Stormwater Drainage Report and Calculations

FRA-SR 317-10.63
CIP NO. 530103-100052
HAMILTON ROAD
I-70 TO REFUGEE ROAD

June 13, 2016

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Contents

Introduction

The purpose of this report is to document the existing drainage conditions affecting the project and to provide the background information used in the design of proposed ditches, storm sewers and culverts. Every effort was made to perpetuate the existing drainage patterns.
The project area on Hamilton Road (SR-317) ranges from Helsey Park to the south of Refugee Road to the railroad crossing just south I-70 in the Eastland area of Columbus, Ohio.

Existing Conditions

Hamilton Road

Hamilton Road (SR-317) is a north-south undivided 45mph 5-lane principal urban arterial highway with two through lanes in each direction that are, at times, separated by a raised concrete median to protect left turn lanes at major intersections. All thru lanes are approximately 12-feet wide with paved shoulders of varying width but generally not more than 8-feet wide; curb and gutter (1.5-foot gutter pan) sections exist in the lower half of the project area and are exclusively used between Refugee Road and the Eastland Mall south entrance. Curb reveal is degraded in some areas with overlays occasionally burying the gutter pan, and curb inlets appear to be in poor condition, albeit functioning. The profile rises gently from south to north with a major sag under the I-270 Bridge and slightly less so at the Miller Ditch structure. The rough midpoint of the project occurs just north of the Macsway Avenue intersection, at which point, the profile begins to drop slowly to the north until it reaches the low point at Miller Ditch, before climbing again to the north, crossing Groves Road and increasing to accommodate transition over an existing railroad and I-70; the project ends prior to the railroad bridge.

The existing runoff from Hamilton Road drains positively from the crown to the shoulders and is carried away in roadside ditches/swales that are directed to ditch catch basins or culverts that eventually enter storm sewer systems terminating at the sags under I-270 or at Miller Ditch, respectively. There are additional limited areas of curb and gutter throughout the corridor that appear to have been placed when right turn lanes were added and they assist in conveying flow off the roadway into existing ditches or down side streets and off-project.

The curbed section between Refugee and Hamilton Roads is handled by and existing storm sewer with trunks on both sides that are consolidated under I-270 (on the east/right side), channeled north and then transferred back across to the west/left side of Hamilton for evacuation southwest alongside I-270 via an existing 42’ storm pipe. The crossovers appear to

be in an effort to avoid an existing 30" water line that runs along the west side of Hamilton Road throughout the project area.

South of Refugee Road, Hamilton Road is defined by a gentle profile sloping away from the intersection with Refugee and towards the southern project limits. From Refugee, south, to the second set of commercial drives south of the intersection, Hamilton Road consists of curb and gutters with inlets. A median separates Northbound and Southbound Traffic designed to shift traffic and protect the left turn lane. Passed the section of Hamilton Road near Refugee Road, Hamilton Road is undivided and is uncurbed.

In the section with the median, runoff drains from the crown in the median to the outside curb and gutters on both sides of Hamilton Road to a storm system with the trunk line to the right side of Hamilton Road. The existing storm system drains to open ditches to the East of Hamilton Road. Outside the curb and guttered section water is collected in swales and ditches where it drains south towards Big Walnut Creek.

There are relatively large parking lots on both sides of Hamilton Road with service roads running parallel to Hamilton and separated it by wide ditches or swales. The service roads have inverted crowns with catch basins that channel flow into the ditches while the parking lots drain off site, with some exceptions.

Miller Ditch structure

The existing bridge structure over Miller Ditch *(FRA-317-1190, SFN 2516446)* is within the project limits and needs to be replaced as part of the roadway widening project. This is an ODOT structure and as such will be designed to ODOT standards and subject to ODOT design review as the project design is further developed. ODOT has an agreement with the City of Columbus to share in the funding of the project to provide for the structure improvements. As part of the Preliminary Engineering process a Structure Type Study and Hydraulic Analysis Report was prepared to evaluate the design requirements for the replacement of the existing bridge structure over Miller Ditch. A 20'wide x7'high four sided box culvert structure has been selected for replacement of the structure and preliminary plans for the new structure are included with the Stage 1 plans.

Groves Road

Groves Road, a 35 mph urban collector, is at the north end of the project area and has open drainage whereupon runoff sheets off to the sides and into established ditches or swales containing catch basins, both of which direct flow to existing culverts or storm sewers. West of Hamilton Road, there are several culverts that accommodate flows from upstream (northwest), the outlets of which, then enter a buried culvert running under parking lots on the southwest corner of the Groves/Hamilton intersection before daylighting at the Miller Ditch structure on Hamilton Road. The low point on Groves Road is in the general vicinity of an existing 54" RCP roughly 300' west of the centerline of Hamilton Road.

East of Hamilton, Groves Road is characterized by a profile that rises to the east with paved shoulders that flow into swales with catch basins directing flows west into storm sewers that outlet at Miller Ditch. There is a short section of curb along the south/right side of groves near the Hamilton intersection that performs in the same manner, although it does so by letting flows enter the commercial properties to the south, wherein it then gains access to the existing storm system.

Generally speaking, the commercial properties north of Groves, contain their drainage within storm systems that are ultimately directed towards Miller Ditch. To the south, drainage works its way towards Miller Ditch or, east of Hamilton Road, continues southeast and off-project via other storm sewers.

Service Roads (West and East of Hamilton, Off Groves Road)

There are two service roads off Groves Roads on the east and west side of Hamilton Road that run parallel with Hamilton Road. These service roads provide access to local businesses. The Service Roads have inverted crowns and catch basins at the entrances with Groves Road.

Eastpoint Drive

Eastpoint Drive is the next local street south of Groves and serves to connect the commercial properties to the west with Hamilton Road and the adjacent service roads. The profile slopes down towards Hamilton with curb and gutter transferring flows into the ditches adjacent Hamilton Road for conveyance north to Miller Ditch. Some of the commercial properties adjacent the roadway are connected via storm sewers that are part of this collection of systems carrying flows away to Miller Ditch.

Kimberly Parkway

Kimberly parkway is a 35 mph minor collector that drains away to the west via curb containment as part of an existing storm sewer that also collects from commercial properties

on both sides of the roadway. There is a sag just off Hamilton Road where the service roads tie into Kimberly before it rises briefly to the west, prior to falling off again as it continues west and most of the drainage follows this theme, being carried off by an existing 27" storm sewer on the north side of the road. The area adjacent the intersection with Hamilton Road drains to the swale between the service road and Hamilton and is drained away to the north to Miller Ditch.

Kingsland Avenue

Kingsland Avenue is directly across from Kimberly Parkway and is a curbed local road servicing commercial properties and housing developments east of Hamilton Road. There is a sag in the road profile where it meets the service roads adjacent Hamilton Road before climbing briefly to the east and falling off again as it clears the commercial properties. As in with Kimberly Parkway, the area adjacent the intersection with Hamilton Road drains to the swale between the service road and Hamilton and is drained away to the north to Miller Ditch.

Macsway Avenue

Macsway is another curbed local road connecting the commercial properties to the west, with Hamilton Road. The high point on the Hamilton Road profile, it demarcates the separation of drainage flowing north to Miller Ditch from that flowing south to I-270 and an existing 42" storm pipe that carries flows away to the southwest along the north side of the interstate. The northerly flows are accommodated by the swales or ditches on either side of Hamilton Road with drive culverts, as needed, to continue northward. The profile of Macsway Avenue falls away from Hamilton Road to the west and does not contribute drainage to the project area.

Across from Macsway on the east side of Hamilton Road is an unnamed entrance to the commercial properties east of Hamilton Road and direct access to the service road running south. For the purposes of this project, we refer to it as Service Road Entrance 2 and it's a curbed roadway with a profile that falls away to the east after a brief sag in the vicinity of the service road.

Eastland One

The main entrance to the Eastland mall on Hamilton Road is a curbed roadway with a center island separating inbound and outbound traffic. In general, the mall parking lot falls away to the south and drainage within the entrance area does the same, channeling southwards along existing curbing before it finds an opening to the greater parking lot area and access to a storm drain. There is a brief profile sag to accommodate the drainage tangent from Hamilton Road before the roadway continues to fall away to the west. Drainage is not directed towards the project area; it joins existing storm sewers directing flows to the southwest.

Eastland Drive

Across from Eastland One, this curbed roadway provides access to the service roads and commercial properties east of Hamilton Road. Like most of the other minor side streets, it has a sag in the vicinity of the service roads, followed by a high point a little further away from Hamilton Road that demarcates the point at which flows no longer contribute to the project area, although many of the properties to each side of the lesser roads, do ultimately direct their runoff to the swales adjacent Hamilton Road.

Mall Entrance, South

The unnamed southernmost mall entrance on Hamilton Road is short curbed section providing access to the malls internal "ring" road and a bus stop located therewith. It has a slight profile dip before rising again to the west and then dropping off and sheeting flows onto the ring road.

Across from the southern mall entrance and on the east side of Hamilton Road is an unnamed entrance to the commercial properties bound by Hamilton Road and I-270 and a direct access to the service road running north. For the purposes of this project, we refer to it as Service Road Entrance 1 and it's a curbed entrance with a profile that falls away to the east after a brief sag in the vicinity of the service road.

Eastland Square Drive

Eastland Square drive is a signalized, partially curbed access point for commercial businesses to both the east and west of Hamilton Road. The roadway consists of a crest curve with the apex being at the centerline of Hamilton Road and both legs of Eastland Square Drive sloping away from Hamilton Road. On the east leg of Eastland Square Drive a 24" pipe runs underneath the roadway to connect ditch lines on either side of the roadway. The drive pipe drains north to south towards Big Walnut Creek. On the west leg of Eastland Square Drive, water from Hamilton Road flows over the shoulder and out of the right of way where it is captured in the parking lot drainage system.

The existing swales and ditches adjacent Hamilton Road run from the Eastland Mall to the railroad crossing north of Groves and serve to collect roadway sheet flow from Hamilton or flows from adjacent commercial properties via storm sewers that outlet directly to the swales/ditches. In some cases, there is insufficient depth to utilize a culvert under the side streets, so a catch basin is utilized that transfers flows downstream until it can be daylighted into a subsequent ditch or swale.

These systems, like most of the existing drainage appurtenances, appear to be in various stages of disrepair although they appear to function during lighter storm events. While we did not witness their performance during heavy storm events, there is ample evidence of ponding

around these appurtenances, in the form of cracked water damaged pavement, darkened soil, rutting and general erosion that may be indicators of the need for an update.

Proposed Design

Hamilton Road

The proposed profile provides a maximum of 0.3% slope which is slightly more than the flattest existing condition. This serves to allow adequate slope for the proposed curb and gutter while trying to minimize the amount of leveling needed to achieve positive flows. It also avoids the roller coaster effect that would be created with a minimum 0.5 % profile. As such, the profile at the highest point (Macsway Avenue) receives the most leveling or additional asphalt buildup, as does the area over the new Miller Ditch structure, which requires better clearance than the existing structure had.

The proposed roadway layout calls for lane width reduction down to 11-feet, 10-feet at turn lanes, and the installation of curb and gutter throughout. Side streets, however, may receive straight curb with a paved shoulder in lieu of the gutter pan, with the shoulder matching the cross slope of adjacent pavement. Cross slopes reflect normal crown with the outmost lanes on the mainline and major side streets rotated to 2 percent to aide in draining the relatively long distances associated with a 5-lane urban highway. There are several occasions whereby the left turn lane may lay across the centerline and the pavement is rotated to drain towards the median curb with curb inlets provided to intercept flows in an effort to reduce the amount of pavement draining across the roadway. Where the portion draining towards the median curb is 2-feet or less from the normal crown location, the pavement continues up across the crown location to the median curb, such that the additional 2-feet of drainage is sent back across the centerline to the opposing side.

South of Refugee, additional turn lanes on Hamilton Road will alter the existing drainage conditions so median inlet will be added where necessary to collect drainage between the roadway crown and median. Here the crown of the road is shifted to follow the edge of the northbound thru lane to help control the pavement spreads. Proposed curb and gutters will require additional inlets draining into a mostly all new drainage system. Existing trunk lines will be reused along the right side of Hamilton Road where positive drainage can be maintained with proper pipe cover. Where existing trunk line cannot be reused, proposed truck lines will be added between the curb and sidewalk or shared-use path. The proposed trunk line will outlet to a 24” existing drainage pipe that outlets to an open ditch along the right side of Hamilton Road.

The existing profile between Refugee Road and the southernmost entrance to the Eastland Mall does not currently meet 45 mph design standards, and, as such, must be brought into compliance by flattening the sag curve. This results in full depth pavement replacement throughout this area and, coupled with the changing footprint and new shared use path, also invalidates the option of re-using the existing storm sewers. The travel lanes are shifted to the east to provide room for the shared use path in front of the piers under the I-270 Bridge while still meeting minimal horizontal offset to the center piers. One exception to this is the existing 36-inch trunk running south along the left side from the south mall entrance to meet the existing 42" storm trunk line serving as the primary outlet for the storm sewers between the high point at Macsway Avenue and Refugee Road.

In order to maintain clearance from the existing 30-inch water line, a majority of the catch basins are shallower than normal depth requirements would allow and care has been taken to avoid routing the trunks in proximity to the water line, where possible. The contractor will have to exercise added caution when installing the storm sewer and we have made efforts to identify locations of particular concern and provide subsurface utility exploration data.

Between the south mall entrance and Macsway Avenue, the addition of a shared use path at a minimum offset of 5-feet from the service road on the west side of Hamilton Road, results in a ditch separating the path and the proposed curb on Hamilton. The installation of catch basins to drain the ditch again brings the storm trunk into conflict with the 30-inch water line so the catch basins, which also serve as junctions for the trunk line, are placed with invert elevations that are shallower than typically required. With few exceptions, the shared use path drains towards the ditch unless the existing conditions show otherwise.

The service road is the boundary between sheet flows into the ditches and off-site or off-project flow unless the adjacent commercial properties have internal storm sewer systems that conduct flow to the previous ditches; they will be rerouted to tie into the proposed trunk line and carried south.

The drainage from Eastland One profile contributes to this flow, even though the existing condition allows flow to sheet off to the south. With the addition of curb and gutter, the flows will now be contained within the roadway edges and there is not a suitable outlet that doesn't involve substantial trenching to outlet the sewer into the existing system within the mall property. We have opted to provide a trunk line sending flows east to join the trunk line on the west side of Hamilton Road. We fell that there is adequate capacity in the receiving system to accommodate the additional flow.

The proposed design contains the flow within the curb and gutter section but there is no suitable outlet at the western end where it ties into the mall internal roadway circuit. The existing storm sewer at Franksway avenue was not designed to accommodate the flow from Eastland One, in fact the existing condition allows it to sheet to the south following the parking lot curbing until an opening allows it to run down to an existing catch basin, likely thru shallow concentrated flow. This is not an acceptable solution for a proposed design, nor is installing a new storm pipe across several hundred feet of parking lot to access the existing catch basins as outlets.

The proposed design amasses the flows at the western limit of Eastland One and then sends a 12-inch storm trunk east to join the flows on Hamilton Road continuing south. Efforts were made to keep ditch catch basins and storm trunk manholes as far from the 30-inch waterline as possible as the main trunk continued south on Hamilton past the south mall entrance, and its profile sag. Once thru the intersection, the storm trunk enters an existing 36-inch storm trunk that will remain in service although new manholes will be constructed in-line adjacent locations determined by pavement spread calculations and resultant catch basin placement.

