

# ANTIGO LAKE – FAIRGROUNDS RUNOFF MANAGEMENT PLAN



**Prepared for:**

**City of Antigo  
and  
Langlade County  
Wisconsin**

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## Contents

	<u>Page No.</u>
Need for the Study .....	1
Prior Storm Water Planning .....	2
Scope of the Study .....	2
Study Area Characteristics .....	3
Northern Natural Area Description .....	3
Storm Water Basins .....	3
Langlade County Fairgrounds Racetrack.....	8
Site Constraints to Potential Alternatives .....	11
Groundwater Level .....	11
Wetland Disturbance .....	14
Residences near the Northern Natural Area .....	14
Private Landowners .....	14
Treatment Alternatives .....	16
Fairgrounds Alternatives .....	16
Northern Natural Area Improvements .....	17
Recommended Alternative .....	18
Phase I .....	18
Phase II .....	20
Estimated Costs.....	20
Analysis of Potential Funding Sources .....	20
Urban Nonpoint Source and Stormwater Grants.....	20
Targeted Runoff Management Grants.....	21
Lake Protection and Classification Grants.....	21
River Protection Management Grants .....	21

## List of Figures

Figure 1 Locality Map .....	4
Figure 2 Study Area .....	5
Figure 3 Northern Natural Area .....	6
Figure 4 Aerial Photo.....	7
Figure 5 Langlade County Fairgrounds Racetrack.....	9
Figure 6 Gradation Test Results .....	12
Figure 7 House on Virginia Street.....	15
Figure 8 Recommended Alternatives.....	19

## List of Tables

Table 1 Estimated Costs .....	20
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## Need for the Study

The Antigo Lake District offers a diverse recreational resource, but has a history of water quality problems in Antigo Lake including algae blooms, and excess levels of sediment nutrients and organic matter.

After a rain event, storm water carrying red clay particles is discharged from the Langlade County Fairgrounds racetrack into the Northern Natural Area of the City of Antigo. The red colored storm water flows into a channel leading directly into Spring Brook and eventually into Antigo Lake. The red clay remains suspended in Antigo Lake for two to three days following a rain event (Photos No. 1 and 2).



Photo No. 1



Photo No. 2

Recognizing the need to find a solution to the Antigo Lake water quality issue, the City of Antigo and Langlade County authorized Ayres Associates to conduct a study on possible alternatives for correcting the water quality issue.

## **Prior Storm Water Planning**

In 1998, the City of Antigo Lake Protection and Rehabilitation Board was successful in obtaining a Wisconsin Department of Natural Resources (WDNR) Lake Planning Grant to develop a Storm Water Monitoring and Management Plan. The plan was completed in early 2000. The ultimate goal of the plan was to enhance water quality and increase recreational opportunities in the district for residents and visitors. The plan described management and implementation plans for prevention, remediation, and rehabilitation measures to reduce pollutant loadings in the district. The plan was also a mechanism to assist the City of Antigo and the Antigo Lake Protection and Rehabilitation District to secure future funding for pollution reduction activities through various grant programs. The plan indicated a significant suspended solids discharge enters Spring Brook and ultimately Antigo Lake. A detention basin was recommended for the racetrack at the Langlade County Fairground. However, the detention basin was not specifically located nor was estimated cost developed because the plan does not specifically address storm water runoff from the racetrack.

The City of Antigo, in cooperation with Langlade County, applied for and was awarded a second Lake Planning Grant to address the storm water being discharged from the Langlade Fairgrounds Racetrack and the storm water basins into the Northern Natural Area. Specifically, the grant funded a study analyzing the impact of the storm water on the Northern Natural Area, Spring Brook, and Antigo Lake.

## **Scope of the Study**

Ayres Associates was retained by the City of Antigo and Langlade County to prepare a report addressing the storm water flow from the Langlade County Fairgrounds Racetrack and the City of Antigo storm water basins discharging water into the Northern Natural Area, Spring Brook, and Antigo Lake. Components of the study include:

1. Identification of the City of Antigo and Langlade County Fairgrounds storm water detention basins contributing storm water to the Northern Natural Area.
2. Gradation Analysis of the red clay from the Langlade County Fairgrounds Racetrack.
3. Identification of potential site constraints to storm water treatment alternatives.
4. Analysis of potential storm water treatment alternatives.
5. Meet with the WDNR and the Corps of Engineers to discuss potential storm water treatment alternatives.
6. Identification of a recommended alternative.
7. Identification of potential funding sources for implementation of the recommended alternative.
8. Assist the City of Antigo in distributing project information to the public.

