Kent Drain
Engineering Report for
Board of Determination

Prepared for:
Muskegon County Drain Commissioner
June 15, 2015

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INTRODUCTION

Watershed Description

The Kent Drain (Drain) is a tributary to the Holland Drain and is located within the Ryerson Creek watershed. The Kent Drain watershed encompasses approximately 236 acres within Section 26 of Muskegon Township, Muskegon County as shown in the enclosed Exhibit B-2 - Drainage District Map. Land use consists mainly of residential, wooded and few commercial developments. Soils are primarily composed of fairly well draining sands. The United States Fish and Wildlife Service National Wetland Inventory does not identify any wetlands within the watershed; however, there are a few areas with hydric soils.

Route and Course

The Kent Drain was originally established in 1919. The total length of established Drain is slightly less than 1 mile (64.88 chains or 4,282 feet per 1919 Final Order) and extends from the confluence with the Holland Drain at Apple Avenue to just south of Kregel Avenue. The width of drainage easement along the Drain is 50-feet (25-feet each side of centerline). The historic bottom width of the Drain, as established in the 1966 Final Order, varies from 6 to 8-feet.

Petitioned cleanout and improvement projects along the Drain were performed in 1947 and 1966. A portion of the Drain, north of McLaughlin Avenue, was relocated in 2000 to accommodate the Central Assembly of God development.
Drainage District

The historic drainage district, currently on file with the Muskegon County Drain Commissioner’s office, encompasses an area of 313 acres. Land and Resource Engineering, Inc. delineated the drainage district boundary based on available topographic contours, record drawings (including adjacent drainage district boundaries) and field verification. Micro-topography and depression storage areas that may provide for some infiltration within the larger boundary were included in the drainage district. The revised drainage district encompasses 236 acres as shown in the enclosed Exhibit B-2 - Drainage District Map.

A total of 77 acres are recommended to be removed from the drainage district as shown in the enclosed Exhibit B-1 - Lands Added/Removed drawing. The lands removed east of Walker Road flow toward the Barnes Drain, while the lands removed near the intersection of Sheridan Drive and Kregel Avenue flow toward the Rozeboom Drain.

2015 Petition

The Muskegon County Drain Commissioner (MCDC) received a petition from 8 freeholders of land for “cleaning out, relocating, widening, deepening, straightening, tiling, extending, or relocating, adding lands, and/or adding one or more branches” to the Kent Drain. The petition stemmed primarily from flooding of properties near Barlow Street between Annette Street and Burke Avenue.

Land and Resource Engineering, Inc. (LRE) was retained to complete a preliminary engineering review of the Kent Drain and present our findings at the Board of Determination (BOD), which is scheduled for June 16, 2015. The results and recommendations of our preliminary engineering study are presented in this report.
FIELD RECONNAISSANCE

Field Investigation / Topographic Survey

A field investigation of the Drain and associated watershed was conducted by LRE staff on May 29, 2015. In addition to inspecting the entire Drain, LRE also conducted a limited topographic survey using GPS equipment to document the profile of the Drain and evaluate the feasibility of potential branches. Impacted property owners were interviewed to discuss flooding issues within the drainage district. A map of existing conditions along the Drain, including impairments, is provided in Figure 1 – Existing Conditions. A drawing depicting the profile and cross sections of the Drain are shown in Sheet 1 – Profile and Cross Sections, which is provided in the enclosed plastic envelope.

Kent Drain: The Kent Drain is highly channelized with trapezoidal cross section, relatively flat gradient and linear alignment. The bottom width varies from approximately 6 to 10-feet, depth varies from 3 to 4-feet, and bank slopes are slightly steeper than 2:1 (H:V). The gradient of the Drain is less than 0.05%. The substrate is primarily composed of sand, which is consistent with the surrounding soils and gentle gradient.

In general, the Drain is relatively stable with dense vegetation along the banks. Aside from some minor deadfall, the channel is relatively open and free of debris. Up to 2-feet of sediment has accumulated in the Drain. The greatest amount of sediment accumulation is upstream (south) of Kent Avenue.

The road crossings at Apple Avenue and McLaughlin Avenue are in good condition and appear to be set at an appropriate invert elevation. More than 1-foot of sediment has accumulated in the Apple Avenue and McLaughlin Avenue culverts. The Kregel Avenue culvert is in fair condition and partially filled with sediment.

