BLACK CREEK CONSOLIDATED DRAIN  
Egelston, Moorland, Ravenna & Casnovia Townships  
Muskegon County, Michigan  

CONDITIONS SUMMARY REPORT  

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MUSKEGON COUNTY DRAIN COMMISSIONER  

STEPHANIE BARRETT  
MUSKEGON COUNTY DEPUTY DRAIN COMMISSIONER  

Project No. 16041.00  
December 2016  

Eng.  
Engineering & Surveying  
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Lansing, Michigan 48911  

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1.0 INTRODUCTION

The Black Creek Consolidated Drain is an established County Drain located in portions of Egelston, Moorland, Ravenna and Casnovia Townships in Muskegon County, Michigan. The drain was recently consolidated and consists of 52.40 miles of drain.

The existing Drainage District boundary contains approximately 17,549 acres of land, with Egelston Township containing 3,163 acres, Moorland Township with 13,212 acres, Ravenna Township with 99 acres and Casnovia Township with 1,075 acres. The lands in the District are used primarily for agricultural and rural residential purposes.

The study area of this report will focus on land bordered on the west by Maple Island Road and the east by Barnes Road within the former Smith & Mulder Drain. The study area was formulated as the result of a petition for maintenance and improvement to the Black Creek Consolidated Drain filed on June 27, 2016. Besides the nine signers of the petition which reside along Maple Island Road just north of Evanston Avenue, additional complaints have been received from residents within the limits of the study area along Evanston Avenue east of Maple Island Road.

Eng. Inc. analyzed the existing storm water drainage conditions to determine the causes of prolonged flooding and evaluate potential relief options.
The following tasks were performed to accomplish these services:

- Review the file and history of the drain system at the Muskegon County Drain Commissioner’s office (MCDC).

- Review and research existing record information, including County maps, aerial photographs, topographic information, Muskegon County Road Commission records, existing land use information, etc.

- Review any documented drainage complaint records and any adjacent district boundary or drainage district information maps.

- Review any wetland information available from the DEQ for the immediate area, which may impact potential options for improvement.

- Review any available USDA Soil Survey Map information for the immediate area.

- Research and inspect possible routes for a relief branch.

- Meet with petitioners and landowners to determine extent of drainage issues.

- Provide an independent and unbiased assessment of the storm water conditions within the study area.

- Compile analysis in a conditions summary report.
2.0 STUDY AREA EXISTING CONDITIONS & ANALYSIS

Based on review of the topographical maps and meetings with property owners in the study area, the two main recurring issues are prolonged surface flooding and basement flooding.

The soils in the study area are comprised primarily of Pipestone-Covert sands and Roscommon & Au Gres sands, which are fine sands with varying draining capabilities ranging from moderate to poor. The water table in these areas is very shallow (6 inches to 24 inches) based on the NRCS soil survey information. The elevated water table and the lack of an appropriate drainage outlet are the primary causes of the inadequate storm water drainage in the study area.

For residents with basements within the study area, the soil conditions and water table characteristics can result in continuous pumping of foundations and in some cases may require multiple sump pumps to keep up with the groundwater. Extended rainfall during seasonal periods can overtax systems that rely entirely on infiltration, resulting in basement and surface flooding which appears to be occurring to several properties in the study area.

Based on review of the topographical maps (2-foot contours), the area east of Maple Island Road along Evanston Avenue is in a low-lying bowl which receives runoff from surrounding private property and roadway drainage from Evanston Avenue (between Maple Island Road and Barnes Road). The area currently has no positive outlet for storm water. Several of the road culverts along Evanston Avenue have either been removed or are not effective due to this circumstance. As a result of these conditions, storm water must either evaporate or wait until the groundwater levels recede to allow the sandy soils to infiltrate adequately. This process may take days to months depending on the time of year.

Map depicting low area (hatched) with no outlet for surface water
Options to service the properties in the study area were evaluated to determine if an adequate outlet was available and financially feasible. The primary options available were:

1. Extend a branch from the former Smith & Mulder Drain (located to the northeast) of the Black Creek Consolidated Drain.
2. Extend a branch from the Norris Creek Drain located southeast of the study area.
Based on the topographical information, proximity to the Drain, and presence of wetlands, the recommended option for flood relief is the first option: to extend a branch drain to the former Smith & Mulder Drain of the Black Creek Consolidated Drain. The ideal location for the drain is generally as depicted in the map below. The length of the branch drain would consist of approximately 3800 lineal feet of drain along private property and road right of way. A minimum of two easements would be necessary for construction of the drain as proposed.

The approximate elevation of the former Smith & Mulder Drain at the connection point is 662, and the ground elevation at the subject surface flooding locations is 670. The elevation change will provide enough gradient for a sufficient storm water outlet for surface water. Due to the limited depth, and pending a detailed survey of basement elevations, the proposed pipe may not be deeper than basement elevations on Maple Island Road. However, a positive outlet would be provided for sump pumps to discharge and would eliminate the groundwater recharge and recycling and high energy usage which exists in the current state.

Alternative routes to the former Smith & Mulder Drain consist of utilizing the existing public rights of way of Sue Marie Lane, Maple Island Road and Evanston Avenue. Although the route is approximately equal in length to the former alternative, the depth along Evanston Avenue would be compromised slightly and may not provide the same level of service.

Final analysis to determine the preferred route would consider public testimony from the Board of Determination meeting, to ensure all problematic areas receive an adequate level of service to alleviate prolonged surface and basement flooding, where feasible.

The second option, extend a branch from the Norris Creek Drain, would require that drainage be routed to the rear of properties along Evanston Avenue and then across countryside approximately 5600 feet to Sullivan Road and the upper terminus of Norris Creek. In addition to the increased length of this route, this option also requires acquisition of significantly more easements and the crossing of a large wetland complex (which would require more intense DEQ permitting and ultimately may not be permissible).
3.0 RECOMMENDATIONS

The following recommendations address drainage issues within the study area indicated of the Black Creek Consolidated Drain Drainage District:

- Conduct a Board of Determination meeting as outlined in Chapter 8 of the Michigan Drain Code of 1956 to determine if improvements are necessary.

- Review any documented inspection reports of other issues within the Black Creek Consolidated Drain Drainage District to determine if other drainage issues may exist (see appendices).

