Drainage Alterations Analysis

Casaloma Drive Reconstruction  
Stormwater Runoff Diversion from Bentwood Estates  
Detention Basins to Grand Chute Drain

Prepared For The  

Grand Chute  
TOWN OF GRAND CHUTE  
OUTAGAMIE COUNTY, WISCONSIN

APRIL 3, 2018
McM. No. G0003-9-16-00125
BLH/AWS/jlh
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I. INTRODUCTION

The Town of Grand Chute is proposing reconstruction of Casaloma Drive from Victory Lane/Converter Drive to Prairie Song Lane (NE ¼ of SW ¼ of Section 17 and Section 18, T21N, R17E). The reconstruction will consist of widening and “urbanizing” the roadway with curb and gutter, providing storm sewers for drainage, and providing sidewalks and bike paths. The portion of the reconstruction north of Capitol Drive is located within the tributary area to the Main Drain of the Grand Chute Drain (Grand Chute Drain), which is a District Drain under the jurisdiction of the Outagamie County Drainage District. The Grand Chute Drain generally flows from southwest to northeast, and crosses Casaloma Drive approximately 1,800 feet north of the intersection of Amberwood Lane and Casaloma Drive. Exhibit 1 shows a general site location of the proposed improvements and the Grand Chute Drain.

II. PROPOSED ACTION AND OBJECTIVES

There is a residential subdivision (Bentwood Estates) located east of Casaloma Drive near the intersection with Amberwood Lane. The Town of Grand Chute hired McMahon Associates Inc. (McMAHON) to perform a Drainage Alterations Analysis to divert stormwater discharge from Bentwood Estates detention basins to the Grand Chute Drain through proposed storm sewer...
within the Casaloma Drive right-of-way. Exhibit 2 shows a conceptual layout of the Bentwood Estates Diversion Plan.

Bentwood Estates was constructed primarily between 2000 and 2005. Stormwater generally flows from south to north, conveyed through a combination of overland flow and storm sewers to three (3) detention basins along the north side of the subdivision. The detention basins discharge stormwater into a Floodplain Storage and Wetland Area (Wetland Area) identified by the Wisconsin Department of Natural Resources (DNR) Surface Water Data Viewer (SWDV), as indicated in Exhibit 3. In addition to the detention basins discharge, sump pump discharge from the adjacent houses is directed to the Wetland Area. Stormwater discharge from the detention basins and sump pumps is conveyed through the wetland area to the Grand Chute Drain approximately 850 feet east of Casaloma Drive, as shown in Exhibit 4. Appendix A includes aerial photographs of the wetland area. Aerial photographs from 2000 show the wetland area to be forested with primarily silver maple and ash trees, while aerial photographs from 2014 show the wetland area primarily as shallow marsh with most of the trees fallen down or dying. The current vegetation is dominated by non-native phragmites and reed canary grass. The increase in stormwater runoff from the detention basins and sump pumps is believed to be a cause of the trees dying in the wetland area. See a letter from McMAHON to the Town of Grand Chute in Appendix A for further information regarding the objectives of the stormwater diversion.

After several meetings and discussions, it was decided by the Town of Grand Chute, Outagamie County Drainage Board, Wisconsin DNR, and Outagamie County Land Conservation Department to pursue diverting stormwater discharge from the detention basins and sump pumps within Bentwood Estates to the Grand Chute drain through proposed storm sewers built in conjunction with the Casaloma Drive Urbanization project. Exhibit 2 shows a conceptual layout of the proposed diversion. It was determined that the pre-development stormwater runoff rate would continue to be conveyed to the wetland area to sustain the wetland hydrology after the diversion was constructed. The proposal will allow for stormwater runoff generated from the pre-development runoff depth to continue to discharge to the wetland area, while diverting flows greater than those generated from the pre-development depth. The runoff depth of 0.46-inches was determined to be the pre-development runoff depth as noted in Appendix A. The objective of the proposed action is to reduce the frequency and severity of flooding within the Wetland Area and improve conditions for some of the existing trees. The long-term goal is to have the wetland reforest back to original.