On the east side of Hamilton Road and beginning at Service Road Entrance 2 (currently unnamed but directly across from Macsway Avenue), the drainage schematic is essentially the same as the left side, in that it collects from proposed ditch catch basins, catch basins in the curb and gutter and existing storm sewers from the adjacent parking lots. It starts just north of the intersection, adds flow from the intersection sag and continues south to Eastland Drive and its profile sag area (created by drainage tangents) before continuing south to Service Road Entrance 1 (across from the southern mall entrance), where it is then transferred across to the left side of Hamilton Road and into the same existing 36-inch storm sewer that carries the drainage from the left side down to the 42-inch outlet pipe.

The right side swales and ditches are significantly larger than those on the west side and they provide an opportunity to install erosion control measures and, while it is unclear, as yet, which of those options will be selected, there is ample room for a multitude of configurations as this is the flattest area on the project site.

From Macsway Avenue to the Miller Ditch structure, the left and right sides of Hamilton are reflective of the proposed design to the south, with the following exceptions:
The terrain on the west side changes as you approach Miller ditch, in that the dip in the profile leaves no opportunity for a ditch between the shared use path and the back of curb. The flows from the shared use path which is now at a higher elevation relative to the roadway, sheet across the path and the graded slopes to tumble over the curb and into the gutter pan.

Additionally, the proposed layout adds a third thru lane between Groves Road and Kimberly parkway which necessitates full depth pavement replacement in the intersection area with Eastpoint Drive. This then has an effect on the service road immediately west of the intersection, necessitating a complete pavement replacement of the service road in the vicinity of the intersection. The installation of the third southbound lane and the associated drainage tangent is the primary driver for the pavement replacement. The service road receives new catch basins in the center of their respective inverted pavements which straddle the newly lowered pavement for Eastpoint Drive.

The proposed storm trunk is tied directly into the new structure at Miller Ditch. The same is true for the storm sewers bringing flows from the north and Groves Road.

The east side changes as it approaches Eastpoint Drive in that there is no longer any room for erosion control measures as the commercial properties are closer to Hamilton Road. There are still sections of proposed ditch between drives because the parking lots have storm sewer systems that dump into the existing ditches; in most cases those will be tied into a junction on the proposed storm trunk line.

Groves Road

There is a 54-inch reinforced concrete culvert under Groves Road that will need an extension to the north due to the pavement widening and the addition of sidewalk. The upstream waterway is pinched between two parking lots and creates the need for a turn in the culvert extension and our first recommendation is to construct the turn within the confines of a customized masonry collar and align the extension with the stream. The other option would be to install a manhole at the junction and align the new extending leg to meet the stream; the downside is that the manhole cover would likely end up in the new sidewalk.

Roadway widening along Groves Road causes multiple issues with constructing curb and gutters with inlets. These issues include running into existing utilities, such as an AEP duct, gas, and telecom lines along with the amount of inlets needed for the profile of West Groves. The utilities run along groves directly underneath where the inlets should be placed. Further investigation is needed to accurately determine the depths of these utilities. Along with the possibility of digging into a utility the gentle slopes along Groves requires closely spaced inlets to meet minimum pavement spread requirements.

The majority of the Groves Road drainage will be captured by a closed drainage system that is connected to the storm system along Hamilton Road that drains south to the Miller Ditch.

Portions east Groves Road will be captured in inlets and piped directly to the ditch where possible.

Service Road (West of Hamilton, Off Groves Road)

Entrance to the Service Road will be moved away from the Hamilton and Groves Road and reconnect with the existing Service Road through an S-curve. The Service Road will have an inverted crown with catch basins placed in the low point of a sag and near the start and end of the proposed Service Road work.

Service Road (East of Hamilton, Off Groves Road)

Similarly to the Service Road on the West Side of Hamilton Road, the Service Road on the east side of Hamilton Road will be shifted away from the intersection of Groves and Hamilton Road. The Service road will be rerouted around Front Room Furniture Store and reconnect with the existing service round. The proposed service road will have an inverted crown with the high point being at the midway point of the proposed service road, near the cul-de-sac. The inverted crowns will drain towards the entrances of the proposed service road with Groves and/or Hamilton Road, where catch basins collect the drainage along the centerline.

Kimberly Parkway

There is a large parking lot on the northwest corner of the intersection with Hamilton Road that drains across the parking lot and out across the drive apron to the curb on Kimberly before heading west to a catch basin that is just off-project. This distance exceeds the maximum 300 foot distance needed between junctions in order to allow proper cleanout of the system. The proposed design installs a catch basin just downstream of the drive to collect the majority of the drainage, which allows the remainder to be better handled by the existing catch basin downstream.

The right side mimics the existing condition except that a catch basin is added roughly midpoint between Hamilton Road and the existing catch basin downstream (also doesn't meet the maximum 300 foot separation. It ties into an existing system and in effect, is providing an additional inlet to spare the existing catch basin from potential overload.
Once into the existing system, it is carried off to the west in the existing 27-inch storm trunk.

Side streets

The remainder of the side streets and access points to the commercial properties continue to perform in the same manner as the existing condition albeit upgraded to meet current drainage criterion and standards. Drive aprons are curbed and are raised to channel flows onto the

mainline. The northernmost drive on the east side has a low point between the apron and the end of the drive and so a catch basin has been placed at the low side to receive flows from the parking and operating area of the service station.

Inlet Spacing Calculations

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HAMILTON ROAD
I-70 TO REFUGEE ROAD

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INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description :SE corner Eastland Drive back to NW corner SRE1, right side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
30+33	Begin																		
29+10	CB-3A	123.00	0.80	0.12	2.95	1.81	10.00	0.0059	0.0556	0.0200	1.50	0.0313	5.32	0.44	0.08	0.51	0.162	5.45	
28+00	CB-3	110.00	0.90	0.08	2.80	1.79	10.00	0.0048	0.0556	0.0200	1.50	0.0313	5.32	0.45	0.01	0.46	0.162	5.44	
27+00	CB-3A	100.00	0.90	0.07	2.84	1.93	10.00	0.0036	0.0556	0.0200	1.50	0.0313	5.32	0.32	0.03	0.34	0.155	5.09	
26+00	CB-3A	100.00	0.90	0.07	2.83	1.94	10.00	0.0035	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.03	0.36	0.158	5.25	
25+00	CB-3A	100.00	0.90	0.07	2.62	1.83	10.00	0.0040	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.03	0.37	0.156	5.12	
24+00	CB-3A	100.00	0.90	0.07	2.59	1.76	10.00	0.0044	0.0556	0.0200	1.50	0.0313	5.32	0.34	0.03	0.37	0.154	5.01	
23+00	CB-3A	100.00	0.90	0.07	2.42	1.59	10.00	0.0056	0.0556	0.0200	1.50	0.0313	5.32	0.34	0.03	0.37	0.148	4.73	
15+45	CB-3	42.00	0.90	0.05	2.40	0.53	10.00	0.0114	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.27	0.119	3.50	Sag
16+09	Begin																		
15+45	CB-3	91.00	0.73	0.07	1.74	1.61	10.00	0.0054	0.0556	0.0160	1.50	0.0313	5.32	******	******	0.27	0.134	4.64	End

SUMP DATA

Total Flow (cfs) : 0.54 **Ponded Depth (ft.) :** 0.044 **Spread on Pavement (ft.) :** 1.95

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Sag SW corner of the Eastpoint Dr. intersection, left side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
54+28	Begin																		
94+46	CB-3	28.00	0.70	0.03	8.84	0.38	10.00	0.0129	0.0556	0.0180	1.50	0.0313	4.82	******	******	0.10	0.083	1.50	Sag
93+75	Begin																		
94+46	CB-3	72.00	0.81	0.07	2.28	0.78	10.00	0.0168	0.0556	0.0160	1.50	0.0313	4.82	******	******	0.27	0.112	3.32	End

SUMP DATA

Total Flow (cfs) : 0.37 **Ponded Depth (ft.) :** 0.024 **Spread on Pavement (ft.) :** 1.62

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Sag SW corner of the S. Mall Entrance. left side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
22+00	Begin																		
11+56	CB-3	13.00	0.90	0.03	7.50	0.21	10.00	0.0077	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.14	0.104	2.63	Sag
11+23	Begin																		
11+56	CB-3	37.00	0.70	0.03	2.24	0.33	10.00	0.0303	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.11	0.074	1.33	End

SUMP DATA

Total Flow (cfs) : 0.26 **Ponded Depth (ft.) :** 0.006 **Spread on Pavement (ft.) :** 1.45

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Sag SW corner of Eastland One, left side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
44+60	Begin																		
44+54	CB-3	10.00	0.90	0.05	3.51	0.08	10.00	0.0360	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.24	0.095	2.13	Sag
44+61	Begin																		
44+54	CB-3	29.00	0.90	0.03	2.86	0.98	10.00	0.0014	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.14	0.136	4.43	End

SUMP DATA

Total Flow (cfs) : 0.38 **Ponded Depth (ft.) :** 0.025 **Spread on Pavement (ft.) :** 1.63

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Service Road Entrance 2 back to Eastland Drive, right side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
38+84	Begin																		
38+00	CB-3A	86.00	0.83	0.08	3.54	1.78	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.32	0.03	0.35	0.161	5.38	
37+00	CB-3A	100.00	0.90	0.07	2.72	2.06	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.03	0.37	0.163	5.47	
36+00	CB-3A	100.00	0.90	0.07	2.72	2.05	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.04	0.37	0.163	5.49	
35+00	CB-3A	100.00	0.90	0.07	2.79	2.05	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.04	0.37	0.163	5.50	
34+00	CB-3A	100.00	0.90	0.06	2.46	2.11	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.30	0.02	0.32	0.157	5.16	
33+00	CB-3A	100.00	0.90	0.07	2.31	2.07	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.03	0.36	0.162	5.41	
32+00	CB-3A	100.00	0.90	0.07	2.31	2.06	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.03	0.37	0.163	5.47	
60+44	CB-3	97.00	0.83	0.09	2.31	1.16	10.00	0.0109	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.43	0.139	4.61	Sag
60+73	Begin																		
60+44	CB-3	30.00	0.90	0.02	3.22	0.39	10.00	0.0130	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.10	0.082	1.47	End

SUMP DATA

Total Flow (cfs) : 0.53 **Ponded Depth (ft.) :** 0.043 **Spread on Pavement (ft.) :** 1.82

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Service Road 2 up to Kingsland Avenue including right side of Kingsland **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
40+70	Begin																		
41+60	CB-3A	90.00	0.90	0.06	2.90	2.28	10.00	0.0020	0.0556	0.0200	1.50	0.0313	5.32	0.27	0.02	0.29	0.161	5.37	
42+60	CB-3	100.00	0.90	0.08	2.52	1.90	10.00	0.0035	0.0556	0.0200	1.50	0.0313	5.32	0.40	0.00	0.40	0.163	5.49	
43+50	CB-3A	90.00	0.90	0.07	2.67	1.88	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.31	0.03	0.34	0.159	5.26	
44+35	CB-3A	85.00	0.90	0.07	2.67	1.73	10.00	0.0031	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.03	0.36	0.161	5.39	
45+00	CB-3A	65.00	0.90	0.07	3.03	1.32	10.00	0.0031	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.03	0.37	0.162	5.44	
45+80	CB-3A	80.00	0.90	0.07	3.01	1.64	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.04	0.37	0.163	5.49	
46+65	CB-3A	85.00	0.90	0.07	3.02	1.72	10.00	0.0031	0.0556	0.0200	1.50	0.0313	5.32	0.34	0.04	0.37	0.163	5.46	
85+87	CB-3	106.00	0.82	0.15	2.98	1.02	10.00	0.0161	0.0556	0.0160	1.50	0.0313	5.32	******	******	0.69	0.150	5.65	Sag
88+37	Begin																		
86+50	CB-3A	126.00	0.79	0.22	2.95	1.68	10.00	0.0063	0.0160	0.0160	1.50	0.0417	5.32	0.53	0.40	0.92	0.137	8.57	
85+87	CB-3	30.00	0.78	0.04	3.22	0.57	10.00	0.0033	0.0556	0.0160	1.50	0.0313	5.32	******	******	0.56	0.178	7.40	End

SUMP DATA

Total Flow (cfs) : 1.25 **Ponded Depth (ft.) :** 0.108 **Spread on Pavement (ft.) :** 5.95

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Sag SE corner of Service Road Entrance 2, right side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
80+36	Begin																		
80+70	CB-3	39.00	0.83	0.09	3.61	0.29	10.00	0.0346	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.40	0.113	3.16	Sag
81+42	Begin																		
80+70	CB-3	72.00	0.90	0.05	2.45	1.10	10.00	0.0079	0.0556	0.0160	1.50	0.0313	5.32	******	******	0.24	0.121	3.87	End

SUMP DATA

Total Flow (cfs) : 0.64 **Ponded Depth (ft.) :** 0.054 **Spread on Pavement (ft.) :** 2.58

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Sag SE corner of the Service Road Entrance 1, right side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
15+37	Begin																		
15+45	CB-3	11.00	0.90	0.03	3.33	0.21	10.00	0.0055	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.14	0.110	2.96	Sag
15+79	Begin																		
15+45	CB-3	34.00	0.60	0.04	3.07	0.40	10.00	0.0171	0.0556	0.0160	1.50	0.0313	5.32	******	******	0.13	0.086	1.68	End

SUMP DATA

Total Flow (cfs) : 0.27 **Ponded Depth (ft.) :** 0.009 **Spread on Pavement (ft.) :** 1.48

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Sag SE corner of Eastland Drive, right side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
60+29	Begin																		
60+44	CB-3	28.00	0.90	0.06	2.95	0.32	10.00	0.0139	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.29	0.118	3.43	Sag
60+73	Begin																		
60+44	CB-3	31.00	0.90	0.03	2.25	0.39	10.00	0.0135	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.14	0.094	2.09	End

SUMP DATA

Total Flow (cfs) : 0.43 **Ponded Depth (ft.) :** 0.031 **Spread on Pavement (ft.) :** 1.69

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description :SE Radius Refugee Road to Eastland S. Entrance , 50-yr check **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
10+11	Begin																		
11+15	CB-3A	22.00	0.80	0.06	6.94	0.47	10.00	0.0032	0.0556	0.0160	1.50	0.0313	6.50	0.28	0.03	0.31	0.150	5.68	
11+75	CB-3A	60.00	0.68	0.08	2.29	0.91	10.00	0.0068	0.0556	0.0160	1.50	0.0313	6.50	0.34	0.04	0.38	0.143	5.21	
12+45	CB-3A	70.00	0.78	0.10	2.27	0.70	10.00	0.0164	0.0556	0.0160	1.50	0.0313	6.50	0.47	0.08	0.55	0.140	5.01	
13+50	CB-3A	105.00	0.73	0.18	2.44	0.82	10.00	0.0239	0.0556	0.0160	1.50	0.0313	6.50	0.70	0.23	0.93	0.154	5.94	
14+50	CB-3A	100.00	0.74	0.14	2.72	0.79	10.00	0.0235	0.0556	0.0160	1.50	0.0313	6.50	0.69	0.22	0.90	0.153	5.87	
15+45	CB-3A	95.00	0.70	0.17	2.81	0.77	10.00	0.0212	0.0556	0.0160	1.50	0.0313	6.50	0.72	0.27	0.99	0.160	6.28	
16+30	CB-3A	85.00	0.73	0.07	3.09	0.97	10.00	0.0113	0.0556	0.0160	1.50	0.0313	6.50	0.49	0.11	0.60	0.151	5.75	
16+75	CB-3	45.00	0.90	0.05	2.87	1.08	10.00	0.0022	0.0556	0.0160	1.50	0.0313	6.50	******	******	0.41	0.172	7.02	Sag
22+08	Begin																		
20+00	CB-3A	210.00	0.71	0.30	3.33	1.35	10.00	0.0281	0.0556	0.0200	1.50	0.0313	6.50	0.98	0.41	1.38	0.174	6.01	
19+00	CB-3A	100.00	0.51	0.28	13.54	0.71	14.25	0.0251	0.0556	0.0180	1.50	0.0313	5.66	0.86	0.35	1.21	0.168	6.19	
18+50	CB-3A	50.00	0.63	0.16	10.24	0.39	10.76	0.0238	0.0556	0.0160	1.50	0.0313	6.33	0.73	0.26	0.99	0.157	6.11	
17+75	CB-3A	75.00	0.76	0.13	6.43	0.66	10.00	0.0177	0.0556	0.0160	1.50	0.0313	6.50	0.67	0.24	0.90	0.160	6.27	
16+75	CB-3	100.00	0.90	0.11	2.93	1.35	10.00	0.0063	0.0556	0.0160	1.50	0.0313	6.50	******	******	0.88	0.184	7.81	End