## **Study Area Characteristics**

The City of Antigo is located in the southwestern portion of Langlade County. (Figure 1) The Northern Natural Area is located in the east central portion of the City of Antigo. (Figure 2) Spring Brook flows through the Northern Natural Area generally from north to south, eventually flowing into Antigo Lake. A dam located near Fourth Avenue creates Antigo Lake. Spring Brook then flows south from the Antigo Lake dam and exits in the southwest portion of the city.

For the purposes of this study, the study area includes the area of the City of Antigo's storm water drainage system and the Langlade County Fairgrounds which discharge storm water into the Northern Natural Area. Figure 2 indicates the study area boundaries, including the storm water drainage system and discharge points. Figure 3 is a map of the Northern Natural Area indicating the storm water basin discharge points, direction of storm water flow, and entry points into Spring Brook.

## **Northern Natural Area Description**

The Northern Natural Area is an area which offers a diverse range of recreational opportunities, such as walking and wildlife watching, within the City of Antigo. It also serves as a filtering area for storm water discharged from several storm water basins of the City. Figure 4 is an aerial photo of the Northern Natural Area indicating the vegetation type and location of the Langlade County Fairgrounds, Spring Brook, and Antigo Lake. There are three basic vegetation types within the Northern Natural Area, forested, scrub shrub, and upland.

## **Storm Water Basins**

Five storm water basins have been identified within the study area. The following is a brief description of each storm water basin, storm water flow, and entry points into the Spring Brook.

Discharge Point 1 is the outlet for the storm water from the racetrack located at the Langlade County Fairgrounds which drains Basin A. This basin will be discussed in more detail in the next section of the report.

Discharge Point 2 is a 42-inch concrete pipe which drains Basin B. This basin includes the storm water from Wal-Mart and Brickner's facilities, and portions of STH 64 improved in the summer of 2001. The storm water generally flows directly south from the discharge point into Spring Brook and enters at Entry Point B.

Discharge Point 3 is a 12-inch concrete pipe which drains Basin C. Storm water flows east under Virginia Street and enters Spring Brook at Entry Point C.

Discharge Point 4 is a 36-inch concrete pipe which drains Basin D. This includes areas along US Highway 45 (Neva Road) north of the fairgrounds to areas north of STH 64. Storm water from this discharge point flows in two directions. Some of the storm water flows south along the west side of the Northern Natural Area, under Virginia Street, and into Spring Brook at Entry Point C. The other portion of storm water flows southeast and enters a drainage ditch which discharges into Spring Brook at Entry Point A.

**Figure 1 Locality Map**

**Figure 2 Study Area**

**Figure 3 Northern Natural Area**



**Figure 4 Aerial Photo**

Discharge Point 5 is the outlet for the storm water drainage system for the fairgrounds parking area. Eighteen-inch plastic culvert pipe drains the majority of the fairgrounds parking area and runoff from the facilities. Storm water is discharged between the racetrack and the Highway Department salt shed. The storm water flows across the access road on the southern end on the racetrack and then into the Northern Natural Area. The storm water flows southwest to the drainage ditch and then southeast and enters Spring Brook at Entry Point A.

## Langlade County Fairgrounds Racetrack

The Langlade County Fairground Racetrack is a 90 feet wide by 1/2 mile long red clay racetrack (Figure 5). The track is used for stock car, off-road truck, motorcycle, and ATV racing during the summer and snowmobiling racing during the winter. The majority of the interior of the racetrack is grass with a small horse coral filled with sand. The surface of the racetrack consists of a 12 to 18-inch layer of red clay.

The racetrack interior is graded to allow the storm water to flow from north to south. Storm water flowing over the red clay surface picks up the clay particles. The suspended clay particles flow with the storm water as the water drains to the inlet of the racetrack discharge pipe. Photo No. 3 shows the storm water flowing across the racetrack surface and into the inlet of the discharge pipe. The photo indicates the storm water's red color associated with the suspended clay particles. Photo No. 4 is a closer view of the discharge pipe inlet.



