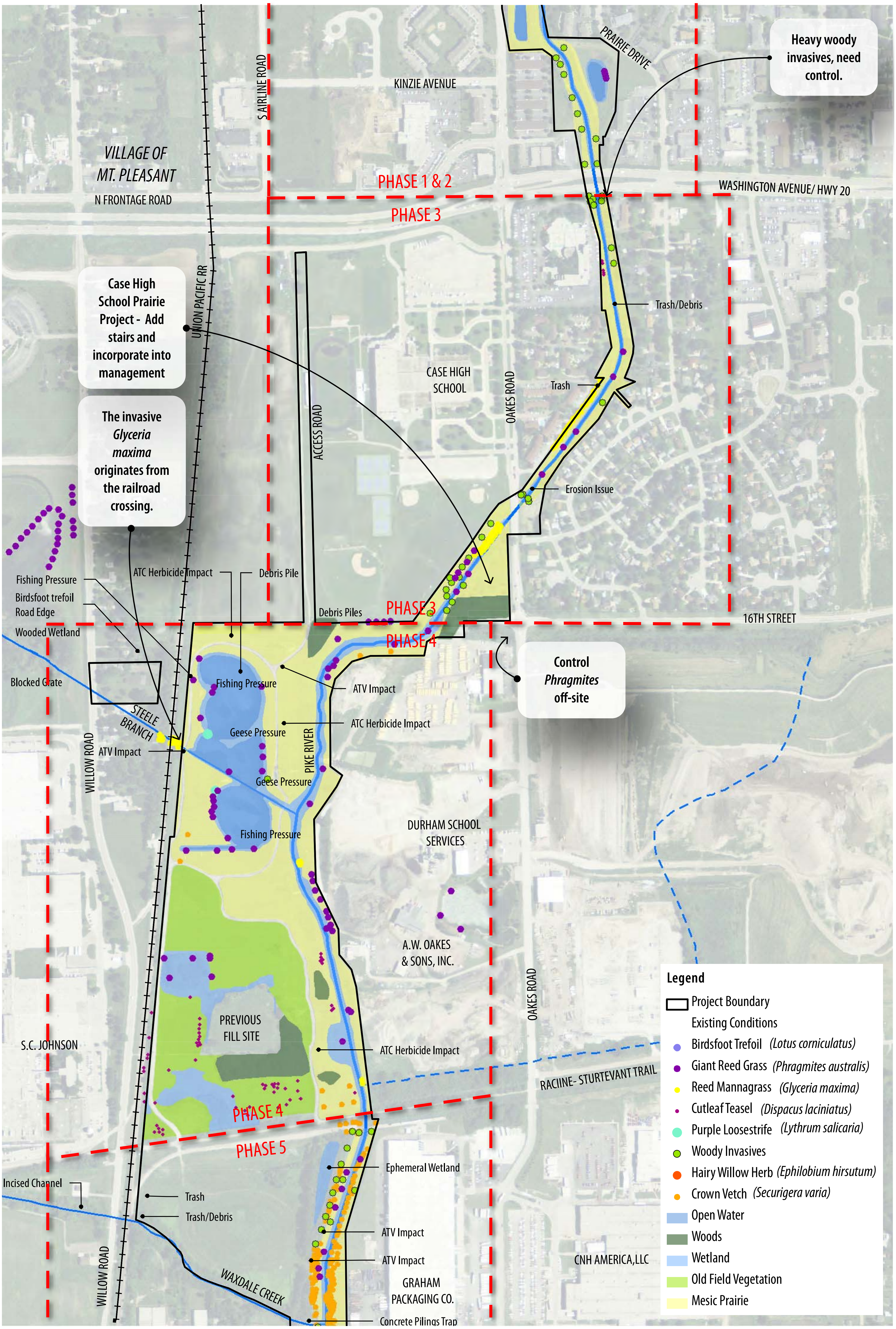
Phases 3 and 4

PHASE 3– Vegetation SWOT Analysis

	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	***Strengths*** • Good diversity, native plantings providing habitat • Case High School prairie planting also showing good diversity/habitat • Enjoyed by Marriott Hotel visitors (nice view) • Utilized by Case High School classes for outdoor education • Opportunity to build trail for management - mowed trail at top of slope	***Weaknesses*** • Established woody invasives, especially near STH 20 • Difficult to access; no trail and narrow with steep slopes • Erosion on Case High School's prairie path - needs a path to be designed/installed • Over mowing is occurring at northeast corner • Cut-leaved teasel observed on stream shelf, needs control • Difficult to burn due to close parking/residences - need mow/cut regime for woody invasives • *Phragmites* and *Glyceria* inputs coming in from stormwater outlets
EXTERNAL (future)	***Opportunities*** • High school environmental education classes • Build trail along high school prairie, continue westward along tree line to connect Phase 3 to Phase 4 trail • High school prairie ready for fire regime, could be a managed burn with Phase 4 • If burning not an option, bush hog/mowing regime needed to control woody invasives/maintain native vegetation	***Threats*** • Marriott Hotel's parking lot may be an input for out-of-state invasives • Inputs from Oakes Road culvert and erosion at outlet • Trash from STH 20 & nearby apartments

PHASE 4– Vegetation SWOT Analysis

	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	***Strengths*** • Well established habitat, good diversity • Excellent bird, fish, wildlife habitat- large enough to promote bird nesting • Ready for fire regime – was burned in April, 2015 • Habitat diversity: ponds, wetland shelves, mesic prairie, mixed hardwoods • Oxbow wetland • Well buffered • Stop over migrant bird habitat • Enjoyed by Case High School track teams, fisherpersons and birders • Bird Boxes established	***Weaknesses*** • Reed canary grass *(Phalaris arundinacea)* dominance under ATC power lines • Cut-leaved teasel - ongoing problem • *Glyceria maxima* input from the Steele Branch at RR tracks • ATC management - herbicide application can harm surrounding mesic prairie plantings
EXTERNAL (future)	***Opportunities*** • Fishing platform / trash can for fish debris • Potential partners: Fishermen, SC Johnson, ATC. ATC may be a potential source of funding for management • SC Johnson - promote access and use by employees • Trails within the woods and buckthorn management (soft mowed trails)	***Threats*** • *Phragmites* inputs from A.W. Oakes quarry and other hot spots • Rail road inputs on west side - invasive species • Debris piles - dumping of woody and other trash • Vehicular/ATV traffic; ATV damage to mesic prairie
	Steele Branch Tributary • Partner with SC Johnson to control *Phragmites* inputs • Prairie plantings buffer Steele Branch at SC Johnson and Sealed Air Building • Opportunity for additional access along Willow Road from SC Johnson to Phase 4 trails	***Steele Branch Tributary*** • Ongoing inputs of *Glyceria maxima from* the Steele branch at RR tracks • *Phragmites* at Steele Branch headwaters and SC Johnson ponds (connect with waterway) • Blocked grate at Willow Road, impounding water west of Willow Road



Vegetation/Management Issues Phase 3 & 4

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

N

1 inch = 550 feet

0 275 550 1,100 FEET

ISSUE DATE: 3/19/2015

PROJECT NUMBER: 04-1083-001

All drawings are preliminary and subject to change.

This Page Intentionally Left Blank

Vegetation SWOT Analysis

Phases 5, 6 and 7

PHASE 5– Vegetation SWOT Analysis

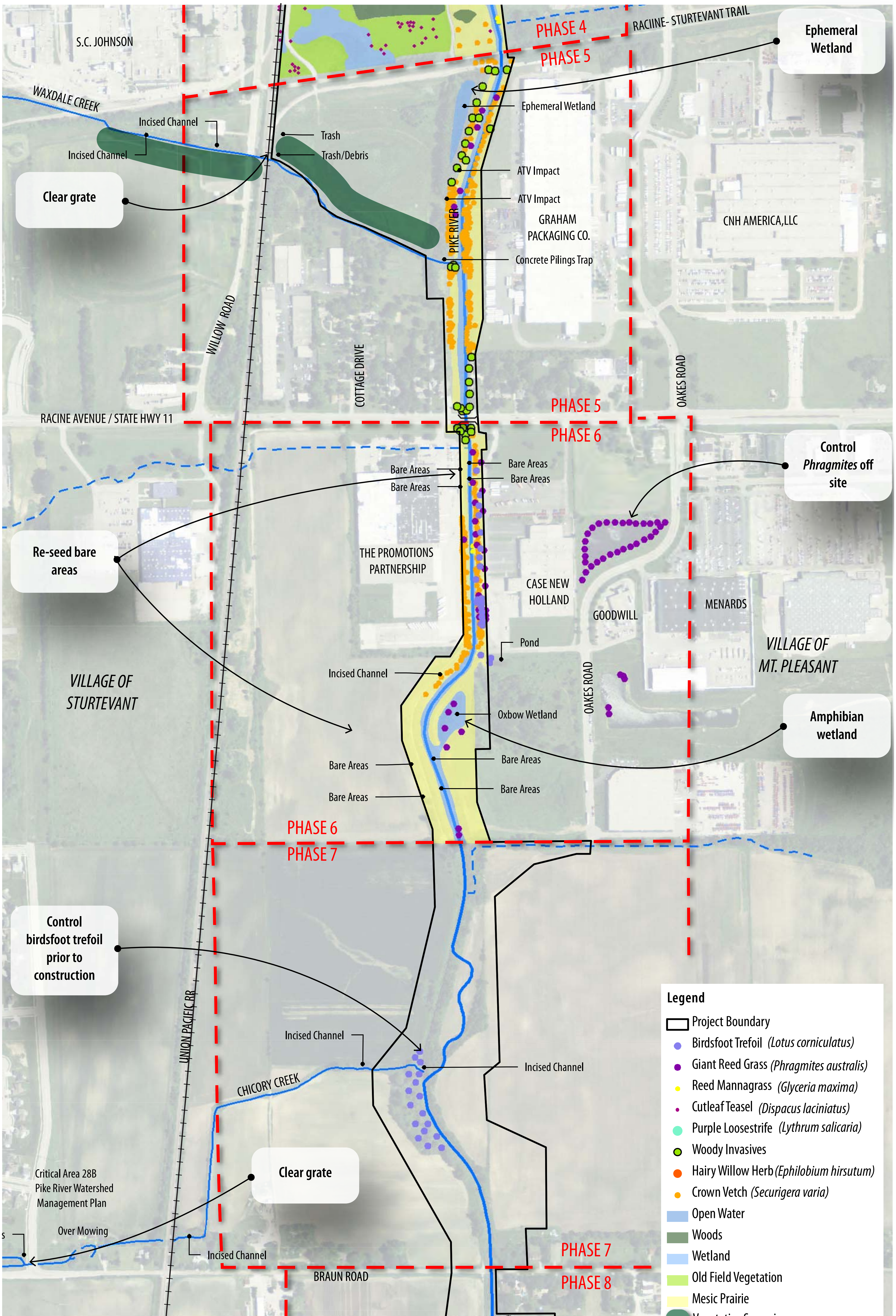
	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	***Strengths*** • Good native diversity • Showing signs of butterfly and grassland bird habitat • Buffered by woods on the western edge of the corridor • Ready for a fire regime, which would help control invasive species • The woody invasive species are currently sapling size, and could be controlled by a prescribed burn • The new trail will aid in access for management	***Weaknesses*** • *Phragmites* (giant reed grass) inputs • Crown vetch is dominant in prairie - control and re-seeding of bare areas needed • The woods along the west are also a source of woody invasive input (e.g., buckthorn, cottonwood, sumac, Siberian elm) • Difficult and dangerous to cross STH 11 between Phase 5 and Phase 6
EXTERNAL (future)	***Opportunities*** • Create additional buffer on Mt. Pleasant land east of Willow Road	***Threats*** • Industrial site and parking lot to east create invasive inputs to corridor • Woody plants under RR spur bridge/county trail on north end of Phase 5 and the south end of Phase 4 may need control
	Waxdale Creek Tributary • Wooded riparian (most shaded tributary) with canopy that keeps water cool • SC Johnson's proposed Waxdale Creek restoration project and buffering opportunity • Potential project partner: Arbor Glen Wood Recycling Plant (west of Waxdale) • Buffer opportunities west of Willow Road - We Energies potential partner • Create buffer on Mt. Pleasant land east of Willow Road	***Waxdale Creek Tributary*** • Concrete abutments adjacent confluence with the Pike on Waxdale Creek trap debris • Steep incised and unstable banks • Grate on east side of Willow Road traps trash and debris

PHASE 6– Vegetation SWOT Analysis

	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	***Strengths*** • Good bird/butterfly habitat already developed (e.g., observed great blue heron) • Wetland shelf is already developing; good diversity • Amphibian diversity observed in oxbow wetland • Need to replant bare areas on steep shelf and stream edge • Ready for a fire regime	***Weaknesses*** • Bare areas where erosion control matting has suppressed vegetation • Bare areas on stream bank • Invasive inputs and trash from STH 11 • Poor access due to tractor storage yard on east side • Potential for dominance of crown vetch and *Glyceria maxima*
EXTERNAL (future)	***Opportunities*** • Maintain trail on a timely basis - already being used by nearby employees at Promotions Unlimited • Potential partners: Promotions Unlimited, discuss if could they assist with parking access	***Threats*** • STH 11 crossing dangerous • No public parking available south of STH 11 • *Phragmites* inputs from the 2 stormwater ponds to the east

PHASE 7– Vegetation SWOT Analysis

	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	***Strengths*** • Good buffers to Pike River • Significant wildlife habitat and corridor adjacent Phase 6 • Burn control possible- schedule burn within first 5 years	***Weaknesses*** • Birdsfoot trefoil on banks of unrestored Pike River (near Chickory Creek) • No management access on east side of project • Future concern of ATV damage with restoration corridor based on current practice at Biex-Ramcke
EXTERNAL (future)	***Opportunities*** • Be early on crown vetch/birdsfoot trefoil control, start the first year post-construction • Educate neighbors on project, especially on the ATV damage issue - signage, and boundary markers • Educate contractors on cleaning equipment before construction	***Threats*** • Future ATV damage possible due to neighboring properties • Agricultural runoff/inputs to project corridor • Future development and stormwater inputs
	Chickory Creek Tributary • Opportunities to buffer/restore along the tributary, especially in the agricultural fields east of Willow Road. • On-line pond west of Willow Road - may be caused by trash impeding flow - investigate	***Chickory Creek Tributary*** • Chickory Creek outlet has significant invasive input, especially birdsfoot trefoil at the mouth of the Pike River • Trash (chair, box springs) in box culvert impeding flow just west of Willow Road • *Phragmites* patch east of 90th St- small and manageable at this point



Vegetation/ Management Issues Phase 5, 6 & 7

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

Vegetation
Phase 5,6 & 7

N

1 inch = 550 feet

0 275 550 1,100 FEET

ISSUE DATE: 3/20/2015

PROJECT NUMBER: 04-1083-001

All drawings are preliminary and subject to change.