INLET SPACING DESIGN

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)

SUMP DATA

Total Flow (cfs) : 1.29 **Ponded Depth (ft.) :** 0.111 **Spread on Pavement (ft.) :** 6.11

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description :SE Radius Refugee Road to Eastland S. Entrance **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
10+11	Begin																		
11+15	CB-3A	22.00	0.80	0.06	6.94	0.49	10.00	0.0032	0.0556	0.0160	1.50	0.0313	5.32	0.24	0.01	0.26	0.142	5.15	
11+75	CB-3A	60.00	0.68	0.08	2.29	0.95	10.00	0.0068	0.0556	0.0160	1.50	0.0313	5.32	0.28	0.02	0.30	0.133	4.62	
12+45	CB-3A	70.00	0.78	0.10	2.27	0.72	10.00	0.0164	0.0556	0.0160	1.50	0.0313	5.32	0.39	0.04	0.43	0.130	4.42	
13+50	CB-3A	105.00	0.73	0.18	2.44	0.85	10.00	0.0239	0.0556	0.0160	1.50	0.0313	5.32	0.60	0.14	0.74	0.144	5.29	
14+50	CB-3A	100.00	0.74	0.14	2.72	0.82	10.00	0.0235	0.0556	0.0160	1.50	0.0313	5.32	0.57	0.12	0.69	0.142	5.15	
15+45	CB-3A	95.00	0.70	0.17	2.81	0.81	10.00	0.0212	0.0556	0.0160	1.50	0.0313	5.32	0.60	0.15	0.75	0.148	5.51	
16+30	CB-3A	85.00	0.73	0.07	3.09	1.03	10.00	0.0113	0.0556	0.0160	1.50	0.0313	5.32	0.38	0.05	0.43	0.137	4.84	
16+75	CB-3	45.00	0.90	0.05	2.87	1.15	10.00	0.0022	0.0556	0.0160	1.50	0.0313	5.32	******	******	0.29	0.155	5.96	Sag
22+08	Begin																		
20+00	CB-3A	210.00	0.71	0.30	3.33	1.41	10.00	0.0281	0.0556	0.0200	1.50	0.0313	5.32	0.85	0.28	1.13	0.163	5.50	
19+00	CB-3A	100.00	0.51	0.28	13.54	0.74	14.28	0.0251	0.0556	0.0180	1.50	0.0313	4.58	0.72	0.21	0.93	0.155	5.47	
18+50	CB-3A	50.00	0.63	0.16	10.24	0.41	10.75	0.0238	0.0556	0.0160	1.50	0.0313	5.17	0.60	0.14	0.73	0.144	5.29	
17+75	CB-3A	75.00	0.75	0.11	6.43	0.72	10.00	0.0177	0.0556	0.0160	1.50	0.0313	5.32	0.49	0.09	0.58	0.140	5.05	
16+75	CB-3	100.00	0.90	0.10	7.61	1.47	10.00	0.0063	0.0556	0.0160	1.50	0.0313	5.32	******	******	0.57	0.162	6.42	End

INLET SPACING DESIGN

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)

SUMP DATA

Total Flow (cfs) : 0.85 **Ponded Depth (ft.) :** 0.075 **Spread on Pavement (ft.) :** 3.87

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description :NW Radius Refugee to Eastland S. Entrance- 50 yr check **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
10+11	Begin																		
11+15	CB-3A	37.00	0.83	0.08	4.17	0.76	10.00	0.0028	0.0556	0.0200	1.50	0.0313	6.50	0.38	0.06	0.43	0.173	5.98	
11+95	CB-3A	80.00	0.81	0.13	3.63	0.96	10.00	0.0082	0.0556	0.0200	1.50	0.0313	6.50	0.58	0.16	0.74	0.173	5.99	
12+70	CB-3	75.00	0.73	0.21	3.87	0.58	10.00	0.0199	0.0556	0.0200	1.50	0.0313	6.50	0.95	0.21	1.16	0.173	6.00	
13+50	CB-3	80.00	0.78	0.25	4.55	0.50	10.00	0.0300	0.0556	0.0200	1.50	0.0313	6.50	1.15	0.33	1.48	0.175	6.10	
14+50	CB-3A	100.00	0.78	0.20	5.26	0.70	10.00	0.0234	0.0556	0.0200	1.50	0.0313	6.50	0.94	0.40	1.34	0.177	6.18	
16+00	CB-3A	150.00	0.79	0.15	1.87	1.18	10.00	0.0185	0.0556	0.0200	1.50	0.0313	6.50	0.84	0.33	1.17	0.176	6.13	
16+75	CB-3	75.00	0.82	0.10	4.68	1.08	10.00	0.0047	0.0556	0.0200	1.50	0.0313	6.50	******	******	0.86	0.198	7.22	Sag
22+00	Begin																		
20+00	CB-3A	201.00	0.71	0.28	3.11	1.35	10.00	0.0265	0.0556	0.0200	1.50	0.0313	6.50	0.93	0.36	1.29	0.172	5.91	
18+70	CB-3	130.00	0.77	0.20	2.91	0.89	10.00	0.0247	0.0556	0.0200	1.50	0.0313	6.50	1.07	0.29	1.36	0.176	6.15	
17+65	CB-3A	105.00	0.79	0.17	3.03	0.84	10.00	0.0177	0.0556	0.0200	1.50	0.0313	6.50	0.83	0.33	1.16	0.177	6.16	
16+75	CB-3	90.00	0.77	0.11	2.06	1.20	10.00	0.0057	0.0556	0.0200	1.50	0.0313	6.50	******	******	0.88	0.193	6.99	End

SUMP DATA

Total Flow (cfs) : 1.74 **Ponded Depth (ft.) :** 0.144 **Spread on Pavement (ft.) :** 6.85

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description :NW Radius of Refugee Road to Eastland S. entrance **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
10+11	Begin																		
11+15	CB-3A	37.00	0.83	0.08	4.17	0.79	10.00	0.0028	0.0556	0.0200	1.50	0.0313	5.32	0.32	0.03	0.35	0.163	5.46	
11+95	CB-3A	80.00	0.81	0.13	3.63	1.00	10.00	0.0082	0.0556	0.0200	1.50	0.0313	5.32	0.49	0.10	0.59	0.162	5.41	
12+70	CB-3	75.00	0.73	0.21	3.87	0.60	10.00	0.0199	0.0556	0.0200	1.50	0.0313	5.32	0.80	0.12	0.92	0.161	5.39	
13+50	CB-3	80.00	0.78	0.25	4.55	0.52	10.00	0.0300	0.0556	0.0200	1.50	0.0313	5.32	0.96	0.19	1.16	0.163	5.46	
14+50	CB-3A	100.00	0.78	0.20	5.26	0.74	10.00	0.0234	0.0556	0.0200	1.50	0.0313	5.32	0.78	0.24	1.02	0.163	5.47	
16+00	CB-3A	150.00	0.79	0.15	1.87	1.25	10.00	0.0185	0.0556	0.0200	1.50	0.0313	5.32	0.69	0.19	0.87	0.161	5.36	
16+75	CB-3	75.00	0.82	0.10	4.68	1.16	10.00	0.0047	0.0556	0.0200	1.50	0.0313	5.32	******	******	0.62	0.179	6.27	Sag
22+00	Begin																		
20+00	CB-3A	201.00	0.71	0.28	3.11	1.40	10.00	0.0265	0.0556	0.0200	1.50	0.0313	5.32	0.81	0.25	1.06	0.161	5.40	
18+70	CB-3	130.00	0.77	0.20	2.91	0.93	10.00	0.0247	0.0556	0.0200	1.50	0.0313	5.32	0.90	0.17	1.07	0.164	5.51	
17+65	CB-3A	105.00	0.79	0.17	3.03	0.89	10.00	0.0177	0.0556	0.0200	1.50	0.0313	5.32	0.69	0.19	0.88	0.162	5.45	
16+75	CB-3	90.00	0.77	0.11	2.06	1.28	10.00	0.0057	0.0556	0.0200	1.50	0.0313	5.32	******	******	0.64	0.175	6.10	End

SUMP DATA

Total Flow (cfs) : 1.27 **Ponded Depth (ft.) :** 0.109 **Spread on Pavement (ft.) :** 5.12

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description :NW corner of Macsway Ave., left side of Hamilton (from high point back to MacS) **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
40+70	Begin																	
40+00	CB-3A	70.00	0.90	0.05	2.82	2.01	10.00	0.0016	0.0556	0.0200	1.50	0.0313	5.32	0.23	0.01	0.24	0.157	5.19

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Sag NW corner of Kimberly Pkwy., left side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
83+01	Begin																		
84+43	CB-3	146.00	0.83	0.17	6.21	2.26	10.00	0.0045	0.0556	0.0200	1.50	0.0313	4.82	******	******	0.68	0.185	6.58	Sag
48+55	Begin																		
84+43	CB-3	42.00	0.86	0.14	3.27	0.50	10.00	0.0095	0.0556	0.0200	1.50	0.0417	4.82	******	******	0.58	0.157	5.18	End

SUMP DATA

Total Flow (cfs) : 1.26 **Ponded Depth (ft.) :** 0.109 **Spread on Pavement (ft.) :** 4.57

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Sag NW corner of the Eastpoint Dr. intersection, left side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
93+75	Begin																		
94+46	CB-3	80.00	0.68	0.11	6.44	0.76	10.00	0.0209	0.0556	0.0160	1.50	0.0313	4.82	******	******	0.36	0.119	3.70	Sag
55+13	Begin																		
94+46	CB-3	7.00	0.90	0.08	3.47	0.07	10.00	0.0157	0.0556	0.0180	1.50	0.0313	4.82	******	******	0.35	0.123	3.70	End

SUMP DATA

Total Flow (cfs) : 0.71 **Ponded Depth (ft.) :** 0.061 **Spread on Pavement (ft.) :** 2.85

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Sag NE corner of Service Road Entrance 2, right side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
40+70	Begin																		
80+71	CB-3	149.00	0.85	0.13	2.68	1.76	10.00	0.0099	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.59	0.155	5.49	Sag
81+42	Begin																		
80+71	CB-3	72.00	0.90	0.02	1.93	1.33	10.00	0.0064	0.0556	0.0160	1.50	0.0313	5.32	******	******	0.10	0.093	2.10	End

SUMP DATA

Total Flow (cfs) : 0.68 **Ponded Depth (ft.) :** 0.059 **Spread on Pavement (ft.) :** 2.88

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Sag NE corner of Kingsman Ave., right side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
48+29	Begin																		
85+87	CB-3	77.00	0.81	0.11	3.01	0.95	10.00	0.0136	0.0160	0.0160	1.50	0.0417	4.08	******	******	0.36	0.084	5.23	Sag
88+37	Begin																		
85+87	CB-3	251.00	0.70	0.18	1.97	4.45	10.00	0.0045	0.0160	0.0160	1.50	0.0417	4.08	******	******	0.51	0.117	7.32	End

SUMP DATA

Total Flow (cfs) : 0.88 **Ponded Depth (ft.) :** 0.077 **Spread on Pavement (ft.) :** 3.60

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Median for Kingsland Ave. WB Left Turn Lane onto Hamilton SB **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 7.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
86+65	Begin																	
85+87	I-2-6	78.00	0.90	0.01	1.19	2.80	10.00	0.0033	0.0160	0.0160	0.00	0.0417	4.82	0.04	0.00	0.04	0.049	3.07

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Median for Kimberly EB Left Turn Lane onto Hamilton NB **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 7.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
83+01	Begin																	
84+14	I-2-6	113.00	0.90	0.02	0.59	2.97	10.00	0.0047	0.0160	0.0160	0.00	0.0417	4.82	0.09	0.00	0.09	0.060	3.73

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Hamilton Road southbound left turn lane onto Refugee Road **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
10+58	Begin																	
11+15	I-2-6	189.00	0.90	0.05	2.91	2.81	10.00	0.0119	0.0160	0.0160	0.00	0.0417	5.32	0.19	0.05	0.24	0.073	4.58
14+50	I-2-6	180.00	0.90	0.04	1.83	2.04	10.00	0.0236	0.0160	0.0160	0.00	0.0417	5.32	0.17	0.07	0.24	0.065	4.05

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Hamilton Road southbound left turn lane onto Kingsland Avenue **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
48+46	Begin																	
50+25	I-2-6	179.00	0.90	0.02	1.35	5.78	10.00	0.0029	0.0160	0.0160	0.00	0.0417	5.32	0.10	0.00	0.10	0.068	4.23

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Hamilton Road northbound left turn lane into the Eastland S. Entrance **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
21+60	Begin																	
20+00	I-2-6	280.00	0.90	0.03	1.69	3.44	10.00	0.0274	0.0160	0.0160	0.00	0.0417	5.32	0.12	0.02	0.14	0.052	3.23

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description :SW radius @ Macsway to Eastland One NW radius, left side of Hamilton **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
38+79	Begin																		
38+15	CB-3A	79.00	0.90	0.06	3.26	2.05	10.00	0.0019	0.0556	0.0200	1.50	0.0313	5.32	0.27	0.02	0.29	0.162	5.43	
37+35	CB-3A	80.00	0.90	0.07	2.86	1.66	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.32	0.03	0.35	0.161	5.36	
36+65	CB-3A	70.00	0.90	0.07	2.86	1.44	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.03	0.37	0.163	5.46	
35+85	CB-3A	80.00	0.90	0.07	3.05	1.64	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.04	0.37	0.163	5.49	
35+00	CB-3A	83.00	0.90	0.08	2.81	1.48	10.00	0.0040	0.0556	0.0200	1.50	0.0313	5.32	0.37	0.05	0.42	0.162	5.44	
34+00	CB-3A	101.00	0.90	0.11	2.84	1.66	10.00	0.0042	0.0556	0.0200	1.50	0.0313	5.32	0.47	0.11	0.58	0.178	6.21	
32+50	CB-3A	150.00	0.86	0.17	3.11	2.57	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.63	0.26	0.88	0.214	8.01	
31+61	CB-3A	89.00	0.90	0.10	3.16	1.61	10.00	0.0029	0.0556	0.0200	1.50	0.0313	5.32	0.55	0.18	0.74	0.203	7.48	
44+49	CB-3	32.00	0.90	0.08	3.17	0.27	10.00	0.0237	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.57	0.134	4.34	Sag
44+31	Begin																		
44+49	CB-3	14.00	0.90	0.02	2.54	0.22	10.00	0.0093	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.10	0.087	1.69	End