- Perform a field review of Drain conditions throughout the Black Creek Consolidated Drain Drainage District to determine if other drainage issues may exist (see appendices).
APPENDIX A –

Report Exhibits & Photos (8.5” x 11”)

Map Unit Legend

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>FaB</td>
<td>Belding and Allendale soils, 0 to 6 percent slopes</td>
<td>4.1</td>
<td>0.6%</td>
</tr>
<tr>
<td>ClmnaaB</td>
<td>Coloma-Drems-Fern complex, 0 to 6 percent slopes</td>
<td>19.0</td>
<td>2.4%</td>
</tr>
<tr>
<td>CovabB</td>
<td>Covert-Pipestone sands, 0 to 6 percent slopes</td>
<td>224.3</td>
<td>32.6%</td>
</tr>
<tr>
<td>NuB</td>
<td>Nester-Ubl typs of sands, 2 to 6 percent slopes</td>
<td>10.9</td>
<td>1.6%</td>
</tr>
<tr>
<td>PtflabB</td>
<td>Plainfield sand, 0 to 6 percent slopes</td>
<td>158.2</td>
<td>23.2%</td>
</tr>
<tr>
<td>PtflabD</td>
<td>Plainfield sand, 6 to 18 percent slopes</td>
<td>24.3</td>
<td>3.6%</td>
</tr>
<tr>
<td>PpsaaA</td>
<td>Pipestone-Covert-Saugatuck sands, 0 to 3 percent slopes</td>
<td>19.7</td>
<td>2.9%</td>
</tr>
<tr>
<td>Sa</td>
<td>Reconstituted Au Gras sands</td>
<td>176.9</td>
<td>26.0%</td>
</tr>
<tr>
<td>SkkaaB</td>
<td>Spinks loamy sand, 0 to 6 percent slopes</td>
<td>13.6</td>
<td>2.0%</td>
</tr>
<tr>
<td>Ss</td>
<td>Suel soils</td>
<td>26.0</td>
<td>3.9%</td>
</tr>
<tr>
<td>Td</td>
<td>Tonkey and Deford soils</td>
<td>7.6</td>
<td>1.1%</td>
</tr>
<tr>
<td>Totals for Area of Interest</td>
<td></td>
<td>681.6</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties
APPENDIX B –

Drain Inspection Reports
Black Creek Drain Inspection Report

Date: April 21, 2016
By: Dan Fredricks, P.E. – Land & Resource Engineering (LRE)
Re: HH&G Drain – Drainage Issues

Background: Land and Resource Engineering (LRE) was authorized by the Muskegon County Drain Commissioner to investigate drainage concerns expressed by residents along the former HH&G Drain (Drain) located on the north side of Apple Avenue (M-46). LRE made a site visit to assess the condition of the Drain on April 21, 2016. The results of our inspection are summarized in this report.

Site Visit: The HH&G Drain was consolidated into the Black Creek Consolidated Drain in April of 2011. The former HH&G Drain is a tributary to Black Creek. The convergence is located at the downstream terminus of the established Black Creek Consolidated Drain in Section 27 of Egelston Township. The downstream end of the Drain flows through a wooded riparian corridor and is very stable with positive gradient, well connected floodplain and more-natural meandering pattern. A few minor fallen trees and debris were noted, but in general the channel is relatively free of obstructions.

A series of in-line ponds and weirs have been constructed by the property owner south of Apple Avenue (M-46) and west of Maple Island Road. The control structures appear to be backing up flow west of Maple Island Road and causing excessive sediment build-up in the Drain.
The primary area of concern is located upstream (north) of Apple Avenue (M-46). Residents complain of stagnant flow and sediment build-up. The horse farm immediately north or Apple Avenue (M-46) appears to be the culprit for upstream drainage issues. Several areas of erosion, and excessive sedimentation due to uncontrolled horse access to the Drain were identified through the pasture area. In addition, undersized and perched culverts also appear to be impeding flow.

**Recommendations:** Downstream portions of the Drain are stable and appear to be adequately conveying the flow and sediment supplied by the contributing watershed. No work other than routine woody debris management is recommended along this reach.

Upstream portions of the Drain are clearly in need of maintenance and/or improvement. A topographic survey of the Drain from the pond area just south of Apple Avenue (M-46) to the upstream terminus should be conducted and a maintenance/improvement plan should be developed to address impairments such as man-made restrictions including weirs, and undersized or perched culverts. In addition, efforts should be made to limit animal access to the Drain.

Sincerely,

**Land & Resource Engineering**

[Signature]

Daniel J. Fredricks, P.E.
Project Manager
Black Creek Drain Inspection Report

Date: October 7, 2016
By: Kyle Visker, P.E. – Land & Resource Engineering (LRE)
Re: Black Creek Consolidated Drain (Muskegon Newaygo Drain) – Drainage Issues

Background: Land and Resource Engineering (LRE) was authorized by the Muskegon County Drain Commissioner to investigate drainage concerns expressed at the Black Creek Consolidated Drain Day of Review on August 8, 2015. Mr. Wayne Traxler lives at 10860 E. Apple Avenue and has provided a photo and complaint about a private crossing on the former Muskegon Newaygo (Drain) downstream of his property. LRE conducted an inspection of the Drain on March 3, 2013 from Moorland Road to Bossett Road and also met with Mr. Traxler to discuss the drainage issues. Below is a brief summary of our 2013 investigation along with the attached recommendations figure.

Site Visit: LRE staff walked the Drain from downstream to upstream starting at the Moorland Road crossing. The 16-foot wide by 8-foot high concrete box culvert at Moorland Road is relatively new and in good condition. Continuing upstream (east), the channel has a number of moderate to severe areas of bank erosion. The eroding banks predominately consist of sandy soils and are sending a significant amount of sediment downstream.

The private crossing identified by Mr. Traxler is located on the south side of Apple Ave. and consists of twin 8-foot wide by 6.5-foot high corrugated metal culverts. The culverts are only 20 feet long and the headwalls are in very poor condition consisting of broken concrete, cobble and wood. The crossing surface is a concrete surface and serves as a residential driveway.

Just upstream of the private crossing is a meander and sharp bend to the northeast. The channel banks in this area are eroding and causing trees to fall in the Drain; thereby, creating a log jam.
The Apple Ave (M46) crossing is a clear span bridge in good condition. The bridge has an open width of approximately 20 feet.

