Phase I Preliminary Report

for the

Woolfitt Drain #0588

Jeffrey Wright

Genesee County Drain Commissioner

Genesee County, Michigan

Prepared By:
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601 N. Saginaw Street, Suite 2A
Flint, Michigan 48502

March 2006

EXECUTIVE SUMMARY

WOOLFITT DRAIN #0588

At the request of the Genesee County Drain Commissioner, Wade Trim has completed a Phase I Preliminary Report for the Woolfitt Drain #0588 in Mt. Morris Township. The basis of this request was a petition filed by residents regarding drainage concerns, including flooding within the downstream end of the district, and testimony given at a Board of Determination in Mt. Morris Township.

Through site investigation and hydrologic/hydraulic analysis, it has been determined that storm water cannot be adequately conveyed through the existing drainage district within the tile drain and enclosed storm sewer. Based on these findings, the entire length of the Woolfitt Drain will need to be improved. At the request of the Genesee County Drain Commissioner's office, phased options for the drain improvements have been developed. Please refer to Exhibits 1 and 2 for a plan view showing both of the following phases and/or options:

PHASE 1

This phase includes the necessary improvements to the downstream portion of the drain. The drain would begin as an open channel approximately 1,350 feet east of Clio Road and transition to an enclosed sewer approximately 550 feet east of Clio Road. The drain would continue as an enclosed sewer across Clio Road, turn north within the road right-of-way and follow the existing route where it would discharge to a natural watercourse. The downstream watercourse requires deepening and widening for approximately 930 feet.

PHASE 2

This phase includes the necessary improvements to the upstream portion of the drain. Two options have been prepared for Phase 2.

Option A:

This option uses a combination of enclosed sewers and open channels. The drain would begin as an enclosed sewer on the east side of Neff Road and discharge to an open channel approximately 400 feet west of Neff Road. The drain would continue west as an open channel, centered on common property lines, to the upstream limit of Phase 1.

Option B:

This option uses an enclosed system for the length of the drain. The drain would use the same route as Option A and would consist of 24 to 54-inch storm sewer. This option also includes enclosing the upstream open channel portion of Phase 1.

GIANT OAKS SUBDIVISION

At the Board of Determination, several residents from within the Giant Oaks Subdivision expressed their concerns regarding drainage problems within the subdivision. As a part of this study, the capacity of the existing Giant Oaks Subdivision storm sewer along Merrwood Drive has also been evaluated. Through site investigation and hydrologic/hydraulic analysis, it has been determined that the existing storm sewers do not have adequate capacity convey storm water out of the subdivision and into the Woolfitt Drain. At the request of the Genesee County Drain Commissioner, two alternatives have been prepared. Please refer to Exhibit 3 for a plan view of the following options:

Option A:

Upgrade the Giant Oaks storm sewer system along Merrwood Road from approximately 250-feet west of Clio Road to Clio Road from an existing 12-inch sewer to an 18-inch sewer. In addition, upgrade the Clio Road storm sewer from an existing 15 and 18-inch sewer to a 30-inch sewer from Giant Oaks to the proposed Woolfitt Drain.

Option B:

Upgrade the entire Giant Oaks storm sewer system along Merrwood Drive from an existing 12-inch sewer to a 15 and 18-inch sewer. In addition, upgrade the Clio Road storm sewer from an existing 15 and 18-inch sewer to a 30-inch sewer from Giant Oaks to the proposed Woolfitt Drain.