SUMP DATA

Total Flow (cfs) : 0.66 **Ponded Depth (ft.) :** 0.057 **Spread on Pavement (ft.) :** 2.61

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Macsway Ave ahead to Kimberly Pkwy, left side of Hamilton. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
40+70	Begin																	
41+50	CB-3A	80.00	0.90	0.07	2.82	1.80	10.00	0.0025	0.0556	0.0200	1.50	0.0313	5.32	0.31	0.03	0.34	0.163	5.47
42+35	CB-3A	85.00	0.90	0.08	3.05	1.49	10.00	0.0042	0.0556	0.0200	1.50	0.0313	5.32	0.36	0.05	0.41	0.160	5.33
43+10	CB-3A	75.00	0.90	0.07	2.77	1.44	10.00	0.0035	0.0556	0.0200	1.50	0.0313	5.32	0.34	0.04	0.38	0.161	5.37
43+85	CB-3A	80.00	0.90	0.07	2.83	1.52	10.00	0.0036	0.0556	0.0200	1.50	0.0313	5.32	0.34	0.04	0.37	0.159	5.29
44+50	CB-3A	65.00	0.90	0.07	2.88	1.32	10.00	0.0031	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.04	0.37	0.162	5.45
45+10	CB-3A	60.00	0.90	0.06	2.94	1.30	10.00	0.0028	0.0556	0.0200	1.50	0.0313	5.32	0.30	0.02	0.32	0.158	5.24
45+85	CB-3A	75.00	0.90	0.07	2.65	1.53	10.00	0.0031	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.03	0.36	0.161	5.37
46+60	CB-3A	50.00	0.90	0.07	2.64	1.01	10.00	0.0031	0.0556	0.0200	1.50	0.0417	5.32	0.34	0.03	0.37	0.162	5.43
84+14	CB-3A	98.00	0.90	0.15	2.64	1.20	10.00	0.0077	0.0556	0.0200	1.50	0.0313	5.32	0.58	0.17	0.75	0.175	6.10

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Kingsland Avenue to Groves Road, Miller Ditch SAG 50 yr Check **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
48+29	Begin																		
49+25	CB-3A	96.00	0.83	0.08	3.01	1.94	10.00	0.0029	0.0556	0.0200	1.50	0.0313	6.50	0.38	0.06	0.43	0.172	5.93	
50+25	CB-3A	100.00	0.90	0.07	2.45	1.96	10.00	0.0030	0.0556	0.0200	1.50	0.0313	6.50	0.40	0.07	0.47	0.175	6.09	
51+15	CB-3A	90.00	0.90	0.07	2.45	1.76	10.00	0.0030	0.0556	0.0200	1.50	0.0313	6.50	0.40	0.07	0.48	0.177	6.16	
51+90	CB-3A	75.00	0.90	0.07	2.96	1.44	10.00	0.0031	0.0556	0.0200	1.50	0.0313	6.50	0.41	0.07	0.48	0.176	6.14	
53+50	CB-3	160.00	0.85	0.13	2.96	1.77	10.00	0.0096	0.0556	0.0200	1.50	0.0313	6.50	0.70	0.09	0.79	0.172	5.95	
55+00	CB-3A	150.00	0.90	0.13	2.83	1.61	10.00	0.0100	0.0556	0.0200	1.50	0.0313	6.50	0.64	0.21	0.85	0.175	6.09	
55+70	CB-3A	70.00	0.90	0.08	2.83	0.99	10.00	0.0056	0.0556	0.0200	1.50	0.0313	6.50	0.53	0.14	0.67	0.178	6.25	
56+50	CB-3A	80.00	0.90	0.08	2.90	1.16	10.00	0.0056	0.0556	0.0200	1.50	0.0313	6.50	0.49	0.12	0.61	0.173	5.98	
57+50	CB-3A	100.00	0.90	0.09	2.90	1.45	10.00	0.0054	0.0556	0.0200	1.50	0.0313	6.50	0.51	0.13	0.64	0.177	6.17	
58+33	CB-3	106.00	0.82	0.15	2.98	0.91	10.00	0.0167	0.0556	0.0200	1.50	0.0313	6.50	******	******	0.93	0.166	5.65	Sag
63+72	Begin																		
62+45	CB-3A	99.00	0.88	0.16	2.98	0.86	10.00	0.0166	0.0556	0.0200	1.50	0.0313	6.50	0.70	0.21	0.91	0.166	5.62	
61+35	CB-3A	110.00	0.90	0.10	2.91	1.27	10.00	0.0087	0.0556	0.0200	1.50	0.0313	6.50	0.61	0.19	0.80	0.175	6.10	
60+35	CB-3A	105.00	0.90	0.09	3.04	1.31	10.00	0.0075	0.0556	0.0200	1.50	0.0313	6.50	0.56	0.15	0.71	0.173	6.00	
59+50	CB-3A	80.00	0.90	0.07	3.06	1.30	10.00	0.0044	0.0556	0.0200	1.50	0.0313	6.50	0.46	0.10	0.56	0.175	6.08	

INLET SPACING DESIGN

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
58+80	CB-3A	70.00	0.90	0.06	3.07	1.35	10.00	0.0032	0.0556	0.0200	1.50	0.0313	6.50	0.39	0.06	0.45	0.172	5.92	
58+33	CB-3	47.00	0.90	0.05	3.10	1.45	10.00	0.0011	0.0556	0.0200	1.50	0.0313	6.50	******	******	0.35	0.188	6.73	End

SUMP DATA

Total Flow (cfs) : 1.28 **Ponded Depth (ft.) :** 0.110 **Spread on Pavement (ft.) :** 5.18

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Kingsland Avenue to Groves Road, right side of Hamilton **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
48+29	Begin																		
49+25	CB-3A	96.00	0.83	0.08	3.01	2.02	10.00	0.0029	0.0556	0.0200	1.50	0.0313	5.32	0.32	0.03	0.35	0.162	5.42	
50+25	CB-3A	100.00	0.90	0.07	2.45	2.06	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.03	0.37	0.163	5.47	
51+15	CB-3A	90.00	0.90	0.07	2.45	1.85	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.04	0.37	0.163	5.49	
51+90	CB-3A	75.00	0.90	0.07	2.96	1.52	10.00	0.0031	0.0556	0.0200	1.50	0.0313	5.32	0.34	0.04	0.37	0.163	5.46	
53+50	CB-3	160.00	0.85	0.13	2.96	1.86	10.00	0.0096	0.0556	0.0200	1.50	0.0313	5.32	0.58	0.04	0.62	0.160	5.34	
55+00	CB-3A	150.00	0.90	0.13	2.83	1.69	10.00	0.0100	0.0556	0.0200	1.50	0.0313	5.32	0.54	0.12	0.66	0.162	5.45	
55+70	CB-3A	70.00	0.90	0.08	2.83	1.05	10.00	0.0056	0.0556	0.0200	1.50	0.0313	5.32	0.43	0.07	0.51	0.163	5.50	
56+50	CB-3A	80.00	0.90	0.08	2.90	1.22	10.00	0.0056	0.0556	0.0200	1.50	0.0313	5.32	0.40	0.06	0.46	0.158	5.25	
57+50	CB-3A	100.00	0.90	0.09	2.90	1.53	10.00	0.0054	0.0556	0.0200	1.50	0.0313	5.32	0.42	0.07	0.49	0.162	5.45	
58+33	CB-3	106.00	0.82	0.15	2.98	0.96	10.00	0.0167	0.0556	0.0200	1.50	0.0313	5.32	******	******	0.72	0.154	5.03	Sag
63+72	Begin																		
62+45	CB-3A	99.00	0.88	0.16	2.98	0.89	10.00	0.0166	0.0556	0.0200	1.50	0.0313	5.32	0.61	0.14	0.75	0.156	5.13	
61+35	CB-3A	110.00	0.90	0.10	2.91	1.33	10.00	0.0087	0.0556	0.0200	1.50	0.0313	5.32	0.51	0.11	0.62	0.162	5.44	
60+35	CB-3A	105.00	0.90	0.09	3.04	1.38	10.00	0.0075	0.0556	0.0200	1.50	0.0313	5.32	0.46	0.08	0.54	0.159	5.29	
59+50	CB-3A	80.00	0.90	0.07	3.06	1.38	10.00	0.0044	0.0556	0.0200	1.50	0.0313	5.32	0.37	0.05	0.42	0.160	5.31	

INLET SPACING DESIGN

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
58+80	CB-3A	70.00	0.90	0.06	3.07	1.43	10.00	0.0032	0.0556	0.0200	1.50	0.0313	5.32	0.31	0.03	0.33	0.157	5.16	
58+33	CB-3	47.00	0.90	0.05	3.10	1.54	10.00	0.0011	0.0556	0.0200	1.50	0.0313	5.32	******	******	0.26	0.172	5.92	End

SUMP DATA

Total Flow (cfs) : 0.99 **Ponded Depth (ft.) :** 0.087 **Spread on Pavement (ft.) :** 3.99

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : High point on Kimberly Parkway back to the west using ex. systems **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 7.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
83+01	Begin																	
81+00	CB-3A	150.00	0.73	0.28	2.58	1.45	10.00	0.0117	0.0200	0.0200	1.50	0.1700	4.82	0.68	0.31	0.99	0.136	6.79
78+81	CB-3A	269.00	0.67	0.42	2.84	2.47	10.00	0.0102	0.0200	0.0200	1.50	0.1700	4.82	0.96	0.71	1.66	0.170	8.48

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : High point on Kimberly Parkway back to the west using ex. systems **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 7.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
83+01	Begin																	
81+60	CB-3A	131.00	0.86	0.68	2.55	1.09	10.00	0.0085	0.0200	0.0200	1.50	0.1700	4.82	1.34	1.48	2.82	0.214	10.70
78+90	CB-3A	277.00	0.70	0.36	2.87	0.41	10.00	0.9700	0.0200	0.0200	1.50	0.1700	4.82	1.87	0.83	2.70	0.087	4.33

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Kimberly Parkway to Groves Road, Miller Ditch SAG, 50 yr Check **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 50 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
48+55	Begin																		
49+10	CB-3	55.00	0.83	0.08	3.27	1.08	10.00	0.0031	0.0556	0.0200	1.50	0.0313	6.50	0.43	0.00	0.43	0.170	5.84	
49+85	CB-3A	75.00	0.83	0.08	3.27	1.45	10.00	0.0032	0.0556	0.0200	1.50	0.0313	6.50	0.38	0.06	0.44	0.170	5.83	
50+55	CB-3A	70.00	0.90	0.07	3.23	1.36	10.00	0.0031	0.0556	0.0200	1.50	0.0313	6.50	0.40	0.07	0.47	0.174	6.05	
51+35	CB-3	80.00	0.90	0.07	4.44	1.56	10.00	0.0030	0.0556	0.0200	1.50	0.0313	6.50	0.47	0.01	0.48	0.177	6.16	
52+50	CB-3A	115.00	0.85	0.11	3.07	1.60	10.00	0.0061	0.0556	0.0200	1.50	0.0313	6.50	0.50	0.12	0.62	0.171	5.90	
53+25	CB-3A	75.00	0.75	0.12	3.11	0.84	10.00	0.0100	0.0556	0.0200	1.50	0.0313	6.50	0.56	0.14	0.70	0.165	5.59	
54+00	CB-3A	75.00	0.75	0.12	3.15	0.83	10.00	0.0100	0.0556	0.0200	1.50	0.0313	6.50	0.58	0.15	0.72	0.167	5.67	
54+50	CB-3A	50.00	0.77	0.09	3.13	0.58	10.00	0.0100	0.0556	0.0200	1.50	0.0313	6.50	0.50	0.10	0.60	0.157	5.19	
55+60	CB-3	24.00	0.85	0.11	5.14	0.25	10.00	0.0121	0.0556	0.0200	1.50	0.0313	6.50	0.64	0.06	0.70	0.161	5.36	
56+30	CB-3	70.00	0.70	0.12	3.22	1.01	10.00	0.0056	0.0556	0.0200	1.50	0.0313	6.50	0.57	0.04	0.61	0.173	5.96	
57+00	CB-3A	70.00	0.75	0.12	3.23	1.00	10.00	0.0057	0.0556	0.0200	1.50	0.0313	6.50	0.50	0.12	0.62	0.174	6.01	
57+60	CB-3A	60.00	0.72	0.10	3.22	0.92	10.00	0.0050	0.0556	0.0200	1.50	0.0313	6.50	0.48	0.11	0.59	0.174	6.04	
58+00	CB-3A	40.00	0.73	0.07	3.24	0.85	10.00	0.0025	0.0556	0.0200	1.50	0.0313	6.50	0.38	0.06	0.44	0.177	6.19	
58+33	CB-3	33.00	0.73	0.07	3.29	1.08	10.00	0.0009	0.0556	0.0200	1.50	0.0313	6.50	******	******	0.39	0.200	7.33	Sag
63+77	Begin																		

INLET SPACING DESIGN

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
62+60	CB-3A	100.00	0.83	0.18	2.44	0.91	10.00	0.0142	0.0556	0.0200	1.50	0.0313	6.50	0.72	0.25	0.97	0.173	5.98	
61+65	CB-3A	95.00	0.85	0.10	3.24	1.07	10.00	0.0092	0.0556	0.0200	1.50	0.0313	6.50	0.61	0.19	0.80	0.174	6.04	
60+85	CB-3A	80.00	0.90	0.08	2.92	1.12	10.00	0.0059	0.0556	0.0200	1.50	0.0313	6.50	0.52	0.13	0.65	0.175	6.09	
59+90	CB-3	95.00	0.84	0.10	2.92	1.33	10.00	0.0058	0.0556	0.0200	1.50	0.0313	6.50	0.62	0.06	0.68	0.178	6.22	
59+25	CB-3A	65.00	0.72	0.10	3.41	1.08	10.00	0.0043	0.0556	0.0200	1.50	0.0313	6.50	0.44	0.09	0.53	0.172	5.94	
58+75	CB-3A	50.00	0.75	0.08	3.38	0.93	10.00	0.0034	0.0557	0.0200	1.50	0.0313	6.50	0.41	0.07	0.48	0.173	5.98	
58+33	CB-3	42.00	0.70	0.09	3.44	1.26	10.00	0.0010	0.0556	0.0200	1.50	0.0313	6.50	******	******	0.48	0.210	7.81	End

SUMP DATA

Total Flow (cfs) : 0.87 **Ponded Depth (ft.) :** 0.076 **Spread on Pavement (ft.) :** 3.48