Mr. Traxler’s property is located on the north side of Apple Ave (M-46) on the northwest side of the Drain crossing. Pictures of his property and house completely flooded were provided. The top of bank on his side of the Drain is low so when floodwaters back up in the Drain it overflows on to his property.

Mr. Traxler’s neighbor to the east has placed a private crossing over the Drain. The crossing is an old trailer bed with the wheels still attached. The wood decking is in poor condition.

During the 2013 inspection an old culvert without any cover was sitting in the middle of the Drain approximately 2,000 feet southwest of the Bossett Road crossing. Based on aerial images this culvert may have been removed since the inspection.

The Bossett Road crossing is a clear span bridge consisting of a concrete deck with wood abutments. The wood pier abutments are wrapped in metal. The bridge has an open width of approximately 17 feet.

**Recommendations:** The field investigation identified several deficiencies along the Drain that require improvement. The private culvert to the residential home appears to be undersized based on the size of the upstream and downstream crossings. It is possible that the flow restriction from this culvert is a factor in the flooding of Mr. Traxler’s property. We recommend surveying the Drain and conducting a hydraulic analysis to properly size a new culvert and reduce the potential for flooding along Mr. Traxler’s property. We also recommend addressing areas of channel instability, bank erosion and the removal of obstructions.

Sincerely,

**Land & Resource Engineering**

[Signature]

Kyle Visker, P.E.
Black Creek Drain
Inspection Report

Date: September 27, 2016
By: Chad Mencarelli – Land & Resource Engineering (LRE)
Re: Black Creek Consolidated Drain (Porter Drain) – Drainage Issues

Background: Land and Resource Engineering (LRE) was authorized by the Muskegon County Drain Commissioner to investigate drainage concerns expressed at the Black Creek Consolidated Drain Day of Review on August 8, 2015. Residents at the day of review believe the Porter Drain requires a cleanout, LRE made a site visit to assess the condition and the conveyance capacity of the Drain.

Site Visit: The Porter Drain was consolidated into the Black Creek Consolidated Drain in April of 2011, since that time an outlet stabilization project was completed near the convergence of with the Black Creek Consolidated Drain. Upstream of Bossett Road the Drain appears to be flowing freely, forming a two stage channel to the culvert under Bossett Road. The culvert under Bossett appears to be in good condition. Downstream of Bossett Road the channel converts to a more traditional trapezoidal shaped channel and standing water was observed in this area indicating an obstruction downstream. The channel both upstream and downstream of Bossett Road was thickly vegetated with some instances of small trees growing in the channel bottom.

The Drain at Moorland Road was flowing freely and the channel is thickly vegetated with tall grasses and small trees growing on the bank. The outlet of the Drain was in relatively good condition, however, fracturing of the riprap was observed at the outlet of the concrete bridge structure. In addition, a scour hole is beginning to form at the bottom of the riprap spillway that was installed at the outlet of the concrete bridge/channel structure. The scour does not appear to be undermining any of the Drain banks. Exposed erosion control blanket (geotextile) was observed along the north bank near the concrete bridge/channel structure. The constructed floodplain area at the convergence of the Black Creek Consolidated Drain appears well vegetated and stable.

Porter Drain
Bossett Road, Looking East

Riprap Spillway
Outlet to Concrete Bridge Structure, Looking East

Land & Resource Engineering
3800 West River Drive Suite A, Comstock Park, MI 49321
Phone: 616.301.7888
Summary of Findings:

1. With the exception of an area downstream of Bossett Road, the Drain appears to be flowing freely.
2. The Drain is thickly vegetated with tall grasses and small trees growing on the banks.
3. The riprap spillway at the outlet of the concrete bridge structure (west of Moorland Road) is beginning to fail due to fracturing of riprap and may require maintenance.
4. A scour has developed at the outlet to the riprap spillway; the scour does not appear to be affecting the stability of the channel banks.

Sincerely,

Land & Resource Engineering

Chad Mencarelli, E.I.T.
Black Creek Drain Inspection Report

Date: September 27, 2016
By: Chad Mencarelli – Land & Resource Engineering (LRE)
Re: Black Creek Consolidated Drain (JTB&S Drain) – Irwin Drive East of Ravenna Road (Ms. Gilbert)

Background: Land and Resource Engineering (LRE) was authorized by the Muskegon County Drain Commissioner to investigate drainage concerns expressed at the Black Creek Consolidated Drain Day of Review on August 8, 2015. One such issue involves a road side ditch that outlets into the formally name JTB&S – Slater Drain, which was consolidated into the Black Creek Consolidated Drain in April 2011. The MDC heard testimony from Ms. Gilbert, 11960 Irwin Drive, stating that the “Road Commission dug ditches to south, east, and north 4 or 5 years ago – but last county drain project was completed in 1970’s and the Drain needs maintenance to improve outlet and provide drainage relief.”

Site Visit: Irwin Drive is a private drive located east of Ravenna Road and north of White Road; it is a gravel road and is contained within a 20-foot ingress-egress easement. Drainage from the road is provided by a ditch on the north side of the road which runs east and west from Ravenna Road to the convergence with the Black Creek Consolidated Drain (Formally JTB&S – Slater Drain). LRE conducted a site visit to inspect the condition and conveyance properties of the Roadside Ditch (Ditch).

The Ditch banks are relatively stable with thick vegetation consisting of small trees growing in the Ditch in areas towards the downstream convergence with the Black Creek Consolidated Drain. Evidence exists of a recent cleanout (approximately 600 feet) with the ditch having the appearance of being over dug. Standing water greater than 1 foot deep was observed in this area. With the exception of an elliptical concrete pipe near the convergence with the Black Creek Consolidated Drain, all the culverts are in poor condition with several being perched. Many of the culverts also appeared to be undersized.
The Black Creek Consolidated Drain at the outlet of the Ditch appears to be in good condition with adequate grade and flow. The culvert under Irwin Drive appears to be in fair condition with no obstructions. No obstructions were observed 100 feet downstream of the convergence.

It was noted that the Road Commission installed an RCP culvert under Ravenna Road just south of Irwin Drive to convey storm water from the west roadside Ditch to the east, eventually outleting into the former Bell Drain. In so doing, the CMP culvert under Irwin Drive was crushed at the south invert and cannot convey storm water from the Ravenna Road Ditch to the RCP Culvert. Much of this storm water then overflows into the Irwin Drive Ditch.