This Page Intentionally Left Blank

Vegetation SWOT Analysis

Phases 8 and 9

PHASE 8– Vegetation SWOT Analysis

	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	***Strengths*** • Good existing buffers to Pike River • Wide prairie buffers with significant habitat is planned for construction • Significant wildlife habitat will be restored • Burn control possible - schedule burn within first 5 years	***Weaknesses*** • Access will be difficult for management, particularly on east side • Need to control birdsfoot trefoil and crown vetch immediately in first year following construction as well as pre-construction • Future concern of ATV damage with restoration corridor based on current practice at Biex-Ramcke
EXTERNAL (future)	***Opportunities*** • Be early on crown vetch and birdsfoot trefoil control. Start the first year post-construction. • Opportunities to buffer/restore along the tributaries • Educate contractors on cleaning equipment before and during construction • Educate neighbors to stop ATV traffic • Create visible edge of restored prairie, signage	***Threats*** • Agricultural impacts and over-cropping • Possible ATV damage to plantings from neighboring properties • Woody invasive species will likely enter corridor post-construction • Future development and stormwater inputs

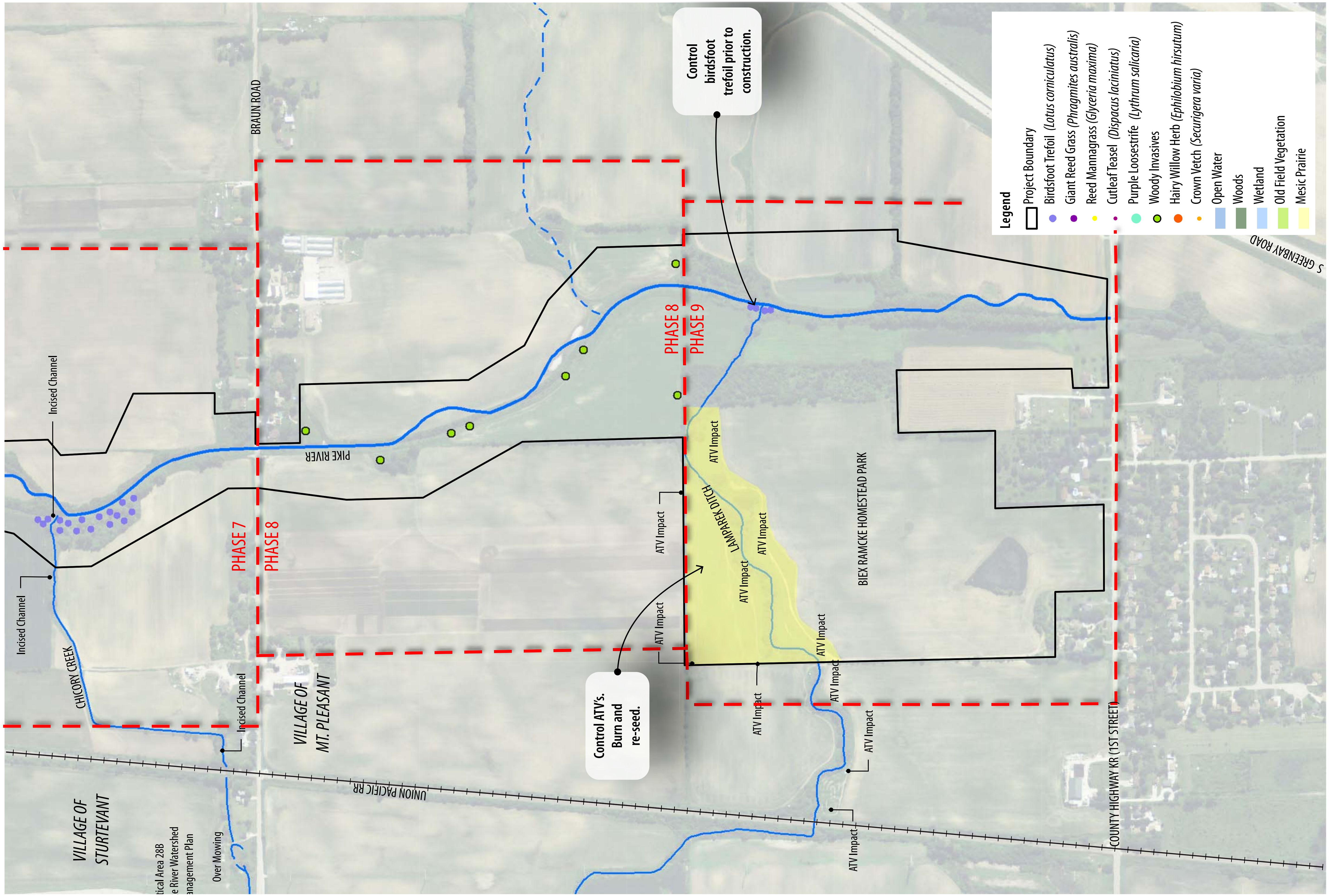
PHASE 9 Vegetation SWOT Analysis

	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	***Strengths*** • Good buffers to Pike River are included in the construction plans • Biex-Ramcke Prairie Planting (seeded in 2009) needs a burning regime • Wide prairie buffers with significant wildlife habitat being planned/constructed • Burn control possible - schedule burn within first 5 years • Pike-spawning habitat is included in the planned restoration	***Weaknesses*** • Significant ATV damage in Biex-Ramcke prairie, needs signage, discussion with local landowners • Birdsfoot treefoil and crown vetch in project area - need to herbicide in advance of construction and control in first year following construction • Will need management access on east side of project corridor • Be early on crown vetch/ birdsfoot trefoil control. Start the first year post-construction • Educate contractors on cleaning equipment before and during construction
EXTERNAL (future)	***Opportunities*** • Educate neighbors to stop ATV traffic at Biex-Ramcke site, need signage at site boundaries	**Threats** • Agricultural inputs, potential over-cropping into project area • Potential ATV damage into the project corridor from the Biex-Ramcke site • Future development and stormwater inputs
	Lamparek Ditch Tributary • Lamparek Ditch well buffered by Biex-Ramcke prairie planting • Significant opportunities to buffer/restore along Lamparek ditch from CTH H to Biex-Ramcke • Buffer included in Pike River Watershed Plan AG-05 • Potential wetland restoration west of Railroad, south of Lamparek	***Lamparek Ditch Tributary*** • ATV damage in farmland adjacent Lamparek Ditch • Poor farm buffers (actively farmed to top of bank) adjacent Lamparek except at Biex-Ramcke site (Village owned)

Vegetation/Management Issues Phase 8 & 9

Pike River Maintenance Plan

Mount Pleasant, Wisconsin



Vegetation
Phase 8 & 9

This Page Intentionally Left Blank

Aquatic Resources and Stream Stability Assessment

Migrating Brown Trout in Phase 5 of the Pike River.

Ongoing effort will be required to maintain a naturally-functioning stream in the Pike River Corridor. Rivers are dynamic and ever changing over time. The "bends" in the channel called "meanders" are really verbs not nouns. Meanders like to meander.

AQUATIC RESOURCES AND STREAM STABILITY ASSESSMENT

Stream Bend and Bank Stability

Stream channels have a capacity to carry water, and that capacity is determined by the streams width and depth (cross-sectional area), and slope. If the channel cross-section is not large enough to accommodate storm flow the channel will deepen and widen itself until a stable cross-section is achieved. Streams also carry sediment, sediment washed off the watershed and from the stream's bed and banks. For a channel to be stable over time it has to have the ability to safely pass both storm events and sediment from the watershed. At a given flow and velocity a stream has the ability to transport a given amount of sediment. If the stream is receiving more sediment than the flow can carry deposition in the channel will take place. If the energy of the flow is higher than the sediment available, the flow will begin to scour the bed and banks. The ability of a stream to transport, deposit or eroded sediment will vary depending on the bed and bank material size and make-up. The concept sediment transport, deposition and erosion are illustrated in Figure 2.4.1.

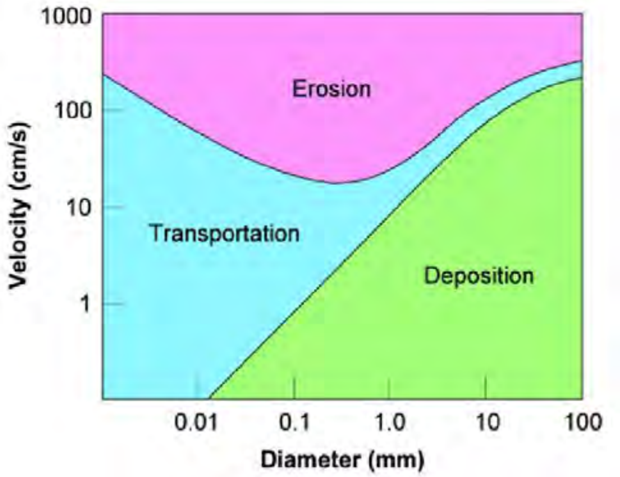


Figure 2.4.1 Concept Sediment Transport, Deposition and Erosion

All earthen lined stream channels are dynamic, experience deposition under given events and scour during other. A stable earthen channel is defined as a channel where the planform, cross section, and longitudinal profile are sustainable over time.

Some of the factors that influence erosion and channel stability, and their relevant characteristics include the following:

Factors Influencing Erosion and Channel Stability

Flow Properties	Magnitude, frequency and variability of stream discharge; Magnitude and distribution of velocity and shear stress; Degree of turbulence
Sediment Composition	Sediment size, gradation, cohesion and stratification
Climate	Rainfall amount, intensity and duration; Frequency and duration of freezing
Subsurface conditions	Seepage forces; Piping; Soil moisture levels
Channel geometry	Width and depth of channel; Height and angle of bank; Bend curvature
Biology	Vegetation type, density and root character; Burrows
Antropogenic factors	Urbanization, flood control, irrigation

While channel migration may not always be acceptable due to site constraints, it is important to note that a natural channel can migrate and still be considered stable, in that it's overall shape and cross-sectional area do not change appreciably. Design features are often employed to reduce the frequency and magnitude of these changes. When designing a stable channel some variables are given, or called independent, such as watershed size, given discharges and bed material and its associated roughness (bed friction). Other variables can be modified, and are called dependent variables. These dependent variables include such things as stream width, depth and slope.

Stream channels need some degree of sediment input to remain stable. Problems with channel stability take place when the channel receives either too much sediment for its sediment carrying capacity and deposition takes place, or is receiving too little sediment and the stream begins to scour, or "cannibalize" it bed and banks. A problem in many urbanizing areas like Mount Pleasant is that the stream is receiving large amounts of fine sediment in the form of silts and clays, and little course sediment such as sand and gravel. To identify how much fine sediment the is being delivered to the Pike River north of CTH KR a suspended sediment runoff calculation was conducted using the watershed model Long Term Hydrologic Impact Analysis (L-THIA) developed by Purdue University. The results of runoff modeling analysis are summarized in the Runoff Modeling Analysis Tables in the Appendix. The model indicates that during an average year approximately 2,282,400 pounds of suspended sediment enter the north branch of the Pike River above CTH KR. Of this sediment input, 1,495,911 or 65.5% comes from agricultural runoff and 783,089 or 34.3% comes from urban land uses. Watershed models to estimate bed load sediment are not available. However, based on field observations conducted as part of the fish habitat analysis, the north branch of the Pike River has limited course material.

Sediments carried by the Pike River include several forms. The first is suspended sediment, which is fine sediment carried in suspension by the energy of free flowing water. Suspended sediment is made up of clays, silts and fine sands. The second form is dissolved ions, which are dissolved minerals in the water, which are generally ignored when evaluating stream bed and bank stability. The last form of sediment is bed load, which is course material that rolls along the bed of the stream. Bed material is made up of course sand, gravel and cobbles, which are too heavy to be picked up by the and water but can be moved downhill by the forces of flowing water. The ability of a stream to move suspended sediment and bed load can be estimated by using two engineering methods called allowable velocity and allowable shear stress.

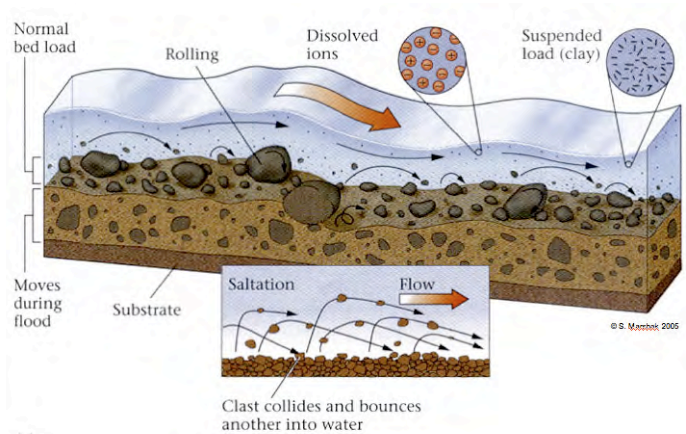


Figure 2.4.2 Types of Sediment Transported by Streams

The ability of a stream to move suspended sediment can be estimated by the velocity of the water. Velocity is the power that can scour a fine particle from the bed or bank and move it into suspension. The ability of flowing water to move a given particle size is called the allowable or permissible velocity. The allowable velocity is the greatest mean velocity that will not cause the channel boundary to erode. The allowable velocity can be approximated from tables that relate boundary material to allowable velocity, but tabular estimates should be tempered by experience and judgment. In general, older channels have higher allowable velocities because the channel boundary typically becomes stabilized with the deposition of colloidal material in the interstices. Also, a deeper channel will typically have a higher allowable velocity than shallow channels because erosion is a function of the bottom velocity. Bottom velocities in deep channels are less than bottom velocities in shallow channels with the same mean velocity. Allowable velocities have been determined for a large variety of boundary materials and are provided in many texts and manuals. For our analysis, we used information from Fortier and Scobey (1926), who present maximum permissible velocities for earthen irrigation canals with no vegetation or structural protection (See Runoff Modeling Anlaysis Tables in the Appendix).

Defining the Parameters of a Stable Stream Channel

The allowable shear approach (sometimes referred to as the tractive stress approach) is typically used with channels that are lined with rock, gravel, or cobbles and is the preferred tool for determining the movement of bed load material. Shear is the pull of water on an object in the direction of flow, and measured in units of force/area. Shear stress is the product of the energy slope, hydraulic radius, and unit weight of water. Shear stress represents the forces that will cause a particle to roll along the bottom of a stream channel. The formula for Shear stress is shown in Equation 2.4.1.

Hydraulic radius and the specific weight of water are important factors in shear stress as these represent the force of the overlying water on the bed particle, which causes it to be pushed downstream as bed load. Unlike velocity, which decreases on the bed with depth, shear stress increases with depth. Chang, H.H. (1988) summarizes typical channel shear stress based on interviews with professional practitioners and empirical observations.

The first step in applying either the allowable velocity or allowable shear stress methods is to calculate the hydraulics of the study reach. Studies have shown that greatest amount sediment transported from the bed and bank of a stream channel takes place during a condition called "bank full flow".

Equation 2.4.1:

$$\tau_o = \gamma RS$$

where: τ_o = total bed shear stress (lb/ft2 or N/m2)
γ = specific weight of water (lb/ft3 or N/m3)
R = hydraulic radius (ft or m)
S = energy slope, dimensionless

Most portions of the Pike River channel are alluvial, meaning that they create their own channels by moving sediment from the watershed and from the stream channel itself. Major episodes of such movement occur during floods and are called "channel forming events." These events determine the size of the channel needed to convey the water. In a period of relatively stable climate and land cover, a stream system will develop equilibrium between its flows and the size of the channel, whereby the channel is large enough to contain the stream under most flow conditions. When flows are greater than this capacity, the stream overflows its banks and flooding occurs.