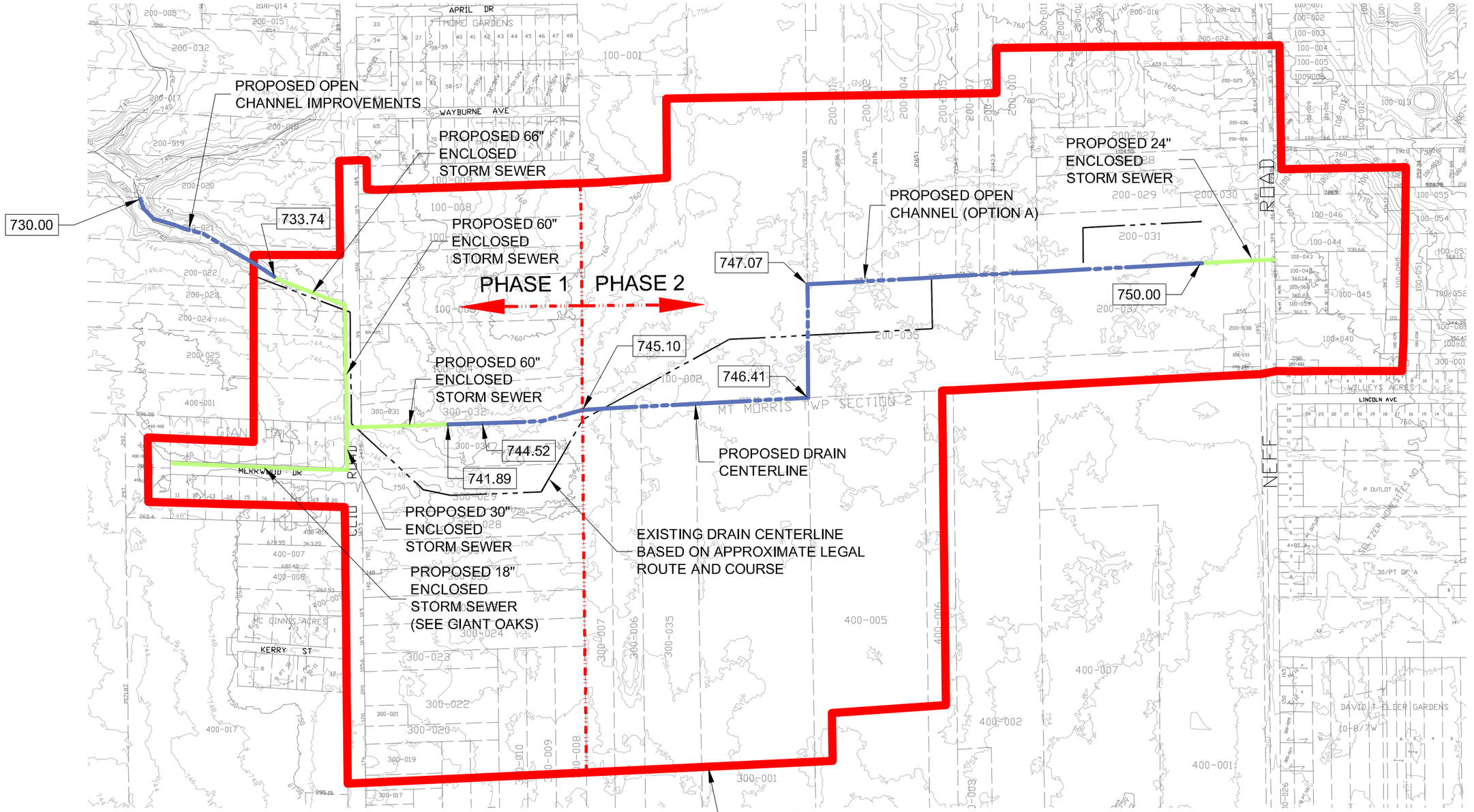
ESTIMATED PROJECT COSTS

Estimated project costs were determined for each phase and/or option. For estimating purposes, assumptions included estimated construction costs based in 2006 dollars and a 35% allowance for administration, survey, design engineering, inspection, construction administration and contingency. Costs for easement document preparation and acquisition have not been included in any of the project estimates. Total construction costs are summarized as follows (see Appendix E for a detailed breakdown of costs):

Woolfitt Drain		
Phase 1	$ 720,000	
	Option A	**Option B**
Phase 2	$ 370,000	$783,000
Giant Oaks Subdivision	$ 72,000	$ 154,000

CONCLUSIONS

Based on the drain analysis, the entire length of the Woolfitt Drain is in need of improvement. At a minimum, the downstream portion of the drain (Phase 1) must be upgraded to provide adequate conveyance of storm water. Also, upgrades to the Giant Oaks Subdivision (Option A) must be completed to alleviate the potential for future flooding in this area. Should the western portion of the Giant Oaks continue to have storm water problems, Option B for the subdivision could be implemented at a later date. Improvements using either of the options presented for the upstream portion of the district (Phase 2), may be completed concurrently with Phase 1, or in the future following further development within the district.