Photo No. 3

The inlet for the storm water pipe is located in the southeast corner of the racetrack. Storm water entering the inlet flows south under the racetrack and discharges into the Northern Natural Area. Photos No. 5 and 6 show the storm water at the outlet of the racetrack discharge pipe which enters the Northern Natural Area. The storm water then flows south and southwest, eventually entering a drainage ditch. The drainage ditch allows the storm water to flow southeast until it enters Spring Brook. Photo No. 7 shows the storm water entering Spring Brook at Entry Point A.

**Figure 5 Langlade County Fairgrounds Racetrack**





Photo No. 4



Photo No. 5



Photo No. 6





Photo No. 7

Samples of the red clay from the racetrack were analyzed as part of this study. Figure 6 are the results from the Gradation Test. The Gradation test indicated that 70 percent of the material passes a #200 sieve. Due to the material being so fine, the material remains suspended within the water longer causing the storm water runoff to turn red.

## **Site Constraints to Potential Alternatives**

Prior to discussing potential treatment alternatives, site constraints must be identified and used during the evaluation of the alternatives. While researching the project, the following site constraints have been identified.

### **Groundwater Level**

The groundwater level is very close to the ground surface at the southern end of the Langlede County Fairgrounds and in the Northern Natural Area (Photo 8). A test location revealed the groundwater level was approximately four (4) feet below the ground surface. The ground water level will limit the depth of storm water detention ponds.



Photo No. 8

## Figure 6 Gradation Test Results

Second page of Test

## **Racetrack Surface Material (Red Clay)**

Since the red clay consists of very fine particles, settling time is significantly increased. Also, settled clay particles are easily re-suspended by storm water generated from other rain events. Photo No. 9 shows the red clay particles which have settled out of the storm water prior to entering Spring Brook.



Photo No. 9

## **Wetland Disturbance**

The amount of disturbance to the soils in the Northern Natural Area with any alternative will be limited by the WDNR and the U.S. Corps of Engineers. The U.S. Corps of Engineers has indicated it will not allow any excavation below the hardpan.

## **Residences near the Northern Natural Area**

The City of Antigo and Langlade County have indicated they do not want to increase the amount of water that will impact the house located on the west side of Virginia Street (Figure 7). The residence has experienced times with water in the back yard and basement flooding during rain events and thawing cycles.

## **Private Landowners**

There are private landowners within the Northern Natural Area. The Wisconsin Department of Transportation (WDOT) already has an easement to discharge storm water into the Northern Natural Area. Any improvements to the western portion of the Northern Natural Area would need to address private land issues.



**Figure 7 House on Virginia Street**

## Treatment Alternatives

An analysis of potential treatment alternatives is an essential portion of the study. Potential alternatives were generated, compared with the site constraints of the project, and discussed with the City of Antigo, Langlade County, WDNR, and the U.S. Army Corps of Engineers. The following is a discussion of potential treatment alternatives.

### Fairgrounds Alternatives

1. Use of Racetrack Interior as a Detention Basin.

This alternative would involve detaining the storm water within the interior of the racetrack to increase the detention time. Increased detention time will allow settling of the suspended clay particles and a slower introduction of the storm water into the Northern Natural Area. Improvements inside the racetrack would involve changing the grade of the discharge pipe inlet, reducing the size of the discharge pipe, and changing the grade of the drainage ditches within the infield of the racetrack.

2. Mechanical Treatment

This alternative would involve the installation of a storm water filtering device at the inlet or outlet of the storm water discharge pipe from the racetrack basin.

3. Detention Ponds

This alternative involves the construction of storm water detention pond(s) within the Langlade County Fairgrounds property. Potential detention pond sites include an area directly south of the racetrack and an area southeast of the racetrack.

4. Altering the Racetrack Surface Type

This alternative involves the removal of the red clay surface and replacing it with a clay surface which would not be as fine or constructing an asphalt racetrack surface.

5. Storm Water Filtering System

This alternative includes the construction of a storm water filtering system consisting of rocks and gravel. A potential site for this alternative is the area southeast of the racetrack along the tree line on the southern property line. Storm water would be redirected from its existing discharge point to the filter. The filter would discharge the treated water into the Northern Natural Area where natural filtering would take place.

