SEWRPC Staff Memorandum

EVALUATION OF THE POTENTIAL IMPACT OF THE REMOVAL OF THE MONTEREY DAM ON WATER QUALITY AND WATER QUANTITY IN ASHIPPUN LAKE

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INTRODUCTION

During 2011, the Town of Oconomowoc (Town), owners of the Monterey dam and appurtenances, and the Wisconsin Department of Natural Resources (WDNR) have been engaged in discussions concerning the removal of the dam structure and abandonment of the dam permit. These discussions also included the reconstruction of the Mill Street bridge by the Town, the abutments of which currently are an integral part of the dam. As part of this bridge reconstruction project, the Wisconsin Department of Transportation, which was providing cost share funding for the reconstruction project, required that the dam structure and bridge structure be separated. Consequently, planning for the bridge reconstruction was undertaken by the Town and its partners with the assumption that the dam would be removed.

With regard to the potential dam removal and bridge replacement, the Town of Oconomowoc engaged the Southeastern Wisconsin Regional Planning Commission (SEWRPC) to provide guidance for the staging of the removal operations and stabilization of the accumulated sediments from within the basin of the Mill Pond. Consequently, SEWRPC staff conducted a survey of the Mill Pond and adjacent areas upstream and downstream of the dam in January 2011. Based upon the outcome of this survey, SEWRPC staff presented the following recommendations to the Town:[1]

- "Spring-2011—Remove mill race culvert and fill to an elevation of 860.0 [in feet referenced to National Geodetic Vertical Datum of 1929], which is 2 feet below the current minimum elevation in the mill race box (DS [downstream] invert)—This controlled release of sediments will coincide with high water periods for better dilution of sediments downstream."

- "Summer to Fall-2011—Construct new bridge and mechanically excavate sediments from the southern bank of the eroding channel within the impoundment—The entire channel upstream of the impoundment will be allowed to erode and re-adjust its slope, but as the impoundment dries out it will allow contractors to gain access and use back-hoe equipment to excavate any excess sediments on the southern bank within the impoundment. As we discussed at the meeting, we can deposit our excavated materials onsite upstream of the existing dam."

- "Winter-2011-2012—Construct new stream channel connection while the impoundment is frozen between new bridge and existing channel at some point upstream—The impoundment area will have had a whole growing season to dry out and once frozen will be accessible for larger construction equipment to excavate a new stream channel. This will minimize damage to vegetation that has begun to grow within the floodplain of the impoundment area. The best location for the connection of this new channel will depend on where the channel erodes a new alignment. SEWRPC will help identify this location."

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[1]In litt., *Dr. Thomas M. Slawski, Southeastern Wisconsin Regional Planning Commission Principal Environmental Planner, to Jeff Hermann, Town Administrator, Town of Oconomowoc, dated January 25, 2011. Note that the time frame for these actions was based on an assumed schedule as of January 2011.*

- "Spring-2012—Remove the remaining fill in the mill race to match the streambed elevation of the new channel underneath the new bridge—This second stage controlled release of sediments will again coincide with high water periods for better dilution of sediments downstream. This will allow the entire historic stream channel to become exposed and stabilized upstream of the impoundment. There may be opportunities to continue to excavate excessive sediments as the channel erodes within the impoundment and stockpiled onsite."

- "Summer to Fall 2012 (depends on weather)—Once stream banks are adequately vegetated and stabilized, then divert flow into new channel and fill in remaining channels upstream and in the mill race downstream—This will allow the complete removal of all remaining mill race elements and the road will be open and project ended."

The SEWRPC staff noted that this scenario was designed to reduce the impacts of the sediment in a manner consistent with U.S. Army Corps of Engineers guidelines.[2] In addition, the scenario was designed to maximize the total length of restored stream channel upstream, ensure fish passage through the new bridge, and establish a more stable slope over the one-mile length of channel upstream of the new bridge.

During the course of the Monterey dam and Mill Pond discussion and associated investigations, the Ashippun Lake Protection and Rehabilitation District (Lake District), a duly constituted public inland lake protection and rehabilitation district created pursuant to Chapter 33 of the *Wisconsin Statutes*, became concerned about the possible impact of the drawdown of the Monterey dam Mill Pond on the water levels observed in Ashippun Lake. During a May 27, 2011, intergovernmental meeting at the Oconomowoc town hall, the SEWRPC staff noted that systematic collection of Ashippun Lake level data that could be correlated with precipitation would be useful in evaluating possible causes of Lake level fluctuation. The Lake District's concern led to conversations between the WDNR staff and the Board of Commissioners of the Lake District, which resulted in the placement of a staff gauge in the Lake to track lake surface elevations referenced to National Geodetic Vertical Datum of 1929 (NGVD 29). Records of lake stage of Ashippun Lake have been maintained by the District since the end of April 2011.

In mid-December 2011, the Town of Oconomowoc was informed by the WDNR that a decision regarding removal of the existing structure had to be made no later than early February 2012. In response, the Town of Oconomowoc requested that the SEWRPC staff evaluate the potential consequences of the removal of the Monterey dam on Ashippun Lake, and various remedial measures to mitigate possible effects on the Lake, prior to the Town Board meeting scheduled for late-January 2012. In addition, the Town requested that the SEWRPC staff evaluate water quality in Ashippun Lake with and without replacement of the Monterey dam. SEWRPC staff undertook to assemble available data and information relating to an evaluation of the consequences of the removal or replacement of the Monterey dam, at no cost to the Town, during this five-week period, and to provide a recommended course of action to the Town by the end of January 2012.

This memorandum presents the inventory findings assembled by the SEWRPC staff in response to the request by the Town of Oconomowoc, and sets forth an evaluation of alternatives related to removal and replacement of the Monterey dam (or other replacement structures) based upon the available inventory data and information acquired from the WDNR, Waukesha County, Town of Oconomowoc, Ashippun Lake Protection and Rehabilitation District, and SEWRPC's records and plans. Because of the short time frame available to prepare this study, the evaluation is largely based on existing information, including field information collected by the SEWRPC staff in

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[2]*U.S. Army Corps of Engineers Regulatory Guidance Letter No. 05-04, "Guidance on the Discharge of Sediments From or Through a Dam and the Breaching of Dams, for Purposes of Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899," August 2005.*

early 2011 relative to the potential dam removal and bridge replacement. During the course of the study presented herein, instances were identified where further study is warranted and those instances are noted in this memorandum.

BACKGROUND

The Monterey dam is located on the Ashippun River in the Town of Oconomowoc in northwestern Waukesha County, as shown in Exhibit 1. The dam was originally constructed prior to 1848 as an earthen and concrete structure intended to provide hydropower to a flour mill, and, later, to a hydroelectric power generator. The dam was in private ownership until 2009, when the ownership and operating permit was transferred to the Town of Oconomowoc.

Deficiencies in the Monterey dam and its appurtenances were noted initially by the WDNR in their dam inspection report dated September 5, 1980. The WDNR staff notified the then-owner of the Monterey dam of the need to perform various repairs and to undertake specific remedial actions for the protection of human life and property. A previous inspection, conducted by the WDNR during October 1975, did not indicate any specific concerns.[3]

Consequent to the 1980 dam inspection, a WDNR Order specifically noted erosion, slumping, and undercutting of the southern portion of the earthen embankment, the upstream portions of the embankment, the downstream portions of the embankment, and beneath the spillway apron.[4] The concrete piers within which the stoplogs were located were noted as being deteriorated, with one pier being completely washed out, and the earthen embankments were noted as being overgrown by trees and brush, which could affect the structural integrity of the embankments. These repairs were required to be identified in plans by July 15, 1981, and remedial actions to repair the deficiencies were required to be completed by November 15, 1981. It is unclear if these repairs were made as no documentation of completion was found.

A subsequent dam inspection was carried out by the WDNR on June 20, 1997.[5] Issues of concern included embankment, concrete, and gate (stoplog) operation repairs; control and monitoring of seepage; installation of signage; and preparation of an operation, inspection and maintenance plan and emergency action plan, inclusive of a dam failure analysis. The majority of these actions were required to be completed between June 1, 1998 and November 1, 2000, with the reconstruction of the dam's outlet structure to be completed by November 1, 2007.

In June 2009, following another inspection of the dam by the WDNR staff on August 20, 2007, the operating permit for the dam was transferred from the then-owner of record to the Town of Oconomowoc. The Monterey dam inspection reports are attached as Exhibit 2.

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[3]In litt., *Andrew C. Damon, Administrator of the Wisconsin Department of Natural Resources, to William Chapman, Attorney, undated.*

[4]In litt., *Daniel Holzman, Water Regulation Section of the Wisconsin Department of Natural Resources, to Arnold Roth, dated September 5, 1980; see also the "Findings of Fact, Conclusion of Law, and Order dated April 8, 1981, and referenced 3-SE-80-907.*

[5]In litt., *Konstantin Margovsky, P.E., Dam Safety, Water Regulation and Zoning Engineer, Wisconsin Department of Natural Resources, to Richard Roth, dated October 21, 1997.*

In the interim, and as a consequence of continuing seepage noted at the dam, the WDNR ordered that the water level in the Mill Pond be reduced. The WDNR staff noted that the drawdown began on August 28, 2007 and continued at a rate of 0.5 foot per day (one flash board) until all boards were removed from the dam.[6] Removal of the flash boards lowered the surface elevation of the Mill Pond by 2.8 feet. The WDNR staff also noted that the millpond surface elevation was further reduced during April 2009 when the mill building was removed, the mill race boards were removed, and the downstream mill race was stabilized to permit increased flows through the outlet structure. The work on the mill race opening dropped Mill Pond elevations at the dam another 1.7 feet. Exhibit 3 includes a schematic of the modifications made to the Monterey dam. As of January 2011 the total lowering of the control elevation at the Monterey dam was 4.5 feet relative to the elevation prior to commencement of the drawdown in August 2007.

On June 24, 2009, the Town submitted a request to the WDNR to abandon the dam, and a Chapter NR 150 environmental analysis of the proposed abandonment was prepared by the WDNR. This analysis, dated February 28, 2011 and attached hereto as Exhibit 4, suggested that an environmental impact statement would not be required prior to the abandonment of the Monterey dam.

During early 2011, residents of the Ashippun Lake community reported a reduction in the surface elevation of Ashippun Lake which was perceived to be related to the drawdown of the Monterey dam. The lake residents convened a meeting to discuss their concerns which was attended by WDNR staff, SEWRPC staff, and a Commissioner of the Ashippun Lake Protection and Rehabilitation District on April 28, 2011. As a consequence of this meeting, the WDNR established a staff gauge in the Lake, with the first reading of the lake surface elevation being made by the Lake District on April 29, 2011, as shown in Exhibit 5.[7]

Subsequently, at the annual meeting of the Ashippun Lake Protection and Rehabilitation District held on June 14, 2011, the electors and property owners present voted in favor of motions to recommend to the Oconomowoc Town Board the following actions:

1. Retention of the operating permit for the Monterey dam so as to maintain the opportunity to replace or restore the Monterey dam pending the outcome of data analyses regarding the assumed relationship between the Monterey dam and Ashippun Lake;

2. Conduct of analyses to better quantify the possible relationship between water levels in the Monterey dam Mill Pond and in the upstream areas of the Ashippun River, including Ashippun Lake; and,

3. Investigation of possible funding sources to support an agreed upon course of action relating to the removal and replacement of the Monterey dam.

The electors and property owners at the annual meeting of the Ashippun Lake Protection and Rehabilitation District also adopted a budget which included some funding to support the further investigation of the relationship between water levels in the Monterey Mill Pond, the upstream reach of the Ashippun River, and in Ashippun Lake.

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[6]In litt., *electronic mail communication from Michelle M Hase, P.E. , Wisconsin Department of Natural Resources Water Management Engineer, to Dr. Jeffrey A. Thornton, P.H., of the SEWRPC staff, dated January 17, 2012.*

[7]*Yaggy Colby Associates, Memorandum to Jeff Hermann from Mark Mickelson regarding Ashippun Lake Levels, dated November 16, 2011.*

In response to this latter decision, the Board of Commissioners of the Ashippun Lake Management District requested that RJN Environmental Services, LLC, develop a preliminary groundwater model-based assessment of the possible linkages between the Mill Pond, Lake, and River. In letter reports to the Town of Oconomowoc dated December 19, 2011 and January 23, 2012,[8] RJN Environmental Services, LLC, presented the results of evaluations of the possible effects on groundwater and Ashippun Lake levels of removal of the Monterey dam.

ISSUES OF CONCERN

During a December 22, 2011, meeting, the Town of Oconomowoc, in consultation with the Ashippun Lake Management District, Waukesha County, WDNR, and SEWRPC, refined the concerns voiced by the Ashippun Lake Management District, identifying four specific issues of concern regarding the relationship between the Monterey Mill Pond, the Ashippun River, and Ashippun Lake. These issues of concern formed the basis of the Town of Oconomowoc request for assistance to SEWRPC. These issues were:

1. The water quality and water quantity impacts of removing and not replacing the Monterey dam;

2. The water quality and water quantity impacts of placing a water level/flow control structure at the outlet to Ashippun Lake in the vicinity of Saddlebrook Lane;

3. The water quality and water quantity impacts of placing a control structure on lands owned by Waukesha County in the vicinity of the headwaters of the former Monterey Mill Pond at the downstream end of a wetland complex; and,

4. The water quality of the Ashippun River in the vicinity of the Monterey dam with replacement of the Monterey dam.

These four issues were developed into four alternatives that are described in subsequent sections of this memorandum. As noted, the SEWRPC evaluation was based upon existing information, and application of scientific, technical, and legal knowledge to the concerns identified relative to the four alternatives listed above. SEWRPC staff was requested to provide to the Town as complete an assessment of these issues of concern as could be achieved between December 20, 2011, and January 26, 2012. Where substantial uncertainty or lack of information precluded such an assessment, the SEWRPC staff was requested to identify these uncertainties.

INVENTORY FINDINGS

Much of the background data on the water quality and water quantity of Ashippun Lake is drawn from the comprehensive lake management plan for the Lake prepared by SEWRPC,[9] and from WDNR.[10,11] Additional

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[8]*RJN Environmental Services LLC, "Ashippun Lake Groundwater & Surface Water Issues,"* in litt. *to the Town Board, Town of Oconomowoc, dated December 19, 2011, and RJN Environmental Services LLC, "Ashippun Lake Groundwater & Surface Water Issues,"* in litt. *to Jeffrey Thornton, Ph.D.; Thomas Slawski, Ph.D., and Laura Kletti, P.E., CFM, dated January 23, 2012.* .

[9]*See SEWRPC Community Assistance Planning Report No. 48, 1st Edition,* A Water Quality Management Plan for Ashippun Lake, Waukesha County, Wisconsin , *January 1982; see also SEWRPC Community Assistance Planning Report No. 48, 2nd Edition,* A Lake Management Plan for Ashippun Lake, Waukesha County, Wisconsin, *May 2007.*

[10]*Wisconsin Department of Natural Resources Publication No. PUBL-WT-668-2002,* The State of the Rock River Basin, *April 2002, recommended that WDNR staff consider the feasibility of removing the structure impounding (Footnote Continued)*

data were acquired by SEWRPC staff during field investigations conducted in the vicinity of the Monterey Mill Pond during January 2011, and from data assembled by Yaggy Colby Associates, consultants to the Town of Oconomowoc.[12]

Pre-Dam Historical Survey

Available Data and Analysis

As documented on the original year 1836 plat map, Ashippun Lake and the Ashippun Lake outlet existed prior to establishment of the Monterey dam (Exhibit 6). This historical map also demonstrates the existence of an extensive wetland complex connecting Ashippun Lake with the Ashippun River in this pre-impounded state. Since the original surveyors did not have the same sophistication of equipment and technology that exists today, it is important to keep in mind that exact comparisons of wetland, stream, and lake boundaries is not practicable. Nonetheless, comparison of these features overlain on current aerial photography can be a very effective tool in understanding general changes over time. Since the 1836 plat is the only geographic information that exists on the Ashippun River and Ashippun Lake prior to creation of the Monterey dam, comparison of this historical map with the current 2010 color digital orthophotograph is useful. Exhibit 7 was created by digitizing the features of Exhibit 6 and using the section lines to register the features. For example, comparison of the 1836 plat map and the year 2010 orthophoto indicates that there appears to have been some wetland loss, but the majority of the wetland vegetation within and adjacent to Ashippun Lake largely has been maintained as shown in the Inset to Exhibit 7. Most significantly, the extent and distribution of the large wetland complex connecting Ashippun Lake with the Ashippun River still exists. Although there are some exceptions, in general the year 2010 Ashippun River stream centerline is similar to the location of the 1836 river system centerline despite 175 years of land use changes in this portion of the watershed.

It is important to note that features shown on the 1836 plat would likely be more accurately located near, or on, a U.S. Public Land Survey section line than further away from a section line; hence, the level of confidence in making comparisons in these areas is higher than in other areas. With this in mind, there are several important features of the Ashippun River system worth noting in 1836 versus 2010 comparisons:

1. The Ashippun River in 1836 is shown to be located at the current location of the Monterey dam mill race shown on the 2010 aerial photograph.

2. The confluence of the Ashippun Lake outlet channel with the Ashippun River appears to have been modified or relocated east of the historic 1836 location. The historical confluence was observed to fall on the intersection of two section lines. This relocation may be associated with alteration of the outlet from Ashippun Lake at the time of construction of the road over the outlet channel that exists today.

3. The Ashippun River in 1836 is shown to be located south of the existing 2010 position of the stream at CTH P; given the topography of the stream alignment at this point, this is not improbable.

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the Monterey Mill Pond, which had a maximum depth of about eight feet and a surface area of about 28 acres. See also Wisconsin Department of Natural Resources Publication No. PUBL-WR-190-95REV, Upper Rock River Basin Water Quality Management Plan, *December 1995.*

[11]*Additional data were acquired from the Wisconsin Department of Natural Resources Surface Water Information Management System (SWIMS), accessed at: http://dnr.wi.gov/org/water/swims/.*

[12]*Yaggy Colby Associates, Memorandum to Jeff Hermann from Mark Mickelson regarding Ashippun Lake Levels,* op. cit.

4. The centerline of the Ashippun River in 1836 was not shown as flowing through the Monterey dam impoundment area, rather it was shown to flow directly through a saddlepoint (area of lower elevation) in the 2010 topography linking the two large wetlands. This is important due to the fact that these wetlands are shown to be at the same elevation on the 2010 aerial, which makes the stream alignment shown on the 1836 public land survey possible. In addition, there also were no wetlands shown to exist within the Monterey dam impoundment area in 1836, which is remarkable given the large size of the Monterey Mill Pond. It is possible that the 1836 stream centerline was drawn incorrectly (i.e., too far south), but it is also possible the stream was depicted correctly and it never flowed through the Monterey Mill Pond impoundment area until it was diverted north into the Mill Pond area after the dam was constructed

Important Findings

- Ashippun Lake and the Ashippun Lake outlet channel were documented to exist prior to establishment of the Monterey dam.

- The historical information demonstrates the existence of an extensive wetland complex connecting Ashippun Lake with the Ashippun River during the pre-impoundment period.

- The Ashippun Lake outlet channel appears to have been modified or relocated from its original position. The Ashippun River may have been diverted from its historic course in 1836 into the Mill Pond.

Monterey Dam Modifications

Available Data and Analysis

A schematic of the upstream face of the Monterey dam is included in Exhibit 3. This schematic is based upon a 1977 SEWRPC survey, 2010 Baxter & Woodman survey, 2011 SEWRPC field survey, and a discussion with John Roth, the former owner and operator of the dam, on January 24, 2012. The Monterey dam modifications began in August 2007 with the removal of the flash boards from the dam spillway. As is depicted in Exhibit 3, the elevation of the top of the six 5.5 inch tall flash boards was estimated at 867.6 feet above NGVD 29. In discussions with WDNR staff and Mr. Roth, it was determined that a documented operating plan for the Monterey dam does not exist. Mr. Roth indicated the full complement of six flash boards was in place on the Monterey Dam at the start of the drawdown in August 2007. Therefore, the removal of the flash boards dropped the controlling elevation of the dam by approximately 2.8 feet, to the fixed spillway crest elevation of 864.8 feet above NGVD 29. In April 2009, the boards blocking the mill race structure were removed and the downstream side of the mill race was cleared. Based on the January 2011 survey by SEWRPC staff, the invert of the sediment on the upstream side of the mill race was at an elevation of 863.1 feet above NGVD 29. Therefore, since August 2007, the total reduction in the controlling elevation at the Monterey dam was 4.5 feet.

Important Findings

- Removal of the flash boards controlling water surface elevations in the Monterey dam was undertaken during late-summer of 2007, reducing the water surface elevation in the Mill Pond by 2.8 feet, to 864.8 feet above NGVD 29.

- Removal of the boards blocking the mill race was undertaken during spring of 2009, reducing the water surface elevation in the Mill Pond by an additional 1.7 feet, to 863.1 feet NGVD as of January 2011.

Stream Characteristics Upstream and Downstream of the Monterey Dam

Available Data and Analysis

The Ashippun River has an overall gradient of approximately 2.0 feet per mile over its entire length.[13] The entire watershed, as shown in Exhibit 1 has a drainage area of approximately 43 square miles, extending from Washington County, Dodge County, Waukesha County, and Jefferson County. The Ashippun River offers extensive water-based recreational opportunities due to its large size. The majority of adjacent riparian corridor lands are rural in character, consisting primarily of agricultural lands.[14] In comparison, the Ashippun Lake subwatershed, which is tributary to the Ashippun River, is only about 0.7 square miles or approximately 1.5 percent of the Ashippun River watershed area.[15]

Exhibit 8 shows the water surface elevation profile of the Ashippun River from County Trunk Highway P (CTH P) to its confluence with the Rock River in Jefferson County under 2005 conditions (black line). The water surface profile shows the River following gentle slopes from CTH P to the upstream side of the Monterey dam, with elevations ranging from 876 feet NGVD 29 near CTH P to 867 feet near the top of the impounded water surface within the Monterey dam under pre-drawdown conditions. Slopes increase downstream of the dam, with water surface elevations decreasing from 856 feet NGVD 29 just below the dam to 838 feet at the Ashippun River confluence with the Rock River.

The SEWRPC staff conducted field investigations of the Ashippun River in the vicinity of the Monterey Mill Pond in January 2011. The results of this survey are included in Exhibit 8. These data can be used to compare pre- and post-drawdown conditions. These survey results are shown in greater detail in Exhibit 9. Streambed elevations were determined for the River below the main spillway of the Monterey dam (dark blue line) as well as for the mill race (red line). Due to winter conditions, the River in the former Mill Pond area was frozen. Top of ice elevations were collected to represent the water surface (blue line). Holes were drilled into the ice in order to probe the depths of unconsolidated sediment in the Mill Pond basin. The top of sediment elevations and bottom of sediment elevations are shown as brown and gray lines, respectively. Exhibit 9 shows that unconsolidated sediment accumulation in the former Mill Pond area was significant and extended approximately 4,500 feet upstream of the dam.

A total of 41 transects were established by the SEWRPC staff along the mainstem of the Ashippun River, both upstream and downstream of the Monterey dam. These transects were sampled in January 2011. Transect locations were documented by geographic positioning system (GPS) location and mapped using 2010 digital, color orthophotography, as shown on Exhibit 10. At each transect, physical data on stream morphology were collected pursuant to a methodology adapted from the Wisconsin Department of Natural Resources, *Guidelines for Evaluating Habitat of Wadable Streams* (revised June 2000). Specifically, the following parameters were evaluated at each transect location: water depth, water width, including bankfull characteristics where possible, unconsolidated sediment depth, substrate type, bank height, bank slope, thalweg depth, and habitat types where possible given the frozen conditions.

The Ashippun River within the study area can be separated into four unique reaches, as shown in Exhibit 11. It is important to note that the field investigations only assessed instream physical characteristics of reaches 2 and 3 as

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[13]*Wisconsin Conservation Department,* Surface Water Resources of Waukesha County, *1963.*

[14]*SEWRPC Memorandum Report No. 139,* Surface Water Resources of Washington County Wisconsin, Lake and Stream Classification Project: 2000, *September 2001; SEWRPC Memorandum Report No. 145,* Lake and Stream Resources Classification Project for Waukesha County, Wisconsin: 2000, *December 2005.*

[15]*SEWRPC Community Assistance Planning Report No. 48, 2nd Edition,* op. cit.

shown in Exhibit 11. The furthest downstream reach, reach 1 which extends from the confluence with the Rock River to State Trunk Highway 67 (STH 67), is the longest reach (about 5.4 miles), has the lowest slope (2.8 feet per mile), and a sinuosity of 1.65, which is characteristic of a highly meandering natural channel. The furthest upstream reach 4 is the second longest reach of about 3.2 miles, with a low slope of 3.2 feet per mile, and very high sinuosity of 2.73. Reach 2 is about one mile long, with a higher slope of 5.2 feet per mile, and a high sinuosity of about 1.4, indicative of a naturally meandering stream channel. In contrast to the existing conditions in reach 3, which can be characterized as having a gentle slope of two feet per mile as shown in Exhibit 11, the potential, recreated reach 3—designated as reach 3a in Exhibit 11— will have the highest slope along an approximately one mile length of restored channel upstream across the site of the former Monterey dam. It was this steeper slope that made this site on the Ashippun River a good location for construction of a dam and impoundment. This reach is also unique in that it has a low sinuosity, with a value of nearly one, indicative of modification or channel straightening. It is possible that the historical channel beneath the accumulated sediments may exhibit a more meandering pattern in the Mill Pond area, but the channel that has redeveloped to date is very straight, unlike the other three reaches surveyed within the Ashippun River.

The overall bankfull channel characteristics of reach 2 include an average width of 34.6 feet, and average depth of 1.9 feet, as summarized in Exhibit 12. The channel material is comprised mainly of sand and gravel substrates. This reach also has a water width of 31.1 feet, an average depth of 1.2 feet, and a width to depth ratio ranging from about 15 to 66. This stream reach was well-connected to the adjacent floodplain, where flows greater than the bankfull event would spill out into the floodplain area. This is probably related to the relatively good condition of the streambanks that seemed stable and did not show signs of severe erosion in January 2011. As previously mentioned, this is a highly meandering reach which helps to support the maintenance of an excellent pool and riffle structure of deep and shallow habitats ranging from 3.8 feet to 0.5 foot in depth, respectively. Instream habitat was highly diverse with a variety of substrates and woody debris of various sizes. Despite much of the stream being partially frozen, numerous mussel shells were observed throughout the entire reach, accounting for seven of the known species to occur in this River system. Given the instream habitat quality and diversity as well as the proximity to the Rock River, it is not surprising that there is a high abundance and diversity of fishes, mussels, and other organisms within this reach, a fact that was summarized in the WDNR Environmental Assessment, shown in Exhibit 4 and tabulated in Exhibit 13. This downstream reach would serve as an excellent reference reach for re-creation or reconstruction of an appropriately sized stream channel within the upstream Monterey Mill Pond area.

Comparison of stream channel conditions in reach 2 (downstream of the Monterey dam) with reach 3 (upstream of the Monterey dam) illustrates that water width, water depth, and sediment depth conditions are all greater within reach 3 (Exhibits 12 and 14). As previously detailed in the “Monterey Dam Modifications” section above, the Ashippun River flow has been diverted from the dam spillway to the mill race; hence, the dam is still impounding some water upstream. Consequently, water widths within reach 3are two to five times greater than the range in channel widths observed in the downstream portion of reach 2. The water depths are actually deeper in the upstream sections of reach 3 compared to the downstream areas closer to the dam. It is important to note that this open water channel was excavated by scouring after the flash boards were removed and flows were diverted to a lower elevation than the pre-existing condition. Based upon the measured characteristics of the scoured low flow channel as set forth in Exhibit 12 (59-foot average width, 1.6-foot average water depth, and 4,557-foot length), it is estimated that approximately 16,000 cubic yards of sediments have already been scoured from the impoundment area and deposited downstream since 2007. As can be seen in Exhibit 14 sediment depths are greatest in the areas closest to the dam and diminish in depth moving upstream, which demonstrates a decreasing, approximately linear trend in depth ranging from a maximum of 7.2 feet to less than one foot over a total surveyed length of about 4,600 feet. This sediment consists of very fine silts and organics and is highly erodible as evidenced by the ease of pushing a one inch diameter rod through more than seven feet of material in January 2011, as can be seen in the photographs attached hereto as Exhibit 15.

The potential volume of sediment in the Mill Pond that may be transported downstream if the dam were removed was calculated as shown in Exhibit 16. A typical cross section in the Mill Pond (200 feet upstream of dam, green line) and the potential final stream cross sections with the dam removed are shown. The two potential cross sections shown include the smallest potential cross section (1 in purple), the largest potential cross section (2 in orange), along with the typical cross section downstream of the dam during the 2011 SEWRPC field visit (in red) for comparison purposes. The original floodplain overbank elevations in the Mill Pond were not determined during the SEWRPC January 2011 survey due to frozen conditions. Quantities of unconsolidated sediment in the Mill Pond were estimated to range from 30,000 cubic yards to 100,000 cubic yards.

Important Findings

- The SEWRPC staff roughly estimated there are between 30,000 and 100,000 cubic yards of potentially erodible sediment in the Monterey Mill Pond area, in contrast to estimates of approximately 2,000 cubic yards of sediment set forth in the Town of Oconomowoc U.S. Army Corps of Engineers Section 404 permit application (Exhibit 17).

- The potential environmental degradation associated with the deposition of these higher volumes of sediment on the downstream invertebrate, fish, and wetland communities, without remediation,[16] are likely to be significant.

Mill Pond Sediment Quality

Available Data and Analysis

Sediment sampling of the Monterey Mill Pond basin and associated laboratory testing was completed in July 2010 as part of the Phase 1Hazardous Materials Investigation undertaken by Baxter & Woodman Consulting Engineers for the Mill Street bridge replacement project (Exhibit 18) presents the pertinent sections of this report). Eight locations were sampled within the Mill Pond in the vicinity of the expected area of channel re-creation, extending from the Monterey dam to a location approximately 200 feet upstream of the dam. The sediment samples were obtained from a maximum depth of approximately three feet. The sediments were classified as a mixture of dark gray to black silt, with little to some clay, trace sand, and some fibrous organic and shell matter. The samples were combined and then tested for metals, pesticides, nutrients and polychlorinated biphenyls (PCBs). No elevated levels of contaminants requiring special handling or disposal were detected, with the exception of arsenic, although the Phase 1 evaluation did not include a determination of the background arsenic level for the area. The Phase 1 report did include synopses of discussions between Baxter & Woodman Consulting Engineers and the WDNR, wherein it was determined that, if the sediment was to be hauled offsite, it would be considered a solid waste and would need to be properly handled and disposed of at a WDNR-licensed facility. If the dredged sediment was to remain onsite, a background arsenic level would need to be established to determine if a cover layer or cap of low arsenic content soil would be required to cover the contaminated sediment.

Important Findings

- No elevated levels of contaminants requiring special handling or disposal were detected, with the exception of arsenic.

- If the sediment was to be hauled offsite, it would be considered a solid waste and would need to be properly handled and disposed of at a WDNR-licensed facility.

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[16] *It is important to note that stabilization of this unconsolidated sediment and re-creation of the River channel are considered to be* ***essential prerequisites*** *for all of the Alternatives evaluated in this Memorandum.*

- If the dredged sediment was to remain onsite, a background arsenic level would need to be established to determine if a cover layer or cap of low arsenic content soil would be required to cover the contaminated sediment.

Correlation of Precipitation Data and Water Features Shown on Aerial/Orthophotography

Available Data and Analysis

Historical precipitation information for the project area was gathered from the National Climatic Data Center and the National Weather Service. Exhibit 19 depicts the average annual precipitation for southeastern Wisconsin for the years from 1895 to 2010. Years above the average annual precipitation for the period between 1895 and 2007 (31.79 inches), are colored green, while years below the average are colored orange on the Exhibit. Based upon these categories, as shown by the arrows in Exhibit 19, 1970 could be categorized as a normal year, 2000 as a very wet year, and 2005 as a dry year in southeastern Wisconsin.

Exhibit 20 shows the 2005 to 2011 monthly precipitation totals for the National Weather Service Oconomowoc gauge. Also included on the Exhibit, as the red line, is the normal monthly precipitation for the period between 1971 and 2000 as determined for the Oconomowoc gauge. Annual precipitation totals are compared to the normal annual total precipitation at the Oconomowoc station of 33.90 inches. Annual precipitation totals were categorized for this evaluation relative to the annual average, or Normal, precipitation for the location in the following manner:

- Normal +/-2 inches
- Wet +2.1 to +5 inches
- Very Wet > +5.1 inches
- Dry -2.1 to -5 inches
- Very Dry <-5 inches

These criteria were applied to the data set forth in Exhibit 20. From Exhibit 20, it can be seen that, since the flash boards were removed from the Monterey dam in August of 2007, the project area has experienced Normal to Very Wet conditions.

Aerial photographs or orthophotographs from eleven different years (1941, 1950, 1963, 1970, 1980, 1990, 1995, 2000, 2005, 2007, and 2010) were examined by the SEWRPC staff. Aerial photographs were typically captured during April of each year; for purposes of this investigation, the photographs centered on the former Monterey Mill Pond area, including the wetland complex just upstream of the former Mill Pond extending to CTH P, Ashippun Lake, and the Ashippun Lake outlet channel. Of the eleven years examined, aerial photographs of three years—1970 (Exhibit 21), 2000 (Exhibit 22), and 2005 (Exhibit 23)—were included herein as Exhibits because they correspond to the various categories of annual precipitation defined above; 1970 could be categorized as a normal year, 2000 as a very wet year, and 2005 as a dry year. Based upon these photographs, the study area has maintained approximately similar visual characteristics throughout the years leading up to the drawdown of the Mill Pond regardless of annual precipitation. Of particular note are the wet areas adjacent to the Ashippun River in the wetland complex, which are visible in all the pre-2007 aerial photographs.

Exhibit 24, accompanied by six insets, shows side by side comparisons of the aerial photographs from 2005 (approximately two years before drawdown of the Mill Pond) and 2010 (approximately three years after drawdown). Precipitation for April 2005 was well below the monthly normal, while precipitation for April 2010 was well above the monthly normal. Significant changes in the areal extent of surface water features are observed not only in the Mill Pond area, but also in the area of the wetland complex just upstream of the former Mill Pond. Inset 1 to Exhibit 24 shows the Ashippun River now follows the northern edge of the former Mill Pond area with the southern two-thirds of the former Mill Pond now assuming wetland characteristics. Inset 2 to Exhibit 24

shows an area of the wetland complex just upstream of the former Mill Pond area. Several backwater areas extending off the main channel of the Ashippun River that were prominent in 2005 appear to have mostly dried and become vegetated in 2010. The impacts of the Mill Pond drawdown on the wetland complex appear to diminish further upstream of the Mill Pond as seen in Inset 3 to Exhibit 24 and Inset 4 to Exhibit 24. No discernible differences are apparent in surface water in Ashippun Lake or the Ashippun Lake outlet based on the aerial photos.

Important Findings

- Significant changes in the areal extent of surface water features between 2005 and 2010 aerial photography are observed not only in the Mill Pond area, but also in the area of the wetland complex just upstream of the former Mill Pond.

- Backwater areas extending off the main channel of the Ashippun River that were prominent prior to 2007 appear to have mostly dried and become vegetated by 2010.

- No discernible differences are apparent in the areal extent of surface water in Ashippun Lake or the Ashippun Lake outlet between 2005 and 2010.

Flood Conditions

Available Data and Analysis

The 2008 Waukesha County flood profiles for the Ashippun River, set forth in the Federal Emergency Management Agency (FEMA) flood insurance study (FIS), were reviewed. The portion of the Ashippun River drainage area tributary to the Monterey dam is given in the FIS as 35.8 square miles. As can be seen in Exhibit 1, there is a significant amount of wetland storage in the portion of the subwatershed upstream of the Monterey dam. The flood storage volume provided by these wetlands significantly reduces the peak flood flows experienced at the Monterey dam.

Exhibit 25 shows the one-percent-annual-probability (100-year recurrence interval) flood profile for the Ashippun River from its confluence with the Rock River to a point upstream of CTH P, immediately upstream of the aforementioned wetland complex. The Monterey dam is shown on the Exhibit, and it should be noted that the dam was included in the FIS hydraulic model with flash boards removed and without the mill race being available to convey flood flows. A few cross section locations, from the digital flood insurance rate map (DFIRM), included as Exhibit 26, are noted on Exhibit 25 to relate the flood profile to the floodplain map. These cross sections show that, even with the flash boards removed from the Monterey dam, the backwater effect from the dam extends upstream past the Ashippun Lake outlet. Exhibit 26 is the DFIRM panel in the area of interest, with the cross sections noted on Exhibit 25 highlighted in orange. For the FIS, cross section ‘AS’ was used to determine the flood elevations for Ashippun Lake as set forth below. This cross sections shows that, even for the ten-percent-annual-probability (10-year recurrence interval storm), the lake level is influenced by the Ashippun River elevation. To date, no modifications have been made to the FIS hydrologic or hydraulic models to evaluate the effects of the Monterey dam removal on the Ashippun River flood profiles.

Important Findings

- The Monterey dam has a considerable backwater effect under flood conditions. The Ashippun Lake levels are influenced by the Ashippun River elevations for 10-percent-annual-probability or less frequent (larger) events.

- Additional hydrologic and hydraulic modeling would be required to determine the effects of the Monterey dam removal under flood conditions.

Water Budget for Ashippun Lake

Available Data and Analysis

The long-term water budget for Ashippun Lake was computed using estimated groundwater inflows combined with inflows from direct precipitation and surface water runoff from the surrounding land. Groundwater levels, based upon data from five pairs of observation wells located around the Lake, indicated that groundwater flows were toward the Lake around the entire perimeter of the Lake. It was therefore assumed that no significant groundwater outflows occurred from Ashippun Lake.[17] Rather, outflows from the Lake, due to surface water outflow through the unnamed creek at the northeast end of the Lake and to evaporation from the Lake's surface, were assumed to balance the inflows during this period.

As documented in the comprehensive lake management plan for Ashippun Lake,[18] and reproduced herein as Exhibit 27, an average of about 575 acre-feet, or about 55 percent, of the water entering the Lake, is contributed by surface runoff, about 237 acre-feet, or 23 percent, is contributed by groundwater inflow,[19] and about 228 acre-feet, or 22 percent, is contributed by precipitation directly onto the lake surface.[20] Of this total long-term annual inflow of 1,040 acre-feet, it is estimated that 837 acre-feet, or about 80 percent, is lost due to outflow through the unnamed creek, and 203 acre feet, or about 20 percent, is lost due to evaporation from the Lake surface.

The long-term hydraulic residence time for Ashippun Lake, likely to be applicable during years of average precipitation, was determined to be approximately 1.3 years.[21] The hydraulic residence time is important in determining the expected response time of the Lake to increased or reduced nutrient and other pollutant loadings.

Important Findings

- Observed groundwater flows observed during the initial planning program were toward Ashippun Lake around the entire perimeter of the Lake, and it was therefore assumed that no significant groundwater outflows occur from Ashippun Lake.[22]

- About 237 acre-feet, or 23 percent of the annual water load to Ashippun Lake, is contributed by groundwater inflow.

- The long-term hydraulic residence time for Ashippun Lake, an important determinant of the expected response time of the Lake to increased or reduced nutrient and other pollutant loadings, likely to be

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[17]*SEWRPC Community Assistance Planning Report No. 48, 1st Edition,* op. cit.

[18]*SEWRPC Community Assistance Planning Report No. 48, 2nd Edition,* op. cit.

[19]*Groundwater inflows to Ashippun Lake are principally through the numerous springs that exist around the perimeter of the Lake.*

[20]*Backflow occurrences to the Lake from the Ashippun River following unusually high precipitation events were estimated during the initial planning program to amount to about 126 acre-feet, or about 12 percent of the long-term total water inflow to the Lake from all sources. Given the periodic and intermittent nature of this occurrence, however, this volume is not reflected as inflow to the Lake from the River, but is subsumed into the surface water runoff component. See SEWRPC Community Assistance Planning Report No. 48, 1st Edition,* op. cit.

[21]*SEWRPC Community Assistance Planning Report No. 48, 2nd Edition,* op. cit.

[22]*SEWRPC Community Assistance Planning Report No. 48, 1st Edition,* op. cit.

applicable during years of average precipitation with the Monterey dam in place, was determined to be approximately 1.3 years.[23]

Historical Ashippun Lake Levels

Available Data and Analysis

The surface elevations of Ashippun Lake have been recorded sporadically since 1991. A summary of the recorded lake level elevations between 1991 and 2011 was compiled by Yaggy Colby Associates and is included in Exhibit 5. Also included in Exhibit 5 are lake surface elevations observed during the 1976-1977 study period documented in the initial Ashippun Lake management plan completed by SEWRPC,[24] and lake surface elevation data recorded periodically at a permanent staff gauge placed on Balthazor's pier in Ashippun Lake by the WDNR beginning in April 2011. This gauge is referenced to NGVD 29.

Exhibit 28 depicts the monthly precipitation totals for the Oconomowoc rain gauge. The Ashippun Lake surface elevations recorded during 1976-1977 and between 2005 and 2011 are superimposed on this Exhibit. The rainfall data for the 2005 to 2011 period were included in Exhibit 20 and discussed previously. The annual rainfall totals set forth in Exhibit 28 were categorized relative to the average annual precipitation according to the very dry-very wet classification system discussed in the "Correlation of Precipitation Data and Water Features Shown on Aerial/Orthophotography section above. The baseline lake surface elevation of 868.5 feet above NGVD 29 is shown on Exhibit 28 is to provide a reference for the recorded lake level observations. The modifications to the Monterey dam undertaken in 2007 and 2009, summarized above, are noted on the Exhibit.

As can be seen from Exhibit 28, the lake surface elevations for Ashippun Lake have not been consistently recorded over time, complicating any comparison of the monthly precipitation totals and trends in lake surface levels. However, after the very dry period in 1976, it is interesting to note the recorded fluctuations in lake levels relative to precipitation. The lake levels observed during the 1977 wet year fluctuated over a ranged of 1.4 feet. It is unclear if this range in recorded elevations was due to a blockage along the lake outlet, as the April 1977 rainfall was very close to normal, but reports from lake residents have suggested that beaver periodically build dams along this outlet channel.[25]

Systematic recording of lake elevations began in 2011, which was determined to be a normal precipitation year. Few other observations of the Ashippun Lake surface elevations were recorded between 2005 and 2010; however, based on the data collected, it appears that the Ashippun Lake surface elevations recorded during 2011 were not outside of the range of elevations experienced historically.

It is recommended that the Ashippun Lake levels be recorded on at least a monthly basis to better document trends.

Important Findings

- Few observations of the Ashippun Lake surface elevations were recorded between 2005 and 2010; however, based on the data collected, it appears that the Ashippun Lake surface elevations recorded during 2011 were not outside of the range of elevations experienced historically.

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[23]*SEWRPC Community Assistance Planning Report No. 48, 2nd Edition,* op. cit.

[24]*SEWRPC Community Assistance Planning Report No. 48, 1st Edition,* op. cit.

[25]*SEWRPC Community Assistance Planning Report No. 48, 2nd Edition,* op. cit.

Shallow Groundwater Levels

Available Data and Analysis

There are no long-term shallow groundwater level gauge data for the project area along the Ashippun River. However, data from two shallow groundwater well gauges that are operated by the USGS (nwis.waterdata.usgs.gov/nwis/gwlevels/) and which provide long term groundwater elevation records may shed some light on the shallow groundwater fluctuations in the area of Ashippun Lake and the Ashippun River corridor.

The data obtained from the two USGS groundwater wells evaluated are summarized in the table below. The locations of the wells are shown on Exhibit 29. Well 1 is located just north of the Fox River in southern Waukesha County, while Well 2 is located just west of Lulu Lake in northeastern Walworth County. Although the groundwater level depths vary significantly between the two gauges, both wells represent the local elevations of the shallow aquifer. It should be noted that it is not possible to use these two wells to specifically characterize the shallow groundwater response in the project area. Well 1 is located very close to the Fox River and may be influenced somewhat by the River water levels. Well 2 is most likely influenced by Lulu Lake levels, which, in turn, are controlled by the Eagle Spring Lake dam.[26] Nevertheless, some general conclusions regarding shallow groundwater can be drawn from the available data, as summarized below.

The well level readings for Wells 1 and 2 between 2005 and 2010 are summarized in Exhibit 30. Note that the left axis pertains to Well 1 (red) and the right axis corresponds to Well 2 (green). Well 1 data fluctuate considerably more than the Well 2 readings, ranging by some seven feet versus 1.3 feet. The overall trend for the two wells, however, is consistent, with groundwater levels rising until 2008 and then declining through 2011. This corresponds with the very wet precipitation year in 2008 and relatively drier years that followed.

As Well 1 data are taken from a depth significantly closer to the ground surface, and thus form a closer approximation to the shallow groundwater depths in the project area, this Well was evaluated in more detail. Well 1 data for the period between 2005 and 2011 were evaluated not only to determine the response to precipitation but also to determine if the Well was unduly influenced by Fox River levels. In Exhibit 31, Well 1 data have been added to the graph of Oconomowoc precipitation data discussed previously. A closer precipitation gauge to the Well 1 location was not pursued for this analysis as the Oconomowoc gauge should suffice to represent rainfall in both areas. The similarity between the Normal rainfall trend on the figure and the Well 1 groundwater levels shown on Exhibit 31 is important to note. The timing of the rise and fall of the Well 1 data corresponds very well with that of the precipitation dataset. Overall the Well 1 levels appear to rise more quickly when monthly precipitation exceeds the normal value, and also appear fall more quickly when the monthly precipitation value is below the normal value. Exhibit 31 indicates that shallow groundwater does respond to precipitation, and that shallow groundwater levels can vary significantly over time.

To check that Well 1 data are not significantly influenced by Fox River fluctuations, a comparison was made between Well 1 and the Fox River gauged flows as shown in Exhibit 32. The closest USGS streamflow gauge to Well 1 on the Fox River is located in the City of Waukesha approximately 1 mile downstream of the Barstow Dam (USGS 05543830), as shown on Exhibit 29. In Exhibit 32, the Fox River flow data (blue and black) are referenced to the right axis, while the Fox River gauge readings (green) are referenced to the left axis. The Fox River, 10-percent-annual probability (10-year recurrence interval) flood has a flow rate of 1,700 cubic feet per second (cfs) as documented in the 2008 FEMA FIS for this stream gauge location. Only twice during the 2005-2011 period did the Fox River flows exceed this 10-percent-annual probability flow rate (June 2008 and July

[26]*SEWRPC Community Assistance Planning Report No. 226, 2nd Edition,* A Lake Management Plan for Eagle Spring Lake, Waukesha County, Wisconsin, *June 2011; SEWRPC Community Assistance Planning Report No. 309,* Mukwonago River Watershed Protection Plan, *June 2010.*

2010). The Fox River gauge height readings are included in Exhibit 32 to show the rise/fall in the River during the 2005-2010 period. Daily Fox River streamflow gauge heights were not available, so the flow rates corresponding to the gauge heights are included in Exhibit 32 as black data points. Nevertheless, Well 1 groundwater levels did not fluctuate nearly as much as the Fox River levels did in response to flood events, so it can be concluded that shallow groundwater levels are predominantly driven by precipitation.

Important Findings

- Shallow groundwater levels can fluctuate significantly.

- Shallow groundwater levels react rather quickly to, and are predominantly driven by, precipitation events.

- During the period from 2005 to 2011, in general, shallow groundwater levels for USGS monitoring wells in Walworth and Waukesha Counties peaked in mid-2008. Similar well data were not available in the Ashippun River subwatershed.

Groundwater Modeling Summary

Available Data and Analysis

RJN Environmental Services, LLC, was hired by the Lake District to evaluate the potential consequences of the Monterey dam removal with regard to shallow groundwater and Ashippun Lake. A December 19, 2011, letter report to the Town of Oconomowoc from RJN Environmental Services, LLC, regarding this analysis is included in Exhibit 33. Subsequently, SEWRPC staff met with Robert Nauta, P.G., the President of RJN Environmental Services, LLC, on January 10, 2012, to discuss the modeling effort and assumptions used in the preparation of the letter report. Based on this discussion, RJN Environmental Services, LLC, provided an additional memorandum, dated January 23, 2012, reporting on additional modeling analyses. This memorandum also is included in Exhibit 33. The main points from the RJN Environmental Services, LLC, groundwater modeling effort are summarized below.

RJN Environmental Services, LLC, used the regional groundwater model created by USGS for SEWRPC to simulate the Monterey dam removal.[27] The regional model went through a rigorous calibration and review process and was shown to accurately represent groundwater conditions in the seven-county SEWRPC region. RJN Environmental Services, LLC, did not modify the regional groundwater model grid size (2,500 feet by 2,500 feet) for the Ashippun Lake analysis. The only modification analyzed was the change in Ashippun River water surface with the Monterey dam removed. No additional well data were available to calibrate the model for the project area. RJN Environmental Services, LLC, did not modify the representation of the wetland complex north of the Lake in the groundwater model, keeping it as a source of water. Thus, the results from the modeling are conservative, as the wetland complex is modeled as a high water surface.

Assuming removal of the Monterey dam, model results indicated a trend toward lower groundwater levels extending from the dam site east to about the confluence of the Ashippun Lake outlet channel with the Ashippun River. RJN Environmental Services, LLC, evaluated the effect of less groundwater flowing through Ashippun Lake with the Monterey dam removed, and its effect on Lake water quality. Based on the lower groundwater levels projected under the RJN Environmental Services, LLC adjusted model, RJN implied that Ashippun Lake water quality would decline following the Monterey dam removal. Better estimation of the amount of groundwater lowering, and the impacts of such lowering, would require additional modeling as discussed below.

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[27] *SEWRPC Technical Report No. 41*, op. cit.

To provide a better prediction of the groundwater changes with the Monterey dam removed, development of an inset model with a finer grid representation is recommended for the project area. Local groundwater well data should be used to calibrate this model. This would require placing approximately three groundwater wells both north and south of the Ashippun River from CTH P to the Monterey dam location. This also should include placement of approximately three groundwater wells around Ashippun Lake, providing a total of nine groundwater wells placed and monitored for at least one year.

Important Findings

- Utilizing the regional groundwater model as modified by RJN Environmental Services, LLC, the removal of the Monterey dam could result in a trend toward lower groundwater levels extending from the dam site east to about the confluence of the Ashippun Lake outlet channel with the Ashippun River. However, the January 23, 2012, RJN Environmental Services, LLC, letter report characterizes the analysis described therein as "cursory," and it is the opinion of the SEWRPC staff that meaningful conclusions can only be drawn through additional analyses conducted using a finer-scale "inset" model developed within the overall framework of the regional groundwater model.

- Based on the lower groundwater discharge to Lake Ashippun projected under the RJN Environmental Services, LLC adjusted model, RJN implied that Ashippun Lake water quality would decline following the Monterey dam removal.[28] Better estimation of both possible future groundwater conditions and the impacts of changes in the groundwater regime would require additional modeling as discussed above.

Water Quality of Ashippun Lake

Available Data and Analysis

As documented in the comprehensive lake management plan for Ashippun Lake, the Lake is a typical hard-water, alkaline lake that is considered to have relatively good water quality. Physical and chemical parameters measured during the lake management plan study period indicated that the water quality was within the "good" to "very good" range, depending upon the parameters considered. Total phosphorus levels were found to be generally at or below the level considered to cause nuisance algal and macrophytic growths. Summer stratification was not commonly observed in Ashippun Lake, and the surface waters of the Lake remained well oxygenated. The Lake supported a healthy fish population, and winterkill was not reported to be a problem. Likewise, internal releases of phosphorus from the bottom sediments were not considered to be a problem.[29]

There are no significant point sources of pollution in the Ashippun Lake tributary area. Nonpoint sources of pollution include stormwater runoff from urban and agricultural areas. In 2000, the total annual phosphorus load to Ashippun Lake was estimated to be 420 pounds. Runoff from the rural lands contributed the largest amount of phosphorus, about 65 percent of the total phosphorus load, with the runoff from urban lands contributing about 30 percent of the total phosphorus load, approximately 5 percent of which was allocated as originating from malfunctioning onsite sewage disposal systems. Direct precipitation onto the Lake surface contributed the balance of the total phosphorus load, or a relatively minor amount of about 5 percent of the total phosphorus load. Agricultural lands constituted the primary source of phosphorus to the Lake under current land use conditions within the area tributary to the Lake. Under forecast year 2020 conditions, both agricultural and urban lands are anticipated to contribute approximately equal masses of phosphorus to Ashippun Lake, each contributing in

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[28]*For a discussion of the relationship between calcium and magnesium carbonate in groundwater and phosphorus in surface waters, see Werner Stumm and James J. Morgan,* Aquatic Chemistry: An Introduction Emphasizing Chemical Equilibria in Natural Waters, *Wiley-Interscience, New York, 1970.*

[29]*SEWRPC Community Assistance Planning Report No. 48, 2nd Edition,* op. cit.

excess of 40 percent of the load. Approximately 10 percent of the phosphorus load, under buildout conditions, is anticipated to be from woodlands, wetlands, and direct deposition onto the Lake surface.[30]

Approximately 65 percent, or about 260 pounds, of the total annual phosphorus load is estimated to remain in the Lake by conversion to biomass or through sedimentation, resulting in a net transfer of about 160 pounds of phosphorus downstream.

Trophic Status of Ashippun Lake

Lakes are commonly classified according to their degree of nutrient enrichment, or trophic status. The ability of lakes to support a variety of recreational activities and healthy fish and other aquatic life communities is often correlated to the degree of nutrient enrichment which has occurred. There are three terms generally used to describe the trophic status of a lake: oligotrophic, mesotrophic, and eutrophic.

Oligotrophic lakes are nutrient-poor lakes. These lakes characteristically support relatively few aquatic plants and often do not contain very productive fisheries. Oligotrophic lakes may provide excellent opportunities for swimming, boating, and waterskiing. Because of the naturally fertile soils and the intensive land use activities, there are relatively few oligotrophic lakes in southeastern Wisconsin.

Mesotrophic lakes are moderately fertile lakes which may support abundant aquatic plant growths and productive fisheries. However, nuisance growths of algae and macrophytes are usually not exhibited by mesotrophic lakes. These lakes may provide opportunities for all types of recreational activities, including boating, swimming, fishing, and waterskiing. Many lakes in southeastern Wisconsin are mesotrophic.

Eutrophic lakes are nutrient-rich lakes. These lakes often exhibit excessive aquatic macrophyte growths and/or experience frequent algae blooms. If the lakes are shallow, fish winterkills may be common. While portions of such lakes are not ideal for swimming and boating, eutrophic lakes may support very productive fisheries. Although some eutrophic lakes are present in the region, severely eutrophic or hypertrophic lakes are rare, especially since the regionwide implementation of recommendations put forth in the aforereferenced regional water quality management plan.

Several numeric "scales," based on one or more water quality indicators, have been developed to define the trophic condition of a lake. Because trophic state is actually a continuum from very nutrient poor to very nutrient rich, a numeric scale is useful for comparing lakes and for evaluating trends in water quality conditions. Care must be taken, however, that the particular scale used is appropriate for the lake to which it applies. In this case, two indices appropriate for Wisconsin lakes have been used; namely, the Vollenweider-OECD open-boundary trophic classification system,[31] and the Carlson Trophic State Index (TSI),[32] with a variation known as the Wisconsin Trophic State Index value (WTSI).[33] The WTSI is a refinement of the Carlson TSI designed to account

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[30]Ibid.

[31]*Organization for Economic Cooperation and Development (OECD),* op. cit.*; see also H. Olem and G. Flock, U.S. Environmental Protection Agency Report EPA-440/4-90-006,* The Lake and Reservoir Restoration Guidance Manual, Second Edition*, Washington, D.C., August 1990.*

[32]*R.E. Carlson, "A Trophic State Index for Lakes,"* Limnology and Oceanography*, Vol. 22, No. 2, 1977.*

[33]*See R.A. Lillie, S. Graham, and P. Rasmussen, "Trophic State Index Equations and Regional Predictive Equations for Wisconsin Lakes,"* Research and Management Findings*, Wisconsin Department of Natural Resources Publication No. PUBL-RS-735 93, May 1993.*

for the greater humic acid content—brown water color—present in Wisconsin lakes, and has been adopted by the WDNR for use in lake management investigations. Based on the Vollenweider phosphorus loading model and the WTSI ratings calculated from the Ashippun Lake data, Ashippun Lake may be classified as a mesotrophic lake.

Water Quality Responses to Precipitation

All of the known Secchi depth transparency, total phosphorus, and chlorophyll-a observations taken on Ashippun Lake from 1976 to 2011 and their associated WTSI values on are shown in Exhibit 34. Although there are some observations in the 1970s and early 1980s, the most consistent and comprehensive data collection began in 1990.

As shown in Exhibit 35, the majority of the summer season WTSI values for all three parameters demonstrates that Ashippun Lake is generally in a mesotrophic condition, but sometimes can be oligotrophic or eutrophic condition. There is considerable variation from year to year in Secchi depth, total phosphorus, and chlorophyll-*a* concentrations within Ashippun Lake. None of these variables are shown to be significantly increasing or decreasing over time (i.e., from 1990 to 2011). Despite this variability from year to year, it is possible to see that increases and decreases in Secchi depth are associated with increases and decreases in total phosphorus and chlorophyll-*a* concentrations. For example, in 1993, Secchi depths were poor and the corresponding Secchi depth WTSI values were in the eutrophic range, while at the same time total phosphorus and chlorophyll-*a* concentrations were high, causing their respective WTSI values also to be high or indicative of eutrophic conditions. In contrast, the opposite conditions were observed during the year 2002, which showed that good Secchi depth values (i.e., greater water clarity) were related to reduced nutrient and chlorophyll-*a* concentrations in Ashippun Lake. These relationships between Secchi depth (water clarity), total phosphorus (nutrients), and chlorophyll-*a* (algae) are normal.[34]

More explicitly, there is a significant negative correlation between Secchi depth (feet) and chlorophyll-*a* concentrations within Ashippun Lake (Pearson correlation coefficient r = -0.622, number of observations = 47); as the amount of chlorophyll-*a* increased, water clarity decreased. In addition, there also was a significant positive correlation between chlorophyll-*a* and total phosphorus concentrations in this Lake (Pearson correlation coefficient r = 0.328, number of observations = 47).

In an effort to better understand the annual variability of the summer WTSI values for Ashippun Lake, total annual precipitation categories, derived from the Oconomowoc weather station as shown in Exhibit 20 and discussed above, were superimposed on Secchi disc WTSI values. Exhibit 36 shows that, as the annual precipitation varies from year to year, there appears to be some relationship between water quality in Ashippun Lake and the volume of rain within that year. Due to limited number of observations for total phosphorus and chlorophyll-*a* concentrations obtained from Ashippun Lake, it was not possible to test for the effect of annual precipitation on these two parameters; however, Secchi depths within Ashippun Lake were consistently collected monthly and in some cases bi-weekly every year from 1990 to 2011, for a total of 136 measurements. An Analysis of Variance (ANOVA) statistical test was used to determine if Secchi depth (water clarity) within Ashippun Lake was related to differences in the annual precipitation categories (very dry, dry, normal, wet, and very wet). Application of that statistical test generates a parameter, designated the "P-value," which relates to statistical significance of the relationship. The statistical analysis was performed using SYSTAT.[35] For the foregoing data set, the P-value was less than 0.05, which indicates a statistically significant result confirming that water quality is affected by annual precipitation.

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[34] *Organization for Economic Cooperation and Development (OECD),* op. cit.

[35] *SYSTAT Software,* SYSTAT 10.2*, 2002.*

The Normal and Dry precipitation categories were associated with the best WTSI water quality values, the Wet and Very Wet categories were associated with poorer water quality conditions, and the worst WTSI values were associated with the Very Dry years, as shown in Exhibit 36. In addition, the WTSI values within the Very Dry category were all within the eutrophic condition, which indicates that water quality within Ashippun Lake is worst during the driest years. Although the exact mechanism as to how this relationship between precipitation and water quality functions within Ashippun Lake is unknown, it does demonstrate that precipitation is an important determinant of water quality within the Lake.

Important Findings

- As described in the "Water Budget for Ashippun Lake" section above, groundwater is an important part of the water budget contributing nearly 25 percent of the total inflow into Ashippun Lake.

- As summarized in the "Shallow Groundwater Levels" section above, precipitation is the major determinant of shallow groundwater levels. These groundwater levels increase with greater precipitation and decrease as conditions get dryer.

- Precipitation is an important determinant of water quality within Ashippun Lake, with the worst water quality conditions being associated with the lowest annual precipitation periods.

- A loss or reduction in volume of groundwater flows to Ashippun Lake could lead to significant reductions in water quality within Ashippun Lake, particularly under Very Dry precipitation conditions.

Wetland Inventory

Available Data and Analysis

The Ashippun River floodplain–wetland complex, located in the Town of Oconomowoc, Waukesha County, Wisconsin, between the Monterey Dam (Mill Street) site and the area associated with the Ashippun Lake outlet channel and the Ashippun Lake wetland complex, were inventoried by the Commission staff on January 10, 2012. This inventory also incorporates the result of smaller scale inventories that had previously been conducted in this area on March 21, 2000; September 17, 2003; and, September 16, 2010.

Eight plant community areas associated with this wetland system were identified during the 2012 survey. A list of plant species observed is attached hereto as Exhibit 37. The eight communities identified during the 2012 survey were mapped and are shown in Exhibit 37.

Plant Community Area No. 1 is an approximately 22.1-acre plant floodplain-wetland complex which consists of shallow marsh, Southern sedge meadow, fresh (wet) meadow, and shrub-carr (willow thicket) with scattered stands of second growth, Southern wet to wet-mesic lowland hardwoods. Disturbances included agricultural land management activities such as plowing along the wetland edge, past grazing along the wetland edge, the *ad hoc* establishment of all-terrain vehicle (ATV) trails, and siltation and sedimentation due to stormwater runoff from adjacent lands.

Plant Community Area No. 2 is an approximately 32.0-acre floodplain-wetland complex which consists of shallow marsh and fresh (wet) meadow which now occupies the bed of the former millpond. Disturbances included filling along the wetland edge, siltation and sedimentation due to stormwater runoff from adjacent lands, and water level changes due to opening of the spillway.

Plant Community Area No. 3 is an approximately 225-acre floodplain-wetland complex which consists of a mosaic of shallow marsh with small stands of Southern sedge meadow and alder thicket. Disturbances included agricultural land management activities including plowing along the wetland edge, pond excavation, side casting of dredge spoil material, and siltation and sedimentation due to stormwater runoff from adjacent lands.

Plant Community Area No. 4 is an approximately 150-acre wetland complex associated with Ashippun Lake and consists of a mosaic of deep and shallow marsh, sedge fen, and shrub-carr (willow thicket). Disturbances to this wetland complex included agricultural land management activities such as plowing along the wetland edge, past filling for public boat launch, and siltation and sedimentation due to stormwater runoff from adjacent lands.

Plant Community Area No. 5 is an approximately 39.4-acre wetland complex that consists of degraded fresh (wet) meadow. Disturbances include agricultural land management activities such as plowing, past filling, siltation and sedimentation due to stormwater runoff from adjacent lands, and water level changes due to past ditching and draining.

Plant Community Area No. 6 is an approximately 18.0-acre wetland complex which consists of shrub carr (willow thicket) and fresh (wet) meadow. Disturbances included agricultural land management activities such as plowing along the wetland edge, past filling, selective cutting of trees, siltation and sedimentation due to stormwater runoff from adjacent lands, and water level changes due to past ditching, draining, and impoundment by the road.

Plant Community Area No. 7 is an approximately 17.8-acre wetland complex consisting of a bog, deep and shallow marsh, and fresh (wet) meadow. Disturbances included agricultural land management activities along the wetland edge, mowing, and siltation and sedimentation due to stormwater runoff from adjacent lands.

Plant Community Area No. 8 is an approximately 7.3-acre wetland complex and consists of open water and shallow marsh. Disturbances included dumping and mowing along the wetland edge, side casting of dredge spoil material, siltation and sedimentation due to stormwater runoff from adjacent lands, and water level changes due to past ditching and draining.