In general, the private corrugated metal pipe (CMP) crossings along the Drain are deteriorating and in poor condition. The 42-inch diameter reinforced concrete pipe (RCP) near Sta. 24+50 is in good condition but slightly perched above the historic grade. The 30-inch diameter CMP culverts upstream (south) of Kent Avenue are nearly full of sediment.
Watershed Issues: The topography of the contributing watershed is relatively flat and consists of a mixed land use including residential, forest, meadow and commercial development. Walker Road and Sheridan Drive essentially serve as the respective east and west boundaries of the drainage district. The residential developments between McLaughlin Street and Vine Street lack a proper drainage network to efficiently convey surface runoff to the Kent Drain. Preliminary topographic survey review indicates that Barlow Street essentially acts as a dam, cutting off flow to the Drain. Widespread flooding of basements and yards has been reported, especially in areas along Barlow Street between Annette Street and Burke Avenue.
EVALUATION OF PRELIMINARY ALTERNATIVES

Several alternatives were considered to alleviate flooding to areas west of the Drain, near Barlow Street; however, conveyance improvements to the existing drainage network were deemed the most feasible and cost effective. Therefore, the focus of our preliminary evaluation was to determine the best alignment for the proposed Drain branch(es).

Three potential drain alignments were considered to convey storm water runoff from flood-prone areas near Barlow Street to the existing Drain as shown in Figure 2 – Improvement Alternatives.

Alternative 1 provides the most direct route to convey storm water from the area of reported flooding to the Kent Drain. It includes the construction of a main branch to the Kent Drain through the Annette Street right-of-way (road was never constructed), located east of Barlow Street. Additional branches (drainage swales) are proposed on either side of Barlow Street from McLaughlin Avenue to Burke Avenue to convey surface runoff to the main branch. This alternative requires that driveway culverts along Barlow Street be installed or replaced and new cross culverts be placed under Annette Street and Barlow Street.

A resolution from the Township or County Road Commission is required within areas of road right-of-way that are to be established as part of the County Drain. In addition, easements along Barlow Street may be necessary if the limits of the proposed branch(es) extend beyond the road right-of-way.

Alternative 2 includes the construction of a main branch to the Kent Drain along an existing drainage ditch on the north side of Burke Avenue, east of Barlow Street. Additional branches (drainage swales) are proposed on either side of Barlow Street from McLaughlin Avenue to Burke Avenue to convey surface runoff to the main branch. The total length of additional branches is essentially the same as Alternative 1 (slightly less than 2,000 linear feet).

Alternative 2, like Alternative 1, requires that driveway culverts along Barlow Street be installed or replaced and new cross culverts be placed under Annette Street and Barlow Street. In addition, four driveway culverts along Burke Avenue must be installed or replaced.
A resolution from the Township or County Road Commission is required within areas of road right-of-way that are to be established as part of the County Drain. In addition, easements along Barlow Street and Burke Avenue may be necessary if the limits of the proposed branch(es) extend beyond the road right-of-way.

**Alternative 3** is likely the most expensive of the three alternatives, but provides the most comprehensive drainage network. It includes the establishment of a main branch to the Kent Drain along an existing drainage ditch on the south side of Vine Street. Two additional branches (drainage swales) are proposed on either side of Barlow Street to convey surface drainage south to Vine Street. The proposed eastern branch along Barlow Street extends from McLaughlin Avenue to Burke Avenue, where it crosses Barlow Street. The proposed western branch along Barlow Street conveys surface drainage from McLaughlin Avenue to the main branch at Vine Street.

Alternative 3 requires the most significant amount of culvert replacements. Driveway culverts along Barlow Street and Vine Street must be installed or replaced. In addition, this alternative requires that new cross culverts be placed under Barlow Street, Annette Street, Burke Avenue, Kent Avenue and Vine Street.

A resolution from the Township or County Road Commission is required within areas of road right-of-way that are to be established as part of the County Drain. In addition, easements along Barlow Street and Vine Street may be necessary if the limits of the proposed branch(es) extend beyond the road right-of-way.
Kent Drain Improvement Alternatives

SECTION 26 OF MUSKEGON TOWNSHIP
MUSKEGON COUNTY, MICHIGAN

LEGEND
- Drainage District Boundary
- Drain Centerline
- Road Centerline
- Section Line
- Alternative 1 Drain Alignment
- Alternative 2 Drain Alignment
- Alternative 3 Drain Alignment
- Common Drain Alignment
- Flow Directions
- Section Numbers

FIGURE 2
IMPROVEMENT ALTERNATIVES

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