6. Move Racetrack Storm Water Discharge Point

This alternative would move the existing storm water discharge point to the east. This would increase the area in the Northern Natural Area filtering the storm water.

## Northern Natural Area Improvements

### 7. Redirect Storm Water from the 36-inch Discharge Pipe

This alternative involves re-grading the drainage ditch running along the western portion of the Northern Natural Area. Storm water would flow south along the west edge of the Northern Natural Area. Storm water would be channeled, preventing it from combining with the storm water discharged from the racetrack. By preventing the combination of the storm water, the racetrack discharge will have a longer detention time in the Northern Natural Area before it enters Spring Brook.

These alternatives were reviewed with the City of Antigo, Langlade Public Property Committee, and the WDNR at several meetings in December of 2001. The purpose of this review was to discuss the advantages and disadvantages of each alternative and to eliminate any potential alternatives which have site constraints, environmental issues, or political issues. Preliminary base maps were discussed. The maps indicated the study area, storm water discharge points, topography of the study area, and storm water flow. The results from the gradation test of the red clay from the racetrack were presented.

The following is a list of issues raised during the review completed in December of 2001:

- The WDNR had a concern about ditch improvements along the west side of the Northern Natural Area. Gary Bartz of the WDNR, stated a limited amount of ditching near the 36-inch storm sewer outlet and some ditching behind the house on the west side of Virginia Street prone to water backing up into the yard could possibly be allowed. Gary advised the idea of having a continuous ditch would probably not be approved by the WDNR. Gary indicated he would look into this issue further.
- There is the possibility of increased water around the house on Virginia Street with the proposed ditch improvements.
- Is the size of the culvert under Virginia Street large enough to handle the increased amount of water if ditching occurs on the west side of the Northern Natural Area?
- The ground water level on the southeast portion of the fairgrounds facility is within four feet of the surface. This would limit the amount of excavation which could occur in the area.
- Gary Bartz indicated that in previous conversations with Mike O'Keefe from the Corps of Engineers, they would prefer any detention areas be located on Langlade County's property, limiting the affect on the Northern Natural Area.
- The greater the detention time within the Northern Natural Area without influence from other storm water, the greater amount of natural filtration.

After discussion of the alternatives with the City of Antigo, Langlade County Public Property Committee, and the WDNR, the following alternatives warranted further consideration:

1. Increasing the detention time within the infield of the track.
2. Directing the storm water flow from the racetrack east along the southern portion of the Langlade County Fairgrounds facility.
3. Creating some type of detention basin on the Langlade County Fairgrounds facility.
4. Redirecting the storm water from the 36-inch storm water pipe entering the northwestern portion of the Northern Natural Area.
5. Changing the type of material used on the racetrack.
6. Mechanical treatment of storm water at the inlet within the racetrack.

Although changing the type of surface on the racetrack and using mechanical treatment for the storm water are options to be considered, at this time they would be the last alternatives considered because the costs appear to be prohibitive.

A second meeting was held with the City of Antigo, WDNR, and the Corps of Engineers in February of 2002. Discussion at this meeting focused on the feasibility of the treatment alternatives and possible sequencing of some of the alternatives.

## **Recommended Alternative**

The recommended action to attempt to limit the amount of suspended solids in the storm water discharging from the racetrack consists of a combination of activities discussed in the alternatives. The project should be constructed in two phases. This will allow for more control of the work items and costs associated with the improvements, and analysis of the effectiveness of the improvements. Also, if the improvements in Phase I reduce the amount of clay particles entering Spring Brook and Antigo Lake, there may not be a need to complete the improvements listed in Phase II.

Figure 8 indicates where the recommended alternative actions would be located. The following outlines the course of action.

### **Phase I**

1. Provide a storm water control structure inside the interior of the racetrack to limit the rate of storm water discharge.
2. Construct an out fall conduit/culvert to redirect the storm water flow from the racetrack to run east along the south property line.
3. Construct a rock filter system along the south property line. The filter system should be long and narrow consisting of sand, clear stone, and riprap to filter storm water from the racetrack.
4. Restore the drainage ditch disturbed in the summer of 2001. Remove the earth berm constructed to detain the storm water.