With respect to groundwater discharge indicator species, the southern boundary area of Plant Community Area No. 1 supports some plant species often associated with such discharges. This suggests that groundwater flow may contribute to this plant community area's wetland hydrology along the southern boundary. In Plant Community Area No.4, the sedge fen, located along the southwest shoreline just west of the public boat launch, is supported by an active groundwater seepage area. Finally, while Plant Community Area No. 3 contains a few individuals of Swamp Lousewort (*Pedicularis lanceolate*) near its southeast boundary, it is difficult to conclude that groundwater flow is a significant contributor to the wetland hydrology of this plant community area. The remaining wetland plant communities observed appear to be surface water driven.

The great egret (*Casmerodius albus*), a State-designated Threatened bird species, was observed during the September 2010 field inspection within Plant Community Area No. 2. Riparian residents have reported regularly seeing this species along the Ashippun River shoreline. In addition, slender madtom, (*Noturus exilis*), a State-designated Endangered fish species, is known to occur in Plant Community Area No. 2 and 3 adjacent to the Ashippun River.

The Commission's *Amendment to the Natural Areas and Critical Species Habitat Protection and Management Plan for the Southeastern Wisconsin Region,*[36] identifies Plant Community Area No. 3 and 4 as part of the Ashippun River Lowlands (NA-2), a natural area of countywide or regional significance, and Plant Community No. 7 as part of the Meadow View School Bog (NA-3), a natural area of local significance.

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[36]*SEWRPC Planning Report No. 42, A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, September 1997, as amended.*

All of the eight plant community area wetlands are located within a Commission-delineated Primary Environmental Corridor.[37] As such, these wetlands are also designated as Advanced Identification (ADID) wetlands under the Federal Section 404(b)(1) guidelines.

Important Findings

- This wetland vegetation inventory is inconclusive in determining the connectivity between the wetland complex associated with the Ashippun River and groundwater system within and adjacent to Ashippun Lake.

- The survey indicated areas of vegetation indicative of groundwater in two of the areas surveyed, which supports the importance of groundwater in portions of this system.

- Groundwater discharge appears to be a driver for at least a portion of the wetlands in PCA #1 of 4, rather than an artifact of the presence of wetlands.

ALTERNATIVE ACTIONS CONSIDERED

The four issues set forth in the "Issues of Concern" section near the beginning of this memorandum approximately correspond to the four alternative actions identified by the WDNR in their Chapter NR 150 environmental analysis (EA), with the exception of the "no action" alternative, which was not considered as a viable alternative in the EA (Exhibit 4). Alternative 1 considers removal of the dam, Alternatives 2 and 3 consider options other than a replacement of the Monterey dam, and Alternative 4 considers reconstruction of the dam.

It should be noted that removal of the existing Monterey dam structure is a prerequisite for all four Alternatives considered. It also should be noted that Alternatives 1, 2, and 3 are predicated upon the proper stabilization and re-creation of the Ashippun River through the former Mill Pond to the maximum extent practicable.

The locations of the interventions considered herein under the four Alternatives are shown on Exhibit 38.

Alternative 1: Removal of the Monterey Dam

This Alternative is based upon the removal of the Monterey dam and its appurtenances, without replacement. As noted above, it is considered to be essential that measures be instituted during this process to recreate the former stream course through the impoundment, both to minimize the volume of sediment available for transport downstream and to restore the normal functioning of the stream system as it is converted back to a lotic system from its previous state as a reservoir or lentic system. Under this Alternative, the middle portion of the Ashippun River system would be returned to its pre-impoundment hydrological state through a managed intervention.

Surface Water Quantity Impacts

The 2005 and 2010 aerial photographs of the project area clearly show that the drawdown (and potentially the ultimate removal) of the Monterey dam has altered the character of the Ashippun River in the vicinity of the former Mill Pond and dam site. The Ashippun River has lost its lacustrine (impounded) character over an approximately 5,500-foot length of stream extending upstream from the dam site. Upstream of that location, the Ashippun River resumes its lotic (flowing water) characteristics.

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[37]*See SEWRPC Technical Record Vol. 4, No. 2, "Refining the Delineation of Environmental Corridors in Southeastern Wisconsin," by Bruce P. Rubin and Gerald H. Emmerich, Jr., March 1981.*

Possible impacts on Ashippun Lake during this same period are less obvious. The Ashippun River FEMA flood profile indicates that the Monterey dam causes significant backwater effects for the 10-percent-annual-probability flood and greater. In fact, Ashippun Lake levels included in the FIS are based on the levels of the Ashippun River. With the Monterey dam removed, it is anticipated that the Ashippun River would likely have a substantially lower flood profile in the area of the wetland complex north of Ashippun Lake, and there would be a reduction in the flood stage elevation of Ashippun Lake. To fully document this outcome under flood conditions, however, further analysis beyond the scope of this memorandum would be required to determine more precisely the magnitude of the reduction in backwater elevations within the wetland complex and Lake with the Monterey dam removed.

Comparison of the 2005 and 2010 aerial photographs of the Middle Ashippun River clearly shows a decline in the areal extent of surface water adjacent to the Ashippun River between these years, at a time when the surface water levels of the Monterey Mill Pond were being drawn down but when regional rainfall amounts and groundwater recharge rates remained relatively high.[38] This is especially true for the waters adjacent to, and immediately upstream of, the historical Mill Pond.

Groundwater Quantity Impacts on Surface Water Quantity

Dams are known to increase not only surface water elevations due to the impoundment of streamflows but also to increase groundwater infiltration, and thereby increase groundwater levels.

Removal of the Monterey dam might be expected to lead to a decline in groundwater elevations in response to the decreased infiltration from the Mill Pond to the groundwater and to the "focusing" of the wetlands closer to the stream course.[39] This is consistent with the forecast of groundwater discharge to the Lake decreasing in response to the removal of the Mill Pond as suggested by RJN Environmental Services, LLC.[40] As noted previously, additional modeling and field data are necessary to better quantify the groundwater impacts of the dam removal on Ashippun Lake.

Lake Water Quality Impacts

RJN Environmental Services, LLC, raised the issue of possible surface water quality impacts arising from a modified groundwater flow; namely, the possibility of increased enrichment of surface waters due to a decrease in the input of groundwater-derived calcium carbonate, and the accompanying reduction in the rate of formation of insoluble calcium phosphate. Given that the Ashippun Lake system is currently considered by the WDNR to be a spring lake in which groundwater is the primary source of inflow to the Lake,[41] there is an ongoing introduction of calcium carbonate and magnesium carbonate through the groundwater system into the Lake. The carbonaceous

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[38]*See U.S. Geological Survey Scientific Investigations Report No. 2008–5235,* Flood of June 2008 in Southern Wisconsin, *2008.*

[39]*As the water table declines, the outer wetland fringes located at the higher elevations in the landscape may diminish in area due to the drier conditions which would not be conducive to the continued existence of wetland communities. Another possible outcome could be maintenance of wetland conditions supporting different wetland plant communities.*

[40]*RJN Environmental Services, LLC,* op. cit.

[41]*See Wisconsin Department of Natural Resources Publication No. PUB-FH-800 2009,* Wisconsin Lakes, *2009: "Spring lakes have no inlet, but do have an outlet. The primary source of water for spring lakes is groundwater flowing into the bottom of the lake from inside and outside the immediate surface drainage area. Spring lakes are the headwaters of many streams and are a fairly common type of lake in northern Wisconsin."*

materials are derived from the passage of infiltrated water through the dolomite aquifer.[42,43] Reducing the volume of inflow through lowering the groundwater table (as suggested by RJN Environmental Services, LLC), could result in a reduced loading rate or rate of introduction of calcium ions into the surface water system. Less calcium means a loss of calcium binding capacity and a proportionately greater amount of ionized phosphorus (phosphate) potentially available in the water column.[44] This additional mass of biologically available phosphorus could spur the growths of aquatic plants, especially algae.[45] Algal blooms have not historically or recently been observed in the Lake. Such plants are typically associated with the perception of water quality degradation.[46]

The comprehensive lake management plan for Ashippun Lake also noted that the outflow from Ashippun Lake was indirectly influenced by the Monterey dam.[47] During high flow events, the backwater effect created by this impoundment was estimated to result in the diversion from the Ashippun River of approximately 126 acre-feet per year of water into Ashippun Lake. These waters were assumed to carry a higher contaminant load than that carried by direct runoff into Ashippun Lake from its relatively small tributary area. Thus, a lowering of Ashippun River flood elevations with the Monterey Dam removal may have a positive impact on Ashippun Lake water quality.

Alternative 2: Installation of a Control Structure Near the Outlet to Ashippun Lake
Under this Alternative, the Monterey dam and appurtenances would be removed as envisioned under Alternative 1. However, in an effort to maintain the current hydrologic regime of the Lake to the degree possible,

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[42]*See SEWRPC Technical Report No. 37,* Groundwater Resources of Southeastern Wisconsin*, June 2002.*

[43]*"The chemical composition of groundwater in the Region is primarily a result of its movement through the interaction with Pleistocene unconsolidated materials and Paleozoic rocks, which all contain large amounts of dolomite, $CaMg(CO_3)_2$, that is dissolved by water passing through the materials and rocks. In general, groundwater quality tends to be relatively uniform within a given aquifer, both spatially and temporally, but major differences in groundwater quality within the Region can be observed." Source: SEWRPC Technical Report No. 37,* Groundwater Resources of Southeastern Wisconsin*, June 2002, page 89.*

[44]*Dr. Dale Robertson, U.S. Geological Survey, personal communication. See also, Werner Stumm and James J. Morgan,* op. cit.

[45]*See Organization for Economic Cooperation and Development (OECD), Eutrophication of Waters: Monitoring, Assessment and Control, Organization for Economic Cooperation and Development, Paris, 1982; see also Sven-Olof Ryding and Walter Rast,* The Control of Eutrophication of Lakes and Reservoirs*, Unesco Man and the Biosphere Series, Volume 1, Parthenon Press, Carnforth, 1989; Jeffrey A. Thornton, Walter Rast, Marjorie M. Holland, Geza Jolankai, and Sven-Olof Ryding,* The Assessment and Control of Nonpoint Source Pollution of Aquatic Ecosystems*, Unesco Man and the Biosphere Series, Volume 23, Parthenon Press, Carnforth, 1999; H. Olem and G. Flock, U.S. Environmental Protection Agency Report EPA-440/4-90-006,* The Lake and Reservoir Restoration Guidance Manual, Second Edition*, Washington, D.C., August 1990.*

[46]*Thornton, J. A., P. H. Mcmillan, and P. Romanovsky, "Perceptions of Water Pollution in South Africa: Case Studies from Two Waterbodies (Hartbeespoort Dam and Zandvlei),"* South African Journal of Psychology*, volume 19, pages 197-204, 1989; Thornton, J. A., "Perceptions of Public Waters: Water Quality and Water Use in Wisconsin." In: T. van Valey, S. Crull & L. Walker,* The Small City and Regional Community*, Volume 10, University of Wisconsin-Stevens Point Foundation Press, Stevens Point, pages. 469-478, 1993. ISBN 0-932310-22-2.*

[47]*SEWRPC Community Assistance Planning Report No. 48, 1st Edition,* op. cit.

following removal of the dam, this Alternative would seek to minimize or moderate any postulated lowering of Lake level and reduction of Lake volume by placement of a control structure at the outlet to Ashippun Lake. By regulating the outflow of water from Ashippun Lake, this Alternative would seek to maintain water levels in the Lake despite the anticipated reduction in inflows from both surface (backflow from the Ashippun River estimated to average about 128 acre-feet per year) and groundwater inputs.[48]

Surface Water Quantity Impacts

The normal level of Ashippun Lake has been reported to be about 868.5 feet above NGVD 29.[49] Lake levels are known to fluctuate around this elevation, as documented in the initial comprehensive lake management plan.[50] In addition, Yaggy Colby Associates recently complied observations of the surface elevation of Ashippun Lake based upon field surveys conducted by Waukesha County, and confirmed a mean lake surface elevation of between 868.5 feet and 868.6 feet above NGVD 29, based upon records dating from 1991 through 2009.[51] These fluctuations were observed to be the result of changes in precipitation and evaporation and groundwater inflow and outflow, the latter also being driven by precipitation.

Given the generally low topographic gradients in the study area, typified by the presence of extensive wetlands, and consequent risk of flooding of riparian homesteads surrounding Ashippun Lake, the maintenance of lake water levels was identified as an issue to be considered in the comprehensive lake management plan for Ashippun Lake.[52] To this end, a staff gauge was placed in the Lake by the WDNR during April 2011. Periodic readings since that time have been obtained by the Ashippun Lake Management District. All of the recent observations fall at or slightly below the "normal level" of Ashippun Lake (868.5 feet above NGVD 29). Currently, there is no permanent dam, weir, or other outflow control device at the outlet of Ashippun Lake that directly regulates the outflow of water from the Lake to the Ashippun River.

A structure at the outlet of Ashippun Lake near Saddlebrook Lane will help maintain surface water elevations in the Lake. Depending on how this structure is built, it may prevent backflow into the Lake from the Ashippun River during floods.

Groundwater Quantity Impacts on Surface Water Quantity

It is unclear if a structure at the outlet of Ashippun Lake will maintain shallow groundwater elevations in the Ashippun Lake area with the Monterey dam removal. This alternative was not evaluated in the groundwater evaluation by RJN Environmental Services, LLC. The groundwater elevations generally drop from east to west, suggesting that a small control structure at Saddlebrook Lane may not be sufficient to maintain groundwater elevations. The presence of significant areas of wetland adjacent to the Lake and its outlet channel would suggest that an outlet control device could have little effect on groundwater levels, as water from the Lake could potentially seep around such a structure and drain into the Ashippun River. This would be consistent with the elevation difference between the Lake and River. Previous experience with such a device, intended by the Lake

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[48]*See footnote to Figure 3 in SEWRPC Community Assistance Planning Report No. 48, 1st Edition,* op. cit.*; see also RJN Environmental Services LLC,* op. cit.

[49]*SEWRPC Community Assistance Planning Report No. 48, 1st Edition,* op. cit.

[50]Ibid.

[51]*Yaggy Colby Associates, Memorandum dated November 16, 2011.*

[52]*SEWRPC Community Assistance Planning Report No. 48, 2nd Edition,* op. cit.

District to limit flows from the Ashippun River into Ashippun Lake, was unsuccessful and consequently does not provide any guidance as to the likely consequences of placing an outlet control structure at the Lake outlet.

Lake Surface Water Quality Impacts

As noted above in the evaluation of Alternative 1, the lake management plan for Ashippun Lake noted that the outflow from Ashippun Lake was influenced, indirectly, by the Monterey dam with the backwater effect during floods on the Ashippun River resulting in the diversion from the River of approximately 126 acre-feet per year of water into the Lake. Because these waters were assumed to carry a higher contaminant load than that carried by direct runoff into Ashippun Lake from its relatively small tributary area, measures to limit such backflows were recommended, and there was an unsuccessful attempt by residents to reduce this backflow through the use of an inhibitor device installed in the outlet channel near the north side of the Lake. Thus, there are no data on the effect of reducing backflows into Ashippun Lake.

It is unknown to what degree a structure at the Ashippun Lake outlet could offset possible reductions in groundwater discharge to the Lakes with the Monterey dam removed. From a water quality perspective, it is also unclear if a reduction in groundwater contribution to the lake and its negative impacts on water quality will be mitigated by a reduction in poor water quality flood backwater from the Ashippun River.

While the nature and extent of such impacts, however, cannot be fully (quantitatively) evaluated by examination of the available data, a functioning flow control device at the Lake outlet might mimic the current Lake levels, but probably would increase water residence times in the Lake. Increased water residence times would be due to the absence of flood inflows to the Lake from the Ashippun River as well as possible reduced groundwater discharge to the Lake as a consequence of the reduced water table associated with the removal of the Monterey dam as summarized under Alternative 1. The effects of longer water residence times, in turn, can be surmised by reference to the water quality observed under Dry conditions. In other words, some reduction in water quality could be expected to occur.[53]

Alternative 3: Replacement of the Monterey Dam with a Structure(s) Upstream of the Current Impoundment

Under this Alternative, the Monterey dam and appurtenances would be removed as envisioned under Alternative 1, above, without the placement of any outflow controls on the Ashippun Lake outlet. However, to minimize possible wetland impacts and to maintain water surface elevations within Ashippun Lake, one or more habitat structures, as defined in Chapter NR 323 of the *Wisconsin Administrative Code*, would be placed along the mainstem of the Ashippun River. These structures would create a series of pools and riffles to gradually step-down the water surface elevations downstream of the wetland complex in such a way as emulate the backwater effect of the Monterey dam without incurring the levels of cost or risk associated with dam replacement, while simultaneously achieving the public safety and environmental benefits associated with the removal of the dam on the mainstem of the Ashippun River.

Surface Water Quantity Impacts

Although this Alternative is likely to require significant developmental work prior to the installation of a structure or structures upstream of the existing Monterey dam site, the potential exists to develop a weir or series of stepped grade control structures near the approximate location of the former upstream extent of the Monterey Mill Pond. The WDNR staff has noted the merits of such an approach, which would include enhancement of the existing series of pools and riffles through placement of additional structures along this reach of the Ashippun River.

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[53]*Note that water residence time is an important determinant of in-lake phosphorus concentrations; both water loading rate and water residence time are important variables in the denominator of the phosphorus loading model of the Organization for Economic Cooperation and Development,* op. cit.

These structures would enhance existing fish habitat in this area and potentially serve to approximate the backwater effect of the Monterey dam and Mill Pond along this stretch of River. The creation of a pool and riffle structure could enable maintenance of the surface water levels conducive to sustaining the riparian wetland complex and contributing to the occurrence of backflows from the Ashippun River to Ashippun Lake. Under this Alternative, the Monterey dam and appurtenances would be removed, and the stream restored through the area of the former Mill Pond.

Groundwater Quantity Impacts on Surface Water Quantity

By enhancing the riffle and pool structure of the Ashippun River at a point upstream of the current location of the Monterey dam but downstream of the confluence of the Ashippun River and Ashippun Lake outlet channel, there is a potential to moderate the effect of dam removal on the shallow groundwater table and mitigate the reduction in groundwater elevations anticipated as a result of the removal of the Monterey dam. This alternative was not evaluated by RJN Environmental Services, LLC. This approach is expected to enhance the availability of habitat for fish and other aquatic organisms, and may maintain groundwater recharge sufficient to maintain local groundwater elevations. Maintaining groundwater elevations would benefit both Ashippun Lake and its associated wetland complexes, and minimize possible negative consequences of diminished groundwater elevations on Lake water quality.

Surface Water Quality Impacts

Given the importance of groundwater flows to both Ashippun Lake and its surrounding wetlands, actions to moderate the reduction in groundwater levels that are to be anticipated as a consequence of the removal of the Monterey dam would not only benefit water surface elevations but also maintain water quality in a state similar to that currently observed in Ashippun Lake. While the nature and extent of such impacts, however, cannot be fully (quantitatively) evaluated, maintenance of the current water levels in the vicinity of the Ashippun Lake outlet would potentially mimic the current water and nutrient loading regime. Maintenance of the current water and nutrient loading regime would have minimal impacts to Lake water quality.

Observations Regarding Possible Sites for Placement of Instream Structures

It should be noted that both WDNR staff and SEWRPC staff observed a riffle in the Ashippun River approximately 3,000 feet upstream of the Monterey dam. This riffle is downstream of the area suggested for the construction of the artificial riffles and instream habitat under Alternative 3. It is unclear if this high riffle point in the Ashippun River profile extends across the entire width of the Mill Pond valley. During the January 2011 SEWRPC survey it was not possible to probe the entire width of the valley at this location due to frozen conditions. This potential high point was not included in the original channel profile shown in Exhibit 9 as there is a possibility that the original channel is south of the current Ashippun River centerline. Also, the channel bottom profile without the high spot included was more consistent with the upstream and downstream profiles of the River. Additional investigation will be required to determine if this high spot in the Ashippun River profile exists across the Mill Pond valley. If so, it may be a good location to evaluate further for a series of controlled drop structures as proposed in Alternative 3.

Alternative 4: Reconstruction of a "Monterey Dam"

This Alternative would involve the reconstruction of the Monterey dam at its present location. This Alternative is qualified by the need for any replacement structure (a) to be physically separated from the roadway and bridge, and (b) to meet all applicable State requirements for new dams, including the requirement that a replacement meet the appropriate dam hazard designation as outlined in NR 333 of the *Wisconsin Administrative Code*. The existing dam is designated a Low Hazard Dam, but regulated as high hazard dam until the area of the hydraulic shadow resulting from a dam failure is regulated to restrict development according to the *Wisconsin Administrative Code*. It is anticipated that a replacement dam would have the same designation. This Alternative would best mimic the current conditions within the Ashippun River and its environs in the area around Ashippun Lake.

Replacement of the Monterey dam to its historical spillway elevations would restore the original backwater effect of the dam during both flood and baseflow times. It is anticipated that Alternative 4 would return shallow groundwater elevations to their pre-drawdown elevations over time. Therefore the interplay of groundwater and the wetland complex and Ashippun Lake would be restored.

That said, reconstruction of a "Monterey Dam" is not only the most costly of the Alternatives considered, but is an Alternative that would have negative impacts on the biological integrity of the Ashippun River. Construction of an impoundment to the same or similar specifications of the Monterey dam would reinstate a barrier to the migration of fish and other aquatic organisms in the Middle Ashippun River.

It was requested by the Lake District that dredging of the Mill Pond area be considered under the evaluation of the dam replacement alternative. The intent for the dredging was to increase water depths for aquatic recreation. The sediment sampling for the bridge replacement project indicated arsenic levels were high, thus, if the Mill Pond was restored, the dredged material would have to be taken to a WDNR licensed facility for disposal which would increase costs significantly. Removal of substrate would allow for the future deposition of materials being transported into the dam basin by the Ashippun River, and limit the downstream transport of such materials. A consequence of this sediment deposition in dam basins is increased downstream erosion caused by clearer water being discharged from the impoundment within the downstream reach of the River. Such erosion in the downstream reach could impair aquatic habitat in this area, while deposition within the impoundment, over time, would similarly impair aquatic habitat within the new impoundment.

With respect to recreational use, dredging of the new lake basin, as proposed by the Lake District, would increase water depths which, depending on the depth of dredging, may decrease emergent aquatic vegetation while contributing the increase in submergent vegetation. Because waterfowl hunting was mentioned as a current use enjoyed by local residents, increasing depths and reduced emergent vegetation may discourage waterfowl from using the re-created Mill Pond. Since the re-created Mill Pond would have a relatively small surface area, recreational boating opportunities would be limited to small craft.

At the 2011 annual meeting, the Ashippun Lake Management District electors and property owners resolved to recommend to the Town of Oconomowoc that the Town retain the permit to place a dam on the Ashippun River in the vicinity of the current Monterey dam for a period of five years after removal of the existing structure. This resolution was accepted by the Town, with the support of the WDNR who noted that, pursuant to the provisions of Chapter 31 of the *Wisconsin Statutes*, the permit to place a dam was separable from the permit to operate a dam.

CONCLUSIONS

Based upon the data and information set forth in this memorandum, removal of the current Monterey dam and its appurtenances is supported on the basis of the risks to life and property that exist due to the degraded condition of the existing structure. Consequently, the SEWRPC staff has assumed removal of the dam and the stabilization and re-creation of the Ashippun River course through the former Mill Pond as a prerequisite in the consideration of Alternatives 1, 2, and 3. Alternative 4 assumes removal of the dam, but may not require as extensive re-creation of a navigational channel through the Mill Pond as would the other three Alternatives. The SEWRPC staff concurs with the WDNR in foregoing consideration of the "do nothing" Alternative, focusing instead on four feasible Alternatives; namely, 1) removal of the Monterey Dam without further action other than stabilizing and re-creating the river course through the former Mill Pond, 2) installing an outlet control device at the outlet to Ashippun Lake in the vicinity of Saddlebrook Lane extended, 3) placement of an enhanced pool and riffle grade control structure in the Ashippun River at the downstream end of the Ashippun Lake wetland complex, and 4) reconstruction of the Monterey dam.

Of these Alternatives, Alternatives 3 or 4 would appear to best meet the needs of both the Monterey dam community and Ashippun Lake community by maintaining a semblance of the hydrologic and water quality conditions associated with the Ashippun River with the Monterey dam in place. Alternative 3, with the use of riffles as grade control structures, has the benefit over Alternatives 1 and 2 of maintaining surface water levels in the Ashippun River in the vicinity of the Ashippun Lake wetland complex. Such grade control structures also would contribute to mimicking the surface backwater effects currently created by the Monterey dam, ensuring periodic inundation of the wetlands and the associated back flows into Ashippun Lake. In addition, the creation of a series of pools and riffles would enhance instream habitat and promote the migration of fishes and other aquatic organisms within the mainstem of the Ashippun River.

There is not a detailed, location-specific groundwater model available that represents conditions under each of the Alternatives. Thus, the relative benefits of Alternative 3 versus Alternative 4 in mitigating shallow groundwater elevations have not been quantified. It has been shown that decreases in groundwater discharge to Ashippun Lake could have a significant impact on Lake water quality. Therefore, before a decision is made on whether to proceed with Alternative 3 or Alternative 4, it is recommended that a detailed groundwater analysis be performed, applying an inset model within the context of the regional groundwater model.

Alternatives 2 and 3 would enhance the riverine environment by including the removal of the existing impediment formed by the Monterey dam. This would open the Middle Ashippun River to improved canoe access and enhance human recreational experience offered by this River reach, and allow the passage of fish and aquatic organisms. By maintaining the riparian wetland corridor, Alternative 3 would provide support to terrestrial organisms and maintain the aesthetic qualities of this River reach. Placement of a structure at the outlet of Ashippun Lake, as proposed under Alternative 2, would not provide these additional benefits within the River corridor.

Under Alternative 3, the creation of the enhanced pool and riffle structures would be preferable to the installation of impermeable weirs. With such porous structures in place there might be periods during which these structures do not maintain the elevations of either surface or groundwater in this area. It is likely that these structures would best mimic current conditions in the Middle Ashippun River under high flow conditions regimes; however, under very dry conditions some negative effects may be expected as River stages are reduced, the pools may become isolated, and groundwater levels may be reduced.

In addition, a general comparison of costs is helpful in comparing Alternatives. The cost of removing the current Monterey dam and restoring the Mill Pond area (Alternative 1) is also applicable to Alternatives 2 and 3. The cost of removing the current Monterey dam also would be included in Alternative 4, which calls for replacing the dam. It is assumed that the permitting and construction of an impermeable structure at the outlet of Ashippun Lake (Alternative 2) would be more expensive than the creation of instream habitat structures (Alternative 3). Replacing the Monterey dam is assumed to be the most costly to permit and construct, as well as to maintain and periodically inspect as required by the WDNR.

Alternatives 3 and 4 have the least potential impact on Ashippun Lake as described above. Alternative 3 could have a somewhat higher cost than Alternative 1 because of the need to establish instream structures. The cost of Alternative 2 would be expected to be more than Alternative 3 and less than Alternative 4, which is the most costly.

* * *

SEWRPC Staff Memorandum

EVALUATION OF THE POTENTIAL IMPACT OF THE REMOVAL OF THE MONTEREY DAM ON WATER QUALITY AND WATER QUANTITY IN ASHIPPUN LAKE

January 26, 2012

EXHIBITS

Exhibit 1

SUBBASINS WITHIN THE ASHIPPUN RIVER WATERSHED

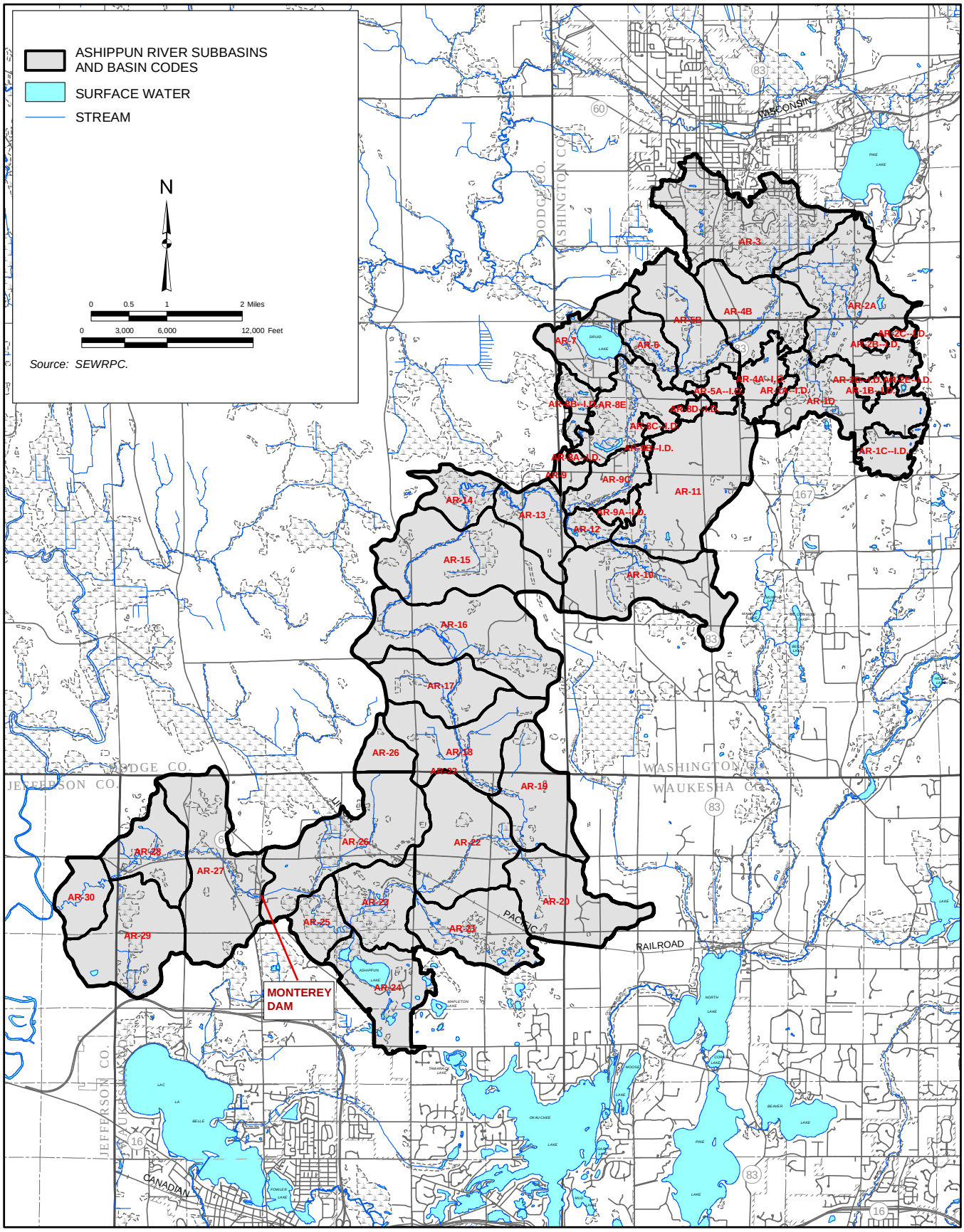


Exhibit 2

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Anthony S. Earl
Secretary

BOX 7921
MADISON, WISCONSIN 53707

IN REPLY REFER TO: _____

Mr. William Chapman, Attorney
Kerro, Chapman, Snyder & Pike
156 East Wisconsin Avenue
Oconomowoc, Wisconsin 53066

Dear Mr. Chapman:

Our records do not indicate there is concern about the condition of Monterey Dam in Waukesha County. Our last report in October 1975 indicated the concrete seemed to be in good shape. The Southeast District continues to have complaints about the water levels - some think the water is too high, others think it is too low. The District is attempting to get this problem settled and hopes to have a satisfactory solution this season.

The dam has not been inspected recently and there are no orders concerning it. I hope this answers your questions, but if it doesn't, please advise.

Sincerely,
Division of Enforcement

Andrew C. Damon
Administrator

Hwy Supr. called Oshkosh - Milw. office - took info and promised to inspect dam in area -

May 29, 1980

COPY

Mr. Bill Ellis, Highway Supt.
Town of Ocontomoc
6812 Brown St.
Oconomowoc, WI 53066

Dear Bill:

I received a call from the DNR engineer who will be inspecting the Monterey Dam. I recommended that he contact you to arrange for a time to meet. He thought it would be June 5th.

Please advise when you are meeting with him at the dam, as I may wish to be present. Thank you.

Very truly yours,

William Chapman, Attorney
TOWN OF OCONOMOWOC
WC:dbm
cc Town Board

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Anthony S. Earl
Secretary

BOX 7921
MADISON, WISCONSIN 53707

June 3, 1980

IN REPLY REFER TO: _____

Mr. William Chapman, Attorney
Herro, Chapman, Snyder & Pike
156 East Wisconsin Avenue
Oconomowoc, Wisconsin 53066

Dear Mr. Chapman:

Thank you for your letter of April 24 inquiring about the condition of the Monterey Dam at Oconomowoc. Mr. Daniel Holzman, Engineer with the Bureau of Water Regulation and Zoning in Madison, will be making an inspection with Mr. Bill Ellis of the Town of Oconomowoc Highway Department on June 5 at about 9:00 a.m. Mr. Holzman will supply you with a copy of his findings after the inspection.

Thank you for your inquiry. I hope this will take care of your concerns.

Sincerely,
Bureau of Enforcement

Andrew C. Damon

Andrew C. Damon
Administrator

WAUKESHA
TITLE CO., INC.

615 WEST MORELAND BLVD.
WAUKESHA, WISCONSIN 53188
(414) 547-2411
P.O. BOX 1138

JOHN J. GEHRINGER
President

June 13, 1980

Herro, Snyder & Chapman
156 E. Wisconsin Ave.
Oconomowoc, Wi 53066

Attn: Atty. William Chapman
Re: A55175
Monterey Mill Pond Dam

Dear Mr. Chapman:

You have inquired as to the ownership of the lands on the West end of the Monterey Mill Pond on the West side of former highway "67". While we are not in a position to state where the dam for the Mill pond is acutally located, in the absence of a survey, we find that the title to the lands abutting the West side of the highway at the West end of the Mill Pond are vested in Arnold F. Roth, a/k/a Arnold Roth, Jr. and Richard Roth, a/k/a Richard E. Roth.

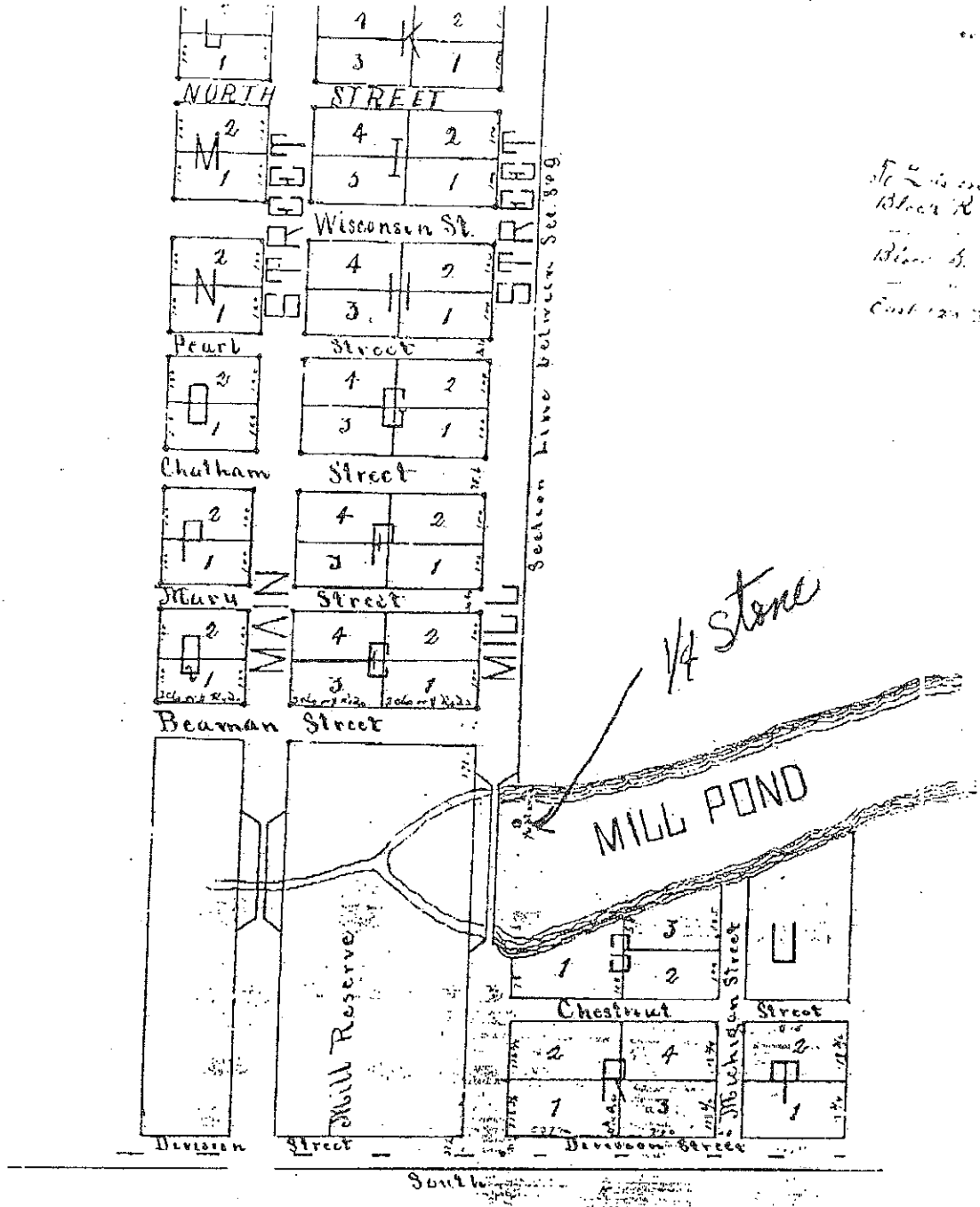
We have enclosed a photo copy of Volume 617, page 534. The legal description of the subject premises is that shown for Parcel No. 1 from x to x. The conveyances excepted from said description as Document Nos. 320866 and 324895 would not appear to affect the portion of the subject premises where the dam would be expected to be located.

You have also inquired as to width of the highway abutting the subject premises to the East. We have enclosed a copy of a part of the plat of the Village of Monterey. The subject premises lie within the "Mill Reserve" lying to the West of Mill Street as shown thereon. The plat does not indicate a dimension for Mill Street as platted. It should be noted that the legal description of subject premises commences at a point 66 feet West of the East quarter post and that the subject premises lie 66 feet West of the East section line.

Very truly yours,

WAUKESHA TITLE CO., INC.
Martin J. Wefra
Martin J. Wefra
Title Attorney

MJW/m
Attach 2



REGISTER OF DEEDS' OFFICE,
WAUKESHA COUNTY, WIS. } ss.

I, O. C. Hautel Register of Deeds, in and for said County and State, do hereby certify that I have compared the annexed copy of This Plat with the original thereof, of record in said office, and that the same is a true and correct transcript thereof and of the whole thereof.

Witness my hand and official seal this 20th day of May A. D. 1893

O. C. Hautel Register of Deeds.

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Anthony S. Earl
Secretary

September 5, 1980

IN REPLY REFER TO: 3500
D-10C32

Mr. Arnold Roth
37876 Division Street
Oconomowoc, WI 53066

Dear Mr. Roth:

On June 5, 1980 I inspected the Monterey Dam at Oconomowoc, accompanied by Bill Ellis, Town Highway Supervisor. During this inspection, I noted that the dam is in poor condition and is in need of repair. Among the problems I noted were:

1. Severe scour and slumping of the left dike.
2. Severe spalling of concrete on the stop log piers. One pier has washed out completely.
3. Slumping of upstream embankment.
4. Undercutting of left downstream abutment.
5. Possible undercutting of the spillway apron.

After a search of our records, and a title search by the Waukesha Title Company, Inc., it appears that you and Mr. Richard Roth jointly own title to the dam. Since you own the structure, state statutes require you to keep the dam in good repair and free of hazard. I suggest you retain an engineering firm or a contractor and undertake to repair the deficiencies I noted above. If you have any questions, or would like to have an on-site visit to discuss the required repairs, please call me at 608-266-7037, or write. If you decide not to repair the dam, you may apply for a permit to abandon the dam, or you may apply for a permit to transfer the dam to another party who will make the necessary repairs. Please respond within 30 days about your intentions on this case. Thank you.

Sincerely,
Bureau of Water Regulation & Zoning

Daniel Holzman

Daniel Holzman
Water Regulation Section

DH:mn
cc: G. Pilarski - SED
Atty. W. Chapman

BEFORE THE

DEPARTMENT OF NATURAL RESOURCES

In the matter of the unsafe condition of the Monterey Dam on the Ashippun River, Waukesha County	)))	3-SE-80-907

FINDINGS OF FACT, CONCLUSION OF LAW AND ORDER

FINDINGS OF FACT

1. The Monterey Dam was originally built to power a sawmill and feed mill some time prior to 1848. The dam is located on the Ashippun River in Section 8, T8N, R17E, Town of Oconomowoc, Waukesha County.

2. The dam was partially rebuilt around 1924. The dam was again repaired in 1946 due to deterioration of the spillway.

3. The dam is currently owned by Mr. Arnold Roth, who resides at 37876 Division Street, Oconomowoc, Wisconsin 53066.

4. On June 5, 1980, Department personnel inspected the dam and observed that it was badly in need of repairs. On September 5, 1980, Mr. Roth was sent a letter advising him of the deficiencies in the dam. The letter also advised Mr. Roth about procedures for transferring or abandoning the dam. Later in September, Mr. Roth called the Department, and the points made in the letter were reiterated.

5. The Monterey Dam is classified as a significant hazard dam pursuant to the U.S. Army Corps of Engineers "National Program for Inspection of Non-Federal Dams," ER 1110-2-106, CFR 33, September 26, 1979. This classification means that failure of the dam could result in loss of life and would probably cause property damage.

6. The necessary dam repairs at this time include:

a) Repair of the left (south) dike, which is badly slumped and eroded.

b) Repair of the deteriorated concrete on the stoplog piers. One pier has washed out completely, and needs to be replaced.

c) Repair of the upstream embankment, which is slumping.

d) Repair or replacement of the left (south) downstream abutment. This abutment is badly undercut, and should be underpinned and reformed to original dimensions.

e) The spillway apron needs to be checked for undercutting, and a cutoff wall may need to be built on the downstream end.

f) The left and right dikes need to be cleared of overgrown brush and trees, and the dike must be sodded or seeded with grass cover.

7. The Monterey Dam in its present condition is not sufficiently strong to withstand the forces which may be imposed upon it; is unsafe and dangerous to life and property.

8. The order hereinafter contained is reasonable and necessary to prevent impending danger to persons and property and for the conservation and protection of public rights in navigable waters and protection of life, health and property.

CONCLUSIONS OF LAW

1. The Department has general supervisory powers over dams under Section 31.02(2), Wisconsin Statutes.

2. The Department has authority and responsibility to inspect under section 31.19, Statutes.

3. The Department has authority under section 31.19, Statutes, to determine if a dam is not sufficiently strong or is unsafe, to determine what alterations or repairs are necessary, and to order such repairs.

4. The Department has authority under section 31.12, Statutes, and NR 117, Wisconsin Administrative Code, to require that plans for repair of the dam be prepared by a professional engineer registered in the State of Wisconsin and to approve such plans prior to any construction activity.

5. The Order hereinafter contained is reasonable and necessary to prevent impeding dangers to persons and property in conformance with section 31.19, Statutes.

ORDER

IT IS THEREFORE ORDERED THAT:

1. Mr. Arnold Roth shall, by May 1, 1981, pursuant to NR 117.02, Wisconsin Administrative Code, retain a competent engineer registered in the State of Wisconsin to prepare plans for repair of the dam and inform the Department in writing of the name of the personnel retained.

2. The plans for repair shall include at a minimum:

a) Repair of the left (south) dike.

b) Repair of all deteriorated concrete on the abutments and stoplog piers.

c) Repair of the upstream embankment.

d) Removal of all trees and brush from the dikes.

e) Inspection and repair of the spillway apron for scour and undercutting.

3. Plans for repair of the dam shall be submitted by July 15, 1981.

4. The owner shall repair the dam in accordance with the approved plans by November 15, 1981.

5. The owner shall notify the Department within 5 days of completion of the repairs.

6. If repair plans are not submitted by July 15, 1981, the impoundment must be drawn down to the minimum possible level no later than July 20, 1981, in accordance with the Department instructions designed to protect life, health, property and the public interest.

Dated at Madison, Wisconsin April 8, 1981

STATE OF WISCONSIN DEPARTMENT OF NATURAL RESOURCES
For the Secretary

By George E. Meyer
George E. Meyer, Administrator
Division of Enforcement

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

WISCONSIN DEPT. OF NATURAL RESOURCES

George E. Meyer
Secretary

101 South Webster Street
P.O. Box 7921
Madison, Wisconsin 53707
TELEPHONE 608-266-2621
TELEFAX 608-264-9200
TDD 608-267-6897

October 21, 1997

IN REPLY REFER TO: 67.18

Mr. Richard Roth
38077 Beaman Street
Oconomowoc, WI 53066

SUBJECT: Monterey Mill Dam, Field File # 67.18, Dam Safety Inspection Report, Waukesha County.

Dear Mr. Roth:

This is the Department of Natural Resources' Dam Safety Report based on our inspection of the Monterey Mill Dam on June 20, 1997. The attached report identifies work that needs to done on the dam and a schedule for when that work is to be completed.

As you are already aware the Department of Transportation is proposing to replace the Mill Street bridge over Ashippun River, just upstream of the dam. Considering an alternative schedule for the dam repairs, you may want to coordinate it with the bridge replacement project schedule. The information on the bridge project can be obtained from Mr. Scott Solverson at Rust Environmental Engineering. Scott can be reached at 414 225-5264. In order for us to consider a schedule other than this, you must submit your alternative schedule by December 1, 1997. If we do not hear from you by then, the schedule we have determined will be in affect.

If you have any questions concerning this report, the operation and maintenance of your dam, or are uncertain how to proceed, please call me at 608/264-6047.

Sincerely,

Konstantin Margovsky, P. E.
Dam Safety, Water Regulation & Zoning Engineer
South East Region

encl.: Dam Safety Inspection Report

cc.: Kay and Don Kratz - W379 N8504 Mill St., Oconomowoc, WI 53066
Bill Peebles - N88 W37788 CW, Oconomowoc, WI 53066
Asher and Doris Moore - 8428 Mill St., Oconomowoc, WI 53066
Greg Breese - SER
Scott Belonger - Applied Technologies, Inc. - 16815 West Wisconsin Sve., Brookfield, WI 53005
Heidi J. Bunk - SER
Scott Solverson - Rust Environmental Engineering

DAM SAFETY INSPECTION REPORT

ESTIMATES OF THE DAM HAZARD RATING, SPILLWAY CAPACITY AND FLOOD FLOWS

Our estimate of the Dam Hazard Rating for the Monterey Mill Dam is Class III or High Hazard and is based on preliminary flood flow estimates and map surveillance. This is only an estimate of the Hazard Rating required by Wisconsin Administrative Code NR 333.04. Hazard ratings reflect downstream development that could be affected by a failure of the dam, and floodplain zoning in place below the dam. A dam failure analysis performed by an engineer will verify our estimate.

The design hydraulic capacity of the dam is established in NR 333.07(2) by hazard classification. It is dependent upon: 1) the size of the dam, 2) existing land use downstream of the dam and, 3) existing land use control downstream of the dam.

The size of the dam is divided into classifications of "minor" and "major" dams. A major dam has structural height of greater than or equal to 15 feet and/or greater than or equal to 300 acre feet of maximum storage capacity. All other structures not meeting this criteria are classified as minor. *The Monterey Mill Dam has a structural height of approximately 16 feet, and a maximum of 200 acre feet. This puts the Monterey Mill Dam in the Major dam classification.*

Existing land use is divided into land use classifications low, significant and high. These are based on the current land use downstream of the dam. *Because no houses and developed areas are situated downstream of the Monterey Mill Dam, the dam could be classified as Low Hazard.*

The land use control classifications can be established by either 1) restrictive covenants, easements or legal arrangements or, 2) a floodplain zoning ordinance adopted in accordance with NR 116. *There is no land use control downstream of the dam and this puts the Monterey Mill Dam into the High Hazard dam classification.*

Because the Monterey Mill Dam is probably a High Hazard dam, due to the lack of zoning, and it is a Major dam, it is required by NR 333 to pass the 1000 year flood flow (Q_{1000}). We have estimated that the Q_{1000} for Ashippun River in the Waukesha County at the Mill Street bridge is approximately 1,700 cubic feet per second (cfs). The total spillway capacity was estimated at 706 cfs in that report. The flow rate of 706 cfs corresponds to only about the 20 year flood (Q_{20}). This flow was calculated with the stop logs removed in all bays. The spillway is not adequate to pass the 100 year flood.

These estimates appear in this report for comparison purposes only and are not intended for use in the design of hydraulic structures of any kind.

A Hazard Rating of Low could possibly be assigned to the Monterey Mill Dam if Waukesha County adopts zoning to restrict development in the hydraulic shadow (dam failure floodplain) of the dam. In order to determine a hydraulic shadow for the dam, you will have to hire an engineer to perform a dam failure analysis. Once the analysis has been performed and approved by DNR, the dam hazard rating will be assigned. Waukesha County would then adopt zoning to secure the hazard rating of low. We will also re-evaluate the spillway capacity at that time. By having a low hazard rating assigned and secured to the dam you could:

a) Decrease probability of increased property damage and/or loss of life in the event of a dam failure.
b) Decrease personal liability associated with dam ownership.
c) Reduce the requirements on the dam hydraulic capacity. As Low Hazard, the Monterey Mill Dam will be required by NR 333 to pass only the 50 year flood flow (Q_{50}) which, according to our estimate, is approximately 953 cfs which would still require additional spillway capacity.

Note: Right and left are referenced while standing on the dam looking downstream.

ITEM	WORK TO BE COMPLETED BY

1) SIGNING — June 1, 1998

Portage signing identifying a safe portage route for boaters is required around dams in the State in accordance with Wisconsin Administrative Code NR 330. A copy of the code is included with this report for your convenience. Please send me a picture of the signs when installed.

2) EMBANKMENT REPAIRS — November 1, 1998

Trees and bushy vegetation growing on both the right and left sides of the embankment and the mill race must be removed. Tree removal is important for a number of reasons. Trees can topple over in a severe storm taking with them a portion of the earthen embankment. The root systems provide a path for seepage waters to follow through the embankment. Trees grow old, die and topple over and/or leave their root system in the embankment to rot and provide a path for seepage. Trees also shade the embankment and make it difficult for grass to become established. Grass has proven to be the best method for controlling erosion on earthen embankments. Tree roots have also proven to be attractive to burrowing animals for use as homes. Root systems have been known to penetrate concrete and masonry structures causing damage. All of these things lead to the same end, a risk of failure. By eliminating the trees from the embankment you reduce the risk of failure caused by tree growth.

Tree removal is to include the complete removal of the stumps and the roots, filling of the holes created with firmly compacted tight soils. Once tree removal is completed the down stream slope of the embankment should be reshaped to an even 4:1 slope to provide for stability and future maintenance, top soiled and grass seeded to establish grass growth. The embankments should then be mowed on a regular basis so that the growth does not exceed 6 inches at any time.

The following areas of concern were noted during the inspection:

a) at the left abutment - erosion, slides and small area of depression, missing rip-rap;
b) at the right abutment - foot traffic erosion, minor slides.

All eroded areas should be repaired and rip-rap protection restored where necessary.

3) OPERATION, INSPECTION AND MAINTENANCE PLAN — November 1, 1998

The Monterey Mill Dam should have a written plan for regular operation, inspection and maintenance. Maintenance of the dam should include all of those areas identified on the "Dam Inspection Checklists" which are included as part of this report.

Because our inspection program only allows for an inspection of your dam every ten years, I recommend that a registered professional engineer visually inspect the dam at least once every five years and after every major flood. Inspection should include soundings of the stream bed upstream and downstream of the dam. Copies of the reports should be sent to this office.

4) CONCRETE DAM REPAIRS — November 1, 1999

The concrete piers of the structure are beginning to deteriorate. Surface spalling and cracking especially noticeable on piers number 2, 4 and 6 counting from the left. To avoid increased repair costs caused by

further deterioration, the concrete structure should be repaired now.

5) SEEPAGE REPAIR AND MONITORING — November 1, 1999

Seepage, flowing at approximately 5 gallon per minute, was identified next to the left abutment near the toe. You will have to hire an engineer registered in the state of Wisconsin to investigate and design the repairs of this area. Though at the time of inspection, the seepage was flowing clear, you should monitor the area at least twice a month and after major floods. If you note a significant increase in the amount of seepage or a change in color of the water, please notify this office immediately.

6) GATES OPERABILITY — November 1, 2000

The stop logs installed on the structure must be accessible and removable during flood conditions. Means to operate the gates must be designed by an engineer registered in the state of Wisconsin.

7) DAM FAILURE ANALYSIS / EMERGENCY ACTION PLAN — November 1, 2000

To protect the area immediately downstream of the Monterey Mill Dam from future development in the hydraulic shadow (dam failure floodplain) of the dam and to determine the extent of the hydraulic shadow, you will have to hire an engineer registered in the state of Wisconsin to perform a dam failure analysis. The analysis is to be completed by the date shown.

An Emergency Action Plan (EAP) is required for the area downstream of the dam. The EAP must be based on the dam failure analysis.

8) OUTLET STRUCTURE — November 1, 2007

As it appears in this report the Monterey Mill Dam does not meet the requirements of NR 333.07 (2) on minimum hydraulic capacity. Upgrading the spillway capacity is required. The additional spillway capacity must be designed by an engineer registered in the State of Wisconsin. Please note that all plans for the repairs must be approved by the Department of Natural Resources prior to performing any repairs.

SUMMARY OF REQUIRED WORK AND SCHEDULE

ITEM		REQUIRED COMPLETION DATE
1.	SIGNING	June 1, 1998
2.	EMBANKMENT REPAIRS	November 1, 1998
3.	OPERATION, INSPECTION AND MAINTENANCE PLAN	November 1, 1998
4.	CONCRETE REPAIRS	November 1, 1999
5.	LEAKAGE REPAIR AND MONITORING	November 1, 1999
6.	GATES OPERABILITY	November 1, 2000
7.	DAM FAILURE ANALYSIS/EMERGENCY ACTION PLAN	November 1, 2000
8.	OUTLET STRUCTURE	November 1, 2007

Department of Natural Resourc Form 1-74 Rev. 3-89

DAM INSPECTION CHECKLIST

Date 6.20.97

NAME OF DAM MONTEREY MILLS DAM FILE 67.18
OWNER'S NAME RICHARD ROTH TELEPHONE NO. 414 567-3240
STREET OR ROUTE 38077 BEAHAN STREET
CITY, STATE, ZIP CODE OCONOMOWOC, WI 53066
COUNTY WAUKESHA DISTRICT SER WATERWAY ASHIPPUN R
WEATHER & SITE CONDITIONS T=85 CLOUDY, RAINING
INSPECTORS KEM HEIDI BUNK OWNER
OTHERS SEE CC LIST OF REPORT
CONTACT PERSON OWNER

MISCELLANEOUS AREAS

CHECK AREA AS INSPECTED	CHECK/CIRCLE CONDITIONS NOTED		OBSERVATIONS
MONITORING	✓	piezometers	NONE
	✓	weirs	NONE
		monuments/benchmarks	BM 2686 FOUND
GAGES	✓	rainfall	NONE LOCATED
	✓	pool level (op. range)	NONE. ESTABL LEVELS 95.8-96.4
	✓	stream	NONE
WATERSHED	✓	slopes	ROLLING
	✓	land use	AGRICULTURAL
	✓	other impoundments	ASHIPPUN LAKE
D/S AREA	✓	stream channel	WELL DEFINED FIRST 2 MC, THEN MARSH
		channel crossings	CTH CW & HWY 67
	✓	flood plain zoning	NONE
	✓	development	SPARSE
EMERG. PLAN	✓	notification list	NONE
	✓	evacuation plan	NONE
	✓	materials/equipment	NONE
	✓	access road to dam	GOOD — MILL STREET
HYDRO POWER	✓	last date used	UNKNOWN
	—	current cap.	
		condition of powerhouse	OK
BOATING SAFETY	✓	upstream signs	"DAM" SIGN @ BRIDGE
	✓	portage signs	NOT PROVIDED

General Comments, Sketches, & Field Measurements

INVENTORY UPGRADED 10.21.97

Department of Natural Resources | Form 3500-74A | Rev. 3-89

DAM INSPECTION CHECKLIST

Date 6.20.97

NAME OF DAM MONTEREY HILLS DAM FILE 67.18

INSPECTORS KEM, HB

EMBANKMENT - DIKE - LEVEE

CHECK AREA AS INSPECTED		CHECK/CIRCLE CONDITION NOTED	OBSERVATIONS	ACTION: REPAIR	ACTION: MONITOR
U/S SLOPE	✓	vegetation/riprap	SHEET PILING NOT WATERTIED TO CONCRETE		
	✓	beaching/slide/cracks	NONE		
	✓	undermining/erosion	@ RT. BRIDGE ABUTM. APP. 2.5' DEEP EXTENDS	✓	
		~~rodent burrows~~	TOWARD THE CENTER OF ROAD		
CREST	✓	ruts/erosion	NONE VISIBLE		
	✓	cracks/settlement	@ RT BRIDGE ABUT. & BETWEEN BR. & MILLRACE	✓	
	✓	poor alignment	OK		
D/S SLOPE	✓	vegetation/erosion	HERVELLY VEGETATED, SOME EROSION	✓	
	✓	rodent burrows	SOME		✓
	✓	sloughs/slides/cracks	NONE APP.		
	✓	seepage/wetness	NONE VISIBLE		
GROINS	✓	vegetation/riprap	SMALL TREES & BRUSH	✓	
	✓	erosion	SOME	✓	
	✓	seepage/wetness	NONE APP		
ABUTMENTS	✓	vegetation/erosion	TREES BOTH SIDES, EROSION FROM RUNOFF	✓	
	✓	sloughs/slides/cracks	FOOT TRAFFIC @ BOTH + DEPRES & SMALL SINK		
	✓	seepage/wetness	NONE APP.		
			HOLE @ LT ABUTM. FORMING (TYPE OF)	✓	
TOE	✓	cracks/slumps	SOME EROSION	✓	
	✓	embankment drains	NONE		
	✓	seepage/wetness	SEEP @ LT ABUTMENT APP 5 G/MIN	✓	
MILL RACE DIKE		vegetation/erosion			
		sloughs/slides/cracks	N/A		
		seepage/wetness			
		rodent burrows			

General Comments:

Department of Natural Resources ln 3500-74B Rev. 3-89

DAM INSPECTION CHECKLIST Date 6.20.97

NAME OF DAM MONTEREY HILLS DAM FILE 62.18

INSPECTORS KEM, HB.

CONCRETE DAM TYPE GRAVITY

CHECK AREA AS INSPECTED	CHECK/CIRCLE CONDITION NOTED		OBSERVATIONS	ACTION: REPAIR	MONITOR	INVESTIGATE
U/S FACE	✓	deteriorated joints				
	✓	cracking/spalling	NOT VISIBLE			✓ *
CREST	✓	deteriorated joints	NONE APP.			
	✓	cracking/spalling	PIERS 2,4,6 - SEVERE (COUNT FROM LT)	✓		
	✓	poor alignment	OK			
D/S FACE		deteriorated joints	NONE VISIBLE			
	✓	cracking/spalling	@ ALL PIERS	✓		
		seepage	NONE APP.			
ABUTMENTS	✓	vegetation/erosion	SOME EROSION, HEAVY VEGET	✓		
		sloughs/slides/cracks	MINOR @ LT	✓		
		seepage/wetness	NONE APP			
TOE	✓	erosion/undermining	RESTORE RIP-RAP @ LT	✓		
	✓	seepage/wetness	SEEP @ LT ABUTM. ~5G/MIN	✓		✓
	✓	foundation drains	NONE APP. — CHECK PLANS			✓
GALLERY		deteriorated joints	N/A			
		cracking/spalling				
		seepage				

General Comments:

* INVEST UNDER LOW FLOW COND.

Applied Technologies
Engineers - Architects

Applied Technologies, Inc.
16815 West Wisconsin Avenue
Brookfield, Wisconsin 53005
Fax 262-784-6847
Telephone 262-784-7690
www.ati-ae.com

October 10, 2007

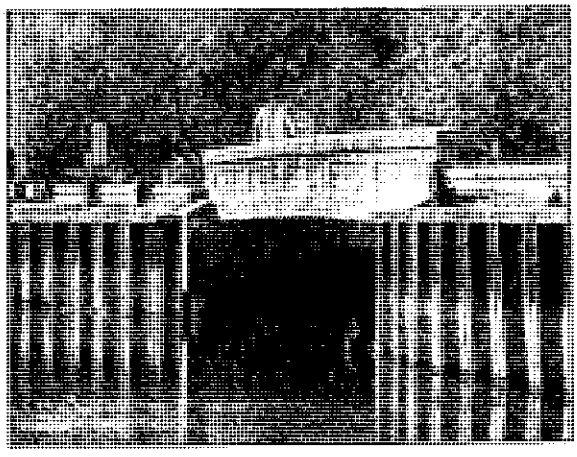
Jeffrey Herrmann
Administrator/Planner
Town of Oconomowoc
W359 N6812 Brown Street
Oconomowoc, WI 53066

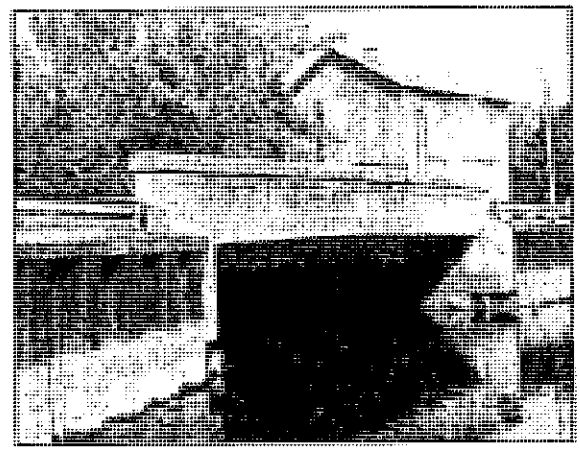
Re: Monterey Dam Bridge Inspection
Mill Street over Ashuppun River
Waukesha County
P-67-0021

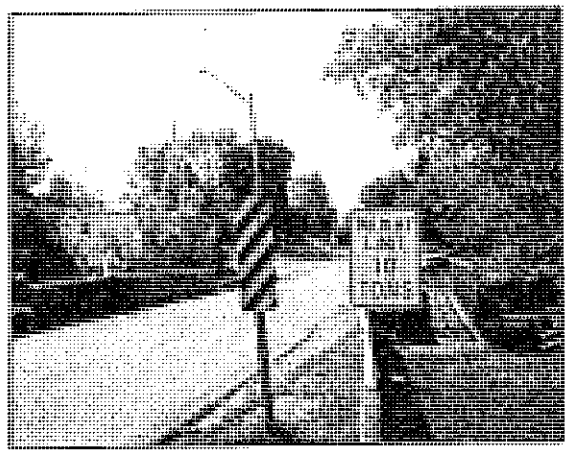
Dear Jeffrey:

On September 21, 2007 we were authorized by the Town of Oconomowoc to perform a structural inspection of the Monterey Dam Bridge. This was an optimal time to inspect the bridge because the Wisconsin DNR ordered a recent drawdown of water at the dam, which exposed at least an additional three feet of the abutments for visual inspection.

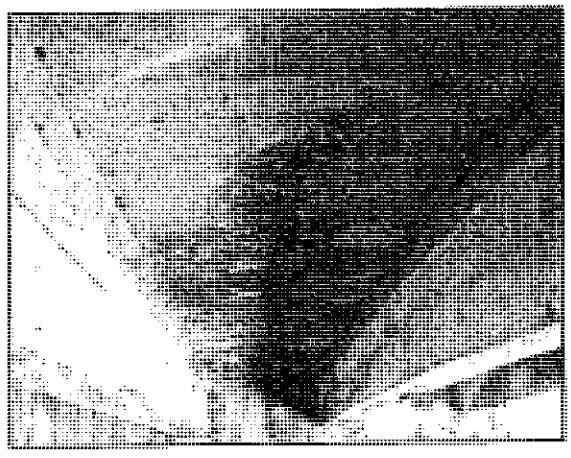
The existing bridge is a 38 foot span concrete deck girder bridge constructed in 1923, as documented in past WISDOT inspection reports. The bridge is posted for a 10 ton load limit and is adjacent to and integral with the Monterey Dam. There are no plans available for the existing bridge or dam.