Recommendations: LRE recommends a clean-out of the Ditch and replacement (upsizing) of the driveway culverts along the Ditch to provide relief to the residents along Irwin Drive. A more in depth investigation including topographic survey should be performed to determine the viability of another ditch cleanout and any culvert replacement. In addition, more research should be done to determine the governing body responsible for Irwin Drive (and the Ditch). LRE found no evidence that Irwin Drive falls under the Jurisdiction of the Muskegon County Road Commission.

Sincerely,

Land & Resource Engineering

Chad Mencarelli, E.I.T.
**Black Creek Drain Inspection Report**

**Date:** October 27, 2016  
**By:** Dan Fredricks, P.E. – Land & Resource Engineering (LRE)  
**Re:** JTB&S – Drainage Issues

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**Background:** Land and Resource Engineering (LRE) was authorized by the Muskegon County Drain Commissioner (MCDC) to investigate channel stability concerns at the Moorland Road crossing along the former JTB&S Drain (Drain). The JTB&S Drain was consolidated into the Black Creek Consolidated Drain in April of 2011.

The Waste Water Treatment Authority reconfigured several county drains that traverse the waste water treatment property in the 1970’s during the course of construction of the waste water treatment plant. Unfortunately, the authority did not recognize or follow the requirements prescribed by the Michigan Drain Code (Act 40 of 1956, as amended). In addition, the authority did not coordinate the county drain reconfigurations with the MCDC. The county drain modifications resulted in several negative impacts throughout the district, most notably, the ensuring head-cut compromised the integrity of the JTB&S Drain crossing at Moorland Road.

The Muskegon County Road Commission identified the issue at Moorland Road in the summer of 2012, at which time the channel bottom had down-cut several feet, undermining the bridge footings and compromising portions of the road. The Road Commission recognized the severity of the issue and immediately implemented temporary shoring measures and the installation of a vinyl sheet pile weir to serve as a temporary grade control structure.

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*JTBS Drain at Moorland Rd.*  
Looking East (Upstream) – Stable
Site Visit: LRE made a site visit to assess the condition of the Moorland Road crossing on October 27, 2016. The vinyl sheet piling was only partially visible and appears to be bent / damaged. Riprap has been placed along the bridge abutments to protect the footing. No obvious signs of excessive scour or channel head-cutting were observed.

Recommendations: LRE recommends conducting a topographic survey of the JTB&S Drain to evaluate the stability of the channel and design appropriate in-stream stabilization measures to protect the Moorland Road crossing.

Sincerely,

Land & Resource Engineering

[Signature]
Daniel J. Fredricks, P.E.
Project Manager
**Black Creek Drain Inspection Report**

Date: October 10, 2016  
By: Dan Fredricks, P.E. – Land & Resource Engineering (LRE)  
Re: Black Creek Consolidated Drain (Kinne Drain) – Drainage Issues

**Background:** Land and Resource Engineering (LRE) was authorized by the Muskegon County Drain Commissioner to investigate drainage concerns expressed at the Black Creek Consolidated Drain Day of Review on August 8, 2015. Residents at the day of review believe the former Kinne Drain (Drain) requires maintenance or improvement. LRE made a site visit to assess the condition of the Drain on October 10, 2016. The results of our inspection are summarized in this report.

**Site Visit:** The Kinne Drain was consolidated into the Black Creek Consolidated Drain in April of 2011. The former Kinne Drain is a tributary to the former Muskegon/Newaygo Drain. The convergence is located near the west quarter corner of Section 22 in Moorland Township, just east of Bossett Road. The former Muskegon/Newaygo Drain appears to provide an adequate outlet for the Drain. There is some erosion near the convergence due to the failure of a rock grade control structure that was installed downstream (west) of the Bossett Road crossing along the former Muskegon Newaygo Drain.

Wooded portions of the Drain, west of Ravenna Road have a low-flow meandering channel within the larger excavated channel. The banks appear fairly stable and are densely vegetated with trees. There are a few fallen trees and log jams within this reach.
The Drain takes the form of a more traditional, trapezoidal shaped ditch upstream (east) of Ravenna Road. The channel is choked with vegetation and sediment.

Upstream branches near Hall Road are overgrown and virtually non-functional.

**Recommendations:** Upstream portions of the Drain are clearly in need of maintenance and/or improvement. A topographic survey of the entire Drain should be conducted to identify specific reaches that require maintenance or improvement.

Sincerely,

**Land & Resource Engineering**

[Signature]

Daniel J. Fredricks, P.E.
Project Manager
Background: Land and Resource Engineering (LRE) was authorized by the Muskegon County Drain Commissioner to investigate drainage concerns expressed at the Black Creek Consolidated Drain Day of Review on August 8, 2015. Testimony was heard expressing concerns over drainage issues at the intersection of Hall and Bossett Road. Hall and Bossett Roads are both county roads under the jurisdiction of the Muskegon County Road Commission (MCRC). LRE made a site visit to address the complaint.

Site Visit: The intersection of Hall and Bossett Roads is paved with rolled concrete curb on the each corner. The concrete curb directs water away from the intersection towards roadside ditches/swales that convey storm water away from the intersection in each direction. With the exception of the northwest quadrant, the swales appear functional, the deeper swales being on the northeast and southeast quadrants.

The swale in the northwest quadrant is blocked by several private driveways that do not have culverts. As a result, storm water must overtop the private crossings; thereby, impeding drainage from the intersection.

No culverts were located at the intersection during the site visit and a review of culvert location information provided by the Muskegon County Geographical System (GIS) confirms that no culverts have been installed at the intersection.
Evidence of ponding water was observed on each corner of the intersection, with the most severe being on the northeast and northwest corners of the intersection. Large amounts of debris and sediment were also observed in each corner the intersection. This may indicate that the road lacks sufficient grade to convey storm water to the roadside swales.

Summary of Findings:
1. The intersection lacks proper conveyance to the swales in the northeast and southeast quadrants. The swale in the northwest quadrant is blocked by several private driveways that do not have culverts.
2. Large amounts of sediment in the road may indicate that the road lacks proper grade to convey storm water to the roadside swales.