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Kimberly Parkway ahead to Groves Road, left side of Hamilton **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
48+55	Begin																		
49+10	CB-3	55.00	0.83	0.08	3.27	1.12	10.00	0.0031	0.0556	0.0200	1.50	0.0313	5.32	0.35	0.00	0.35	0.160	5.34	
49+85	CB-3A	75.00	0.83	0.08	3.27	1.51	10.00	0.0032	0.0556	0.0200	1.50	0.0313	5.32	0.32	0.03	0.35	0.159	5.30	
50+55	CB-3A	70.00	0.90	0.07	3.23	1.42	10.00	0.0031	0.0556	0.0200	1.50	0.0313	5.32	0.33	0.03	0.37	0.162	5.42	
51+35	CB-3	80.00	0.90	0.07	4.44	1.64	10.00	0.0030	0.0556	0.0200	1.50	0.0313	5.32	0.37	0.00	0.37	0.163	5.49	
52+50	CB-3A	115.00	0.85	0.11	3.07	1.67	10.00	0.0061	0.0556	0.0200	1.50	0.0313	5.32	0.43	0.07	0.50	0.160	5.35	
53+25	CB-3A	75.00	0.75	0.12	3.11	0.88	10.00	0.0100	0.0556	0.0200	1.50	0.0313	5.32	0.47	0.08	0.55	0.153	4.99	
54+00	CB-3A	75.00	0.75	0.12	3.15	0.87	10.00	0.0100	0.0556	0.0200	1.50	0.0313	5.32	0.48	0.08	0.56	0.154	5.02	
54+50	CB-3A	50.00	0.77	0.09	3.13	0.61	10.00	0.0100	0.0556	0.0200	1.50	0.0313	5.32	0.41	0.04	0.45	0.144	4.53	
55+60	CB-3	24.00	0.85	0.11	3.47	0.30	10.00	0.0083	0.0556	0.0200	1.50	0.0313	5.32	0.52	0.02	0.54	0.157	5.18	
56+30	CB-3	70.00	0.70	0.12	3.22	1.07	10.00	0.0056	0.0556	0.0200	1.50	0.0313	5.32	0.46	0.01	0.47	0.160	5.31	
57+00	CB-3A	70.00	0.75	0.12	3.23	1.05	10.00	0.0057	0.0556	0.0200	1.50	0.0313	5.32	0.42	0.07	0.49	0.161	5.39	
57+60	CB-3A	60.00	0.72	0.10	3.22	0.96	10.00	0.0050	0.0556	0.0200	1.50	0.0313	5.32	0.39	0.06	0.45	0.160	5.35	
58+00	CB-3A	40.00	0.73	0.07	3.24	0.90	10.00	0.0025	0.0556	0.0200	1.50	0.0313	5.32	0.30	0.02	0.33	0.162	5.43	
58+33	CB-3	33.00	0.73	0.07	3.29	1.15	10.00	0.0009	0.0556	0.0200	1.50	0.0313	5.32	******	******	0.30	0.184	6.51	Sag
63+77	Begin																		

INLET SPACING DESIGN

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
62+60	CB-3A	100.00	0.83	0.18	2.44	0.95	10.00	0.0142	0.0556	0.0200	1.50	0.0313	5.32	0.63	0.17	0.80	0.163	5.46	
61+65	CB-3A	95.00	0.85	0.10	3.24	1.12	10.00	0.0092	0.0556	0.0200	1.50	0.0313	5.32	0.51	0.11	0.62	0.161	5.37	
60+85	CB-3A	80.00	0.90	0.08	2.92	1.18	10.00	0.0059	0.0556	0.0200	1.50	0.0313	5.32	0.42	0.07	0.49	0.160	5.35	
59+90	CB-3	95.00	0.84	0.10	2.92	1.40	10.00	0.0058	0.0556	0.0200	1.50	0.0313	5.32	0.50	0.02	0.51	0.163	5.50	
59+25	CB-3A	65.00	0.72	0.10	3.41	1.14	10.00	0.0043	0.0556	0.0200	1.50	0.0313	5.32	0.36	0.04	0.40	0.158	5.25	
58+75	CB-3A	50.00	0.75	0.08	3.38	0.98	10.00	0.0034	0.0557	0.0200	1.50	0.0313	5.32	0.33	0.03	0.36	0.159	5.28	
58+33	CB-3	42.00	0.70	0.09	3.44	1.34	10.00	0.0010	0.0556	0.0200	1.50	0.0313	5.32	******	******	0.37	0.193	6.98	End

SUMP DATA

Total Flow (cfs) : 0.66 **Ponded Depth (ft.) :** 0.057 **Spread on Pavement (ft.) :** 2.50

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description :SW radius @ Eastland One back into the Mall, right side. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 7.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
44+31	Begin																	
41+50	CB-3A	282.00	0.87	0.20	2.86	3.60	10.00	0.0080	0.0556	0.0160	1.50	0.0313	4.08	0.53	0.18	0.71	0.167	6.74

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description :NW radius @ Eastland One back into the Mall, left side. **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 2 **Total Allow. Spread (ft.) :** 7.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
44+31	Begin																	
41+50	CB-3A	283.00	0.55	0.24	2.53	3.71	10.00	0.0085	0.0556	0.0160	1.50	0.0313	4.08	0.44	0.10	0.54	0.153	5.85

INLET SPACING DESIGN

PID : 95570 **Date :** 02/23/2012 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description :SW radius return @ Eastland One to Eastland S. Entrance, left side of Hamilton **Designer :** Schuster

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
30+39	Begin																		
29+50	CB-3A	90.00	0.84	0.10	3.96	1.36	10.00	0.0058	0.0556	0.0200	1.50	0.0313	5.32	0.39	0.05	0.45	0.156	5.15	
28+30	CB-3A	120.00	0.84	0.10	2.96	1.82	10.00	0.0055	0.0556	0.0200	1.50	0.0313	5.32	0.43	0.07	0.50	0.163	5.49	
27+50	CB-3A	80.00	0.90	0.07	2.85	1.50	10.00	0.0036	0.0556	0.0200	1.50	0.0313	5.32	0.36	0.05	0.41	0.164	5.51	
26+70	CB-3A	80.00	0.90	0.07	2.80	1.53	10.00	0.0035	0.0556	0.0200	1.50	0.0313	5.32	0.34	0.04	0.38	0.161	5.38	
25+50	CB-3A	119.00	0.85	0.11	2.80	1.81	10.00	0.0053	0.0556	0.0200	1.50	0.0313	5.32	0.45	0.09	0.54	0.168	5.71	
23+10	CB-3	240.00	0.88	0.27	2.93	3.14	10.00	0.0047	0.0556	0.0200	1.50	0.0313	5.32	1.04	0.31	1.35	0.227	8.70	
11+49	CB-3	33.00	0.90	0.08	3.09	0.38	10.00	0.0097	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.70	0.164	5.97	Sag
11+23	Begin																		
11+49	CB-3	33.00	0.90	0.03	2.32	0.66	10.00	0.0048	0.0556	0.0180	1.50	0.0313	5.32	******	******	0.14	0.112	3.10	End

SUMP DATA

Total Flow (cfs) : 0.84 **Ponded Depth (ft.) :** 0.074 **Spread on Pavement (ft.) :** 3.55

INLET SPACING DESIGN

PID : 95570 **Date :** 04/11/2016 **Project :** FRA-317-10.63 **Location :** City of Columbus - Hamilton Road 3303E

Description : Groves Road - East, Left Side, Sta. 10+49 Sta. 107+84 - 5 yr Design **Designer :** CAG

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
110+50	Begin																		
109+60	CB-3A	103.00	0.90	0.16	2.66	1.01	10.00	0.0142	0.0556	0.0200	1.50	0.0000	4.82	0.55	0.13	0.67	0.154	5.05	
108+50	CB-3A	65.00	0.92	0.05	2.43	0.70	10.00	0.0149	0.0556	0.0200	1.50	0.0000	4.82	0.32	0.02	0.34	0.124	3.52	
107+84	CB-3	60.00	0.88	0.08	4.07	0.95	10.00	0.0059	0.0556	0.0200	1.50	0.0000	4.82	0.34	0.01	0.34	0.144	4.52	
107+46	CB-3	44.00	0.94	0.06	1.84	0.71	10.00	0.0059	0.0556	0.0200	1.50	0.0000	4.82	******	******	0.29	0.137	4.18	Sag
64+34	Begin																		
107+46	CB-3A	32.00	0.94	0.06	5.00	0.33	10.00	0.0167	0.0556	0.0200	1.50	0.0000	4.82	******	******	0.29	0.115	3.09	End

SUMP DATA

Total Flow (cfs) : 0.58 **Ponded Depth (ft.) :** 0.060 **Spread on Pavement (ft.) :** 4.21

INLET SPACING DESIGN

PID : 95570 **Date :** 04/11/2016 **Project :** FRA-317-10.63 **Location :** City of Columbus - Hamilton Road 3303E

Description : Groves Road - East, Left Side, Sta. 10+49 Sta. 113+50 - 5 yr Design **Designer :** CAG

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
113+50	Begin																		
111+35	CB-3	103.00	0.91	0.16	2.66	1.00	10.00	0.0142	0.0556	0.0200	1.50	0.1667	4.82	0.68	0.00	0.68	0.155	5.08	
10+49	CB-3	55.00	0.91	0.09	2.43	0.61	10.00	0.0142	0.0556	0.0160	1.50	0.1667	4.82	******	******	0.41	0.130	4.44	Sag
12+75	Begin																		
11+75	CB-3A	100.00	0.91	0.12	2.11	1.29	10.00	0.0090	0.0556	0.0160	1.50	0.0000	4.82	0.42	0.10	0.52	0.150	5.68	
10+49	CB-3	125.00	0.91	0.09	1.84	1.00	10.00	0.0275	0.0556	0.0160	1.50	0.0000	4.82	******	******	0.52	0.127	4.22	End

SUMP DATA

Total Flow (cfs) : 0.92 **Ponded Depth (ft.) :** 0.081 **Spread on Pavement (ft.) :** 6.21

INLET SPACING DESIGN

PID : 95570 **Date :** 04/11/2016 **Project :** FRA-317-10.63 **Location :** City of Columbus - Hamilton Road 3303E

Description : Groves Road - East, Right Side, Sta. 107+75 Sto Sta. 113+50 - 5 yr Design **Designer :** CAG

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
113+50	Begin																		
111+47	CB-3A	193.00	0.87	0.09	2.75	2.15	10.00	0.0142	0.0560	0.0160	1.50	0.1667	4.82	0.38	0.00	0.38	0.128	4.24	
110+14	CB-3A	130.00	0.80	0.18	2.98	1.31	10.00	0.0142	0.0560	0.0160	1.50	0.1667	4.82	0.60	0.10	0.70	0.154	5.87	
108+80	CB-3A	130.00	0.88	0.13	3.04	1.30	10.00	0.0149	0.0560	0.0166	1.50	0.1667	4.82	0.57	0.07	0.64	0.149	5.40	
107+75	CB-3A	87.00	0.88	0.09	4.35	1.36	10.00	0.0059	0.0560	0.0160	1.50	0.1667	4.82	******	******	0.46	0.154	5.89	End

INLET SPACING DESIGN

PID : 95570 **Date :** 04/11/2016 **Project :** FRA-317-10.63 **Location :** City of Columbus - Hamilton Road 3303E

Description : Groves Road - West Left Side, Sta. 100+54 to Sta. 103+89 - 5 yr Design **Designer :** CAG

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
100+54	Begin																		
101+94	CB-3A	110.00	0.81	0.10	2.41	2.08	10.00	0.0040	0.0556	0.0160	1.50	0.1667	4.82	0.39	0.01	0.39	0.156	6.03	
102+98	CB-3A	100.00	0.87	0.09	2.32	1.90	10.00	0.0040	0.0556	0.0160	1.50	0.1667	4.82	0.38	0.01	0.39	0.155	5.98	
103+50	CB-3A	46.00	0.85	0.04	2.52	0.99	10.00	0.0040	0.0556	0.0160	1.50	0.1667	4.82	******	******	0.16	0.120	3.77	Sag
103+89	Begin																		
103+50	CB-3A	27.00	0.88	0.02	2.84	0.67	10.00	0.0033	0.0560	0.0160	1.50	0.1667	4.82	******	******	0.10	0.105	2.82	End

SUMP DATA

Total Flow (cfs) : 0.26 **Ponded Depth (ft.) :** 0.008 **Spread on Pavement (ft.) :** 1.47

INLET SPACING DESIGN

PID : 95570 **Date :** 04/11/2016 **Project :** FRA-317-10.63 **Location :** City of Columbus - Hamilton Road 3303E

Description : Groves Road - West, Right Side, Sta. 100+56.00 to Sta. 106+46.00 **Designer :** CAG

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
100+56	Begin																		
102+00	CB-3A	123.00	0.89	0.06	2.64	2.48	10.00	0.0040	0.0556	0.0160	1.50	0.0000	4.82	0.24	0.02	0.27	0.139	4.97	
102+75	CB-3A	71.80	0.90	0.04	2.54	1.52	10.00	0.0040	0.0556	0.0160	1.50	0.0000	4.82	0.19	0.01	0.19	0.126	4.15	
103+50	CB-3	70.20	0.90	0.04	2.62	1.48	10.00	0.0040	0.0556	0.0160	1.50	0.0000	4.82	******	******	0.20	0.127	4.21	Sag
106+46	Begin																		
105+66	CB-3A	49.00	0.80	0.04	2.48	1.17	10.00	0.0031	0.0566	0.0160	1.50	0.0000	4.82	0.16	0.00	0.17	0.126	4.09	
105+07	CB-3	55.00	0.94	0.09	4.11	1.14	10.00	0.0031	0.0556	0.0160	1.50	0.0000	4.82	0.39	0.02	0.41	0.164	6.52	
104+86	CB-3A	17.00	0.76	0.04	2.62	0.41	10.00	0.0030	0.0556	0.0160	1.50	0.0000	4.82	0.18	0.01	0.18	0.129	4.37	
104+30	CB-3	10.00	0.94	0.07	3.27	0.22	10.00	0.0031	0.0556	0.0160	1.50	0.0000	4.82	0.31	0.01	0.32	0.153	5.82	
103+50	CB-3	68.00	0.88	0.06	2.49	1.49	10.00	0.0033	0.0556	0.0160	1.50	0.0000	4.82	******	******	0.26	0.142	5.19	End

SUMP DATA

Total Flow (cfs) : 0.46 **Ponded Depth (ft.) :** 0.035 **Spread on Pavement (ft.) :** 3.33

INLET SPACING DESIGN

PID : 95570 **Date :** 06/02/2016 **Project :** FRA-317-10.63 **Location :** City of Columbus - Hamilton Road 3303E

Description : Groves Road -West Access Road, Sta. 10+64.73 to Sta. 15+10.07 **Designer :** CAG

Rainfall Area: C **Storm Frequency (yr.) :** 5 **Total Allow. Spread (ft.) :** 6.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
106+28	Begin																		
105+87	CB-3	80.00	0.92	0.08	5.00	1.63	10.00	0.0031	0.0556	0.0200	1.50	0.0000	4.82	0.36	0.01	0.36	0.162	5.41	
105+30	CB-3A	50.00	0.86	0.05	2.52	1.17	10.00	0.0031	0.0556	0.0160	1.50	0.0000	4.82	0.19	0.01	0.20	0.133	4.58	
104+60	CB-3A	60.00	0.84	0.05	2.52	1.39	10.00	0.0031	0.0556	0.0160	1.50	0.0000	4.82	0.21	0.01	0.22	0.136	4.81	
104+10	CB-3	26.00	0.93	0.06	5.00	0.57	10.00	0.0031	0.0556	0.0160	1.50	0.0000	4.82	0.29	0.01	0.29	0.148	5.57	
10+75	CB-3A	44.00	0.77	0.04	1.86	0.89	10.00	0.0048	0.0556	0.0160	1.50	0.0000	4.82	******	******	0.14	0.112	3.26	Sag
13+00	Begin																		
12+85	CB-3A	20.00	0.70	1.03	13.16	0.17	13.32	0.0050	0.0556	0.0160	12.00	0.0000	4.24	2.04	1.02	3.06	0.358	6.43	
11+70	CB-3A	110.00	0.70	0.07	5.00	1.06	10.00	0.0137	0.0160	0.0160	12.00	0.0000	4.82	0.64	0.61	1.25	0.133	8.30	
10+75	CB-3A	90.00	0.70	0.06	1.84	0.95	10.00	0.0137	0.0160	0.0160	12.00	0.0000	4.82	******	******	0.81	0.113	7.06	End