The storm sewer system which is proposed to divert stormwater runoff to the Grand Chute Drain is considered a private drain. The Town of Grand Chute is seeking authorization from the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) to connect the private drain to the Grand Chute Drain as required under ATCP 48.34 (1) (c). This Analysis has been prepared in conformity with ATCP 48.36. The requested action complies with the applicable standards under ATCP Subchapter IV, notably ATCP 48.21 (5) and 48.26 (2).
III. DESIGN SPECIFICATIONS

ATCP 48.36 (1) (f) states that the design specifications for the proposed action shall comply with applicable standards under subchapter IV. The applicable standards of subchapter IV, and a description of how the proposed stormwater diversion and private drain connection to the Grand Chute Drain meet the standards, is described below.

ATCP 48.20 (6)(c) A county drainage board may proceed under ATCP 48.21 to change or clarify the cross-section, grade profile, or alignment of a district drain.

The proposed improvements fall under ATCP 48.21 (5), and meet these requirements as described below.

ATCP 48.21 (5)(a) A county drainage board may not change the formally established grade profile of a district drain unless the county drainage board does all of the following:

1. Provides, to every landowner in the drainage district whose access to drainage will be affected by the proposed change, a written notice that clearly describes the proposed change and gives the landowner at least 30 days to object. A change is deemed to affect a landowner’s access to drainage if it impedes gravity flow of water from his or her land, through a real or assumed drain, to any real or assumed outlet at the formally established cross-section and grade profile of the district drain.

There are no proposed physical changes to any landowner’s property; therefore, there is no negative impact to the drainage from landowner’s property to the Grand Chute Drain. The diversion allows the pre-development runoff depth to continue to discharge to the wetland area, and redirects runoff greater than the pre-development rate approximately 850 feet upstream of the location where the runoff currently discharges into the Grand Chute Drain.

2. Resolves, to the satisfaction of the objecting landowner, every timely objection filed with the county drainage board by a landowner who is entitled to notice under subsection 1.

As noted above, there will not be any landowners whose access to drainage will be affected by the proposed change. Therefore, there should not be any objections. However, should any objections be filed, the applicant will work to resolve the objection with the landowner.

3. Obtains the department’s approval for the proposed change under ATCP 48.34.

This report is a formal application for approval from the DATCP as required under ATCP 48.34.

ATCP 48.36 (1)(i) Construction plan. A construction plan, if applicable, including all of the following:

1. A plan for controlling construction site erosion.
2. The estimated amount of material, if any, that will be removed.
3. A plan for depositing removed material, if any, including the location and configuration of any deposits.

Construction plans for the diversion have been included in Appendix E. The proposed dredging concept is attached in Appendix D. Outagamie County will complete the dredging plans and construction. Spoils deposition will be determined by the County as part of the dredging project.

ATCP 48.36 (1)(k) Formal changes to cross-section, grade profile or alignment. All of the following information if the county drainage board proposed to change the formally established cross-section, grade profile, or alignment of a district drain:

1. The cross-section, grade profile, or alignment, which the county drainage board proposes to change.

   The proposed cross-section and grade profile at cross-section 134+91 are included in Appendix D.

2. The new cross-section, grade profile, or alignment proposed by the county drainage board. The new specifications shall be prepared by an engineer who is qualified under s. 88.21 (5), Stats.

3. If the county drainage board proposes to change a formally established alignment, a statement that the county drainage board has complied with s. ATCP 48.21 (4)(a) 1.

   The formally established alignment will not be changed.

4. If the county drainage board proposes to change a formally established grade profile, a statement that the county drainage board has complied with s. ATCP 48.21 (5)(a) 1. and 2.

   This statement is addressed above.

IV. HYDROLOGIC ANALYSIS

A. EXISTING CONDITIONS ANALYSIS

A hydrologic analysis was prepared by McMAHON to analyze the effect the Bentwood Estates watershed and determine the existing 10-year, 24-hour discharge into the Grand Chute Drain from the three (3) Bentwood Estates detention basins. The 25-year 24-hour event has not been analyzed for the Grand Chute Drain; therefore, no existing conditions analysis will be performed for the 25-year 24-hour rainfall event.