In such streams, the channel is usually big enough to contain a high-flow event that recurs on an average of every 1.5 to 2.0 years (which we call the "1.5-year to 2.0-year flood"). Such a frequency of inundation is frequent enough that perennial vegetation can't grow there, either because its roots are too wet or its seedlings get swept away. So usually, what you will see if you look at the cross-

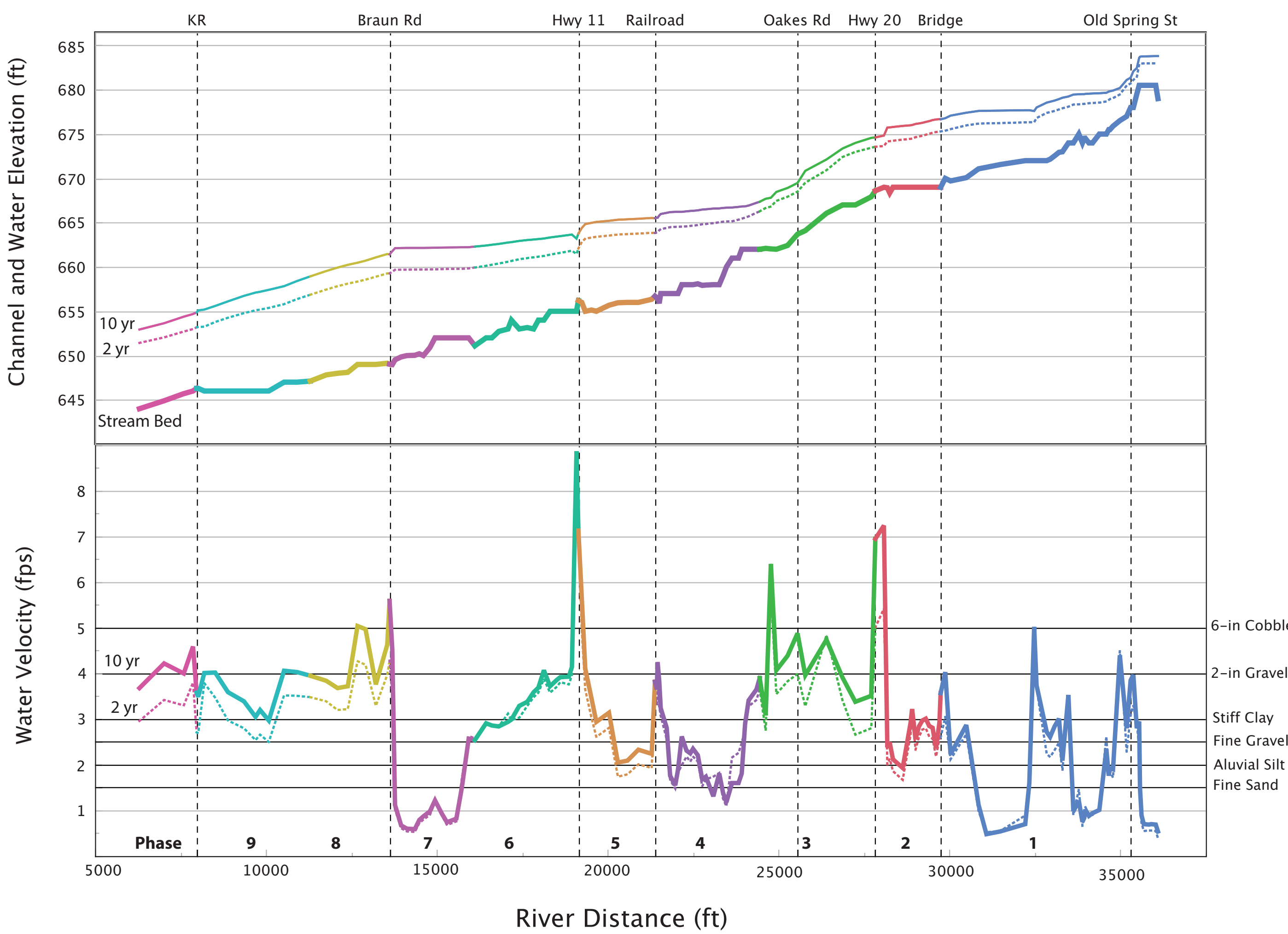


Figure 2.4.3 Critical Velocities and Sediment Transport in the North Branch of the Pike River

section of a stream channel is a sort of "bowl" that contains the stream most of the time, inside which no perennial vegetation grows and a place over the top of this bowl where the water can flow during a high-water event greater than a 1.5-to 2.0 year flood. This "floodplain" may be on one or both banks, depending on the site. For this analysis we used the 2.0-year storm to represent the "channel-forming event." Using the HEC-RAS flood plain model developed for the Village of Mount Pleasant, the 2-year water surface elevation, average channel velocity and average channel shear stress were calculated.

Stream Bed Stability of the Pike River

The results of the HEC-RAS analysis for water surface elevation and average channel velocity for the 193 cross-sections and each project reach on the Pike River in the Village of Mount Pleasant are illustrated in Figure 2.4.3. On the figure are the allowable velocities for various bed material particle sizes. From the graphic we see that several reaches have velocities greater that 3-fps which can erode stiff clay, the predominant bed material in the study reach. Also several reaches have velocities below 1.5-fps where deposition of fine sediments can take place.

Water Quality

YSI 6600 multiparameter datasondes were utilized to collect hydrological data from an established sampling site adjacent to Phase 4. This site has been monitored since 1999 (except during periods of ice cover) and the data provide valuable information to assess changes in hydrology and water quality. Readings were obtained every 20 minutes and are able to document changes that occur quickly within the system as well as longer-term trends over days, weeks and months. Figure 2.4.4 depicts a typical example of the daily fluctuations in water depth, turbidity (a measure of cloudiness) and specific conductance (a measure of dissolved salts and nutrients) recorded at the Phase 4 monitoring station. This example shows the widespread spring flooding that occurred across much of Wisconsin was observed the Pike River, with water depth peaking at 2.7 meters in April 2009. Other lesser peaks in depth correspond to rain events in late May, and

The following is a summary of the sediment issues by project reach:

Reach 1 → Reach 1 has a wide range of channel velocities. Generally higher velocities exist at the entrance and exit at the stream crossings. Specifically the reaches above and below Old Spring Road should be monitored for bank and bed scour and if necessary armored with rip-rap. Reaches between stream length 31080 and 32216, 33783 and 34183, and 35683 and 36098 have very wide stream widths that result in low velocities and are likely to areas with deposition issues. Narrowing of the channels in these reaches could increase velocities and reduce the need for maintenance dredging.

Reach 2 → This is generally an area where deposition should not be a major problem as 2-year velocities are generally above 2-fps. There is a high velocity area at the entrance to the STH 20 bridge that should be monitored for potential scour.

Reach 3 → This is generally a high velocity reach. Between STH 20 and Oakes Road the stream bed is the steepest in the entire north branch of the Pike River. 2- year velocities in this reach can exceed 5-fps. An area of concern is at Oakes Road where a steep grade change is causing scour just below the bridge. If the Oakes Road crossing is replaced the design should include addressing the steep grade.

Reach 4 → This reach is characterized by generally moderate velocities during a 2-year event. A potential problem area to monitor is at the entrances to the two bridges at the lower end of this reach.

Reach 5 → This reach begins with a high velocity as water exits the RR track (Bike path) bridge. Velocities are moderate, until the Waxdale Tributary enters the Pike River. At this point the flow doubles from 599-cfs to 1030-cfs. Velocities south of the Waxdale Branch increase to as high as 4.9-fps at the entrance the CTH 11 bridge. The lower section of Reach 5 should be monitored for bed and bank scour and armored if necessary.

Reach 6 → This reach has the highest velocities in the north branch of the Pike River at the exit of the CTH 11 bridge. Velocities exceeding 8-fps are found just below the bridge. This high-energy area will need to be protected with rip-rap. Below the bridge, velocities drop gradually but remain moderately high.

Reach 7 → This reach has the lowest velocities of any in the study area. In Reach 7 the stream slope becomes very flat and the channel width becomes wider. Reach 7 is an area that will likely have problems with deposition of fine sediment. Efforts to narrow the low-flow channel should be implemented in this reach to increase velocities and move fine sediment.

Reach 8 & 9 → These reaches have moderate to high velocities under current condition. Either widening the channel or placement of course material may be needed to maintain this reach in a stable condition.

both early and mid-September. Generally turbidity increased with peaking flows, most likely associated with a mixture of bed-load transport, soil and bank erosion. Conversely, specific conductance decreased with peak flows, indicating that significant surface runoff from rainfall was entering the stream.

As the vegetation establishes in Phases 1-6 and with the completion of Phases 7-9, the prediction is that the hydrograph will exhibit less pronounce flashy peaks and more consistent base-flow. Additional years of monitoring will be required to establish this statistically, independent from year-to-year weather patterns.

In addition to depth, parameters monitored by the sondes included temperature, dissolved oxygen, pH, turbidity and conductivity. Maximum daily mean water temperatures in 2010 were highest in the months of June and July, reaching close to 30 C. Specific conductance increased markedly in December, January and February, closely linked with snowfall events and road salting on Highway 20 and surrounding parking lots. An example is shown in Figure 2.4.5.

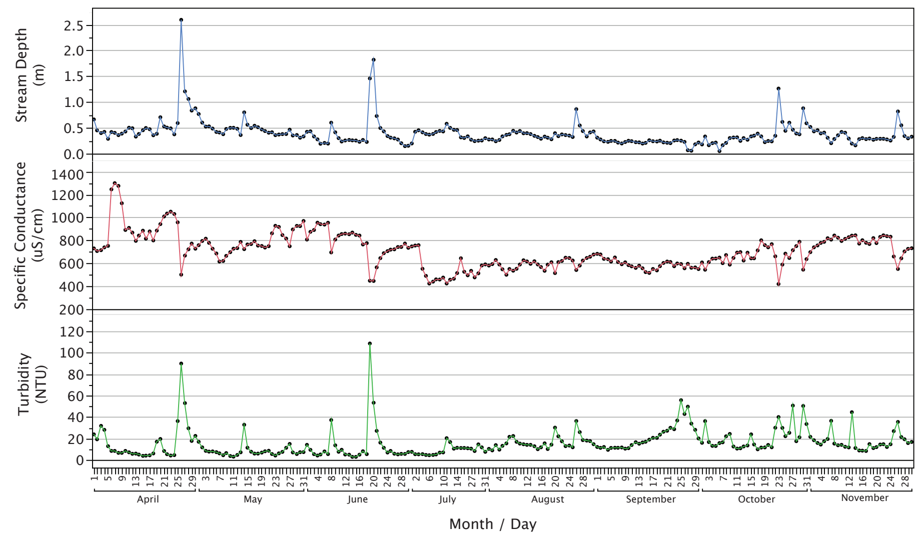


Figure 2.4.4 Example Water Quality Data Profile for the North Branch of the Pike River

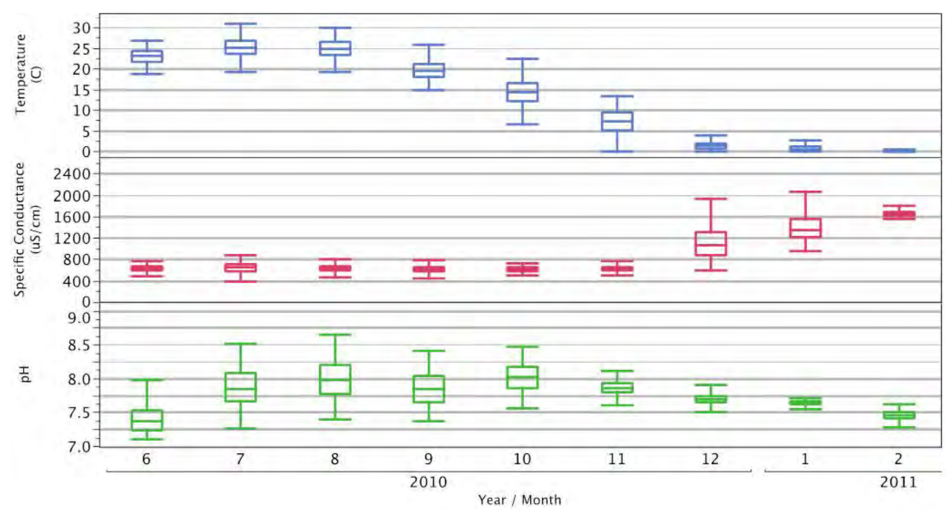


Figure 2.4.5 Example Monthly Water Quality Summary for the North Branch of the Pike River

Fish Habitat

A major focus for the Pike River Restoration has been to improve in-stream and riparian habitat. Floodplain modification, reshaping the stream channel, installation of instream habitat, and planting of riparian vegetation has been completed for Phases 1-6. Phases 7-9 will include many of the same structural features and methods used in Phase 6, with additional new channel construction as in Phases 1 and 4.

Three different methods have been employed to measure instream and adjacent riparian features. First, data collection followed the procedures outlined by Simonson et al. (1993) for small (<10 m) streams. This method takes a holistic approach in the assessment of habitat, focusing on features influencing fish population and community structure such as substrate, instream cover, channel morphology, and bank condition. The final score is out of a maximum score of 100. The score reflects the ability of the sampled habitat to support a healthy fish community, and is intended to correlate with the fish index of biotic integrity metric (Simonson et al., 1993). Second, a low-gradient habitat metric (Wang et al., 1998) was calculated for each site. This protocol is specifically tailored to Wisconsin streams having gradients at or less than 3m/km and riffles comprising less than 5% of their length (Wang et al., 1998). The low-gradient habitat rating system assesses the suitability of habitat for fish assemblages through 7 metrics: channelization (percent and age), instream cover, bank erosion, sinuosity, thalwag depth, and buffer vegetation. This method better reflects how the restoration activities within and surrounding the stream channel in the upper reach of the North Pike River has enhanced the habitat.

Scores and component metrics for the Wang et al. (1998) methods are presented in Figure 2.4.7, showing that the Pike River exhibited habitat scores in the range from Fair to Good, with higher scores for the restored sections. The primary driver for the higher scores include the creation of riffles, pools and instream fish cover during the restoration of the channels.