WOOLFITT DRAIN #0588

600' 300' 0' 300' 600' 1200'

SCALE IN FEET

WADETRIM

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FAX: 810.235.4975
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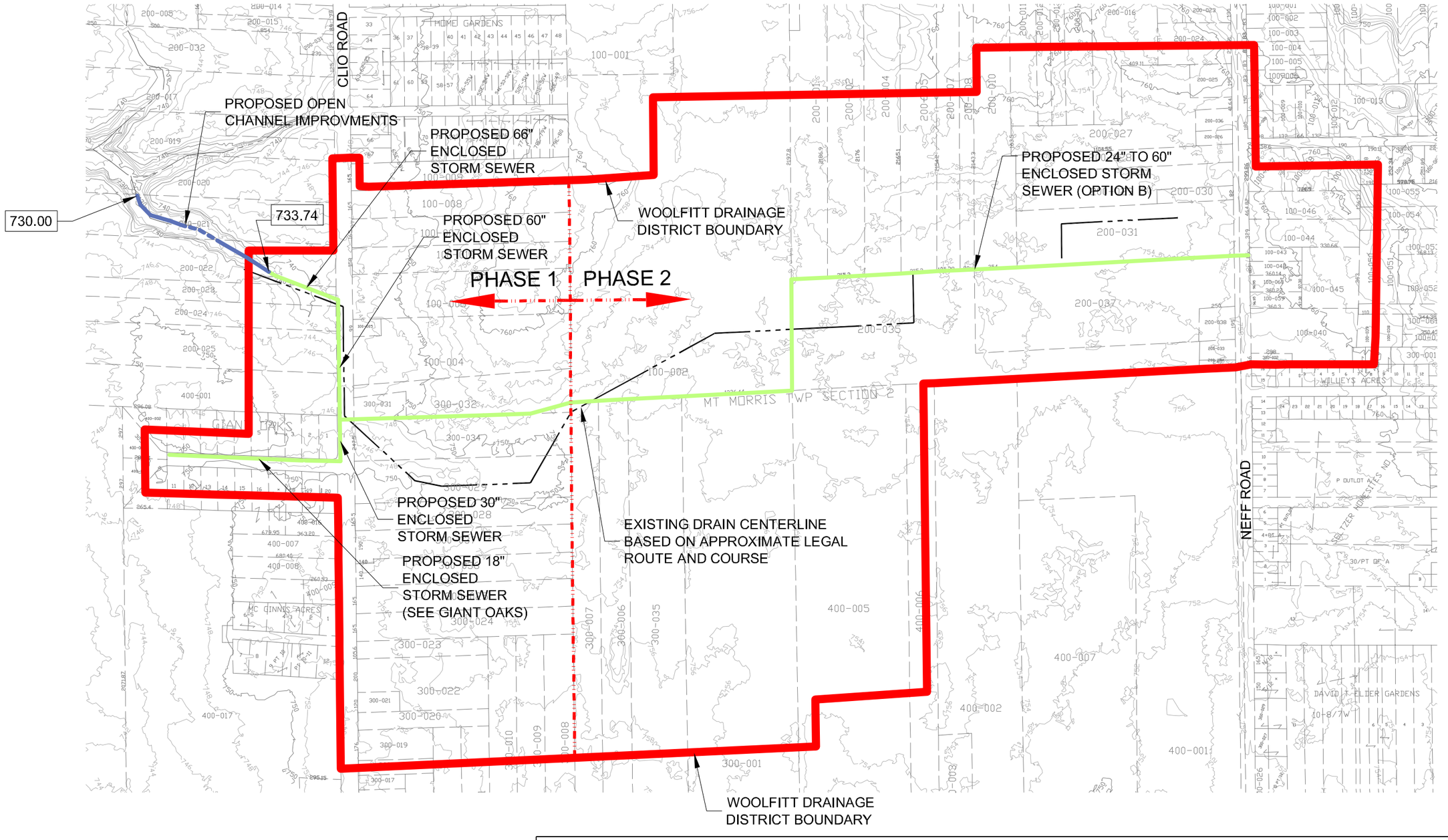
GENESEE COUNTY SWM DRAIN COMMISSIONER

PROPOSED DRAINAGE IMPROVEMENTS OPTION A OPEN CHANNEL

JOB NO. GDC 2037.01F

SHEET EXHIBIT 1

PROJECT MANAGER: JASON R. KENYON, P.E.
FIELD BOOK INFORMATION: 97-E, PG 34
P:\GDC2037\01F\CADD-DATA\DWG\CSP-PLTS.DWG - PLAN-A - FULL SCALE MONOCHROME.STB - PLOTTED 2/24/2006 8:24 AM BY LASALLE, SCOTT