SUMP DATA

Total Flow (cfs) : 0.96 **Ponded Depth (ft.) :** 0.105 **Spread on Pavement (ft.) :** 7.94

INLET SPACING DESIGN

PID : 95570 **Date :** 04/11/2016 **Project :** FRA-317-10.63 **Location :** City of Columbus - Hamilton Road 3303E

Description : Hamilton Road - Left Side, Sta. 63+85.00 to Sta. 69+87.00 **Designer :** CAG

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 4.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
69+87	Begin																		
69+22	CB-3	99.30	0.92	0.11	2.02	0.66	10.00	0.0396	0.0556	0.0200	1.50	0.0000	5.32	0.51	0.02	0.53	0.122	3.43	
68+16	CB-3	101.50	0.92	0.12	2.14	0.80	10.00	0.0251	0.0556	0.0200	1.50	0.0000	5.32	0.55	0.04	0.58	0.135	4.10	
67+40	CB-3	71.00	0.92	0.08	2.62	0.71	10.00	0.0161	0.0556	0.0200	1.50	0.0000	5.32	0.41	0.01	0.42	0.131	3.88	
66+64	CB-3	71.00	0.92	0.08	2.62	0.72	10.00	0.0161	0.0556	0.0200	1.50	0.0000	5.32	0.40	0.01	0.41	0.129	3.80	
65+87	CB-3	72.00	0.92	0.08	2.61	0.73	10.00	0.0161	0.0556	0.0200	1.50	0.0000	5.32	0.40	0.01	0.41	0.129	3.80	
65+10	CB-3	72.00	0.92	0.08	2.57	0.72	10.00	0.0167	0.0556	0.0200	1.50	0.0000	5.32	0.40	0.01	0.40	0.129	3.76	
64+39	CB-3	65.70	0.93	0.08	2.62	0.66	10.00	0.0167	0.0556	0.0200	1.50	0.0000	5.32	0.38	0.01	0.39	0.127	3.67	
106+28	CB-3A	40.00	0.92	0.08	2.17	0.40	10.00	0.0167	0.0556	0.0200	1.50	0.0000	5.32	******	******	0.41	0.129	3.77	End

INLET SPACING DESIGN

PID : 95570 **Date :** 04/11/2016 **Project :** FRA-317-10.63 **Location :** City of Columbus - Hamilton Road 3303E

Description : Hamilton Road - Right Side, Sta. 63+85.00 to Sta. 69+87.00 **Designer :** CAG

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 4.00 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)	
69+87	Begin																		
68+35	CB-3A	29.60	0.91	0.03	2.58	0.35	10.00	0.0161	0.0556	0.0200	1.50	0.0000	5.32	0.13	0.00	0.13	0.087	1.68	
67+55	CB-3A	78.00	0.91	0.07	2.62	0.80	10.00	0.0161	0.0556	0.0200	1.50	0.0000	5.32	0.34	0.02	0.36	0.125	3.56	
66+70	CB-3	82.00	0.91	0.07	2.62	0.84	10.00	0.0161	0.0556	0.0200	1.50	0.0000	5.32	0.37	0.01	0.38	0.127	3.67	
65+95	CB-3	73.00	0.92	0.08	2.61	0.73	10.00	0.0165	0.0556	0.0200	1.50	0.0000	5.32	0.40	0.01	0.41	0.130	3.81	
65+15	CB-3	77.00	0.91	0.08	2.57	0.78	10.00	0.0164	0.0556	0.0200	1.50	0.0000	5.32	0.38	0.01	0.38	0.127	3.66	
64+34	CB-3	78.00	0.91	0.08	2.62	0.79	10.00	0.0161	0.0556	0.0200	1.50	0.0000	5.32	******	******	0.39	0.128	3.73	End

INLET SPACING DESIGN

PID : 95570 **Date :** 06/03/2016 **Project :** Hamilton Road **Location :** Columbus, Ohio

Description : Hamilton Road Median Area 340 **Designer :** CAG

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
109+05	Begin																	
108+40	CB-3A	94.00	0.90	0.03	5.00	2.54	10.00	0.0036	0.0160	0.0160	0.00	0.0000	5.32	0.13	0.02	0.14	0.076	4.73
107+75	CB-3A	65.00	0.90	0.03	5.00	1.70	10.00	0.0036	0.0160	0.0160	0.00	0.0000	5.32	0.14	0.02	0.16	0.079	4.93
107+11	CB-3A	64.00	0.90	0.03	5.00	1.66	10.00	0.0036	0.0160	0.0160	0.00	0.0000	5.32	0.14	0.02	0.17	0.080	4.99
106+20	CB-3A	91.00	0.90	0.03	5.00	2.37	10.00	0.0036	0.0160	0.0160	0.00	0.0000	5.32	0.14	0.02	0.17	0.080	5.01

INLET SPACING DESIGN

PID : 95570 **Date :** 06/03/2016 **Project :** Hamilton Road **Location :** Columbus, Ohio

Description : Hamilton Road South of Refugee Left Side **Designer :** CAG

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
109+50	Begin																	
109+00	CB-3A	62.00	0.75	0.07	5.00	1.30	10.00	0.0036	0.0560	0.0160	1.50	0.0000	5.32	0.25	0.03	0.28	0.143	5.22
108+25	CB-3A	70.00	0.75	0.07	5.00	1.44	10.00	0.0036	0.0560	0.0160	1.50	0.0000	5.32	0.27	0.04	0.31	0.147	5.46
107+80	CB-3	55.00	0.75	0.07	5.00	1.13	10.00	0.0036	0.0560	0.0160	1.50	0.0000	5.32	0.30	0.01	0.31	0.147	5.46
107+19	CB-3A	56.00	0.85	0.07	5.00	1.15	10.00	0.0036	0.0560	0.0160	1.50	0.0000	5.32	0.28	0.04	0.31	0.149	5.53
106+60	CB-3A	70.00	0.85	0.08	5.00	1.31	10.00	0.0036	0.0560	0.0200	1.50	0.0000	5.32	0.35	0.05	0.40	0.163	5.45
106+10	CB-3A	50.00	0.80	0.08	5.00	0.94	10.00	0.0036	0.0560	0.0200	1.50	0.0000	5.32	0.34	0.05	0.39	0.162	5.42
105+60	CB-3A	50.00	0.80	0.08	5.00	0.94	10.00	0.0036	0.0560	0.0200	1.50	0.0000	5.32	0.34	0.05	0.39	0.162	5.41
105+19	CB-3	41.00	0.80	0.07	5.00	0.79	10.00	0.0036	0.0560	0.0200	1.50	0.0000	5.32	0.34	0.01	0.35	0.156	5.12
104+38	CB-3	70.00	0.90	0.08	5.00	1.32	10.00	0.0036	0.0560	0.0200	1.50	0.0000	5.32	0.38	0.01	0.39	0.162	5.38
103+60	CB-3A	70.00	0.90	0.08	5.00	1.32	10.00	0.0036	0.0556	0.0200	1.50	0.0000	5.32	0.34	0.05	0.39	0.162	5.42
102+80	CB-3A	75.00	0.90	0.07	5.00	1.42	10.00	0.0036	0.0556	0.0200	1.50	0.0000	5.32	0.34	0.05	0.39	0.161	5.38

INLET SPACING DESIGN

PID : 95570 **Date :** 06/03/2016 **Project :** Hamilton Road **Location :** Columbus, Ohio

Description : Hamilton Road south of Refugee Right side **Designer :** CAG

Rainfall Area: C **Storm Frequency (yr.) :** 10 **Total Allow. Spread (ft.) :** 5.50 **Allowable Depth (ft.)** 0.42

STATION	C.B. Type	GUTTER LENGTH (ft.)	RUNOFF COEF	RUNOFF AREA (acres)	CONC. TIME (min.)	GUTTER TIME (min.)	TIME USED (min.)	LONG. SLOPE (ft./ft.)	GUTT. SLOPE (ft./ft.)	PAVT. SLOPE (ft./ft.)	GUTT. WIDTH (ft.)	LOCAL DEPRESS. (ft.)	RAIN FALL (in./hrs.)	INTERCPTD FLOW (cfs.)	BYPASS FLOW (cfs.)	TOTAL FLOW (cfs.)	DEPTH FLOW (ft.)	PAVT. SPREAD (ft.)
109+10	Begin																	
108+40	CB-3A	70.00	0.86	0.08	5.00	1.34	10.00	0.0036	0.0560	0.0200	1.50	0.0000	5.32	0.32	0.04	0.37	0.159	5.23
107+63	CB-3A	77.00	0.86	0.08	5.00	1.44	10.00	0.0036	0.0560	0.0200	1.50	0.0000	5.32	0.35	0.06	0.41	0.164	5.51
106+95	CB-3A	72.00	0.86	0.07	5.00	1.37	10.00	0.0036	0.0560	0.0200	1.50	0.0000	5.32	0.33	0.05	0.38	0.160	5.31
106+30	CB-3A	65.00	0.86	0.07	5.00	1.24	10.00	0.0036	0.0560	0.0200	1.50	0.0000	5.32	0.32	0.04	0.37	0.159	5.24
105+70	CB-3A	60.00	0.86	0.07	5.00	1.15	10.00	0.0036	0.0560	0.0200	1.50	0.0000	5.32	0.32	0.04	0.36	0.158	5.22
105+23	CB-3A	47.00	0.86	0.05	5.00	0.95	10.00	0.0036	0.0560	0.0200	1.50	0.0000	5.32	0.25	0.02	0.27	0.144	4.52
104+77	CB-3A	63.00	0.86	0.06	5.00	1.31	10.00	0.0036	0.0560	0.0160	1.50	0.0000	5.32	0.26	0.03	0.29	0.145	5.33
104+00	CB-3A	77.00	0.86	0.06	5.00	1.59	10.00	0.0036	0.0560	0.0160	1.50	0.0000	5.32	0.27	0.03	0.31	0.147	5.45
103+35	CB-3A	65.00	0.86	0.06	5.00	1.34	10.00	0.0036	0.0560	0.0160	1.50	0.0000	5.32	0.27	0.04	0.31	0.148	5.49
102+65	CB-3A	65.00	0.86	0.06	5.00	1.34	10.00	0.0036	0.0560	0.0160	1.50	0.0000	5.32	0.27	0.04	0.31	0.148	5.50

Storm Sewer Calculations

FRA-SR 317-10.63
CIP NO. 530103-100052
HAMILTON ROAD
I-70 TO REFUGEE ROAD

June 13, 2016

ms consultants, inc.
engineers, architects, planners
2221 Schrock Road
Columbus, Ohio 43229-1547

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 28 MARCH 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD BOTH SIDES FROM REFUGEE ROAD TO I-270 PLUS SERVICE ROAD 1 BACK TO I-270 RIGHT SIDE