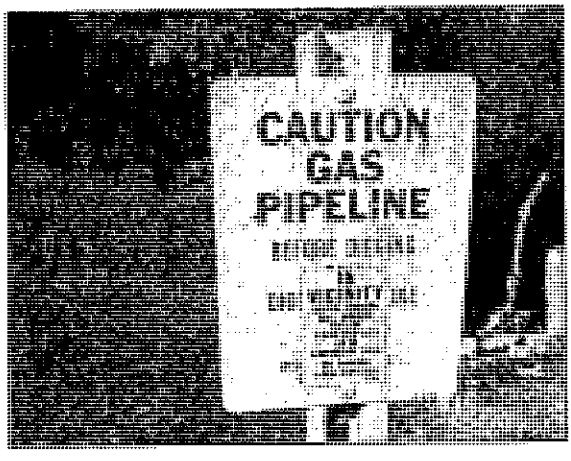




The superstructure consists of three concrete deck girders that are supported by concrete sill abutments that appear to be placed on top of an older existing stone masonry foundation, probably from a previous bridge abutment.

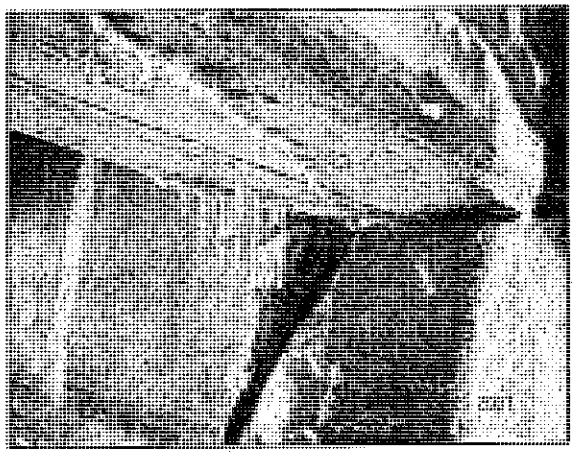


The wingwalls on the east side of the bridge are constructed of driven steel sheet piles. The reinforced concrete parapets probably serve as upturned exterior concrete deck girders. There is a 6-inch diameter gas pipeline on the west side of the bridge adjacent to the parapet and between the bridge deck and the steel walkway over the dam.

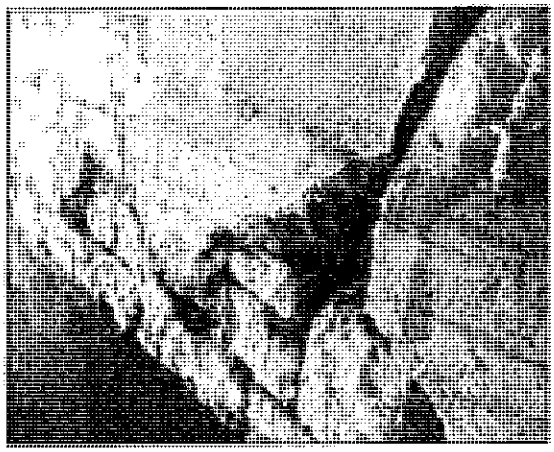


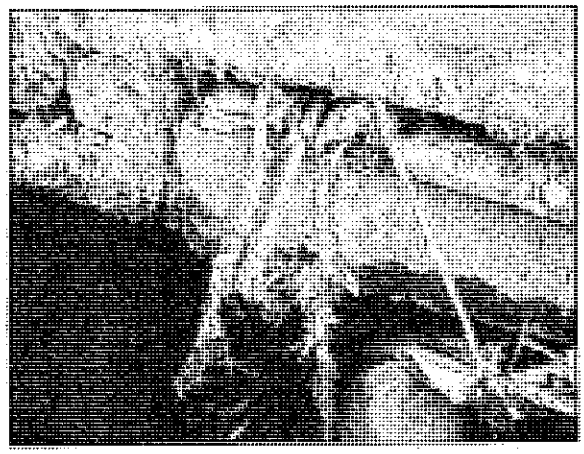
The bridge is in generally poor condition with the major deficiencies listed below:

- There are major cracks with large chunks of concrete missing from the concrete sill abutments, especially on the south abutment. There is also evidence of some movement and rotation of the west and east ends of the south abutment.

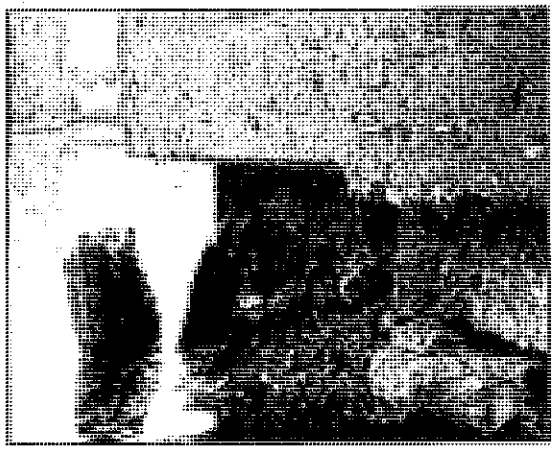


- The joints of the older stone masonry abutment foundations lack mortar and allow water to pass through them. This is most likely the reason for the water leakage at the sides of the dam (pictured below). There are roots and debris lodged in these joints.

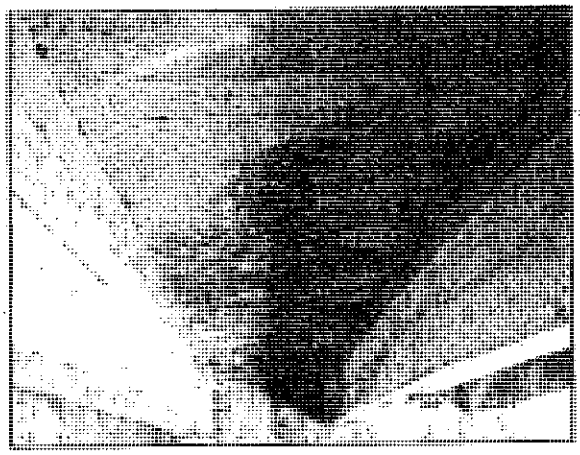




- The stone masonry abutment foundation at the west ends of the north and south abutments have been washed out and are missing. The remnants of timber piles, likely from a previous wingwall, are present on the east ends of the abutments.



- There is major spalling and loss of concrete cover at the middle of the center deck girder. There is also spalling on the underside of the deck.



This bridge should be replaced as soon as possible. The noted deficiencies have been present for considerable time; however, after review of the 1996 photos, it appears that they are progressing.

We have also marked up copies of the WISDOT bridge inspection forms and can update the on-line inspection report if the Town so desires.

Thank you for this opportunity to work for the Town of Oconomowoc. Please contact me with any questions or comments.

Sincerely,
Applied Technologies, Inc.

Robert C. Janke

Robert C. Janke, P.E.

Enclosure

AppliedTechnologies
Engineers - Architects

Applied Technologies, Inc.
16815 West Wisconsin Avenue
Brookfield, Wisconsin 53005
Fax 262-784-6847
Telephone 262-784-7690
www.ati-ae.com

February 19, 2009

Jeffrey Herrmann
Administrator/Planner
Town of Oconomowoc
W359 N6812 Brown Street
Oconomowoc, WI 53066

Re: Monterey Dam Bridge Inspection
Mill Street over Ashuppun River, Waukesha County
P-67-0021

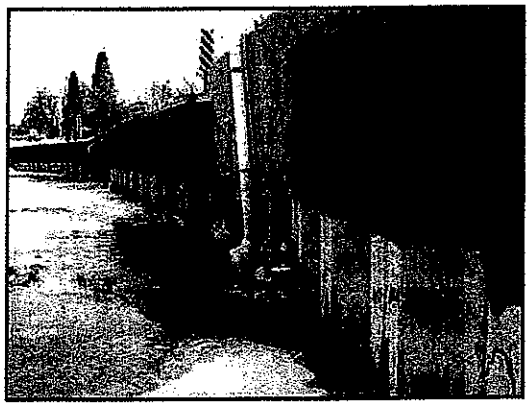
Dear Jeffrey:

On February 16, 2009 we were authorized by the Town of Oconomowoc to perform a structural inspection of the Monterey Dam Bridge. Our previous inspection was conducted on September 21, 2007. The water level was still quite low because the Wisconsin DNR ordered a drawdown of water at the dam in 2007, which exposed at least an additional three feet of the abutments for visual inspection.

The existing bridge is a 38 foot span concrete deck girder bridge constructed in 1923, as documented in past WISDOT inspection reports. The bridge is still posted for a 10 ton load limit and is adjacent to and integral with the Monterey Dam. There are no plans available for the existing bridge or dam.

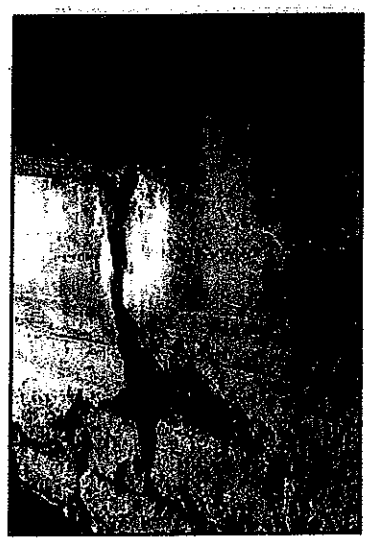
The superstructure consists of three concrete deck girders that are supported by concrete sill abutments that appear to be placed on top of an older existing stone masonry foundation, probably from a previous bridge abutment. The reinforced concrete parapets probably serve as upturned exterior concrete deck girders. It also appears as though the waterway opening under the bridge has silted in from the flood in June 2008.

The wingwalls on the east side of the bridge are constructed of driven steel sheet piles. An old fire department standpipe remains on the east side. It appears as though the retaining wall above the mill race by the standpipe is tipping to the east. There is a 6-inch diameter gas pipeline on the west side of the bridge adjacent to the parapet and between the bridge deck and the steel walkway over the dam.



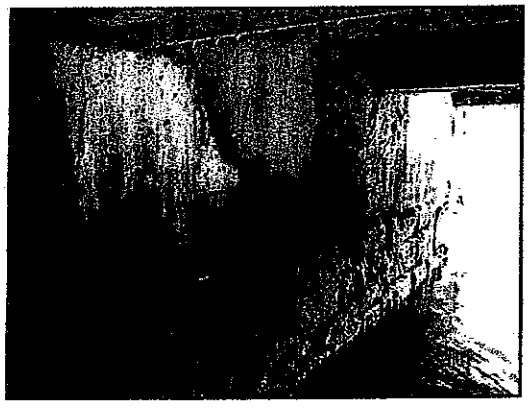
The bridge is in generally poor condition with the major deficiencies listed below:

- There are major cracks with large chunks of concrete missing from the concrete sill abutments, especially on the south abutment. There was evidence of some movement and rotation of the west and east ends of the south abutment present during our September 21, 2007 inspection, but our present inspection showed the west end to be pushed in approximately 3" and the east end approximately 2".



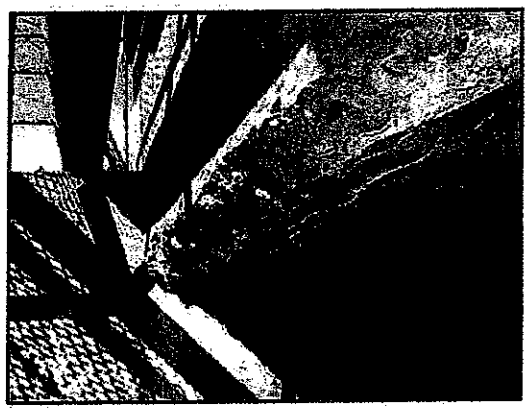
West end of south abutment appeared to have moved in 3". East end pushed in 2".

- The joints of the older stone masonry abutment foundations lack mortar and allow water to pass through them similar to the large cracks in the concrete abutment above. This is the reason for the ice buildups at the cracks and joints.



- The stone masonry abutment foundation at the east ends of the north and south abutments have been washed out and are missing. The remnants of timber piles, likely from a previous wingwall, are present on the east ends of the abutments. This was also observed on September 21, 2007.

- There was major spalling and loss of concrete cover at the middle of the center deck girder observed on September 21, 2007, along with spalling on the underside of the deck. The deterioration has advanced on the center deck girder with exposed rusting reinforcing steel. There also appears to be advanced deterioration at the northwest corner of the deck.



Both the north and south approach roadways are exhibiting signs of settlement away from the bridge, as reported on September 21, 2007. This bridge should be replaced as soon as possible. The noted deficiencies have been present for considerable time; however, after review of the 2007 photos, it appears that they are progressing.

If the Town so desires, we can update the WISDOT bridge inspection forms. Thank you for this opportunity to work with the Town of Oconomowoc. Please contact me at (262) 784-7690 or rcjanke@ati-ae.com with any questions or comments.

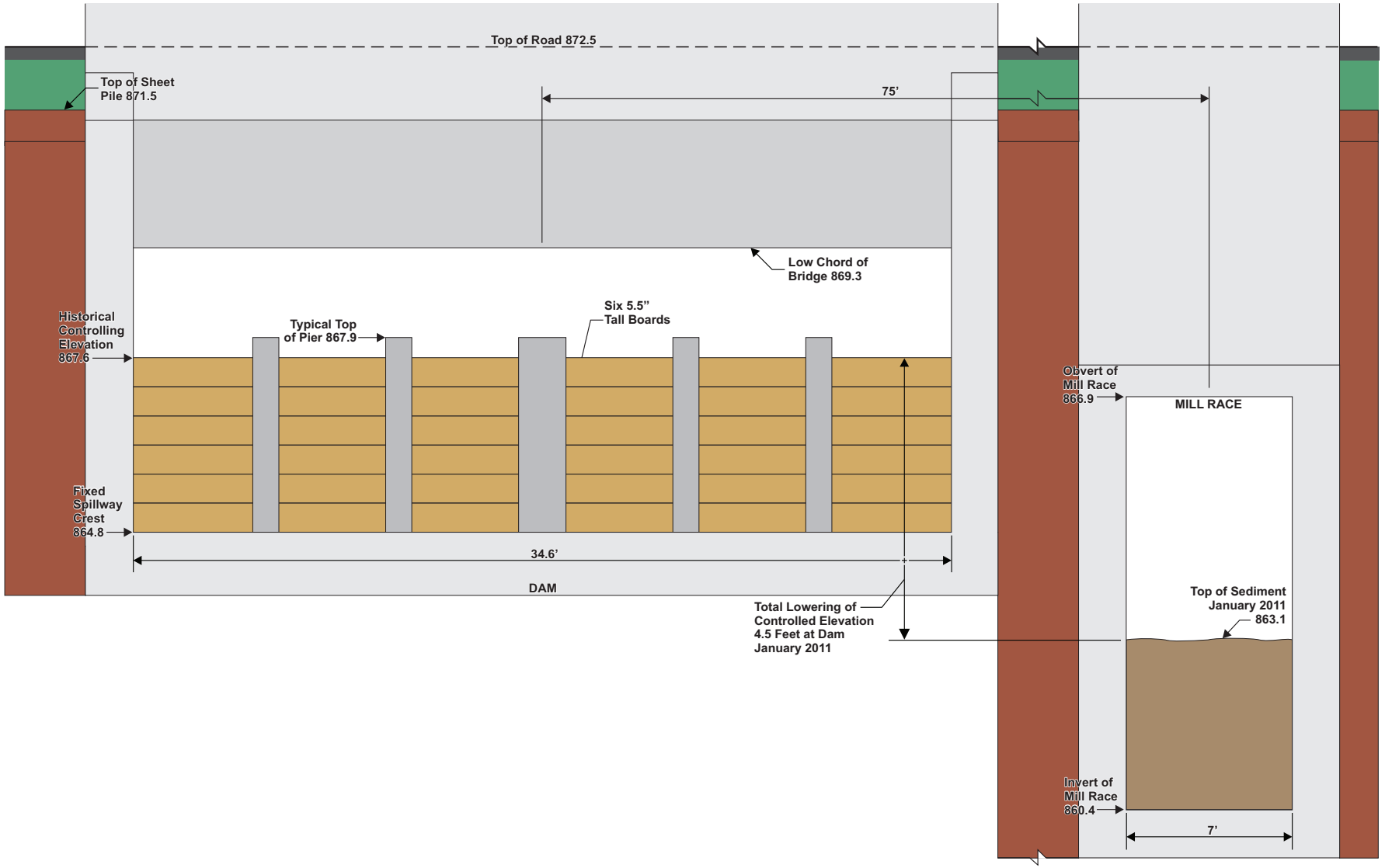
Sincerely,
Applied Technologies, Inc.

Robert C. Janke

Robert C. Janke, P.E.

Exhibit 3

MONTEREY DAM SCHEMATIC LOOKING DOWNSTREAM



NOTE: Elevations are in feet above NGVD 29.

Source: SEWRPC.

Exhibit 4

ENVIRONMENTAL ANALYSIS AND DECISION ON THE NEED FOR AN ENVIRONMENTAL IMPACT STATEMENT (EIS) Department of Natural Resources (DNR)

Form 1600-1 Rev. 6-2001

Region or Bureau Southeast Region
Type List Designation Type List Designation II

NOTE TO REVIEWERS: This document is a DNR environmental analysis that evaluates probable environmental effects and decides on the need for an EIS. The attached analysis includes a description of the proposal and the affected environment. The DNR has reviewed the attachments and, upon certification, accepts responsibility for their scope and content to fulfill requirements in s. NR 150.22, Wis. Adm. Code. Your comments should address completeness, accuracy or the EIS decision. For your comments to be considered, they must be received by the contact person before 4:30 p.m., 3/1/2011

Contact Person:
Andrew Hudak
Andrew.Hudak@wi.gov

Title: Water Management Specialist

Address: 141 NW Barstow St. Rom 180

Waukesha, WI 53188

Telephone Number
262-574-2172

Applicant: Town of Oconomowoc

Address: W359 N6812 Brown Street Oconomowoc, WI 53066

Title of Proposal: Monterey Dam Abandonment

Location: Waukesha County, Town of Oconomowoc
Township Range Section(s): NE ¼ SE ¼ Section 8, Township 8 North, Range 17 East

PROJECT SUMMARY

1. Brief overview of the proposal including the DNR action (include cost and funding source if public funds involved)

The Town of Oconomowoc (hereafter "Town") has requested to abandon the Monterey Dam which

impounds the Monterey Millpond (hereafter "Millpond") located on the Ashippun River, in Northeast ¼ of the Southeast ¼ of Section 8, Township 8 North, Range 17 East, Waukesha County.

The Town has received a grant from the Department of Natural Resources (hereafter "Department") under (ss.31.385(2)(ag) and (ar) Wis. Stats.; and ch. NR 336, Wis. Adm. Code in the amount of $50,000 to assist in the cost for the removal of the abandoned Monterrey Dam.

The application for abandonment did not include a site specific dam removal and river restoration plan. The Department will require that a full engineering document for removal of the structure be submitted and approved before any work begins. The project may require additional permits/approvals from the Department and local units of government depending on the scope of work proposed in the removal plans. Examples of the elements needed for the Department to proceed with the Town's application include but are not limited to:

- Material Removal Plan
- Erosion Control Plan
- Sediment Stabilization Plan
- Planting Plan
- Floodplain Analysis
- Stream bank Stabilization Plan
- Existing and Proposed Grades
- Construction Sequencing
- Site specific analysis
- Sediment analysis

The objectives of a typical dam removal/restoration project include enhancing the water quality and biotic integrity of the river (Ashippun River) by:

a) Restoring the original banks and bed of the River
b) Eliminating the thermal impacts of a shallow Millpond
c) Restoring fish migration (passage) to upper and lower portions of the river
d) Eliminate spawning habitat for undesirable, non-native fish species such as common carp

2. Purpose and Need (include history and background as appropriate)

The Monterey Dam (hereafter "the dam") was originally an earthen and concrete dam constructed prior to 1848. The dam used to power a flour mill, and later produced electricity. Department records show the Millpond currently covers approximately 28 acres and has a maximum depth of 8 feet. (Wisconsin Lakes, PUB-FH-800 2005)

The Roth family owned Monterey Dam for many years. The Roth family then transferred the dam to the Town of Oconomowoc in June of 2009.

On August 20, 2007, Department staff conducted an inspection of the Monterey Dam. As a result of the seepage noted at the dam, the Department issued an Order requiring a drawdown of the impoundment. The Order also required that the dam be either reconstructed or removed. After consideration of the high cost of reconstructing the dam, the Town of Oconomowoc submitted a dam abandonment request to the Department on June 24, 2009.

The Monterey Dam and Mill Street bridge currently share portions of their foundations. The Town of

Oconomowoc is seeking to replace the bridge in conjunction with the dam removal.

3. Authorities and Approvals (list local, state and federal permits or approvals required)

Wisconsin Statutes 31.02, 31.19
Wisconsin Administrative Code NR 102, NR 103, NR 104, NR 116, NR 150, NR 195, NR 333
Waukesha County/Town of Oconomowoc Conditional Use Permit
Army Corps of Engineers Permit under Section 404 of the Clean Water Act

PROPOSED PHYSICAL CHANGES (more fully describe the proposal)

4. Manipulation of Terrestrial Resources (include relevant quantities - sq. ft., cu. yard, etc.)

The Monterrey Dam is currently interconnected with the Mill Street Bridge crossing over the Ashippun River. Approximately 300 feet of Mill Street will be removed and replaced along with the complete removal of the bridge, dam, and raceway culvert. A new replacement highway bridge will be constructed and the river channel will be re-established to flow through the new bridge. The project will include the removal of the entire concrete portion of the dam. Portions of the embankment will be removed in order to alleviate the backwater created by high flows during the 100-year flood event. Removing the dam structure will result in a portion of the 28-acre Millpond being converted from a shallow pond to a terrestrial environment dominated by wetland vegetation. The resulting width of the river channel, consisting of the remaining portion of the Millpond, will be similar to upstream and downstream sections. Removal of the dam proposes to eliminate the continual concentration of sediment within the millpond that is released annually downstream during spring and high water flows. The project proposes to restore the natural fluctuations in sediment translocation to improve aquatic habitat and sediment stabilization.

The dam has been drawn down since 2007. The dam in the drawn down state limits the mobilization of trapped sediment; however some movement of material is inevitable as sediment base flow from the river scours through the existing channel. The majority of the exposed sediment within the impoundment has re-vegetated which aids in stabilization of the sediments within the Millpond. The process to draw down a dam and allow vegetation to establish will subsequently ensure that less sediment will travel downstream upon the final removal of the dam structure.

5. Manipulation of Aquatic Resources (include relevant quantities - cfs, acre feet, MGD, etc.)

The dam and Millpond have altered, homogenized, and decreased the quality of aquatic habitat within this section of the Ashippun River. The dam removal will allow the river to return to its natural, pre-dam state by improving water quality and conditions for native aquatic species; restoring riverine habitat and increasing biodiversity.

The project will include the removal of the entire concrete portion of the dam. Portions of the embankment will be removed in order to alleviate the backwater created by high flows during the 100-year flood event.

The Department has not received full engineering plans for this project. As a result, the Department evaluation of the "Manipulation of Aquatic Resources" section will need to take into account the following information (Please note that this list is not all inclusive):

- Water diversion plan
- Construction staging plan (removal of structure, embankment, stabilization of banks, etc.) and timeline
- Sediment and Erosion Control plans for the dam removal
- Planting/stabilization plan
- Site specific analysis
- Sediment sampling
- Sediment dredging
- Bank treatments

6. Buildings, Treatment Units, Roads and Other Structures (include size of facilities, road miles, etc.)

No buildings or other permanent structures will be created or destroyed as part of this project. The area in which the dam is located will be restored to natural conditions once the dam is removed.

7. Emissions and Discharges (include relevant characteristics and quantities)

No emissions or discharges are proposed. During and following removal of the dam, turbidity and sediment transport typically increases due to the in-water construction. These conditions will remain following the dam removal and river channel restoration until a natural equilibrium of sediment transport and deposition is reached. Typically a stabile stream flow and bed and bank formation will occur within the first three years. Sediment management practices will be used during construction to limit sediment transport. At a future time, it is expected that the Ashippun River will act like a natural stream system and effectively transport sediment based on standard fluvial geomorphic principles.

Typically, air emissions, including dust and exhaust, from dam demolition equipment and activities will increase temporarily in the local area during the work period.

8. Identify the maps, plans and other descriptive material attached

Attachment 1 Street map showing the general area of the project

Attachment 2 Topographic map

Attachment 3 Plat map

Attachment 4 2007 Aerial photograph of site

Attachment 5 Wetlands map

Attachment 6 Land use map

Attachment 7 Current Land Ownership map

Attachment 8 Primary Environmental Corridor map

Attachment 9 Environmental Corridor Handout

Attachment 10 Prime Agricultural Lands map of SE Wisconsin

Attachment 11 Soils map

Attachment 12 Cropland Interpretations from USDA

Attachment 13 DNR Fact Sheet – Basic Nomenclature of a Dam

Attachment 14 Ashippun Lake Study

AFFECTED ENVIRONMENT (describe existing features that may be affected by proposal)

9. Information Based On (check all that apply):

X Literature/correspondence (specify major sources)

- Correspondence contained within the WDNR Dam Safety file
- A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, Planning Report No. 42 SEWRPC
- Natural Heritage Inventory
- NRCS Soil Survey for Milwaukee and Waukesha Counties
-

X Personal Contacts (list in item 25)

Field Analysis By: ☐ Author **X** Other (list in item 25)

Past Experience with Site By: **X** Other (list in item 25)

10. Physical Environment (topography, soils, water, air)

The Ashippun River is located within the Rock River Watershed. The river originates in the Southeast ¼ of the Section 34, Township 10 North, Range 18 East, Town of Hartford, Washington County, and flows in a southwesterly direction. The Monterey Dam lies on Mill Road and impounds the Ashippun River to form the approximately 28 acre Millpond.

The Millpond ranges in depth from 0.5 feet to 8 feet, with the water being deepest near the dam spillway. The average depth is 3 feet. The Millpond substrate materials have not been explored due to the nature of the project. The substrates are not expected to be largely disturbed given the drawn down state of the Millpond.

SOILS

The soils adjacent to the Millpond are classified as Fox, Casco, Juneau, Matherton, Mayville, Sebewa and Theresa silt loams and Houghton Muck per the NRCS Wisconsin Soil Survey. Soils such as the silt loams listed are classified as prime agricultural lands. Theses soils have the physical and chemical properties to be the best soil types for crop production. The remainder of the soil classifications is dominated by wetland soil types.

The qualities of the sediments within the Millpond are unknown. It is unknown if the levels present would preclude active management such as dredging, capping, or land spreading.

WATER QUALITY

Ashippun Lake forms one of the headwater tributaries to the Ashippun River, which then flows into the Millpond. Ashippun Lake is routinely monitored for water clarity, total phosphorus and chlorophyll a. The average summer water clarity (based on 108 samples) is 7.8 feet. The average summer total phosphorus, based on 28 samples, is 13.4 ug/L. The average summer chlorophyll a value, based on 27 samples, is 4.0 ug/L. These values indicate good to very good water quality.

One record is available regarding water quality on the Monterey millpond. Water quality monitoring was conducted on the Monterey millpond on September 7th, 1979. Water clarity was 4 feet, total phosphorus was 73 ug/L and the chlorophyll a value was 36.8 ug/L. These values indicate poor water quality. The total phosphorus value of 73 ug/L is slightly above the average for impoundments in Wisconsin (65 ug/L).

The Millpond on the Ashippun River lies within the Upper Rock River subwatershed. The Department has placed numerous waters in the Rock River Basin on the state's 303(d) Impaired Waters List, and has ranked the waters as high priority for the development of pollutant Total Maximum Daily Loads (TMDL) to address the impairments caused by excess phosphorus and sediment loading. These impairments include degraded habitat and elevated water temperature due to excessive sediment and low dissolved oxygen and eutrophication due to excessive phosphorus. A draft TMDL for the Rock River Basin is currently in public notice.

HYDROLOGY

The Ashippun River Watershed is approximately 68.70 square miles. The Ashippun River is classified as a warm water sport fishery and flows approximately 27 miles form the headwaters in Washington County until the confluence with the Rock River in Jefferson County. Approximately 4.7 miles downstream of the Monterey Millpond the Ashippun River converges with the Rock River in Jefferson County

The Monterey millpond was classified as an impounded drainage lake before the drawdown. Drainage lakes typically have both an inlet and an outlet. The largest contributing source of water is stream drainage from the Ashippun River. Contributing flow is also received through adjacent surface water flow through wetlands and a navigable tributary that serves as an agricultural drainage way from lands to the north. Drainage lakes that owe one half or greater of their maximum water depth due to a dam are further classified as an impoundment.

Ashippun Lake is classified as a spring lake. Spring lakes do not have an inlet, but do have an outlet. The primary source of water for spring lakes typically is groundwater, supplemented by surface drainage from the immediate area. The Southeastern Wisconsin Regional Planning Commission (SEWRPC) calculated the water budget for Ashippun Lake in the 2nd edition of "A Lake Management Plan for Ashippun Lake", Community Assistance Planning Report No. 48. The water budget for Ashippun Lake indicates that 23% of the inflow is from groundwater; 22% is from direct precipitation and 55% is from surface water runoff. The long term hydraulic residence time for water in Ashippun Lake is 1.3 years. The residence time decreases in years of higher water, such as the floods of 2007 and 2008.

Backflow occurrences to Ashippun Lake, from the Ashippun River following unusually high precipitation events, have been documented since 1956. This is largely due to the presence of the Monterey millpond downstream of Ashippun Lake. SEWRPC (Community Assistance Planning Report No. 48) calculated that this backflow, when it occurs, amounts to approximately 125 acre feet, or 12 percent of the water inflow into Ashippun Lake (when compared to long term data). SEWRPC calculations from 1980 indicate during normal to low flow periods, the Monterey Dam did not affect water levels in Ashippun Lake if the dam were operated in accordance with WDNR permit requirements.

11. Biological Environment (dominant aquatic and terrestrial plant and animal species and

habitats including threatened/endangered resources; wetland amounts, types and hydraulic value)

FISH

Fish species observed in the Ashippun River upstream of Monterey millpond were sampled at Norwegian Road in 2004 and 2009. Downstream of the Monterey millpond, fish species were sampled at Pennsylvania Street in 2003 .The downstream Index of Biological Integrity, (IBI), scored GOOD. The upstream IBI score varied from GOOD to FAIR (Table 1). The number of native species upstream averaged 17 compared to the number of native species downstream was 20. The number of intolerant species did not significantly change from year to year or by location. Variability in upstream IBI scores and species diversity is expected due to the connectivity of Ashippun Lake.

In addition, the Pug-nosed Shiner and Western Sand Darter, special concern species, have been documented downstream of the impoundment and the Slender Madtom, a State-designated endangered fish species, has been known to occur near the Monterrey Millpond on the Ashippun River.

ASHIPPUN RIVER FISH SAMPLES			
	Norwegian Rd. - 04	**Pennsylvania Rd.**	**Norwegian Rd. - 09**
CENTRAL MUDMINNOW	1	2	15
NORTHERN PIKE	22		
COMMON CARP	32	41	6
HORNYHEAD CHUB	285	37	112
COMMON SHINER	107	254	214
BLUNTNOSE MINNOW	3	14	
CREEK CHUB	37		
WHITE SUCKER	141		75
SPOTFIN SHINER		54	
SAND SHINER		43	
RAINBOW DARTER	8	0	2
STONECAT	1	1	28
ROCK BASS	29	11	11
CREEK CHUB		2	29
PUMPKINSEED	11	216	1
BLUEGILL	2	20	2
GREEN SUNFISH	8	3	
SMALLMOUTH BASS		6	
LARGEMOUTH BASS	4	1	
FANTAIL DARTER	10	4	17
JOHNNY DARTER	32	19	21
BLACKSTRIPE TOPMINNOW		40	
BLACKSIDE DARTER		6	
WALLEYE		3	
BLACK BULLHEAD	6		
YELLOW BULLHEAD	7	2	5
BLACK CRAPPIE			29
SOUTHERN REDBELLY DACE			1
BROOK STICKLEBACK			3
TOTAL NUMBER OBSERVED	746	779	571
NUMBER OF SPECIES OBSERVED	19	22	17
NUMBER OF NATIVE SPECIES	18	20	16
NUMBER OF INTOLERANT	2	3	2

SPECIES			
WARMWATER IBI SCORE	47	52	57
IBI RATING	**FAIR**	**GOOD**	**GOOD**

MACROINVERTABRATES

Sampling of the aquatic macroinvertebrate communities upstream and downstream of the Monterey Dam (in the same location as the fish community sampling) are considered good, when using the Hillsenhoff Biotic Index (HBI). This index is primarily used for indicating the degree of organic pollution in a waterbody. However, sampling conducted immediately downstream of the dam revealed a lower quality community than at the other locations, only ranking fair on the HBI.

Mussel populations in the Ashippun River are healthy and diverse. The following Mussel species have been documented.

Ashippun River Mussel Species (END, THR, and SC)	Host Species	Status
Creek Heelsplitter - Lasmigona compressa	Unknown	SC
Elktoe - Alasmidonta marginata	Red Horse, Sucker Spp., Rock Bass	SC
Ellipse - Venustaconcha ellipsiformis	Darters	THR
Rainbow Shell - Villosa iris	Rock Bass, SM Bass, LM, Bass	END
Round Pigtoe - Pleurobema sintoxia	Carp and Minnow Spp.	SC
Slippershell Mussel - Alasmidonta viridis	Johnny Darter, Mottled Sculpin	THR
Washboard - (Megalonaias nervosa)	Eel, catfish, centracids, bowfin, bass	SC

Other Ashippun River Mussel Species

Creeper - Strophitus undulates
Cylindrical Papershell - Anodontoides ferussacianus
Fatmucket - Lampsilis siliquoidea
Giant Floater - Pyganodon grandis
Plain Pocketbook - Lampsilis cardium
Spike - Elliptio dilatata
Squawfoot - Strophitus undulatus
Three-ridge - Amblema plicata
Wabash Pigtoe - Fusconaia flava
White Heelsplitter - Lasmigona complanata

WILDLIFE

The Millpond in its existing condition provides herptile, furbearer, and waterfowl habitat. Given the rural nature of all but the small portion of shoreland area of the millpond, a variety of mammals, ranging in size from large animals like the northern white-tailed deer to small animals like the pygmy shrew, are found in the Ashippun River Watershed area. Mink, muskrat, beaver, otter, white-tailed deer, red and grey fox, coyote, grey and fox squirrel, and cottontail rabbits are mammals reported to frequent the area.

A large number of birds, ranging in size from large game birds to small songbirds, are found in the Ashippun River watershed area.

Mallards, wood duck, and the resident Canada geese are the most common waterfowl and are known to nest

in the area. Many other waterfowl utilize the river as a migratory stop. Many games birds, songbirds, waders, and raptors also reside or travel the river corridor and watershed environments.

Because of the mixture of lowland and upland woodlots, wetlands, and agricultural lands sill present in the area, along with the favorable summers climate, the area supports many other species of birds. Hawks and owls function as major rodent predators within the ecosystem. Swallows, whippoorwills, woodpeckers, nuthatches, and flycatchers, as well as several other species, serve as major insect predators in the vicinity. In addition to their ecological roles, birds such as robins, red-winged blackbirds, orioles, cardinals, kingfishers, and mourning doves serve as subjects for bird watchers and photographers.

Amphibians and reptiles are vital components of the ecosystems in Ashippin River watershed. Examples of amphibians native to the area include frogs, toads, and salamanders. Turtles and snakes are examples of retiles common to the area. The Northern Cricket Frog, a Endangered species, has a been historically documented in wetland near the downstream reaches of the river near the confluence of the Rock River.

AQUATIC PLANTS

Plant survey work was conducted on nearby Ashippun Lake in 1977, 1989, 2001 and 2006. Plants found in the 2006 survey include:

Common Name	**Scientific Name**
Coontail	*Ceratophyllum demersum*
Muskgrass	*Chara vulgaris*
Common waterweed	*Elodea Canadensis*
Northern water milfoil	*Myriophyllum sibiricum*
Eurasian Water Milfoil	*Myriophyllum spicatum*
Bushy pondweed	*Najas flexillis*
Spiny naiad	*Najas marina*
Spatterdock	*Nuphar variegata*
White water lily	*Nymphaea odorata*
Variable pondweed	*Potamogeton gramineus*
Illinois pondweed	*Potamogeton illinoensis*
White stem pondweed	*Potamogeton praelongus*
Flatstem pondweed	*Potamogeton zosteriformus*
Curly leaf pondweed	*Potomogeton crispus*
Soft stem bulrush	*Scirpus validus*
Sago pondweed	*Stuckenia pectinata*
Creeping bladderwort	*Utricularia gibba*
Common bladderwort	*Utricularia vulgaris*
Water celery	*Vallisneria americana*

There are no known records regarding the plant community in the Monterey millpond.

WETLANDS

Ashippun River is a slow moving, low gradient meandering stream through emergent and wet meadow wetland complexes. According to the Wisconsin Wetland inventory classification system, the wetland areas adjacent to the Millpond were classified as broadleaf persistent wet meadow and non-persistent wet meadow.

An intact emergent marsh wetland complex and southern tamarack swamp (rich) are located upstream and south of the impoundment.

Emergent Marsh natural communties are open, marsh, lake; riverine and estuarine communities with permanent standing water are dominated by robust emergent macrophytes, in pure stands of single species or in various mixtures. Dominants include cattails, bulrushes, bur-reeds, giant reed, pickerel-weed, water-plantains, arrowheads, larger species of spike rushes, and wild rice.

Aquatic plants, including both emergent and submergent aquatic vegetation, form the foundation of healthy and flourishing aquatic ecosystems - both within lakes and rivers and on the shores and wetlands around them. They not only protect water quality, but they also produce life-giving oxygen. Aquatic plants are a lake's own filtering system, helping to clarify the water by absorbing nutrients like phosphorus and nitrogen that could stimulate algal blooms. Plant beds stabilize soft lake and river bottoms and reduce shoreline erosion by reducing the effect of waves and current.

Aquatic plants also serve as spawning habitat for fish and amphibians, as shelter for various life stages of a variety of species, and as nesting habitat for birds. Plant beds support populations of aquatic insects that serve as a food base for other species. Seeds and other plant parts provide vital nutrition to a number of waterfowl and other bird species. Healthy, native aquatic plant communities also help prevent the establishment of invasive exotic plants like Eurasian watermilfoil.

The southern tamarack swamp community is similar to a northern wet forest but less acidic, supporting understory associates that are more nutrient-demanding and tolerant of higher pH levels. Tamarack is the dominant tree, though in some stands hardwoods such as paper birch, red maple, black ash, or American elm may be present as associates, saplings, or as sub-canopy trees. The understory is more diverse and structurally complex than in the more acid spruce-dominated swamps and includes nutrient-demanding species such as speckled alder, bog holly, winterberry holly, and black ash. Poison sumac is the most abundant tall shrub in many southern Wisconsin tamarack forests. The bryophytes may include many genera other than Sphagnum.

Stands that are fed by spring seepage sometimes support plants such as marsh-marigold, cinnamon fern, royal fern, and skunk-cabbage. These seepage stands have been separated out as a distinct type or subtype in some nearby states and provinces. In Wisconsin, the tamarack seepage swamps occur statewide but may be more common south of the tension zone. Historically, tamarack swamps occurred extensively in parts of southeastern Wisconsin and on the margins of Glacial Lake Wisconsin. Many of the swamps were drained and cleared for agricultural purposes. Intact examples are now uncommon but occur in a wide variety of settings, such as on the margins of lakes or streams, at the base of moraines, in outwash areas, and in a few Driftless Area stream valleys.

Wetland boundaries were identified within the Millpond project area. There is approximately a 0.1 acre plant community area that is contained within the Ashippun River floodplain-wetland complex that consists of fresh (wet) meadow with shallow marsh along the millpond edge. Disturbances to this plant community

include filling along the wetland edge and water level changes.
Wetland functional values throughout the immediate Millpond fringe wetlands suggest a moderate functional value rating for fishery habitat, flood attenuation, shoreline protection and groundwater discharge. These wetlands provide a high functional value for wildlife habitat, floristic diversity, and water quality protection.

WETLAND PLANTS

Wetland plant species observed within the millpond project area include:

Plant Common Names	
American Elm	Lesser Duckweed
Black Locust	Marsh Aster
Black Raspberry	Marsh Milkweed
Black Walnut	Motherwort
Black Willow	Mullein
Boxelder	Narrow Leaved Cattail
Broad Leaved Cattail	Norway Maple
Calico Aster	Orchard Grass
Canada Thistle	Prickly Wild Lettuce
Chicory	Purple Loostrife
Clearweed	Red Osier Dogwood
Common Burreed	Red Stalked Plantain
Common Wood Sorrel	Reed Canary Grass
Cottonwood	Rice Cut Grass
Creeping Charlie	Riverbank Grape
Dames Rocket	Silver Maple
Deadly Nightshade	Smartweed
Enchanter's Nightshade	Soft Stemmed Bulrush
Frost Aster	Stinging Nettle
Garlic Mustard	Swamp Aster
Giant Goldenrod	Virginia Blue flag
Giant Ragweed	Virginia Creeper
Glossy Buckthorn	White Avens
Green Ash	White Mulberry
Horseweed	Wild Black Currant
Hybrid Honeysuckle	Wild Cucumber
Jewelweed	Willow Herb
Lady's Thumb	Wood Nettle

12. Cultural Environment

LAND USE

The 2035 recommended land use plan prepared by SEWRPC allocates the entire area surrounding the millpond vicinity as rural containing prime agricultural land, other agricultural lands, and rural density residential containing no more the 0.2 units/ acre. The area adjacent to the river corridor is also located within the primary environmental corridor.

SOCIAL ECONOMIC

The Monterey Dam was originally constructed to power a flour mill. Later, electrical power generation was added and ran continuously except in times of inadequate flow or when the structure was being repaired or maintained. Generation of electricity was ceased in the late 1990s and the turbine, penstock and mill building were abandoned and removed in 2009. It is possible that some of the properties which currently abut the Millpond will not be immediately adjacent to the new river channel formed after removal of the dam.
The recreational and navigational opportunities within the former impoundment will be slightly altered by the loss of the impoundment; however the removal of the dam and restoration of the river within the stream reach will not be detrimental to the public interests in navigable waters.

ARCHAEOLOGICAL/HISTORICAL

According to Mark Dudzik, DNR Archaeologist, no significant historical or archeological sites are known to exist in the project area.

13. Other Special Resources (e.g., State Natural Areas, prime agricultural lands)

The area directly surrounding the millpond and within the Ashippun River watershed contain soils identified as prime farmland. The farmland soils in this area are both of national and statewide importance.

ENVIRONMENTAL CONSEQUENCES (probable adverse and beneficial impacts including indirect and secondary impacts)

14. Physical (include visual if applicable)

SEDIMENT
The ordered drawdown of the Millpond for safety reasons resulted in the exposure of a portion of the substrate located in the impoundment. An undetermined amount of this exposed area will become the restored river channel. The sand and cobbles of the natural river bed will constitute most of the exposed area, however there are areas closer to the dam structure that contain deep, silty sediments. These soil materials will require seeding and may need to be mechanically stabilized after drawdown to minimize the transport of sediment downstream after the dam removal is complete. Once the exposed soils have dewatered and become vegetated, they should not be a source of noxious odors.

STREAM FLOW
Removal of the dam and the resulting Millpond will restore an approximately 1 mile long, free-flowing reach of the Ashippun River. Average water depths will decrease within the Millpond and millrace. Following dam removal, water depths will likely mimic water depths that currently exist upstream and downstream of the dam. Water velocities will increase after the free-flowing river channel is restored due to a narrower channel and restored historical hydraulic gradient. The construction plans will need to address the elevation differences to prevent erosion and to enhance fish passage.

WETLANDS
The wetlands adjacent to the impoundment are identified as a persistent narrow-leaved emergent/wet meadow and deciduous, broad-leaved forested and scrub/shrub with moderate to high functional values. During the extended drawdown period emergent/wet meadow species such as soft stem bulrush, broad leaved cattail, broad-leaved arrowhead, and giant burred were observed After dam removal it is anticipated that the former impoundment open water habitat areas will revert to a similar narrow-leaved persistent

emergent/wet meadow that is present in the current wetlands upstream of the former impoundment. The current emergent fringe wetlands located within the impoundment may see a shift in vegetative cover to a wet-mesic meadow with reduced periods of inundation.

WATER QUALITY

Negative impacts to downstream water quality will be observed during the continual periods of drawdown and during the removal of the dam structure. The effects to down stream water quality will be minimized from a slow drawdown, stabilization of sediments, and implementation erosion control measures during dam removal. Once the exposed sediment areas are stable, and the dam removal complete, water quality is expected to improve. Higher dissolved oxygen levels, cooler water temperatures, and lower algal levels will encourage the expansion of native aquatic plant and animal communities.

HYDROLOGY

Removal of the dam will either greatly decrease or eliminate the backflow occurrences to Ashippun Lake during high precipitation events. The wetlands located between Ashippun Lake and the Monterey millpond serve as excellent flood storage. The removal of the dam structure and loss of back water effects will prevent back flow of the Ashippun River into Ashippun Lake but the wetlands will continue to serve as flood water storage and attenuation. The culvert located on the Kellogg residence (downstream of the Ashippun Lake outlet) will still control water level in Ashippun Lake to some extent. However, the exact control achieved by the culvert has not been modeled.

EROSION CONTROL

The design of the dam removal and construction activities will be designed to minimize, to the extent practicable, the redistribution of sediment downstream. These activities could, in the event of dam removal, include use of bio-engineering, turbidity barriers or sediment traps where appropriate; or mechanical removal of sediments prior to dam removal. Sediment management practices will be in place during construction to minimize sediment transport downstream.

15. Biological (including impacts to threatened/endangered resources)

WILDLIFE AND FISH

The fish and wildlife assemblage of the millpond and river channel has adapted to the current conditions over the last 160 years that the dam has been constructed. Reverting a from shallow Millpond habitat back to river channel will have a variety of biological impacts on the fish and wildlife assemblage utilizing the impounded area, as well as the upstream and downstream reaches of the Ashippun River. Currently, the Millpond supports vegetation and wildlife that is associated with shallow aquatic environments, including frogs, turtles, warmwater fish species, and exotic invasive plant species. Following the removal of the dam, river characteristic similar to upstream and downstream of the impoundment will alter the benefit the assemblage of fish and wildlife by increase the riparian corridor providing a diverse quality of cover, food, and reproduction habitat; it will provide a stable bed and bank composition that will restore the natural stream morphological processes; and remove an aquatic passage barrier.

Turtles and frogs using this impoundment should easily adapt to a riverine system once the dam has been removed. No significant adverse impacts these species population or disturbition would be expected. Furbearers such as Muskrats (*Ondatra zibethicus*) would be the primary furbearer using the pond; mink (*Mustela vison*) and otter (*Lutra canadensis*) may also be present in this area, but at very low levels. A decrease in muskrat population would be expected if the dam is removed, however there is adequate habitat nearby and healthy muskrat populations exist in the region. Waterfowl use in the Millpond for species such

as Canada goose (*Branta canadensis*), Mallard (*Anas platyrhynchos*) and Wood Duck (*Aix sponsa*) would be expected to decline with removal of the dam. There are limited forage and roosting sites on the pond. While waterfowl would still use the river system, an overall reduction of numbers is anticipated, however increased waterfowl production may occur as nesting cover establishes in the river corridor. Observance of wading birds such as Great Blue Heron (*Ardea herodias*) and Great Egret (Casmerodius albus), a state threatened species, would also be expected to temporarily decline but impacts to the population would not be expected and over time would adapt well to the riverine system. A naturally fluctuating river system would also provide habitat for shorebirds and provide an opportunity for germination of annual plants which provide a food source for wildlife in the fall.

It is expected that with the removal of the dam and aquatic passage barrier, fish populations would see beneficial effects. Populations of the same species and individual species populations have been physically segregated for a substantial length of time. Isolated fish communities lead to a reduction in genetic diversity within the populations and decreased diversity of species. The extent to which such fragmentation has developed is dependent upon many factors, such as mobility of species, reproductive capacities and habits, life-span etc. The removal of the Monterey Dam should allow these fragmented populations to freely migrate and increase genetic diversity to former isolated fish populations. The segmentation of the populations will be effectively ended, allowing them a greater range in which to feed, nest, breed, and seek shelter. Removal of the dam will open additional riverine habitat to fish and other aquatic life species that have been isolated downstream of the dam and is a long-term effect.

Mussel populations in the Ashippun River are outstanding both upstream and downstream of the Monterrey Dam. Large mussel beds have been documented upstream of the millpond that include all species listed above as threatened, endangered, and of special concern. The dam, which served as an aquatic barrier to prevent migration of the host species, will be removed which allowed isolation of genetic diversity in the river. Overall the populations of mussels within the river should benefit. Existing downstream mussel individual beds may be negatively impacted by increased turbidity during construction, dewatering, and large sediment deposition that may occur downstream during channel stabilization and deposition during construction.

AQUATIC ENVIRONMENT

The potential for aquatic plants and algae to reach nuisance levels will be reduced by removal of the dam and impounded water. The impoundment of water creates a thermal impact to the Ashippun River. The removal of the dam will eliminate warming effects on the impounded water. The ecosystem that is currently supported by the Millpond will change significantly when the river channel is restored. A faster, continuously flowing stream will allow fish migration and colder water will encourage a greater diversity of fish species. Faster flow will also extend and gradually restore the gravelly or sandy substrate favored by the majority of mussel species and lithophilic (fish that spawn on gravel and small stones) fish species for spawning. Organic loading to the stream from the Millpond will be eliminated.

WETLAND PLANT COMMUNITIES

Wetlands upstream, downstream, and within the former impoundment will not display negative impacts associated from the removal of the dam. Wetland complexes within the impoundment may see an alteration in dominance by the plant species, but their fundamental wetland functional values will remain.

Other biological impacts expected to be observed from this project may be better assessed once the Department receives full engineering plans from the applicant as described previously in sections 1 and 5.

16. Cultural

LAND USE (including indirect and secondary impacts)

Removal of the dam will expose a portion of the approximately 28-acre millpond. The exposed land that was under water with the former impoundment consists of accumulated soft organic sediment. Over time this sediment will be capable of supporting wetland plant species and be converted from former open water to a riverine wetland complex. The Waukesha County Register of Deeds will need to be consulted to determine the ownership of the newly exposed land. The quantity of exposed land gained by all owners will be dictated by those records however, no property owner will lose any land as a result of removing the dam. Due to the nature of the sediments, the likelihood of wetland characteristics, and the existence of floodplain it is unlikely that any land gained will be suitable for development. Future development will be governed by the local Zoning Ordinance and any necessary analyses will be the responsibility of the land owner and developer.

SOCIAL/ECONOMIC (including ethnic and cultural groups, and zoning if applicable)

There are no expected consequences or impacts to any ethnic or cultural groups or social impacts resulting from the removal of the dam. The Department of Natural Resources has not conducted any studies regarding economic impacts with dam removal projects.

ARCHAEOLOGICAL/HISTORICAL

According to WDNR Archaeologist Mark Dudzik, there are no known archaeological or historical impacts that will result from removal of the dam.

17. Other Special Resources (e.g., State Natural Areas, prime agricultural lands)

There are no special resources in the general area of the Millpond that should be affected by dam removal activities. The area surrounding the millpond consists of prime agricultural lands and Primary Environmental Corridor. These uses and designations will not be affected by the scope of this project.

18. Summary of Adverse Impacts That Cannot Be Avoided (more fully discussed in 14 through 17)

Negative impacts that cannot be avoided include temporary noise and emissions from earthmoving equipment, and temporarily high turbidity around the dam and downstream areas associated with dam removal activities. Fish and wildlife may be temporarily displaced. Suitable habitat for fish and mussel species downstream from the dam removal may experience temporary or permanent sedimentation from dam removal. Non-vegetated areas of sediment will be exposed prior to seeding, planting, and sediment stabilizing activities. Water quality will be impaired during construction and following the removal. Improvements will be noticed in time but will be variable. Impacts and improvements to aquatic habitat are variable and may differ over time. As the barriers to fish migrating the free-flowing stream is restored, . It is expected that the long-term benefits of removing the structurally unsound dam will outweigh the short-term inconveniences and negative impacts.

DNR EVALUATION OF PROJECT SIGNIFICANCE (complete each item)

19. Environmental Effects and Their Significance

Discuss which of the primary and secondary environmental effects listed in the environmental consequences section are long-term or short-term.

There exists a possibility that isolated communities of aquatic organisms and fish species are present in the impoundment. Populations of the same species and individual species populations have been physically segregated for a substantial length of time. This means that small populations of fish communities exist that have not intermingled or bred with larger populations. The extent to which such fragmentation has developed is dependent upon many factors, such as mobility of species, reproductive capacities and habits, life-span etc. The removal of the Monterrey dam should allow these fragmented populations to freely migrate and reproduce. The segmentation of the populations will be effectively ended, allowing them a greater range in which to feed, nest, breed, and seek shelter. Removal of the dam will open additional riverine habitat to fish and other aquatic life species that have been isolated downstream of the dam.

Reductions in sedimentation will cause improvements in the quality of physical habitat and convert the bed substrate back to sand, gravel, and cobble substrate condition. Most benthic invertebrates require this rocky substrate. These invertebrates are an important food source for fish. Many fish species also prefer these rocky bottom conditions for spawning and feeding. Native species and most sport fish exhibit lowered vitality and productivity under the stresses of increased turbidity, lowered water quality, and scarcity of suitable habitat. Other, generalist types of species, such as carp, are unaffected or actually flourish despite these adverse effects and often dominate the fish community in impoundments.

The removal of the Monterey Dam will improve dissolved oxygen levels and decrease the water temperature in this reach of the Ashippun River. The removal will reduce organic loading from, and also eliminate the artificial warming caused by the impoundment. These effects should have positive impacts on fish and other aquatic life.

Following the permanent drawdown and removal of the dam, the former aesthetics of the Millpond would be lost and replaced with a meandering, free-flowing creek. This would be similar to what existed under pre-development conditions and what currently exists upstream and downstream of the Monterey Dam and Millpond.

Any adverse impacts associated with this project are expected to be short-term and reversible but there is the potential for variability in the term of impact. Adverse impacts include turbidity in the waterway, soil disturbance and human activity near the dam site. These adverse impacts will be only those which are unavoidable and occur despite control measures. Unavoidable turbidity effects will precede the spawning period when fish are most vulnerable. There should be no significant impacts in terms of temperature.

Short-term adverse impacts with variable impact terms associated with the conversion of the Millpond into a free-flowing stream may affect wildlife which currently use the pond, including ducks, herons, turtles and frogs, muskrats, and raccoon. There are substantial areas of wetland adjacent to the project area along the Ashippun River that will provide adequate habitat for wildlife displaced from the Millpond during dam

removal. The adverse impacts may affect some individuals, but will have no significant long-term impact on the overall numbers, the reproductive capability, or the success and stability of the species or regional populations as a whole.

Long-term effects on the riparian and aquatic system should be highly beneficial with limited negative impacts. Improvements will occur in physical characteristics of the river, which in turn will create ecological and biological benefits. The Millpond will revert back to a sandy-cobble substrate characteristic of the Ashippun River, providing additional habitat for riverine forms of aquatic life such as native fish species. Downstream mussel populations may be extirpated if large sediments deposits occur from failures in erosion control BMP's or inadequate construction techniques. The substantial mussel beds upstream provide for a viable source for repopulation of downstream reaches and within the former impoundment provided conditions suitable for individual mussel species exist.

20. Significance of Cumulative Effects

The cumulative impacts of similar projects have shown to have increasingly beneficial effects on the aquatic habitat. The adverse environmental impacts associated with dams and impoundments are well documented in literature regarding riparian systems. Selective dam removal has been proposed as a cost-effective and technically feasible means of restoring river ecosystems in southeastern Wisconsin. Dams have been constructed across Wisconsin waterways to serve a variety of purposes, including generation of hydraulic power, flood control, and the creation of an impoundment for recreational use.

According to the WDNR Dam Safety Section there are approximately 3,800 dams in the state. The Dam Safety Section reviews the condition of dams throughout the State in the interests of public safety, navigability and flood control issues. Many of these dams were put in place over a century ago as a source of energy for a variety of uses and have become obsolete with the development of wide-scale provisions of electric power. Many obsolete dams are no longer providing any benefit and basically serve no useful purpose. In most cases, these neglected and deteriorated dams are hazards to safety, are obstructions to navigation and fish migration and create adverse environmental impacts.

Dam removal projects are underway at many locations across the country. Repeated actions of this type have been found to restore river systems to healthy ecosystems. Dam removals, utilizing best management practices to prevent erosion, reduce sediment deposition downstream, and restore a natural channel will only experience temporary impacts to the environment. The temporary impacts are variable between waterbodies and may be short or long term but the benefits to small dam removal far exceed any long-term negative impact potential.

21. Significance of Risk

There are some unknowns that create uncertainty in predicting the effects on the surrounding environment with a dam removal. It is possible that a substantial amount of sediment will scour upon removal of the dam, and be carried downstream, settling along bends, within pools, and in the floodplain in times of higher flows. The draw down process will aid in stabilizing the sediment in the Millpond by allowing vegetation to take root. During a typical removal, Best Management Practices for erosion control and turbidity are used to minimize impacts of sediment transport downstream.

Typical construction projects require work site inspections at the close of each working day in which the functionality and integrity of all erosion and flow control devices are verified and repaired as necessary. These inspections are also conducted when rainfall exceeds ½-inch. The draw down of the Millpond will

mitigate the effects of exposed soils and runoff by allowing vegetation from existing seed bank to establish itself. Areas exposed by dam removal activities will be seeded to further minimize runoff, erosion, and transport of these materials downstream.

Typically pre-construction meetings for dam removal projects are held with potential property owners, local residents, county and city officials, and local emergency officials, as appropriate.

22. Significance of Precedent

This project does not set any precedent or hold the potential to influence any future WDNR actions or decisions. Water regulation decisions are made on a case-by-case basis, and therefore this decision will not impact future projects.

23. Significance of Controversy over Environmental Effects

Discuss the effects on the quality of the environment, including socio-economic effects, that are (or are likely to be) highly controversial, and summarize the controversy.

Property owners with frontage on the Millpond and along the millrace will be directly impacted as a result of the conversion from a quiescent pool of water to a free flowing river. Wetland environments are likely to replace former impounded areas.

ALTERNATIVES

24. Briefly describe the impacts of no action and of alternatives that would decrease or eliminate adverse environmental effects. (Refer to any appropriate alternatives from the applicant or anyone else.)

No Action – Leaving the dam in place and allowing it to deteriorate due to the effects of river action, weathering and erosion, and the freeze and thaw cycle. The dam would not be upgraded to meet DNR Code requirements. This is neither a technically or environmentally sound, nor a legally acceptable alternative. The dam and supporting infrastructure is structurally unsound and presents a safety hazard to human health and property and the environment should it fail. Sediments from the Millpond would continue to breach the dam during times of high flow, adding to the downstream accumulations. The dam would be out of compliance with NR 333.07, Wisconsin Administrative Code.

Ultimately, dam failure would occur as an uncontrolled and catastrophic event, releasing downstream a wall of flood water, structural debris and sediment. Ultimately, this alternative would result in the greatest negative environmental and socio-economic impacts when compared to other alternatives.

Reconstruct the dam –The owner of the Monterey Dam has determined that reconstructing the dam is not economically feasible at this point in time. The owner would also have to take on the long-term cost of maintaining the dam.

Declare the dam abandoned and remove – Proposed action.

Modify the dam – There is no cost-effective modification to the dam that would meet the State requirements for maintenance of this dam other than total reconstruction.

SUMMARY OF ISSUE IDENTIFICATION ACTIVITIES

25. List agencies, citizen groups and individuals contacted regarding the project (include DNR personnel and title) and summarize public contacts, completed or proposed).

Date	Contact	Comment Summary
08/02/2010	Benjamin Heussner – Fisheries Biologist, Southeast Region, WDNR	Provided fish survey data for the Ashippun River
08/02/2010	Craig Helker - Water Resources Management Specialist, WDNR	Water Quality and Stream Resource Information
08/02/2010	Mark Dudzik – Archaeologist, WDNR	Assessed historical and archaeological impacts of dam removal at Monterey Roller Mill Dam
08/02/2010	Brian Glenzinski – Wildlife Biologist, WDNR	Provided an assessment of wildlife habitat adjacent to the Roller Mill Dam Millpond
08/02/2010	Heidi Bunk – Lakes Biologist, WDNR	Provided analysis of existing data on water quality in Ashippun Lake and Monterey millpond, provided aquatic plant data for Ashippun Lake and provided information on the hydrology of Ashippun Lake and the Monterey millpond.
Ongoing	Michelle Schneider – Water Management Engineer, WDNR	Inspected Monterey Roller Mill Dam. Provided technical dam engineering content

Ongoing	Andy Hudak-Water Management Specialist, WDNR	General resource impacts and public interest
08/02/2010	Brooke Robinson, WDNR	Land use
1/18/2011	Lisie Kitchel-WDNR	Endangered Resources

Project Name: Monterey Roller Mill Dam Abandonment County: Waukesha

DECISION (This decision is not final until certified by the appropriate authority)

In accordance with s. 1.11, Stats., and Ch. NR 150, Adm. Code, the Department is authorized and required to determine whether it has complied with s.1.11, Stats., and Ch. NR 150, Wis. Adm. Code.

Complete either A or B below:

A. EIS Process Not Required ☐

The attached analysis of the expected impacts of this proposal is of sufficient scope and detail to conclude that this is not a major action which would significantly affect the quality of the human environment. In my opinion, therefore, an environmental impact statement is not required prior to final action by the Department.

B. Major Action Requiring the Full EIS Process ☐

The proposal is of such magnitude and complexity with such considerable and important impacts on the quality of the human environment that it constitutes a major action significantly affecting the quality of the human environment.

Signature of Evaluator	Date Signed

Number of responses to news release or other notice:

Certified to be in compliance with WEPA	
Environmental Analysis and Liaison Program Staff	Date Signed

NOTICE OF APPEAL RIGHTS

If you believe that you have a right to challenge this decision, you should know that Wisconsin statutes and administrative rules establish time periods within which requests to review Department decisions must be filed.

For judicial review of a decision pursuant to sections 227.52 and 227.53, Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to file your petition with the appropriate circuit court and serve the petition on the Department. Such a petition for judicial review shall name the Department of Natural Resources as the respondent.

To request a contested case hearing pursuant to section 227.42, Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to serve a petition for hearing on the Secretary of the Department of Natural Resources. The filing of a request for a contested case hearing is not a prerequisite for judicial review and does not extend the 30-day period for filing a petition for judicial review.

Note: Not all Department decisions respecting environmental impact, such as those involving solid waste or hazardous waste facilities under sections 144.43 to 144.47 and 144.60 to 144.74, Stats., are subject to the contested case hearing provisions of section 227.42, Stats.

This notice is provided pursuant to section 227.48(2), Stats.

Jeff Herrmann

Exhibit 5

From: Mark Mickelson [markm@yaggy.com]

Sent: Friday, February 11, 2011 8:22 AM

To: 'Jeff Herrmann'; 'Hudak, Andrew J - DNR'; 'Schneider, Michelle M - DNR'

Cc: 'kjkoepke@netwurx.net'; 'rlparra5@gmail.com'; lexuno1@att.net; 'jer2041@aol.net'

Subject: Ashippun Lake level

Attachments: SEWRPC Ashippun Lake study.pdf; Ashippun Lake elevs.pdf

Following last night's Public Hearing, I research our files for some survey data we shot several years ago. Attached please find a map that summarizes the elevations of the Mill Pond, Ashippun Lake, and the driveway culvert at the lake's outlet.