Sincerely,

Land & Resource Engineering

Chad Mencarelli, E.I.T
BCCD (McSorely Drain)
Pre- and Post-Construction Photos

McSorely Drain, Pre-Construction
Sta. 3+00
Looking North

McSorely Drain, Post-Construction
Sta. 3+00
Looking North

McSorely Drain, Pre-Construction
Sta. 4+00
Looking South

McSorely Drain, Post-Construction
Sta. 4+00
Looking South
BCCD (McSorely Drain)
Pre- and Post-Construction Photos

McSorely Drain, Pre-Construction
Sta. 16+00
Looking East

McSorely Drain, Post-Construction
Sta. 16+00
Looking East

McSorely Drain, Pre-Construction
Sta. 45+00
Looking West

McSorely Drain, Post-Construction
Sta. 45+00
Looking West
BCCD (McSorely Drain)
Pre- and Post-Construction Photos

Branch, Pre-Construction
Confluence with Main Drain
Looking West

Branch, Post Construction
Confluence with Main Drain
Looking West
BCCD (Dirkes Drain)
Pre- and Post-Construction Photos

Dirkes Drain, Pre-Construction
Sta. 13+00
Looking West

Dirkes Drain, Post-Construction
Sta. 13+00
Looking West

Dirkes Drain, Pre-Construction
Sta. 16+50
Looking East

Dirkes Drain, Post-Construction
Sta. 16+50
Looking East
BCCD (Dirkes Drain)
Pre- and Post-Construction Photos

Dirkes Drain, Pre-Construction
Sta. 81+25
Looking West

Dirkes Drain, Post-Construction
Sta. 81+25
Looking West

Branch No. 2, Pre-Construction
Looking South

Branch No. 2, Post-Construction
Looking South
Drain Report 5/26/2015

Kinne Branch of the Black Creek Consolidated Drain

The Kinne Drain is located in Moorland Township, sections 22, 23, and 24. The drain begins at Hall Road, west of Gobel Road. It runs in a southwesterly direction until it empties into the main trunk line of the Black Creek Consolidated Drain.

From Hall Road to the west property line of Michael and Mary Pierson (approximately 4,800 feet) the drain flows through a densely forested landscape. This area is troubled with vegetation and woody debris obstructing the drainage channel. The water has a stagnant flow and consequently is of poor quality. There are also two private culverts that appear to be undersized and set at an improper grade line, further obstructing drain flow. Also affecting this area are several ATV crossings that have eroded banks and caused sediment dams in the drainage channel. Despite these issues, this area has several well connected floodplain/wetland complexes that help to dissipate high flows during storm events.

As the drain leaves the forested area and enters the Pierson’s property, it is met by a large wetland complex (approximately 5 acres) and continues to flow to the Ravenna Road crossing. This section of the Kinne drain is dominated by recently abandoned ag/pasture land, mostly just a grassy prairie landscape. It is difficult to locate the drain channel in the wetland complex until it appears again about 600 feet downstream from the woodlands. The drain channel and banks from that point are in good condition and well vegetated. The drain channel is occupied by thick grasses that may be inhibiting flow. This stretch of drain had been recently brushed and treated with herbicide in 2011 and is free of debris and woody vegetation. Culverts in this section are in good condition and are not disrupting flow.

The Kinne drain then crosses under Ravenna Rd and enters back into an area dominated by woodlands. The Ravenna Road bridge appears to be in good condition with no obstructions visible. This section of the Kinne drain is in good condition, with a well-defined sinuous stream and stable, two-stage ditch design. There are also two connected floodplain wetlands in this section drain further adding to the stability of the system. There are some areas with deadfall and debris, but not a significant amount. There are no private culverts in this section.

The last 2,000 feet of the Kinne drain is defined by an extremely deep ditch bottom and steep banks. Although it loses its two-stage design the drain appears to be in good condition with stable, well vegetated banks. As it flows out from the woodland, it enters an Ag field for its last 850 feet. Here it again forms a two-stage system that is well vegetated with stable banks. There is some vegetation and debris that needs to be removed in this section.
5/26/15

Kinne Branch of the Black Creek Con. Drain. Moorland Township, Sections 22, 23, and 24.

Culvert at Hall Road is in fair condition.

#1683

Looking south from hall road.

Vegetation and deadfall/debris obstructing drain channel.

#1684

Picture showing drain channel obstruction.
Further down stream, several trees growing in drain channel.
Area is completely wooded.
Flow is poor. Drain banks and channel are in poor condition.

Private culvert installed without permit. Not set at proper grade and has obstructed flow and caused local flooding.
#1690
Flooding caused by private culvert!

#1692
Another picture further downstream showing medium/large trees in drain channel. Drain banks and channel are in poor condition.

Water flow is stagnant and poor quality.
Picture is showing ATV crossing causing damage to drain channel and banks. There are several in this area!

The next several pics are showing the same conditions as previous photos. Drain is now facing west.

Vegetation and deadfall/debris in drain channel, poor flow, and poor water quality.
This pic is showing a flooded wooded wetland at the location of the drain turning south again.

Downstream from wooded wetland area looking south.
Deadfall/debris need to be removed. Flow is stagnant and water quality is poor.
#1705
Drain turning west again. Flow has increased slightly in this section. Drain banks and channel in fair condition.

#1706
Dual 8" culverts undersized and need to be replaced.
#1707
Outlet showing scour from under sizing of culvert.

#1708
More deadfall/debris!
This picture is at the end of the wooded area of this drain section. Drain banks are shallow and well connected to the floodplain.

Beginning of Branch #1 which is north of the main drain channel.
#1713

Drain picture looking south.

Drain banks and channel are is fair condition. Some deadfall/debris in channel.

Water flow is stagnant and quality is poor.

#1714

Further downstream, drain crossing powerline. Well vegetated and in good condition.

Some vegetation in channel.
Picture showing drain leaving powerline area and entering back into wooded area.

Again, deadfall/debris need to be removed. Water flow and quality is poor.
End of Branch #1, entering into the main drainage branch.
#1721

This is the beginning of Branch #2 of the Kinnie Drain, abundant vegetation growing in drain channel.

Branch #2 is south of the main branch.

#1722

Private culvert in poor condition.
Outlet of private culvert. This is at the headwaters of Branch #2, so although it is in poor condition, it does not seem to be affecting the system's function.

Picture showing an abundance of vegetation and debris in drainage channel.
Further downstream showing poor water flow and quality.
Large trees obstructing flow!
Further downstream showing same conditions!
Deadfall and Debris!