WOOLFITT DRAIN #0588

600' 300' 0' 300' 600' 1200'

SCALE IN FEET

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GENESEE COUNTY SWM DRAIN COMMISSIONER

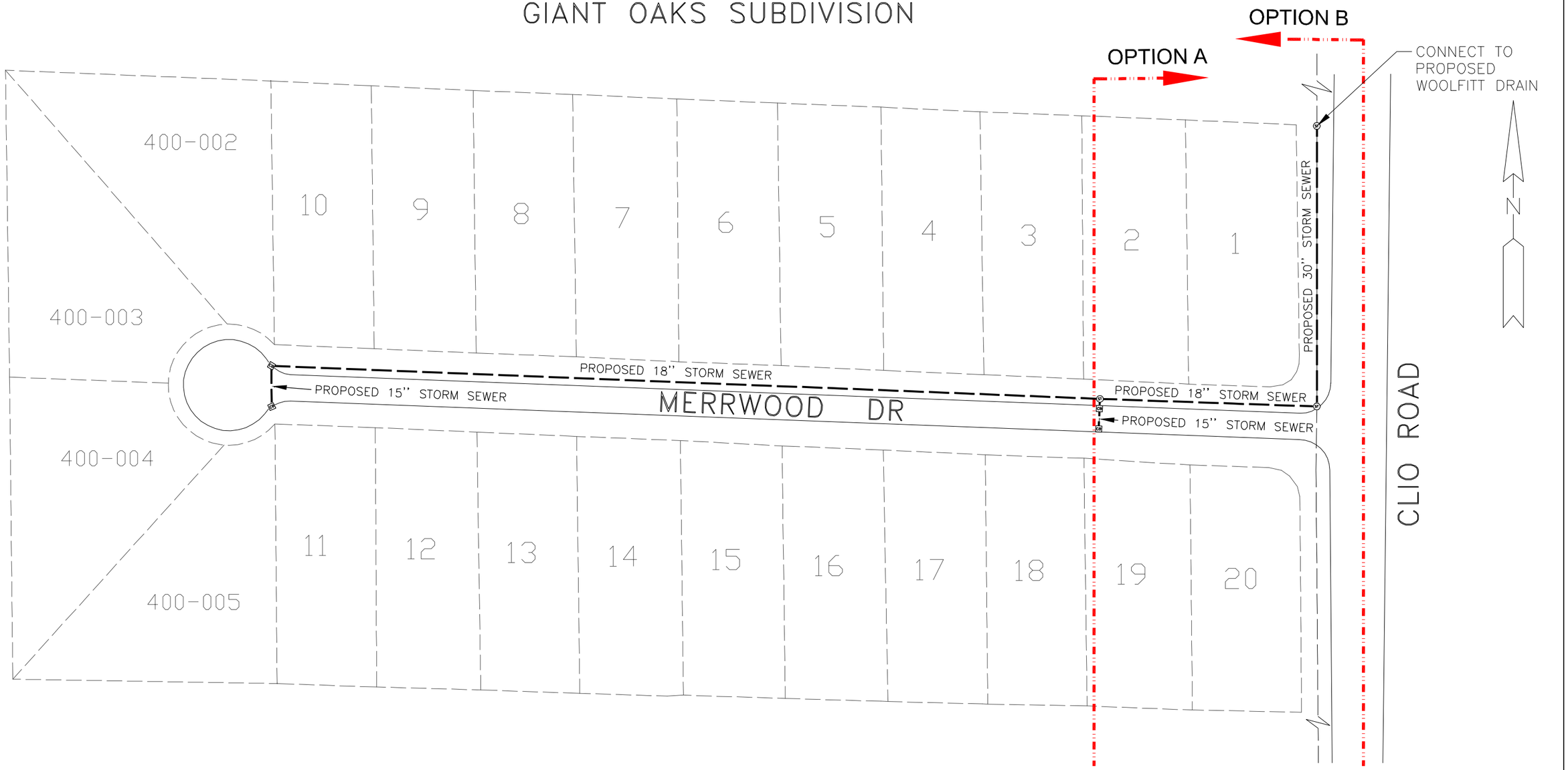
PROPOSED DRAINAGE IMPROVEMENTS OPTION B ENCLOSED DRAIN

JOB NO. GDC 2037.01F

SHEET EXHIBIT 2

PROJECT MANAGER:JASON R. KENYON, P.E. FIELD BOOK INFORMATION:97-E, PG 34
P:\GDC2037\01F\CADD-DATA\DWG\CSP-PLTS-OPTION-B.DWG - PLAN-B - FULL SCALE MONOCHROME.STB - PLOTTED 2/24/2006 8:27 AM BY LASALLE, SCOTT