Our survey was completed in February of 2008. The elevation summary is as follows:

Ashippun Lake: 868.54
Driveway cmp: 866.7 (30" dia. Pipe invert) 868.52 water surface
Mill Pond: 865.3 concrete weir 865.66 water surface 867.8 water marks on concrete (typical pond surface)

This shows that in the winter of 2008, the pond level had been drawn down by approximately 2.2 ft., and was approx. 2.9 ft lower than Ashippun Lake. The SEWRPC report, of which I include the first portion of, mentions that in the 1970's, the lake fluctuated from 868.25-869.5, with a long term average of 868.5. During the flooding in the summer of 2008, we found Ashippun Lake at 869.1, when we surveyed to design the failed storm sewer at South Shore Dr.

The outflow for Ashippun Lake should be influenced by the elevation of the water surface in the Ashippun River at the confluence. I don't have any elevations in that area, but the water surface at the driveway culvert is shown to be similar to the lake. What we don't know is whether the river elevation will change at all with the removal of the dam, or whether it will fluctuate more, or less, once the dam is removed. The confluence is located in a very large wetlands complex, where the river bends quite a bit. The slope of the river channel is likely very flat in this stretch.

I will have our survey crews shoot the lake elevation again, the next time they are traveling in the area.

Mark Mickelson | Principal | YAGGY COLBY ASSOCIATES | 501 Maple Avenue | Delafield, WI 53018 | phone 262.646.6855 ext. 215 | fax 262.646.6864 | markm@yaggy.com | www.yaggy.com

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GREEN TIER

Yaggy Colby Associates is a Wisconsin Green Tier participant

MEMORANDUM

ENGINEERS
LANDSCAPE ARCHITECTS
SURVEYORS
PLANNERS

YAGGY COLBY ASSOCIATES

501 MAPLE AVENUE
DELAFIELD, WISCONSIN 53018

262-646-6855
FAX 262-646-6864

TO	Jeff Herrmann
FROM	Mark Mickelson
RE:	Ashippun Lake Levels
DATE	November 16, 2011
PROJECT NO.	13052.169

Historical Elevation Data

We have compiled additional information on the historical lake levels of Ashippun Lake, for informational purposes. Below and attached are the best data available that we can find, to hopefully fill in a few blanks as to the range and average that the lake has seen over the years.

Waukesha County Surveys:

Jason Fruth, of the Waukesha Dept. of Parks and Land Use, provided a number of surveys completed for properties around the lake for various shoreland related projects that they had archived. Most of these provided USGS elevations for the lake and I have added them to the table below. Several had assumed benchmarks, which unfortunately can not be used without retracing the benchmarks of the surveys.

Town of Oconomowoc

Ashippun Lake Levels

Date	Elevation
Feb-91	868.00
Oct-92	869.50
Sep-96	868.80
Dec-96	868.50
Apr-00	868.50
Feb-02	868.50
Mar-02	868.28
Sep-05	868.35
Sep-07	868.50
Jul-08	869.10
Sep-09	868.40
Average	**868.58**

The July 2008 elevation was taken just after the June 2008 flooding event, when we surveyed along the Hallen residence to replace the South Shore Drive storm sewer that had collapsed in the roadway. This data provides a good sample of random elevations for the past 20 years, most of which occurred before the boards in the Mill Pond were removed, which I believe was in August of 2007. While I don't believe this information has enough data to be considered statistically significant, it does corroborate well with the SEWRPC report data.

Saddlebrook Farms Subdivision Plat:
The final plat for Saddlebrook Farms (north side of the lake) contains a lake elevation table as follows:

Water Elevation – 869.4 USGS Sept. 1991
Low Water Elevation – 867.7 USGS
High Water Elevation – 871.8 USGS

SEWRPC Community Assistance Planning Report 48 "A Water Quality Management Plan for Ashippun Lake":
SEWRPC's report studied lake levels from December, 1976 to October, 1977. This period was preceded by a severe drought, but precipitation during the study was above average. The lake level started at 868.3 in December, 1976, rose to a high of 869.6 in April, 1977, dropped to 868.3 in June and back up to about 869.0 at the end of the study. SEWRPC's follow up study in May of 2007, assumed a nominal elevation of 868.5 for the lake, based on the previous data. The concern that has been noted over this assumption is did the drought that preceded the study, skew the elevation lower than might be typical, even though the period of the study had higher than normal precipitation? This is hopefully where the Waukesha County surveys help fill in the blanks a bit, as that data has no skew and is random. The surveys show a wider range of elevation (868.0-869.5), and just a slightly higher average (868.58).

WDNR Ordinary High Water Mark:
In June of 2011, Mr. Andy Hudak of the WDNR conducted an Ordinary High Water Mark evaluation, near the public boat launch. We surveyed his flagging at 868.7

Ashippun Lake Staff Gauge:
In April of 2011, a staff gauge was placed on Bill and Cathie Balthazor's pier. We surveyed in the gauge to relate the staff readings to USGS datum. This year's data is as follows:

Town of Oconomowoc
Ashippun Lake Levels
Staff Gauge (Balthazor's Pier)
Conversion of 866.59 + reading

Date	Reading	Elevation
29-Apr-11	1.80	868.39
15-May-11	1.82	868.41
30-May-11	1.70	868.29
2-Jun-11	1.66	868.25
30-Jun-11	1.91	868.50
9-Jul-11	1.66	868.25
28-Jul-11	1.82	868.41
30-Aug-11	1.65	868.24
18-Nov-11	1.65	868.24

Chapter I

INTRODUCTION

Thirteen major inland lakes in southeastern Wisconsin were studied under a special program conducted by the Southeastern Wisconsin Regional Planning Commission in cooperation with the Wisconsin Department of Natural Resources, local lake protection and rehabilitation districts and other lake organizations. Eight of the 13 lakes—Eagle Lake, Friess Lake, Lac La Belle, North Lake, Oconomowoc Lake, Pewaukee Lake, Pike Lake, and Wandawega Lake—were studied by the Regional Planning Commission in cooperation with the Bureau of Research, Wisconsin Department of Natural Resources; and four of the lakes—Ashippun Lake, George Lake, Okauchee Lake, and Paddock Lake—were studied by the Regional Planning Commission in cooperation with the respective lake protection and rehabilitation districts and the Wisconsin Department of Natural Resources, Office of Inland Lake Renewal. One of the 13 lakes—Geneva Lake—was studied by the Regional Planning Commission in cooperation with the Geneva Lake Watershed Environmental Agency. The objectives of these studies were to acquire definitive information concerning lake water quality and related land use and land management practices in each lake drainage area; to identify the factors affecting lake water quality, particularly the amount, kind, and temporal distribution of pollutants contributed by the various sources; and to develop recommendations for the abatement of pollution in order to maintain or improve water quality conditions.

On May 20, 1976, the Southeastern Wisconsin Regional Planning Commission entered into a cooperative agreement with the Wisconsin Department of Natural Resources to study Ashippun Lake. The cooperative lake study for Ashippun Lake included the design and conduct of a water quality sampling program to determine existing water quality conditions, and inventories and analyses of pertinent tributary watershed characteristics affecting water quality conditions, including land use and management practices, existing water uses and sources of pollution. The detailed lake water quality sampling program was conducted from December 1976 through November 1977. Some inventory data collected as recently as 1979, however, are incorporated into this report. This report summarizes the results of the sampling program and inventories and provides an evaluation and interpretation of the data collected. From these analyses, feasible alternative actions for the maintenance and enhancement of lake water quality are proposed and evaluated, and water quality management measures are recommended.

Ashippun Lake is an 83-acre lake located entirely within U. S. Public Land Survey Township 8 North, Range 17 East, Section 15, Town of Oconomowoc, in Waukesha County.[1] The lake drains to the Ashippun River via an unnamed outlet stream. Properly managed, the drainage area directly tributary to the lake can contribute to the maintenance of Ashippun Lake as an important asset to the residents of the County and the Region of which the County is an integral part. This report discusses the physical, chemical, and biological characteristics of the lake together with pertinent related characteristics of the tributary drainage area, as well as the feasibility of various water quality management alternatives which may enhance water quality conditions in the lake. Specific management objectives for Ashippun Lake include: 1) providing water quality suitable for recreational use and maintenance of fish and aquatic life, 2) controlling shoreline erosion, 3) reducing the severity of existing nuisance problems due to excessive aquatic plant growths which constrain or preclude intended water uses, and 4) improving opportunities for water-based recreational activities.

The local units of government concerned were asked to review a preliminary draft of this report and comments based upon that review are incorporated into this final report. Accordingly, the lake water quality management plan presented herein should constitute a practical guide for the management of the water quality of Ashippun Lake, and for the management of the land surfaces which drain to this lake.

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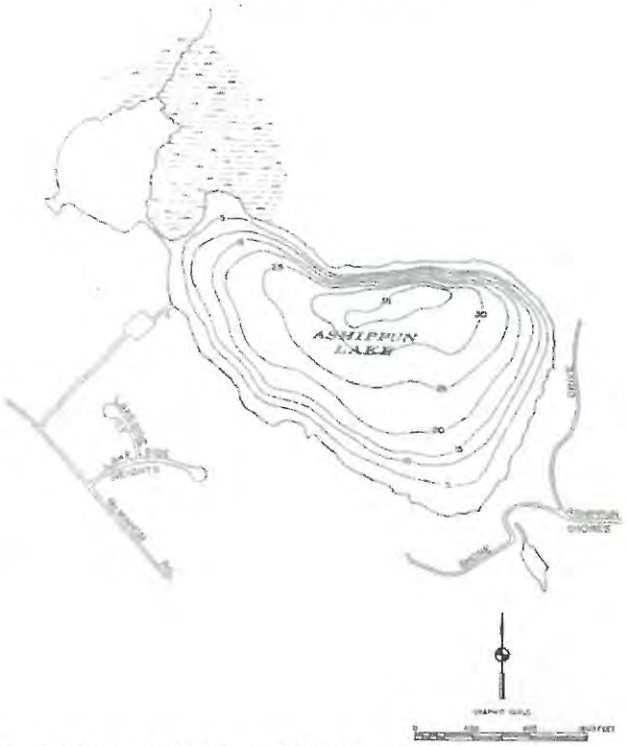
[1] *In SEWRPC Planning Guide No. 5, Floodland and Shoreland Development Guide, (1968) the area of Ashippun Lake was reported to be 84 acres, as measured from 1956 aerial photographs. Based on 1975 aerial photographs and with the use of computer mapping techniques to measure areas, the area of Ashippun Lake was estimated to be 83 acres.*

Map 1

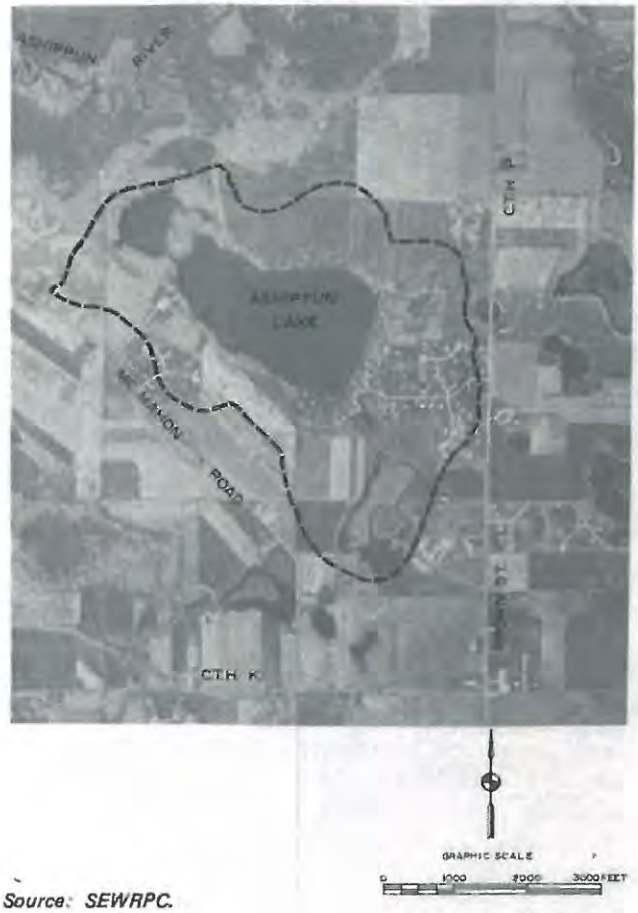
HYDROGRAPHY AND MORPHOMETRY OF ASHIPPUN LAKE



Source: Wisconsin Department of Natural Resources.

Figure 1

AERIAL PHOTOGRAPH OF ASHIPPUN LAKE AND SURROUNDING SHORELINE



Source: SEWRPC.

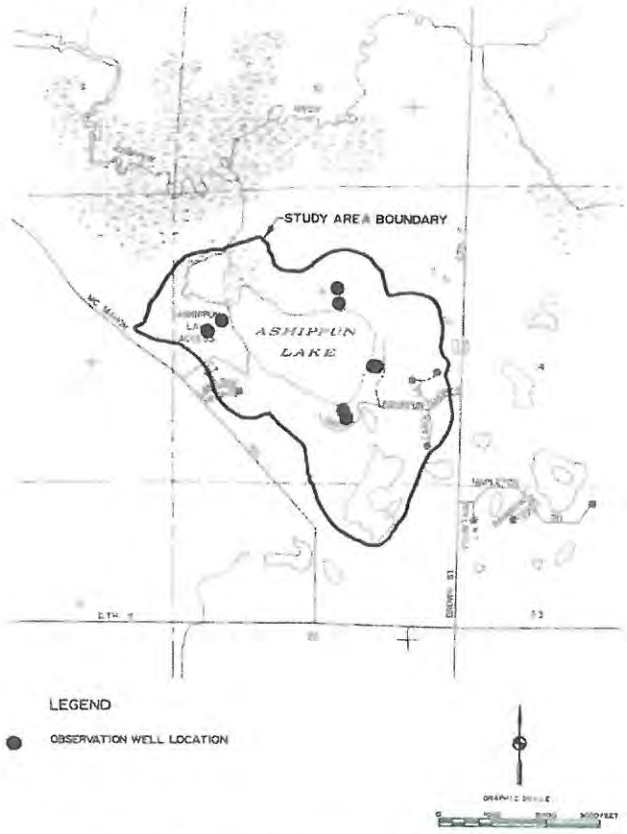
CLIMATE AND HYDROLOGY

Long-term average monthly air temperature and precipitation values for Watertown, Wisconsin, are set forth in Table 2. These averages were taken from official National Oceanic and Atmospheric Administration (NOAA) records. Table 2 also sets forth storm water runoff values derived from U. S. Geological Survey (USGS) flow records for the Rock River at Afton. The mean annual temperature of 47.3°F at Watertown is quite similar to recording locations in southeastern Wisconsin. Mean annual precipitation at Watertown is 31.46 inches. More than half the normal yearly precipitation falls during the growing season, from May to September. Runoff rates are generally low during this period, since evapotranspiration rates are high, vegetative cover is good, and soils are not frozen. Normally, less than 15 percent of the summer precipitation is expressed as surface runoff, but intense summer storms occasionally produce high runoff. Approximately 30 percent of the annual precipitation occurs during the winter or early spring when the ground is frozen, resulting in high surface runoff during those seasons. Impervious areas, such as street surfaces, parking lots, and rooftops, increase the amount of surface runoff and decrease infiltration into the soil.

The 12-month period over which the Ashippun Lake water quality sampling study was carried out—December 1976 through November 1977—was a period of variable temperatures and slightly higher-than-average amounts of precipitation in southeastern Wisconsin, as shown in Table 2. Temperatures were generally below normal during the early winter of 1976, above normal in the spring of 1977, and about normal for the remainder of the

Map 2

DRAINAGE AREA DIRECTLY TRIBUTARY TO ASHIPPUN LAKE AND GROUNDWATER OBSERVATION WELLS



Source: Wisconsin Department of Natural Resources and SEWRPC.

study period. Precipitation for the year as a whole was about 1.86 inches above normal. However, a severe drought occurred in southeastern Wisconsin in the period immediately preceeding, and including the first several months of, the study period. Six of the first seven months of the study period—from December 1976 through June 1977—experienced below normal amounts of precipitation. During the extreme drought conditions of May 1976 through April 1977, precipitation was 11.13 inches below normal at Watertown. Groundwater levels were substantially reduced by this drought, and these reduced groundwater levels were reflected in the below normal flow levels in the Rock River. At Afton, the flow of the Rock River during the study period was only 55 percent of normal. Therefore, while precipitation amounts were slightly higher than normal during the study period, the hydrologic regime of the lake may not have fully recovered from the effects of the preceding drought period.

The water level of Ashippun Lake is primarily determined by the groundwater level and by the amount of precipitation which occurs. As shown in Figure 2, the lake level rose from a low elevation of 868.3 feet above National Geodetic Vertical Datum (NGVD) in early December 1976, to a high elevation of 869.6 feet in mid-April 1977, dropped again to an elevation of 868.3 feet in mid-June 1977, and then rose to an elevation of 869.0 feet during late September 1977.

A water budget for Ashippun Lake was computed from estimated and measured precipitation, evaporation, surface runoff and groundwater inflow, surface outflow, and lake level data and is set forth in Figure 3. For the year of the study, it is estimated that about 174 acre-feet of water, or 28 percent, entered the lake by surface runoff, 233 acre-feet, or 37 percent, entered the lake by direct precipitation on the lake surface, and 217 acre-feet, or 35 percent, entered the lake by groundwater inflow. Losses of 384 acre-feet, or 62 percent, from the lake outlet and 187 acre-feet, or 30 percent, from evaporation were estimated, with a resultant net water gain to the lake of 53 acre-feet, or 8 percent. Groundwater levels and the direction of groundwater movement were observed at five paired observation wells located around the lake, as shown on Map 2. These observations indicated consistent groundwater flows towards the lake around the entire perimeter of the lake, and it was therefore assumed that no significant groundwater outflow occurred.

An abandoned concrete mill dam is located on the Ashippun River in the unincorporated community of Monterey about one and one-half miles downstream of the Ashippun Lake outlet, as shown on Map 3. The so-called Monterey Dam has a normal operating level, as established by Wisconsin Department of Natural Resources requirements of 866.6-867.2 feet NGVD. The level of the dam is controlled by flashboards. Under normal operating conditions, the dam level is 1.1-3.0 feet lower than the elevation of the Ashippun Lake, as measured during the study year. However, some lake residents have expressed concern that during periods of high streamflow and/or when additional flashboards are placed on the Monterey Dam, flow from the Ashippun River enters Ashippun Lake, raising the lake level, thereby accelerating shoreline ero-

Table 2

LONG TERM AND 1976-1977 STUDY YEAR CLIMATOLOGICAL AND RUNOFF DATA FOR THE ASHIPPUN LAKE AREA

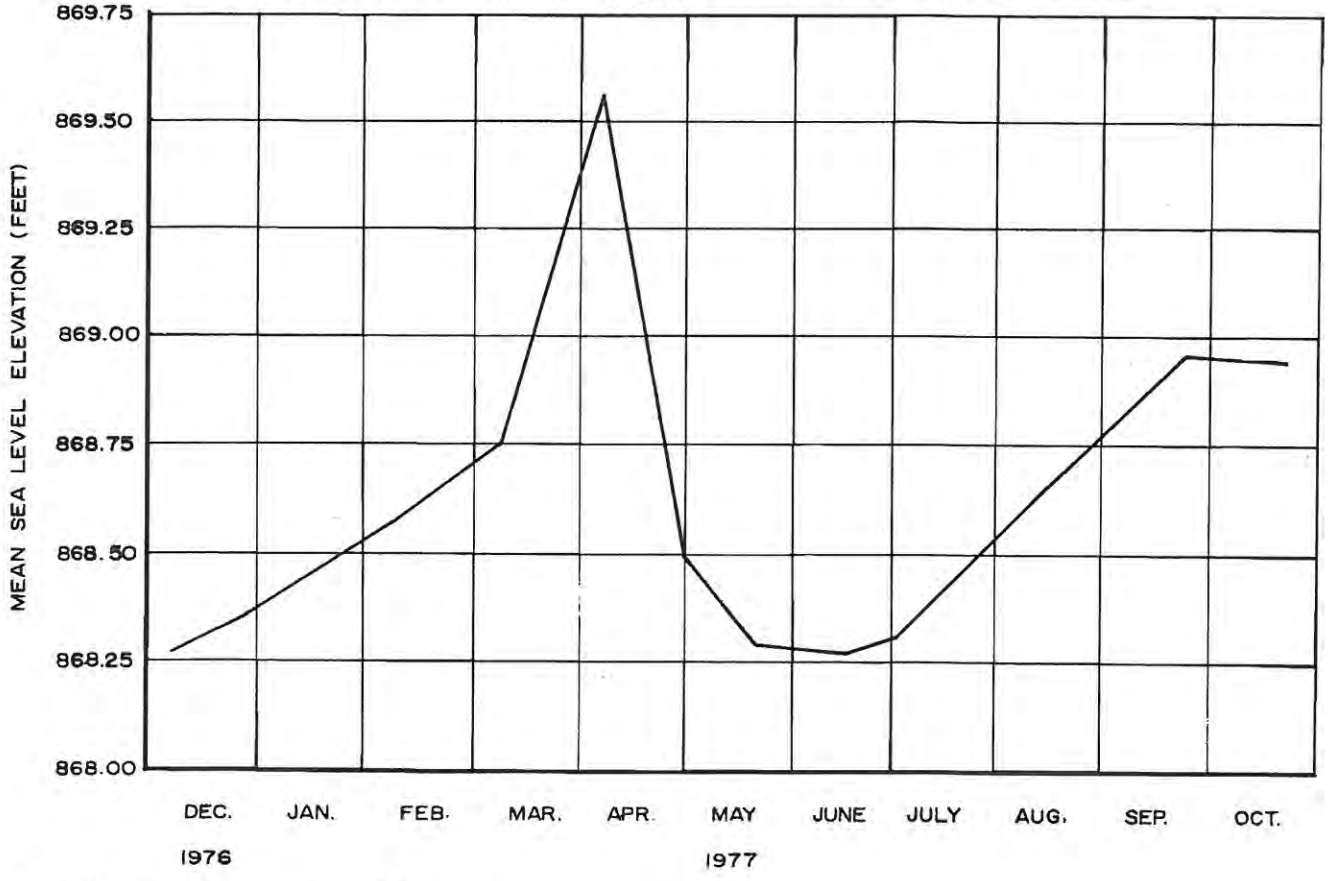
Climatological Data	Long Term Average Monthly Values												
	December	January	February	March	April	May	June	July	August	September	October	November	Annual
Mean monthly air temperature—°F (Watertown) (1890-1975)	24.1	19.5	22.8	32.7	47.6	58.2	67.8	72.2	70.9	62.3	52.4	37.1	47.3
Mean monthly precipitation—inches (Watertown) (1890-1975)	1.64	1.43	1.02	2.18	3.00	3.12	4.05	3.70	3.33	3.78	2.16	2.05	31.46
Mean runoff—inches (Rock River at Afton) (1914-1978)	0.46	0.42	0.46	1.14	1.36	0.85	0.56	0.45	0.34	0.37	0.41	0.45	7.27

Climatological Data	Study Period Average Monthly Values												
	1976	1977											
	December	January	February	March	April	May	June	July	August	September	October	November	Annual
Mean monthly air temperature—°F (Watertown)	14.5	5.4	22.0	41.4	53.4	66.8	66.6	75.5	67.7	63.1	49.8	37.1	47.0
Departure from normal monthly mean air temperature—°F (Watertown)	-9.6	-14.1	0.0	8.7	5.8	8.6	-1.2	3.3	-3.2	0.3	-2.6	0.0	-0.29
Precipitation—inches (Watertown)	0.41	0.51	0.85	4.15	2.33	0.94	3.41	7.70	5.15	3.40	2.15	2.32	33.32
Departure from normal precipitation—inches (Watertown)	-1.23	-0.92	-0.17	1.97	-0.67	-2.18	-0.64	4.00	1.82	-0.38	-0.01	0.27	1.86
Runoff—inches (Rock River at Afton)	0.17	0.17	0.15	0.42	0.65	0.22	0.17	0.22	0.43	0.33	0.54	0.53	4.0
Departure from normal runoff—inches (Rock River at Afton)	-0.29	-0.25	-0.31	-0.72	-0.71	-0.63	-0.39	-0.23	0.09	-0.04	0.13	0.08	-3.17

Source: National Oceanic and Atmospheric Administration, U. S. Geological Survey, and SEWRPC.

Figure 2

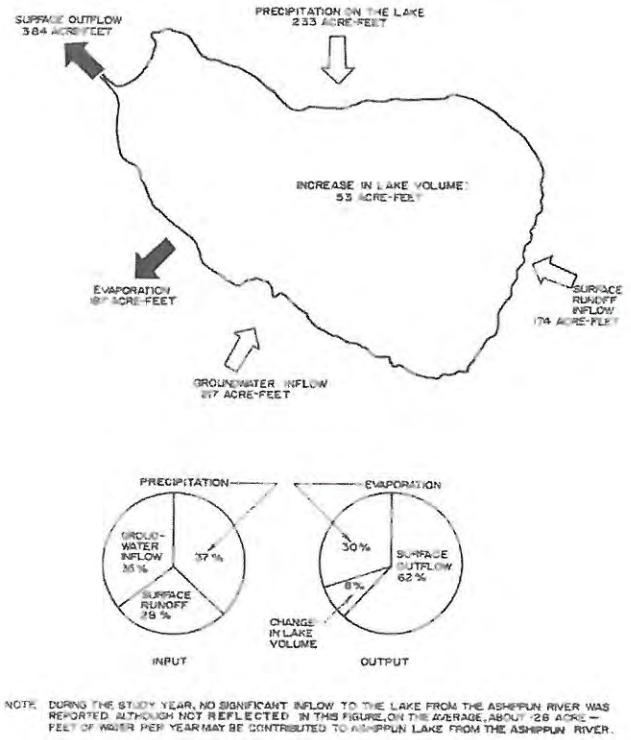
LAKE LEVEL FLUCTUATIONS IN ASHIPPUN LAKE: DECEMBER 1976-OCTOBER 1977



Source: Wisconsin Department of Natural Resources.

Figure 3

HYDROLOGIC BUDGET FOR ASHIPPUN LAKE
DECEMBER 1976-OCTOBER 1977



NOTE: DURING THE STUDY YEAR, NO SIGNIFICANT INFLOW TO THE LAKE FROM THE ASHIPPUN RIVER WAS REPORTED. ALTHOUGH NOT REFLECTED IN THIS FIGURE, ON THE AVERAGE, ABOUT 126 ACRE-FEET OF WATER PER YEAR MAY BE CONTRIBUTED TO ASHIPPUN LAKE FROM THE ASHIPPUN RIVER.

Source: SEWRPC.

Map 3

TOPOGRAPHIC MAP SHOWING
ASHIPPUN LAKE AND MONTEREY DAM

Source: U. S. Geological Survey

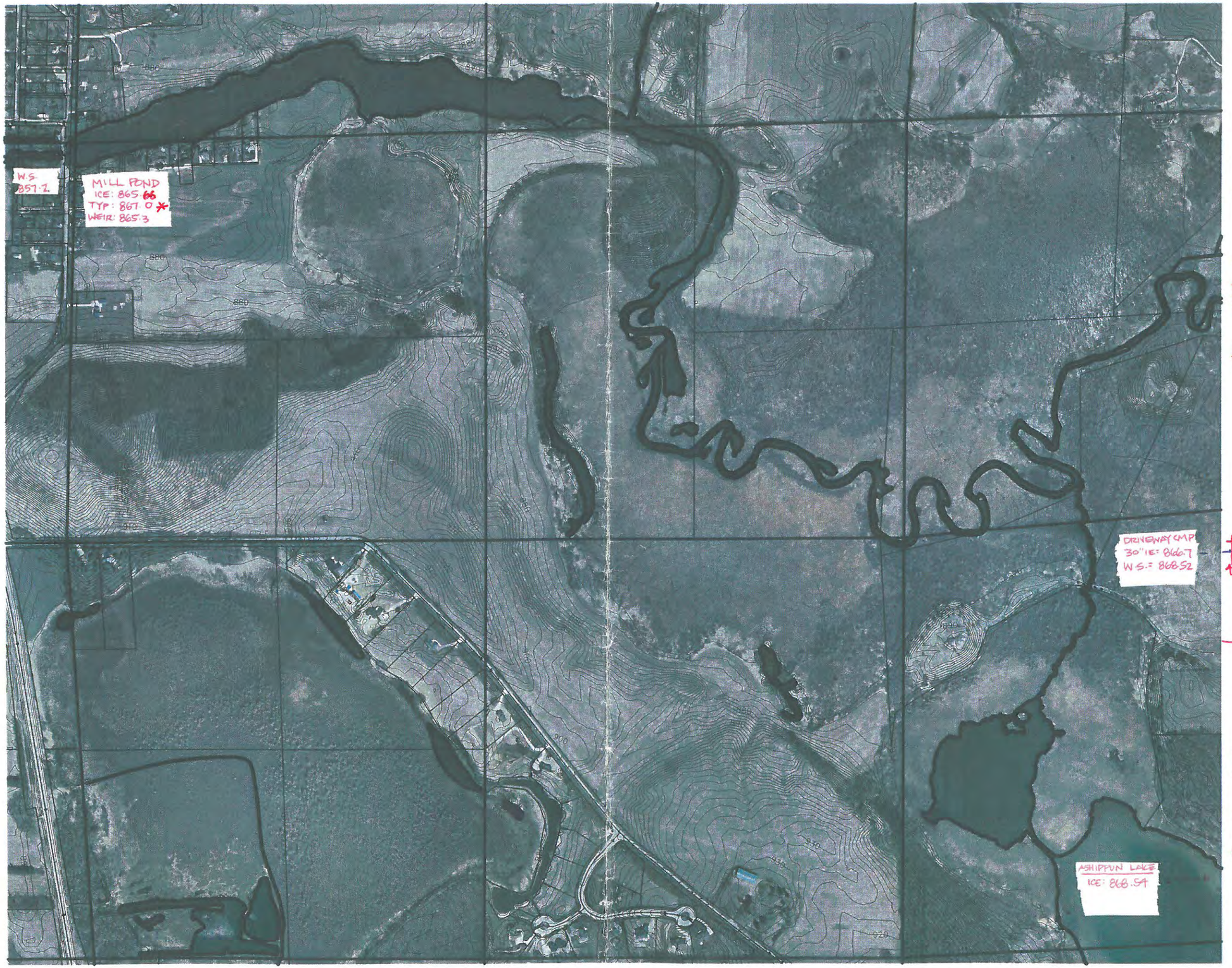
sion, and contributing sediments and nutrients to the lake. During the lake study period, lake level and outlet flow observations made from December 1976 through October 1977, indicated that the flow of water was from Ashippun Lake towards the Ashippun River.

However, analyses conducted by the Regional Planning Commission staff indicate that the Ashippun River could influence the elevation of Ashippun Lake. During normal to low-flow periods, the Monterey Dam does not affect Ashippun Lake water levels, if the dam is operated in accordance with Wisconsin Department of Natural Resources requirements. Because the normal pool level of the Monterey Pool is only one to three feet lower than the normal elevation of Ashippun Lake, during some runoff events the dam—in concert with the natural constrictions in the stream valley—resists the river flow and causes backwater elevations which can induce flow into Ashippun Lake. In an average year, about 126 acre-feet of water may be contributed to Ashippun Lake from the Ashippun River. The water budget shown in Figure 3, which is based on measured data during the study year, does not reflect inflow to the lake from the Ashippun River.

The hydraulic residence time for Ashippun Lake during the study period, which was a year of relatively average precipitation, was approximately 2.3 years. The hydraulic residence time is important in determining the expected response time of the lake to increased or reduced nutrient and other pollutant loadings.

SOIL TYPE AND CONDITIONS

Soil composition, slope, use and management are among the more important factors determining the effect of soils on lake water quality. Major specific soil types were inventoried in the drainage area directly tributary to Ashippun Lake and analyzed in terms of the associated hydrologic characteris-



SADDLEBROOK PLAT

ASH-LAKE: 869.4 sept 1991

LOW 867.7 USGS

HIGH 871.8 USGS

OHWM: 868.7
WDNR Flag: June 2011

MILL POND → LAKE

TYPICAL
868.5 - 867.0 = 1.5 ft.

FEB 08
868.5 - 865.7 = 2.8 ft

866.9 D/S INV.

SURVEYED ELEV.'S
Aug. 2008: 869.1

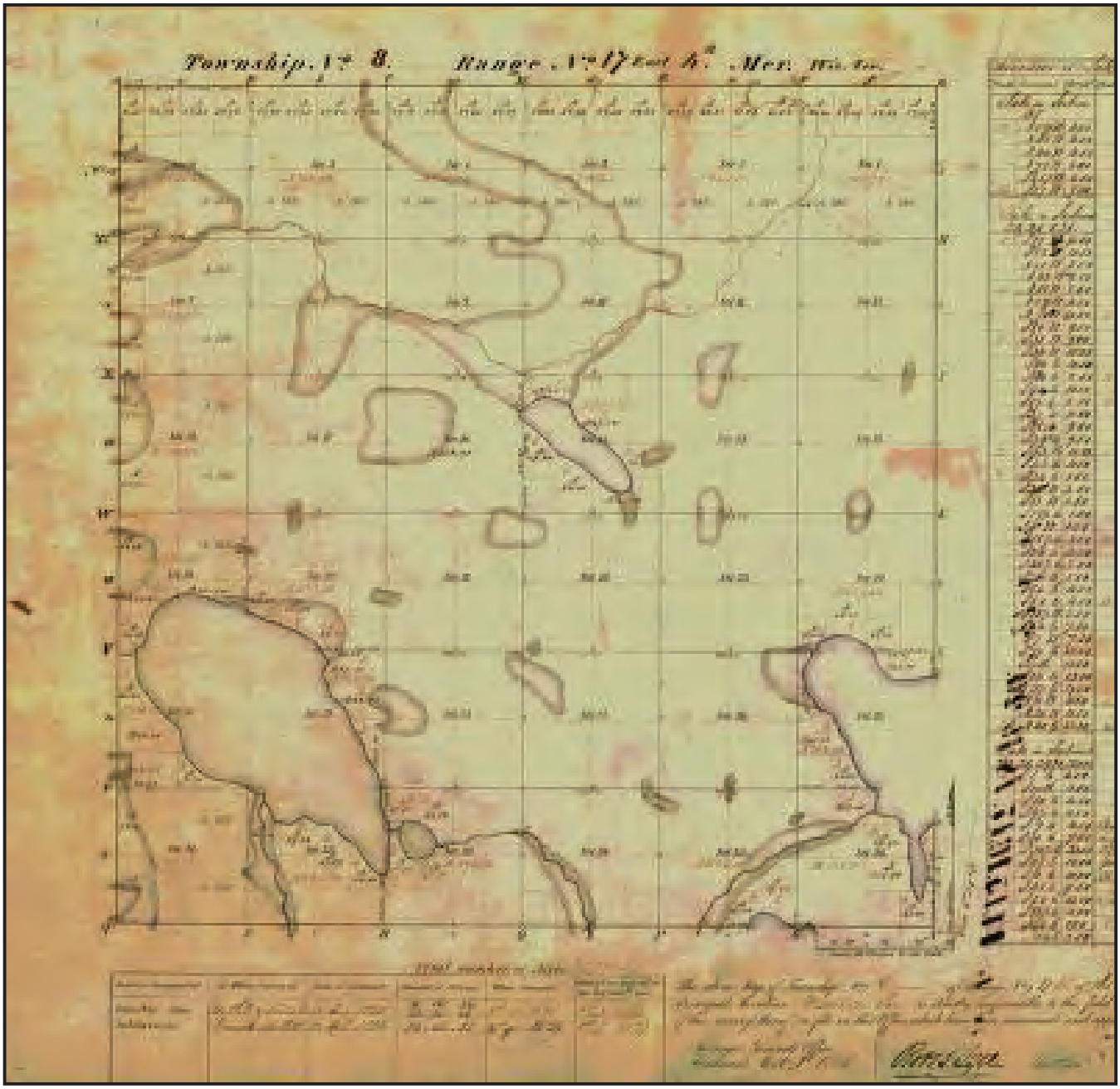
Feb 2008: 868.54
Feb 2011: 868.36
May 12, 2011: 868.31
June 2 2011: 868.29
June 28, 2011: 868.50

ASHIPPUN LAKE
per SEWRPC
WS: 868.25 → 869.5
AVG: 868.5

13052.169

Exhibit 6

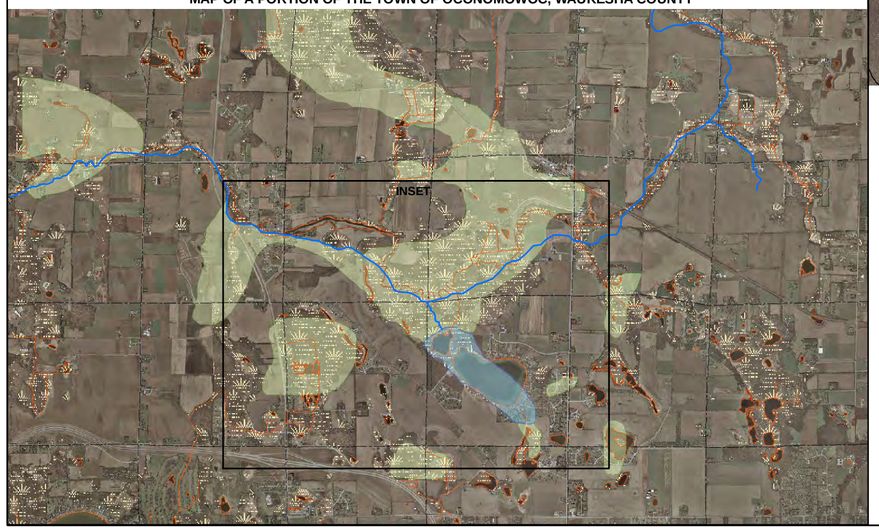
ORIGINAL 1836 PLAT MAP OF A PORTION OF THE TOWN OF OCONOMOWOC, WAUKESHA COUNTY



Source: Wisconsin Board of Commissioners of Public Lands, and the University of Wisconsin Board of Regents.

Exhibit 7

COMPOSITE OVERLAY OF THE 1836 PLAT MAP ONTO THE 2010 AERIAL MAP OF A PORTION OF THE TOWN OF OCONOMOWOC, WAUKESHA COUNTY



INSET

SECTION LINE

2005 APPROXIMATE TOPOGRAPHIC CONTOUR LINE AT TWO FOOT INTERVALS

2010 STREAM LINE

2010 WETLAND AREA

1836 SURFACE WATER

1836 STREAM LINE

1836 WETLAND AREA

Source: Wisconsin Board of Commissioners of Public Lands, and the University of Wisconsin Board of Regents and SEWRPC.

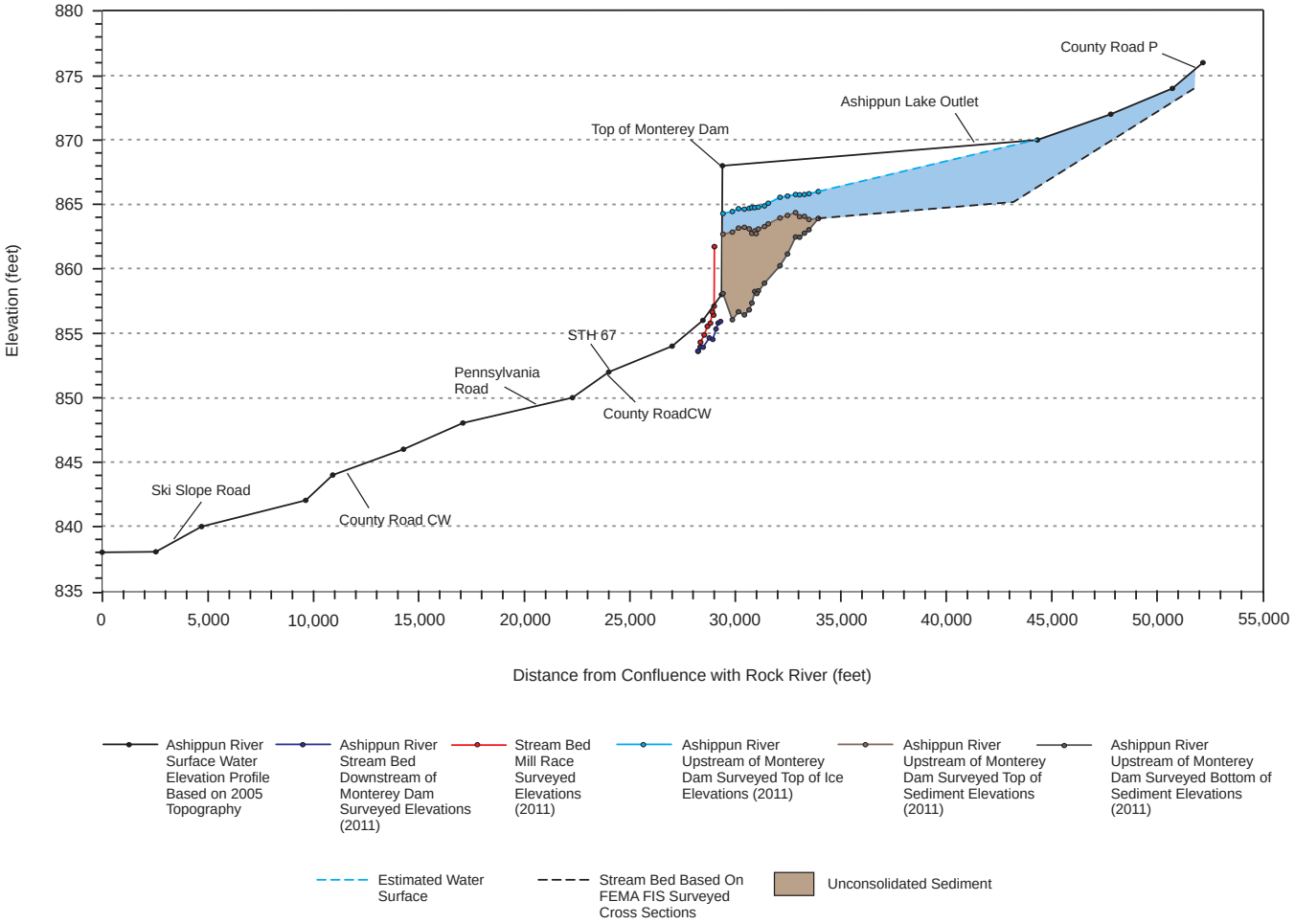
N

0 300 600 900 Feet

DATE OF PHOTOGRAPHY: APRIL 2010

Exhibit 8

APPROXIMATE NORMAL WATER SURFACE ELEVATION PROFILE OF THE ASHIPPUN RIVER (2005) COMPARED TO SURVEYED TOP OF ICE, TOP OF SEDIMENT, AND TOP OF HARD SURFACE ELEVATION PROFILES (2011)



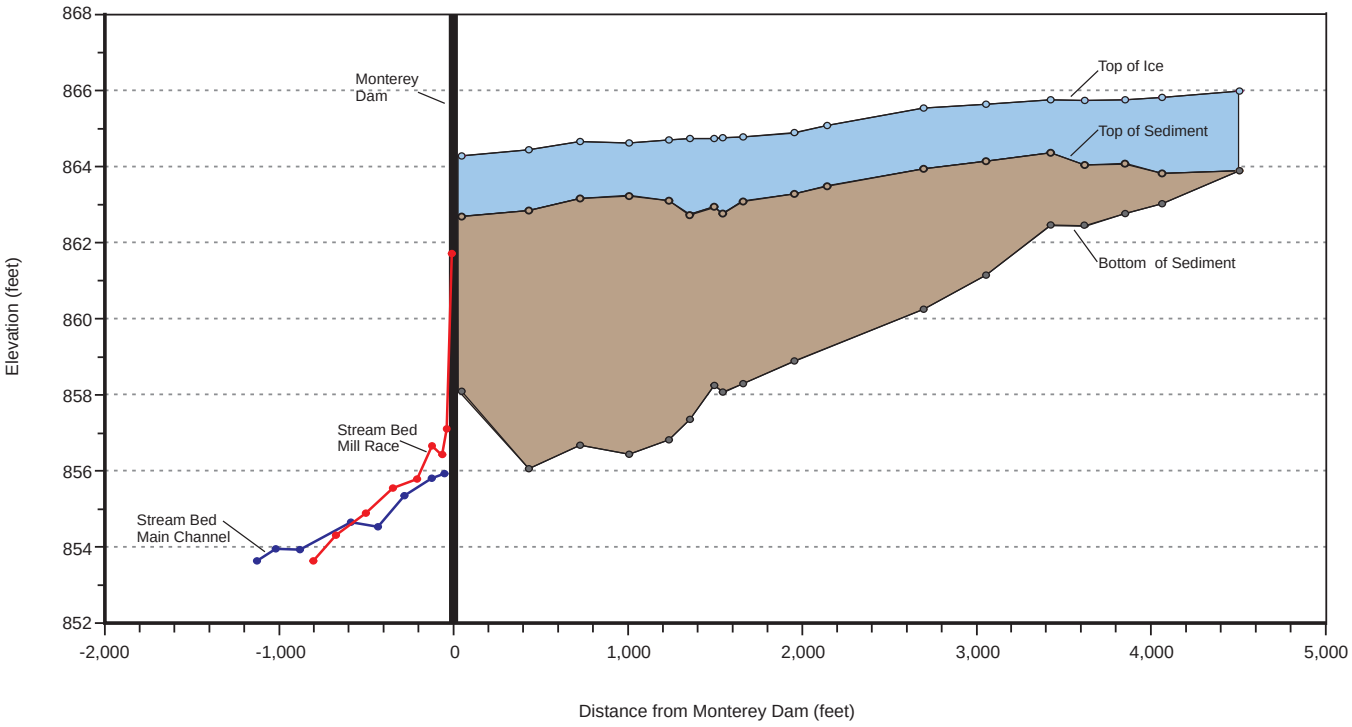
NOTES: Survey was conducted in January 2011.

See Exhibit 10 for location of surveyed cross sections.

Source: SEWRPC.

Exhibit 9

SURVEYED TOP OF ICE, TOP OF SEDIMENT, AND TOP OF HARD SURFACE ELEVATION PROFILES OF MONTEREY MILL POND AREA: 2011



NOTES: Survey was conducted in January 2011.

See Exhibit 10 for location of surveyed cross sections.

Source: SEWRPC.

Exhibit 10

LOCATION OF ASHIPPUN RIVER CROSS SECTIONS SURVEYED BY SEWRPC STAFF: JANUARY 2011

Source: SEWRPC.

Exhibit 11

STREAM REACH CHARACTERISTICS WITHIN THE ASHIPPUN RIVER: 2011

Number	Reaches	Elevation Change (feet)	Stream Length (feet)	Stream Length (miles)	Slope (ft/ft)	Slope (ft/mi)	Sinuosity
1	Confluence with the Rock River to STH 67	12.7	23,952	4.54	0.00053	2.80	1.65
2	STH 67 to about 25 feet down-stream of the Monterey dam	5.22	5,308	1.01	0.00098	5.19	1.38
3	Just upstream Monterey dam to Station #41	1.71	4,507	0.85	0.00038	2.00	1.07
3a	Potential Channel Conditions based upon streambed elevation profile shown in Exhibit 9-post dam removal (About 25 feet downstream of the Monterey Dam to Station #41)	7.91	4,597	0.87	0.00172	9.09	1.09
4	Station #41 to approximately 1,000 feet downstream CTH P	10.17	16,797	3.18	0.00061	3.20	2.73

Source: SEWRPC.

Exhibit 12

PHYSICAL CHARACTERISTICS OF ASHIPPUN RIVER UPSTREAM AND DOWNSTREAM OF MONTEREY DAM: JANUARY 2011

			Bankfull Channel			Low Flow Channel								
				Depth (feet)				Water Depth (feet)		Sediment Depth (feet)				
Description	Transect	Distance from Rock River Confluence (miles)	Width (feet)	Mean	Max	Width (feet)	Width/Mean Depth Ratio	Mean	Max	Mean	Max	Habitat	Ice over Channel	Conditions At Time of Survey
Downstream of Dam	XS 1	4.46	41.5	2.3	2.6	37.3	32.7	1.1	1.4	0.42	0.9	Run	Partial	Downstream-Mapleton Bridge
	XS 2	4.52	23.6	2.5	2.6	21.3	15.9	1.3	1.6	0.24	0.5	Run	Partial	Upstream-Mapleton Bridge & ds Hwy 67 bridge
	XS 3	4.59	36.3	1.7	2.2	29.1	26.5	1.1	1.2	0.10	0.5	Run	Partial	Upstream-Hwy 67 bridge
	XS 4	4.62	22.4	2.1	2.3	20.7	15.4	1.3	1.6	0.00	0.0	Riffle	Partial	Active channel
	XS 5	4.70	- -	- -	- -	37.1	24.4	1.5	1.8	0.00	0.0	Run	Partial	Active channel
	XS 6	4.77	27.1	2.1	2.4	25.5	19.3	1.3	1.6	0.20	0.8	Run	Partial	Active channel
	XS 7	4.86	37.1	1.8	2.0	34.6	35.3	1.0	1.2	0.26	1.0	Run	Partial	Active channel
	XS 8	4.95	24.1	2.0	2.1	21.2	16.8	1.3	1.5	0.00	0.0	Run	Partial	Active channel
	XS 9	5.00	32.1	1.3	1.3	28.2	32.0	0.9	1.0	0.00	0.0	Riffle	Partial	Active channel
	XS 10	5.04	40.1	1.2	1.5	38.2	65.9	0.6	0.8	0.00	0.0	Riffle	Partial	Active channel
	XS 11	5.06	29.8	3.1	3.6	26.2	15.4	1.7	2.3	0.00	0.0	Pool	Partial	Active channel
	XS 12	5.12	33.9	1.9	2.6	31.8	48.2	0.7	1.0	0.00	0.0	Riffle	Partial	Active channel
	XS 13	5.17	39.3	1.8	2.1	37.3	21.9	1.7	2.0	0.18	0.7	Pool	Complete	Active channel
	XS 14	5.23	43.7	2.5	2.9	41.2	28.2	1.5	2.0	0.26	1.2	Run	Complete	Active channel
	XS 15	5.33	37.8	2.3	2.4	36.2	29.0	1.3	1.4	0.10	0.4	Run	Complete	Active channel
	XS 16	5.33	32.3	2.0	2.4	28.7	25.5	1.1	1.6	0.43	1.4	Unknown	Partial	Confluence with Mill race channel
	XS 17	5.35	36.9	2.0	2.2	35.8	28.0	1.3	1.6	0.18	0.6	Unknown	Partial	Not flowing-ds Monterey Dam
	XS 18	5.38	35.1	1.3	1.4	33.3	- -	- -	- -	0.46	0.9	Unknown	Partial	Not flowing-ds Monterey Dam
	XS 19	5.44	24.4	2.5	2.6	18.2	- -	- -	- -	0.00	0.0	Unknown	Partial	Not flowing-ds Monterey Dam
	XS 20	5.46	40.3	1.5	2.1	34.2	- -	- -	- -	0.06	0.2	Unknown	Partial	Not flowing-ds Monterey Dam
	XS 21	5.49	35.6	1.5	1.7	26.1	- -	- -	- -	0.00	0.0	Unknown	Partial	Not flowing-ds Monterey Dam
	XS 22	5.51	- -	- -	- -	- -	- -	- -	- -	- -	- -	Unknown	Partial	Not flowing-ds Monterey Dam
	XS 23	5.54	52.3	1.2	1.4	41.4	- -	- -	- -	0.04	0.2	Unknown	Partial	Not flowing-ds Monterey Dam
Subtotal	Minimum	- -	22.4	1.2	1.3	18.2	15.4	0.6	0.8	0.0	0.0	- -	- -	- -
	Maximum	- -	52.3	3.1	3.6	41.4	65.9	1.7	2.3	0.5	1.4	- -	- -	- -
	Mean	- -	34.6	1.9	2.2	31.1	28.3	1.2	1.5	0.1	0.4	- -	- -	- -
Upstream of Dam	XS 24	5.60	- -	- -	- -	45.0	33.7	1.3	1.6	6.55	7.2	Unknown	Complete	Active channel
	XS 25	5.64	- -	- -	- -	50.0	36.5	1.4	1.6	6.73	7.2	Unknown	Complete	Active channel
	XS 26	5.70	- -	- -	- -	65.0	46.4	1.4	1.5	5.40	6.5	Unknown	Complete	Active channel
	XS 27	5.75	- -	- -	- -	65.0	44.8	1.5	1.6	6.05	6.8	Unknown	Complete	Active channel
	XS 28	5.79	- -	- -	- -	75.0	56.6	1.3	1.7	6.08	6.3	Unknown	Complete	Active channel
	XS 29	5.83	- -	- -	- -	75.0	50.0	1.5	2.0	5.33	5.6	Unknown	Complete	Active channel
	XS 30	5.85	- -	- -	- -	65.0	40.6	1.6	2.0	4.60	5.0	Unknown	Complete	Active channel
	XS 31	5.87	- -	- -	- -	90.0	62.8	1.4	2.0	5.20	6.2	Unknown	Complete	Active channel
	XS 32	5.90	- -	- -	- -	50.0	34.9	1.4	1.7	4.80	4.8	Unknown	Complete	Active channel
	XS 33	5.93	- -	- -	- -	60.0	36.7	1.6	1.8	4.23	4.4	Unknown	Complete	Active channel
	XS 34	5.96	- -	- -	- -	55.0	31.1	1.8	1.9	0.97	1.8	Unknown	Complete	Active channel
	XS 35	6.07	- -	- -	- -	55.0	33.8	1.6	1.9	3.10	3.7	Unknown	Complete	Active channel
	XS 36	6.14	- -	- -	- -	65.0	36.6	1.8	2.3	2.63	3.0	Unknown	Complete	Active channel
	XS 37	6.21	- -	- -	- -	55.0	29.7	1.9	2.2	1.25	1.9	Unknown	Complete	Active channel
	XS 38	6.24	- -	- -	- -	60.0	34.3	1.8	2.1	1.45	1.6	Unknown	Complete	Active channel
	XS 39	6.29	- -	- -	- -	40.0	21.6	1.9	2.4	1.10	1.7	Unknown	Complete	Active channel
	XS 40	6.33	- -	- -	- -	45.0	19.3	2.3	2.5	0.57	0.8	Unknown	Partial	Active channel
	XS 41	6.41	- -	- -	- -	45.0	22.8	2.0	2.2	0.23	0.9	Unknown	Partial	Active channel
Subtotal	Minimum	- -	- -	- -	- -	40.0	19.3	1.3	1.5	0.20	0.8	- -	- -	- -
	Maximum	- -	- -	- -	- -	90.0	62.8	2.3	2.5	6.70	7.2	- -	- -	- -
	Mean	- -	- -	- -	- -	58.9	37.4	1.6	1.9	3.70	4.2	- -	- -	- -

Source: SEWRPC.

Exhibit 13

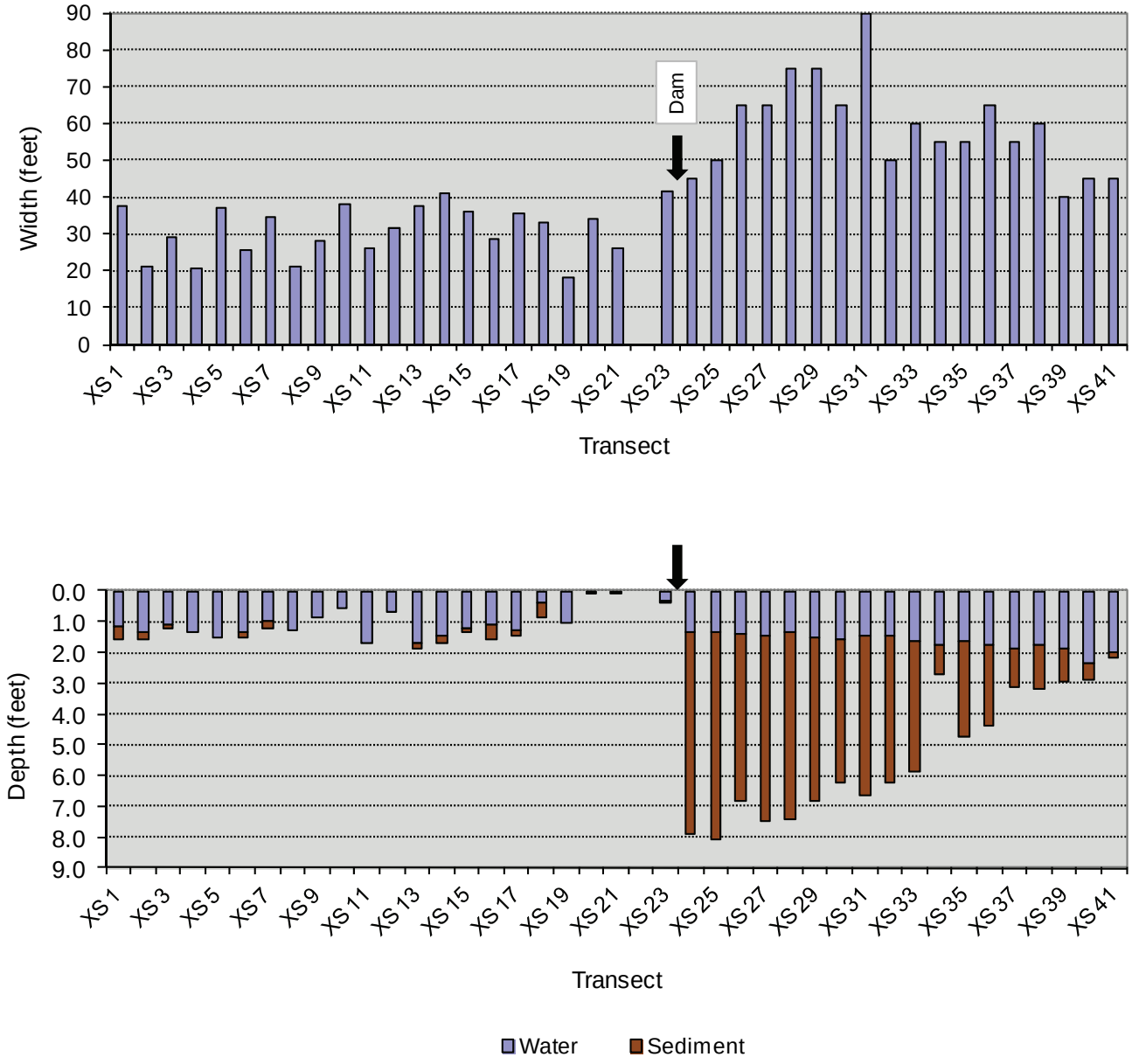
ENDANGERED, THREATENED, AND SPECIES OF SPECIAL CONCERN AND MUSSEL SPECIES LIST WITHIN THE ASHIPPUN RIVER WATERSHED: 1923-2011

Group	Scientific Name	Common Name	State	SRank	GRank	Date
Bird	Nycticorax nycticorax	Black-crowned night-heron	SC/M	S2B	G5	1978
Community	Southern mesic forest	Southern mesic forest	NA	S3	G3	1978
	Emergent marsh	Emergent marsh	NA	S4	G4	1992
	Southern tamarack swamp (rich)	Southern tamarack swamp (rich)	NA	S3	G3	1992
Plant	*Calamagrostis stricta*	Slim-stem small-reedgrass	SC	S3	G5	1929
	Cypripedium reginae	Showy lady's-slipper	SC	S3	G4	1984
Fish	*Etheostoma clarum*	Western sand darter	SC/N	S3	G3	1923
	Etheostoma microperca	Least darter	SC/N	S3	G5	1975
	Noturus exilis	Slender madtom	END	S2	G5	1960
	Opsopoeodus emiliae	Pugnose minnow	SC/N	S3	G5	1923
Herptile	*Acris crepitans blanchardi*	Blanchard's cricket frog	END	S1	G5T5	1927
	Emydoidea blandingii	Blanding's turtle	THR	S3	G4	1979
Invertebrate	*Lasmigona compressa*	Creek heelsplitter	NA	NA	NA	NA
	Anodontoides ferussacianus	Cylindrical papershell	NA	NA	NA	NA
	Alasmidonta marginata	Elktoe	NA	NA	NA	NA
	Venustaconcha ellipsiformis	Ellipse	THR	S2	G3G4	1974
	Lampsilis siliquoidea	Fatmucket	NA	NA	NA	NA
	Pyganodon grandis	Giant floater	NA	NA	NA	NA
	Lampsilis cardium	Plain pocketbook	NA	NA	NA	NA
	Villosa iris	Rainbow shell	NA	NA	NA	NA
	Pleurobema sintoxia	Round pigtoe	NA	NA	NA	NA
	Alasmidonta viridis	Slippershell mussel	NA	NA	NA	NA
	Elliptio dilatata	Spike	NA	NA	NA	NA
	Strophitus undulatus	Squawfoot	NA	NA	NA	NA
	Amblema plicata	Three-ridge	NA	NA	NA	NA
	Fusconaia flava	Wabash pigtoe	NA	NA	NA	NA
	Lasmigona complanata	White heelsplitter	NA	NA	NA	NA

Source: National Heritage Inventory and Wisconsin Department of Natural Resources.

Exhibit 14

WATER SURFACE WIDTH, MEAN WATER DEPTH, AND MEAN SEDIMENT DEPTH AMONG TRANSECTS UPSTREAM AND DOWNSTREAM OF THE MONTEREY DAM WITHIN THE ASHIPPUN RIVER: JANUARY 2011

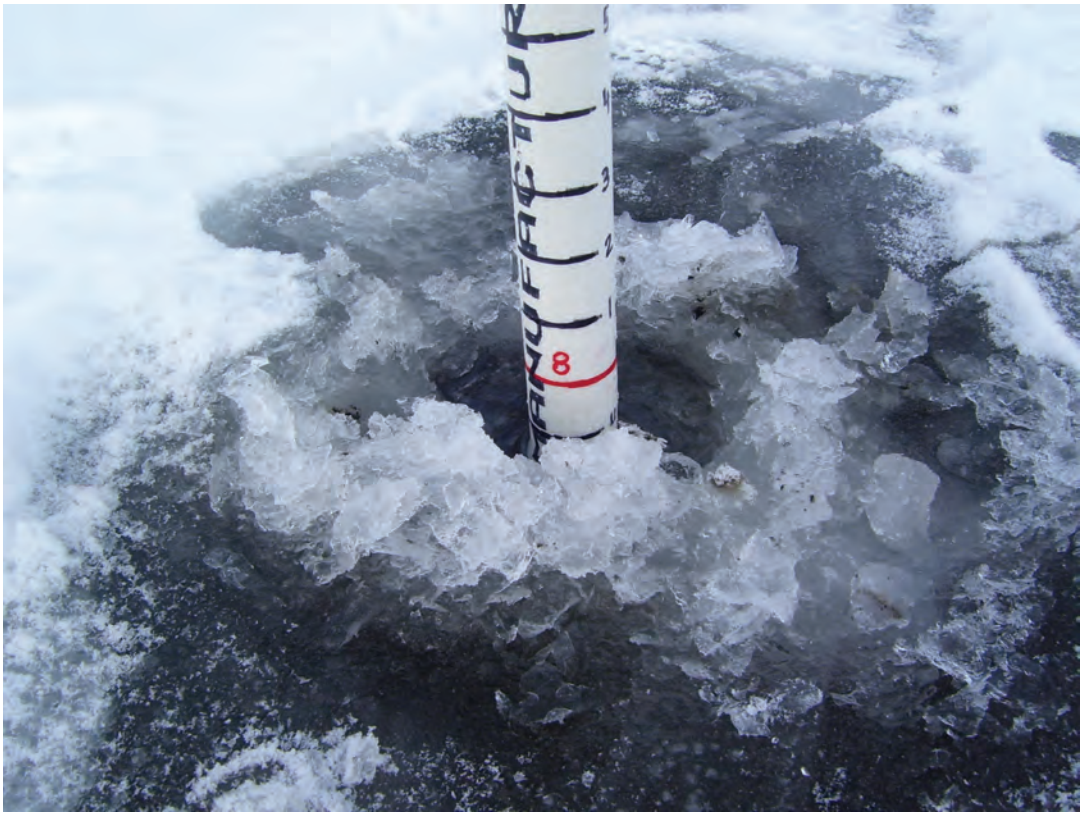


NOTE: Due to the diversion of water from the Monterey Dam spillway to the mill race, water depths in transects 20 through 23 were low in this area because water was not flowing through this section of channel at the time of this survey.

Source: SEWRPC.