Another method used for quantifying habitat quality was the USEPA rapid habitat assessment for low gradient streams (Barbour et al. 1999) during the summer

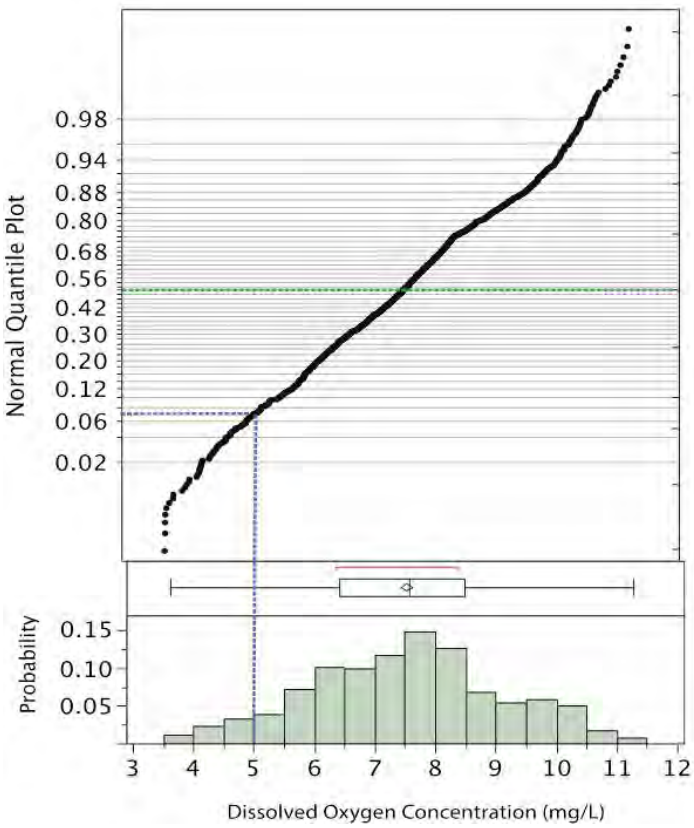


Figure 2.4.6 Example Daily Dissolved Oxygen Fluctuations in the North Branch of the Pike River

of 2009 and 2011. In this protocol, hydrological and habitat parameters are assessed at 6 transects along each reach. A conditional score of 0-20 is assigned to each parameter, which is listed in Table 2.4.1. A maximum of 200 points may be attained. Scoring criteria per metric are as follows: poor (0-5), fair (6-10), good (11-15), and excellent (16-20). All stations fell in to the "Good" classification (Figure 2.4.8). Phases 1 and 3 achieved the highest scores in the USEPA rapid habitat analysis and scored the highest in bank stability, channel alteration, vegetative protection, and riparian buffer zone. This is a reflection of the restoration activities that occurred between 2003-2006 that created a new stream channel and restored the adjacent riparian zone and floodplain.

Fish and Aquatic Invertebrates

Fish were collected during summer low-flow conditions using either a DC-stream electrofisher or a Smith-Root backpack electrofisher. Sampling methods followed Lyons (1992). The length of each station was 35 times the mean stream width with a minimum length of 100 meters. All fish collected within the station were identified, counted, and measured. The list of species collected is presented in the Appendix (Fish and Aquatic Species Collected). Green Sunfish (Lepomis cyanellus), Creek Chub (Semilotus atromaculatus), and Bluegill (Lepomis macrochirus) have been the dominant species by weight and number across sites and year.

The Wisconsin Index of Biotic Integrity (IBI) for Wisconsin Warmwater streams was calculated (Lyons, 1992) and used to compare changes in the quality of fish communities across years. The sampling stations were coded first to their corresponding project restoration phase and secondly by year as to whether

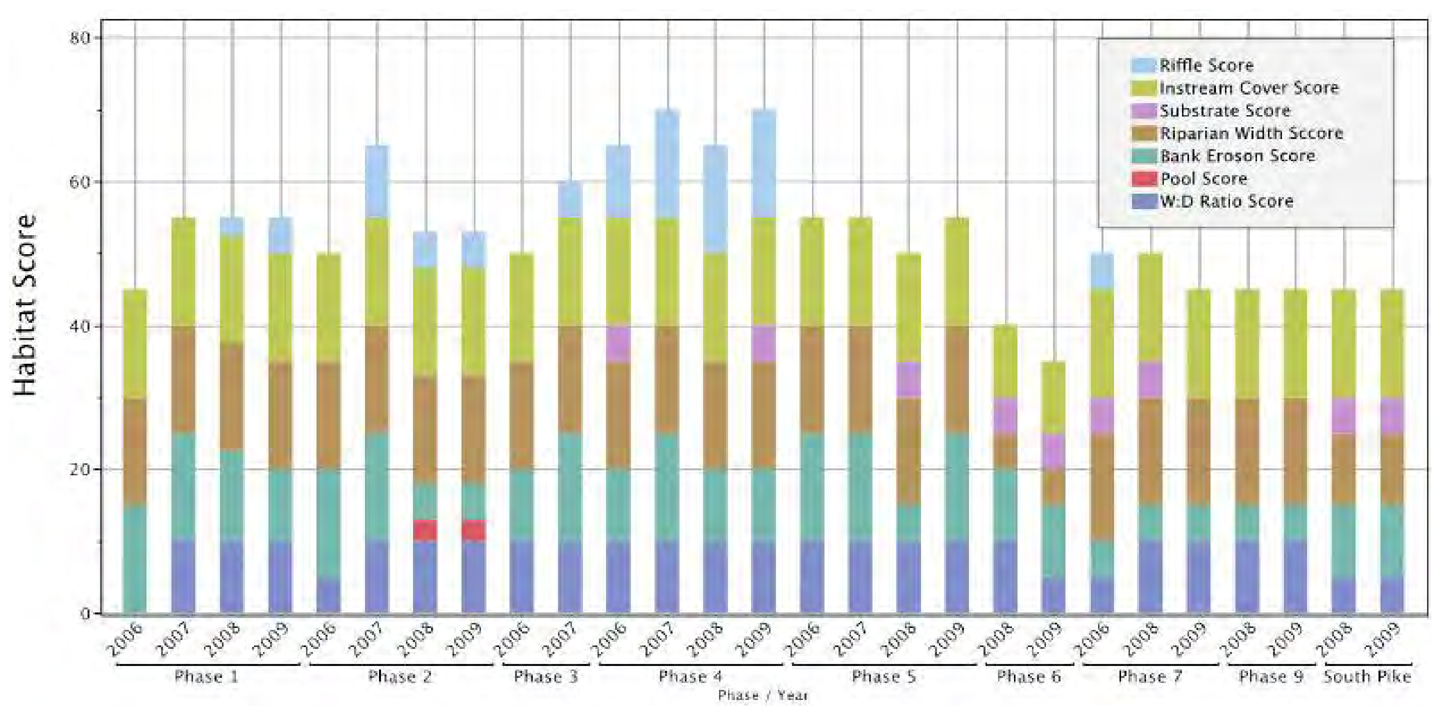


Figure 2.4.7 Habitat Scores Using Wisconsin DNR Methods for Low-Gradient Streams

Station	**Phase 1**		**Phase 2**		**Phase 4**		**Phase 5**		**Phase 6**		**Phase 7**		**Phase 9**		**South Pike**	
Year	**2009**	**2011**	**2009**	**2011**	**2009**	**2011**	**2009**	**2011**	**2009**	**2011**	**2009**	**2011**	**2009**	**2011**	**2009**	**2011**
Station Length (m)	100	100	100	100	100	140	118	140	175	175	149	140	228	210	158	210
MSW (m)	3	2	3	3	3	3	3	5	6	5	4	5	6	7	6	5
Mean Depth (m)	0.25	0.22	0.22	0.24	0.22	0.25	0.27	0.78	0.32	0.68	0.37	0.29	0.63	0.61	0.32	0.30
Epifaunal Substrate/Available Cover	15	13	14	11	11	6	5	11	12	6	12	10	11	10	17	16
Pool Substrate Characterization	14	12	13	13	16	11	10	8	15	11	14	13	10	8	17	15
Pool Variability	1	5	6	11	3	11	1	11	4	14	3	10	1	16	3	16
Sediment Deposition	14	9	9	7	13	8	8	6	17	10	18	14	13	6	16	13
Channel Flow Status	20	15	17	16	15	10	12	17	20	18	20	16	20	16	19	12
Channel Alteration	20	9	19	11	18	10	15	6	13	8	14	8	14	10	15	13
Channel Sinuosity	14	16	10	4	2	15	1	3	1	3	3	5	1	3	3	6
Bank Stability	20	19	19	18	16	18	12	18	16	18	18	16	11	8	18	14
Vegetation Protection	20	16	20	16	20	12	15	15	18	14	18	20	9	10	18	14
Riparian Buffer Zone	20	19	20	18	20	16	20	12	5	14	9	14	9	14	12	14
TOTAL SCORE	**157**	**133**	**148**	**125**	**134**	**117**	**99**	**107**	**119**	**116**	**129**	**126**	**98**	**101**	**137**	**133**
% of Total Points Earned	**79**	**67**	**74**	**63**	**67**	**59**	**49**	**54**	**60**	**58**	**65**	**63**	**49**	**51**	**68**	**67**

Excellent	16-20
Good	11-15
Fair	6-10
Poor	0 - 5

Table 2.4.1 Habitat Scores Using US EPA RAPID Methodology

that site had undergone restoration (Table 2.4.2). The hypothesis being that fish IBI would increase in restored sections of the Pike River relative to unrestored sections This analysis shows that the fish IBI scores in the restored reaches of the Pike River have progressively increased relative to the scores for the non-restored reaches (Figure 2.4.8). The steady increases in biotic integrity scores are attributable to increased metric values for fish abundance, fewer tolerant species (as percent of all individuals) and increased insectivores and lithotroph species in the restored sections. It is important to note that the scores for the restored sections, although higher (Fair) than the non-restored (Poor) on the IBI scoring system for Wisconsin, are still below the goal (Good) set forth in the facilitated restoration plan. Numerous factors may be involved, such as water quality, canopy cover, temperature, toxics and competition with non-native/invasive species. This will be discussed below in the recommendations section as the end of this report.

Other Factors Limiting Recovery of Aquatic Resources

Although biological integrity of the Pike River has improved during the course of the restoration work, the data show that it is not yet at the level set as a goal for the project. Although trend suggest that improvement will continue, three targeted studies were conducted to examine the factors limiting fish and macroinvertebrate communities in the Pike River and to suggest steps to better guide adaptive management of the subsequent restoration phases.

With respect to macroinvertebrates, these studies demonstrated that shading along the stream banks and substrate composition of the streambed are two factors constraining recovery. One study examined the responses of benthic communities to shading in the new stream channel in Phase 1 (Benson 2005). Shade, temperature, oxygen and stream flow were shown to be the factors that could potentially have affected benthic responses the most in this restored stream. The improvement of invertebrate scores over time will likely depend on growth and maturation of riparian vegetation planted within the restored reaches. This will assist in improving the invertebrate community by providing shading and limiting filamentous algal growth, which may further improve scores.

A second study conducted a habitat manipulation experiment in a 200m reach in Phase 3 (Ortenblad 2011) in order to test the effects of substrate enhancement on macroinvertebrate responses. A stretch with unrestored stream bottom was selected, and varying treatments of rocky substrate were installed and replicated. Macroinvertebrate communities were sampled over a 3-year period (2007-2009), with initial installation of the substrate occurring in year 1 and additional rocky substrate added in year 2. All metrics improved in treatments where hard substrates (gravels and cobbles) were more than 50% of the substrate surface area, and demonstrated that substrate habitat re-creation with gravels and cobbles is effective at increasing local macroinvertebrate communities. However, the substrate effects were short-lived for a one-year period due to siltation and increased fines. The reintroduction of new gravels each year was necessary to maintain higher levels of invertebrate biotic integrity.

A third, comprehensive study (Jensen 2011) examined the relationships among toxicological factors, land cover, in-stream habitat, water quality and their resultant impacts on the ecological success of stream restoration efforts in the Pike River. Sediment samples were collected from stations within the Pike River, its tributaries, and from best- and worst-case regional reference streams. Three separate bioassays using ostracods, brine shrimp and higher plants were performed to assess total toxicity of sediments and pore waters through the observation and interpretation of both lethal and sub-lethal responses. Analyses showed that land cover and in-stream substrate composition were the best predictors of fish assemblages, suggesting that catchment and reach level stressors are the dominant factors influencing fish biological integrity. By contrast, ecotoxicological metrics best-predicted variation in aquatic macroinvertebrate assemblages, suggesting that conditions on the local level have

Year	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8	Phase 9	South Pike Average
1990	-	-	-	-	*30*	-	*27*	-	*10*	*26*
1993	-	*25*	-	-	*15*	*30*	*25*	-	*10*	*22*
1994	-	*20*	-	-	*25*	*30*	*25*	-	*25*	*23*
2000	40	35	-	12	30	-	15	-	20	26
2001	30	20	20	15	15	-	35	-	35	24
2002	-	27	17	17	29	12	16	12	17	19
2003	7	-	-	12	22	17	17	2	27	22
2004	**25**	**34**	22	17	42	37	17	17	24	18
2005	**23**	**30**	15	20	35	-	22	15	27	10
2006	**30**	**35**	10	35	40	-	27	-	20	-
2007	**40**	**39**	**30**	37	25	-	25	-	20	32
2008	**34**	**37**	**32**	30	25	-	25	-	4	22
2009	**32**	**32**	**-**	30	25	-	5	-	15	30
2010	**37**	**35**	**27**	**-**	**-**	-	15	-	20	-
2011	**39**	**35**	**-**	**42**	**40**	-	20	-	22	25

DNR Historical Data
Un-Restored North Pike
Restored North Pike
South Pike (Reference)

Table 2.4.2 Fish Index of Biotic Integrity (IBI) Scores by Year, Phase and Restoration Status

greater impact on benthic invertebrate communities. Spatial patterns in responses indicate that toxic inputs from tributary streams have strong local impacts on invertebrate communities in the main channel of the Pike River. Although a study of the concentrations of heavy metals in the sediments showed only that copper was at levels above effect concentrations, regressions models demonstrated that the combined effects of copper, lead and cadmium were able to explain significant amounts of variation in invertebrate community composition.

Together, these studies demonstrate that impaired biological integrity is seldom the result of single stressors acting in watersheds. In the case of the Pike River, fish and invertebrates are integrating stressors acting across diverse scales – ranging from watershed level stormwater runoff to localized erosion, substrate composition and shading. The result makes it clear that the longer term recovery and maintenance of the Pike River restoration project will require continued attention at both scales.

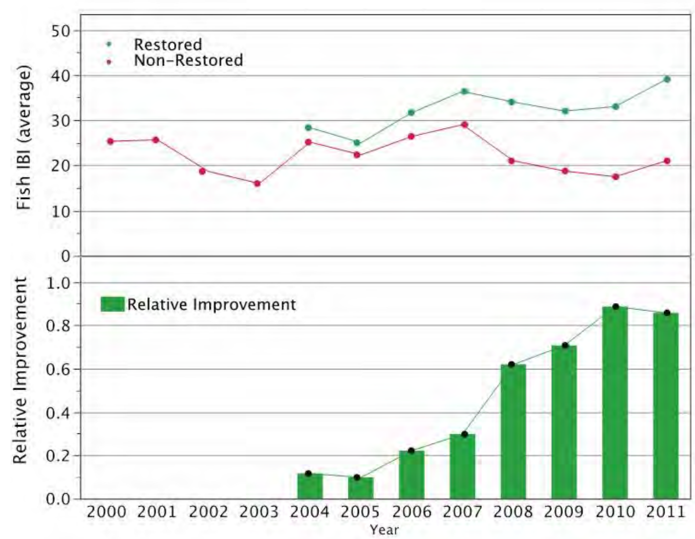


Figure 2.4.8 Fish Index of Biotic Integrity (IBI) Scores Comparing Restored with Non-Restored Phases

Analysis and Conclusions (SWOT)

1. Fish Index of Biological Integrity shows a steady improvement in restored sections of the stream, relative to non-restored and reference streams.
2. Although this indicates that the restoration actions are having a positive impact, the level of recovery is still less than the objectives set in the restoration plan.
3. Although improvement is expected over time as the restored sections mature with increased vegetation and fish cover, there are specific restoration actions that have been successful in the shorter term, including using boulder clusters and logs to increase in-stream cover.
4. Increased numbers of carp have been seen in recent years, perhaps associated with the pools constructed in Phases 4 and 5. These need to be monitored closely to ensure that they do not cause problems for other aspects of the restored sections of the stream.
5. Macroinvertebrate Indices of Biotic Integrity exhibit significant variation among sites and across years, unrelated to the restoration activities.
6. Studies show that invertebrates are responding positively to substrate quality (amount of gravels in the stream bed) and negatively to toxic substances entering from tributaries.
7. Additional extensive rock riffles have been included in Phase 6 and will be monitored in 2013 to see if they are

effective in promoting better macroinvertebrate responses.