The outlets for the Bentwood Estates detention basins are located north of the subdivision, as indicated on Exhibit 4. The stormwater discharge from the west and central basins drains northerly through the wetland area into a discharge ditch, and is conveyed through the drainage ditch, ultimately discharging into the Grand Chute Drain approximately 850 feet east of Casaloma Drive. The discharge from the east detention basin is directed into a very flat portion of the wetland area, where it is stored and will
not be conveyed to the Grand Chute Drain. See Exhibit 4 for the conveyance path of the stormwater discharge from the Bentwood Estates detention basins.

The existing conditions for the 10-year, 24-hour stormwater discharge into the Grand Chute Drain from Bentwood Estates was analyzed using XP-SWMM v 2017.1. The discharge was determined to be 19.6 cfs at a location 850 feet downstream of the Casaloma Drive crossing. These flows are conveyed from the pond outlet pipes into a small ditch through the wetland area to the Grand Chute Drain.

Existing and Proposed Hydrologic Parameters are shown in Appendix B. Results of the Existing condition are shown in Tables 1 and 2.

**B. PROPOSED CONDITIONS ANALYSIS**

A hydrologic analysis was also prepared by McMAHON to analyze the effect the proposed action has on the WSEL of the Grand Chute Drain for a 10-year, 24-hour event. The base flow of the Grand Chute Drain downstream of station 136+16 (850’ downstream of Casaloma Drive) will not be increased. The 10-year water surface elevations are reduced in the Grand Chute Drain. The 25-year 24-hour event has not been analyzed for the Grand Chute Drain; therefore, the impacts from the proposed actions are not analyzed for the 25-year 24-hour rainfall event.

The pre-development stormwater runoff rate to the wetland area will continue to be conveyed to the wetland area in the proposed condition to help sustain wetland hydrology. Stormwater runoff in excess of the pre-development rate will be diverted. See Appendix A for more information regarding the hydrology of the wetland area.

Wet Detention Pond Conservation Practice Standard 1001, noted in Appendix A, was used to determine the pre-development stormwater runoff depth (0.46-inches) for the area tributary to the wetland area north of Bentwood Estates. The stormwater runoff rate generated using the pre-development stormwater runoff depth of 0.46-inches will continue to be conveyed to the wetland area, an ultimately to the Grand Chute Drain. XP-SWMM v 2017.1 hydrologic modeling was used to determine the stormwater runoff to the wetland area, and the flow diverted to the Grand Chute Drain.

The three (3) detention basins within Bentwood Estates were modeled to determine the flow conveyed to the wetland area and the WSEL in each basin using the pre-development stormwater runoff depth of 0.46-inches.

The existing storm sewer outlet pipes will remain to allow the pre-development stormwater runoff to be conveyed to the wetland area. For the diversion, storm sewers (above the device bottom and above the existing primary outlets) will be installed to bypass stormwater from the three detention basins to the Grand Chute Drain prior to
discharge into the wetland area. The sump pumps adjacent to the wetland area will also be connected to the bypass storm sewer.

XP-SWMM modeling was then used to determine the 10-year, 24-hour stormwater runoff to the Grand Chute Drain at the downstream end of the Casaloma Drive crossing through the bypass storm sewer. This flow was determined to be 14.4 cfs. Additionally, the flow from Bentwood Estates is reduced to 15.7 cfs (model node IDs: link 43 & link 44). Appendix E contains the diversion construction plan, which indicates the location of the diversion outlet to the Grand Chute Drain.

XP-SWMM modeling was also used to determine the effect of the proposed changes to the flow rates and water surface elevation of the Grand Chute Drain. Results of the existing condition and proposed condition of the Grand Chute Drain are shown in Tables 1 and 2.

The elevation of the storm sewer diversion discharge will require dredging of the Grand Chute Drain from Casaloma Drive east for a distance of 600 feet. The dredging will extend from Casaloma Drive to station 133+71. The slope of the storm sewer is set to allow flow from the 100-year 24-hour storm event to be conveyed to the Grand Chute Drain. The outfall invert at the Grand Chute Drain is approximately 0.9 feet below the existing bottom of the Drain (at Casaloma Drive). The Proposed Grand Chute Drain Dredging Plan is located in Appendix D and diversion plans are shown in Appendix E.