Exhibit 15

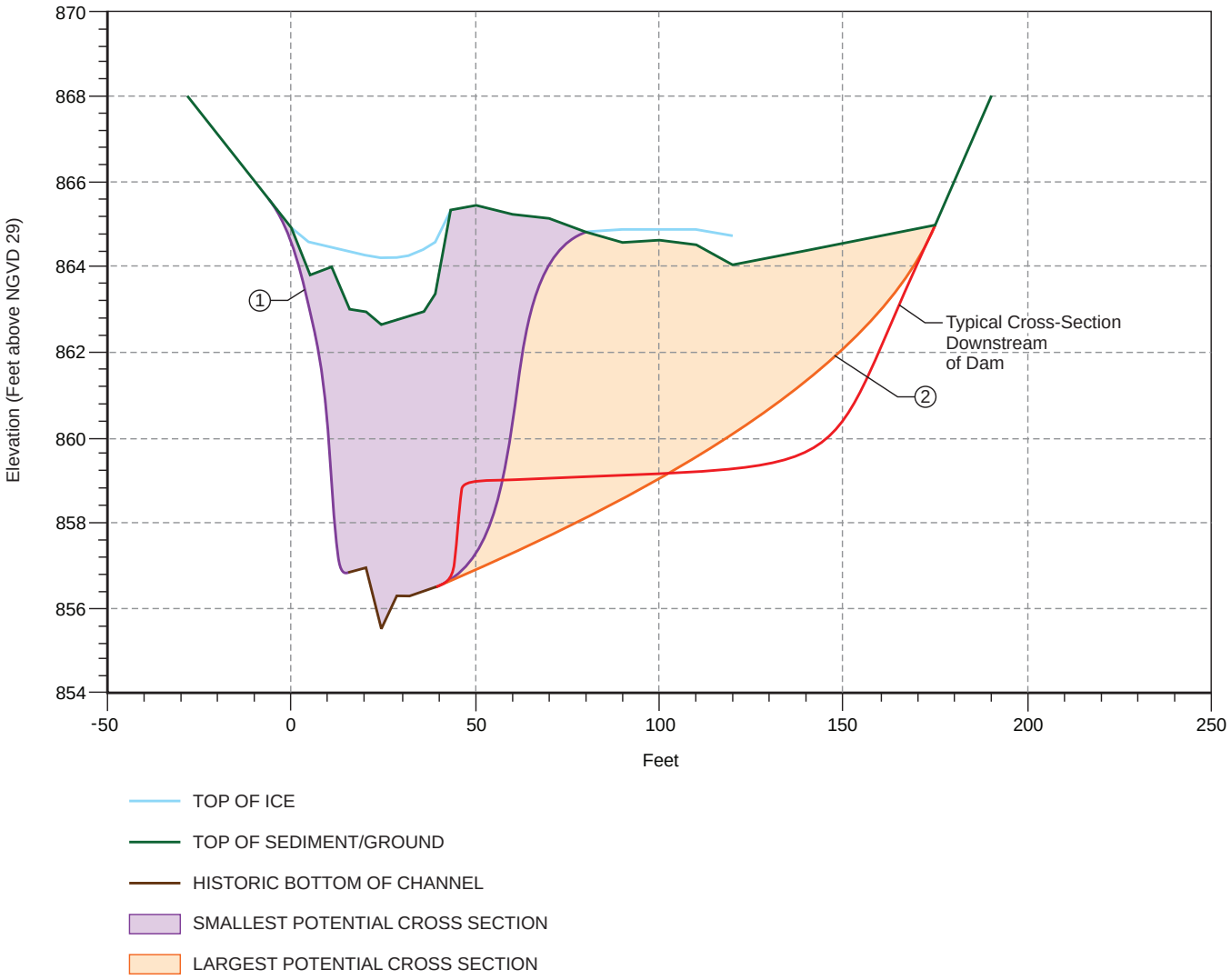
SEDIMENT DEPTH MEASUREMENT WITHIN THE MONTEREY DAM IMPOUNDMENT: JANUARY 2011



Source: SEWRPC.

Exhibit 16

MILL POND SEDIMENT CROSS SECTIONS



NOTE: The top of ice and top of sediment/ground cross sections are approximately 200 feet upstream of Monterey dam, looking upstream.

Source: SEWRPC.

Exhibit 17

Information for File # 2010-05027-DJP

Applicant: Town of Oconomowoc

Corps Contact: Dale Pfeiffle

Address: U.S. Army Corps of Engineers

20711 Watertown Road, Suite F

Waukesha, Wisconsin 53186

E-Mail: dale.j.pfeiffle@usace.army.mil

Phone: (262) 717-9345 ext. 2

Primary County: Waukesha

Section: NE ¼, SE ¼, Sec. 8

Township: 8 North

Range: 17 East

Information Complete On: April 1, 2011

Posting Expires On: May 2, 2011

Authorization Type

This application is being reviewed in accordance with the practices for documenting Corps jurisdiction under Sections 9 & 10 of the Rivers and Harbor Act of 1899 and Section 404 of the Clean Water Act identified in Regulatory Guidance Letter 07-01. We have made a preliminary determination that the aquatic resources that would be impacted by the proposed project are regulated by the Corps of Engineers under Section 404 of the Clean Water Act. Our jurisdictional review and final jurisdictional determination could result in modifications to the scope of the project's regulated waterbody/wetland impacts and compensatory mitigation requirements identified above. An approved jurisdictional determination will be made prior to reaching a permit decision, and will be posted on the St. Paul District web page at http://www.mvp.usace.army.mil/.

Project AFTER-THE-FACT APPLICATION? NO.

PROJECT INVOLVES:

FEDERALTHREATENED OF ENDANGERED SPECIES? NO.

TRIBAL TRUST OR OTHER RESOURCES? NO.

A LISTED STATE-IMPAIRED WATER? NO.
FEMA 100-YEAR FLOODPLAIN? NO.
COASTAL RIDGE&SWALE COMPLE? NO.
MINK, KAKAGON OR BAD RIVER? NO.
PLEASANT PRAIRIE ADID? NO.

PROJECT DESCRIPTION AND PURPOSE: The Monterey Dam is an earthen and concrete dam constructed prior to 1848. Per Wisconsin Department of Natural Resources (WDNR) records (Wisconsin Lakes, PUB-FH-800 2005) the Monterey Dam (the dam) millpond covered approximately 28 acres and had a maximum depth of approximately 8 feet with an average depth of 3 feet. In August, 2007, WDNR inspected the dam and observed seepage. WDNR determined that the dam was unsafe and ordered the applicant to drawdown the impoundment. The WDNR order also required the applicant to either repair or remove the dam. In June, 2009, the applicant submitted a request to abandon and remove the dam. As part of the dam removal project, the applicant also proposes to restore approximately 290 lineal feet of the Ashippun River channel upstream of the dam.

The applicant proposes to sequence construction activities as follows:

1. Construct rock bag sediment traps in downstream raceway.
2. Construct a temporary bypass channel directing flow through the raceway.
3. Install silt fence at all locations except the temporary bypass channel.
4. Remove the dam and bridge and stockpile demolition materials.
5. Excavate the permanent replacement channel.
6. Divert flow from bypass channel into the permanent channel.
7. Install remaining silt fence.
8. Backfill remaining roadway embankments and sheet pile walls.
9. Bury stockpiled materials in raceway outside of roadway.
10. Construct roadway.
11. Complete abandonment of raceway.
12. Restore the site with topsoil, seed, mulch, and erosion mat.

The project would also result in the removal of the Mill Street Bridge which is interconnected with the dam. The replacement of the Mill Street Bridge is expected to impact approximately 0.1 acre of wetlands adjacent to the Ashippun River. The Corps will review the bridge replacement project and its associated impacts under a separate application.

For projects involving historic dams, the Corps of Engineers typically considers the upstream hydrology resulting from the impoundment of waters as the baseline condition. In this case the dam was constructed in 1848 and the resulting 28 acre millpond established the baseline condition. The 2007 WDNR ordered drawdown lowered water levels and eliminated most of the 28 acre millpond. The WDNR drawdown order prohibits the applicant from re-establishment of the millpond unless the dam is repaired. Since the applicant will not pursue repairing the dam, the current upstream conditions

resulting from the ordered drawdown have become permanent and therefore, established a "new" baseline condition. The Corps evaluation of impacts to waters of the United States associated with the dam removal project will be based npon the current baseline conditions that resulted from the drawdown.

NAME, AREA AND TYPES OF WATERS (INCLUDING WETLANDS) SUBJECT TO LOSS: The project would result in a discharge dredged and fill materials in approximately 0.75 acre of the Ashippun River and its adjacent wetlands for the purpose of demolishing and removing the Monterey Dam and restoring the Ashippun River to its natural channel. Discharges of dredged or fill materials associated with the project include the filling of the raceway, abandoned channel segments, grading within the drained impoundment associated with the redistribution and stabilization of sidecast dredged materials or seeding preparation, installation of rock bag sediment traps, installation of stone ditch checks, and riprap. The impacted wetlands consist of fresh wet meadow and shallow marsh plant communities with species such as reed canary grass, cattail, and purple loosestrife, With the exception of the raceway fill (0.01 acre) and riprap bank stabilization, the impacts to the Ashippun River and its adjacent wetlands would be temporary.

ALTERNATIVES CONSIDERED: Under the WDNR Order, the applicant was provided with an option to complete repairs to the dam and reestablish the millpond. The applicant obtained an estimate that the restoration of the dam would cost approximately $780,000 compared to a cost of approximately $240,000 to remove the dam and restore the Ashippun River channel. The applicant determined that the alternative to repair the dam was cost prohibitive.

The applicant also considered the no action alternative. Under this alternative the dam would not be upgraded, would continue to deteriorate, and would continue to violate the WDNR order. After evaluating the environmental and public safety issues associated with an uncontrolled or catastrophic event resulting in dam failure, the no action alternative was dropped from further consideration.

MINIMIZATION: Projects involving the removal of historic dams often result in a large quantity of accumulated sediments being transported and deposited within downstream waters. Field investigations indicate that the accumulated millpond sediment extends up to 2000 feet upstream of the dam. The applicant has estimated that approximately 2000 cubic yards of accumulated sediments would be susceptible to being transported downstream.

The applicant proposes to minimize the volume of the downstream transport of accumulated sediment by diverting the Ashippun River channel through the existing raceway located north of the dam's spillway while work is completed to establish the permanent channel. To manage accumulated sediment the banks of the temporary diversion channel would be protected with a poly liner, the bed of the channel would be lined with a 12 inch layer of light riprap, and four rock bag sediment traps would be

installed in the raceway channel. Prior to receiving flow from the diversion channel, the permanent channel and the adjacent disturbed areas would be protected with erosion mat, silt fence, and riprap ditch checks.

COMPENSATORY MITIGATION: The project would result in minimal permanent impacts from the dredging, grading, and filling activities associated with the relocation of the existing river channel and adjacent wet meadow wetlands within the former millpond area. Since the permanent wetland impacts are minor and the project is not expected to result in a net loss of wetlands, compensatory mitigation would not be required.

Drawings See attached.

PROJECT ID: 3852-02-76
WITH: N/A
COUNTY: WAUKESHA

ORDER OF SHEETS

TOTAL SHEETS =

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

PLAN OF PROPOSED IMPROVEMENT

MILL STREET
(BRIDGE OVER ASHIPPUN RIVER)

LOCAL ROAD
WAUKESHA COUNTY

STATE PROJECT	FEDERAL PROJECT	
	PROJECT	CONTRACT
3852-02-76		

2010-5027-DJP
Page 1 of 13

STATE PROJECT NUMBER
3852-02-76

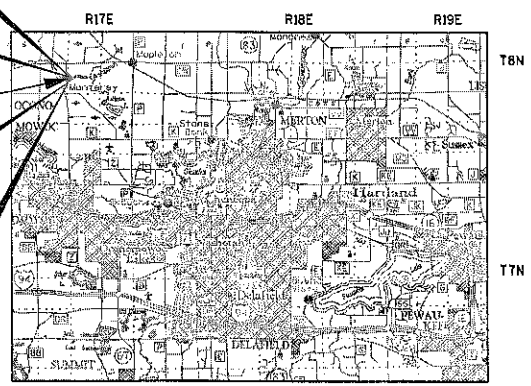
END CONSTRUCTION
STA. 21+96.00

END PROJECT
STA. 21+50.00

STRUCTURE B-67-0004

BEGIN PROJECT
STA. 18+50.00
X=2,400,211.98
Y=430,608.05

BEGIN CONSTRUCTION
STA. 18+15.00



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DESIGN DESIGNATION

A.A.D.T. (2011)	=	335
A.A.D.T. (2031)	=	430
D.H.V. (2031)	=	65
D.D.	=	62/38
T. (A.D.T.)	=	3.5%
DESIGN SPEED	=	30 MPH
ESALS	=	29,200

CONVENTIONAL SYMBOLS

PLAN
- CORPORATE LIMITS
- PROPERTY LINE
- LOT LINE
- LIMITED HIGHWAY EASEMENT
- EXISTING RIGHT OF WAY
- PROPOSED OR NEW R/W LINE
- SLOPE INTERCEPT
- REFERENCE LINE
- EXISTING CULVERT
- PROPOSED CULVERT (Box or Pipe)
- COMBUSTIBLE FLUIDS (CAUTION)
- MARSH AREA
- WOODED OR SHRUB AREA

PROFILE
- GRADE LINE
- ORIGINAL GROUND
- MARSH OR ROCK PROFILE (To be noted as such)
- SPECIAL DITCH
- GRADE ELEVATION (95.36)
- CULVERT (Profile View)

UTILITIES
- ELECTRIC (E)
- FIBER OPTIC (FO)
- GAS (G) (SIZE)
- SANITARY SEWER (SAN) (SIZE)
- STORM SEWER (SS) (SIZE)
- TELEPHONE (T)
- WATER (W) (SIZE)
- UTILITY PEDESTAL
- POWER POLE
- TELEPHONE POLE

LAYOUT
SCALE 0 2 MI.

TOTAL NET LENGTH OF CENTERLINE = 0.057 MI. (RURAL)

COORDINATES ON THIS PLAN ARE REFERENCED TO THE WISCONSIN STATE PLANE COORDINATE SYSTEM (WSPCS), SOUTH ZONE (NAD27) A CONCRETE MONUMENT WITH SERRPC BRASS CAP, THE POINT BEING THE NORTH 1/4 CORNER, SECTION 8, T8N, R17E, TOWN OF OCONOMOWOC, WAUKESHA CO. WI

ACCEPTED FOR

TOWN of OCONOMOWOC

(Date) (Signature & Title of Official)

ORIGINAL PLAN PREPARED BY:

BAXTER WOODMAN Consulting Engineers

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

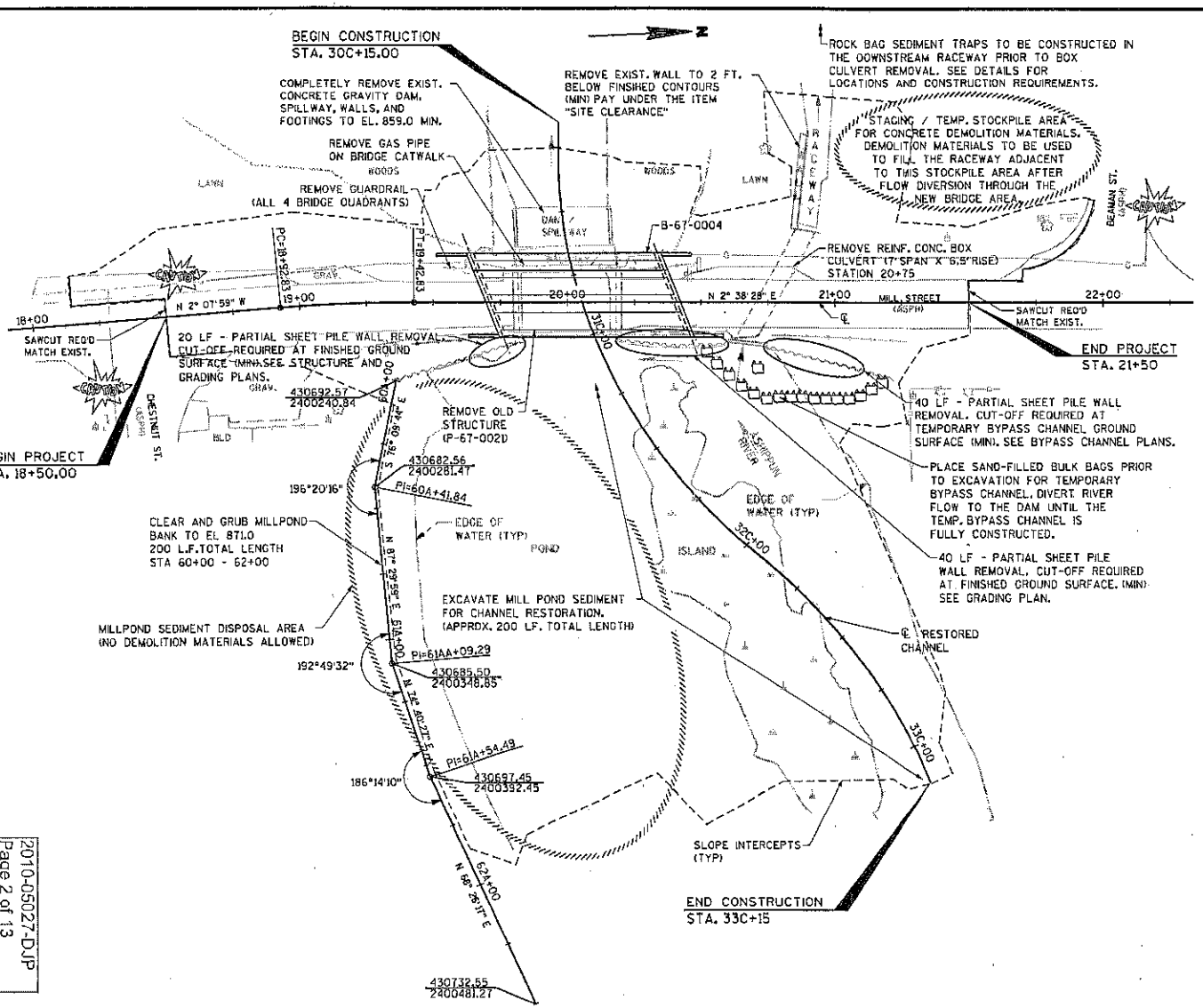
PREPARED BY

Surveyor	BAXTER & WOODMAN, INC.
Designer	BAXTER & WOODMAN, INC.
Management Consultant	DAAR ENGINEERING, INC.
C.O. Examiner	

APPROVED FOR THE DEPARTMENT

DATE: _____ (Management Consultant Signature)

E



PLANNED CONSTRUCTION SEQUENCE

CONSTRUCT ROCK BAG SEDIMENT TRAPS IN DOWNSTREAM RACEWAY.

PLACE SAND-FILLED BULK BAGS TO DIVERT RIVER FLOW TO THE DAM.

REMOVE RACEWAY BOX CULVERT AND STOCKPILE BOX CULVERT DEMOLITION MATERIALS.

CONSTRUCT TEMPORARY BYPASS CHANNEL.

INSTALL SILT FENCE AT ALL LOCATIONS EXCEPT TEMPORARY BYPASS CHANNEL.

DIVERT FLOW TO THE TEMPORARY BYPASS CHANNEL.

REMOVE BRIDGE AND DAM. STOCKPILE DEMOLITION MATERIALS.

CONSTRUCT NEW BRIDGE.

EXCAVATE RESTORED CHANNEL.

DIVERT CHANNEL FLOW INTO RESTORED CHANNEL.

INSTALL REMAINING SILT FENCE.

BACKFILL REMAINING ROADWAY EMBANKMENTS AND SHEET PILE WALLS.

BURY STOCKPILED DEMOLITION MATERIALS IN RACEWAY OUTSIDE OF ROADWAY.

CONSTRUCT ROADWAY.

COMPLETE ABANDONEMENT OF RACEWAY.

RESTORE SITE TOPSOIL, SEED, MULCH AND EROSION MAT.

NOTES

EROSION CONTROL ITEMS TO BE CONSTRUCTED PRIOR TO REMOVALS AND EXCAVATION.

REMOVALS SHOWN ON THIS SHEET ARE NOT ALL INCLUSIVE. THERE MAY BE OTHER REMOVALS REQUIRED THAT ARE SHOWN ELSEWHERE IN THE PLANS.

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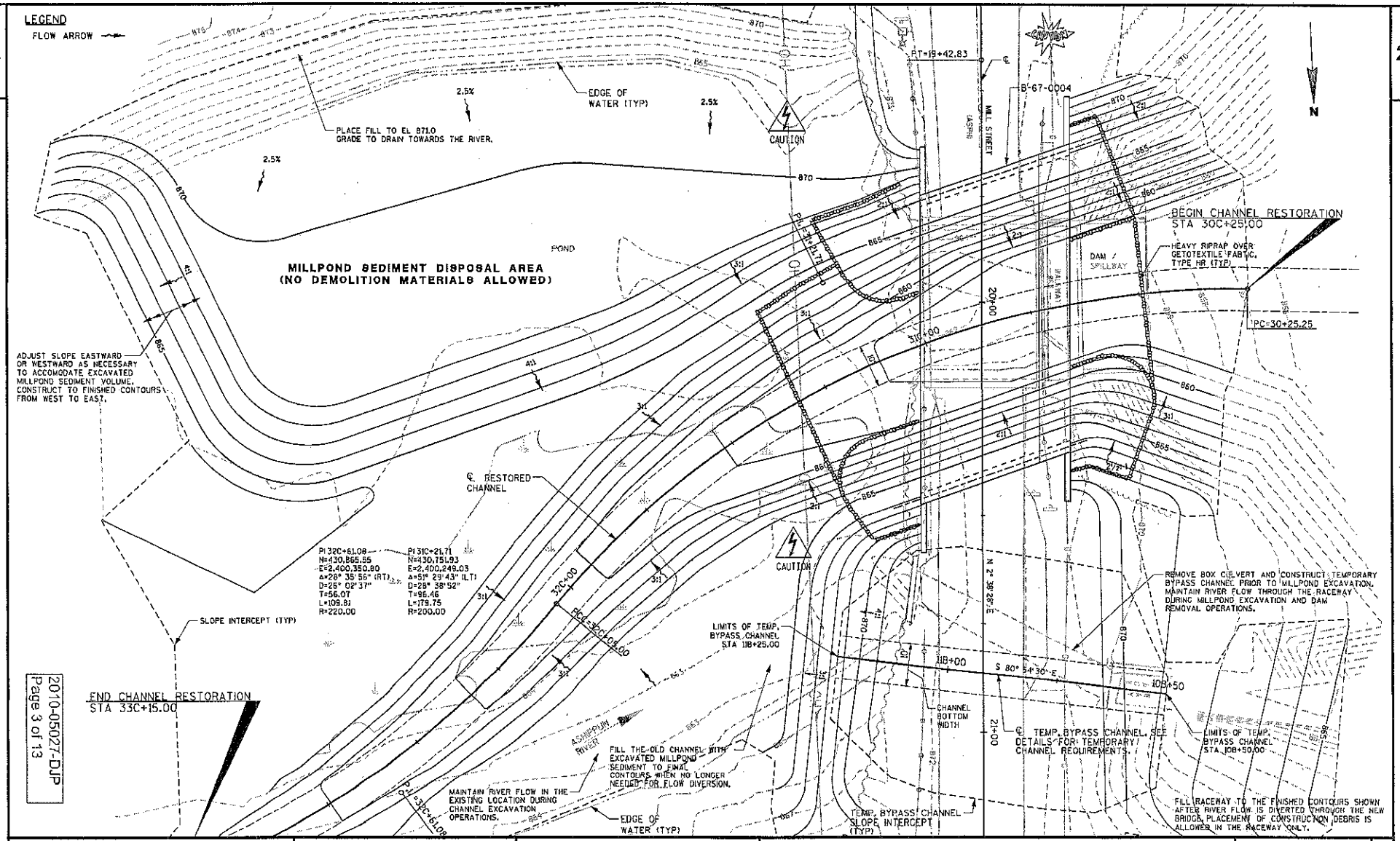
PROJECT NO: 3852-02-76	HWY: MILL STREET	COUNTY: WAUKESHA	REMOVAL PLAN	SHEET E

I:\MADISON\W\DOT\IC0277\CADD-SURVEY\DRAWINGS\DGNS\REMOVALS.DGN 3/21/2011 3:08:17 PM



2010-05027-DJP
Page 3 of 13

PROJECT NO: 3852-02-76	HWY: MILL STREET	COUNTY: WAUKESHA	GRADING PLAN - FINISHED CONTOURS	SHEET	E

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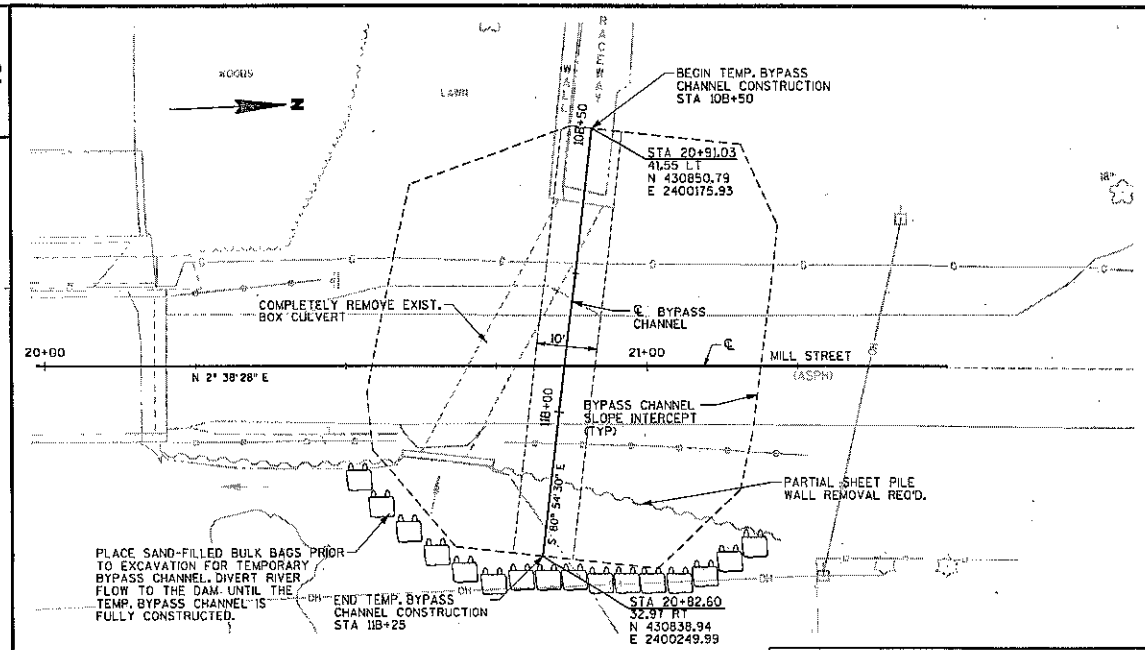
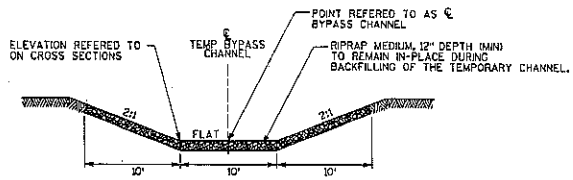
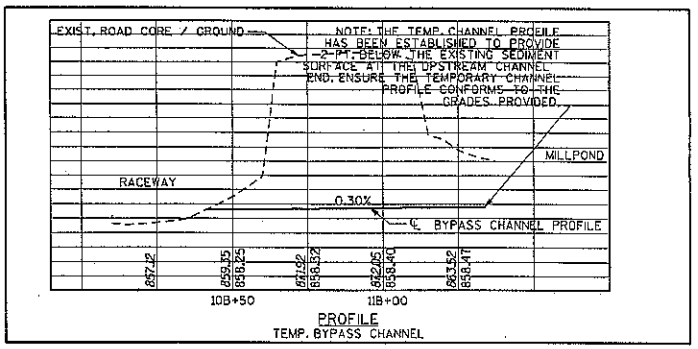
WISDOT/CADDS SHEET 42



PLAN
TEMP. BYPASS CHANNEL
(STA 10B+50 - 11B+25)

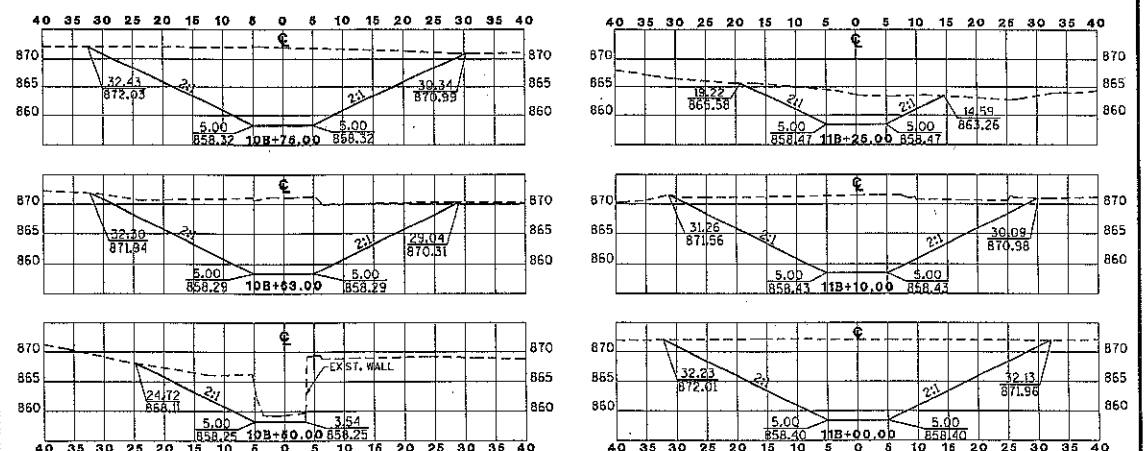


TYPICAL SECTION
TEMP. BYPASS CHANNEL

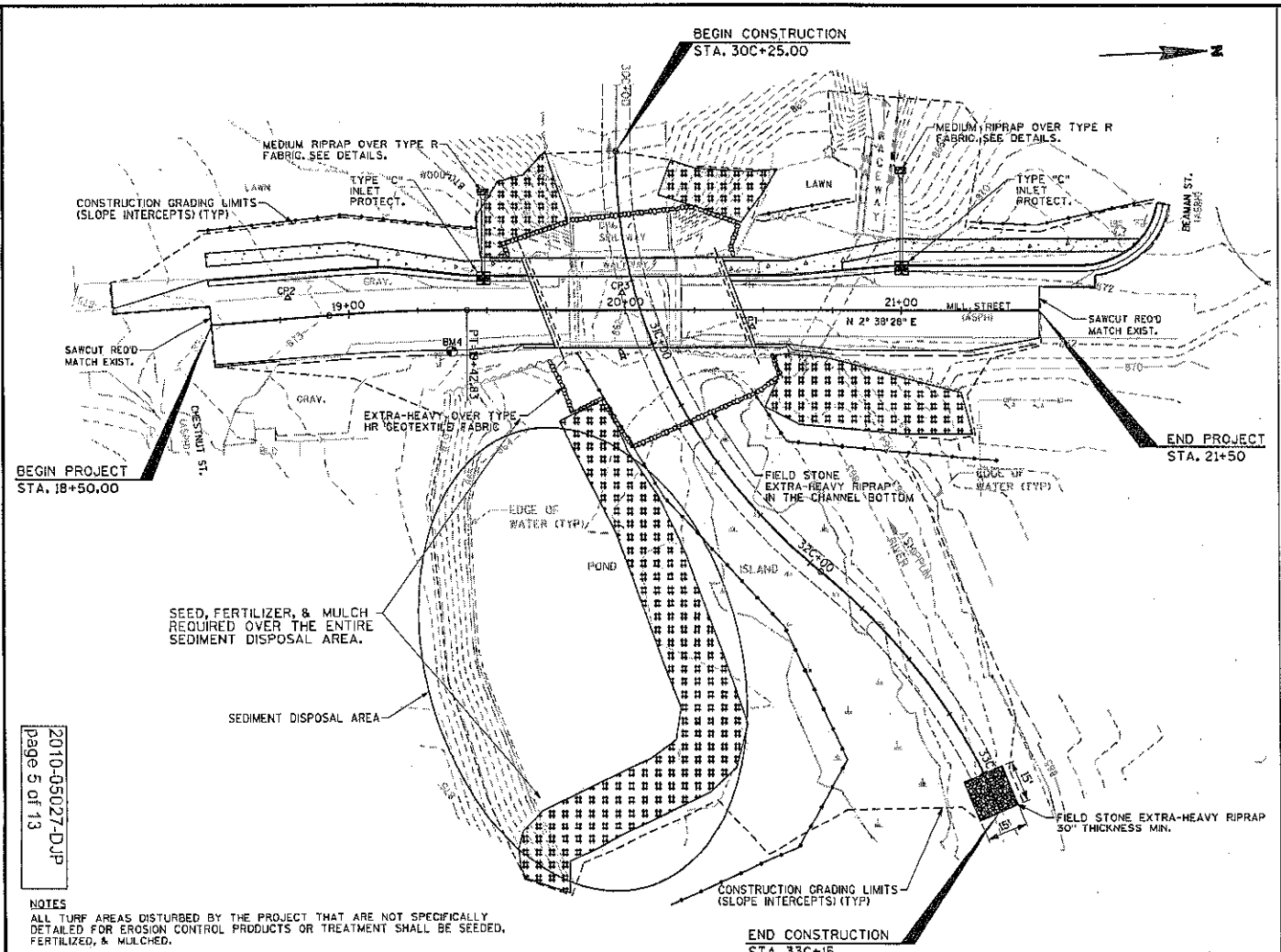


PROFILE
TEMP. BYPASS CHANNEL

TEMP. BYPASS CHANNEL - CROSS SECTIONS

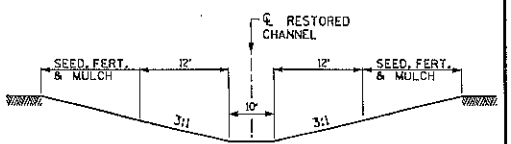


PROJECT NO: 3852-02-76	HWY: MILL STREET	COUNTY: WAUKESHA	DETAILS - CHANNEL BYPASS	SHEET E



LEGEND

- EROSION MAT CLASS I, TYPE B
- SILT FENCE
- EROSION BALE
- RIPRAP
- SLOPE INTERCEPT
- SHEET PILING
- INLET PROTECTION
- SURFACE WATER FLOW



TYP. RESTORED CHANNEL SECTION
(STA 30C+25 - 33C+15)

NOTES
ALL TURF AREAS DISTURBED BY THE PROJECT THAT ARE NOT SPECIFICALLY DETAILED FOR EROSION CONTROL PRODUCTS OR TREATMENT SHALL BE SEEDED, FERTILIZED, & MULCHED.

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page 5 of 13

PROJECT NO: 3852-02-76	HWY: MILL STREET	COUNTY: WAUKESHA	EROSION CONTROL PLAN	SHEET E

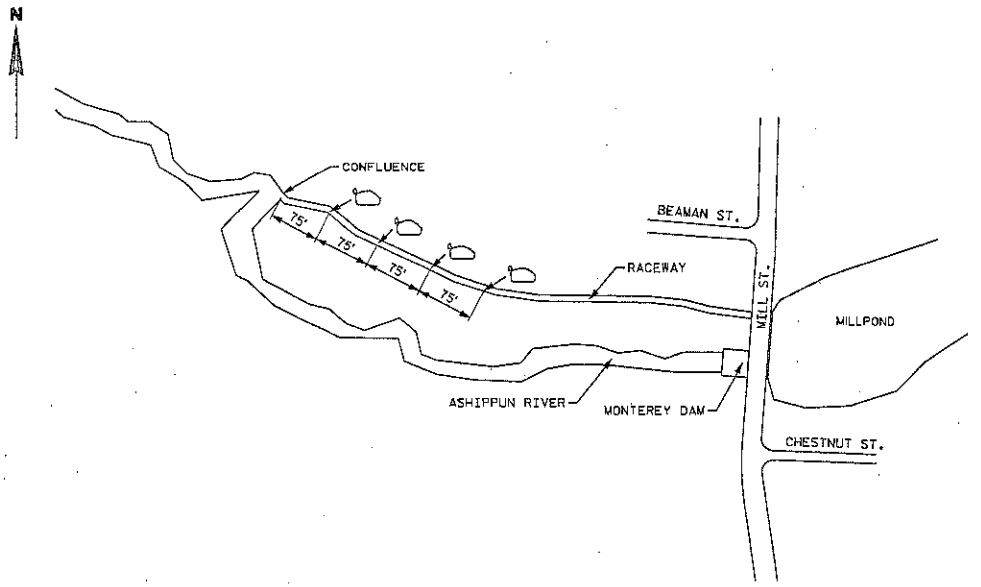
S:\MADISON\WISDOT\100277\CADD-SURVEY\DRAWINGS\DONS\ECONOL.DGN 3/21/2011 3:08:33 PM

2

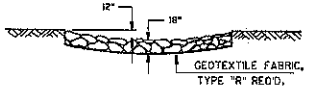
NOTES

ROCK BAG SEDIMENT TRAPS TO REMAIN IN-PLACE UPON PROJECT COMPLETION.

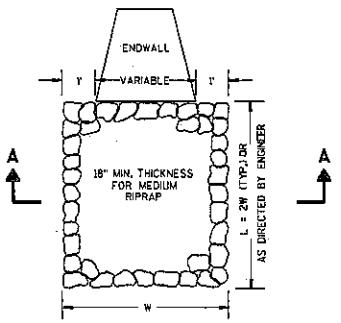
FIELD LOCATIONS OF ROCK BAG SEDIMENT TRAPS SHALL BE DESIGNATED BY THE ENGINEER.



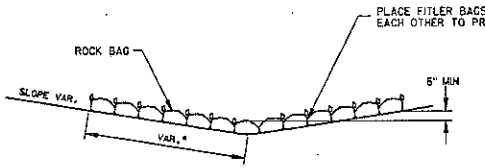
PLAN
(ROCK BAG SEDIMENT TRAP LOCATIONS)



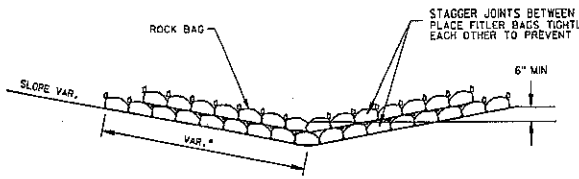
SECTION A-A



MEDIUM RIPRAP TREATMENT AT CULVERTS

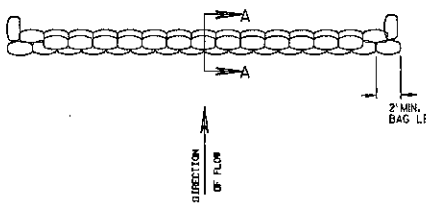


SIDE VIEW (SINGLE LAYER)

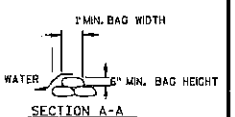


* LENGTH AND NUMBER OF BAGS MAY VARY DEPENDING ON DESIRED DEPTH OF WATER POOL

SIDE VIEW (MULTIPLE LAYER)

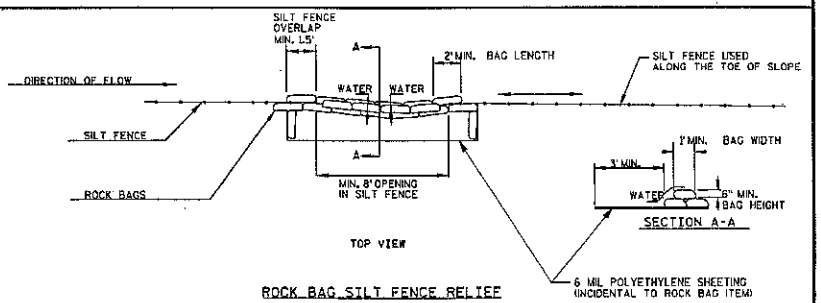


TOP VIEW (MULTIPLE LAYER)



SECTION A-A

ROCK BAG SEDIMENT TRAP



ROCK BAG SILT FENCE RELIEF

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2

PROJECT NO: 3852-02-76	HWY: MILL STREET	COUNTY: WAUKESHA	DETAILS	SHEET NO:	E

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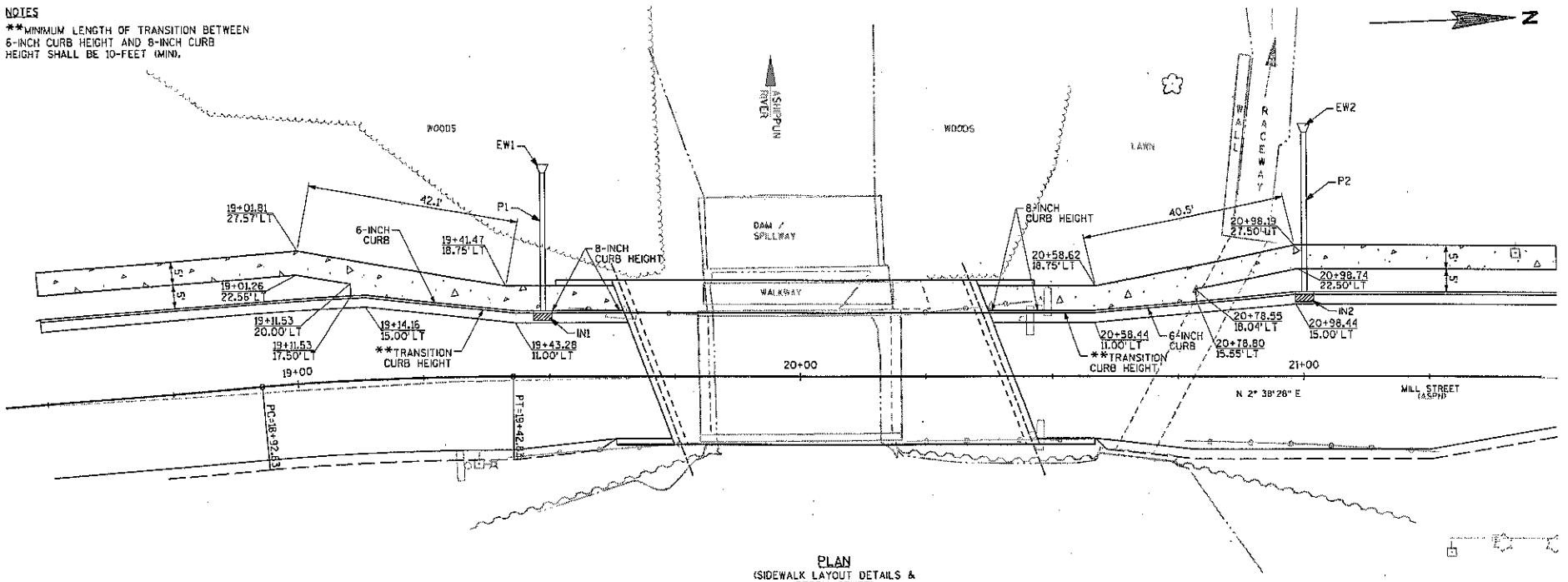
WISDOT/CADDS SHEET 42

NOTES

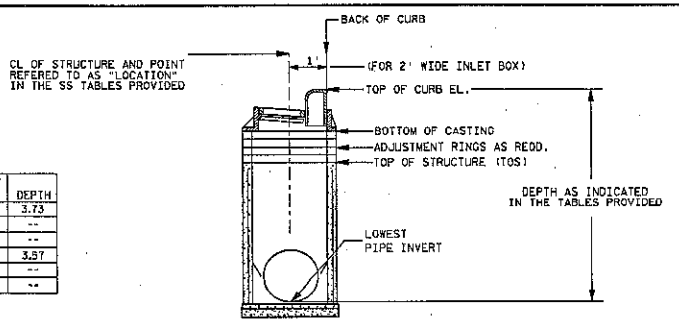
**MINIMUM LENGTH OF TRANSITION BETWEEN 6-INCH CURB HEIGHT AND 8-INCH CURB HEIGHT SHALL BE 10-FEET (MIN).



PLAN
(SIDEWALK LAYOUT DETAILS & STORM SEWER)

STORM SEWER STRUCTURES

NO.	TYPE	LOCATION STA	LOCATION OFFSET	LENGTH	INVERT EL	SLOPE	TOP OF CURB	DEPTH
IN1	3H-S INLET	19+49.0	12.5' LT	--	869.30	--	873.03	3.73
P1	15-IN. RC CL III	--	--	24'	--	2.00%	--	--
EW1	15-IN. ENDWALL	19+49.0	43' LT	--	868.71	--	--	--
IN2	3H-S INLET	21+00.0	15.5' LT	--	868.60	--	872.17	3.57
P2	15-IN. RC CL III	--	--	28'	--	2.00%	--	--
EW2	15-IN. ENDWALL	21+00.0	52' LT	--	867.91	--	--	--



INLET

STRUCTURE ELEVATION DEFINITION

NOTE: SEE STANDARD DETAIL DRAWINGS FOR INLET CONSTRUCTION DETAILS.

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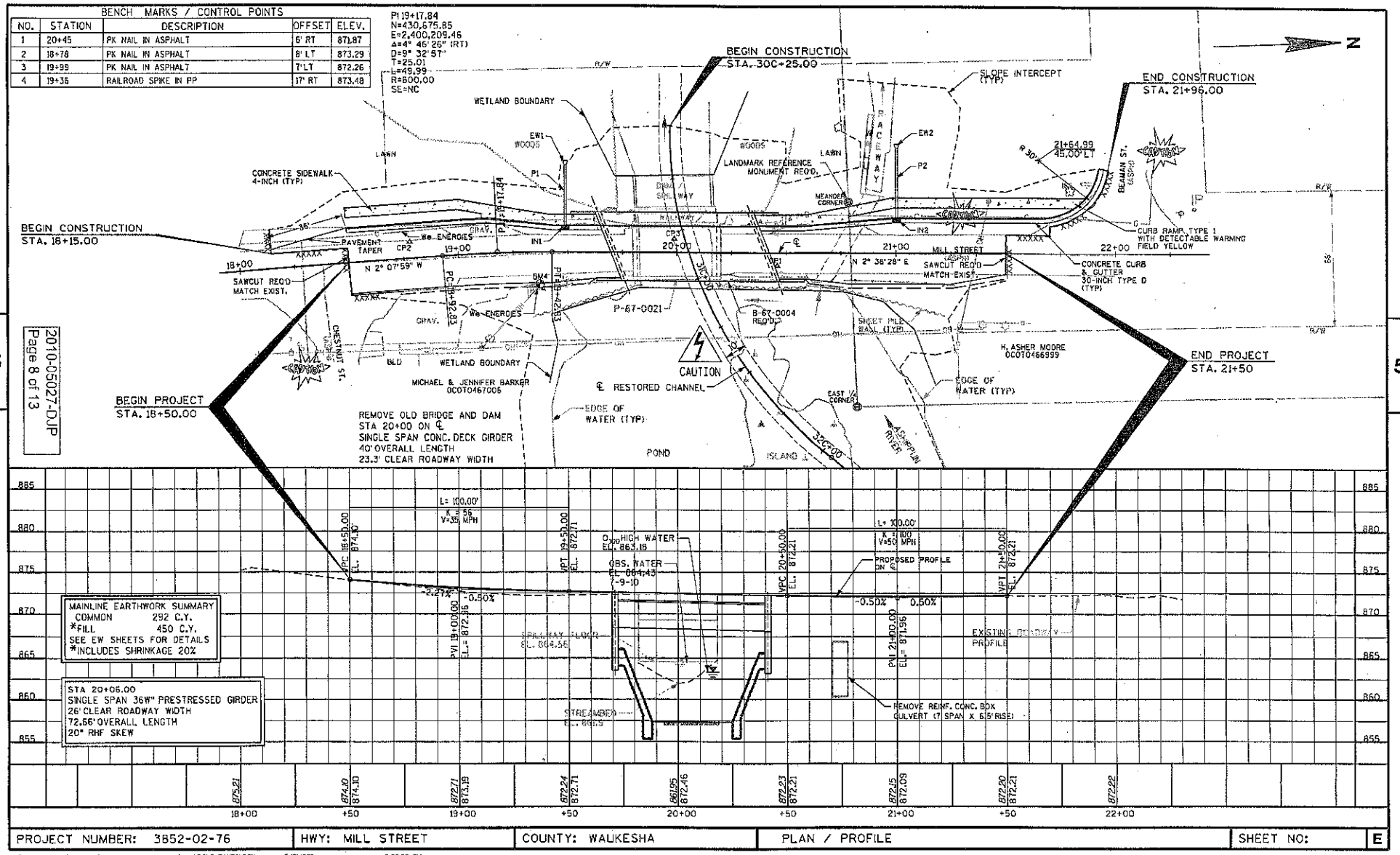
PROJECT NO: 3852-02-76	HWY: MILL STREET	COUNTY: WAUKESHA	DETAILS	SHEET NO: E



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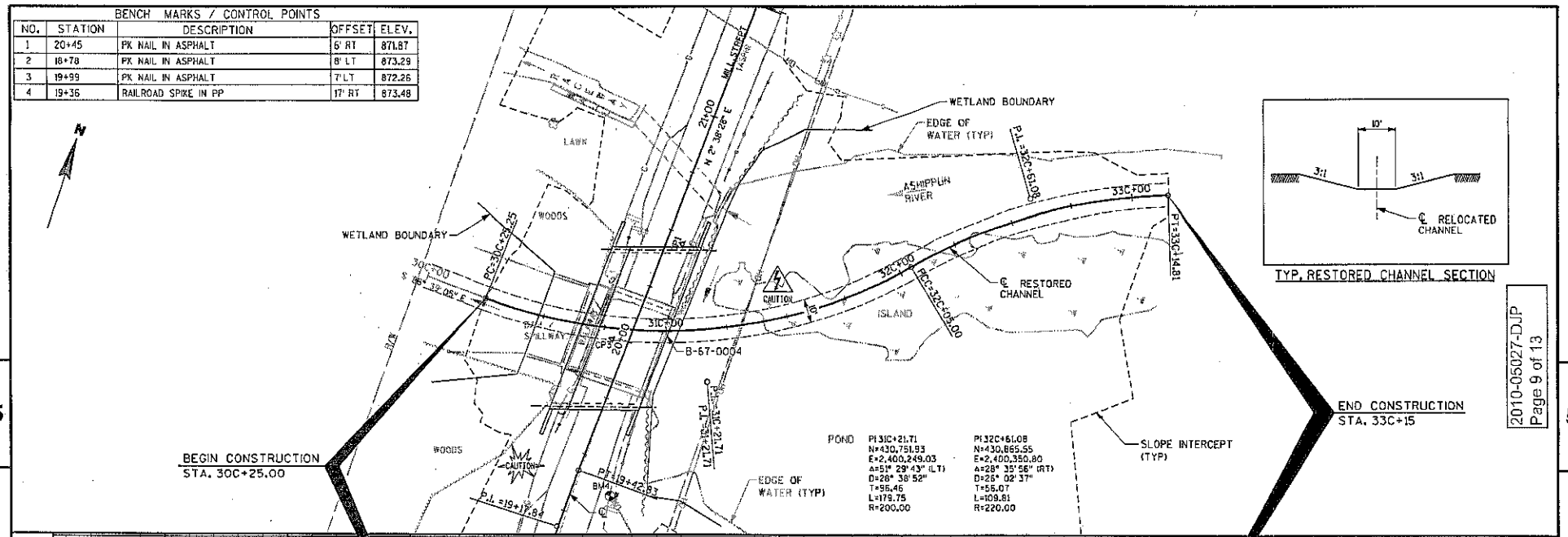
WISDOT/CADDS SHEET 40

BENCH MARKS / CONTROL POINTS

NO.	STATION	DESCRIPTION	OFFSET	ELEV.
1	20+45	PK NAIL IN ASPHALT	6' RT	871.87
2	18+78	PK NAIL IN ASPHALT	8' LT	873.29
3	19+99	PK NAIL IN ASPHALT	7' LT	872.26
4	19+36	RAILROAD SPIKE IN PP	17' RT	873.48



TYP. RESTORED CHANNEL SECTION

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5

PROJECT NUMBER: 3852-02-76	HWY: MILL STREET	COUNTY: WAUKESHA	CHANNEL RESTORATION PLAN / PROFILE	SHEET NO: E

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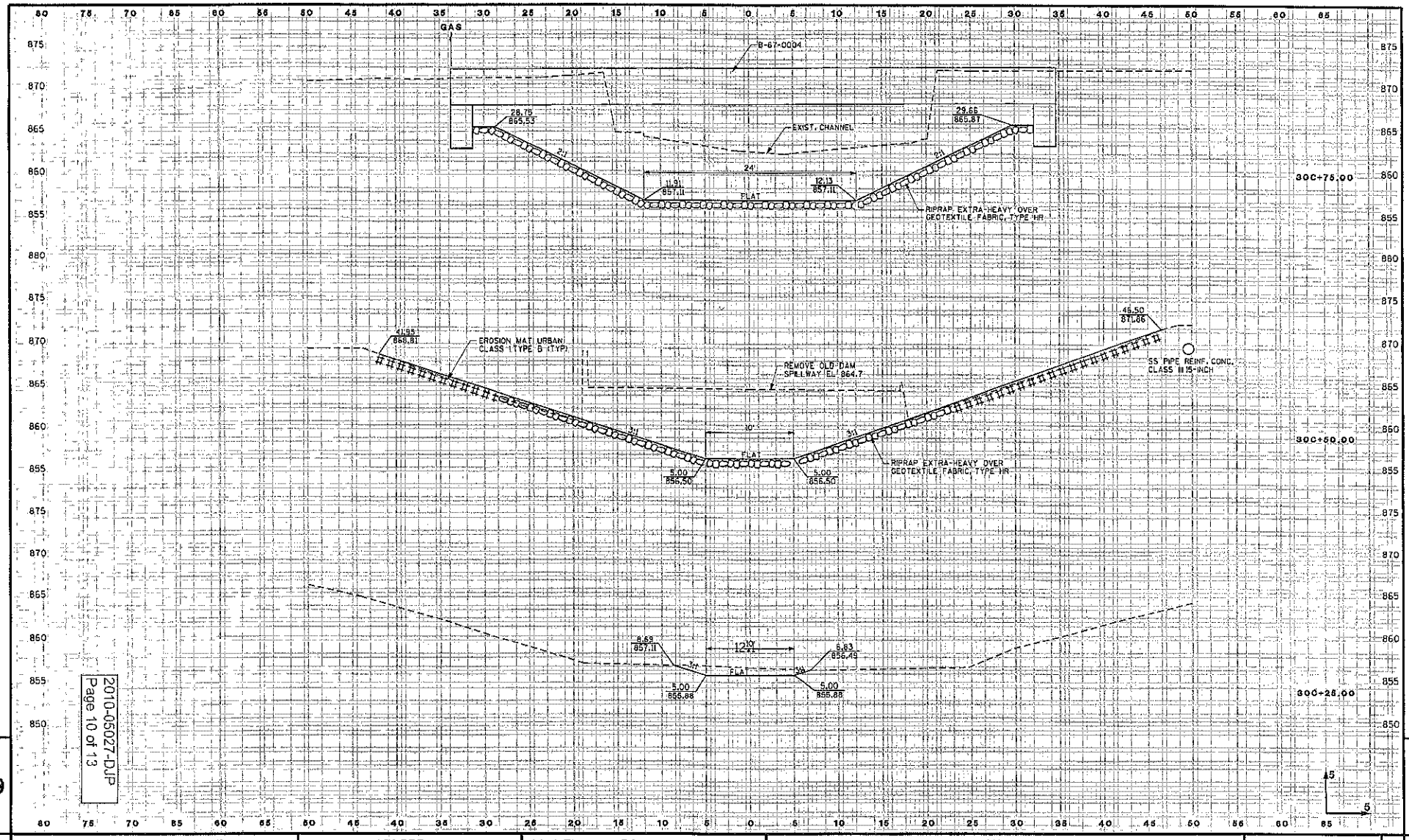
WISDOT/CADDS SHEET 40



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PROJECT NUMBER: 3852-02-76	HWY: MILL STREET	COUNTY: WAUKESHA	CROSS SECTIONS: CHANNEL RESTORATION	SHEET NO: E

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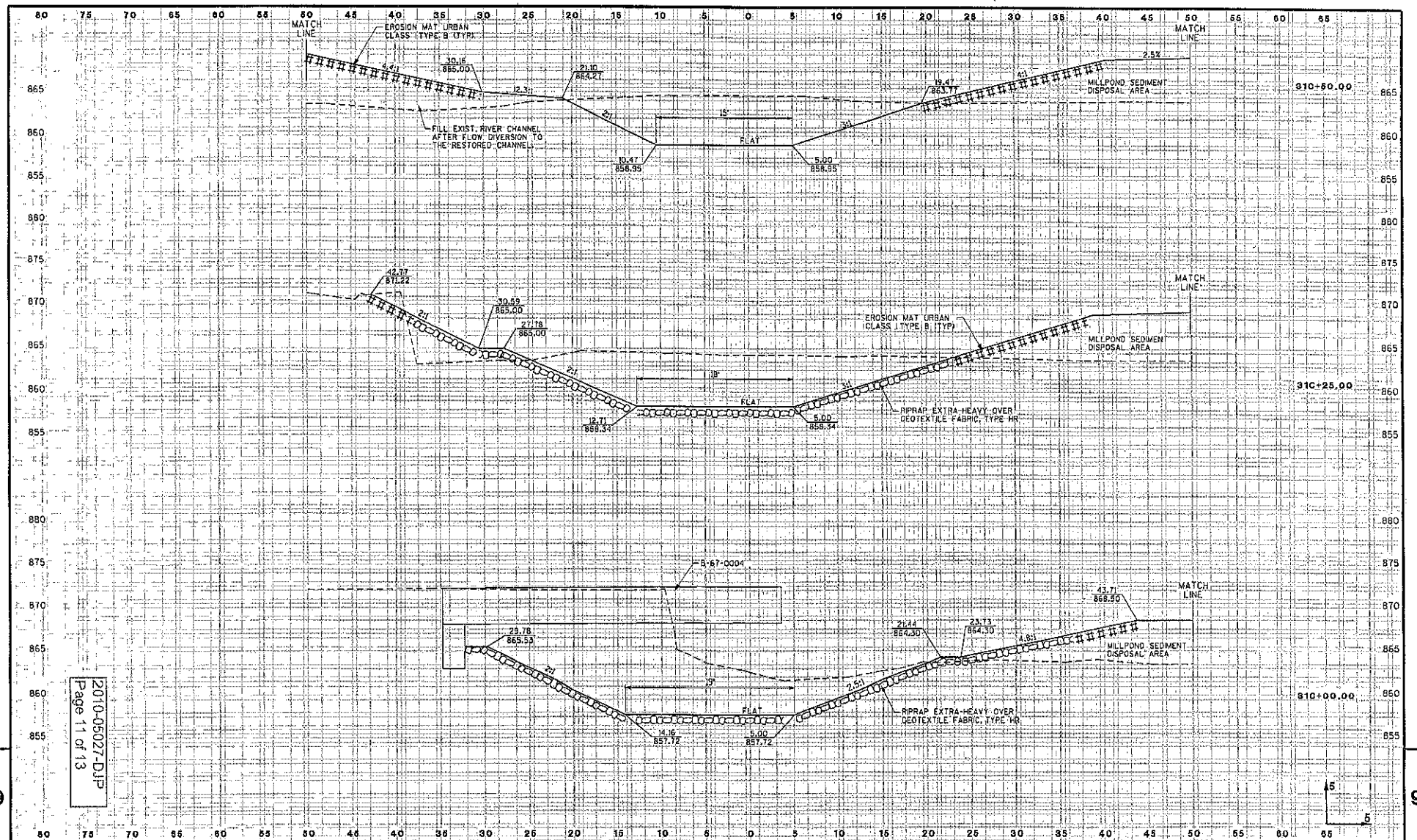

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PROJECT NUMBER: 3852-02-76	HWY: MILL STREET	COUNTY: WAUKESHA	CROSS SECTIONS: CHANNEL RESTORATION	SHEET NO: E

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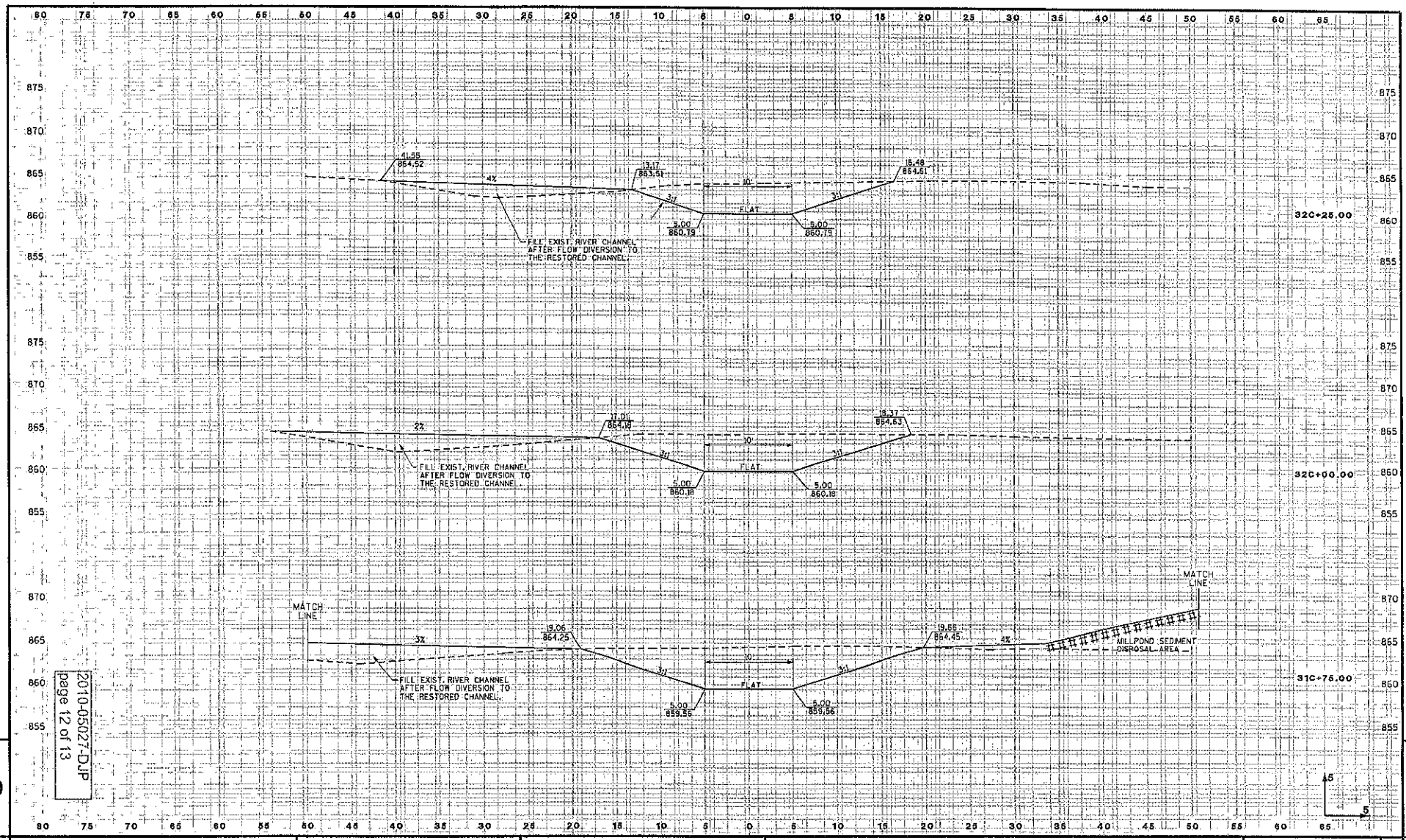
WISDOT/CADDS SHEET 21



PROJECT NUMBER: 3852-02-76	HWY: MILL STREET	COUNTY: WAUKESHA	CROSS SECTIONS: CHANNEL RESTORATION	SHEET NO:	E

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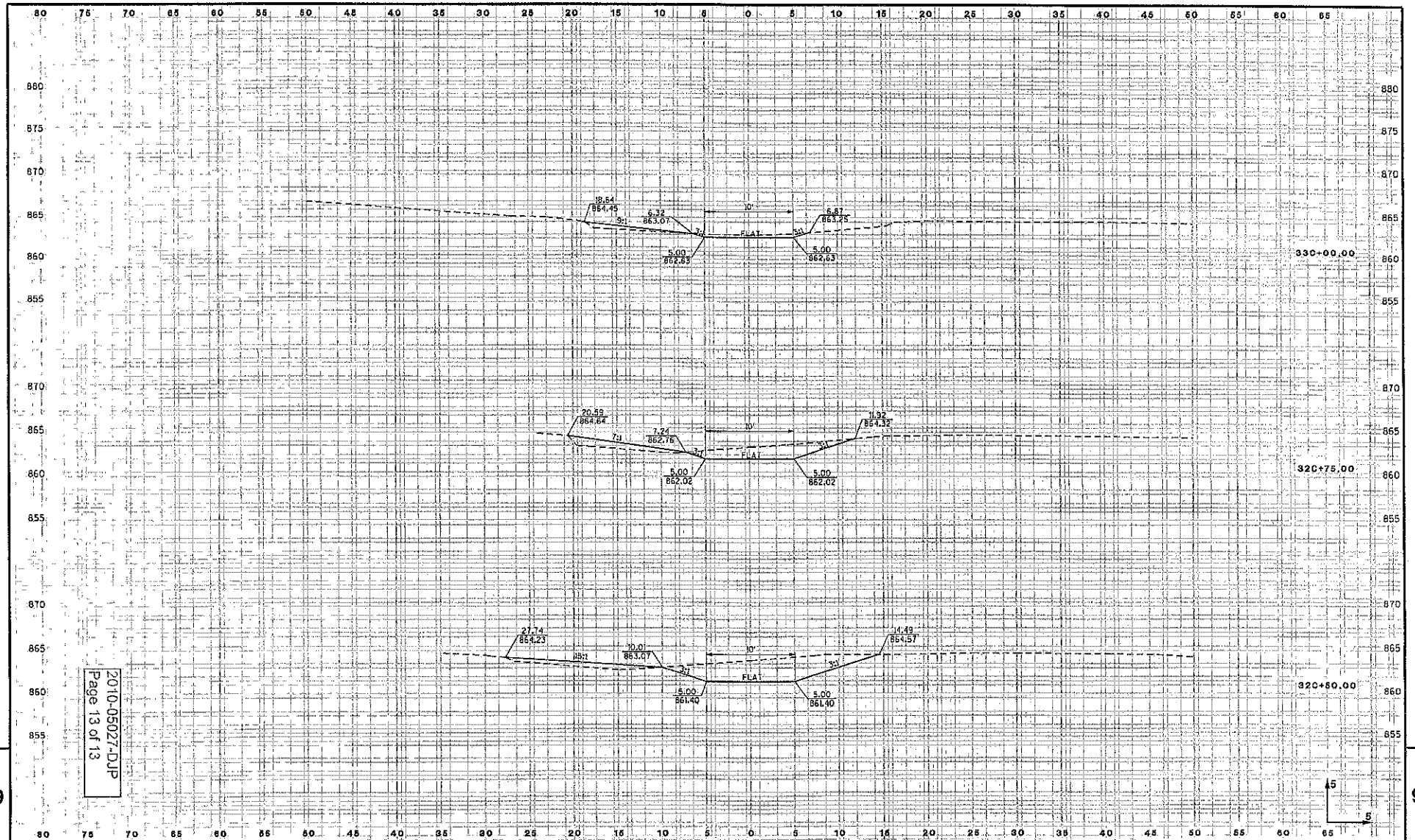

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Page 13 of 13

PROJECT NUMBER: 3852-02-76	HWY: MILL STREET	COUNTY: WAUKESHA	CROSS SECTIONS: CHANNEL RESTORATION	SHEET NO:	E

Exhibit 18

Phase 1
Hazardous Materials Investigation – Addendum

Project ID 3852-02-06

Mill Street, Town of Oconomowoc

(Bridge over Ashippun River)

Town Road, Waukesha County

New Bridge ID B-67-0004

Old Bridge ID P-67-0021

Prepared by

Baxter & Woodman Consulting Engineers

5100 Eastpark Blvd. Suite 200

Madison, WI 53718

September 24, 2010

Project Description

The Wisconsin Department of Transportation and the Town of Oconomowoc propose to replace a deteriorated bridge on Mill Street over the Ashippun River in Section 8, T8N, R17E, Town of Oconomowoc, Waukesha County, WI. (See Exhibit A – Location Map). The existing single span bridge will be removed and replaced with a new hydraulically sized highway bridge. Roadway approach work will be minimized with a desire to match the new structure to the existing roadway as quickly as possible.