8. New monitoring programs are underway (Racine Dept. of Public Health) to better characterize the inputs to the Pike River from the tributary streams.
9. Hydrology and Water Quality monitoring suggest that the channel and floodplain modifications are having the desired effects on peak flows and water quality.
10. Spikes in conductivity during the winter indicate that road salt runoff into the stream is a significant potential short and long-term problem for recovery of the Pike River.
11. Studies of the water quality ponds constructed in Phase 1 show that they are having a significant impact on reducing phosphorus input into the system. Similarly, the meandering stream sections of Phase 1 function to reduce nitrate levels in the stream.

Aquatic SWOT Analysis

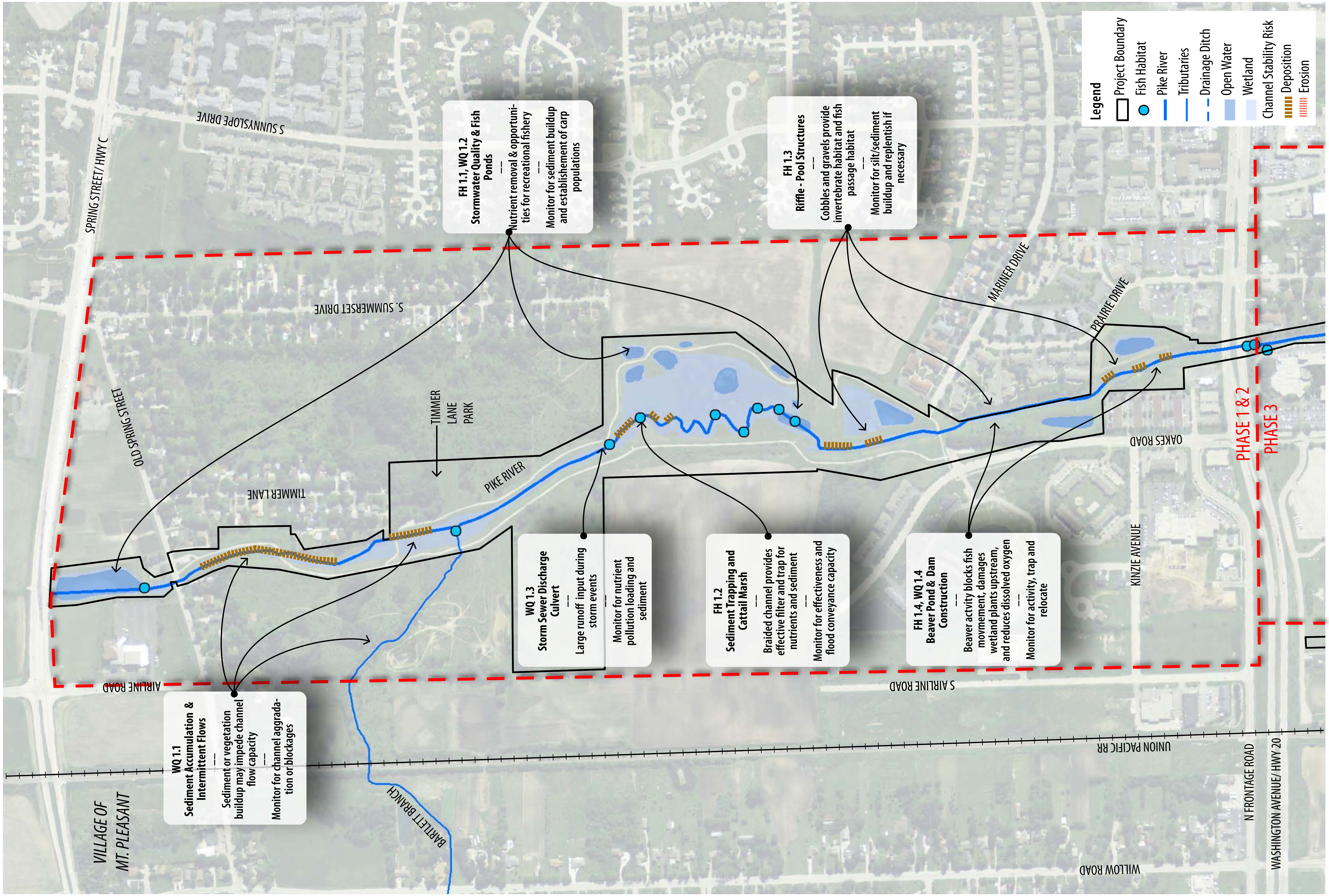
Phases 1 and 2

PHASE 1– Aquatic Resources SWOT Analysis

	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	***Strengths*** • Excellent vegetation cover and canopy along banks • Springs buffer water temperature and maintain summer base flow • Extensive riparian wetland system mitigates flashy flows and water velocity • Water quality ponds at headwaters and in wetland restoration provide nutrient reduction from residential areas	***Weaknesses*** • Large storm sewer culvert at north end of wetland restoration contributes to flashy flows and nutrient loadings • Sedimentation accumulation in upper area of wetland restoration contributes to braided channel formation and cattail marsh • Beaver activity creates ponding that increases water temperature and block fish passage • Pond at downstream end of Phase 1 increases water temperature fluctuations and provides carp breeding habitat
EXTERNAL (future)	***Opportunities*** • Fishing opportunities in north east ponds for sunfish and bass • Trail system provides access for recreational fishing and wildlife watching	***Threats*** • Flow will become increasingly intermittent, due to changes in precipitation patterns resulting from climate change (drought and intense storms) • Future development upstream will increase runoff, flashiness, nutrient and sediment inputs unless proper BMPs included
	Bartlett Branch Tributary • Shrub canopy cools water and overshadow invasive species • Increasing riparian buffers can reduce sediment loading downstream	***Bartlett Branch Tributary*** • Low or intermittent flow during summer • Increased development may increase stream flow flashiness, sediment loading and nutrient inputs

PHASE 2– Aquatic Resources SWOT Analysis

	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	***Strengths*** • Excellent vegetation overhand along steam bank • Channel structures provide for fish passage between Phase 1 and Phase 3	***Weaknesses*** • Sections with minimal water depth at low flow reduce fish passage • Beaver activity can create flow blockages and flood upstream areas
EXTERNAL (future)	***Opportunities*** • Pool-riffle structure can be enhanced using cobble-sized stones to improve fish and invertebrate habitat	***Threats*** • Potential for nutrient and pollution inputs from stormwater ponds from commercial and residential development



Fish Habitat Phase 1 & 2

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

Fish Habitats
Phase 1 & 2

This Page Intentionally Left Blank

Aquatic SWOT Analysis

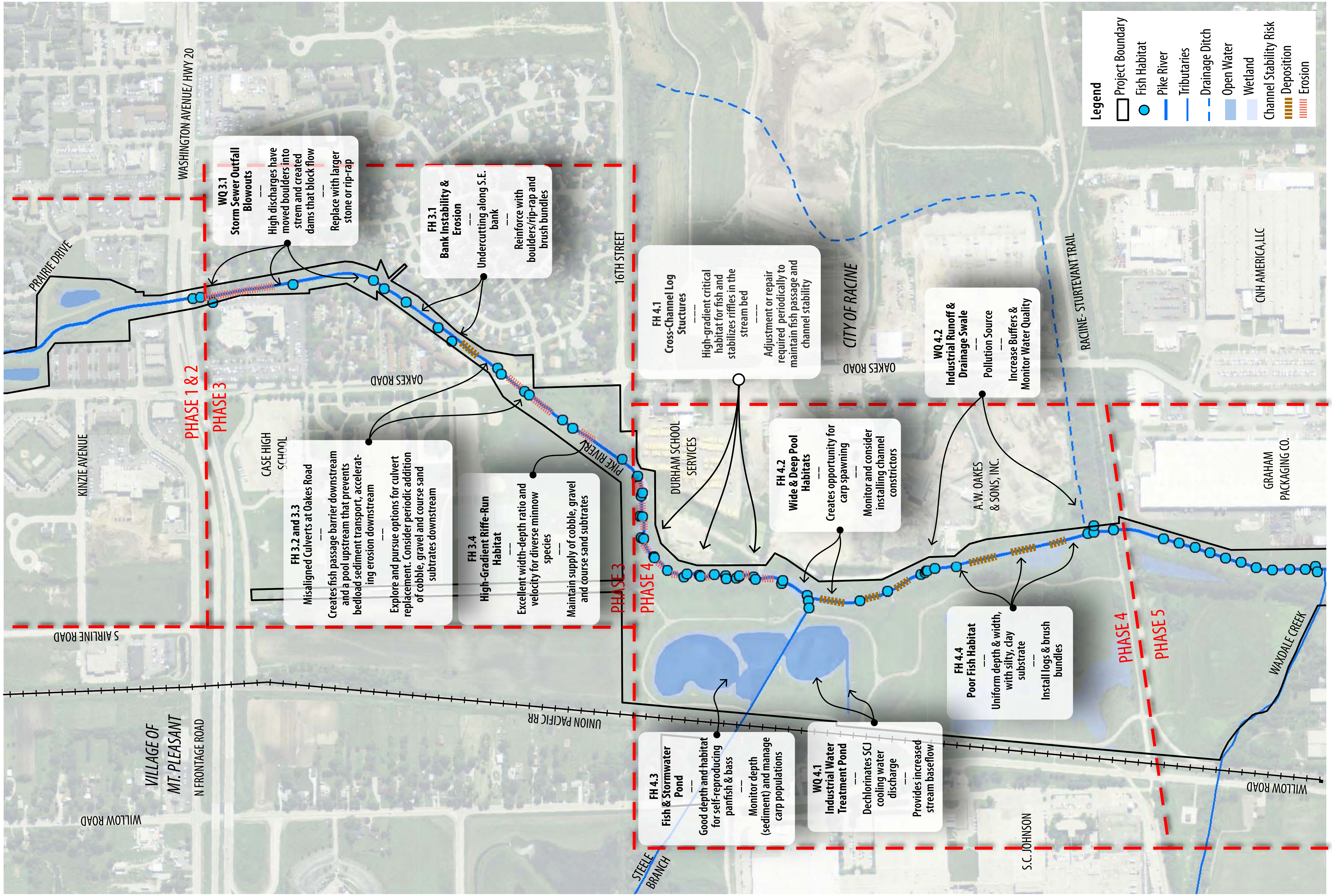
Phases 3 and 4

PHASE 3– Aquatic Resources SWOT Analysis

	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	***Strengths*** • Good pool-riffle structure in reach downstream of Oakes Road crossing provides excellent habitat and water velocities for macroinvertebrates	***Weaknesses*** • Blocking of bed-load sediment by culvert at Oakes Road creates in sediment accumulation upstream and erosion downstream • High velocities from stormwater culvert inputs have pushed boulders into stream channel and created impoundments and barriers to fish passage • Undercutting of stream banks along southeastern
EXTERNAL (future)	***Opportunities*** • Placement of brush bundles in the reach upstream of Oakes Road can promote channel meandering and habitat enhancement • Periodic addition of small gravels and course sands downstream of Oakes Road can enhance habitat and bed stability • Replacement of culverts at Oakes Road with a clear span bridge will improve fish passage and streambed stability	***Threats*** • Oakes Road culvert blockage of bed-load sediment will result in continued bed and bank erosion problems downstream until the culverts are replaced with proper placement or by a clear-span bridge • Oakes Road culvert blocks upstream fish passage and prevents full potential of upstream fish community

PHASE 4– Aquatic Resources SWOT Analysis

	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	***Strengths*** • Pools, riffles and log structures in the new channel upstream provide good diversity of habitats • Well-established bank vegetation and overhang • Stormwater ponds provide water quality benefits • Stormwater ponds provide recreational fishing opportunities	***Weaknesses*** • Channel bed and banks are continuing to adjust following the construction of the new channel in 2009, due in part to the disruption of bedload transport by the misplaced culvert at Oakes Road • Instream log structures require elevation adjustments due to bed erosion and sediment deposition • Slow, deep pools near confluence with Steele Branch provide carp breeding habitat • Low habitat diversity in the reach downstream of confluence with Steele Branch
EXTERNAL (future)	***Opportunities*** • Installation of brush bundles can promote meandering and improve channel habitat diversity downstream of Steele Branch, and provide opportunities for community engagement • Installation of fishing stations or piers on ponds can create recreational opportunities	***Threats*** • Runoff from asphalt recycling and landfill sites create potential for pollution inputs into the stream • ATV users crossing the stream from parking lots to the east • Any reduction in SC Johnson cooling water effluent would have negative effects on stream baseflow



1 inch = 550 feet

ISSUE DATE: 3/19/2015

All drawings are preliminary and subject to change.