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Pipe Area, A (ft^2)	Thickness (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Upstream HGL Calc. (HIDE)	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D200	11+15R	0.8	0.06	0.05	5.00	0.33	0.42	17	12	0.7854	2.00	753.90	752.73	1.00	751.73	0.0041	3.16	2.48	OK	752.44	752.47	OK	AA-S133A
D201	11+15R		0.06	0.05								754.50	752.66	1.67	751.66					752.40	752.51		0.012
D201	11+15R	0.3	0.00	0.00	5.00	0.33	0.42	60	12	0.7854	2.00	754.50	752.66	1.67	751.66	0.0067	4.02	3.16	OK	752.15	752.51	OK	MH-TYPE C
D202	11+75R		0.06	0.05								754.30	752.26	1.87	751.26					752.11	752.22		0.012
D203	11+75R	0.68	0.08	0.05	5.00	0.38	0.48	17	12	0.7854	2.00	753.50	752.33	1.00	751.33	0.0041	3.16	2.48	OK	752.17	752.22	OK	AA-S125A
D202	11+75R		0.14	0.10								754.30	752.26	1.87	751.26					752.15	752.15		0.012
D202	11+75R	0.3	0.00	0.00	5.00	0.71	0.90	85	12	0.7854	2.00	754.30	752.26	1.87	751.26	0.0138	5.78	4.54	OK	750.77	751.76	OK	MH-TYPE C
D205	12+60R		0.14	0.10								752.86	751.09	1.60	750.09					750.59	751.01		0.012
D204	12+45R	0.78	0.10	0.08	5.00	0.54	0.69	23	12	0.7854	2.00	752.35	751.18	1.00	750.18	0.0039	3.08	2.42	OK	751.37	751.43	OK	ODOT CB 6
D205	12+60R		0.24	0.18								752.86	751.09	1.60	750.09					751.34	751.34		0.012
D205	12+60R	0.3	0.00	0.00	5.00	1.26	1.59	65	12	0.7854	2.00	752.86	751.09	1.60	750.09	0.0302	8.56	6.72	OK	749.25	750.81	OK	MH-TYPE C
D207	13+25R		0.24	0.18								751.30	749.13	2.00	748.13					748.85	748.85		0.012
D207a	12+85R	0.86	0.70	0.60	5.00	4.19	5.29	152	12	0.7854	2.00	751.87	749.52	2.18	748.52	0.0064	3.94	3.09	ERROR	751.19	751.19	OK	Existing CB
D207	13+25R		0.94	0.78					Ex. 8" Clay			751.30	748.55	2.58	747.55					748.27	750.81		0.012
D208	13+50R	0.73	0.18	0.13	5.00	0.92	1.16	30	12	0.7854	2.00	749.84	748.67	1.00	747.67	0.0150	6.04	4.74	OK	747.89	748.17	OK	AA-S125A
D207	13+25R		1.12	0.91								751.30	748.22	2.91	747.22					747.72	#REF!		0.012
D207	13+25R	0.3	0.00	0.00	5.00	6.37	8.03	73	15	1.2272	2.25	751.30	748.22	2.89	746.97	0.0084	5.23	6.41	OK	747.62	747.62	OK	MH-TYPE C
D209	13+97R		1.12	0.91								749.56	747.61	1.76	746.36					746.99	746.99		0.012
D209a	14+78R	0.88	2.56	2.25	10.00	11.94	15.03	145	15	1.2272	2.25	752.13	748.28	3.66	747.03	0.0041	3.65	4.48	ERROR	750.81	750.81	OK	Existing CB
D209	13+97R		3.68	3.17								749.56	747.69	1.68	746.44					747.07	747.17		0.012
D209	14+10R	0.3	0.00	0.00	5.00	22.06	27.84	53	21	2.4053	2.75	749.56	747.61	1.72	745.86	0.0166	9.22	22.18	OK	746.73	747.17	OK	MH-TYPE C
D210	14+50R		3.68	3.17								748.38	746.73	1.42	744.98					746.29	746.76		0.012
D212	14+50R	0.74	0.14	0.10	5.00	0.72	0.91	16	12	0.7854	2.00	747.49	746.32	1.00	745.32	0.0038	3.02	2.37	OK	0.00	0.00	OK	AA-S125A
D210	14+50R		3.82	3.27								748.38	746.26	1.95	745.26					0.00	0.00		0.012
D210	14+50R	0.3	0.00	0.00	5.00	22.78	28.75	112	21	2.4053	2.75	748.38	746.73	1.42	744.98	0.0196	10.01	24.07	OK	0.00	0.00	OK	MH-TYPE C
D214	15+61R		3.82	3.27								746.05	744.54	1.28	742.79					0.00	0.00		0.012
D213	15+45R	0.7	0.17	0.12	5.00	0.83	1.05	18	12	0.7854	2.00	745.48	744.31	1.00	743.31	0.0039	3.07	2.41	OK	0.00	0.00	OK	AA-S125A
D214	15+61R		3.99	3.39								746.05	744.24	1.64	743.24					0.00	743.35		0.012
D218a	15+40R	0.57	3.34	1.90	14.90	8.34	10.48	22	18	1.7671	2.50	751.34	750.14	0.99	748.64	0.1682	26.48	46.79	OK	0.00	0.00	OK	Existing CB
D218	15+49R		3.34	1.90								752.72	746.44	6.07	744.94					0.00	744.04		0.012
D218	15+49R	0.3	0.00	0.00	5.00	13.26	16.74	34	18	1.7671	2.50	752.72	746.44	6.07	744.94	0.0529	14.86	26.25	OK	0.00	0.00	OK	Existing CB
D214	15+61R		3.34	1.90								746.05	744.64	1.20	743.14					0.00	743.35		0.012
D214	15+61R	0.3	0.00	0.00	5.00	36.88	46.53	90	24	3.1416	3.00	746.05	744.54	1.26	742.54	0.0226	11.75	36.91	OK	742.74	744.04	OK	MH-TYPE C
D215	16+50R		7.33	5.29								745.22	742.51	2.46	740.51					742.01	743.25		0.012
D216	16+30R	0.73	0.07	0.05	5.00	0.36	0.45	22	12	0.7854	2.00	744.52	742.85	1.50	741.85	0.0041	3.15	2.48	OK	743.28	743.35	OK	AA-S125A
D215	16+30R		7.40	5.34								745.22	742.76	2.29	741.76					743.26	753.29		0.012
D217	16+75R	0.9	0.05	0.05	5.00	0.31	0.40	27	12	0.7854	2.00	744.42	742.75	1.50	741.75	0.0037	3.00	2.36	OK	743.17	743.25	OK	MH-TYPE C
D215	16+50R		7.45	5.39								745.22	742.65	2.40	741.65					743.15	743.15		0.012
D220	11+15L	0.83	0.08	0.07	5.00	0.46	0.58	6	12	0.7854	2.00	753.96	752.79	1.00	751.79	0.0050	3.48	2.74	OK	753.28	753.29	OK	AA-S125A
D221	11+15L		0.08	0.07								754.65	752.76	1.72	751.76					753.26	753.26		0.012
D221	11+15L	0.3	0.00	0.00	5.00	0.46	0.58	80	12	0.7854	2.00	754.65	752.76	1.72	751.76	0.0082	4.48	3.52	OK	0.00	0.00	OK	MH-TYPE C
D222	11+95L		0.08	0.07								754.00	752.10	1.73	751.10					0.00	0.00		0.012
D223	11+95L	0.81	0.13	0.11	5.00	0.73	0.93	6	12	0.7854	2.00	753.30	752.13	1.00	751.13	0.0050	3.48	2.74	OK	0.00	0.00	OK	ODOT CB 6
D222	11+95L		0.21	0.17								754.00	752.10	1.73	751.10					0.00	0.00		0.012
D222	11+95L	0.3	0.00	0.00	5.00	1.20	1.51	75	12	0.7854	2.00	754.00	752.10	1.73	751.10	0.0239	7.61	5.98	OK	0.00	0.00	OK	MH-TYPE C
D225	12+70L		0.21	0.17								752.52	750.31	2.04	749.31					0.00	0.00		0.012
D206	12+70R	0.9	0.05	0.05	5.00	0.31	0.40	45	12	0.7854	2.00	752.18	750.51	1.50	749.51	0.0038	3.03	2.38	OK	750.86	751.01	OK	AA-S123
D224	12+70L		0.05	0.05								751.81	750.34	1.30	749.34					750.84	750.84		0.012
D224	12+70L	0.73	0.21	0.15	5.00	1.38	1.74	6	12	0.7854	2.00	751.81	750.34	1.30	749.34	0.0050	3.48	2.74	OK	0.00	0.00	OK	AA-S125B
D225	12+70L		0.26	0.20								752.52	750.31	2.04	749.31					0.00	0.00		0.012
D225	12+70L	0.3	0.00	0.00	5.00	2.58	3.25	80	12	0.7854	2.00	752.52	750.31	2.04	749.31	0.0203	7.01	5.51	OK	0.00	0.00	OK	MH-TYPE C
D227	13+50L		0.47	0.37								750.67	748.69	1.81	747.69					0.00	#REF!		0.012
D226	13+50L	0.78	0.25	0.20	5.00	1.36	1.71	7	12	0.7854	2.00	749.89	748.72	1.00	747.72	0.0043	3.23	2.53	OK	0.00	0.00	OK	AA-S125B
D227	13+50L		0.72	0.57								750.67	748.69	1.81	747.69					0.00	749.19		0.012
D227	13+50L	0.3	0.00	0.00	5.00	3.94	4.97	100	12	0.7854	2.00	750.67	748.69	1.81	747.69	0.0262	7.98	6.26	OK	748.33	749.19	OK	MH-TYPE C
D228	14+50L		0.72	0.57								748.34	746.07	2.10	745.07					746.57	746.57		0.012
D211	14+50R	0.9	0.04	0.04	5.00	0.25	0.32	37	12	0.7854	2.00	747.93	746.26	1.50	745.26	0.0038	3.03	2.38	OK	746.64	746.76	OK	AA-S123
D229	14+50L		0.04	0.04								747.55	746.12	1.26	745.12					746.62	746.62		0.012

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 28 MARCH 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD BOTH SIDES FROM REFUGEE ROAD TO I-270 PLUS SERVICE ROAD 1 BACK TO I-270 RIGHT SIDE

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Pipe Area, A (ft^2)	Thickness (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Upstream HGL Calc. (HIDE)	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D229	14+50L	0.78	0.20	0.16	5.00	1.34	1.69	**11**	**12**	0.7854	2.00	**747.55**	746.12	1.26	**745.12**	0.0045	3.32	***2.61***	**OK**	746.61	746.62	**OK**	AA-S125A
D228	14+50L		0.24	0.19								**748.34**	746.07	2.10	**745.07**					746.57	#REF!		0.012
D228	14+50L	0.3	0.00	0.00	5.00	5.27	6.66	**150**	**15**	1.2272	2.25	**748.34**	746.07	2.08	**744.82**	0.0167	7.40	***9.08***	**OK**	0.00	0.00	**OK**	AA-S134A
D230	16+00L		0.96	0.76								**745.58**	743.56	1.83	**742.31**					0.00	744.11		0.012
D231	16+00L	0.79	0.15	0.12	5.00	0.83	1.04	**11**	**12**	0.7854	2.00	**744.78**	743.61	1.00	**742.61**	0.0045	3.32	***2.61***	**OK**	744.09	744.11	**OK**	AA-S125A
D230	16+00L		1.11	0.88								**745.58**	743.56	1.85	**742.56**					744.06	744.06		0.012
D230	16+00L	0.3	0.00	0.00	5.00	6.10	7.70	**50**	**15**	1.2272	2.25	**745.58**	743.56	1.83	**742.31**	0.0082	5.18	***6.35***	**OK**	0.00	0.00	**OK**	AA-S134A
D232	16+50L		1.11	0.88								**745.26**	743.15	1.92	**741.90**					0.00	0.00		0.012
D233	16+75L	0.82	0.10	0.08	5.00	0.57	0.72	**28**	**12**	0.7854	2.00	**744.43**	743.26	1.00	**742.26**	0.0039	3.09	***2.43***	**OK**	0.00	0.00	**OK**	AA-S125B
D232	16+50L		1.21	0.96								**745.26**	743.15	1.94	**742.15**					0.00	0.00		0.012
D232	16+50L	0.3	0.00	0.00	5.00	6.67	8.42	**78**	**15**	1.2272	2.25	**745.26**	743.15	1.92	**741.90**	0.0091	5.46	***6.69***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D215	16+50R		1.21	0.96								**745.22**	742.44	2.59	**741.19**					0.00	0.00		0.012
D215	16+50R	0.3	0.00	0.00	5.00	44.22	55.80	**125**	**30**	4.9087	3.50	**745.22**	742.51	2.42	**740.01**	0.0099	9.04	***44.38***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D240	17+75R		8.66	6.35								**745.81**	741.27	4.25	**738.77**					0.00	0.00		0.012
D241	17+75R	0.75	0.11	0.08	5.00	0.57	0.73	**9**	**12**	0.7854	2.00	**745.05**	742.88	2.00	**741.88**	0.0044	3.29	***2.58***	**OK**	0.00	0.00	**OK**	AA-S125A
D240	17+50R		8.77	6.43								**745.81**	742.84	2.80	**741.84**					0.00	0.00		0.012
D240	17+75R	0.3	0.00	0.00	5.00	44.79	56.52	**45**	**30**	4.9087	3.50	**745.81**	741.27	4.25	**738.77**	0.0102	9.18	***45.05***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D242	18+20R		8.77	6.43								**746.51**	740.81	5.41	**738.31**					0.00	0.00		0.012
D242a	19+09R	0.66	2.38	1.57	5.00	10.94	13.81	**100**	**15**	1.2272	2.25	**752.12**	751.12	0.81	**749.87**	0.1024	18.30	***22.45***	**OK**	0.00	0.00	**OK**	Ex. CB
D242	18+20R		11.15	8.00								**746.51**	740.88	5.44	**739.63**					0.00	0.00		0.012
D250	20+00R	0.71	0.30	0.21	5.00	1.48	1.87	**5**	**12**	0.7854	2.00	**750.08**	746.91	3.00	**745.91**	0.0040	3.12	***2.45***	**OK**	0.00	0.00	**OK**	AA-S125A
D251	20+00R		0.30	0.21								**750.75**	746.89	3.69	**745.89**					0.00	#REF!		0.012
D251	20+00R	0.3	0.00	0.00	5.00	1.48	1.87	**130**	**12**	0.7854	2.00	**750.75**	746.89	3.69	**745.89**	0.0226	7.41	***5.82***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D252	18+70R		0.30	0.21								**747.12**	743.95	3.00	**742.95**					0.00	0.00		0.012
D253	19+00R	0.9	0.07	0.06	5.00	0.44	0.55	**31**	**12**	0.7854	2.00	**747.57**	746.40	1.00	**745.40**	0.0145	5.94	***4.66***	**OK**	0.00	0.00	**OK**	AA-125A
D252	18+70R		0.37	0.28								**747.12**	745.95	1.00	**744.95**					0.00	#REF!		0.012
D254	18+50R	0.63	0.16	0.10	5.00	2.63	3.31	**21**	**12**	0.7854	2.25	**746.38**	745.19	1.00	**744.19**	0.0052	3.57	***2.80***	**OK**	0.00	0.00	**OK**	AA-125A
D252	18+70R		0.53	0.38								**747.12**	745.08	1.85	**744.08**					0.00	#REF!		0.012
D252	18+70R	0.3	0.00	0.00	5.00	2.63	3.31	**51**	**12**	0.7854	2.00	**747.12**	743.95	3.00	**742.95**	0.0335	9.02	***7.09***	**OK**	#REF!	#REF!	**#REF!**	MH-TYPE C
D242	18+20R		0.53	0.38								**746.51**	742.24	4.10	**741.24**					#REF!	#REF!		0.012
D242	18+20R	0.3	0.00	0.00	5.00	58.36	73.64	**84**	**36**	7.0686	4.00	**746.51**	740.81	5.37	**737.81**	0.0086	9.49	***67.08***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D265	17+99L		11.68	8.38								**746.24**	740.09	5.82	**737.09**					0.00	0.00		0.012

ENTERS AN EXISTING STORM MANHOLE, Hamilton Road Sta. 17+99 Lt. 36" RCP El. 737.09

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD LEFT SIDE FROM MACSWAY AVE.BACK TO I-270 (INCLUDES FROM SERVICE ROAD 2 BACL TO SERVICE ROAD 1 ON THE RIGHT SIDE)