#1734

#1735
End of Branch #2 entering back into the main branch.
The next several pictures are showing the area of the drain as it has left the wooded area and entered a wetland complex.

Drain channel is undefined but reemerges further downstream.
#1740

This picture is looking back east toward the wooded area the drain flows in from.

#1741
Drain is leaving wetland complex and has defined channel and banks again.

Drain channel is in fair condition with thick growth of grasses. Flow is fair and water quality is fair.
#1744
Showing thick grasses growing directly in drain channel.

#1745
This pic is a flooded area at a point when the drain turns to the north.

#1747
Drain facing north. Thick grasses growing in drain channel.
Private culvert in good condition.
Picture as drain turns south again. Drain banks and channel are in good condition, well vegetated.
Further downstream, approaching Ravenna Road, thick grasses in drain channel.

Flow is fair and water quality is fair.
Ravenna Road bridge is in good condition.
Drain along Ravenna Road.
Banks and channel in good stable condition.
Drain turning south again from Ravenna Road.

Banks and channel are in good condition. Very healthy established vegetation and two-stage channel.
Further downstream, drain channel and banks continue to be in good condition with a minimal amount of debris in channel.

Some debris!
#1766

#1767

Continues to have a good flow and good water quality.
Nicely connected drain channel to wetland complex!
Some more debris!
#1777

Drain leaving wooded area and entering into pasture/ag land.

Very deep drainage channel, well vegetated and in good condition.
Some vegetation and debris in this section.
End of Kinne branch entering main Black Creek system.
APPENDIX C –

Photo Log of Drain Conditions District Wide
Photo #1
Looking NE at Daley Branch from Bailey Road.
Stagnant water. Aquatic vegetation, shrubs and small trees in channel center. 1' of sediment in channel.

Photo #2
Looking SW, Daley Branch from Bailey Road.
Stagnant water. Vegetation, Shrubs and small trees in Channel center. 1' of sediment in channel.

Photo #3
Looking NW, JTB&S Slater Branch from Bailey Road.
Flowing water. Sandy solid bottom. Local man said, "the drain seems to be working, but it could stand to be cleaned out."

Photo #4
Looking SE, JTB&S Branch from Bailey Road.
Flowing water. Sandy solid bottom.
Black Creek Consolidated Drain
Condition Inventory Photos

Photo #5
Looking NW at small concrete bridge S. of Bailey Road.
Structure shows no signs of deterioration.

Photo #6
Looking S. from White Road.
Stagnant water. Woody Debris, trees growing in bank but not centerline of channel. Well defined channel.

Photo #7
Looking NE at small concrete bridge S of White Road.
Structure shows no signs of deterioration.

Photo #8
Looking NE from Dead End of N. Slocum Road.
Stagnant water. 10' Channel bottom. Trees in banks, none observed in centerline. Some woody debris in channel.
Black Creek Consolidated Drain
Condition Inventory Photos

Photo #9
Looking S along the E. side of Slocum Road.
Banks and centerline vegetated, no erosion or
trees in centerline. Water moving.

Photo #10
Looking E. along Bailey Road at twin 4' dia.
Concrete Culverts.
Culverts show no signs of deterioration.

Photo #11
Looking N. from Bailey Road.
Heavy vegetation and trees in banks and
centerline.

Photo #12
Looking W. from the E. side of N. Slocum
Road at wooden culvert.
Structurally poor condition, water flows
through it, but wood is rotten and very old.
Bottom has 2" silty sediment.
Looking E. from the W. side of N. Slocum Road at wood culvert. Structurally poor condition, water flows through it, but the wood is rotten and very old. Bottom has 2" silty sediment.

Looking W. from above wooden culvert under N. Slocum Road. Channel banks and centerline have heavy vegetation, small shrubs, but no trees in centerline.

Looking N. at the bridge under White Road. Some rot in wood, but overall appears stable.

Looking N. upstream from E. White Road. Erosion on W. bank (40' long, 20' wide). Large (4'to 6' diameter) tree in bank. Very steep, vegetated banks and centerline. Water is flowing.
**Black Creek Consolidated Drain**

**Condition Inventory Photos**

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**Photo #17**
Looking N., 100' N. of White Road. Vegetated channel and banks, No trees observed in the centerline of the channel. No erosion observed.

**Photo #18**
Looking S., Downstream, Muskegon Branch 4 and Convergence with Muskegon/Newaygo Branch Muskegon/Newaygo: Vegetated bottom and banks, no trees in channel. Muskegon Branch 4: Opens up to a 20' wide channel bottom, upstream of convergence channel is about 3' wide with vegetation on banks and in channel.

**Photo #19**
Looking E. upstream at the Muskegon/Newaygo Branch. Tall, steep vegetated banks, 15'-20' high side slopes with a vegetated centerline.

**Photo #20**
Looking W. at W. Bank of Muskegon Branch 4 at the convergence with the Muskegon/Newaygo Branch. Some slight erosion at the top of bank. Water is stagnant.
Looking E. at Muskegon Branch 2 from Goebel Road. 5' channel with agricultural fields on either side with 5' vegetated buffer. No vegetation in channel bottom, sandy bottom.

Looking W. at Muskegon Branch 2 from Goebel Road. 5' channel with agricultural fields on either side with 5' vegetated buffer. No vegetation in channel bottom, sandy bottom.

Looking S.E. at a 4' diameter arch pipe under Goebel Rd., Muskegon Branch 2. Sandy channel bottom, water is flowing.

Looking W. downstream at Muskegon Branch 1. Large section of cut tree in channel. Vegetated centerline and banks, 5' buffer with agriculture on either side.
Black Creek Consolidated Drain Condition Inventory Photos

Photo #25
Looking S.E. upstream at Muskegon Branch 1. Vegetated centerline and banks, 5' buffer with agriculture on either side.

Photo #26
Looking W upstream into Muskegon Branch 1 culvert under Goebel Road.
Water is stagnant on W. side, moving fast on E. side, looking into pipe it appears the slope increases substantially halfway under the road. No cracking observed in pavement of the road.

Photo #27
Looking N. upstream at the Muskegon Branch 4. So much vegetation in the channel and banks that the channel is barely identifiable. Stagnant water. 30' buffer each side of the channel.