© 2014 Hitchcock Design Group

Fish Habitat Phase 3 & 4

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

This Page Intentionally Left Blank

Aquatic SWOT Analysis
Phases 5, 6 and 7

PHASE 5– Aquatic Resources SWOT Analysis

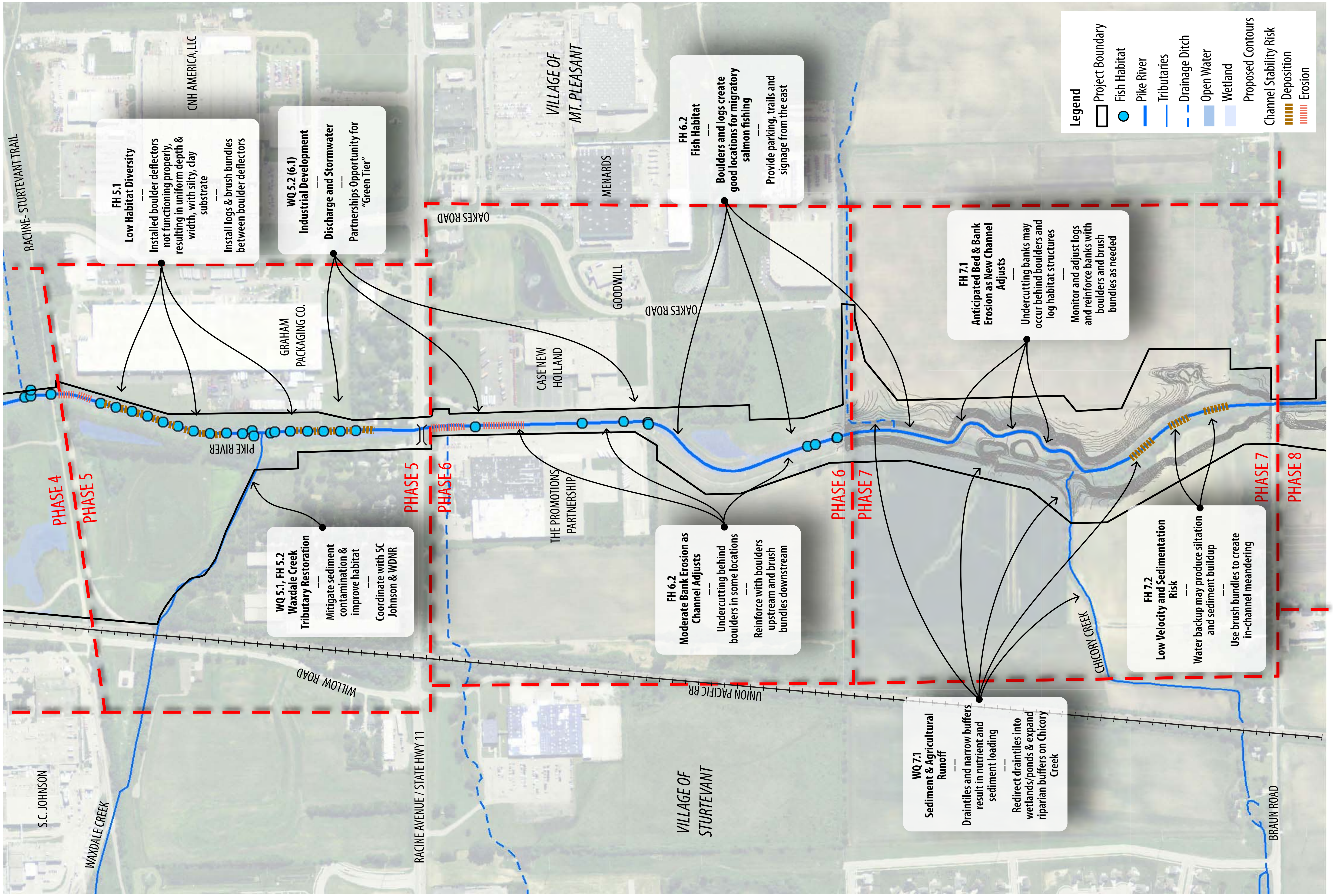
	HELPFUL *(positive)*	HARMFUL *(negative)*
INTERNAL *(current)*	***Strengths*** • Good baseflow status during most of the year • Boulder channel deflectors crease some localize variation in habitat • Tree canopy over Waxdale Creek cools water during the summer and mitigated temperatures in Pike River	***Weaknesses*** • Straight channel and lack of diversity in water depths, water velocity and substrate composition provide little habitat diversity • Narrow riparian buffer to the east • Stormwater runoff from culverts draining industrial development and parking lots increases flashiness and reduces water quality
EXTERNAL *(future)*	***Opportunities*** • Installation of brush bundles will increase width, depth and water velocity variation • Collaborative stormwater and discharge management among industrial business using Green Tier Program http://dnr.wi.gov/topic/GreenTier/ could reduce environmental impacts and promote cost savings	***Threats*** • Ecotoxicology tests in Waxdale Creek show evidence of sediment contamination that should be addressed in tributary restoration

PHASE 6– Aquatic Resources SWOT Analysis

	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	**Strengths** • Log structures, boulders and rock deflectors create quality fish habitat along the full reach • Good flow status is maintained year-round, including during the summer months • Wide riparian zone in downstream reach provides buffer from agricultural fields	**Weaknesses** • Narrow riparian buffer in the upstream section combined with stormwater runoff from culverts draining industrial development and parking lots increases flashiness and reduces water quality • Some bank erosion and undercutting is occurring as the new channel adjusts to changing flow regime
EXTERNAL (future)	**Opportunities** • Flow status and habitat provide a fishing opportunity for spring and fall migrating steelhead salmon • Collaborative Stormwater and discharge management among industrial and commercial business using Green Tier Program http://dnr.wi.gov/topic/GreenTier/ could reduce environmental impacts and promote cost savings	**Threats** • Increased development along Highway 11 corridor without sufficient stormwater management could produce increased stream flashiness and result in bank erosion, bed instability, habitat loss and reduced water quality

PHASE 7 – Aquatic Resources SWOT Analysis

	HELPFUL (positive)	HARMFUL (negative)
INTERNAL (current)	**Strengths** • Wide riparian buffers to Pike River are included in the construction plans, which will help protect from agricultural non-point pollution • Stone riffles, log and boulder structures included in the construction plans will enhance water width, depth and velocity variation to improve fish and invertebrate habitat • Pike-spawning wetland are included in the planned restoration for Phases 8 and 9	**Weaknesses** • Chickory Creek (Phase 7) and Lamparek Ditch (Phase 9) are sources of agricultural pollution (nutrients, sediment and pesticides) that have negative effects on fish and invertebrate communities • Restoration activities will temporarily reduce canopy cover and shading, possibly promoting increased algae growth and extreme dissolved oxygen fluctuations
EXTERNAL (future)	**Opportunities** • Spawning wetlands and ponds will provide recreational opportunities for expanded fishing access • Redirection of drain tiles into wetlands/ponds may help reduce nutrient loadings into stream • Enhanced riparian buffers along Chickory Creek and Lamparek Ditch can reduce pollution and improve water quality	**Threats** • Future agriculture or residential development should use appropriate best management for nutrient management and stormwater



Fish Habitat Phase 5, 6 & 7

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

Fish Habitats
Phase 5, 6 & 7

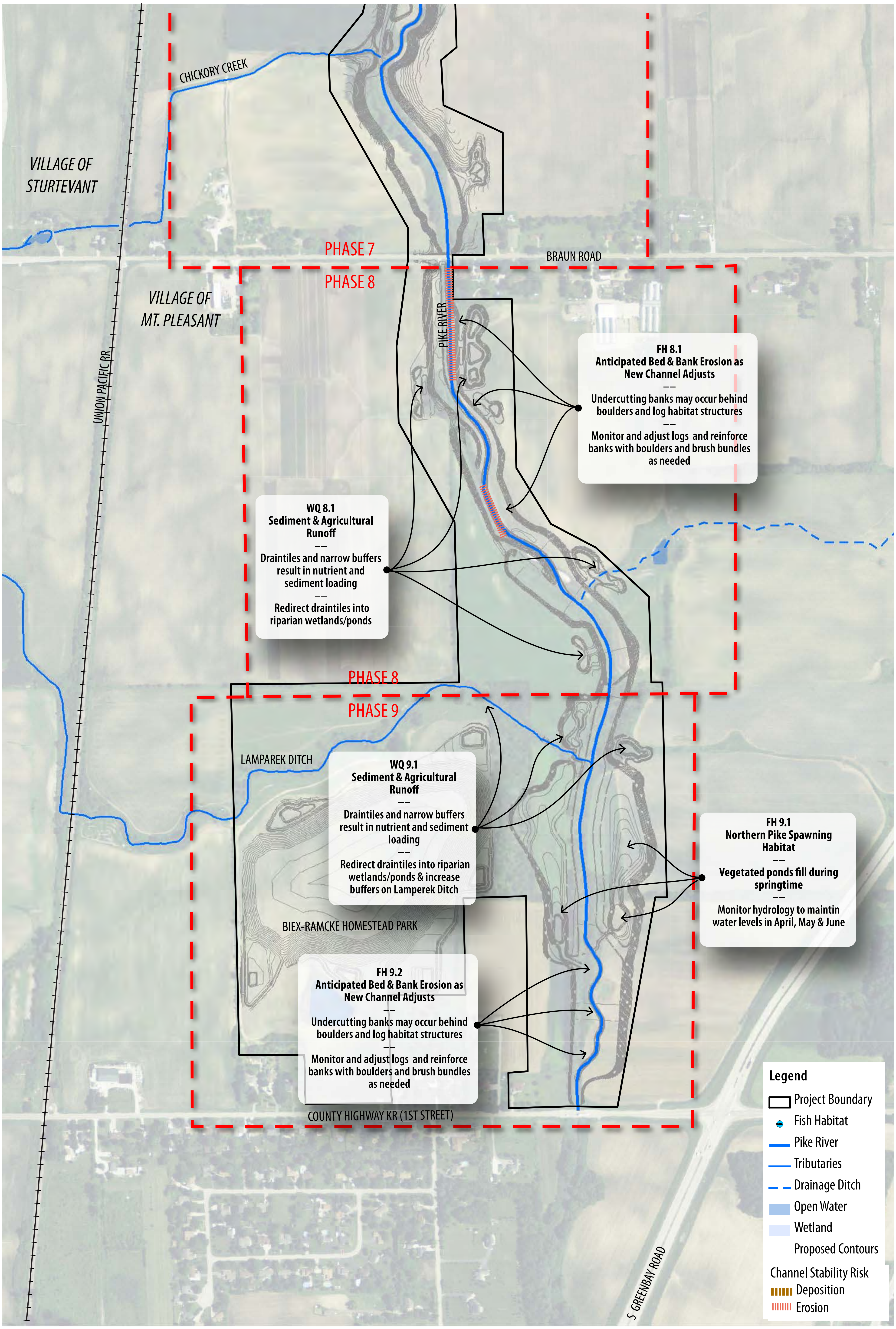
This Page Intentionally Left Blank

Aquatic SWOT Analysis

Phases 8 and 9

PHASE 8 & 9 – Aquatic Resources SWOT Analysis

	HELPFUL *(positive)*	HARMFUL *(negative)*
INTERNAL *(current)*	***Strengths*** • Wide riparian buffers to Pike River are included in the construction plans, which will help protect from agricultural non-point pollution • Stone riffles, log and boulder structures included in the construction plans will enhance water width, depth and velocity variation to improve fish and invertebrate habitat • Pike-spawning wetland are included in the planned restoration for Phases 8 and 9	***Weaknesses*** • Chickory Creek (Phase 7) and Lamparek Ditch (Phase 9) are sources of agricultural pollution (nutrients, sediment and pesticides) that have negative effects on fish and invertebrate communities • Restoration activities will temporarily reduce canopy cover and shading, possibly promoting increased algae growth and extreme dissolved oxygen fluctuations
EXTERNAL *(future)*	***Opportunities*** • Spawning wetlands and ponds will provide recreational opportunities for expanded fishing access • Redirection of drain tiles into wetlands/ponds may help reduce nutrient loadings into stream • Enhanced riparian buffers along Chickory Creek and Lamparek Ditch can reduce pollution and improve water quality	***Threats*** • Future agriculture or residential development should use appropriate best management for nutrient management and stormwater



Fish Habitats
Phase 8 & 9

Fish Habitat Phase 8 & 9

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

1 inch = 550 feet

ISSUE DATE: 3/19/2015
PROJECT NUMBER: 04-1083-001
All drawings are preliminary and subject to change.

This Page Intentionally Left Blank

Phase 6 stream, in strream habitat structures on left of photo, bare banks on right side of photo. Photo by A. Thompson 2014

Trail Corridor, Park and Recreational

The Trail Corridor, Park & Recreational Inventory and Analysis considers the regional context, natural and cultural and infrastructure resources in developing an understanding of the corridor's current and potential recreational assets and opportunities.

REGIONAL CONTEXT

The Village of Mount Pleasant is located in Racine County in southeastern Wisconsin and wraps around the southern and western edges of the City of Racine. The Village municipal limits also surround the Village of Sturtevant an immediate neighbor of a portion of the project area. The close proximity of I-94 gives it regional access to Milwaukee, just 28 miles to the north and Chicago, Illinois, 73 miles to the south. The sprawling municipality is 36 square miles and spans from I-94 all the way to Lake Michigan. This proximity to the Lake is a major asset for residents and visitors alike. The Village of Mount Pleasant has 40 park and open space sites, comprising 1,527 acres across the Village. The Pike River Corridor serves as a greenway spine, stretching nearly the entire community from north to south. (See Recreation Analysis Maps)

NATURAL AND CULTURAL RESOURCES

Pike River Corridor

The Pike River is primarily a riparian corridor with built and planned flood mitigation wetlands and detention ponds that also provides the community with unique recreational opportunities. Once completed, the Pike River Pathway will have nearly 7 miles of trails dedicated to bicycle and pedestrian activity, meandering through residential, industrial and rural landscapes. The Pike River Parkway in Mount Pleasant consists of approximately 450 acres of dedicated, conservation easement and Village owned land, which includes Biex-Ramcke Homestead Park, an undeveloped Park (87 acres).

The 6.75 mile long corridor stretches from Highway C (Spring Street) to County Highway KR (1st Street) and directly connects a network of local and regional bike routes and trails including Racine-Sturtevant Regional Trail and on road facilities from Old Spring Road to Stuart Road. This system provides a localized network with access from the corridor and on-road trails to

Smolenski Park (72 acres) the Village Civic Campus (38 acres) and Cozy Acres (27 acres).

Pike River Pathway

All 9 Phases of the Parkway are in varying levels of development, construction and maintenance. Phase 1, 2, 4 and 6 trail segments have been constructed and are currently open to the public. Phase 5 is under construction, has a gravel base course in place and is waiting to be paved in the spring/summer of 2015. Phase 6 is in need of serious maintenance as a large portion of the trail is indistinguishable and unusable due to overgrown weeds. Phases 1 and 2 are quite picturesque, while other areas adjacent to industry have unsightly views of loading and services areas and industrial yards. Phase 7 construction spoils, (waste material brought up during the course of construction) will be deposited in Phase 4, creating some topographic change within the area. Additional construction fill from Phases 8 and 9 will be located in Biex Ramcke Homestead Park. (See Recreation Analysis Maps)

INFRASTRUCTURE RESOURCES

Streets

Five transportation corridors bisect the river corridor and trail and are controlled by three different jurisdictions. The Village of Mount Pleasant controls Spring Street and Braun Road, Racine County controls County Highway KR and also has jurisdiction over the connecting Racine-Sturtevant Bicycle Trail. The Wisconsin Department of Transportation controls both Highway 20 and 11. Future roadway projects include a connection to the road spur at the intersection of Lannon and Oakes Road that will connect to Mariner Drive. Safe connection off Mariner Drive should be considered at the time of implementation.

Traffic speed limits, roadway width and volumes play a critical role in determining not only the safety of users but also the comfort of pedestrians and cyclists and their ability and desire to cross these intersections. The majority of the roads that access, or are adjacent to the corridor have posted speed between 25 and 45 mph, with a majority at or near 45 mph. State Highway 20 and Highway 11 have

Timmer Lane (residential) Sumerset Drive (residential)

Oakes Road (2-4 lanes)

Old Spring Street (2 lanes) Stuart Road (2 lanes) Willow Road (2 lanes)

Highway 11 (4 lanes)

HIghway 20 (4 lanes divided Braud Road County Highway KR (2 lanes)

According to the U.S. Department of Transportation Federal Highway Administration: "Arterials serve a high share of longer distance trips and daily vehicle miles of travel." In rural areas, Arterials typically account for approximately half of the daily vehicle miles of travel. Collectors account for the next largest percentage of travel.

posted speeds of 45 mph and 40 mph respectively, but the standard flow of traffic on the average day well exceeds the posted limits. The other two major roadways that bisect the project (Braun Road and County Highway KR) have posted speed limits 45 mph.