GIANT OAKS SUBDIVISION



100' 50' 0' 50' 100' 200'

SCALE IN FEET

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GENESEE COUNTY SWM DRAIN COMMISSIONER

GIANT OAKS SUBDIVISION
PROPOSED STORM SEWER
IMPROVEMENTS

JOB NO. GDC 2037.01F

SHEET
EXHIBIT 3

PROJECT MANAGER: S.LASALLE
P:\GDC2037\01F\CADD-DATA\DWG\CSP-PLTS-GIANT-OAKS.DWG - GIANT OAKS - FULL SCALE MONOCHROME.STB - PLOTTED 2/24/2006 8:28 AM BY LASALLE, SCOTT
FIELD BOOK INFORMATION: -

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Appendices

I. INTRODUCTION

During major storm events, residents along Clio Road within the Woolfitt Drain drainage district have experienced drainage/flooding problems. The residents of the drainage district and Mt. Morris Township have petitioned the Genesee County Drain Commissioner to investigate an effective solution to relieve the flooding problems they have been experiencing. At the Board of Determination Meeting, several of the district residents expressed their concerns. A copy of the petition and meeting minutes can be found on file at the Genesee County Drain Commissioner's office. The Genesee County Drain Commissioner has retained the services of Wade Trim to prepare an engineering report to analyze the feasibility of drainage improvements to the drainage district known as the Woolfitt Drain #0588. This report has been prepared to evaluate possible alternatives that will improve the existing drainage system.

II. EXISTING DRAINAGE COURSE AND OUTLET

The area being considered in this report, the Woolfitt Drain #0588 district, is located in Sections 1, 2, and 3 of Mt. Morris Township, Genesee County, Michigan, as shown in Appendix A. The Woolfitt Drain's upper limit begins near Neff Road as an enclosed drain consisting of approximately 10-15 inch diameter clay drain tile. The enclosed drain continues westerly for approximately one mile and becomes an open drain just west of Clio Road. The drain continues to the west until it meets an unnamed natural watercourse. The total length of the Woolfitt Drain is approximately 1.5 miles.

III. DOWNSTREAM CONTROLS

The Woolfitt Drain outlets to an unnamed natural watercourse. The unnamed watercourse continues for approximately 1,400 feet northwest to a small in-line pond. Water exits the pond through an opening in an earthen berm and then enters an existing driveway culvert, which discharges freely approximately 1.5 feet above the dry weather elevation of the Brent Run/Lake Drain, just south of Frances Road. There is significant topographic relief (over 20 feet) from the downstream end of the Woolfitt Drain and the downstream end of the natural watercourse that empties into the Brent Run/Lake Drain. There is also a well defined natural (unmapped) floodplain at the downstream end of the Woolfitt Drain. For the purpose of this study, the normal channel elevation at the downstream end of the Woolfitt Drain has been assumed as the limiting downstream hydraulic control of the system.

IV. EXISTING CONDITIONS / DATA COLLECTION

The Drain Commissioner's office provided a map of the existing drainage district boundary. Topographical information was primarily obtained utilizing 2-foot contour maps provided by Genesee County with field survey limited to evaluating the western and southern district boundaries and the open channel portion of the drain. For the purpose of this study, the existing land-use characteristics for the tributary area are assumed to represent complete build out conditions. Land use boundaries were estimated based on aerial photography from the Michigan Department of Natural Resources collected in 1998. Existing soil conditions were obtained from the USDA Soil Survey reissued in December of 1993. Maps of the drainage district, topography, land use, and soil type have been included in Appendix C.

FIELD INSPECTION

A field inspection of the study area revealed critical areas for storm water flows within the open channel portion of the drain. Immediately downstream from where the Woolfitt Drain becomes an open channel, there is a large fallen tree that is severely limiting the conveyance of flow within the district. Further downstream there is a 12 inch culvert that appears to be partially blocked which is also limiting the drain's flow. Photographs taken during the field inspection are included in Appendix A.