### Table 2

**Grand Chute Drain & Wetland Area Existing and Proposed Water Surface Elevation**

<table>
<thead>
<tr>
<th>XP-SWMM Node ID</th>
<th>Location</th>
<th>Existing Condition Max. WSEL</th>
<th>Proposed Condition Max. WSEL</th>
<th>Reduction in Max. WSEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>GC Dra 127+71</td>
<td>DS End Casaloma Dr</td>
<td>813.38</td>
<td>812.67</td>
<td>0.71</td>
</tr>
<tr>
<td>128+35</td>
<td>64’ east of Casaloma</td>
<td>813.10</td>
<td>812.52</td>
<td>0.59</td>
</tr>
<tr>
<td>133+71</td>
<td>600’ east of Casaloma</td>
<td>810.16</td>
<td>810.16</td>
<td>0.00</td>
</tr>
<tr>
<td>134+91</td>
<td>720’ east of Casaloma</td>
<td>809.71</td>
<td>809.71</td>
<td>0.00</td>
</tr>
<tr>
<td>136+16</td>
<td>845’ east of Casaloma</td>
<td>809.37</td>
<td>809.35</td>
<td>0.01</td>
</tr>
<tr>
<td>B4g1</td>
<td>Discharge of West Pond</td>
<td>810.24</td>
<td>810.05</td>
<td>0.19</td>
</tr>
<tr>
<td>B4g2</td>
<td>Discharge of Central Pond</td>
<td>809.85</td>
<td>809.84</td>
<td>0.01</td>
</tr>
<tr>
<td>Node50</td>
<td>Wetland Area Discharge</td>
<td>809.37</td>
<td>809.35</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Table 3
Grand Chute Drain & Wetland Area Existing and Proposed Peak Flows (cfs)

<table>
<thead>
<tr>
<th>Node ID</th>
<th>Location</th>
<th>Existing Condition Peak Flow</th>
<th>Proposed Condition Peak Flow</th>
<th>Reduction in Peak Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>GC Drain 00</td>
<td>Casaloma Dr to Diversion Outfall</td>
<td>584.2</td>
<td>584.2</td>
<td>0.0</td>
</tr>
<tr>
<td>GC Drain 01</td>
<td>Diversion outfall to east end of dredging</td>
<td>584.6</td>
<td>585.4</td>
<td>-0.7</td>
</tr>
<tr>
<td>GC Drain 02</td>
<td>Dredging limits to station 134+91</td>
<td>583.0</td>
<td>583.7</td>
<td>-0.7</td>
</tr>
<tr>
<td>GC Drain 03</td>
<td>Station 134+91 to 850' east of Casaloma</td>
<td>581.6</td>
<td>582.1</td>
<td>-0.6</td>
</tr>
<tr>
<td>GC Drain 04</td>
<td>Diversion Outfall to 850 feet East</td>
<td>519.8</td>
<td>515.9</td>
<td>3.9</td>
</tr>
<tr>
<td>Link43</td>
<td>Bentwood West Pond to Wetland Area</td>
<td>11.5</td>
<td>7.7</td>
<td>3.7</td>
</tr>
<tr>
<td>Link44</td>
<td>Bentwood Central Pond to Wetland Area</td>
<td>8.1</td>
<td>8.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Link45</td>
<td>Wetland area to Grand Chute Drain</td>
<td>-119.2</td>
<td>-114.0</td>
<td>5.2</td>
</tr>
</tbody>
</table>

As shown in Tables 1 and 2, existing peak flows through the Grand Chute Drain are maintained or reduced in the proposed condition downstream of station 136+16. From Casaloma Drive to station 136+16 (850’ east of Casaloma), the flows increase due to the diversion pipe discharge at Casaloma Drive. However, the model shows that the proposed water surface elevations are reduced compared to existing water surface elevations (WSEL) for the entirety of the studied portion of the Grand Chute Drain. The reduction in WSEL’s of the Grand Chute Drain at or near the Casaloma Drive crossing is due to the proposed dredging. Without completing the dredging, the water surface elevations would increase by approximately 0.005 feet for locations where the dredging is proposed.