## Figure 8 Recommended Alternatives

## Phase II

1. Construct a small basin at the out fall of the 36-inch storm water discharge. Some suspended solids could be captured at this point prior to flowing through the Northern Natural Area.
2. Construct a drainage ditch/swale from the 36-inch discharge to Virginia Street along the western portion of the Northern Natural Area.
3. Change the size of the culvert under Virginia Street to prevent backup of water from the ditch/swale.

## Estimated Costs

The following are the estimated costs associated with the Recommended Alternative. The actual costs will be controlled by the final design and bidding conditions at the time of the bid. Also, the estimated costs are based upon the project being let out to bid for contractors. There may be cost savings available if the City of Antigo and Langlade County perform the improvements with its own forces.

**Table 1 Estimated Costs**

<b>Work Item</b>		<b>Estimated Cost</b>
1	Racetrack Inlet Storm Water Control Device	\$ 1,500.00
2	Re-Direct Racetrack Storm Water Discharge Pipe	\$13,000.00
3	Construct Rock Storm Water Filter	\$10,000.00
4	Drainage Ditch Restoration	\$ 1,000.00
<b>Phase I Subtotal</b>		<b>\$25,500.00</b>
5	Construct Detention Basin at 36 Inch Storm Water Pipe Outlet	\$ 2,500.00
6	Drainage Ditch/Swale Construction	\$10,000.00
7	Virginia Street Culvert Replacement	\$ 3,000.00
<b>Phase II Subtotal</b>		<b>\$15,500.00</b>
<b>ESTIMATED TOTAL PROJECT COST</b>		<b>\$41,000.00</b>

## Analysis of Potential Funding Sources

The following is a discussion of potential funding sources available through the WDNR for implementation of the recommended alternative.

### Urban Nonpoint Source and Stormwater Grants

Urban Nonpoint Source and Stormwater Grants promote urban runoff management for existing urban areas, developing urban areas and urban re-development. The primary goals include implementing urban runoff performance standards (Wis. Admin. Code NR151), achieving water quality standards, protecting groundwater, and helping municipalities meet municipal storm water permit conditions (Wis. Admin. Code NR216). Eligible projects could include stormwater detention pond construction, urban streambank stabilization and land acquisition to increase permeable areas for infiltration. Urban Nonpoint Grants can fund 70% of technical assistance while standard cost-share funds are available at 50% of the project cost. The maximum amount that can be granted for a construction project is \$150,000. The maximum amount that can be

granted for a technical assistance project is \$100,000. Applications are due May 1, 2002 for funding beginning in January 2003.

### **Targeted Runoff Management Grants**

Targeted Runoff Management (TRM) Grants are competitive financial awards to support small-scale, short-term projects that are completed by local governmental units within 24 months of the start of the grant period. Both urban and rural projects can be funded through a TRM Grant. Up to 70% of a project can be funded through a TRM grant, to a maximum of \$150,000 funding. Project selection is based on geographical water quality priorities, local support for the project, the ability of the project to control nonpoint pollution and other factors. Staffing, studies, and design are not eligible costs of the grant. Applications are due May 1, 2002 for funding beginning in January 2003.

### **Lake Protection and Classification Grants**

The Lake Protection and Classification Grant program provides up to 75% state cost sharing assistance up to \$200,000 to carry out lake protection, restoration, and improvement projects. A 25% local cost share is required. Eligible activities under this program include, purchase of property or a conservation easement, restoration of wetlands, development of local regulations or ordinances, lake classification projects, and lake improvement projects. Applications are due May 1, 2002. Grants are usually awarded in September.

### **River Protection Management Grants**

The River Protection Grant Program assists local organizations and local units of government in protecting or improving rivers and natural river ecosystems. Cost sharing grant assistance is available for activities that will help to provide information on river ecosystems, improve river system assessment and planning, increase local understanding of the causes of river problems, and assist in implementing management activities that protect or restore river ecosystems. River management grants up to \$50,000 are available from the WDNR for the purposes that include purchase of land or a conservation easement, local ordinance development, installation of nonpoint source pollution control practices, and river restoration activities. Grants are based on 75% of the total eligible project costs and are capped at the maximum grant amount. Applications are due on May 1<sup>st</sup> of each year.

The following pages are summaries of the previously discussed programs.