Photo #28
Looking N.W. at bridge and Muskegon Branch 4. Channel character same as upstream. Water stagnant. Bridge is 15'x6' concrete. Rock Bottom. Road slopes up to provide cover over channel. Structure shows no signs of deterioration.
Photo #29
Looking N. at Bell Branch along the W. side of Ravenna Road just N. of White Road.
Trees in banks, heavy vegetation in channel

Photo #30
Looking S. at Bell Branch along E. side of Ravenna Road just S. of White Road.
Roadside ditch, heavily vegetated. 18" conc. culvert too covered over to photograph.

Photo #31
Looking N.E. at Bell Branch.
Heavy vegetation in channel centerline and on banks. Fully grown trees in banks and in centerline.

Photo #32
Looking NE at Bell Branch.
Heavy vegetation in channel centerline and on banks.
Fully grown trees in banks and in centerline.
Black Creek Consolidated Drain Condition Inventory Photos

Photo #33
Looking N., upstream, at Little Branch from White Road.
Channel meanders. Heavy vegetation, small shrubs and
trees in channel centerline and on banks.

Photo #34
Looking S., downstream, at Little Branch from
White Road.
Well defined channel 8'-10' wide. Sandy
bottom. Many trees in bank, some old growth.

Photo #35
Looking N. upstream at Little Branch bridge
under White Road.
No deterioration observed (12' wide 5' tall)

Photo #36
Looking E. upstream at Little Branch.
Stagnant water, muck filled. 20' wide channel.
Photo #37
Looking S.W. downstream at Little Branch.
Stagnant water, muck filled. Heavy vegetation and small shrubs in the centerline and on banks.

Photo #38
Looking W. downstream at the JTB&S Branch (Muskegon/Newayg Branch 3) 100' W. of Little Branch.
Vegetated, meandering channel with small shrubs on banks and in channel centerline. Note: looked for connection of JTB&S Branch and Little Branch and none was discovered, the channels are independent of one another.

Photo #39
Looking E. upstream at the Little Branch on W. side of Ravenna Road.
Could not find culvert, heavy vegetation in channel centerline and on banks.

Photo #40
Looking W. downstream at the Little Branch from Ravenna Road.
Showing 5 farm crossings. No trees observed in channel centerline W. of Ravenna Road. Vegetated bank and channel
Black Creek Consolidated Drain
Condition Inventory Photos

Photo #41
Looking E. upstream at the Little Branch from Ravenna Road.
Large old growth trees in channel centerline, shrubs and vegetation in centerline and on banks. Channel is hard to identify.

Photo #42
Looking S.W. downstream at Daley Branch from Bossett Road
Heavy vegetation in channel. No trees observed in channel centerline. Under Bossett is a 6'x4' wooden culvert with heavy erosion from road.

Photo #43
Looking S.E. at wooden culvert in Daley Branch.
Heavy erosion along N. side of culvert.

Photo #44
Looking N.E. upstream at Daley Branch from N. Bossett Rd.
Trees and shrubs in channel centerline and on banks. Channel width 4', with heavy vegetation.
Black Creek Consolidated Drain
Condition Inventory Photos

Photo #45
Looking N. at Daley Branch from White Road.
Heavy shrubs and vegetation in channel and on banks.
Culvert is a 36" CMP with no deterioration observed.

Photo #46
Looking S. at Daley Branch from White Road.
Shrubs and vegetation and smaller trees in channel.

Photo #47
Looking NE upstream at the JTB&S Branch from
Moorland Road. Well defined 15' meandering
channel. Homeowner on channel said that he catches
'decent sized' fish out of the channel.

Photo #48
Looking S.W. downstream at the JTB&S Branch from
Moorland Road.
Bank full on S bank. Little vegetation in channel.
Vinyl weir in poor condition.
Photo #49
Looking N.E. upstream at the JTB&S Branch at culvert under Moorland Road.
No deterioration observed in culvert.

Photo #50
Looking N. from Hall Road upstream at Little Branch.
Channel is a small swale with trees and shrubs in

Photo #51
Looking S. from Hall Road Downstream at Little Branch.
4'-6' wide channel with trees and shrubs in channel.

Photo #52
Looking E. upstream from Bossett Road at the JTB&S Branch.
30' channel bottom, meanders due to vegetation and trees in centerline.
**Photo #53**  
Looking W. downstream from Bossett Road at the JTB&S Branch.  
20' channel bottom, water moving.  
Trees in the S. bank.

**Photo #54**  
Looking E. upstream at Bossett Road bridge over the JTB&S Branch.  
Concrete deck, wooden sides, no rotting observed.

**Photo #55**  
Looking S.E. upstream at Little Branch twin 24" CMP culverts under Hall Road.  
Water is stagnant.

**Photo #56**  
Looking N. from Hall Road at Little Branch.  
Stagnant water, trees and vegetation on banks, not in channel centerline.
Photo #57
Looking E. at private crossing in Little Branch just N. of Hall Road.
Rusted out old tank with hole cut in it.

Photo #58
Looking S. downstream from Hall Road at Little Branch.
Vegetation and debris in channel. Trees in the W. bank.

Photo #59
Looking N.E. upstream from Hall Road at the Muskegon/Newaygo Branch.
Well defined channel. Vegetation and shrubs in channel centerline and on W. bank.

Photo #60
Looking S.W. from Hall Road at Muskegon/Newaygo Branch.
Large 7' Diameter tree in the channel.
Black Creek Consolidated Drain
Condition Inventory Photos

Photo #61
Looking N.W. at a wooden bridge under Hall Road at Muskegon/Newaygo Branch. No rot observed.

Photo #62
Looking S.W. upstream at a concrete bridge under Ravenna Road on the Muskegon/Newaygo Branch. Bridge and abutments show no signs of deterioration.

Photo #63
Looking N.E. upstream from Ravenna Road on the Muskegon/Newaygo Branch. Vegetated and meandering channel. Thick shrubs on the S. side of the channel.

Photo #64
Looking S.W. downstream from Ravenna Road at the Muskegon/Newaygo Branch. Grassy vegetated meandering channel with a sandy bottom.
Black Creek Consolidated Drain Condition Inventory Photos

Photo #65
Looking N. upstream at Shavalier Branch N. of Corral Drive.
Undefined channel, dry. 18" conc. pipe with no signs of deterioration.

Photo #66
Looking E. at Shavalier Branch S. of Corral Drive.
Overgrown swale with small trees, shrubs, and vegetation, dry.