The existing Monterey Dam will be removed in conjunction with the bridge replacement project. The roadway bridge is supported on walls that are integral with the deteriorated and obsolete dam. The environmental impacts of the dam removal and millpond dredging project are being evaluated by WDNR separately from the bridge replacement project.

Ground disturbance caused by this bridge replacement project includes excavation of materials in the span area between the new abutments. Channel excavation in the former millpond is required to establish the stream profile through the new bridge. Additional land interests are not required to construct the project.

Removal of a reinforced concrete box culvert carrying the raceway is required. This box culvert is an independent structure located under Mill Street approximately 50 ft. north of the dam/bridge. Removal of a masonry wall located downstream from the box culvert along the raceway is also planned.

Minor tree removals will be necessary in the downstream wingwall areas. Placement of heavy riprap to protect the new bridge from scour is planned.

The project is scheduled for construction in 2011.

Project Background

In 1997, the subject project was designed by Applied Technologies of Brookfield, WI under the review of WisDOT's management consultant, Earth Tech. The project was designed to remove and replace the existing bridge with the dam remaining in-place. This project was designed to near PS&E completion, at which time the project was suspended due to the discovery of private ownership of the dam and portions of the right-of-way.

Since the 1997 project suspension, the dam has deteriorated to a point that WDNR issued an order to the dam owner to transfer, reconstruct, or remove the dam. The Town of Oconomowoc received transfer of the dam from the owner in June 2009. Subsequent to the transfer, WDNR granted funds to the Township from the Dam Removal Grant Program.

Some documents prepared for the 1997 project plan are applicable to the current project with updates. This Phase 1 Hazardous Materials Addendum supplements the original report, which is attached as Exhibit B.

Project Considerations

For the current project, additional soil borings were not performed. The 1997 geotechnical report was revised to include LRFD design parameters for use in substructure design (Exhibit D – Geotechnical Report).

Changes to the area since the 1997 Phase 1 HAZMAT report include removal of the mill house adjacent to the raceway. The structure was completely removed with the exception of the masonry foundation walls. This mill house was located south of the raceway channel and west of Mill Street. There is no evidence of contamination or hazardous materials on the former building site.

Two former gas stations were identified during the 1997 HAZMAT investigation. One of these sites, Site 03-68-004530 Louie's Trading Post, is listed on the WDNR RR Sites Map as closed. The other gas station site "Killing Time" is not listed with WDNR.

No other historic changes to the area have occurred since the 1997 Phase 1 Report that could pose HAZMAT concerns.

Millpond Sediment Sampling & Testing

Millpond sediment sampling & laboratory testing was performed in July 2010. Sampling of sediments occurred at 8 locations within the millpond near the expected channel excavation area. The Pond Sediment Sampling & Testing Report is included as Exhibit F to this report.

Analytical testing of millpond sediment samples included testing for the following metals:

Arsenic	Cadmium
Chromium (total)	Copper
Lead	Mercury
Nickel	Selenium
Zinc	

Analytical testing of millpond sediment samples included testing for the following pesticides / organics:

Aldrin	Chlordane
Dieldrin	Endrin
Heptachlor	Lindane
Toxaphene	DDT
DDE	Dieldrin

In addition, samples were tested for total organic carbon and nutrients, including nitrate plus nitrite, TKN, ammonia, phosphorus, and potassium. One total PCB test was conducted on one combined, composite sample.

None of the samples contained elevated levels of contaminants that would require special handling or disposal. Arsenic concentrations are above the residual contaminant level, but WDNR states that the naturally occurring background concentration should be used as the

soil cleanup level. WDNR was asked to provide an opinion on the arsenic background concentration typically found in the project area. In addition, results of the sampling and testing have been provided to WDNR with a request for direction as to the suitable disposal considerations for excavated millpond sediments. The most desirable scenario would be to classify sediments as common excavation with unrestricted management. The anticipated worst case scenario would be a requirement to provide clean cover materials to cap the excavated millpond sediment material. Removal of sediments from the project site will likely require disposal at a facility licensed by WDNR to receive solid waste.

WisDOT policy is to assume any painted steel may have the potential to contain lead based paint. A "Notice to Contractor" should be included in the project special provisions with the following information: "Steel components of the bridge structures may be covered with paint containing lead. Any work which may disturb the paint must follow all applicable state and federal regulations regulating lead and lead waste."

An asbestos investigation for the project was completed on Sept. 21, 2010 with negative results. See Exhibit E for report details

Recommendations

While the current project scope requires more excavation activities than the 1997 project, the location of former gas station properties is well outside the project limits and evidence of contaminant migration does not exist. The "Louie's Trading Post" site is closed based on WDNR records. A Phase 2 investigation does not seem to be warranted and is not recommended.

Further sampling and testing to determine background arsenic levels in the area is not recommended. Topsoil cover material can be placed economically over millpond sediment slopes, and topsoil should be placed to provide proper erosion control and slope stabilization regardless of other considerations. If information is discovered that would require removal and disposal of sediments due to arsenic, consideration should be given to conducting the background testing with the possibility that sediment levels are lower than background levels.

Attachments

Exhibit A – Location Map

Exhibit B - 1997 Phase 1 Hazardous Materials Investigation Report

Exhibit C - 1997 Local Program Management Consultant comments

Exhibit D - Geotechnical Report with 2010 updates

Exhibit E – Asbestos Inspection Report

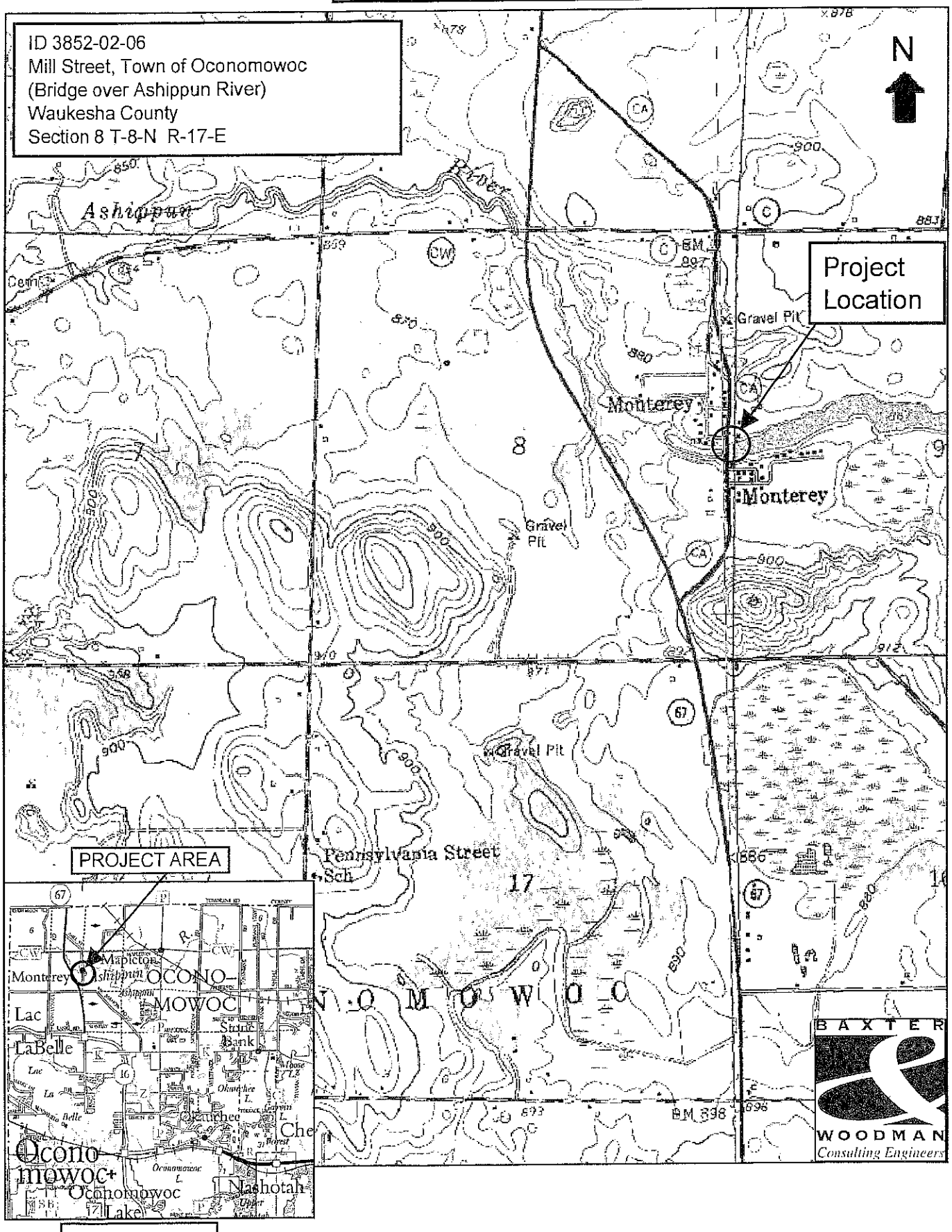
Exhibit F – Pond Sediment Sampling & Testing Report

Exhibit G - Preliminary Project Plans

Exhibit A

Location Map

LOCATION MAP



AREA MAP

APPENDIX C

PROJECT PLAN

I.D. 3852-02-06
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(October 16, 1997)

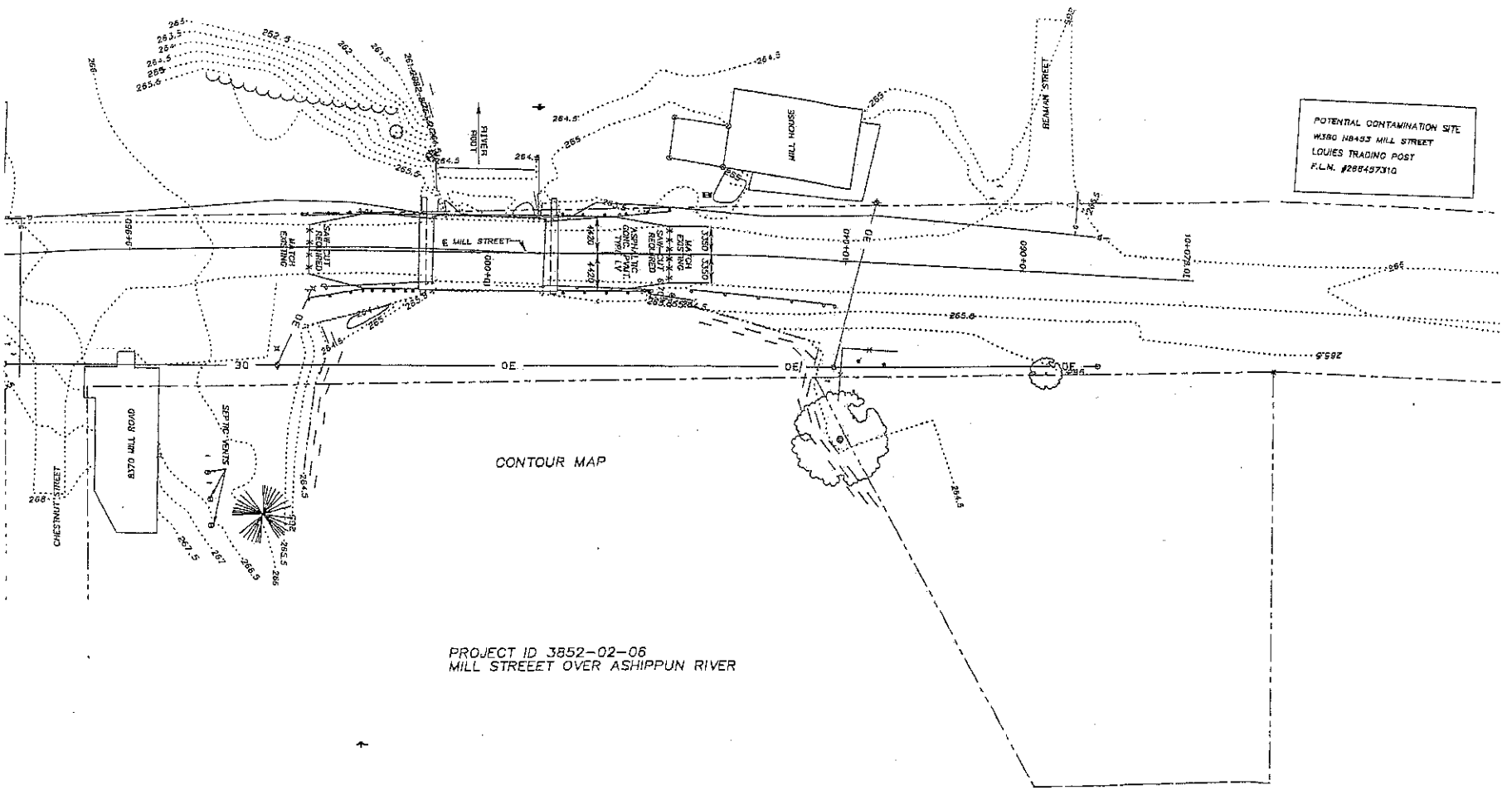

POTENTIAL CONTAMINATION SITE
W380 N8453 MILL STREET
LOUIES TRADING POST
F.L.N. #288457310
MILL HOUSE
BEAMAN STREET
E MILL STREET
8370 MILL ROAD
CHESTNUT STREET
SEPTIC VENTS
RIVER
CONTOUR MAP
PROJECT ID 3852-02-06
MILL STREEET OVER ASHIPPUN RIVER

Exhibit F

Pond Sediment Sampling & Testing Report

midwest engineering services, inc.

geotechnical • environmental • materials engineers

821 Corporate Court
Suite 102
Waukesha, WI 53189-5010
262-521-2125
FAX 262-521-2471
www.midwesteng.com

September 22, 2010

Mr. Daniel Durig
Baxter and Woodman Consulting Engineers
5100 Eastpark Blvd, Suite 200
Madison, Wisconsin 53718

Subject: Pond Sediment Sampling and Analysis Services
Mill Street Bridge Over Ashippun River
Mill Street
Town of Oconomowoc, Wisconsin
ID Number: 3852-02-06
MES Project No. 7-101016

Dear Mr. Durig,

Introduction

Midwest Engineering Services (MES) is pleased to submit herewith the findings of the sediment sampling and analysis performed on the former Mill Street Bridge pond in the Town of Oconomowoc, Wisconsin. The sediment sampling and analysis services were performed at the request and authorization of Mr. Daniel Durig with Baxter and Woodman Consulting Engineers (Baxter and Woodman).

Purpose

The purpose of these services was to collect sediment samples, in general accordance with Chapter NR347 of the Wisconsin Administrative Code, within the proposed dredging area in the former mill pond and to present the findings. In addition, subsequent to receipt of the laboratory test results, the client requested that MES contact the Remediation and Redevelopment Department of the WDNR to discuss the detected arsenic concentrations. The requested services did not include an evaluation of the data or the provision of engineering recommendations for the dredging or disposal activities. These activities are not intended to define the extent of any encountered contamination, and do not include remedial activities. The limited services are not intended to serve as an "all-inclusive" evaluation of the potential presence of petroleum products, hazardous materials or other chemical constituents

to be present within the sediment across the project area. In addition, at the direction of the client, the purpose of this study was not to evaluate surface water or groundwater quality.

Scope

The scope of services included obtaining eight (8) samples of the sediment from the area indicated by Baxter and Woodman that will be dredged to improve the channel of the Ashippun River; determination of soil characteristics by physical and analytical laboratory testing; a presentation of the data obtained; and the preparation of this letter report. In addition, MES contacted the WDNR, at the request of the client, to discuss the detected arsenic concentrations in the composite samples.

Authorization

The authorization to perform these sediment sampling and analysis services was in the form of a signed Subconsultant Services Agreement between MES (Subconsultant) and Baxter and Woodman Inc. (Consultant) of which MES' Proposal No. 7-10115R, dated April 13, 2010, was included as Exhibit B. The description of the services and analyses performed by MES for this project was included in MES' proposal.

Project Background

The project area is situated to the east of Mill Street and in the area of the former mill pond, in the Town of Oconomowoc, Wisconsin. The project area lies within the Northeast ¼ of the Southeast ¼ of Section 8 and the Northwest ¼ of the Southwest ¼ of Section 9, in Township 8 North and Range 17 East of Waukesha County. It is understood that a mill was formerly situated on the west side of Mill Street, but was razed several years ago. Further, it is understood that the mill pond was drained in the last year.

The project will consist of the removal of the existing Mill Street dam and mill raceway, and the construction of a new bridge across Ashippun River. In addition to the bridge construction, it is understood that a new channel to improve the flow direction of the Ashippun River will be excavated by dredging pond sediment from the area of the former mill pond. The general location of the subject site is indicated on Figure 1, enclosed with this letter.

Field Activity

The project area and the general sample locations are indicated on the enclosed diagram

(Figure 2) that was provided by the client. Eight (8) sediment samples, designated as 1 through 8, were generally collected from within the planned grading limits for the channel relocation phase of the project. The grading limits were determined by the client and also indicated on plans provided to MES by the client. MES representatives collected these samples on July 27, 2010. Samples were collected utilizing standard sediment sampling equipment in general accordance with Chapter NR347 of the Wisconsin Administrative Code. As requested, the sediment samples were obtained from a maximum depth of approximately 3 feet and GPS coordinates were obtained at each sampling location. Also, as requested, portions of the sediment samples collected from the eight locations were combined into four (4) composite samples. The four (4) samples were analyzed for the presence of heavy metals, pesticides, and nutrients. In addition, grain-size analyses/hydrometers were performed on these composite samples. Further, one composite sample prepared from all of eight samples was tested for the presence of PCBs. The test panels were selected by the client.

Sample Preparation and Laboratory Analysis

The sediment samples were combined into four (4) separate composite samples for chemical and physical analyses. The selected samples tested for the presence of metals, pesticides and nutrients analyses were prepared by filling clean glass jars provided by the laboratory. The single composite sample for the PCB analysis was prepared by filling a clean glass jar provided by the laboratory. A portion of the composite samples were also placed into quart plastic bags for grain-size analyses.

The samples collected for chemical testing were placed on ice, chain of custody procedures were initiated, and the samples were submitted to Pace Analytical (Pace) of Green Bay, Wisconsin. The analytical report and chain of custody are included in the Appendix.

Sediment Conditions

Dark gray to black organic silt sediment with shells and fibrous materials was encountered at each of the sample locations. The sediment samples from locations 1 and 2; 3 and 4; 5 and 6; and 7 and 8 were combined into four (4) separate composite samples for chemical and physical analyses. Each composite sample was separated into two samples. One of these samples was then subjected to physical testing to determine percent solids and grain size. The other sample was subjected to analytical laboratory testing for presence of the analytes selected by the client and expressed in Chapter NR347. In addition, samples from all the locations were combined into a single composite sample for PCB analysis.

NR720 Generic Soil RCLs

Chapter 720 of the NR700 series code established generic residual contaminant levels (RCLs) for soils. The residual contaminant levels in the below table are based on protection of human health from direct contact through ingestion of soil or inhalation of particulate matter as it relates to land use. NR720 also states that naturally occurring background concentrations of arsenic in soil may be higher than the residual contaminant level for arsenic listed in the below table. In such instances, the WDNR states that the naturally occurring background concentration should be used as the soil cleanup level.

Contaminant	RCL (mg/kg)	
	(non industrial)	(industrial)
Arsenic	0.039	1.6
Cadmium	8	510
Chromium tri (hexa)	16,000 (14)	na (200)
Lead	50	500

mg/kg = milligrams per kilogram na = not applicable

Analytical and Physical Test Results

The composite samples were submitted to an analytical laboratory to test for the presence of predetermined analytical parameters provided by the client. These analytical parameters included ammonia as nitrogen; nitrate plus nitrite; total phosphorus; total potassium; total Kjeldahl nitrogen; total organic carbon; polychlorinated biphenyls (PCBs); total heavy metals (arsenic, cadmium, chromium, copper, nickel, selenium, zinc, lead, and mercury); organochlorine pesticides [Aldrin, gamma-BHC (Lindane), Chlordane (tech), 4,4-DDE, 2,4-DDE, 4,4-DDT, 2,4-DDT, 4,4-DDD, 2,4-DDD, Dieldrin, Endrin, Heptachlor, and Toxaphene]; and total percent solids.

The results of the analytical testing can be found on the laboratory reports, enclosed with this letter report. In addition, the results are summarized on the following table:

TABLE 1
Composite Sediment Sample Analytical Results

Analyte	Composite-1	Composite-2	Composite-3	Composite-4	EPA Method
Ammonia as Nitrogen (mg/kg)	543	734	781	575	EPA 350.1
Nitrate plus Nitrite (mg/kg)	<3.3	8.4J	<3.6	4.1J	EPA 1664
Total Potassium (mg/kg)	764	974	1,040	949	EPA 9045B

Analyte	Composite-1	Composite-2	Composite-3	Composite-4	EPA Method
Total Phosphorus (mg/kg)	**906**	**693**	**957**	**1,140**	EPA 365.2
Total Kjeldahl Nitrogen (mg/kg)	**7,460**	**11,600**	**7,810**	**9,700**	EPA 351.2
Total Organic Carbon (mg/kg)	**14,000**	**64,400**	**30,300**	**51,700**	EPA 9060
Percent Solids (%)	**37.6**	**28.6**	**34.7**	**34.5**	EPA 5035
Heavy Metals (mg/kg)					
Arsenic	**3.5J**	**4.9J**	**3.1J**	**3.7J**	EPA 6010B
Cadmium	**0.41J**	**0.57J**	**0.54J**	**0.59J**	EPA 6010B
Chromium	**13.2**	**17.1**	**18.3**	**17.4**	EPA 6010B
Lead	**11.4**	**15.2**	**13.9**	**15.4**	EPA 6010B
Copper	**13.9**	**18.2**	**19.3**	**17.6**	EPA 6010B
Nickel	**9.4**	**12.1**	**11.9**	**11.7**	EPA 6010B
Selenium	**1.3J**	**2.0J**	**1.7J**	**1.5J**	EPA 6010B
Zinc	**51.2**	**59.7**	**62.5**	**60.4**	EPA 6010B
Mercury	**0.053**	**0.073**	**0.061**	**0.068**	EPA 7471A
Pesticides (ug/kg)					
Aldrin	<1.2	<1.6	<1.3	<1.3	EPA 8081A
gamma-BHC (Lindane)	<1.2	<1.6	<1.3	<1.4	EPA 8081A
Chlordane (tech)	<33.8	<44.5	<36.6	<36.8	EPA 8081A
4,4'-DDE	<2.6	<3.5	<2.9	<2.9	EPA 8081A
2,4'-DDE	<1.6	<2.1	<1.7	<1.7	EPA 8081A
4,4'-DDT	<4.1	<5.4	<4.4	<4.4	EPA 8081A
2,4'-DDT	<1.5	<2.0	<1.7	<1.7	EPA 8081A
4,4'-DDD	<4.0	<5.3	<4.3	<4.4	EPA 8081A
2,4'-DDD	<1.6	<2.1	<1.7	<1.7	EPA 8081A
Dieldrin	<3.1	<4.1	<3.4	<3.4	EPA 8081A
Endrin	<2.6	<3.4	<2.8	<2.8	EPA 8081A
Heptachlor	<1.4	<1.9	<1.5	<1.5	EPA 8081A
Toxaphene	<60	<78.9	<64.9	<65.3	EPA 8081A

Notes:
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
J = Laboratory estimated concentration
Bold numbers indicate detected concentrations

In addition to the above-mentioned analytical test results, no PCBs were detected in the single sample composited from the eight (8) collected sediment samples.

Grain-size analyses were performed on the four (4) composite samples. The particle size distribution tests were performed in accordance with the ASTM D422. The results of the physical testing indicated that the sediment samples were classified as a mixture of dark gray to black silt, with little to some clay, trace sand, and fibrous organic and shell matter. The

results of the physical testing can be found on the physical laboratory reports, enclosed with this letter report.

Summary of Findings

The field sampling and classification indicated that the sediment consisted of dark gray to black organic silt with shells and fibrous materials. The results of the analytical testing indicated that the detected concentrations within the composite samples were not above soil cleanup levels, where established, with the exception of arsenic at concentrations ranging from 3.1 to 4.9 mg/kg. At the request of the client, MES contacted a representative of the Remediation and Redevelopment Department of the WDNR, which is the department that regulates investigative and remedial activities for contamination encountered in soil and groundwater. The representative indicated that background levels of arsenic in soil in Southeast Wisconsin are site specific. He further indicated that they are typically within a range between 1 to 10 mg/kg, but can be as high as 15 mg/kg and still be considered background levels. However, the representative also indicated that if any of the sediment excavated during the dredging process is removed from the project area, it would be considered a solid waste and would need to be properly handled and disposed within a WDNR-licensed disposal facility. The representative noted that the excavated sediment could remain on the site to be used as fill if it is covered with unaffected soils (confirmed by analytical testing) from other areas of the project or clean imported fill soils.

The representative indicated that if background levels outside of the project area are established, and generally have similar concentrations as the levels detected in the composite samples, no cover would be required. A background evaluation of the nearby soils was beyond the scope of approved MES services for this project. Such an evaluation would include, but may not be limited to, gaining access to areas not included in the project area and collecting shallow soil samples for the analytical testing for the presence of arsenic.

Closing

Should you have any questions or if we could be of any further assistance, please call at any time. MES appreciates the opportunity to be of service.

Very truly yours,

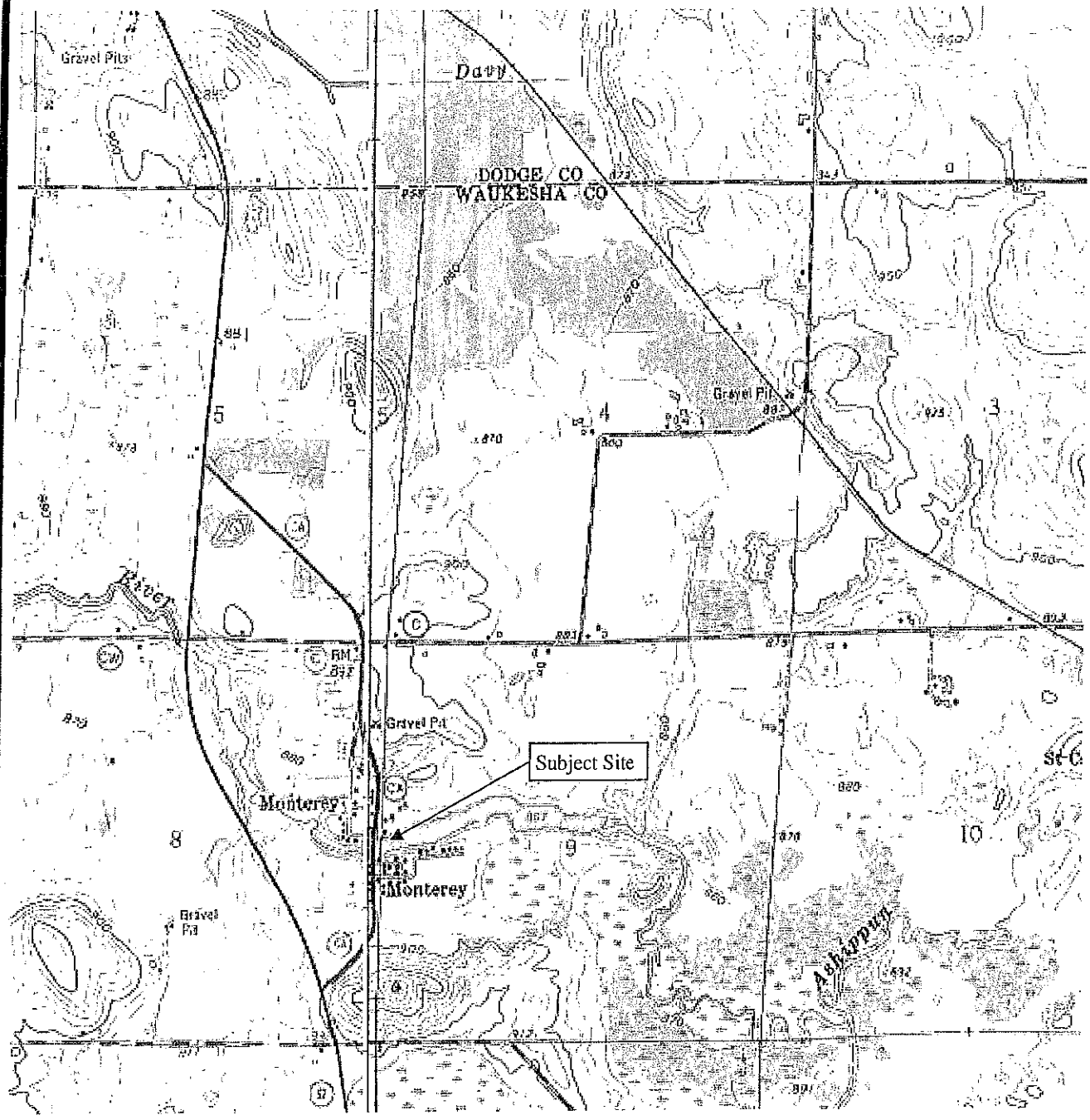
MIDWEST ENGINEERING SERVICES, INC.

Patrick J. Patterson, P.E., P.G.
Department Manager
Environmental Services

James M. Becco, P.E.
Region Manager

Appendix:

- Figure 1: Site Location Map (1)
- Figure 2: Pond and Sample Location Plan (1)
- Analytical Laboratory Report Chain of Custodies (33)
- Physical Laboratory Reports (4)



Source: USGS Stonebank and Ixonia Quadrangle Maps, Dated 1959 and Photo-Revised 1971 and 1976

Site: Southeast 1/4 of Section 8 and Southwest 1/4 of Section 9, Township 8 North and Range 17 East, Waukesha County

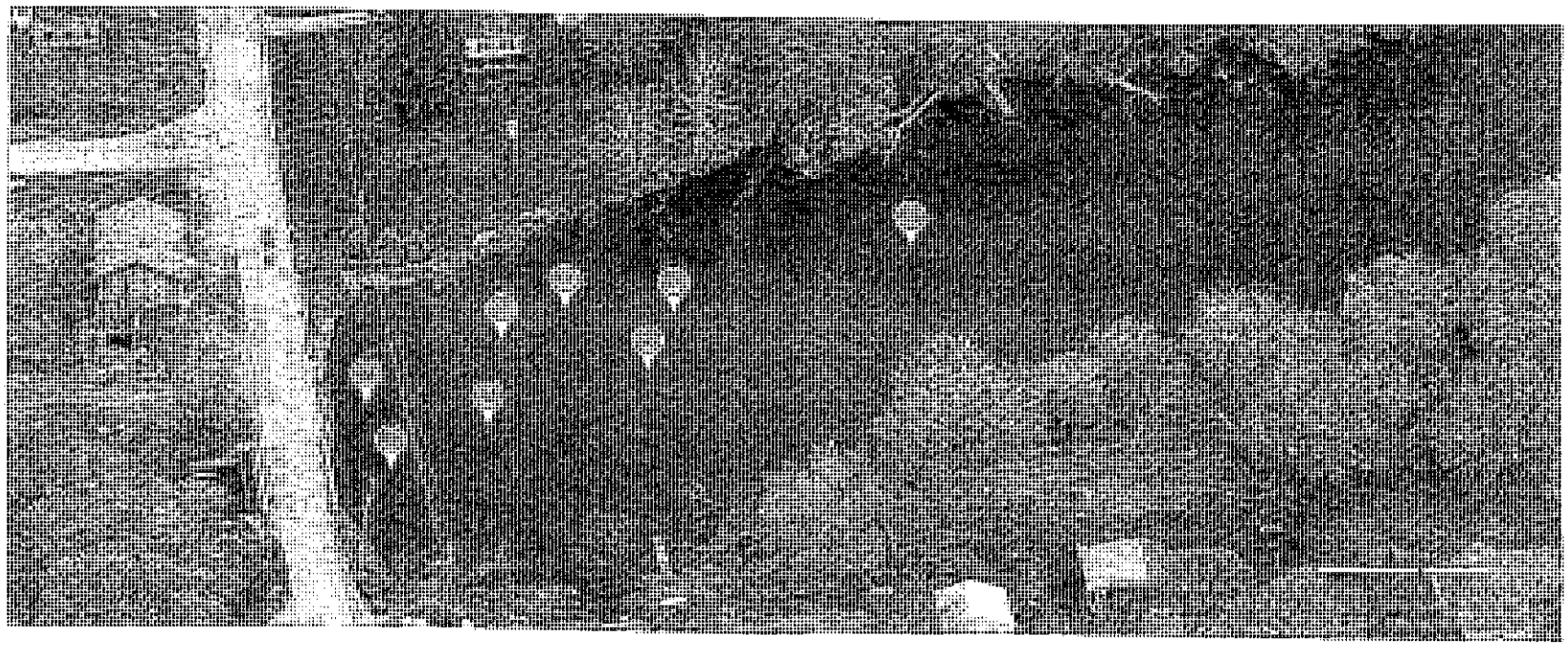
midwest engineering services, inc.	Mill Street Bridge Over Ashippun River Mill Street Town of Oconomowoc, Wisconsin	Scale: 1" = 2000' ±
		Project No.: 7-101016
	SITE LOCATION MAP	Date:

Figure 1

Notes:
1) Adapted from Bing Maps.

Locations:

1) N 43.17203, W -88.49965
2) N 43.17214, W -88.49966
3) N 43.17209, W -88.49950
4) N 43.17223, W -88.49945
5) N 43.17216, W -88.49926
6) N 43.17227, W -88.49935
7) N 43.17225, W -88.49920
8) N 43.17233, W -88.49884



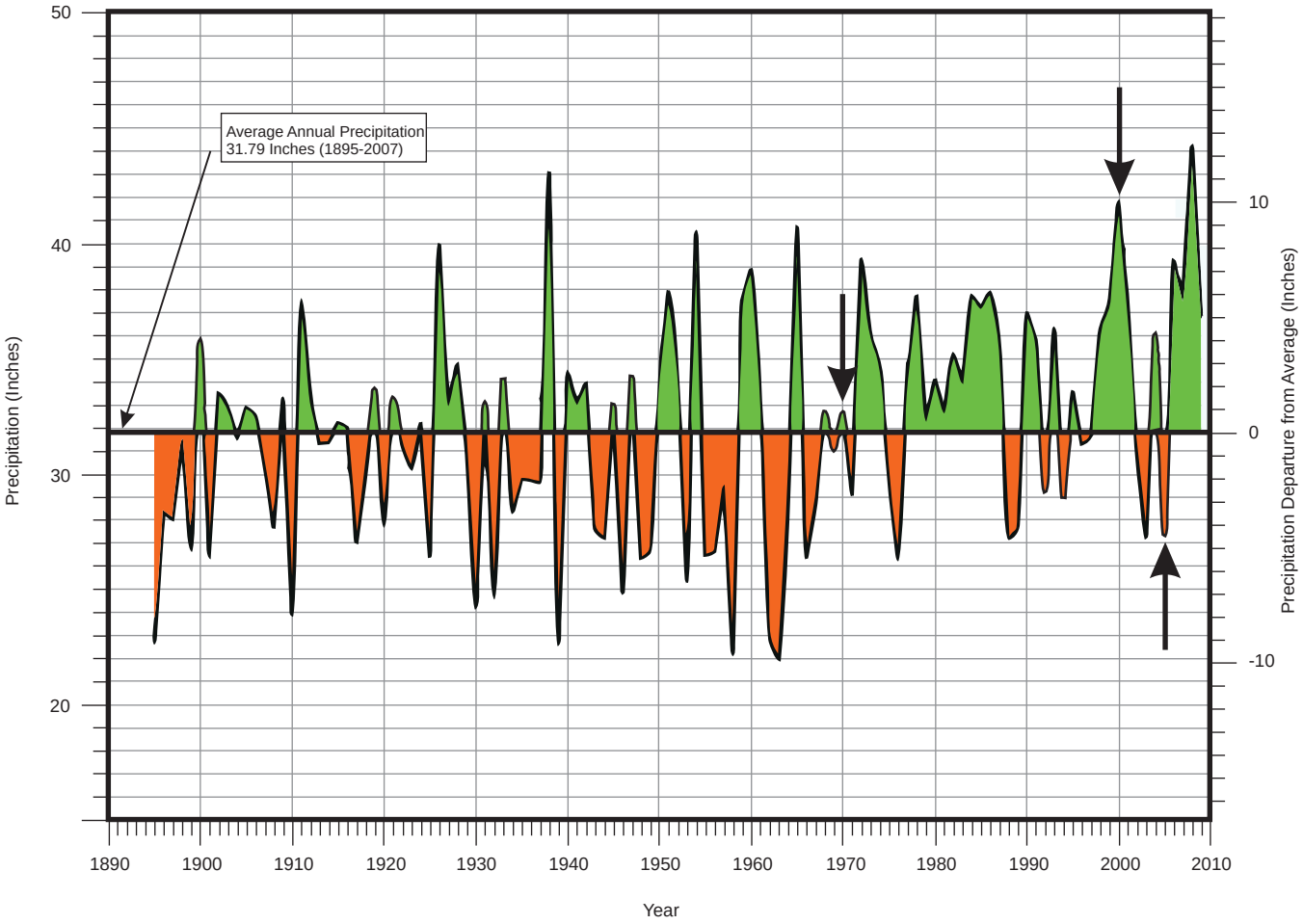
midwest engineering services, inc.

POND AND SAMPLE LOCATION PLAN	Scale: NOT TO SCALE
MILL STREET BRIDGE OVER ASHIPPUN RIVER MILL STREET TOWN OF OCONOMOWOC, WI	Project Number: 7-101016
	Date:
	Drawn By: SEE NOTES

FIGURE 2

Exhibit 19

AVERAGE ANNUAL PRECIPITATION FOR SOUTHEASTERN WISCONSIN: 1895-2010



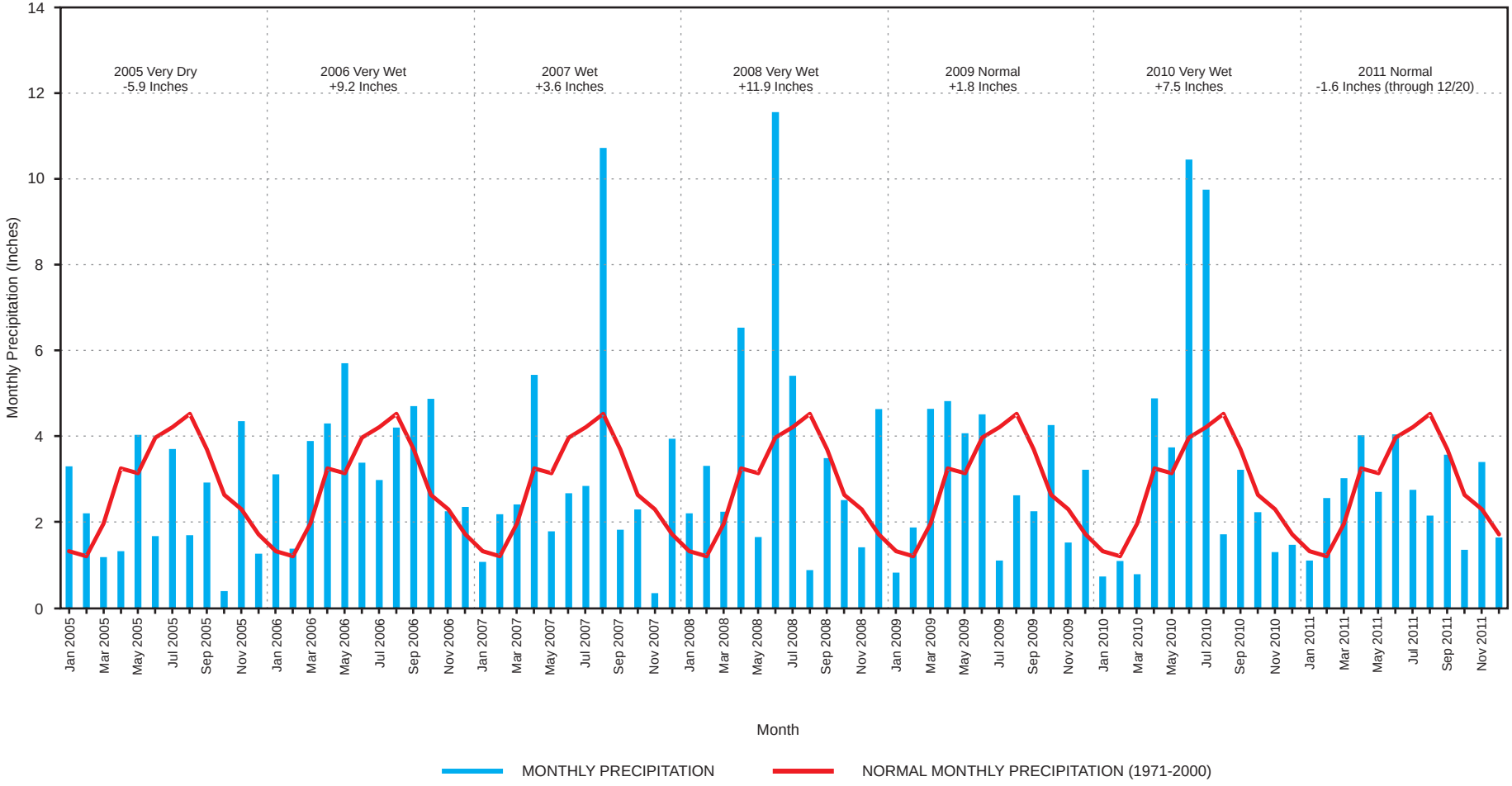
NOTES: Precipitation data is as of January 5th, 2010. Data for the most recent year is considered preliminary. See Exhibit 20 for monthly precipitation data through December 2011.

Arrows indicate years of relatively normal precipitation (1970), above average precipitation (2000), and below average precipitation (2005). Aerial photos of the area upstream of the Monterey dam from each of these described years are provided in Exhibit 21, Exhibit 22, and Exhibit 23, respectively.

Source: Wisconsin State Climatology Office, NOAA National Climatic Data Center, and SEWRPC.

Exhibit 20

MONTHLY RECORDED PRECIPITATION TOTALS AND TOTAL ANNUAL PRECIPITATION CATEGORIES FOR THE OCONOMOWOC WEATHER STATION: 2005-2011



NOTES: Monthly precipitation totals are provided for National Weather Service Cooperative Network Oconomowoc Gauge 476200.

Total annual precipitation categories were based upon a mean precipitation of 33.9 inches from 1971-2000 at the Oconomowoc Station as summarized below: Normal (33.9 inches +/-2.0 inches); Wet (>2.0 to +5 inches); Very Wet (> +5.0 inches); Dry (<-2.0 to -5 inches); and Very Dry (<-5.0 inches).

Source: National Weather Service and SEWRPC.

Exhibit 21

MONTEREY MILL POND, ASHIPPUN RIVER, AND ASHIPPUN LAKE: 1970 (NORMAL ANNUAL PRECIPITATION)

Exhibit 22

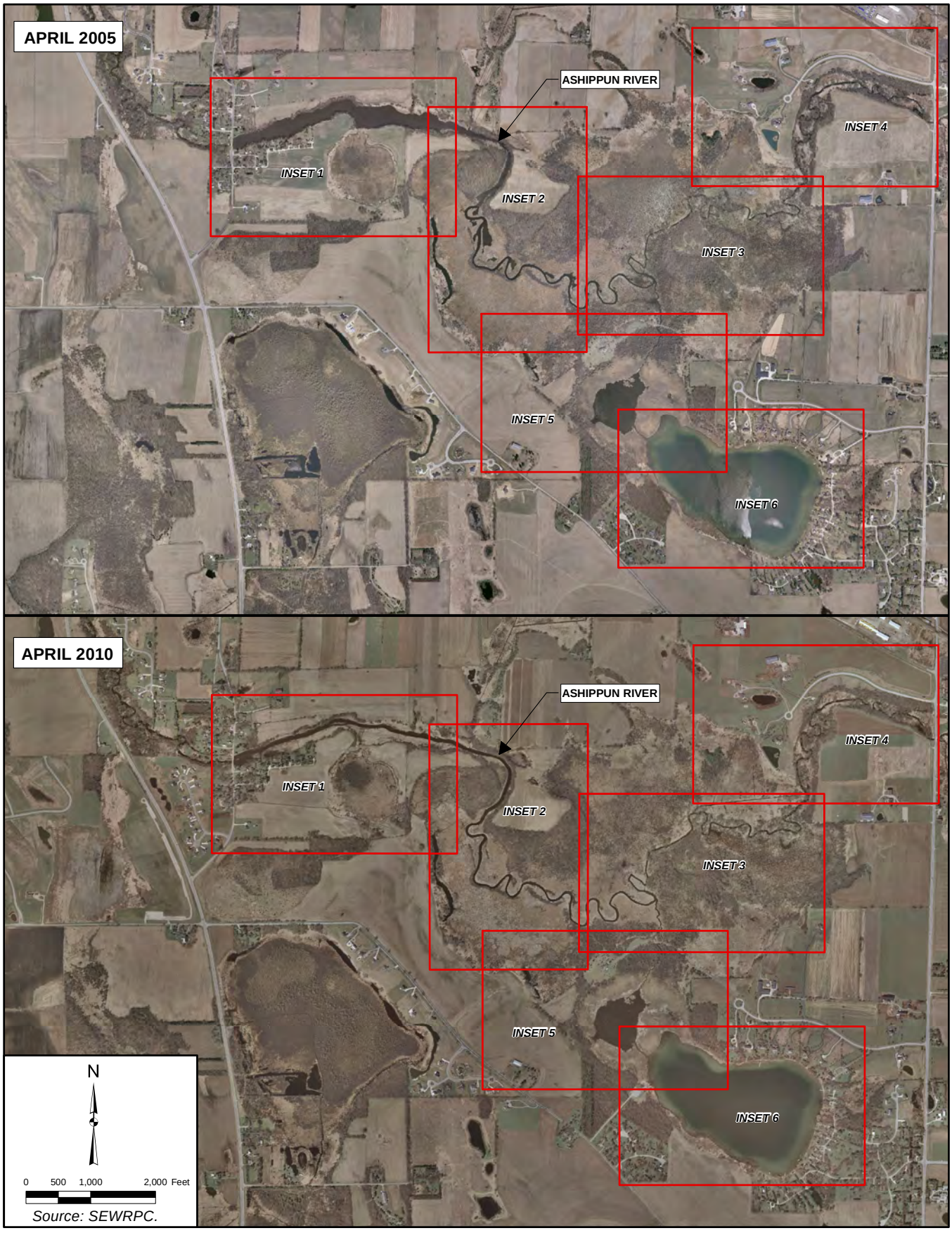
MONTEREY MILL POND, ASHIPPUN RIVER, AND ASHIPPUN LAKE: 2000 (VERY WET ANNUAL PRECIPITATION)

Exhibit 23

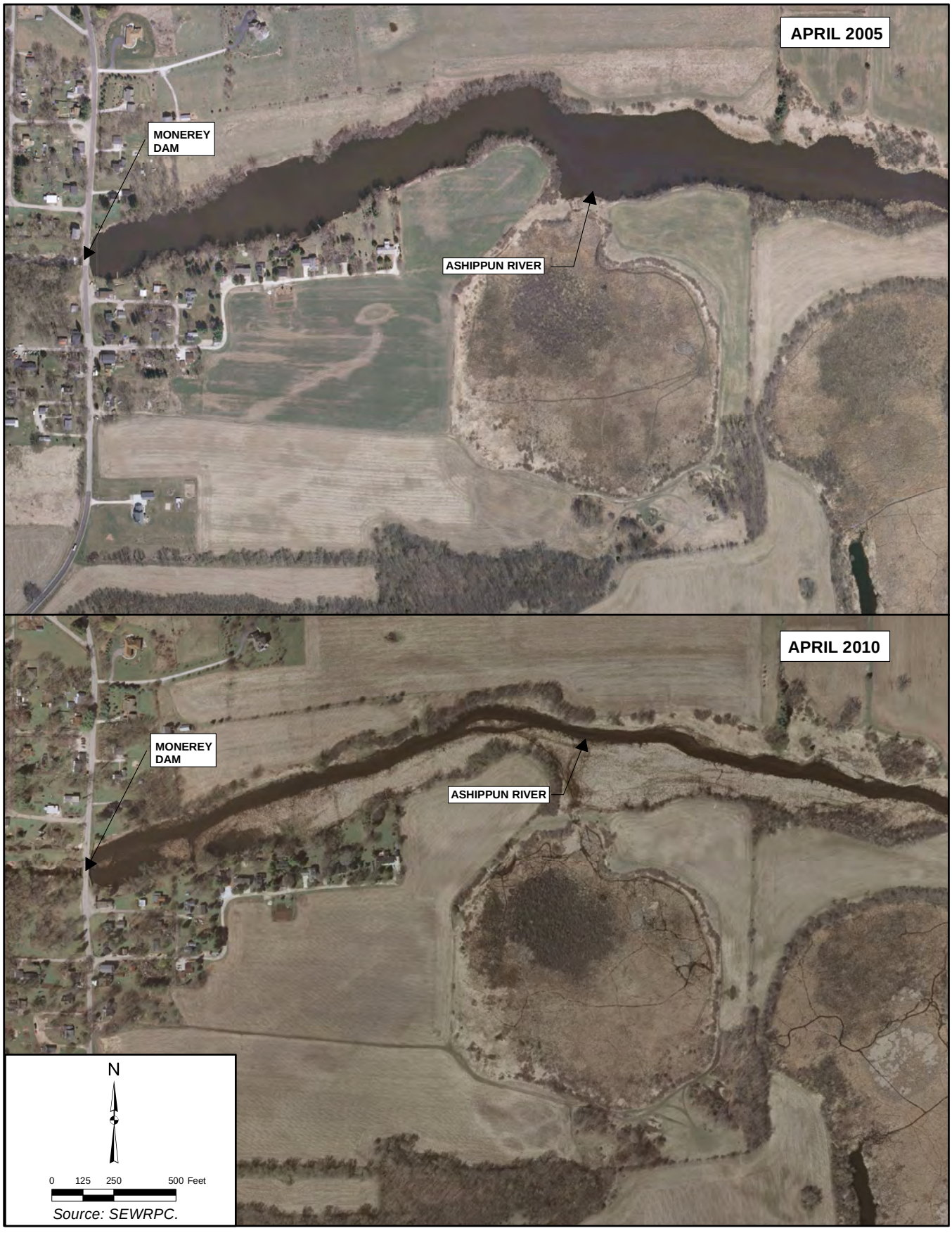
MONTEREY MILL POND, ASHIPPUN RIVER, AND ASHIPPUN LAKE: 2005 (VERY DRY ANNUAL PRECIPITATION)

Exhibit 24

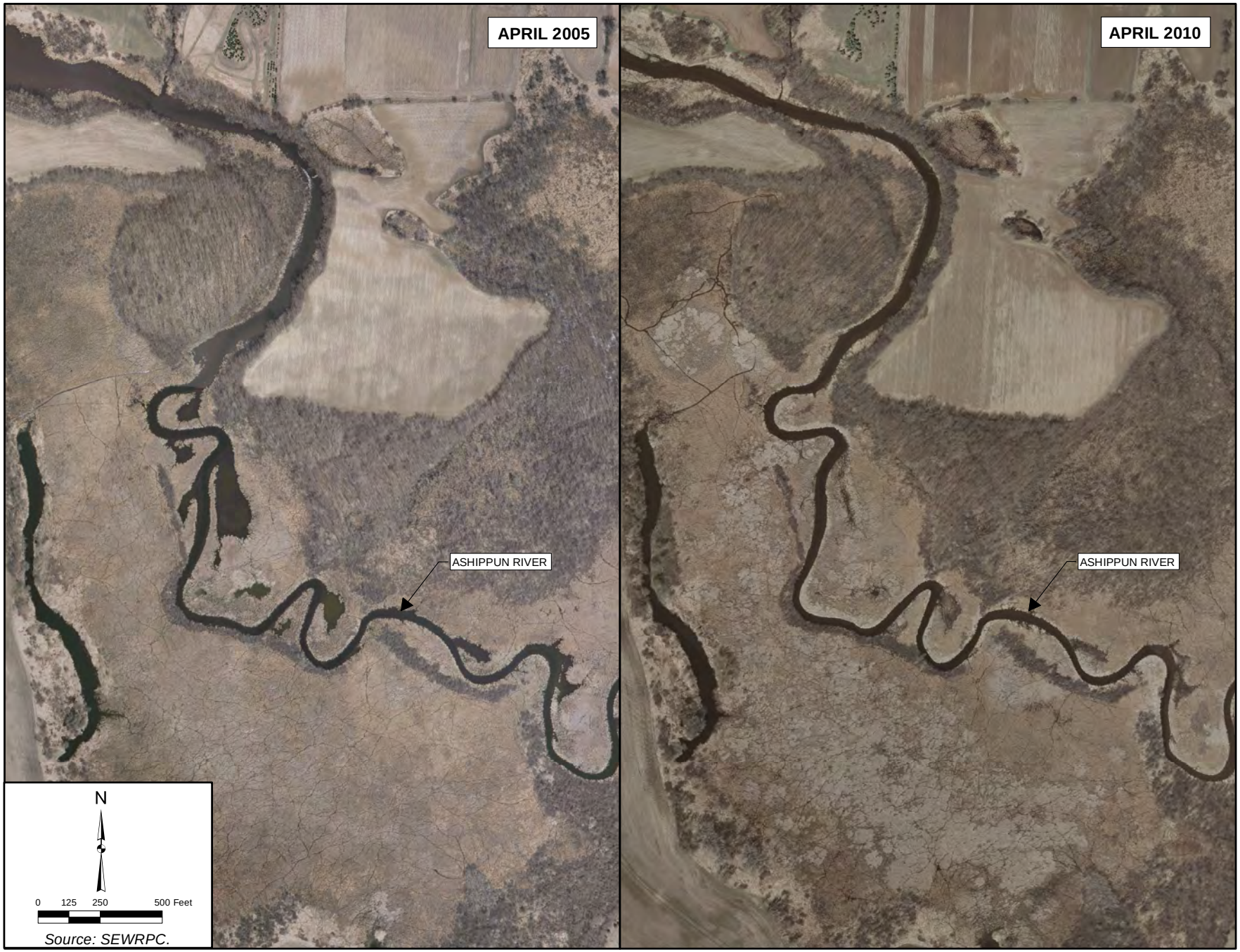
COMPARISON OF AERIAL PHOTOGRAPHS OF THE ASHIPPUN RIVER, ASHIPPUN LAKE, AND ASHIPPUN LAKE OUTLET BEFORE MONTEREY DAM DRAWDOWN (APRIL 2005) AND AFTER MONTEREY DAM DRAWDOWN (APRIL 2010)



Inset 1 to Exhibit 24

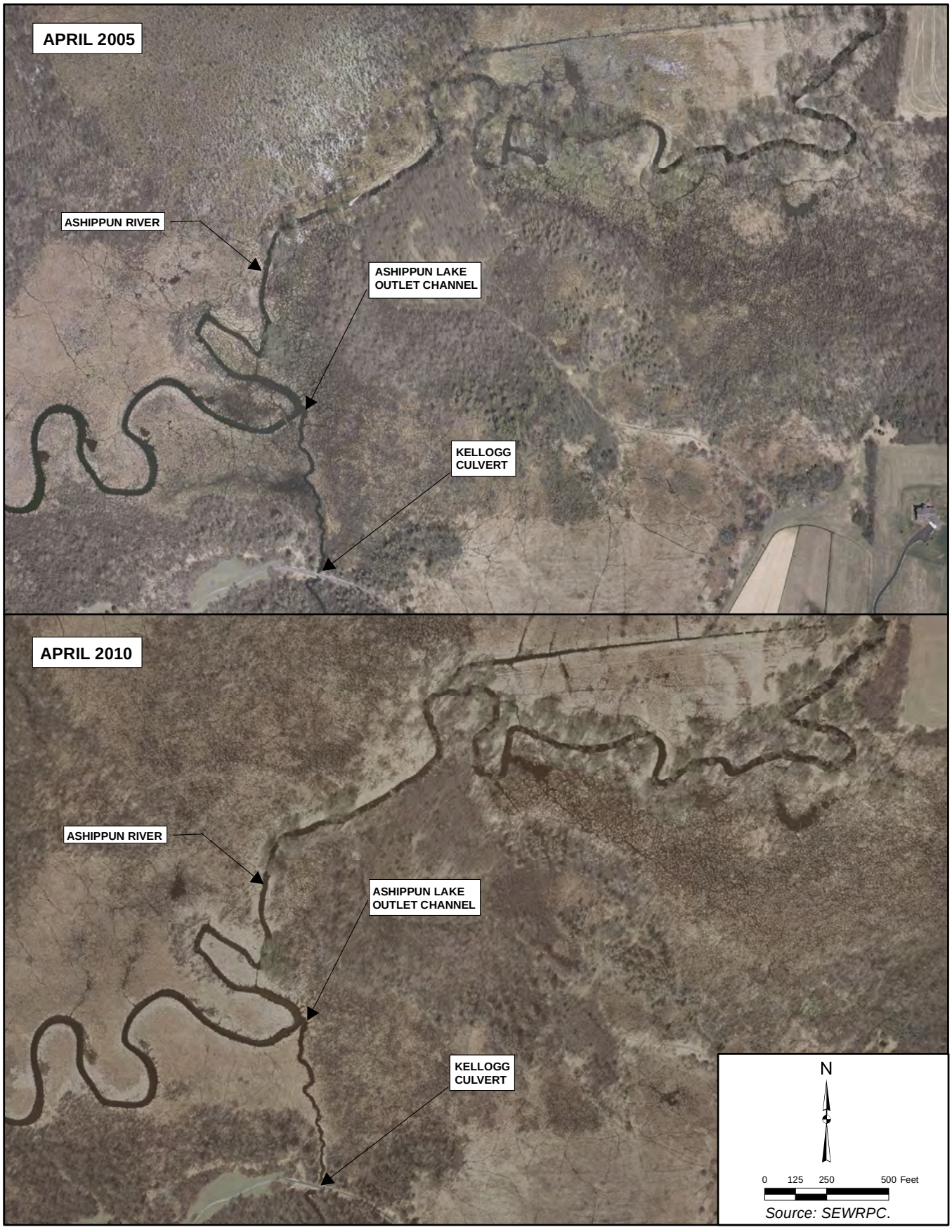


Inset 2 to Exhibit 24

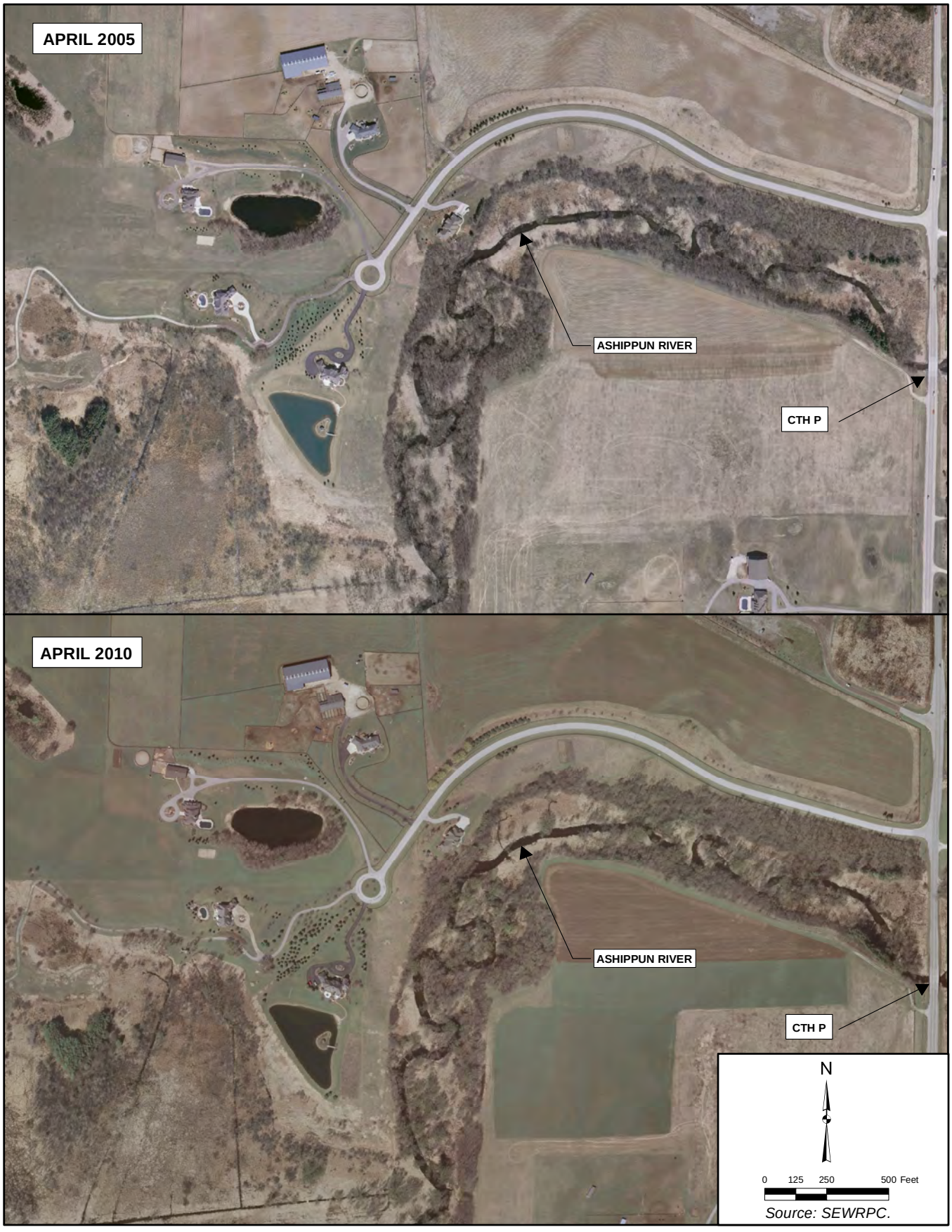


Source: SEWRPC.