V. STUDY CRITERIA

The design parameters used to analyze the Woolfitt Drain were based on the recommended standards of the Genesee County Drain Commissioner's office. The portions of the drain with tributary areas less than 300 acres are sized to convey the 10-year peak flow. The portions with tributary areas greater than 300 acres are sized for the 25-year peak flow rate.

VI. ANALYSIS OF EXISTING CONDITIONS

A TR-55 model using the Graphical Peak Discharge method was developed based on information collected in the field from the County and other sources. Flows were determined at several design points for the 10-year and 25-year peak flow rates.

In the upstream portion of the Woolfitt Drain drainage district, peak flow rates during a 10-year storm range from 38 to 48 cubic feet per second (cfs). This rate far exceeds the normal hydraulic capacity of a 10 to 15-inch tile drain. In the downstream portion of the district, the peak flow rate during a 25-year storm is 84.4 cfs. This rate far exceeds the hydraulic capacity of the existing 15 to 20-inch storm sewer. A copy of the model worksheets (composite runoff curve numbers, time of concentration, and peak discharge) for existing conditions can be found in Appendix B.

VII. FINDINGS AND ALTERNATIVES

At the request of the Genesee County Drain Commissioner's office, we have reviewed the Woolfitt Drain drainage district boundary limits, hydrology, and hydraulic characteristics. This information has been used to develop possible alternatives to improve the existing drainage system.

DRAINAGE DISTRICT BOUNDARY

The Drain Commissioner's office provided a map of the existing drainage district boundary. The western and southern boundaries have been adjusted based on information collected from the Genesee County Road Commission and information acquired from a limited field survey. The revised district boundary includes approximately an additional 18 acres of tributary area. The revised boundary was used to determine both existing and future peak flow rates. A plan view showing both the current and adjusted boundaries can be found in Appendix A.

HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

From the existing drain analysis, it was determined that improvements are necessary for the drain to adequately convey storm water flows while meeting current Genesee County Standards. When improvements are constructed, the hydrologic properties of the watershed will change, resulting in higher peak discharge rates. A TR-55 model using the Graphical Peak Discharge method was developed assuming all improvements are constructed. Flows were determined at several design points for the 10-year and 25-year storm events. A copy of the model worksheets (time of concentration, peak discharge, and channel calculations) can be found in Appendix C.

ALTERNATIVES

At the request of the Genesee County Drain Commissioner's office, we have developed phased options for drain improvements.

Phase 1

This phase includes the necessary improvements to the downstream portion of the drain. Improvements include cleaning out, widening, and deepening the open channel and upsizing the enclosed portion of the drain. Plan, Profile, and Cross-Section views of the drain can be found in Appendix D.

Phase 2

This phase includes the necessary improvements to the upstream portion of the drain. Two options have been prepared for Phase 2. Plan and Profile views of the drain can be found in Appendix D.

Option A:

This option uses a combination of enclosed sewers and open channels. The drain would begin as an enclosed sewer on the east side of Neff Road and discharge to an open channel approximately 400 feet west of Neff Road. The drain would continue west as an open channel, centered on common property lines, to the upstream limit of Phase 1.

Option B:

This option uses an enclosed system for the length of the drain. The drain would use the same route as Option A and would consist of 24 to 54-inch storm sewer. This option also includes enclosing the upstream open channel portion of Phase 1.

VIII. ESTIMATED PROJECT COSTS

Estimated project costs were determined for each phase and/or option. For estimating purposes, assumptions include estimated construction costs based in 2006 dollars. Detailed project construction cost breakdowns are provided in Appendix E and are summarized as follows:

Phase 1	$ 720,000	
	Option A	**Option B**
Phase 2	$ 370,000	$ 783,000

IX. MISCELLANEOUS NOTES

Legal Route and Course

Based on available documentation and historical records provided by the Genesee County Drain Commissioner's office, the existing legal route and course of the drain ends just downstream from where the enclosed sewer discharges to an open natural channel, approximately 600 feet west of Clio Road. The proposed Phase 1 improvements include cleaning out approximately 800 feet of this channel beyond the existing legal end of the drain. The actual length of channel cleanout will need to be determined during final design.