Table 3 also illustrates that in link 45, which connects the Grand Chute Drain to the wetland area between the Drain and Bentwood Estates has both positive and negative flow. This shows that the Grand Chute Drain will back up into and utilize the wetland storage in the proposed condition.

V. ASSESSMENT OF BENEFITS TO LANDOWNERS

When a drainage district is created, the benefits to each parcel of land within the district are assessed. A reassessment may occur if the last confirmed assessment of benefits no longer represents the actual current benefits to parcels of land within that drainage district. The proposed diversion and connection of the private drain will not impact the assessment of benefits to the parcels within the drainage district. Section ATCP 48.08 details the assessment of benefits. The following factors are considered when assessing benefits – the impacts of the proposed changes are noted along with the factors.

- **Increase in land value resulting from drainage.**
  
  The proposed change will have no impact on the drainage within the district, and will neither increase nor decrease the land value.
■ The type, depth, quality, and character of surface soil and subsoil.
   The proposed change will have no impact on the soils within the district.

■ The amount of drainage required by, or provided to the assessed land.
   The proposed change will have no impact on the amount of drainage required by, or provided to the assessed lands within the district.

■ The thoroughness and reliability of drainage provided.
   The proposed change will have no impact.

■ The amount and frequency of flooding on the assessed land.
   The proposed change will reduce the severity and frequency of flooding within the Wetland Area, however, this will still remain a Floodplain Storage and Wetland Area. The proposed change will have no impact on the amount and frequency of flooding within the remaining lands within the district.

■ The difficulty of draining the assessed land.
   The proposed change will have no impact on the draining of the lands within the district.

VI. ENVIRONMENTAL EFFECTS

The following factors are considered when assessing the environmental effects of the proposed changes – the impacts of the proposed changes are noted along with the factors.

■ Lands, waters, and land uses affected by the proposed change.
   The land use, topography, and location of wetlands will not be negatively affected by the proposed change. It is possible that the wetland will be positively affected by the diversion by restoring the pre-development forested conditions, which have been negatively affected by the development.

■ Surface water levels, quality, and temperature.
   Water quality and temperature will not be affected by this diversion, and the minimal reduction in WSEL is not anticipated to have a negative effect on the surrounding environment.

■ Groundwater levels and quality.
   The proposed diversion will have no effect on the ground water level or groundwater quality.
VII. ALTERNATIVES

The wetland area northeast of the Bentwood Estates West Detention Basin is a Zone A floodplain. The area has been subject to flooding which has encroached onto the adjacent properties in the Bentwood Estates subdivision. The proposed stormwater runoff diversion will reduce the frequency and severity of flooding for these properties by reducing the amount of runoff to the Wetland Area primarily in more frequent (annual) storm events. The change is proposed at this time to coordinate the work with the proposed reconstruction of Casaloma Drive. There are no costs to the Outagamie County Drainage District for this change, as Grand Chute Sanitary District No. 3 is paying for the diversion. The alternative is to not divert the stormwater runoff. This will leave the Wetland Area with the same runoff amount, and the flooding and damage to the forested wetland will remain the same or may continue to degrade at the same rate.

VIII. SUMMARY

The Town of Grand Chute seeks approval from the Outagamie County Drainage Board and the Wisconsin Department of Agriculture, Trade, and Consumer Protection for the proposed diversion of stormwater runoff, through a proposed private drain to the Grand Chute Drain at the crossing of Casaloma Drive. The proposed project will help reduce the frequency and severity of flooding in the Bentwood Estates subdivision, and to assist in the restoration of the forest within the wetland and will have minimal impact on the Grand Chute Drain and the surrounding environment.
APPENDIX D

GRAND CHUTE DRAIN DREDGING PLAN, PROFILE, CROSS SECTION
APPENDIX E

BENTWOOD ESTATES DIVERSION PLANS
CASALOMA DRIVE URBANIZATION
(VICTORY LANE TO PRAIRIE SONG LANE)
TOWN OF GRAND CHUTE

OUTAGAMIE COUNTY, WISCONSIN

CONTRACT# 2016-14
MCM # G0006-9-16-00122