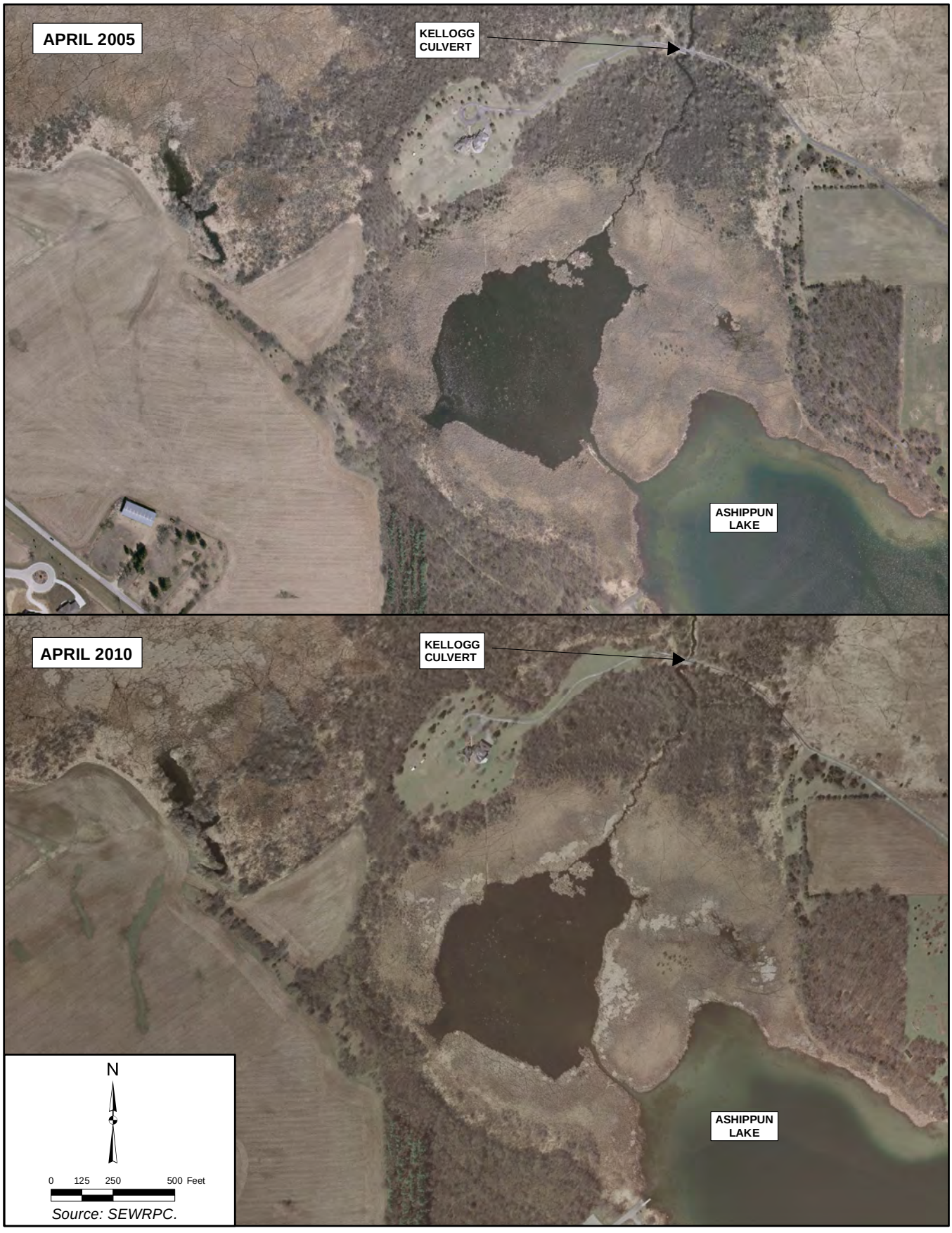
Inset 3 to Exhibit 24



Inset 4 to Exhibit 24



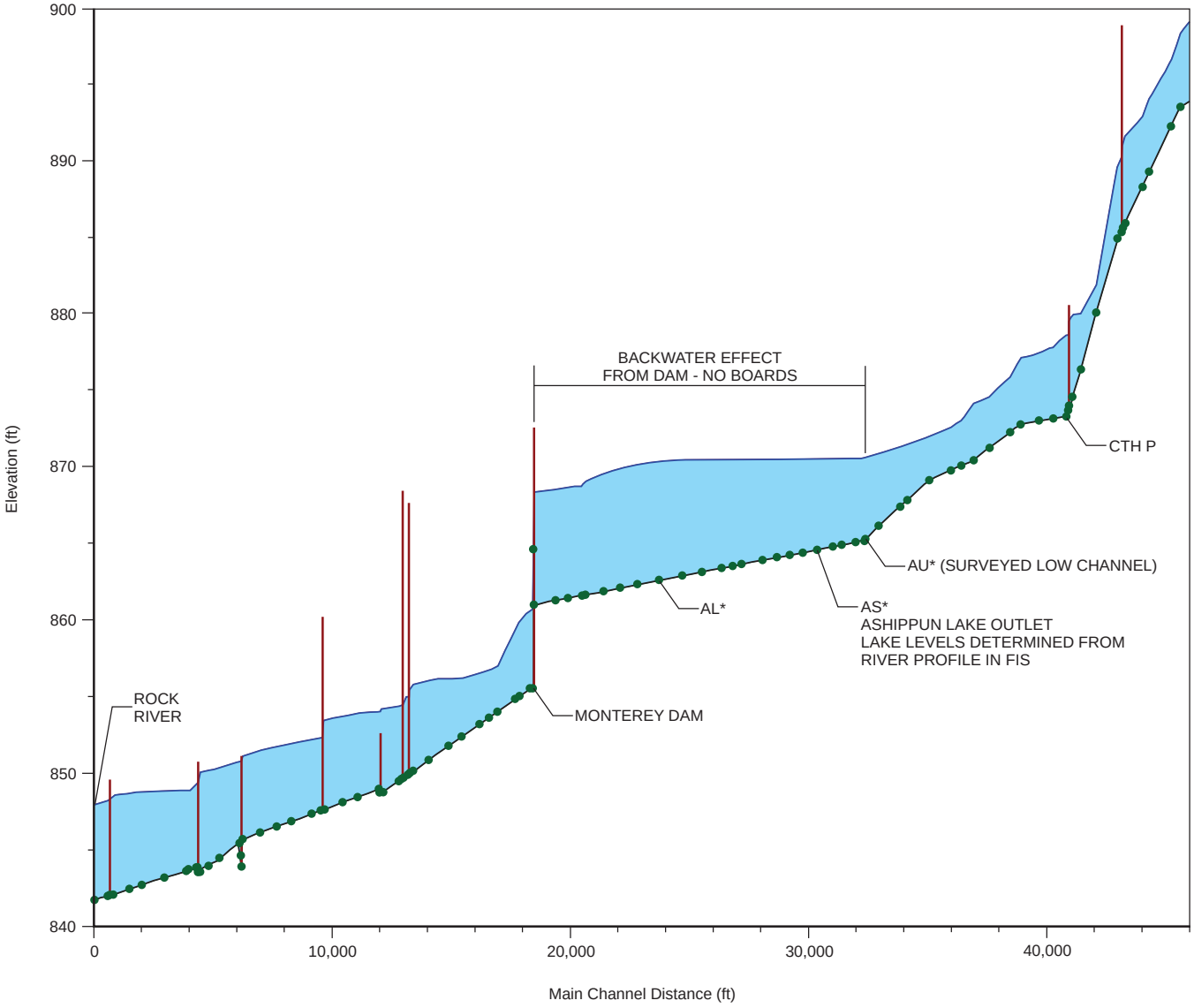
Inset 5 to Exhibit 24



Inset 6 to Exhibit 24

Exhibit 25

ASHIPPUN RIVER ONE-PERCENT-ANNUAL-PROBABILITY PROFILE

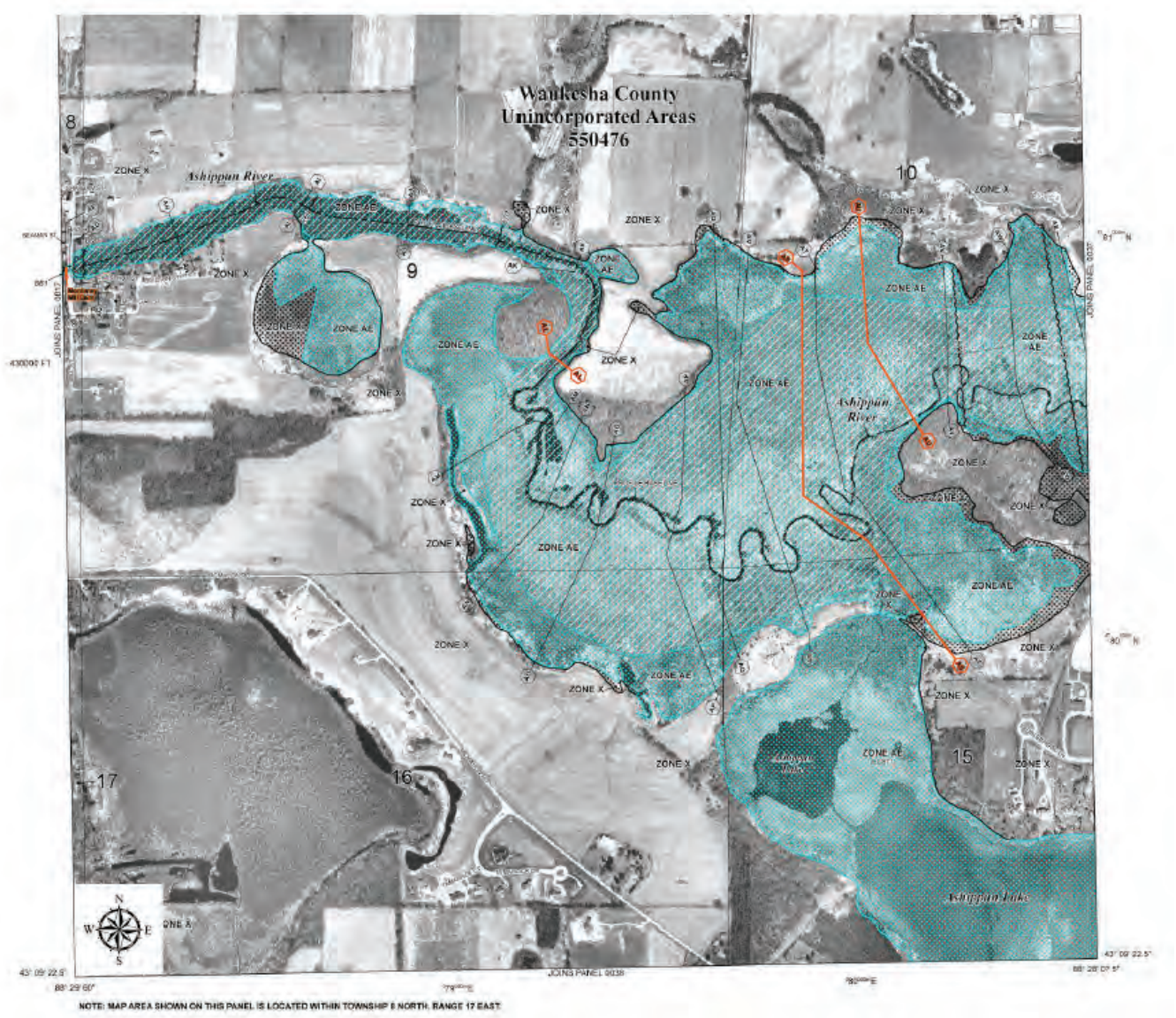


NOTE: *Cross section location on Digital Flood Insurance Rate Map.

Source: Waukesha County 2008 FEMA Flood Insurance Study and SEWRPC.

Exhibit 26

ONE-PERCENT-ANNUAL-PROBABILITY FLOODPLAIN FOR THE ASHIPPUN RIVER



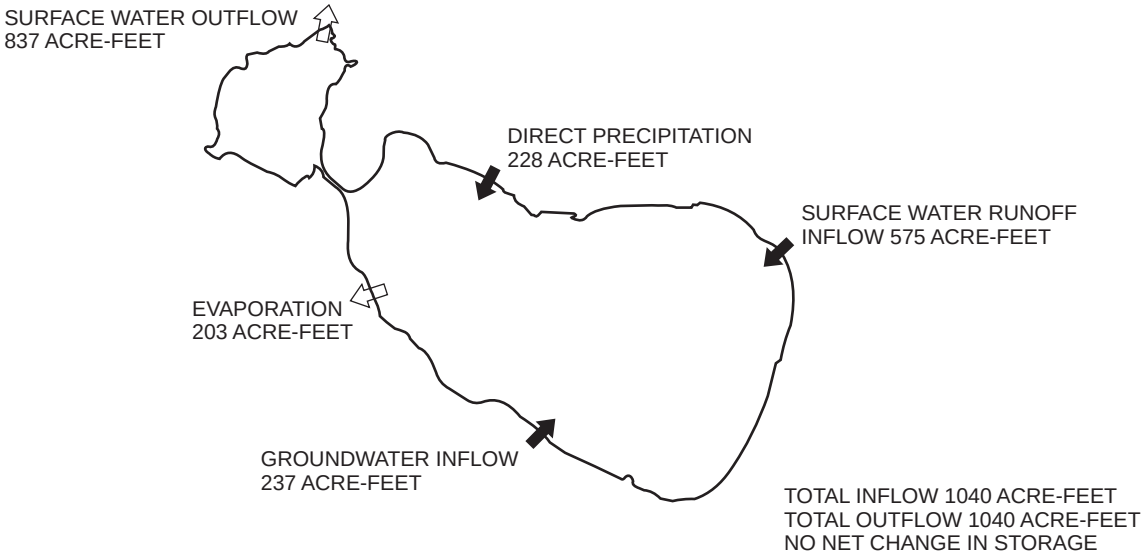
2008 WAUKESHA COUNTY FIS
SUMMARY OF LAKE ELEVATIONS

Annual Probability Event	Ashippun Lake Elevation (NGVD 29)
10%	869.2
2%	870.1
1%	870.6
0.2%	871.2

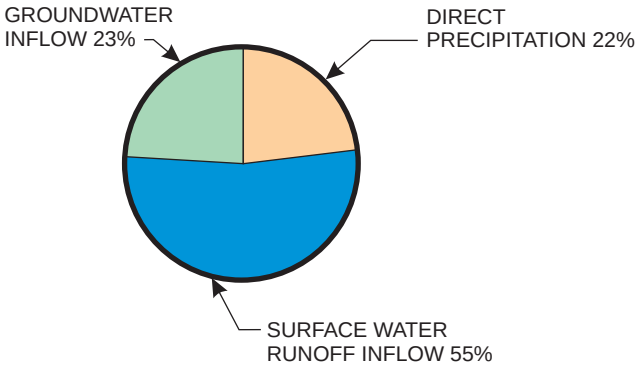
Source: Federal Emergency Management Agency and SEWRPC.

Exhibit 27

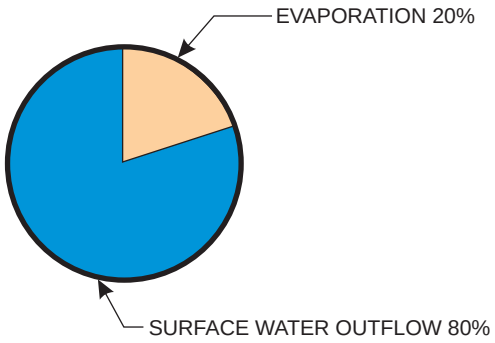
LONG-TERM HYDROLOGIC BUDGET FOR ASHIPPUN LAKE



ASHIPPUN LAKE INFLOW



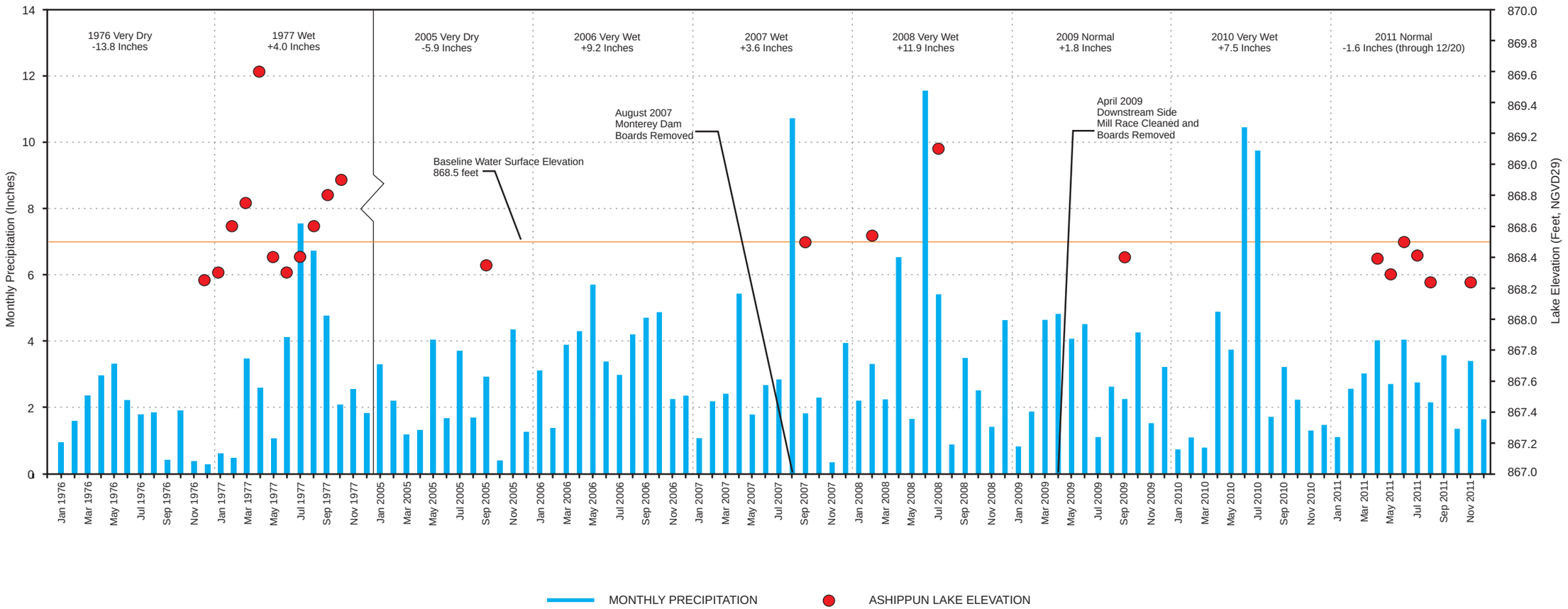
ASHIPPUN LAKE OUTFLOW



Source: U.S. Geological Survey and SEWRPC.

Exhibit 28

MONTHLY RECORDED PRECIPITATION TOTALS AND ASHIPPUN LAKE LEVELS: 1976-1977, 2005-2011



NOTES: The 868.5 baseline water surface elevation was determined in 1976-1977 and documented in SEWRPC Community Assistance Planning Report No. 48, 1st Edition.

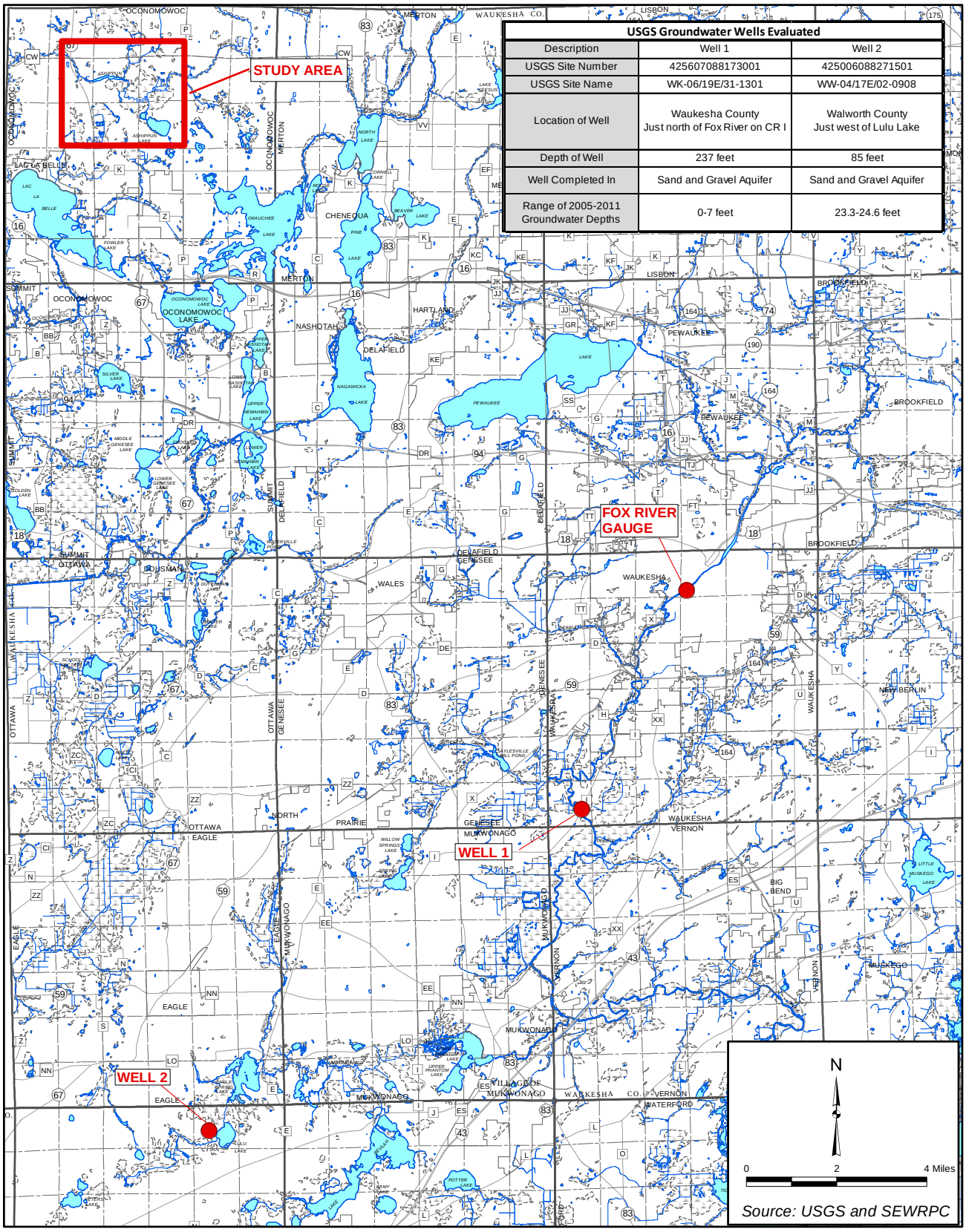
Monthly precipitation totals are provided for National Weather Service Cooperative Network Oconomowoc Gauge 476200.

Total annual precipitation categories were based upon a mean precipitation of 33.9 inches from 1971-2000 at the Oconomowoc Station as summarized below: Normal (33.9 inches +/-2.0 inches); Wet (>2.0 to +5 inches); Very Wet (> +5.0 inches); Dry (<-2.0 to -5 inches); and Very Dry (<-5.0 inches).

Source: Wisconsin Department of Natural Resources, National Weather Service, and SEWRPC.

Exhibit 29

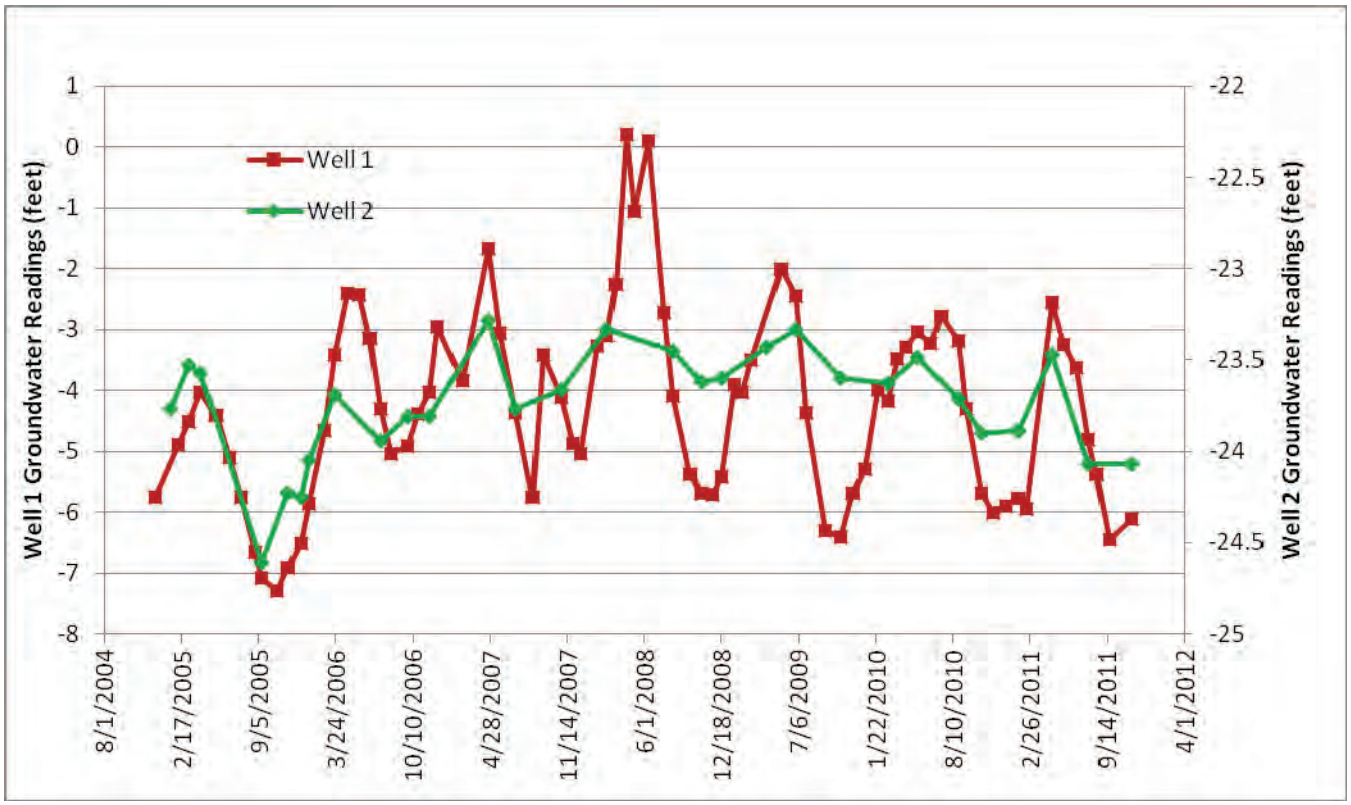
USGS GROUNDWATER WELLS AND FOX RIVER GAUGE LOCATION IN RELATION TO STUDY AREA



USGS Groundwater Wells Evaluated		
Description	Well 1	Well 2
USGS Site Number	425607088173001	425006088271501
USGS Site Name	WK-06/19E/31-1301	WW-04/17E/02-0908
Location of Well	Waukesha County Just north of Fox River on CR I	Walworth County Just west of Lulu Lake
Depth of Well	237 feet	85 feet
Well Completed In	Sand and Gravel Aquifer	Sand and Gravel Aquifer
Range of 2005-2011 Groundwater Depths	0-7 feet	23.3-24.6 feet

Exhibit 30

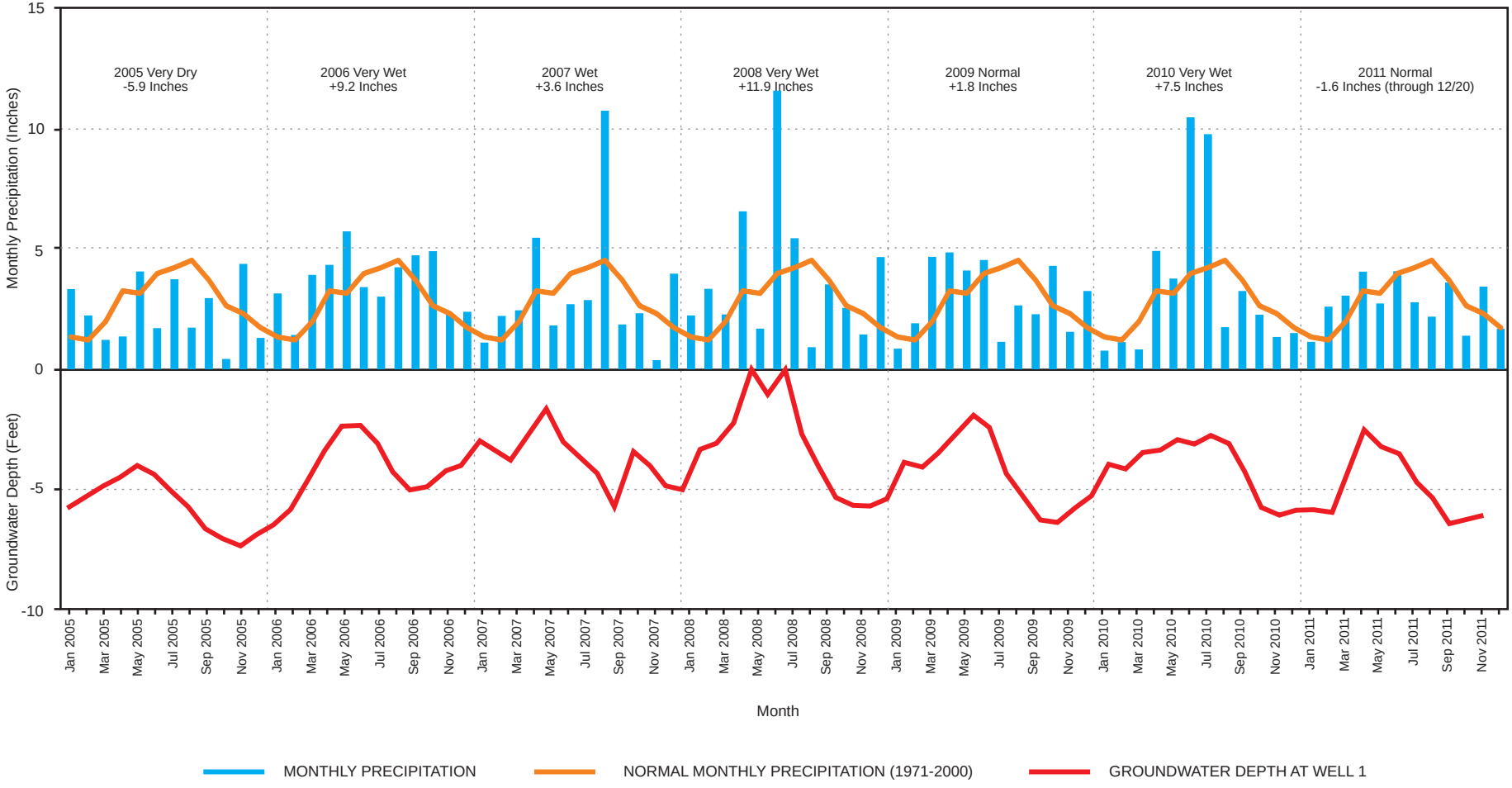
USGS GROUNDWATER WELL 1 AND WELL 2 DATA



Source: U.S. Geological Survey and SEWRPC.

Exhibit 31

MONTHLY RECORDED PRECIPITATION TOTALS AND WELL 1 DATA: 2005-2011



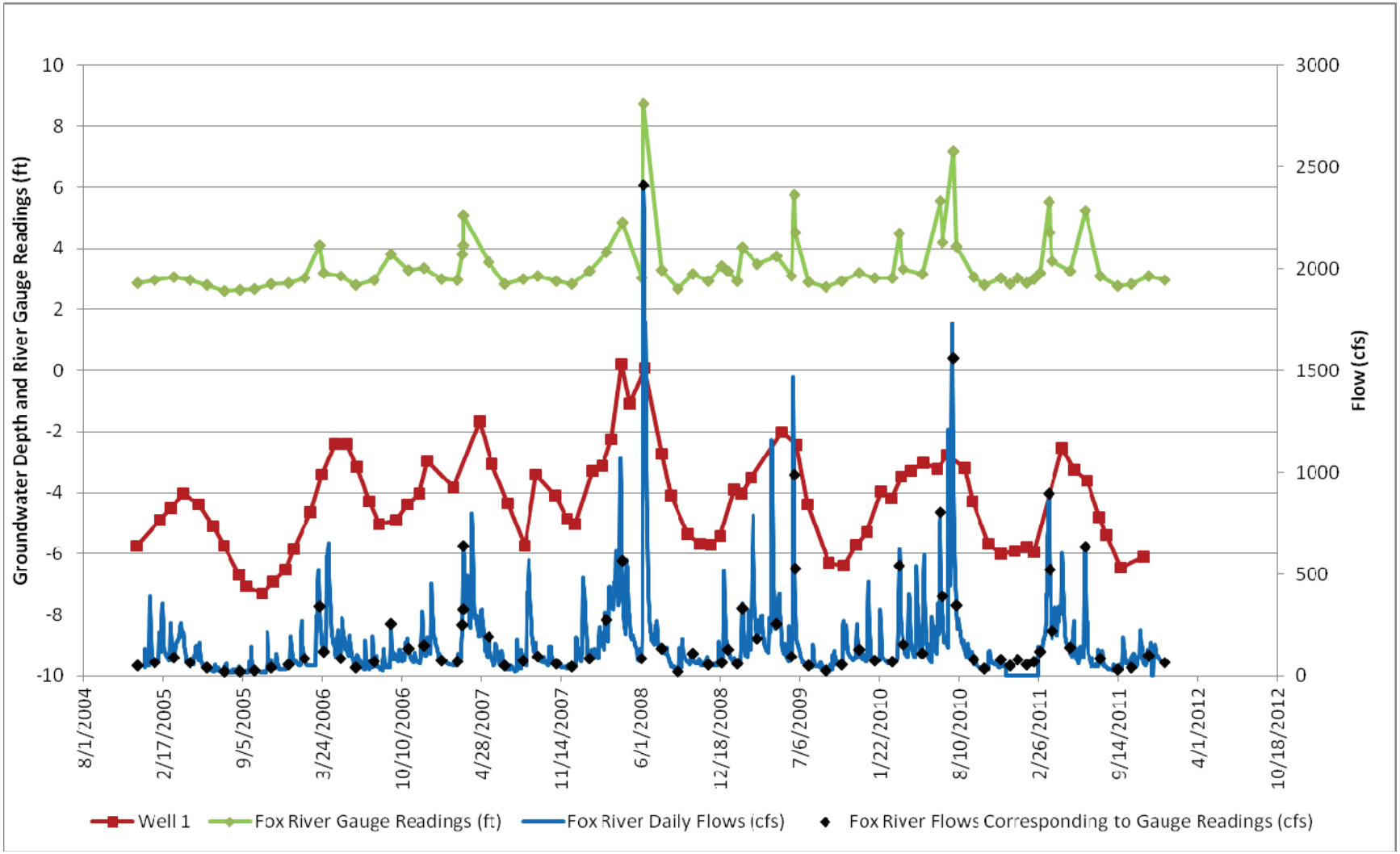
NOTES: Monthly precipitation totals are provided for National Weather Service Cooperative Network Oconomowoc Gauge 476200.

Total annual precipitation categories were based upon a mean precipitation of 33.9 inches from 1971-2000 at the Oconomowoc Station as summarized below: Normal (33.9 inches +/-2.0 inches); Wet (>2.0 to +5 inches); Very Wet (> +5.0 inches); Dry (<-2.0 to -5 inches); and Very Dry (<-5.0 inches).

Source: National Weather Service and SEWRPC.

Exhibit 32

USGS GROUNDWATER WELL 1 WITH FOX RIVER FLOWS AND STAGES



Source: U.S. Geological Survey and SEWRPC.

Exhibit 33

RJN Environmental Services, LLC
Surface Water Studies
Groundwater Studies
Site Investigations

December 19, 2011

Town Board
Town of Oconomowoc
W359 N6812 Brown Street
Oconomowoc, Wisconsin 53066

RE: Ashippun Lake
Groundwater & Surface Water Issues

Dear Board Members:

On behalf of my client, the Ashippun Lake Protection and Rehabilitation District, I have prepared this letter to summarize my understanding of the groundwater/surface water relationships in the Ashippun Lake area, and to provide my professional opinion with respect to the potential impacts to the lake and sensitive area environmental features in the event that the dam at Monterey is removed.

Figure 1 shows the conditions with the dam in place. Ashippun Lake is at an elevation of 869 feet (relative to mean sea level), and the mill pond at Monterey is at 867 feet. This results in a very low gradient from Ashippun to the dam, resulting in the meandering nature of the stream. This condition also acts to stabilize the water table, which, in turn, provides the base for the area wetlands.

Beneath the dam, the water table lowers. It has been my experience in situations such as this that the stream between Ashippun Lake and the mill pond is gaining, i.e., groundwater is discharging to the surface waters. As the dam is approached, the stream changes to losing conditions, where it is releasing water to the aquifer, and there is likely a steep groundwater gradient near the dam, sloping to the west.

I utilized the groundwater flow model created by the USGS for the Southeast Wisconsin Regional Planning Commission, to observe potential impacts from the removal of the dam. This model is a three-dimensional numerical model, which has been carefully calibrated and peer-reviewed. The results of the modeling are shown on Figure 2. On this figure we see the water table dropping 5 feet by the time it reaches the mill pond, and a total of almost 10 feet at the dam.

This would likely result in numerous undesired consequences. First, the source for the wetland community will be gone, with the water table dropping far below ground surface. Adverse

4631 County Road A • Oregon, Wisconsin 53575
Phone: 608.576.3001 • Fax: 608.835.3542

impacts to the wetlands can already be observed as a result of the lowering of the weir level at the dam.

Second, the stream may become intermittent. Because it is part of a small watershed, it will rely primarily on drainage from Ashippun Lake. When it is flowing, the velocity will likely increase, due to the increased gradient caused by the elimination of the mill pond. This will result in accelerated erosion.

Finally, as can be seen from Figure 2, the projected water table drops below the lake level over approximately two-thirds of the lake. This will result in a significant reduction in groundwater discharge to the lake.

However, groundwater entering the lake through the lake bed is a very important part of the lake's ecosystem. Because groundwater has a fairly stable temperature through the year, it serves to stabilize the temperature at the lake bed. Fisheries are very dependent upon lake bed temperature for spawning; a slight change in that stability can be devastating to the fisheries.

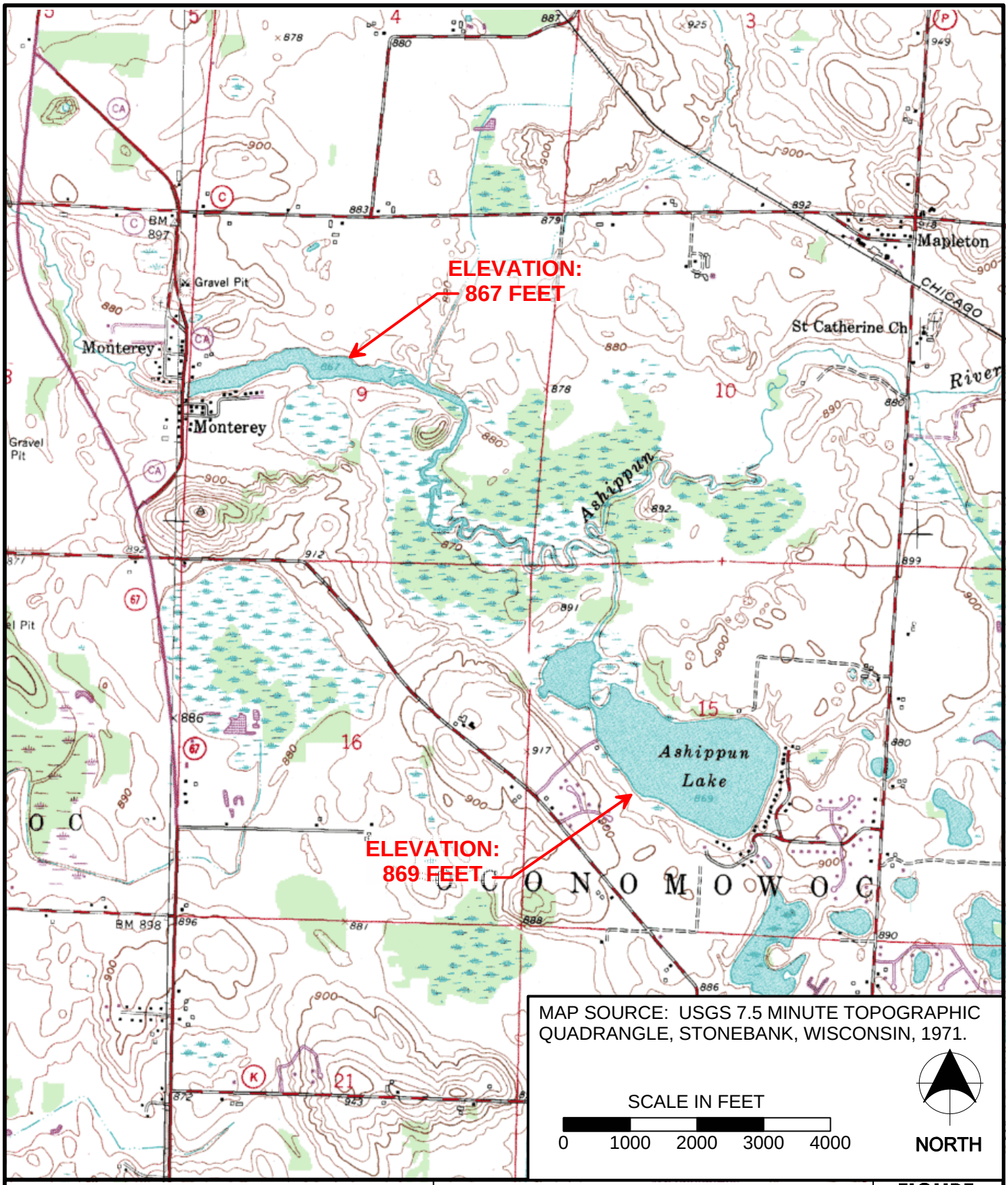
Likewise, groundwater discharge to the lake is very important in maintaining the lake water chemistry. I have found in my studies at nearby Lake Beulah that groundwater is hard (i.e., a high pH) relative to surface waters. This is very important in that hard water will cause nutrients (for example, phosphorus) to precipitate out of solution. This results in the creation of a natural buffer to algae blooms, and prevents eutrophication. Because Ashippun Lake is in an agricultural area, maintaining the groundwater component in the lake water budget is an essential component for sustaining healthy water chemistry.

Based on this evaluation, it is my opinion that the removal of the dam will result in significant, permanent adverse impacts to Ashippun Lake and the stream and wetlands between the lake and Monterey.

Should you have any questions, please contact me.

Sincerely,
RJN ENVIRONMENTAL SERVICES, LLC

Robert J. Nauta, P.G.
Hydrogeologist

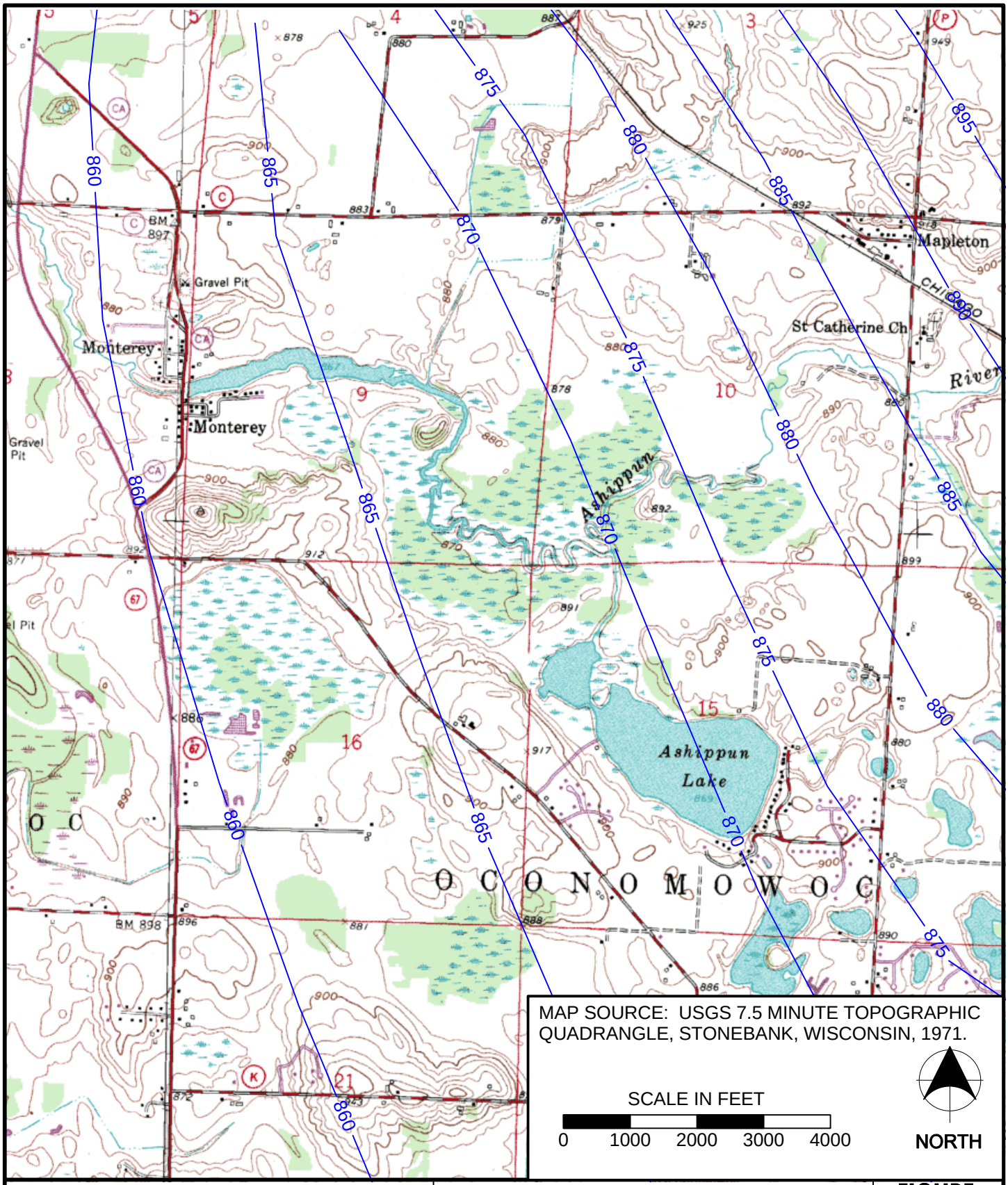


RJN Environmental Services, LLC
Surface Water Studies
Groundwater Studies
Site Investigations
4631 COUNTY ROAD A, OREGON, WISCONSIN 53575 (608) 576-3001

ASHIPPUN LAKE PROTECTION AND REHABILITATION DISTRICT
OCONOMOWOC, WISCONSIN
SITE MAP

FIGURE 1

DRAWN BY	PROJ. No.	DATE	FILE
RN	11-202	04 AUG 11	SITE MAP



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Site Investigations
4631 COUNTY ROAD A, OREGON, WISCONSIN 53575 (608) 576-3001

ASHIPPUN LAKE PROTECTION AND REHABILITATION DISTRICT
OCONOMOWOC, WISCONSIN
PROJECTED WATER TABLE

FIGURE 2

DRAWN BY	PROJ. No.	DATE	FILE
RN	11-202	04 AUG 11	WTR TABLE

RJN Environmental Services, LLC
Surface Water Studies
Groundwater Studies
Site Investigations

January 23, 2012

Jeffrey Thornton, Ph.D.
Thomas Slawski, Ph.D.
Laura Kletti, P.E., CFM
Southeastern Wisconsin Regional Planning Commission
W239 N1812 Rockwood Drive
Waukesha, Wisconsin

RE: Ashippun Lake
Groundwater & Surface Water Issues

All:

As requested, I have added additional detail to my recent letter to the Town Board of the Town of Oconomowoc, related to the possible removal of the dam at Monterey.

To assist in my evaluation, I have run scenarios of the groundwater flow model created by the US Geological Survey for the Southeastern Wisconsin Regional Planning Commission. This model is a three-dimensional numerical model, which has been carefully calibrated and peer-reviewed. The model is of limited use, because it has a cell spacing of 2500 feet; consequently, I combined the model results with plotted water levels from the stream, and then re-contoured using the program Surfer. For this reason, the attached figures provide more detail than the figures submitted with my December 2011 letter to the Town of Oconomowoc.

Figure 1 shows the conditions with the dam in place. Ashippun Lake is at an elevation of 869 feet (relative to mean sea level), and the mill pond at Monterey is at 866 feet. This results in a very low gradient from Ashippun to the dam, which then results in the meandering nature of the stream. This condition also acts to stabilize the water table, which, in turn, provides the base for the area wetlands.

Beneath the dam, the stream level is 858 feet, and the water table lowers. It has been my experience in situations such as this that the stream between Ashippun Lake and the mill pond is gaining, i.e., groundwater is discharging to the surface waters. As the dam is approached, the stream changes to losing conditions, where it is releasing water to the aquifer, and there is a steep groundwater gradient near the dam, sloping to the west.

The model was then modified to simulate the conditions without the dam. As with the baseline simulations, the model results were combined with plotted conditions in the stream, and re-contoured.

The modeling methodology was very straight-forward. Stream "reaches" in the model are defined by setting various parameters, including the stream stages, which is set for endpoints of the reaches. The model then calculates the stream gradient between endpoints. In the original model, the stages for the stream reach between, Ashippun Lake and the Monterey dam were set at 869 feet at the lake to 866 feet at the dam. The next reach to the west starts at 858 feet. To modify the conditions without the

dam, I left the stream reach endpoint at the lake at 869 feet, but then set the western endpoint at 858 feet.

The results of the modeling are shown on Figure 2. With this scenario, the relatively flat groundwater surface between the lake and the dam is replaced by a constant slope. As a result, areas where the water table had been at or near ground surface are now significantly lower.

This would likely result in numerous undesired consequences. First, the source for the wetland community will be gone, with the water table dropping far below ground surface. Adverse impacts to the wetlands can already be observed as a result of the lowering of the weir level at the dam.

Second, due to the steeper gradient, the stream may become intermittent in upstream areas, such as near the outlet from Ashippun Lake. Because it is part of a small watershed, it will rely primarily on drainage from Ashippun Lake. When it is flowing, the velocity will likely increase, due to the increased gradient caused by the elimination of the mill pond. This will result in accelerated erosion. Based on the change in gradient, the erosion would likely begin near the east end of the mill pond, and work its way easterly.

Finally, as can be seen from Figure 2, the projected water table gradient to the west of the lake is increased, resulting in an accelerated flow of water discharging from the lake to the aquifer. However, a balancing increase in the slope upgradient from the lake is not present. Therefore, while the flow of groundwater into the lake is not increased, the outflow is. Although the resolution of the model is not refined enough to show this, it has been my experience that this would also cause the delineation from a gaining lake to a losing lake will migrate upgradient, resulting in a net loss of groundwater discharge to the lake.

Please note, however, that this is a cursory analysis. No field data were included, nor was the model capable of simulating conditions on a small scale with much detail.

However, based on this evaluation, it remains my opinion that the removal of the dam will result in significant, permanent adverse impacts to Ashippun Lake and the stream and wetlands between the lake and Monterey. A logical step would be to collect field data and create a smaller-scale model to refine the results presented above.

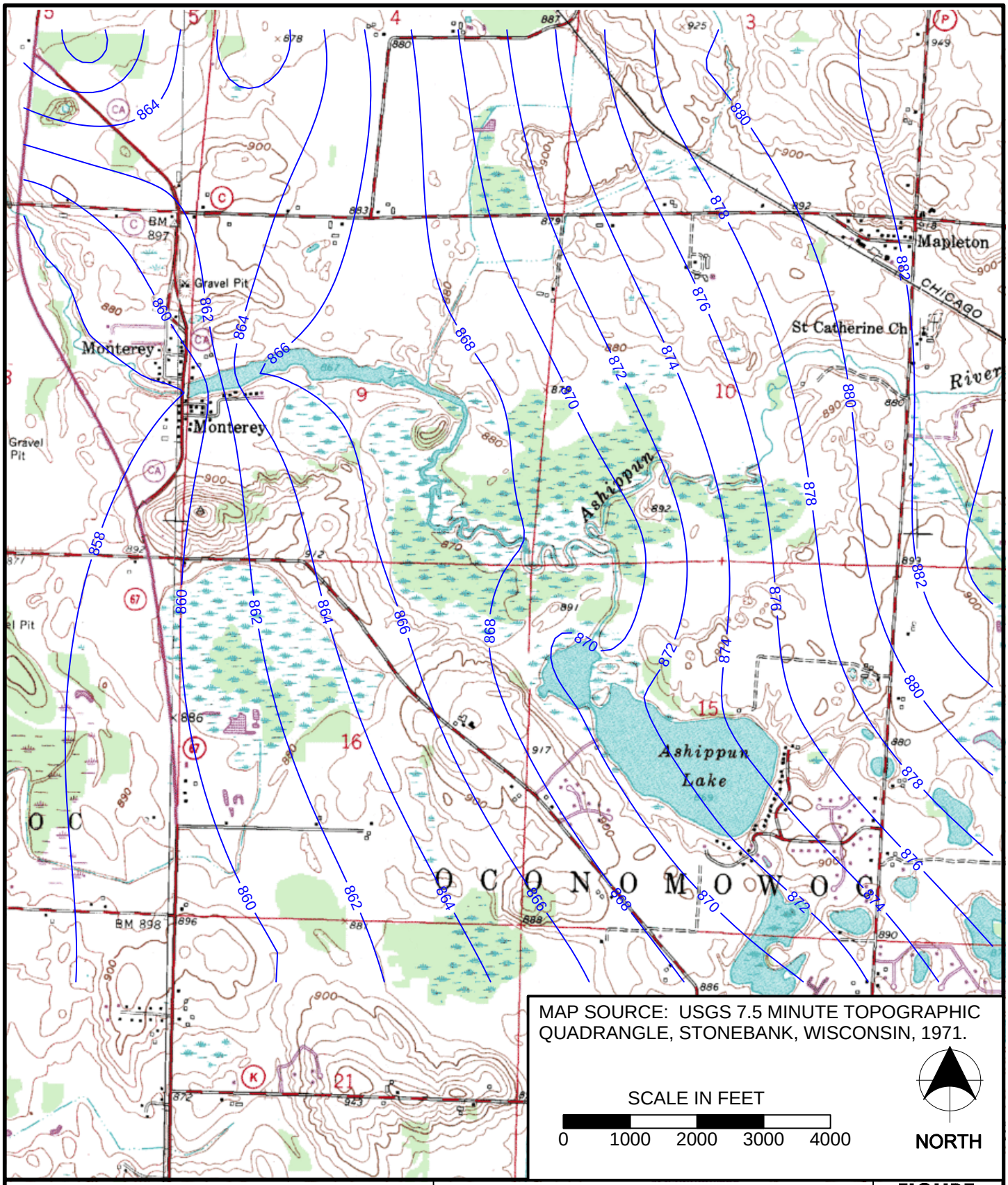
Should you have any questions, please contact me.

Sincerely,

RJN ENVIRONMENTAL SERVICES, LLC

Robert J. Nauta, P.G.

Hydrogeologist



MAP SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, STONEBANK, WISCONSIN, 1971.

SCALE IN FEET

0 1000 2000 3000 4000

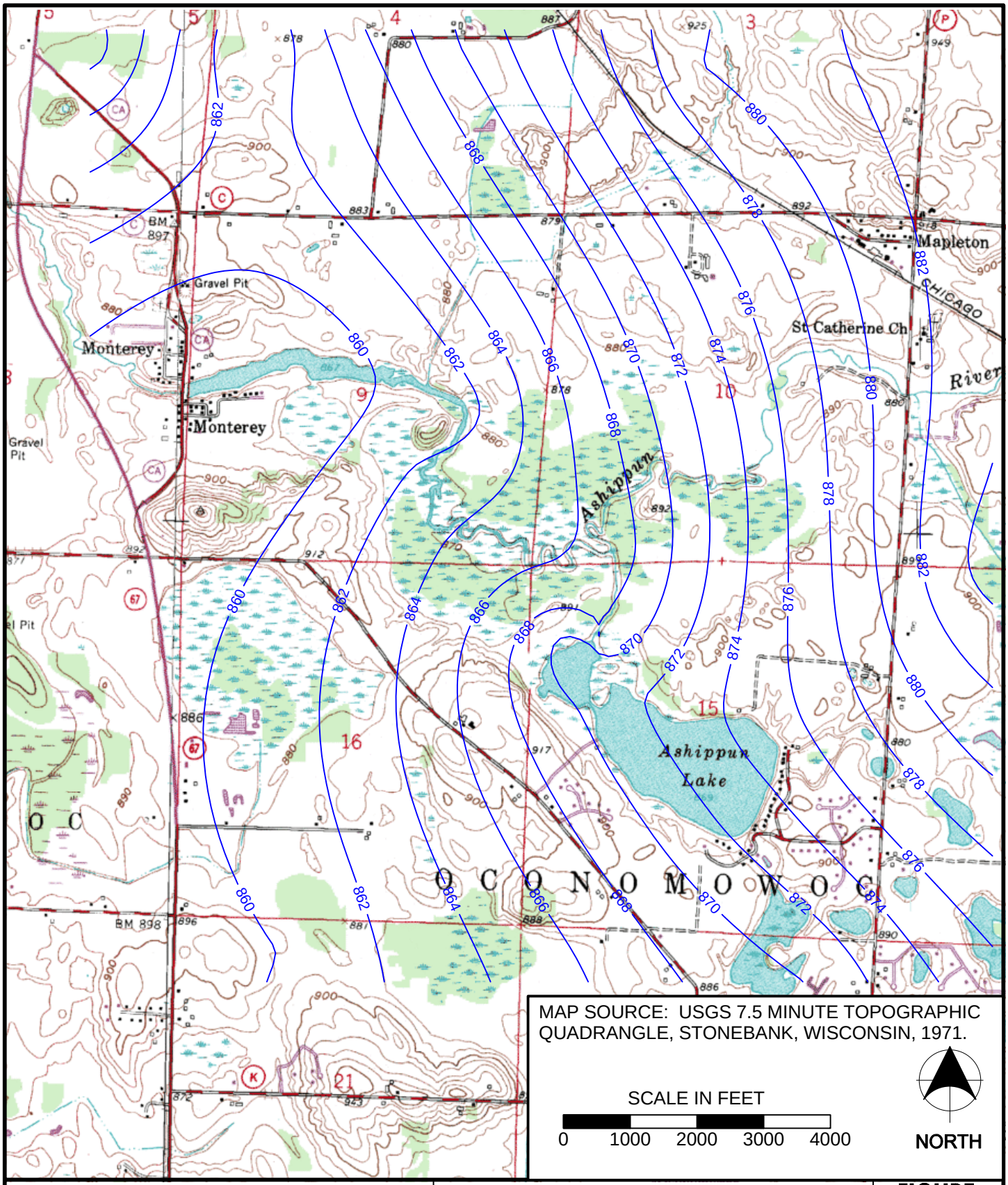
NORTH

RJN Environmental Services, LLC
Surface Water Studies
Groundwater Studies
Site Investigations
4631 COUNTY ROAD A, OREGON, WISCONSIN 53575 (608) 576-3001

ASHIPPUN LAKE PROTECTION AND REHABILITATION DISTRICT
OCONOMOWOC, WISCONSIN
EXISTING WATER TABLE

FIGURE 1

DRAWN BY	PROJ. No.	DATE	FILE
RN	11-202	23 JAN 12	E WTR TABLE



MAP SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, STONEBANK, WISCONSIN, 1971.