The Wisconsin Department of Transportation reports traffic count values called "annual average daily traffic" or AADT to represent traffic volumes on specific roads. Two roadways are classified as Principal Arterials and yield high traffic volumes and present a safety concern for pedestrians and cyclists utilizing the trail. Highway KR is classified as a collector at the point of intersection with the Trail but increases to a minor arterial as traffic moves east.

AADT, a third of traffic from Highway 20. While traffic counts are less on Oakes, it is important to note the increased amount of semi-truck traffic to local industrial businesses.

Railroad

The Union Pacific Railroad parallels the entire corridor to the west and has two spurs that break off toward S.C. Johnson to the west and another that dead ends to the north side of Graham Packaging Company. The rail line does not impact trail users within the parkway, however it does impact those trying to reach the corridor from the west. Residents west of Willow Road have to access the corridor to the north via Old Spring Road, or cross Highway 20 and enter via the Racine-Sturtevant Trail at Phase 4 and 5. Furthermore, the railroad makes the opportunity to create a more direct greenway/trail connection from Smolenski Park to the corridor more challenging. (See Recreation Analysis Maps)

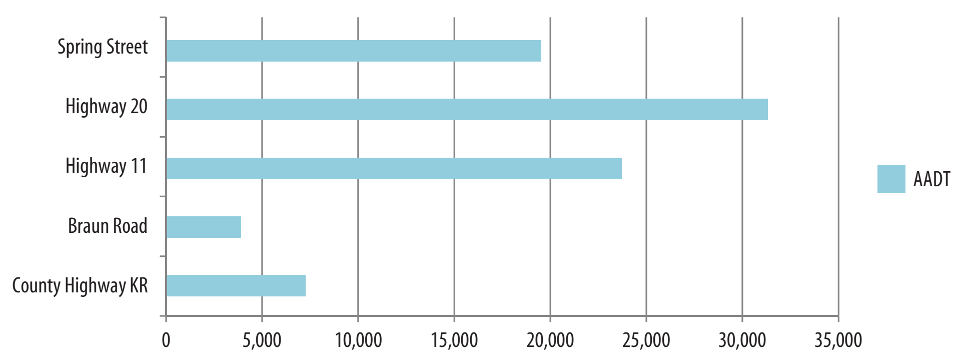
Vehicular Access and Parking

While there are several roads that bisect the corridor, there aren't very many that run adjacent to or parallel north-south. The main access points are via east-west roadways. There are currently three trail head parking lots and a third shared lot with Jerome Case High School. These include the most northern access point off Old Spring Street with 6 parking spaces, 10 parking spaces off Wendi Court, via Timmer Lane and another with 8 parking

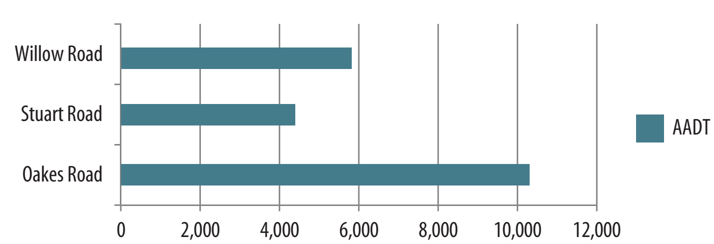
The Federal Highway Administration Best Design Practices Guide for Designing Sidewalks and Trails for Access outline several factors for designing effective pedestrian crossing including: information/signs, signals and markings; turning radius; crosswalks, crossing time; medians, refuge islands and slip lanes; curb ramps; sight lines; traffic patterns and onset of signal phases.

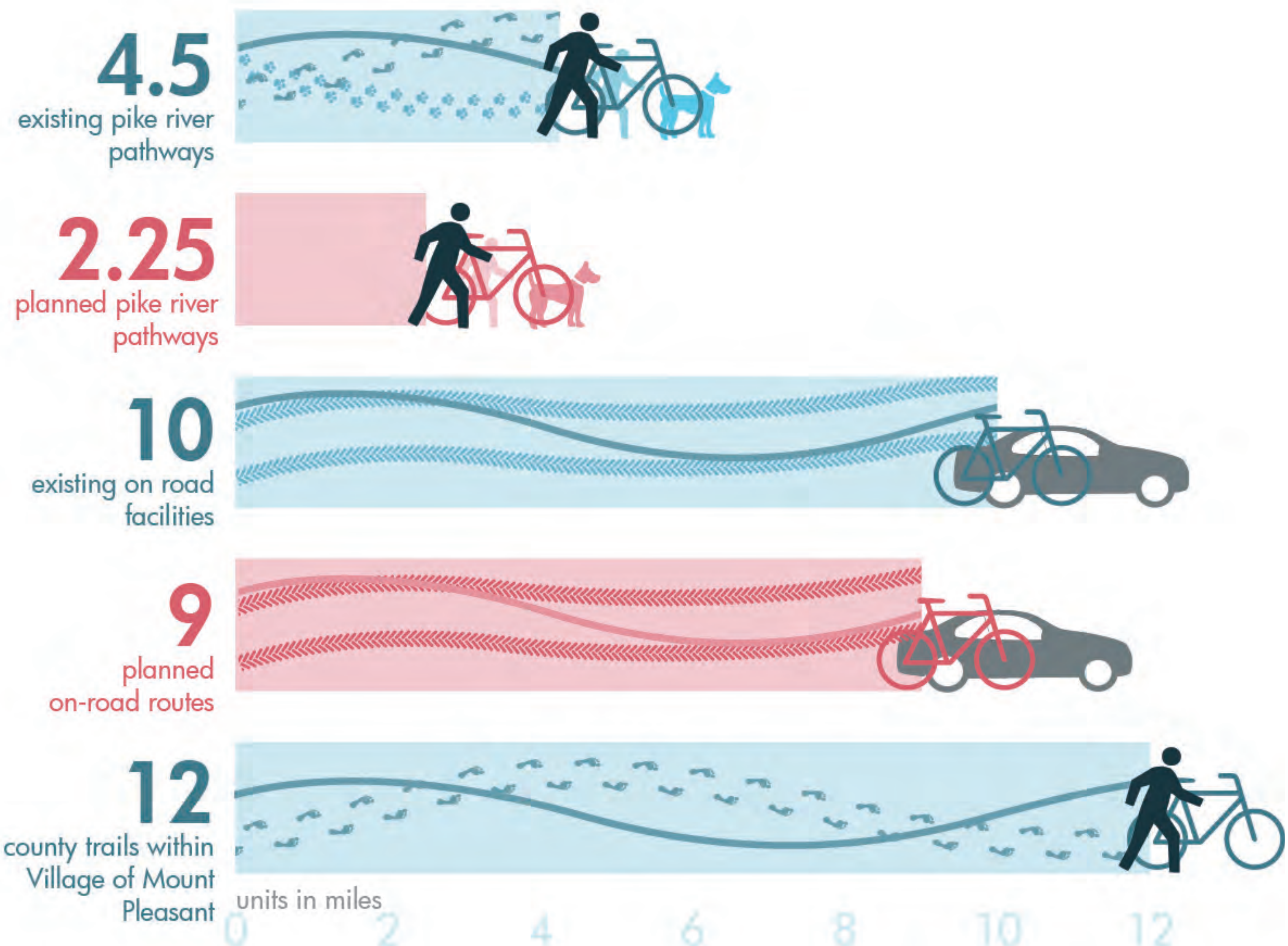
The following charts illustrate the Average Annual Daily Traffic (AADT) for roads that bisect or run adjacent to the Pike River Corridor. Highway 20 (31,300 AADT) and Highway 11 (23,700 AADT) yield the highest amount of traffic and identify potential safety issues for safe crossing both with speeds at least 40 mph as they pass the corridor and trail. The north-south streets yield a significantly lower AADT with Oakes Road being the highest at 10,300

East | West Streets Average Annual Daily Traffic



North | South Streets Average Annual Daily Traffic





spaces off of Oakes Road at Lannon Terrace. (See Recreation Analysis Maps)

Bike Trails

Pike River Corridor Trail connects to a series of existing on-road facilities, including designated shared on-road routes and designated bike lane roads. Existing trails on Braun Road connect west to CTH H, south to County Highway KR and west to I-94 and continue to Yorkville. According to SEWRPC, existing County trails and bike routes within the Village encompass about 12 linear miles. The Pike River Parkway currently has 4.5 miles of existing trails with 2.25 more miles of proposed trails planned in Phase 7, 8 and 9. Trails in Phase 1, 2, 4 and 6 are completed asphalt trails, while phase 5 currently has a gravel path under construction that will be paved with asphalt in spring/summer of 2015. Phases 7-9 are planned and will be constructed in 2015. Phase 4 connects to the Racine-Sturtevant trail, a cross municipality trail that starts at Willow Road and travels east into Racine until West Boulevard.

There are currently gaps in access to the Pike River Pathway, perhaps the most significant being between Phase 1, 2 and 3. The trail ends and does not provide off road connection to and across Highway 20, nor does it safely move people to the trail head near Jerome Case High School off the Frontage Road to the north of the school. This portion of the trail is planned to be extended the summer of 2015 and will follow along the south side of the Frontage Road to Oakes Road, and then head north along the west side of Oakes Road to the existing trail terminus point near Kinzie Avenue. The second gap is between Phases 4 and 6, of which is likely going unused as it is dead ends and the overgrown weeds are a maintenance issue. Trail surfaces in the constructed phases are mostly in good condition with some areas in need of patching and others that will need resurfacing. (See Recreation Analysis Maps)

Trail Heads, Access and Amenities

The trail can be accessed by pedestrians and cyclists through one of the existing three operational trail heads and several other non-vehicular access points. The types of access points have been categorized

Trail Access Inventory

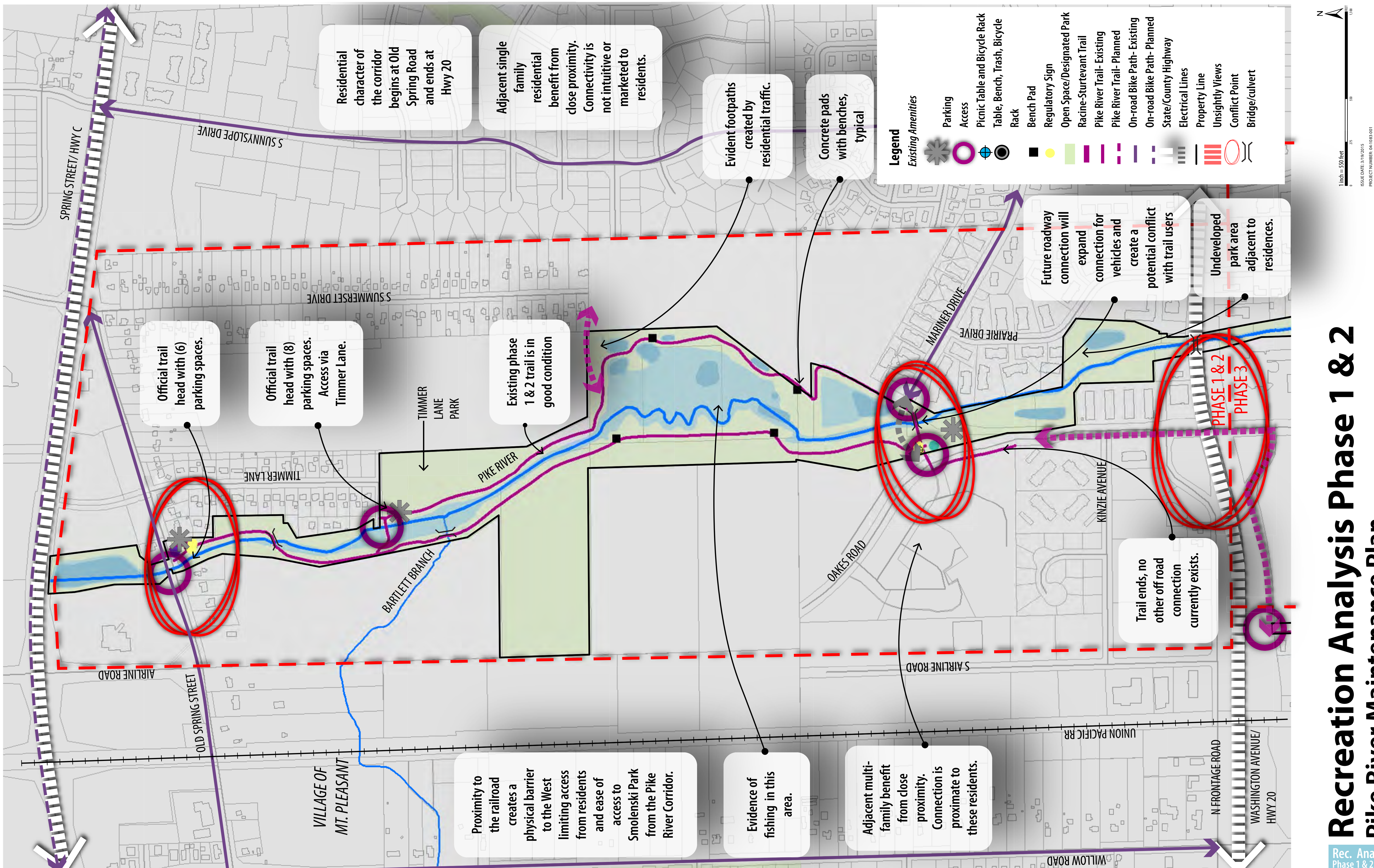
		Official Trailhead (parking spaces)	Official Trail Access	Footpath	Unofficial Access	Planned Trailhead	Planned Trail Access	Vehicular Access
North	**Old Spring Road**	6						
	Wendi Court (via Timmer Lane)	10						
	S. Summerset Drive			■				
	Oakes Road (at Lannon Terrace)	8						
	Mariner Drive		■					
	S. Frontage Road (north of Jerome Case High School)		shared lot					
	Racine-Sturtevant Trail				■			
	Phase 4 (access drive southwest side)				■			
	Phase 5 (access drive)				■			
	Oakes Road (on street parking)					■		
	Braun Road (Biex Ramcke Park)							■
South	**County Highway KR**						■	

and include: Official trail access points for pedestrians and cyclists only, unofficial access and footpaths, vehicular/maintenance access and planned trailhead and trail access points. The existing access points help determine where gaps currently occur and where future connections may be beneficial to create a complete system. Footpaths that have been generated by trail users suggest a need for an official trail connection. These are summarized in the Trail Access Inventory.

Signage and Site Furnishings

Existing identification, informational and regulatory signs are located in various locations throughout the constructed phases of the corridor. Pike River Pathway identification signs with maps of built segments are located at trail heads near access points and parking lots and are in overall good condition. The sign at Oakes Road at Lannon Terrace trail head has been vandalized by graffiti.

Constructed phases (Phase 1, 2 and 4) have trash receptacles, bicycle racks, benches and a few dog waste stations. The Village has plans to add additional site furnishings including picnic tables in Phase 4. Amenities not present that can be considered include path lighting along the trail, emergency call stations, drinking fountains or additional bicycle facilities.