Photo #67
Looking W. downstream from Maple Island Road at the Muskegon/Newaygo Branch.
Sparse woody debris. 30' Channel width, no vegetation in channel, sandy bottom. Slight erosion on banks.

Photo #68
Looking E. from Maple Island Road at the Muskegon/Newaygo Branch.
Meandering Channel, swampy wetlands on either side of the channel. 30' wide channel with sandy bottom.
Photo #69
Looking E. from the W. side of Maple Island Drive at concrete bridge.
Bridge shows no signs of deterioration.

Photo #70
Looking W. downstream from Barnes Road at the Smith & Mulder Branch.
5' meandering channel, sandy bottom.
Vegetation, shrubs, and small trees in banks.

Photo #71
Looking E. upstream from Barnes Road at the Smith & Mulder Branch.
5' meandering channel with a sandy bottom.
Vegetated banks with small trees and shrubs.

Photo #72
Looking W. towards Barnes Road at twin 4' dia. culverts for the Smith & Mulder Branch.
Minor rusting observed.
Photo #73
Looking W. downstream from Barnes Road at Muskegon/Newaygo Branch.
30'-40' channel, sandy bottom, some small trees in channel, some woody debris. Slight erosion on banks.

Photo #74
Looking E upstream from Barnes Road at Muskegon/Newaygo Branch.
30' channel, sandy bottom, trees and woody debris in channel. Low lying wetland areas either side of channel.

Photo #75
Looking W. downstream at wooden bridge under Barnes Road on the Muskegon/Newaygo Branch.
Appears old, but shows little signs of rot.
4 wooden dividers in good shape, some small woody debris caught in them.

Photo #76
Looking N. downstream from Cranberry lane on the Smith & Mulder Branch. 6’ wide channel with sandy/gravelly bottom. Some erosion on banks (outside curves). Woody debris in channel, heavy canopy of dense woods.
Photo #77
Looking S. upstream from Cranberry Lane at Smith and Mulder Branch.
20' wide channel with extensive woody debris and trees growing in channel. Mucky, leafy bottom due to dense canopy.

Photo #78
Looking N. from the S. side of Cranberry Lane at twin 5' diameter concrete culverts.
No deterioration observed, looks like relatively new construction.

Photo #79
Looking W. downstream from Sullivan Road at the Muskegon/Newaygo Branch.
30' channel, with sandy bottom, woody debris in channel. Large trees in banks falling into channel due to erosion in banks.

Photo #80
Looking E upstream from Sullivan Road at the Muskegon/Newaygo Branch.
30' channel, with sandy bottom, woody debris in channel. Large trees in banks falling into channel due to erosion in banks.
Photo #81
Looking W. from the E. side of Sullivan Road at concrete bridge over the Muskegon/Newaygo Branch. No signs of deterioration, bridge looks like more recent construction.

Photo #82
Looking W. downstream from Sullivan Road at the Smith & Mulder Branch. 8' channel, silty/sandy bottom, brush/vegetation/woody debris in channel.

Photo #83
Looking E. upstream from Sullivan Road at the Smith & Mulder Branch. 20' wide channel, silty/mucky/leaf covered bottom. Woody debris and trees growing in the channel. Appears to be a cattle grazing area.

Photo #84
Looking W. from the E. side of Sullivan at a 25' x8' conc. bridge over the Smith & Mulder Branch. No deterioration observed.
**Photo #85**

Looking W. downstream at the Smith & Mulder Branch Approximately 100' W of Sullivan Road.
Channel very overgrown, woody debris, meandering channel, vegetation in channel and on banks.
Trees growing in channel.

**Photo #86**

Looking E. upstream from Ensley Road at the Smith & Mulder Branch.
Stagnant water, shrubs/vegetation/trees growing in channel. Fence crosses channel with heavy vegetation growing in it.

**Photo #87**

Looking E. from the W. side of Ensley Road at an 18" CMP culvert for the Smith & Mulder Branch.
No deterioration observed. Water flowing.

**Photo #88**

Looking W. downstream from Moorland Road at the Smith & Mulder Branch.
5' wide channel, muck filled. Woody debris, trees in channel and on banks, slight erosion on banks.
Black Creek Consolidated Drain
Condition Inventory Photos

Photo #89
Looking E. upstream from Moorland Road at the Smith & Mulder Branch.
5' wide channel, vegetated completely over. Shrubs and small trees on the S. bank.

Photo #90
Looking E. from the W. side of Moorland at twin 5' diameter CMP culverts from the Smith & Mulder Branch.
Pipes rusting out, S. pipe is pinched at top. Stagnant water w/oil-like sheen. Land owner stopped and said "the drain is pretty slow, but their fields are dry, so they must be doing their job"

Photo #91
Looking E. upstream from Bossett Road at Porter Branch.
5' wide, vegetation all through channel causing meandering. Slight erosion, shrubs growing in banks.

Photo #92
Looking W. downstream from Bossett Road at Porter Branch.
5' wide muck filled channel, woody debris. Trees/vegetation/shrubs in banks and in channel.
**Photo #93**
Looking E. from the W. side of Bossett Road at a 4' dia. CMP arch pipe for the Porter Branch. No deterioration observed, water flowing slowly.

**Photo #94**
Looking S. from Maple Island Road at Wray Branch. Barely a swale, trees and vegetation in channel. Row of Pine trees along W. side of channel extending to the Porter Branch.
Muskegon – Newaygo Drain
Outlet at Fuller Rd.
Looking east from Fuller Rd., Grasses and cattails have severely restricted flow.
Picture a little further downstream, on John Schoenborn’s property.
Picture of crossing inlet on Schoenborn's property.
Outlet.
Beginning of section with brush and deadfall, on Schoenborn’s property.
A little further down stream.
Crossing inlet on Bryan Robinson's property.
Outlet.
Picture from Robinson's crossing.
Picture as drain flows south on Wayne Kline's property.
Picture as drain flows west again.
First Crossing on Richard Vandoorne’s property.
Inlet of second crossing on Vandoorne's property. At grade!
Outlet.
Picture on from Vandoorne's second crossing.
Inlet of Vandoorne's third crossing. At grade!
Outlet.
Picture as drain flows north on Vandoorne’s property.
Picture as drain flows west again on Arnold Heiss's property.