SCALE IN FEET

0 1000 2000 3000 4000

NORTH

RJN Environmental Services, LLC
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Groundwater Studies
Site Investigations
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ASHIPPUN LAKE PROTECTION AND REHABILITATION DISTRICT
OCONOMOWOC, WISCONSIN
PROJECTED WATER TABLE

FIGURE 2

DRAWN BY	PROJ. No.	DATE	FILE
RN	11-202	23 JAN 12	P WTR TABLE

Exhibit 34

WATER QUALITY AND TROPHIC STATE INDEX VALUES FOR SECCHI DEPTH, TOTAL PHOSPHORUS, AND CHLOROPHYLL-A FOR ASHIPPUN LAKE CATEGORIZED AMONG SEASONS AND ANNUAL PRECIPITATION: 1976-2011

Date	Season[a]	Annual Precipitation Classification[b]	Secchi Depth (feet)	Total Phosphorus (mg/L)	Chlorophyll-*a* (µg/L)	WTSI Value (Secchi depth)	WTSI Value (total (phosphorus)	WTSI Value (chlorophyll-*a*)
19-Feb-1976	Winter	Very dry	3.00	0.020	- -	- -	49.8	- -
5-Apr-1976	Spring	Very dry	4.20	0.070	- -	56.4	67.9	- -
16-Jul-1976	Summer	Very dry	6.50	0.030	- -	50.1	55.7	- -
9-Nov-1976	Fall	Very dry	5.20	0.080	- -	53.4	69.8	- -
24-Jan-1977	Winter	Wet	3.50	0.050	- -	59.1	63.0	- -
15-Apr-1977	Spring	Wet	5.00	0.030	- -	53.9	55.7	- -
1-Sep-1977	Fall	Wet	8.20	0.070	- -	46.8	67.9	- -
2-Nov-1977	Fall	Wet	1.30	0.060	- -	73.3	65.7	- -
8-Feb-1978	Winter	Normal	2.50	0.090	- -	63.9	71.5	- -
14-Apr-1978	Spring	Normal	4.20	0.060	- -	56.4	65.7	- -
9/7/1979[c]	Fall	Normal	10.00	0.030	- -	43.9	55.7	- -
18-Feb-1981	Winter	Dry	12.00	- -	- -	41.3	- -	- -
14-Jul-1990	Summer	Normal	6.00	- -	- -	51.3	- -	- -
21-Jul-1990	Summer	Normal	7.50	- -	- -	48.1	- -	- -
28-Jul-1990	Summer	Normal	7.25	- -	- -	48.6	- -	- -
5-Aug-1990	Summer	Normal	5.75	- -	- -	51.9	- -	- -
13-Aug-1990	Summer	Normal	4.50	- -	- -	55.4	- -	- -
19-Aug-1990	Summer	Normal	4.25	- -	- -	56.3	- -	- -
26-Aug-1990	Summer	Normal	5.50	- -	- -	52.6	- -	- -
1-Sep-1990	Fall	Normal	5.75	- -	- -	51.9	- -	- -
9-Sep-1990	Fall	Normal	5.25	- -	- -	53.2	- -	- -
16-Sep-1990	Fall	Normal	5.75	- -	- -	51.9	- -	- -
23-Sep-1990	Fall	Normal	6.75	- -	- -	49.6	- -	- -
30-Sep-1990	Fall	Normal	7.25	- -	- -	48.6	- -	- -
6-Oct-1990	Fall	Normal	8.50	- -	- -	46.3	- -	- -
13-Oct-1990	Fall	Normal	9.25	- -	- -	45.1	- -	- -
28-Oct-1990	Fall	Normal	7.00	- -	- -	49.1	- -	- -
11-Nov-1990	Fall	Normal	8.25	- -	- -	46.7	- -	- -
18-Nov-1990	Fall	Normal	9.25	- -	- -	45.1	- -	- -
28-Apr-1991	Spring	Very wet	9.75	- -	- -	44.3	- -	- -
11-May-1991	Spring	Very wet	7.75	- -	- -	47.6	- -	- -
19-May-1991	Spring	Very wet	5.75	- -	- -	51.9	- -	- -
27-May-1991	Spring	Very wet	5.25	- -	- -	53.2	- -	- -
1-Jun-1991	Summer	Very wet	5.25	- -	- -	53.2	- -	- -
8-Jun-1991	Summer	Very wet	6.00	- -	- -	51.3	- -	- -
16-Jun-1991	Summer	Very wet	6.25	- -	- -	50.7	- -	- -
23-Jun-1991	Summer	Very wet	6.25	- -	- -	50.7	- -	- -
5-Jul-1991	Summer	Very wet	6.50	- -	- -	50.1	- -	- -
14-Jul-1991	Summer	Very wet	8.00	- -	- -	47.1	- -	- -
20-Jul-1991	Summer	Very wet	6.00	- -	- -	51.3	- -	- -
27-Jul-1991	Summer	Very wet	6.75	- -	- -	49.6	- -	- -
4-Aug-1991	Summer	Very wet	8.00	- -	- -	47.1	- -	- -
10-Aug-1991	Summer	Very wet	7.00	- -	- -	49.1	- -	- -
18-Aug-1991	Summer	Very wet	4.75	- -	- -	54.7	- -	- -
24-Aug-1991	Summer	Very wet	4.25	- -	- -	56.3	- -	- -
1-Sep-1991	Fall	Very wet	3.25	- -	- -	60.1	- -	- -
7-Sep-1991	Fall	Very wet	3.50	- -	- -	59.1	- -	- -
14-Sep-1991	Fall	Very wet	4.25	- -	- -	56.3	- -	- -
21-Sep-1991	Fall	Very wet	4.75	- -	- -	54.7	- -	- -
5-Oct-1991	Fall	Very wet	6.00	- -	- -	51.3	- -	- -
13-Oct-1991	Fall	Very wet	7.75	- -	- -	47.6	- -	- -
19-Oct-1991	Fall	Very wet	9.75	- -	- -	44.3	- -	- -
27-Oct-1991	Fall	Very wet	7.75	- -	- -	47.6	- -	- -
3-Nov-1991	Fall	Very wet	7.50	- -	- -	48.1	- -	- -
3-May-1992	Spring	Dry	10.75	- -	- -	42.9	- -	- -
10-May-1992	Spring	Dry	14.25	- -	- -	38.8	- -	- -
17-May-1992	Spring	Dry	9.00	- -	- -	45.4	- -	- -
24-May-1992	Spring	Dry	7.50	- -	- -	48.1	- -	- -
31-May-1992	Spring	Dry	8.25	- -	- -	46.7	- -	- -

Exhibit 34

Date	Season[a]	Annual Precipitation Classification[b]	Secchi Depth (feet)	Total Phosphorus (mg/L)	Chlorophyll-*a* (µg/L)	WTSI Value (Secchi depth)	WTSI Value (total (phosphorus)	WTSI Value (chlorophyll-*a*)
7-Jun-1992	Summer	Dry	6.50	- -	- -	50.1	- -	- -
13-Jun-1992	Summer	Dry	7.25	- -	- -	48.6	- -	- -
22-Jun-1992	Summer	Dry	10.75	- -	- -	42.9	- -	- -
27-Jun-1992	Summer	Dry	14.25	- -	- -	38.8	- -	- -
4-Jul-1992	Summer	Dry	15.25	- -	- -	37.8	- -	- -
12-Jul-1992	Summer	Dry	12.50	- -	- -	40.7	- -	- -
19-Jul-1992	Summer	Dry	11.00	- -	- -	42.6	- -	- -
26-Jul-1992	Summer	Dry	9.75	- -	- -	44.3	- -	- -
1-Aug-1992	Summer	Dry	7.25	- -	- -	48.6	- -	- -
8-Aug-1992	Summer	Dry	6.75	- -	- -	49.6	- -	- -
15-Aug-1992	Summer	Dry	6.50	0.010	5.00	50.1	39.8	45.9
10-Oct-1992	Fall	Dry	8.25	- -	- -	46.7	- -	- -
18-Oct-1992	Fall	Dry	8.00	- -	- -	47.1	- -	- -
24-Oct-1992	Fall	Dry	8.75	0.021	8.00	45.9	50.5	49.5
3-May-1993	Spring	Wet	6.00	- -	- -	51.3	- -	- -
9-May-1993	Spring	Wet	7.75	- -	- -	47.6	- -	- -
16-May-1993	Spring	Wet	9.25	- -	- -	45.1	- -	- -
23-May-1993	Spring	Wet	10.00	- -	- -	43.9	- -	- -
31-May-1993	Spring	Wet	7.75	- -	- -	47.6	- -	- -
6-Jun-1993	Summer	Wet	5.00	- -	- -	53.9	- -	- -
12-Jun-1993	Summer	Wet	6.00	0.021	9.78	51.3	50.5	51.1
20-Jun-1993	Summer	Wet	6.25	- -	- -	50.7	- -	- -
27-Jun-1993	Summer	Wet	4.50	- -	- -	55.4	- -	- -
4-Jul-1993	Summer	Wet	6.25	- -	- -	50.7	- -	- -
11-Jul-1993	Summer	Wet	8.75	- -	- -	45.9	- -	- -
18-Jul-1993	Summer	Wet	7.75	0.010	3.20	47.6	39.8	42.5
25-Jul-1993	Summer	Wet	7.25	- -	- -	48.6	- -	- -
1-Aug-1993	Summer	Wet	7.75	- -	- -	47.6	- -	- -
13-Aug-1993	Summer	Wet	5.50	- -	- -	52.6	- -	- -
29-Aug-1993	Summer	Wet	3.00	0.012	9.19	61.3	42.5	50.6
5-Sep-1993	Fall	Wet	3.00	- -	- -	61.3	- -	- -
12-Sep-1993	Fall	Wet	4.25	- -	- -	56.3	- -	- -
19-Sep-1993	Fall	Wet	4.75	- -	- -	54.7	- -	- -
26-Sep-1993	Fall	Wet	5.75	- -	- -	51.9	- -	- -
10-Oct-1993	Fall	Wet	7.00	- -	- -	49.1	- -	- -
16-Oct-1993	Fall	Wet	6.75	0.024	23.90	49.6	52.5	57.9
24-Oct-1993	Fall	Wet	6.75	- -	- -	49.6	- -	- -
31-Oct-1993	Fall	Wet	5.75	- -	- -	51.9	- -	- -
7-Nov-1993	Fall	Wet	5.25	- -	- -	53.2	- -	- -
17-Nov-1993	Fall	Wet	4.75	- -	- -	54.7	- -	- -
10-Apr-1994	Spring	Very dry	7.50	- -	- -	48.1	- -	- -
17-Apr-1994	Spring	Very dry	5.50	- -	- -	52.6	- -	- -
24-Apr-1994	Spring	Very dry	5.33	- -	- -	53.0	- -	- -
8-May-1994	Spring	Very dry	8.00	0.022	3.00	47.1	51.2	42.0
15-May-1994	Spring	Very dry	9.25	- -	- -	45.1	- -	- -
22-May-1994	Spring	Very dry	6.00	- -	- -	51.3	- -	- -
29-May-1994	Spring	Very dry	5.75	- -	- -	51.9	- -	- -
5-Jun-1994	Summer	Very dry	5.00	- -	- -	53.9	- -	- -
19-Jun-1994	Summer	Very dry	6.25	- -	- -	50.7	- -	- -
26-Jun-1994	Summer	Very dry	6.25	0.011	5.36	50.7	41.2	46.5
9-Jul-1994	Summer	Very dry	7.75	- -	- -	47.6	- -	- -
18-Jul-1994	Summer	Very dry	5.50	- -	- -	52.6	- -	- -
24-Jul-1994	Summer	Very dry	4.00	0.011	5.79	57.1	41.2	47.1
31-Jul-1994	Summer	Very dry	3.75	- -	- -	58.1	- -	- -
7-Aug-1994	Summer	Very dry	7.50	- -	- -	48.1	- -	- -
15-Aug-1994	Summer	Very dry	7.00	- -	- -	49.1	- -	- -
21-Aug-1994	Summer	Very dry	5.25	- -	- -	53.2	- -	- -
28-Aug-1994	Summer	Very dry	4.25	- -	- -	56.3	- -	- -
5-Sep-1994	Fall	Very dry	6.00	0.013	7.23	51.3	43.6	48.8
11-Sep-1994	Fall	Very dry	7.25	- -	- -	48.6	- -	- -
18-Sep-1994	Fall	Very dry	6.25	- -	- -	50.7	- -	- -
25-Sep-1994	Fall	Very dry	5.00	- -	- -	53.9	- -	- -
2-Oct-1994	Fall	Very dry	5.25	- -	- -	53.2	- -	- -
9-Oct-1994	Fall	Very dry	6.75	- -	- -	49.6	- -	- -
22-Oct-1994	Fall	Very dry	7.50	0.018	7.01	48.1	48.3	48.5
21-Feb-1995	Winter	Normal	- -	0.007	- -	- -	34.7	- -

Exhibit 34

Date	Season[a]	Annual Precipitation Classification[b]	Secchi Depth (feet)	Total Phosphorus (mg/L)	Chlorophyll-*a* (µg/L)	WTSI Value (Secchi depth)	WTSI Value (total (phosphorus)	WTSI Value (chlorophyll-*a*)
29-Mar-1995	Spring	Normal	- -	0.012	- -	- -	42.5	- -
30-Apr-1995	Spring	Normal	8.00	0.020	8.16	47.1	49.8	49.7
21-May-1995	Spring	Normal	8.75	- -	- -	45.9	- -	- -
29-May-1995	Spring	Normal	8.00	- -	- -	47.1	- -	- -
4-Jun-1995	Summer	Normal	12.00	- -	- -	41.3	- -	- -
10-Jun-1995	Summer	Normal	18.75	- -	- -	34.9	- -	- -
18-Jun-1995	Summer	Normal	18.25	- -	- -	35.3	- -	- -
25-Jun-1995	Summer	Normal	17.25	0.014	1.00	36.1	44.7	33.6
9-Jul-1995	Summer	Normal	11.50	- -	- -	41.9	- -	- -
16-Jul-1995	Summer	Normal	9.50	- -	- -	44.7	- -	- -
23-Jul-1995	Summer	Normal	14.25	0.008	- -	38.8	36.6	- -
26-Jul-1995	Summer	Normal	- -	0.009	- -	- -	38.3	- -
30-Jul-1995	Summer	Normal	11.25	- -	- -	42.2	- -	- -
6-Aug-1995	Summer	Normal	9.25	- -	- -	45.1	- -	- -
13-Aug-1995	Summer	Normal	10.50	- -	- -	43.2	- -	- -
22-Aug-1995	Summer	Normal	11.50	0.007	3.00	41.9	34.7	42.0
27-Aug-1995	Summer	Normal	6.25	- -	- -	50.7	- -	- -
3-Sep-1995	Fall	Normal	6.25	- -	- -	50.7	- -	- -
10-Sep-1995	Fall	Normal	5.75	- -	- -	51.9	- -	- -
17-Sep-1995	Fall	Normal	7.25	- -	- -	48.6	- -	- -
26-Sep-1995	Fall	Normal	- -	0.020	- -	- -	49.8	- -
8-Oct-1995	Fall	Normal	6.50	- -	- -	50.1	- -	- -
29-Oct-1995	Fall	Normal	6.50	0.050	20.00	50.1	63.0	56.6
28-Apr-1996	Spring	Dry	6.25	0.025	10.00	50.7	53.0	51.2
19-May-1996	Spring	Dry	5.75	- -	- -	51.9	- -	- -
14-Jun-1996	Summer	Dry	3.75	- -	- -	58.1	- -	- -
25-Jun-1996	Summer	Dry	5.75	0.011	3.00	51.9	41.2	42.0
6-Jul-1996	Summer	Dry	5.75	- -	- -	51.9	- -	- -
21-Jul-1996	Summer	Dry	11.00	- -	- -	42.6	- -	- -
28-Jul-1996	Summer	Dry	6.25	- -	- -	50.7	- -	- -
4-Aug-1996	Summer	Dry	6.25	- -	- -	50.7	- -	- -
11-Aug-1996	Summer	Dry	5.25	- -	- -	53.2	- -	- -
25-Aug-1996	Summer	Dry	4.25	0.010	4.00	56.3	39.8	44.2
2-Sep-1996	Fall	Dry	6.25	- -	- -	50.7	- -	- -
15-Sep-1996	Fall	Dry	7.50	- -	- -	48.1	- -	- -
22-Sep-1996	Fall	Dry	8.50	- -	- -	46.3	- -	- -
29-Sep-1996	Fall	Dry	7.50	- -	- -	48.1	- -	- -
10-Oct-1996	Fall	Dry	7.75	0.015	7.00	47.6	45.7	48.5
27-Apr-1997	Spring	Normal	11.00	- -	- -	42.6	- -	- -
18-May-1997	Spring	Normal	12.00	- -	- -	41.3	- -	- -
1-Jun-1997	Summer	Normal	11.75	- -	- -	41.6	- -	- -
15-Jun-1997	Summer	Normal	5.25	- -	- -	53.2	- -	- -
6-Jul-1997	Summer	Normal	9.25	- -	- -	45.1	- -	- -
20-Jul-1997	Summer	Normal	6.50	0.027	5.39	50.1	54.2	46.5
3-Aug-1997	Summer	Normal	8.25	- -	- -	46.7	- -	- -
17-Aug-1997	Summer	Normal	8.00	0.021	6.72	47.1	50.5	48.2
1-Sep-1997	Fall	Normal	8.00	- -	- -	47.1	- -	- -
7-Sep-1997	Fall	Normal	9.00	- -	- -	45.4	- -	- -
21-Sep-1997	Fall	Normal	8.00	- -	- -	47.1	- -	- -
28-Sep-1997	Fall	Normal	7.50	- -	- -	48.1	- -	- -
25-Oct-1997	Fall	Normal	6.50	0.037	10.20	50.1	58.7	51.4
27-Oct-1997	Fall	Normal	6.50	- -	- -	50.1	- -	- -
25-Apr-1998	Spring	Very wet	4.25	0.019	- -	56.3	49.1	- -
17-May-1998	Spring	Very wet	5.25	- -	- -	53.2	- -	- -
25-May-1998	Spring	Very wet	5.75	- -	- -	51.9	- -	- -
7-Jun-1998	Summer	Very wet	8.25	- -	- -	46.7	- -	- -
15-Jun-1998	Summer	Very wet	9.00	- -	- -	45.4	- -	- -
29-Jun-1998	Summer	Very wet	7.75	0.008	2.77	47.6	36.6	41.4
11-Jul-1998	Summer	Very wet	7.50	- -	- -	48.1	- -	- -
14-Jul-1998	Summer	Very wet	7.25	- -	- -	48.6	- -	- -
18-Jul-1998	Summer	Very wet	7.25	- -	- -	48.6	- -	- -
26-Jul-1998	Summer	Very wet	7.75	- -	- -	47.6	- -	- -
16-Aug-1998	Summer	Very wet	5.25	0.012	3.74	53.2	42.5	43.7
29-Aug-1998	Summer	Very wet	5.25	- -	- -	53.2	- -	- -

Exhibit 34

Date	Season[a]	Annual Precipitation Classification[b]	Secchi Depth (feet)	Total Phosphorus (mg/L)	Chlorophyll-*a* (µg/L)	WTSI Value (Secchi depth)	WTSI Value (total (phosphorus)	WTSI Value (chlorophyll-*a*)
5-Sep-1998	Fall	Very wet	5.25	- -	- -	53.2	- -	- -
13-Sep-1998	Fall	Very wet	5.00	- -	- -	53.9	- -	- -
18-Oct-1998	Fall	Very wet	6.00	0.028	5.87	51.3	54.7	47.2
5-Nov-1998	Fall	Very wet	6.75	- -	- -	49.6	- -	- -
25-Apr-1999	Spring	Wet	10.75	0.010	- -	42.9	39.8	- -
9-May-1999	Spring	Wet	10.00	- -	- -	43.9	- -	- -
30-May-1999	Spring	Wet	4.75	- -	- -	54.7	- -	- -
20-Jun-1999	Summer	Wet	8.50	0.009	2.43	46.3	38.3	40.4
12-Jul-1999	Summer	Wet	7.50	- -	- -	48.1	- -	- -
25-Jul-1999	Summer	Wet	6.75	0.014	3.36	49.6	44.7	42.9
8-Aug-1999	Summer	Wet	5.75	- -	- -	51.9	- -	- -
22-Aug-1999	Summer	Wet	5.75	0.017	1.92	51.9	47.5	38.6
4-Sep-1999	Fall	Wet	4.75	- -	- -	54.7	- -	- -
18-Sep-1999	Fall	Wet	7.00	- -	- -	49.1	- -	- -
24-Oct-1999	Fall	Wet	6.75	0.021	7.00	49.6	50.5	48.5
26-Apr-2000	Spring	Very wet	- -	0.014	- -	- -	44.7	- -
30-Apr-2000	Spring	Very wet	9.00	0.013	- -	45.4	43.6	- -
29-May-2000	Spring	Very wet	14.25	- -	- -	38.8	- -	- -
4-Jul-2000	Summer	Very wet	12.75	- -	- -	40.4	- -	- -
22-Jul-2000	Summer	Very wet	11.00	0.019	3.00	42.6	49.1	42.0
6-Aug-2000	Summer	Very wet	12.50	- -	- -	40.7	- -	- -
27-Aug-2000	Summer	Very wet	8.50	0.018	4.00	46.3	48.3	44.2
10-Sep-2000	Fall	Very wet	8.75	- -	- -	45.9	- -	- -
24-Sep-2000	Fall	Very wet	9.25	- -	- -	45.1	- -	- -
22-Oct-2000	Fall	Very wet	6.50	0.023	18.00	50.1	51.8	55.7
29-Apr-2001	Spring	Wet	11.50	0.052	- -	41.9	63.6	- -
17-Jun-2001	Summer	Wet	7.00	- -	- -	49.1	- -	- -
27-Jun-2001	Summer	Wet	5.50	0.019	- -	52.6	49.1	- -
12-Jul-2001	Summer	Wet	8.50	- -	- -	46.3	- -	- -
30-Jul-2001	Summer	Wet	8.25	0.014	- -	46.7	44.7	- -
17-Aug-2001	Summer	Wet	5.75	- -	- -	51.9	- -	- -
29-Aug-2001	Summer	Wet	- -	0.017	- -	- -	47.5	- -
22-Sep-2001	Fall	Wet	6.00	- -	- -	51.3	- -	- -
29-Sep-2001	Fall	Wet	5.50	- -	- -	52.6	- -	- -
17-Oct-2001	Fall	Wet	7.50	0.022	- -	48.1	51.2	- -
23-Apr-2002	Spring	Dry	7.25	0.019	- -	48.6	49.1	- -
25-Apr-2002	Spring	Dry	- -	0.022	- -	- -	51.2	- -
30-Jun-2002	Summer	Dry	14.25	0.010	0.96	38.8	39.8	33.3
10-Jul-2002	Summer	Dry	12.00	- -	- -	41.3	- -	- -
29-Jul-2002	Summer	Dry	12.00	0.008	1.70	41.3	36.6	37.7
31-Jul-2002	Summer	Dry	- -	0.013	2.15	- -	43.6	39.5
7-Aug-2002	Summer	Dry	16.25	- -	- -	36.9	- -	- -
15-Aug-2002	Summer	Dry	11.25	- -	- -	42.2	- -	- -
20-Aug-2002	Summer	Dry	12.00	0.010	1.91	41.3	39.8	38.6
12-Sep-2002	Fall	Dry	5.75	- -	- -	51.9	- -	- -
25-Sep-2002	Fall	Dry	6.75	- -	- -	49.6	- -	- -
20-Oct-2002	Fall	Dry	6.75	0.027	9.55	49.6	54.2	50.9
23-Apr-2003	Spring	Normal	8.50	0.013	- -	46.3	43.6	- -
24-Jun-2003	Summer	Normal	5.25	0.015	4.29	53.2	45.7	44.8
27-Jul-2003	Summer	Normal	11.00	0.012	5.80	42.6	42.5	47.1
10-Aug-2003	Summer	Normal	8.75	- -	- -	45.9	- -	- -
14-Aug-2003	Summer	Normal	4.75	- -	- -	54.7	- -	- -
19-Aug-2003	Summer	Normal	4.75	- -	- -	54.7	- -	- -
19-Oct-2003	Fall	Normal	5.75	0.025	13.90	51.9	53.0	53.8
15-Jun-2004	Summer	Normal	12.75	0.015	1.20	40.4	45.7	35.0
20-Jul-2004	Summer	Normal	12.75	0.010	1.45	40.4	39.8	36.4
23-Aug-2004	Summer	Normal	11.00	0.013	5.33	42.6	43.6	46.4
8-Sep-2004	Fall	Normal	- -	0.012	2.72	- -	42.5	41.3
25-Oct-2004	Fall	Normal	6.50	0.027	19.10	50.1	54.2	56.2
19-Apr-2005	Spring	Very dry	15.25	0.020	- -	37.8	49.8	- -
28-Jun-2005	Summer	Very dry	9.75	0.011	2.85	44.3	41.2	41.6
31-Jul-2005	Summer	Very dry	8.75	0.011	3.54	45.9	41.2	43.3
30-Aug-2005	Summer	Very dry	5.75	0.014	4.65	51.9	44.7	45.4
18-Oct-2005	Fall	Very dry	8.50	0.021	4.85	46.3	50.5	45.7
24-Apr-2006	Spring	Very wet	7.00	0.034	- -	49.1	57.5	- -

Exhibit 34

Date	Season[a]	Annual Precipitation Classification[b]	Secchi Depth (feet)	Total Phosphorus (mg/L)	Chlorophyll-*a* (µg/L)	WTSI Value (Secchi depth)	WTSI Value (total (phosphorus)	WTSI Value (chlorophyll-*a*)
28-Jun-2006	Summer	Very wet	3.25	0.014	7.36	60.1	44.7	48.9
25-Jul-2006	Summer	Very wet	5.00	0.013	3.34	53.9	43.6	42.8
22-Aug-2006	Summer	Very wet	9.25	0.014	3.58	45.1	44.7	43.4
25-Oct-2006	Fall	Very wet	- -	0.024	8.76	- -	52.5	50.2
12-Jun-2007	Summer	Wet	16.00	0.016	0.63	37.2	46.6	30.1
29-Jul-2007	Summer	Wet	7.00	0.006	4.33	49.1	32.5	44.8
26-Aug-2007	Summer	Wet	8.75	0.011	- -	45.9	41.2	- -
21-Oct-2007	Fall	Wet	9.25	0.019	4.05	45.1	49.1	44.3
19-May-2008	Spring	Very wet	7.00	- -	- -	49.1	- -	- -
30-Jun-2008	Summer	Very wet	8.75	0.014	2.60	45.9	44.7	40.9
30-Jul-2008	Summer	Very wet	13.00	0.013	1.37	40.1	43.6	36.0
26-Aug-2008	Summer	Very wet	8.25	0.013	4.33	46.7	43.6	44.8
24-Sep-2008	Fall	Very wet	10.75	0.014	3.82	42.9	44.7	43.9
23-Jun-2009	Summer	Normal	9.00	0.014	1.59	45.4	44.7	37.2
23-Jul-2009	Summer	Normal	8.25	0.013	2.92	46.7	43.6	41.8
25-Aug-2009	Summer	Normal	5.00	0.014	4.81	53.9	44.7	45.6
18-May-2010	Spring	Very wet	11.75	0.012	- -	41.6	42.5	- -
29-Jun-2010	Summer	Very wet	11.25	0.009	3.07	42.2	38.3	42.2
27-Jul-2010	Summer	Very wet	5.00	0.014	3.00	53.9	44.7	42.0
23-Aug-2010	Summer	Very wet	5.25	0.017	5.89	53.2	47.5	47.2
22-Sep-2010	Fall	Very wet	5.25	0.019	12.70	53.2	49.1	53.1
14-Jun-2011	Summer	Normal	10.25	0.019	5.59	43.6	49.1	46.8
19-Jul-2011	Summer	Normal	6.75	0.013	2.88	49.6	43.6	41.7
17-Aug-2011	Summer	Normal	7.00	0.012	3.20	49.1	42.5	42.5
20-Sep-2011	Fall	Normal	9.00	0.013	3.20	45.4	43.6	42.5

[a] *Seasons were broken into the following months: Spring (March, April, May); Summer (June, July, August); Fall (September, October, November); Winter (December, January, February).*

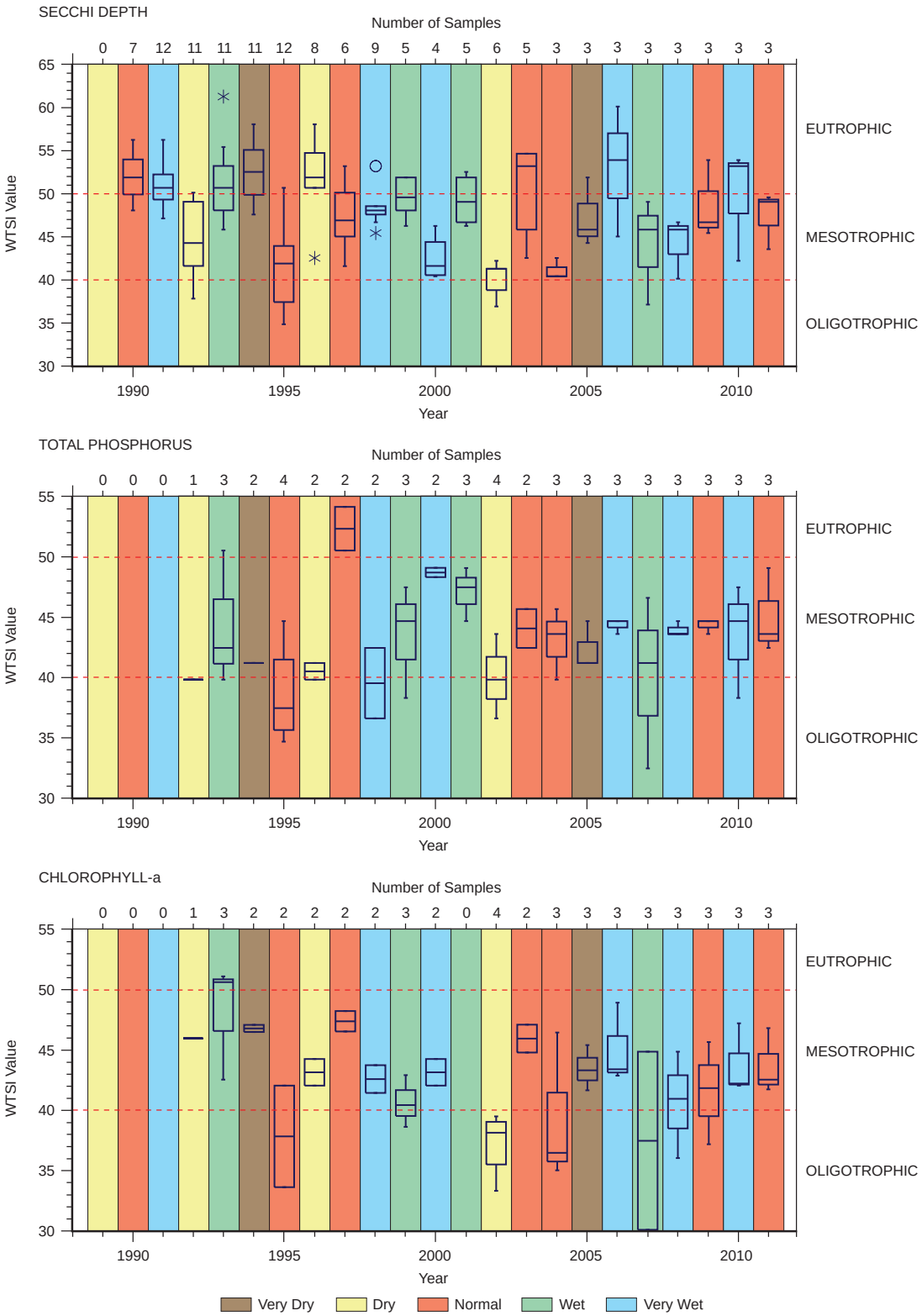
[b] *Total annual precipitation categories were based upon a mean precipitation of 33.9 inches from 1971-2000 at the Oconomowoc Station as summarized below: Normal (33.9 inches +/-2.0 inches); Wet (>2.0 to +5 inches); Very Wet (> +5.0 inches); Dry (<-2.0 to -5 inches); and Very Dry (<-5.0 inches).*

[c] *One water sample was taken within the center of the Monterey Dam Impoundment Station ID 684004 on this same date and the Secchi Depth was 4.0 feet, Total Phosphorus was 0.073 mg/L, and Chlorophyll-a was 36.8 (ug/L).*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Exhibit 35

SUMMER WISCONSIN TROPHIC STATE INDICES FOR ASHIPPUN LAKE: 1990-2011



NOTE: Box plot shows the median (horizontal line), the range (ends of the whiskers), and the upper and lower quartiles (edges of the box) of the *data in each group.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

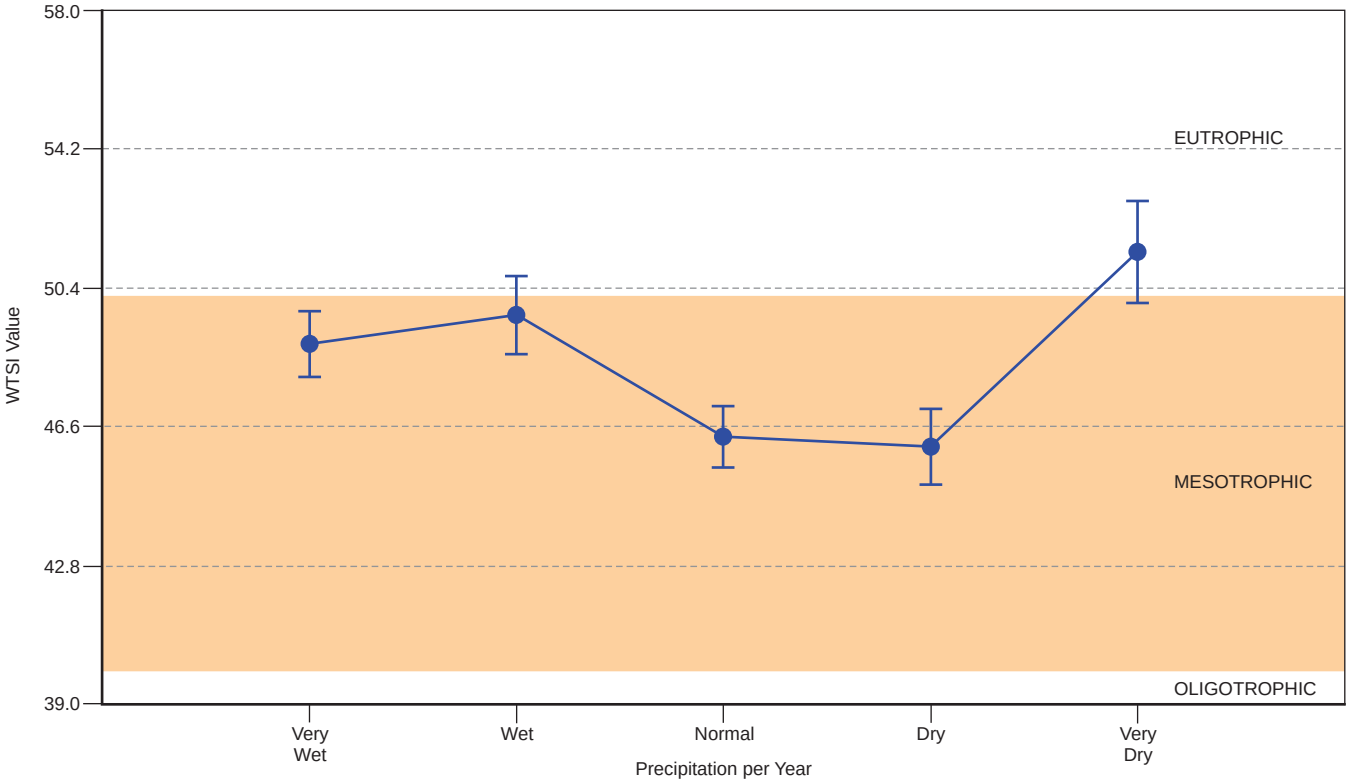
Exhibit 36

ASHIPPUN LAKE ANOVA ANALYSIS RESULTS

Variable	Sum-of Square	Degrees of Freedom	Mean Square	F Statistic	Significance P-value
Annual Precipitation	456.222	4	114.055	4.214	**0.003**
Error	3545.450	131	27.065		

NOTE: ANOVA of Sechhi Depth WTSI values with respect to annual precipitation categories (very dry, dry, normal, wet, and very wet). This analysis was based upon 136 sample points and yielded an R^2 of 0.34 and a significant P-value of less than 0.05 is shown in bold.

SUMMER SECCHI DEPTH WTSI VALUES AMONG ANNUAL PRECIPITATION CATEGORIES: 1990-2011



NOTE: This figure represents the least square means and standard deviations among each annual precipitation category (very dry, dry, normal, wet, and very wet).

Source: SEWRPC.

Exhibit 37

SVY3872

EXHIBIT A

PRELIMINARY VEGETATION SURVEY
ASHIPPUN LAKE AREA

Dates: January 10, 2012
September 16, 2010
September 17, 2003
March 21, 2000

Observers: Donald M. Reed, Ph.D., Chief Biologist
Lawrence A. Leitner, Ph.D., Principal Biologist
Christopher J. Jors, Biologist
Southeastern Wisconsin Regional Planning Commission

Location: Town of Oconomowoc in parts of U.S. Public Land Survey Sections 9, 10, 15, and 16, Township 8 North, Range 17 East, Waukesha County, Wisconsin.

Species List: Plant Community Area No. 1

EQUISETACEAE
- Equisetum arvense--Common horsetail

POLYPODIACEAE
- Thelypteris palustris--Marsh fern

CUPRESSACEAE
- Juniperus virginiana--Red-cedar

TYPHACEAE
- Typha latifolia--Broad-leaved cat-tail
- Typha angustifolia--Narrow-leaved cat-tail

SPARGANIACEAE
- Sparganium eurycarpum--Common burreed

ALISMATACEAE
- Alisma plantago-aquatica--Water plantain

GRAMINEAE
- Bromus ciliatus--Ciliated brome grass
- Festuca elatior[1]--Tall fescue
- Poa pratensis[1,2]--Kentucky bluegrass
- Dactylis glomerata[1,2]--Orchard grass
- Calamagrostis canadensis[3]--Canada bluejoint
- Agrostis stolonifera[1]--Redtop grass
- Phleum pratense[1]--Timothy grass
- Muhlenbergia glomerata--Fen muhly grass
- Muhlenbergia mexicana--Leafy satin grass
- Phalaris arundinacea[1,4]--Reed canary grass

CYPERACEAE
- Scirpus cyperinus--Woolgrass
- Carex stipata--Common fox sedge
- Carex stricta[4]--Tussock sedge
- Carex lacustris[4]--Lake sedge
- Carex sp.--Sedge

IRIDACEAE
- Iris virginica--Virginia blueflag

SALICACEAE
- *Salix nigra*--Black willow
- *Salix interior*--Sandbar willow
- *Salix bebbiana*--Beaked willow
- *Salix discolor*--Pussy willow
- *Salix* spp.[4]--Willows

BETULACEAE
- *Alnus rugosa*--Tag alder

ULMACEAE
- *Ulmus americana*--American elm

POLYGONACEAE
- *Rumex orbiculatus*--Great water dock

ROSACEAE
- *Spiraea alba*--Meadowsweet

RUTACEAE
- *Zanthoxylum americanum*[2]--Prickly-ash

ANACARDIACEAE
- *Rhus vernix*--Poison sumac

AQUIFOLIACEAE
- *Ilex verticillata*--Winterberry

ACERACEAE
- *Acer negundo*--Boxelder

RHAMNACEAE
- *Rhamnus cathartica*[1]--Common buckthorn
- *Rhamnus frangula*[1]--Glossy buckthorn

VITACEAE
- *Vitis riparia*--Riverbank grape

LYTHRACEAE
- *Lythrum salicaria*[1]--Purple loosestrife

ONAGRACEAE
- *Epilobium coloratum*--Willow-herb

UMBELLIFERAE
- *Angelica atropurpurea*--Angelica
- *Oxypolis rigidior*--Cowbane

CORNACEAE
- *Cornus stolonifera*[4]--Red-osier dogwood

OLEACEAE
- *Fraxinus pennsylvanica*--Green ash

ASCLEPIADACEAE
- *Asclepias incarnata*--Marsh milkweed
- *Asclepias syriaca*[2]--Common milkweed

VERBENACEAE
- *Verbena hastata*--Blue vervain

SCROPHULARIACEAE
- *Pedicularis lanceolata*--Swamp lousewort

CAPRIFOLIACEAE
Sambucus canadensis--Elderberry
Lonicera X bella[1]--Hybrid honeysuckle

COMPOSITAE
Bidens sp.--Beggars-ticks
Ambrosia trifida--Giant ragweed
Achillea millefolium[1,2]--Yarrow
Solidago gigantea--Giant goldenrod
Solidago altissima--Tall goldenrod
Solidago graminifolia--Grassleaf goldenrod
Aster novae-angliae--New England aster
Aster lucidulus--Swamp aster
Aster lateriflorus--Calico aster
Aster simplex--Marsh aster
Eupatorium maculatum--Joe-Pye weed
Eupatorium perfoliatum--Boneset
Arctium minus[1,2]--Common burdock
Cirsium arvense[1]--Canada thistle

Total number of plant species: 65+
Number of alien, or non-native, plant species: 13 (20 percent)

This approximately 22.1-acre plant community area is part of the Ashippun River floodplain-wetland complex and consists of shallow marsh, Southern sedge meadow, fresh (wet) meadow, and shrub-carr (willow thicket) with scattered stands of second growth, Southern wet to wet-mesic lowland hardwoods. Disturbances to the plant community area include agricultural land management activities including plowing along the wetland edge, past grazing along the wetland edge, the ad hoc establishment of ATV trails, and siltation and sedimentation due to stormwater runoff from adjacent lands. No Federal- or State-designated Special Concern, Threatened, or Endangered species were observed during the field inspection.

_____

[1] Alien or non-native plant species
[2] Growing along the wetland edge
[3] Sub-Dominant plant species
[4] Co-dominant plant species

Plant Community Area No. 2 (Also surveyed on September 16, 2010)

TYPHACEAE
- Typha latifolia[1]--Broad-leaved cat-tail
- Typha angustifolia--Narrow-leaved cat-tail

SPARGANIACEAE
- Sparganium eurycarpum--Common burreed

GRAMINEAE
- Phalaris arundinacea[1,2]--Reed canary grass
- Leersia oryzoides[1]--Rice cut grass

CYPERACEAE
- Scirpus validus--Soft-stemmed bulrush
- Scirpus fluviatilis--River bulrush
- Carex comosa--Bristly sedge
- Carex lacustris--Lake sedge

LEMNACEAE
- Lemna minor[1]--Lesser duckweed

SALICACEAE
- Populus deltoides[3]--Cottonwood
- Salix nigra[3]--Black willow

JUGLANDACEAE
- Juglans nigra[3]--Black walnut

ULMACEAE
- Ulmus americana[3]--American elm

URTICACEAE
- Urtica dioica--Stinging nettle
- Pilea pumila--Clearweed

POLYGONACEAE
- Polygonum lapathifolium--Smartweed
- Polygonum persicaria[2]--Lady's thumb

CRUCIFERAE
- Alliaria officinalis[2,3]--Garlic-mustard

ROSACEAE
- Rubus occidentalis[3]--Black raspberry

ACERACEAE
- Acer platanoides[2,3]--Norway maple
- Acer saccharinum--Silver maple
- Acer negundo[3]--Boxelder

BALSAMINACEAE
- Impatiens capensis--Jewelweed

VITACEAE
- Vitis riparia[1]--Riverbank grape
- Parthenocissus quinquefolia[3]--Virginia creeper

LYTHRACEAE
- Lythrum salicaria[2]--Purple loosestrife

ONAGRACEAE
- Epilobium coloratum--Willow-herb

OLEACEAE
Fraxinus pennsylvanica[3]--Green ash

ASCLEPIADACEAE
Asclepias incarnata--Marsh milkweed

SCROPHULARIACEAE
Verbascum thapsus[2,3]--Mullein

PLANTAGINACEAE
Plantago rugelii[3]--Red-stalked plantain

CAPRIFOLIACEAE
Sambucus canadensis--Elderberry

COMPOSITAE
Ambrosia trifida[3]--Giant ragweed
Solidago gigantea--Giant goldenrod
Solidago altissima--Tall goldenrod
Aster lucidulus--Swamp aster
Aster pilosus[3]--Frost aster
Aster lateriflorus--Calico aster
Aster simplex--Marsh aster
Conyza canadensis[3]--Horseweed
Cirsium arvense[2,3]--Canada thistle
Lactuca serriola[2,3]--Prickly wild lettuce
Cichorium intybus[2,3]--Chicory

Total number of plant species: 44
Number of alien, or non-native, plant species: 9 (20 percent)

This approximately 32.0-acre plant community area is part of the Ashippun River floodplain-wetland complex and consists of open water, shallow marsh, and fresh (wet) meadow. Disturbances to the plant community area include filling along the wetland edge, siltation and sedimentation due to stormwater runoff from adjacent lands, and water level changes due to opening of the spillway. Great egret (Casmerodius albus), a State-designated Threatened species, was observed during the September 2010 field inspection. In addition, Slender madtom, (Noturus exilis), a State-designated Endangered fish species, is known to occur in this reach of the Ashippun river.

_____

[1] Co-dominant plant species
[2] Alien or non-native plant species
[3] Growing along the wetland edge

Plant Community Area No. 3

PINACEAE
Larix laricina--Tamarack

TYPHACEAE
Typha latifolia[1]--Broad-leaved cat-tail

GRAMINEAE
Calamagrostis canadensis--Canada bluejoint
Muhlenbergia mexicana--Leafy satin grass
(Spartina pectinata--Prairie cordgrass?)
Phalaris arundinacea[1,2]--Reed canary grass

CYPERACEAE
Scirpus cyperinus--Woolgrass
Carex stricta--Tussock sedge
Carex lacustris[3]--Lake sedge
Carex spp.--Sedges

SALICACEAE
Populus tremuloides--Quaking aspen
Salix nigra--Black willow
Salix interior--Sandbar willow
Salix bebbiana--Beaked willow
Salix sp.--Willow

BETULACEAE
Alnus rugosa[3]--Tag alder

ULMACEAE
Ulmus americana--American elm

URTICACEAE
Urtica dioica--Stinging nettle

CRUCIFERAE
Alliaria officinalis[2]--Garlic-mustard

ACERACEAE
Acer negundo[4]--Boxelder

RHAMNACEAE
Rhamnus cathartica[2]--Common buckthorn
Rhamnus frangula[2]--Glossy buckthorn

ONAGRACEAE
Epilobium coloratum--Willow-herb

CORNACEAE
Cornus amomum--Silky dogwood
Cornus stolonifera--Red-osier dogwood

OLEACEAE
Fraxinus pennsylvanica--Green ash

ASCLEPIADACEAE
Asclepias incarnata--Marsh milkweed

CONVOLVULACEAE
Cuscuta sp.--Dodder

SCROPHULARIACEAE
Pedicularis lanceolata--Swamp lousewort

CAPRIFOLIACEAE
Viburnum lentago--Nannyberry
Lonicera X bella[2,4]--Hybrid honeysuckle

CUCURBITACEAE
Echinocystis lobata--Wild cucumber

COMPOSITAE
Bidens sp.--Beggars-ticks
Ambrosia trifida--Giant ragweed
Solidago gigantea--Giant goldenrod
Aster novae-angliae--New England aster
Aster lucidulus--Swamp aster
Aster simplex--Marsh aster
Eupatorium maculatum--Joe-Pye weed
Eupatorium perfoliatum--Boneset
Arctium minus[2]--Common burdock

Total number of plant species: 41
Number of alien, or non-native, plant species: 6 (15 percent)

This approximately 225-acre plant community area is part of the Ashippun River floodplain-wetland complex and consists of shallow marsh with small stands of Southern sedge meadow and alder thicket. Disturbances to the plant community area include agricultural land management activities including plowing along the wetland edge, pond excavation, side casting of dredge spoil material, and siltation and sedimentation due to stormwater runoff from adjacent lands. While no Federal- or State-designated Special Concern, Threatened, or Endangered species were observed during the field inspection, Slender madtom, (Noturus exilis), a State-designated Endangered fish species, is known to occur in this reach of the Ashippun river. In addition, *SEWRPC's Amendment to the Natural Areas and Critical Species Habitat Protection and Management Plan for the Southeastern Wisconsin Region* identifies this plant community area as part of the Ashippun River Lowlands (NA-2), a natural area of countywide or regional significance.

_____

[1] Co-dominant plant species
[2] Alien or non-native plant species
[3] Sub-Dominant plant species
[4] Growing along the wetland edge

Plant Community Area No. 4

SPHAGNACEAE
Sphagnum spp.--Sphagnum

EQUISETACEAE
Equisetum fluviatile--Pipes

POLYPODIACEAE
Thelypteris palustris--Marsh fern

PINACEAE
Larix laricina--Tamarack

TYPHACEAE
Typha latifolia[1]--Broad-leaved cat-tail
Typha angustifolia[1]--Narrow-leaved cat-tail

SPARGANIACEAE
Sparganium eurycarpum--Common burreed

ALISMATACEAE
Sagittaria cristata--Crested arrowhead
Sagittaria latifolia--Common arrowhead

GRAMINEAE
Poa pratensis[2]--Kentucky bluegrass
Calamagrostis canadensis[3]--Canada bluejoint
Agrostis stolonifera[2]--Redtop grass
Muhlenbergia glomerata--Fen muhly grass
Muhlenbergia racemosa--Upland wild timothy
Phalaris arundinacea[2]--Reed canary grass

CYPERACEAE
Eleocharis erythropoda--Red-root spike-rush
Scirpus validus--Soft-stemmed bulrush
Eriophorum angustifolium--Narrow-leaved cotton-grass
Carex stipata--Common fox sedge
Carex stricta--Tussock sedge
Carex hystericina--Bottlebrush sedge
Carex comosa--Bristly sedge
Carex lacustris--Lake sedge
Carex spp.--Sedges

ARACEAE
Acorus calamus--Sweet flag

LEMNACEAE
Lemna minor--Lesser duckweed

PONTEDERIACEAE
Pontederia cordata--Pickerel-weed

IRIDACEAE
Iris virginica--Virginia blueflag

SALICACEAE
Populus tremuloides--Quaking aspen
Salix interior--Sandbar willow
Salix bebbiana[3]--Beaked willow
Salix discolor--Pussy willow
Salix spp.--Willows

ULMACEAE
Ulmus americana--American elm

URTICACEAE
Pilea pumila--Clearweed

POLYGONACEAE
Rumex orbiculatus--Great water dock
Rumex verticillatus--Water dock
Polygonum amphibium--Water smartweed
Polygonum punctatum--Smartweed

CARYOPHYLLACEAE
Stellaria longifolia--Stitchwort

NYMPHAEACEAE
Nuphar variegatum--Yellow water lily
Nymphaea odorata--White water lily

RANUNCULACEAE
Caltha palustris--Marsh marigold
Thalictrum dasycarpum--Tall meadow rue

ANACARDIACEAE
Rhus vernix--Poison sumac

ACERACEAE
Acer saccharinum--Silver maple
Acer negundo--Boxelder

BALSAMINACEAE
Impatiens capensis--Jewelweed

RHAMNACEAE
Rhamnus cathartica[2]--Common buckthorn
Rhamnus frangula[2]--Glossy buckthorn

VITACEAE
Vitis riparia--Riverbank grape

HYPERICACEAE
Triadenum fraseri--Marsh St. John's wort

VIOLACEAE
Viola cucullata--Blue marsh violet

LYTHRACEAE
Lythrum salicaria[2]--Purple loosestrife

ONAGRACEAE
Epilobium leptophyllum--Linear-leaf willow-herb

CORNACEAE
Cornus amomum--Silky dogwood
Cornus stolonifera--Red-osier dogwood

PRIMULACEAE
Lysimachia quadriflora--Prairie loosestrife
Lysimachia thyrsiflora--Tufted loosestrife

OLEACEAE
Fraxinus pennsylvanica--Green ash

ASCLEPIADACEAE
- Asclepias incarnata--Marsh milkweed

LABIATAE
- Scutellaria galericulata--Marsh skullcap
- Lycopus uniflorus--Northern bugleweed
- Lycopus americanus--Cutleaf bugleweed
- Mentha arvensis--Wild mint

SOLANACEAE
- Solanum dulcamara[2]--Deadly nightshade

SCROPHULARIACEAE
- Chelone glabra--Turtlehead
- Pedicularis lanceolata--Swamp lousewort

RUBIACEAE
- Galium boreale--Northern bedstraw
- Galium trifidum--Small bedstraw

CAPRIFOLIACEAE
- Viburnum opulus[2]--European highbush-cranberry
- Lonicera X bella[2]--Hybrid honeysuckle

CAMPANULACEAE
- Campanula aparinoides--Marsh bellflower

COMPOSITAE
- Bidens coronata--Tall swamp-marigold
- Bidens sp.--Beggars-ticks
- Solidago patula--Swamp goldenrod
- Solidago gigantea--Giant goldenrod
- Solidago altissima--Tall goldenrod
- Solidago graminifolia--Grassleaf goldenrod
- Aster puniceus--Red-stemmed aster
- Aster lucidulus--Swamp aster
- Aster junciformis--Rush aster
- Aster simplex--Marsh aster
- Eupatorium maculatum--Joe-Pye weed
- Eupatorium perfoliatum--Boneset

Total number of plant species: 85+
Number of alien, or non-native, plant species: 9 (11 percent)

This approximately 150-acre plant community area is part of the Ashippun Lake floodplain-wetland complex and consists of a mosaic of deep and shallow marsh, sedge fen, and shrub-carr (willow thicket). Disturbances to the plant community area include agricultural land management activities including plowing along the wetland edge, past filling for public boat launch, and siltation and sedimentation due to stormwater runoff from adjacent lands. While no Federal- or State-designated Special Concern, Threatened, or Endangered species were observed during the field inspection, Least darter (Etheostoma microperca), a State-designated Special Concern fish species, has been recorded for Ashippun Lake. In addition, *SEWRPC's Amendment to the Natural Areas and Critical Species Habitat Protection and Management Plan for the Southeastern Wisconsin Region* identifies this plant community area as part of the Ashippun River Lowlands (NA-2), a natural area of countywide or regional significance.

_____

[1] Co-dominant plant species
[2] Alien or non-native plant species
[3] Sub-Dominant plant species

Plant Community Area No. 5

TYPHACEAE
Typha angustifolia--Narrow-leaved cat-tail

GRAMINEAE
Phalaris arundinacea[1,2]--Reed canary grass

SALICACEAE
Populus tremuloides--Quaking aspen
Salix nigra--Black willow
Salix interior--Sandbar willow
Salix spp.--Willows

ULMACEAE
Ulmus americana--American elm

RHAMNACEAE
Rhamnus cathartica[1]--Common buckthorn

CORNACEAE
Cornus stolonifera--Red-osier dogwood

COMPOSITAE
Solidago gigantea--Giant goldenrod

Total number of plant species: 10+
Number of alien, or non-native, plant species: 2 (20 percent)

This approximately 39.4-acre plant community area is part of a larger wetland complex and consists of disturbed fresh (wet) meadow. Disturbances to the plant community area include agricultural land management activities including plowing, past filling, siltation and sedimentation due to stormwater runoff from adjacent lands, and water level changes due to past ditching and draining. No Federal- or State-designated Special Concern, Threatened, or Endangered species were observed during the field inspection.

_____

[1] Alien or non-native plant species
[2] Dominant plant species

Plant Community Area No. 6

TYPHACEAE
Typha angustifolia--Narrow-leaved cat-tail

GRAMINEAE
Calamagrostis canadensis--Canada bluejoint
Phalaris arundinacea[1,2]--Reed canary grass

SALICACEAE
Populus tremuloides--Quaking aspen
Salix nigra--Black willow
Salix discolor--Pussy willow
Salix spp.--Willows

BETULACEAE
Alnus rugosa--Tag alder

ULMACEAE
Ulmus americana--American elm

ACERACEAE
Acer negundo--Boxelder

RHAMNACEAE
Rhamnus cathartica[1]--Common buckthorn
Rhamnus frangula[1]--Glossy buckthorn

LYTHRACEAE
Lythrum salicaria[1]--Purple loosestrife

CORNACEAE
Cornus amomum--Silky dogwood
Cornus stolonifera--Red-osier dogwood

CAPRIFOLIACEAE
Viburnum lentago--Nannyberry

Total number of plant species: 16
Number of alien, or non-native, plant species: 4 (25 percent)

This approximately 18.0-acre plant community area is part of a larger wetland complex and consists of fresh (wet) meadow and shrub-carr. Disturbances to the plant community area include agricultural land management activities including plowing along the wetland edge, past filling, selective cutting of trees, siltation and sedimentation due to stormwater runoff from adjacent lands, and water level changes due to past ditching, draining, and impoundment by the road. No Federal- or State-designated Special Concern, Threatened, or Endangered species were observed during the field inspection.

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[1] Alien or non-native plant species
[2] Dominant plant species

Plant Community Area No. 7 (Surveyed on March 21, 2000)

SPHAGNACEAE
- Sphagnum sp.--Sphagnum

EQUISETACEAE
- Equisetum arvense--Common horsetail
- Equisetum fluviatile--Pipes

POLYPODIACEAE
- Thelypteris palustris--Marsh fern

PINACEAE
- Larix laricina--Tamarack

TYPHACEAE
- Typha latifolia--Broad-leaved cat-tail

ALISMATACEAE
- Sagittaria latifolia--Common arrowhead

GRAMINEAE
- Calamagrostis canadensis--Canada bluejoint
- Agrostis stolonifera[1]--Redtop grass
- Phalaris arundinacea[1]--Reed canary grass

CYPERACEAE
- Scirpus acutus--Hard-stemmed bulrush
- Scirpus cyperinus--Woolgrass
- Eriophorum angustifolium--Narrow-leaved cotton-grass
- Carex lasiocarpa--Woolly sedge
- Carex stricta--Tussock sedge
- Carex comosa--Bristly sedge
- Carex pseudocyperus--Cypress-like sedge
- Carex lacustris--Lake sedge
- Carex spp.--Sedges

LEMNACEAE
- Lemna minor--Lesser duckweed

JUNCACEAE
- Juncus nodosus--Joint rush

IRIDACEAE
- Iris virginica--Virginia blueflag

ORCHIDACEAE
- Cypripedium acaule--Moccasin flower

SALICACEAE
- Salix interior--Sandbar willow
- Salix discolor--Pussy willow

BETULACEAE
- Betula papyrifera--Paper birch

POLYGONACEAE
- Rumex orbiculatus--Great water dock
- Polygonum pensylvanicum--Pinkweed
- Polygonum sagittatum--Arrow-leaved tear-thumb

ROSACEAE
Potentilla palustris--Bog cinquefoil

ANACARDIACEAE
Rhus vernix--Poison sumac

ACERACEAE
Acer rubrum--Red maple

BALSAMINACEAE
Impatiens capensis--Jewelweed

RHAMNACEAE
Rhamnus frangula[1]--Glossy buckthorn

HYPERICACEAE
Triadenum fraseri--Marsh St. John's wort

VIOLACEAE
Viola cucullata--Blue marsh violet

LYTHRACEAE
Lythrum salicaria[1]--Purple loosestrife

CORNACEAE
Cornus stolonifera--Red-osier dogwood

PRIMULACEAE
Lysimachia thyrsiflora--Tufted loosestrife

LABIATAE
Scutellaria galericulata--Marsh skullcap
Lycopus uniflorus--Northern bugleweed

SOLANACEAE
Solanum dulcamara[1]--Deadly nightshade

LENTIBULARIACEAE
Utricularia sp.--Bladderwort

COMPOSITAE
Bidens sp.--Beggars-ticks

Total number of plant species: 44+
Number of alien, or non-native, plant species: 5 (11 percent)

This approximately 17.8-acre plant community area is part of a larger wetland complex and consists of a bog, deep and shallow marsh, and fresh (wet) meadow. Disturbances to the plant community area include agricultural land management activities along the wetland edge, mowing, and siltation and sedimentation due to stormwater runoff from adjacent lands. No Federal- or State-designated Special Concern, Threatened, or Endangered species were observed during the field inspection. In addition, *SEWRPC's Amendment to the Natural Areas and Critical Species Habitat Protection and Management Plan for the Southeastern Wisconsin Region* identifies this plant community area as part of the Meadow View School Bog (NA-3) a natural area of local significance.

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[1] Alien or non-native plant species

Plant Community Area No. 8 (Surveyed March 21, 2000)

TYPHACEAE
Typha latifolia--Broad-leaved cat-tail

GRAMINEAE
Calamagrostis canadensis--Canada bluejoint
Phalaris arundinacea[1,2]--Reed canary grass

CYPERACEAE
Scirpus fluviatilis--River bulrush
Carex blanda--Wood sedge
Carex lacustris--Lake sedge

LEMNACEAE
Lemna minor--Lesser duckweed

PONTEDERIACEAE
Pontederia cordata--Pickerel-weed

SALICACEAE
Populus tremuloides--Quaking aspen
Populus deltoides--Cottonwood

CRUCIFERAE
Barbarea vulgaris[1]--Yellow rocket

ACERACEAE
Acer negundo--Boxelder

RHAMNACEAE
Rhamnus frangula[1,2]--Glossy buckthorn

VITACEAE
Vitis riparia--Riverbank grape

LYTHRACEAE
Lythrum salicaria[1,2]--Purple loosestrife

CORNACEAE
Cornus stolonifera--Red-osier dogwood

COMPOSITAE
Solidago altissima--Tall goldenrod

Total number of plant species: 17
Number of alien, or non-native, plant species: 4 (24 percent)

This approximately 7.3-acre plant community area is part of a larger wetland complex and consists of open water and shallow marsh. Disturbances to the plant community area include dumping and mowing along the wetland edge, side casting of dredge spoil material, siltation and sedimentation due to stormwater runoff from adjacent lands, and water level changes due to past ditching and draining. No Federal- or State-designated Special Concern, Threatened, or Endangered species were observed during the field inspection.

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[1] Alien or non-native plant species
[2] Co-dominant plant species

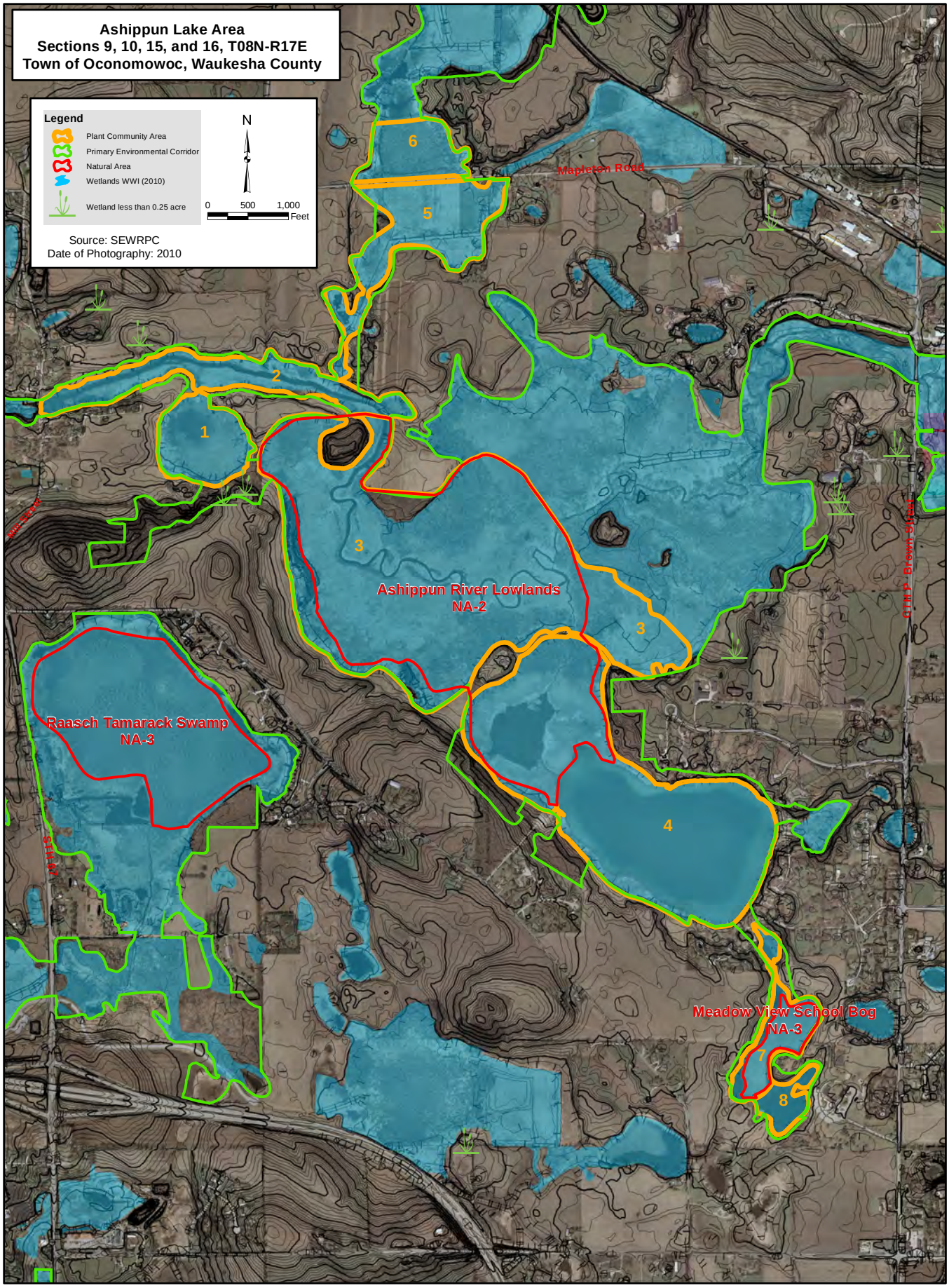
Ashippun Lake Area
Sections 9, 10, 15, and 16, T08N-R17E
Town of Oconomowoc, Waukesha County
Legend
Plant Community Area
Primary Environmental Corridor
Natural Area
Wetlands WWI (2010)
Wetland less than 0.25 acre
N
0
500
1,000
Feet
Source: SEWRPC
Date of Photography: 2010
Mapleton Road
Ashippun River Lowlands
NA-2
Raasch Tamarack Swamp
NA-3
Meadow View School Bog
NA-3
Ashippun River
Ashippun - Brown Street
1
2
3
4
5
6
7
8

Exhibit 38

LOCATION OF ALTERNATIVES EXAMINED FOR MONTEREY DAM REMOVAL

Source: SEWRPC