Easements

In order to relocate the drain onto common property lines, it will be necessary to obtain approximately seven (7) easements for Phase 1 and fifteen (15) easements for Phase 2. However, placing the drain on one side of the properties could reduce the number of easements to five (5) for Phase 1 and three (3) for Phase 2. For the open channel improvements, consideration for easement widths should encompass the entire drain and allow adequate space on one side of the drain for maintenance equipment (typically a minimum of an additional 40 feet). Based on the proposed improvements, easement widths required for the open portions of the drain vary from approximately 60 to 100 feet. Adequate easement widths and locations should be determined prior to beginning the design phase.

Changes to Drain Alignment

It may be necessary to slightly shift the drain alignment due to easement availability. It is not anticipated that minor shifts would have a significant affect on the peak flows in the drain. If the length or slope of the drain is significantly altered during the design phase, it may be necessary to re-evaluate flow rates.

X. CONCLUSIONS

Based on the drainage analysis and cost evaluations, recommendations for drainage improvements to the Woolfitt Drainage District have been developed. During the Board of Determine meeting, there were no complaints from residents in the upstream portion (Phase 2) of the drainage district. At a minimum, the downstream portion of the drain (Phase 1) must be upgraded to provide adequate conveyance of storm water. For Phase 2, both options are feasible. Improvements using either option presented may be completed concurrently with Phase 1, or in the future following further development of this area. The feasibility of moving forward with this drainage project and the selection of which option to elect for Phase 2 will ultimately be determined by the Drain Commissioner and the drainage district stakeholders.

SUPPLEMENT FOR
GIANT OAKS SUBDIVISION

Ia. INTRODUCTION

At the Board of Determination, several residents from within the Giant Oaks Subdivision expressed their concerns regarding drainage problems within the subdivision. As a part of this study, we have also reviewed this specific area of Woolfitt Drain drainage district.

IIa. EXISTING CONDITIONS

Existing topographic and utility information was obtained from the Genesee County Road Commission and from a limited field survey. This information has been used to evaluate the capacity of the existing storm sewer. The Rational Method was used to determine peak runoff rates within the subdivision. Based on our findings, the existing storm sewer does not have adequate capacity to accommodate a 10-year event. In its existing condition, it is estimated that minor rainfall events (events of lower intensity than a 2-year storm) may create standing water in excess of 12 inches in the roadway near the existing catch basins. A copy of the storm sewer calculation worksheet for existing conditions can be found in Appendix B.

IIIa. FINDINGS AND ALTERNATIVES

From the analysis of existing conditions, it was determined that improvements are necessary to meet Genesee County Standards. Two alternatives have been developed for improvements within in and adjacent to Giant Oaks Subdivision. A schematic of the proposed options can be found in Appendix D.

Option A

Upgrade the Giant Oaks storm sewer system along Merrwood Road, from approximately 250 feet west of Clio Road to Clio Road, from the existing 12-inch sewer to an 18-inch sewer. Upgrade the Clio Road storm sewer from the existing 15 and 18-inch sewer to a 30-inch sewer from Giant Oaks to the proposed Woolfitt Drain.

Option B

Upgrade the entire Giant Oaks storm sewer system along Merrwood Drive, from the existing 12-inch sewer to a 15 and 18-inch sewer. Upgrade the Clio Road storm sewer from the existing 15 and 18-inch sewer to a 30-inch sewer from Giant Oaks to the proposed Woolfitt

Drain.

IVa. ESTIMATED PROJECT COSTS

Estimated project costs were determined for each alternative. For estimating purposes, assumptions include estimated construction costs based in 2006. Detailed project cost breakdowns are provided in Appendix E and are summarized as follows:

Giant Oaks	
Option A	$72,000
Option B	$154,000

Va. CONCLUSIONS

Reports of flooding by residents attending the Board of Determination meeting were near the eastern set of catch basins on Merrwood Drive. Upgrading the sewer from this point to the Woolfitt Drain (Option A) will eliminate standing water for a 10-year event at this location and reduce the length of time water stands in the western portion of the subdivision. Furthermore, upgrading the entire storm sewer along Merrwood Drive will eliminate standing water for a 10-year storm event throughout the roadway within the subdivision.

At a minimum, upgrades to the Giant Oaks Subdivision (Option A) must be completed to alleviate the potential for future flooding in this area. It should be noted that if only Option A is selected due to costs, efforts should be taken to remove any sediment or blockages in the upstream storm sewer at the time of construction, and a maintenance schedule should be established to provide sewer clean out on an annual basis. Should the western portion of the Giant Oaks Subdivision continue to have storm water problems, Option B could be implemented at a later date.