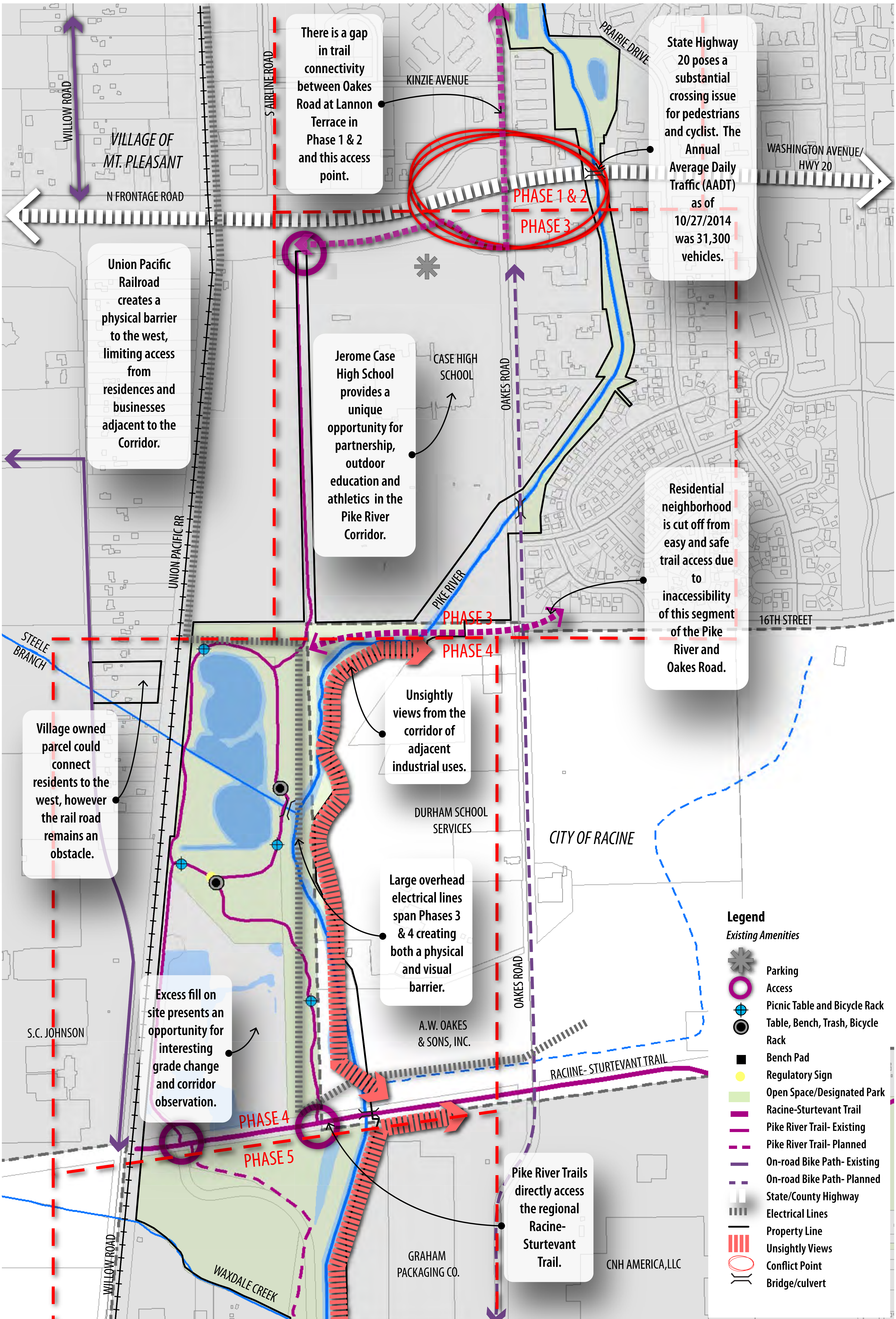
Recreation Analysis Phase 1 & 2

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

Rec. Analysis
Phase 1 & 2

This Page Intentionally Left Blank



ISSUE DATE: 3/19/2015

PROJECT NUMBER: 04-1083-001

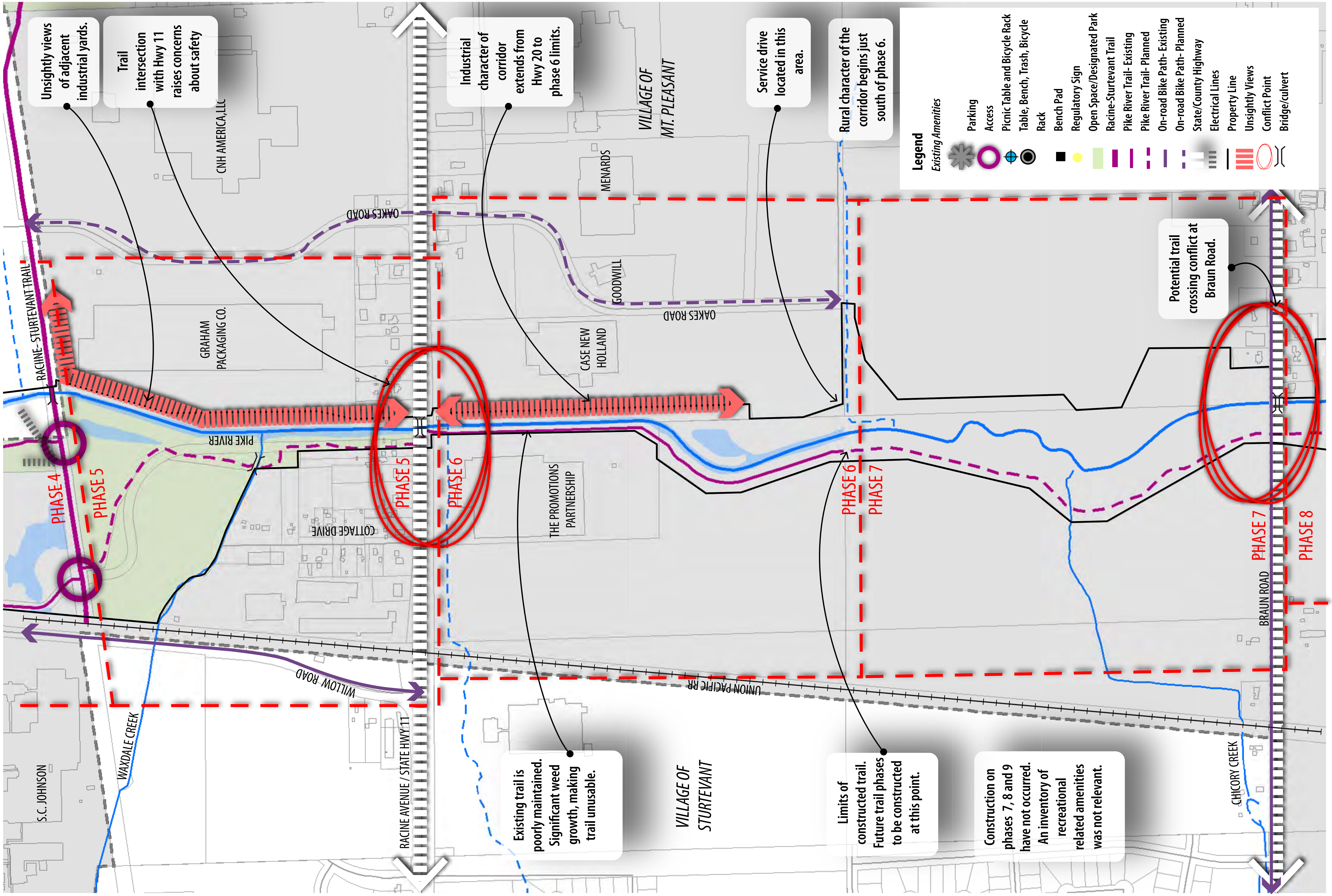
All drawings are preliminary and subject to change.

Phase 3 & 4 Recreation Analysis

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

This Page Intentionally Left Blank



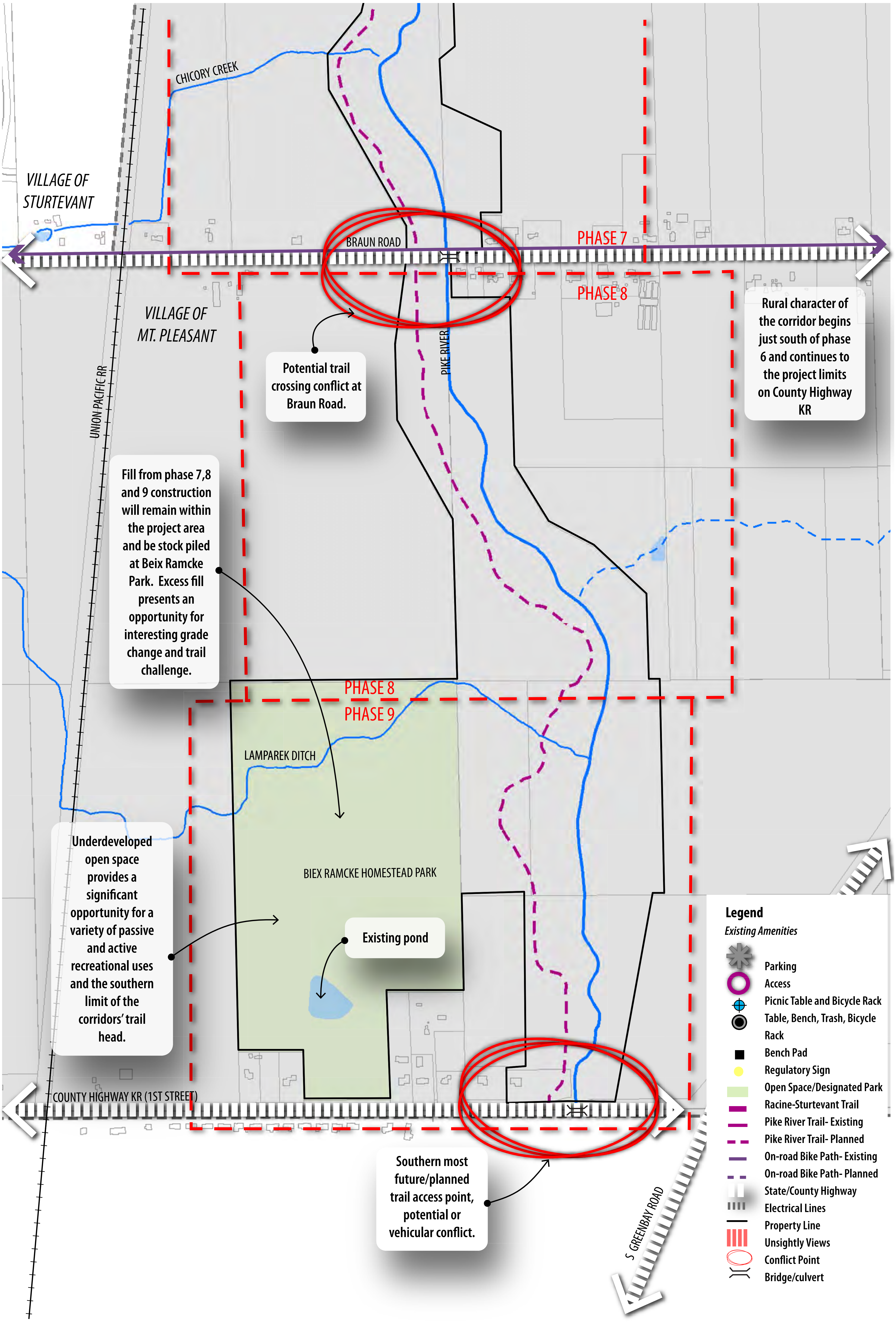
Recreation Analysis Phase 5, 6 & 7

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

Rec. Analysis
Phase 5,6 & 7

This Page Intentionally Left Blank



Recreation Analysis Phase 8 & 9

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

Rec. Analysis
Phase 8 & 9

N

1 inch = 550 feet

ISSUE DATE: 3/19/2015
PROJECT NUMBER: 04-1083-001
All drawings are preliminary and subject to change.

This Page Intentionally Left Blank

CHAPTER TWO

Inventory and Analyis

Key Points

The following list identifies key findings in existing conditions categorized by Pike River Corridor Utilities; Vegetation, Prairie and Wetland Resources; Aquatic Resources and Stream Stability; and Trail Corridor, Park and Recreational.

UTILITIES

- The storm sewer system is showing minor signs of corrosion and deterioration and should continue to be monitored.
- Many of the trash racks (rodent guards) shown on the as-built plans do not appear to have been installed during construction.
- Most of the area around end sections are stable with only a few showing signs of erosion and gully formation.
- Several outfalls and end sections, especially in the upper reaches, are partially filled with debris and showing signs of undermining.
- Most of the channel outfall structures were difficult to find and will become increasingly more difficult to find unless a locating system is implemented.
- One small diameter pipe in Phase 3 may have illicit discharges and can be added to the Village's annual inspection program.

VEGETATION, PRAIRIE AND WETLAND RESOURCES

- Robust native vegetation already present buffers and cools the Pike River and provides critical wildlife habitat.
- Restoring vegetated buffers to the tributaries that feed into the Pike River would improve water quality in the overall watershed.
- The continued, on-going control of invasive plants is critical to maintaining a bio-diverse corridor.
- Healthy prairies and wetlands require on-going prescribed burns or mowing to suppress woody vegetation and encourage native prairie plants.

AQUATIC RESOURCES AND STREAM STABILITY

- Streambed erosion and sedimentation are a normal part of a healthy stream ecosystem. The management plan must address locations in the corridor where excessive erosion or sedimentation have the potential to degrade habitat, reduce floodwater conveyance and/or threaten property.
- Erosion risk is highest adjacent to the road crossings at Highway 20, Highway 11 and Braun Road, in addition the reach downstream of Oakes Road.
- Sedimentation risk is greatest in the lower sections of Phases 1 and 4, the upper section of Phase 5, and the middle section of Phase 7.
- The culvert at Oakes Road blocks the natural movement of sediment, and the periodic addition of hard substrate gravels and cobbles will be required downstream in Phase 4 until such time as the culverts are replaced.
- Log structures constructed to create fish habitat will also require periodic adjustments to ensure that they do not create barriers to fish passage or stream flow.
- The installation of brush bundles in areas of high sedimentation can be an effective management technique for increasing habitat variability.
- Fish communities have improved significantly in restored sections of the Pike River corridor compared to unrestored areas.

TRAIL CORRIDOR, PARK AND RECREATION

- The size of the corridor, constructed and planned improvements are a valuable asset on which to capitalize. The frequency and limits of periodic flooding are a potential hazard to potential improvements.
- Existing regional trail facilities have the potential to draw visitors into the corridor.
- Existing trail and amenities are in good condition.
- Existing adjacent land uses create eye sores and are a source of potential pollutants.
- Major roadways with high average annual daily traffic counts and less than ideal speeds bisect the project area and create potential conflicts for pedestrians and cyclists.
- Patterns of use and access evidenced by footpaths generated by residential traffic and use of the corridor should be considered for permanent access routes.