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Upstream HGL Calc. (HIDE)	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D160	40+00L	0.9	0.06	0.05	5.00	0.38	0.47	14	12	763.31	760.49	2.65	759.49	0.0043	3.23	2.53	OK	760.21	760.23	OK	AA-S125A
D161	40+00L		0.06	0.05						761.60	760.43	1.00	759.43					760.17	760.28		0.012
D161	41+50L	0.47	0.07	0.03	5.00	0.61	0.76	180	12	761.60	760.43	1.00	759.43	0.0038	3.03	2.38	OK	759.69	760.28	OK	AA-S133A
D162	38+20L		0.13	0.09						761.20	759.75	1.28	758.75					759.60	759.98		0.012
D163	38+15L	0.9	0.06	0.05	5.00	0.38	0.47	15	12	762.76	760.09	2.50	759.09	0.0040	3.12	2.45	OK	759.94	759.98	OK	AA-S125A
D162	38+20L		0.19	0.14						761.20	760.03	1.00	759.03					759.92	759.92		0.012
D162	38+20L	0.56	0.07	0.04	5.00	1.25	1.58	85	12	761.20	759.75	1.28	758.75	0.0096	4.84	3.80	OK	758.67	759.25	OK	AA-S133A
D164	37+35L		0.26	0.18						760.10	758.93	1.00	757.93					758.43	759.47		0.012
D165	37+35L	0.9	0.07	0.06	5.00	0.44	0.55	17	12	762.52	759.00	3.35	758.00	0.0041	3.16	2.48	OK	759.20	759.25	OK	AA-S125A
D164	37+35L		0.33	0.24						760.10	758.93	1.00	757.93					759.18	759.47		0.012
D164	37+35L	0.45	0.08	0.04	5.00	1.94	2.45	85	12	760.10	758.93	1.00	757.93	0.0038	3.02	2.37	OK	759.47	759.47	OK	AA-S133A
D166	36+50L		0.41	0.28						762.00	758.61	3.22	757.61					759.11	759.93		0.012
D167	36+65L	0.9	0.07	0.06	5.00	0.44	0.55	21	12	762.38	760.21	2.00	759.21	0.0038	3.04	2.39	OK	759.89	759.93	OK	ODOT CB 6
D166	36+50L		0.48	0.34						762.00	760.13	1.70	759.13					759.85	759.85		0.012
D166	36+50L	0.3	0.00	0.00	5.00	2.38	3.01	65	12	762.00	758.61	3.22	757.61	0.0038	3.06	2.40	OK	758.29	758.29	OK	MH-TYPE C
D168	35+85L		0.48	0.34						760.60	758.36	2.07	757.36					757.86	757.86		0.012
D169	35+85L	0.9	0.07	0.06	5.00	0.44	0.55	14	12	762.07	759.49	2.41	758.49	0.0043	3.23	2.53	OK	758.98	758.99	OK	AA-S125A
D168	35+85L		0.55	0.41						760.60	759.43	1.00	758.43					758.93	758.98		0.012
D168	35+85L	0.46	0.11	0.05	5.00	3.17	4.01	85	15	760.60	758.36	2.05	757.11	0.0028	3.04	3.73	OK	757.69	757.74	OK	AA-S133A
D170	35+00L		0.66	0.46						760.60	758.12	2.29	756.87					757.50	759.39		0.012
D171	35+00L	0.9	0.08	0.07	5.00	0.50	0.63	13	12	761.73	759.48	2.08	758.48	0.0038	3.06	2.40	OK	758.97	758.98	OK	AA-S125A
D170	35+00L		0.74	0.53						760.60	759.43	1.00	758.43					758.93	759.39		0.012
D170	35+00L	0.48	0.13	0.06	5.00	4.11	5.19	100	15	760.60	758.12	2.29	756.87	0.0035	3.38	4.15	OK	757.50	757.50	OK	AA-S133A
D172	34+00L		0.87	0.59						761.35	757.77	3.39	756.52					757.15	758.02		0.012
D173	34+00L	0.9	0.11	0.10	5.00	0.69	0.87	6	12	761.31	759.14	2.00	758.14	0.0050	3.48	2.74	OK	759.39	759.39	OK	AA-S125A
D172	34+00L		0.98	0.69						761.35	759.11	2.07	758.11					759.36	759.36		0.012
D172	34+00L	0.3	0.00	0.00	5.00	4.80	6.06	150	15	761.35	757.77	3.39	756.52	0.0047	3.93	4.83	OK	757.96	758.02	OK	MH-TYPE C
D174	32+50L		0.98	0.69						760.40	757.06	3.15	755.81					757.31	757.31		0.012
D175	32+50L	0.86	0.17	0.15	5.00	1.02	1.29	10	12	760.86	758.69	2.00	757.69	0.0040	3.12	2.45	OK	0.00	0.00	OK	AA-S125A
D174	32+50L		1.15	0.84						760.40	758.65	1.58	757.65					0.00	0.00		0.012
D174	32+50L	0.5	0.06	0.03	5.00	6.03	7.61	89	15	760.40	757.06	3.15	755.81	0.0074	4.92	6.04	OK	0.00	0.00	OK	AA-S133A
D176	31+61L		1.21	0.87						760.05	756.40	3.46	755.15					0.00	0.00		0.012
D177	31+61L	0.9	0.10	0.09	5.00	0.63	0.79	10	12	760.60	758.43	2.00	757.43	0.0040	3.12	2.45	OK	0.00	0.00	OK	AA-S125A
D176	31+61L		1.31	0.96						760.05	758.39	1.49	757.39					0.00	0.00		0.012
D176	31+61L	0.45	0.08	0.04	5.00	6.91	8.71	30	15	760.05	756.40	3.46	755.15	0.0100	5.72	7.02	OK	0.00	0.00	OK	AA-S133A
D178	44+49L		1.39	0.99						759.84	756.10	3.55	754.85					0.00	755.07		0.012
D178	44+49L	0.9	0.11	0.10	5.00	7.60	9.59	87	18	759.84	756.10	3.53	754.60	0.0045	4.32	7.64	OK	0.00	0.00	OK	AA-S125B
D179	44+54R		1.50	1.09						759.74	755.71	3.82	754.21					0.00	754.58		0.012
D280	41+50L	0.55	0.24	0.13	5.00	0.92	1.16	36	12	757.57	756.40	1.00	755.40	0.0039	3.07	2.41	OK	756.81	756.90	OK	AA-S125A
D281	41+50R		0.24	0.13						757.44	756.26	1.01	755.26					756.76	756.87		0.012
D281	41+50R	0.87	0.20	0.17	5.00	2.13	2.69	9	12	757.44	756.26	1.01	755.26	0.0044	3.29	2.58	OK	756.78	756.78	OK	AA-S125A
D282	41+50R		0.44	0.31						757.50	756.22	1.11	755.22					756.72	756.72		0.012
D282	41+50R	0.3	0.00	0.00	5.00	2.13	2.69	126	12	757.50	756.22	1.11	755.22	0.0038	3.04	2.39	OK	756.87	756.87	OK	MH-TYPE C
D283	42+75R		0.44	0.31						758.00	755.74	2.09	754.74					756.24	756.91		0.012
D283	42+75R	0.3	0.00	0.00	5.00	2.13	2.69	180	12	758.00	755.74	2.09	754.74	0.0037	3.01	2.36	OK	756.46	756.46	OK	MH-TYPE C
D179	44+54R		0.44	0.31						759.74	755.07	4.50	754.07					755.57	756.91		0.012
D179	44+54R	0.9	0.08	0.07	5.00	8.10	10.22	96	18	759.74	755.07	4.46	753.57	0.0051	4.61	8.15	OK	754.88	755.07	OK	AA-S125B
D180	29+50L		1.58	1.16						759.21	754.58	4.42	753.08					754.58	754.58		0.012
D181	29+50L	0.84	0.10	0.08	5.00	0.59	0.74	9	12	759.58	756.41	3.00	755.41	0.0044	3.29	2.58	OK	756.89	756.91	OK	AA-S125A
D180	29+50L		1.68	1.25						759.21	756.37	2.67	755.37					756.87	756.87		0.012
D180	29+50L	0.3	0.00	0.00	5.00	8.68	10.96	120	18	759.21	754.58	4.42	753.08	0.0058	4.93	8.71	OK	754.30	754.58	OK	MH-TYPE C
D182	28+30L		1.68	1.25						758.55	753.88	4.46	752.38					753.88	753.88		0.012
D183	28+30L	0.84	0.10	0.08	5.00	0.59	0.74	9	12	758.92	755.75	3.00	754.75	0.0044	3.29	2.58	OK	756.23	756.25	OK	AA-S125A

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD LEFT SIDE FROM MACSWAY AVE.BACK TO I-270 (INCLUDES FROM SERVICE ROAD 2 BACL TO SERVICE ROAD 1 ON THE RIGHT SIDE)

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Upstream HGL Calc. (HIDE)	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D182	28+30L		1.78	1.33						**758.55**	755.71	2.67	**754.71**					756.21	756.21		0.012
D182	28+30L	0.3	0.00	0.00	5.00	9.27	11.70	**80**	**18**	**758.55**	753.88	4.46	**752.38**	0.0066	5.26	***9.29***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D184	27+50L		1.78	1.33						**758.26**	753.35	4.70	**751.85**					0.00	0.00		0.012
D185	27+50L	0.9	0.07	0.06	5.00	0.44	0.55	**9**	**12**	**758.63**	755.46	3.00	**754.46**	0.0044	3.29	***2.58***	**OK**	0.00	0.00	**OK**	AA-S125A
D184	27+50L		1.85	1.39						**758.26**	755.42	2.67	**754.42**					0.00	0.00		0.012
D184	27+50L	0.3	0.00	0.00	5.00	9.71	12.25	**80**	**18**	**758.26**	753.35	4.70	**751.85**	0.0072	5.50	***9.72***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D186	26+70L		1.85	1.39						**757.98**	752.77	5.00	**751.27**					0.00	#REF!		0.012
D187	26+70L	0.9	0.07	0.06	5.00	0.44	0.55	**9**	**12**	**758.35**	755.18	3.00	**754.18**	0.0044	3.29	***2.58***	**OK**	0.00	0.00	**OK**	AA-S125A
D186	26+70L		1.92	1.46						**757.98**	755.14	2.67	**754.14**					0.00	#REF!		0.012
D188	26+70L	0.47	0.38	0.18	5.00	1.24	1.57	**9**	**12**	**755.90**	754.73	1.00	**753.73**	0.0044	3.29	***2.58***	**OK**	0.00	0.00	**OK**	AA-S133A
D186	26+70L		2.30	1.63						**757.98**	754.69	3.12	**753.69**					0.00	#REF!		0.012
D186	26+70L	0.3	0.00	0.00	5.00	11.39	14.37	**121**	**18**	**757.98**	752.77	5.00	**751.27**	0.0100	6.46	***11.41***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D189	25+50L		2.30	1.63						**757.50**	751.56	5.73	**750.06**					0.00	754.73		0.012
D190	25+50L	0.85	0.11	0.09	5.00	0.65	0.82	**6**	**12**	**757.72**	754.55	3.00	**753.55**	0.0050	3.48	***2.74***	**OK**	0.00	0.00	**OK**	AA-S125A
D189	25+50L		2.41	1.73						**757.50**	754.52	2.81	**753.52**					0.00	754.73		0.012
D189	25+50L	0.3	0.00	0.00	5.00	12.04	15.20	**250**	**21**	**757.50**	751.56	5.71	**749.81**	0.0049	5.02	***12.07***	**OK**	750.56	751.31	**OK**	MH-TYPE C
D193	23+00L		2.41	1.73						**757.23**	750.33	6.67	**748.58**					750.08	755.91		0.012
D191	23+10L	0.54	0.15	0.08	5.00	0.56	0.71	**11**	**12**	**755.40**	754.23	1.00	**753.23**	0.0045	3.32	***2.61***	**OK**	754.70	754.73	**OK**	AA-S123
D193	23+00L		2.56	1.81						**757.23**	754.18	2.88	**753.18**					754.68	754.68		0.012
D192	23+10L	0.88	0.27	0.24	5.00	1.66	2.09	**12**	**12**	**756.58**	755.41	1.00	**754.41**	0.0042	3.18	***2.50***	**OK**	755.91	755.91	**OK**	AA-S125A
D193	23+00L		2.83	2.05						**757.23**	755.36	1.70	**754.36**					755.86	755.86		0.012
D194	11+49L	0.9	0.11	0.10	5.00	0.69	0.87	**21**	**12**	**756.26**	755.09	1.00	**754.09**	0.0038	3.04	***2.39***	**OK**	0.00	0.00	**OK**	AA-S125B
D193	23+00L		2.94	2.15						**757.23**	755.01	2.05	**754.01**					0.00	0.00		0.012
D193	23+00L	0.3	0.00	0.00	5.00	14.95	18.87	**91**	**21**	**757.23**	750.33	6.67	**748.58**	0.0076	6.23	***14.99***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D195	11+56R		2.94	2.15						**755.24**	749.64	5.37	**747.89**					0.00	#REF!		0.012
D195	11+56R	0.8	0.06	0.05	5.00	15.29	19.29	**41**	**21**	**755.24**	749.64	5.37	**747.89**	0.0080	6.42	***15.44***	**OK**	0.00	0.00	**OK**	AA-S125B
D196	21+50L		3.00	2.19						**755.71**	749.31	6.17	**747.56**					0.00	#REF!		0.012
D50	40+00R	0.34	0.30	0.10	11.00	0.52	0.65	**62**	**12**	**760.70**	759.53	1.00	**758.53**	0.0037	3.00	***2.36***	**OK**	759.09	759.27	**OK**	AA-S133A
D51	80+71L		0.30	0.10						**762.01**	759.30	2.54	**758.30**					759.04	759.15		0.012
D51	80+71L	0.86	0.15	0.13	5.00	1.61	2.03	**43**	**12**	**762.01**	759.30	2.54	**758.30**	0.0037	3.01	***2.36***	**OK**	759.13	759.15	**OK**	AA-S125B
D52	80+71R		0.45	0.23						**761.74**	759.14	2.43	**758.14**					758.99	759.30		0.012
D52	80+71R	0.86	0.14	0.12	5.00	2.45	3.09	**107**	**12**	**761.74**	759.14	2.43	**758.14**	0.0040	3.12	***2.45***	**OK**	759.30	759.30	**OK**	AA-S125B
D53	38+00R		0.59	0.35						**762.66**	758.71	3.78	**757.71**					758.60	759.16		0.012
D54	38+00R	0.83	0.08	0.07	5.00	0.46	0.58	**7**	**12**	**762.78**	759.61	3.00	**758.61**	0.0171	6.45	***5.07***	**OK**	759.16	759.16	**OK**	AA-S125A
D53	38+00R		0.67	0.42						**762.66**	759.49	3.00	**758.49**					758.99	759.81		0.012
D53	38+00R	0.3	0.00	0.00	5.00	2.91	3.67	**100**	**12**	**762.66**	758.71	3.78	**757.71**	0.0057	3.72	***2.92***	**OK**	759.32	759.32	**OK**	MH-TYPE C
D55	37+00R		0.67	0.42						**762.36**	758.14	4.05	**757.14**					758.39	759.81		0.012
D56	37+00R	0.9	0.07	0.06	5.00	0.44	0.55	**7**	**12**	**762.48**	759.31	3.00	**758.31**	0.0171	6.45	***5.07***	**OK**	759.76	759.81	**OK**	AA-S125A
D55	37+00R		0.74	0.48						**762.36**	759.19	3.00	**758.19**					759.69	759.69		0.012
D55	37+00R	0.3	0.00	0.00	5.00	3.35	4.23	**100**	**15**	**762.36**	758.14	4.03	**756.89**	0.0030	3.13	***3.84***	**OK**	757.68	757.74	**OK**	MH-TYPE C
D57	36+00R		0.74	0.48						**762.06**	757.84	4.03	**756.59**					757.44	758.04		0.012
D58	36+00R	0.9	0.07	0.06	5.00	0.44	0.55	**7**	**12**	**762.18**	759.01	3.00	**758.01**	0.0171	6.45	***5.07***	**OK**	758.56	758.56	**OK**	AA-S125A
D57	36+00R		0.81	0.54						**762.06**	758.89	3.00	**757.89**					758.39	758.39		0.012
D59	36+00R	0.31	0.41	0.13	9.70	0.68	0.86	**9**	**12**	**760.20**	758.53	1.50	**757.53**	0.0044	3.29	***2.58***	**OK**	758.04	758.04	**OK**	AA-S133A
D57	36+00R		1.22	0.67						**762.06**	758.49	3.40	**757.49**					757.99	758.26		0.012
D57	36+00R	0.3	0.00	0.00	5.00	4.67	5.90	**100**	**15**	**762.06**	757.84	4.03	**756.59**	0.0046	3.88	***4.76***	**OK**	757.21	757.22	**OK**	MH-TYPE C
D60	35+00R		1.22	0.67						**761.76**	757.38	4.19	**756.13**					756.76	757.38		0.012
D61	35+00R	0.9	0.07	0.06	5.00	0.44	0.55	**7**	**12**	**761.88**	758.71	3.00	**757.71**	0.0171	6.45	***5.07***	**OK**	758.26	758.26	**OK**	AA-S125A
D60	35+00R		1.29	0.73						**761.76**	758.59	3.00	**757.59**					758.09	759.08		0.012
D60	35+00R	0.3	0.00	0.00	5.00	5.11	6.45	**100**	**15**	**761.76**	757.38	4.19	**756.13**	0.0054	4.20	***5.16***	**OK**	757.34	757.38	**OK**	MH-TYPE C
D62	34+00R		1.29	0.73						**761.46**	756.84	4.43	**755.59**					756.84	759.08		0.012
D63	34+00R	0.9	0.06	0.05	5.00	0.38	6.93	**7**	**12**	**761.58**	758.41	3.00	**757.41**	0.0171	6.45	***5.07***	**OK**	759.08	759.08	**OK**	AA-S125A
D62	34+00R		1.35	0.79						**761.46**	758.29	3.00	**757.29**					758.79	758.79		0.012

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD LEFT SIDE FROM MACSWAY AVE.BACK TO I-270 (INCLUDES FROM SERVICE ROAD 2 BACL TO SERVICE ROAD 1 ON THE RIGHT SIDE)

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Upstream HGL Calc. (HIDE)	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D64	34+00R	0.36	0.32	0.12	8.80	0.65	0.81	10	12	759.40	757.73	1.50	756.73	0.0040	3.12	2.45	OK	0.00	0.00	OK	AA-S133A
D62	34+00R		1.67	0.90						761.46	757.69	3.60	756.69					0.00	0.00		0.012
D62	34+00R	0.3	0.00	0.00	10.00	4.79	6.03	100	18	761.46	756.84	4.41	755.34	0.0031	3.60	6.35	OK	0.00	0.00	OK	MH-TYPE C
D65	33+00R		1.67	0.90						761.16	756.53	4.42	755.03					0.00	0.00		0.012
D66	33+00R	0.9	0.07	0.06	5.00	0.44	0.55	7	12	761.28	758.11	3.00	757.11	0.0171	6.45	5.07	OK	0.00	0.00	OK	AA-S125A
D65	33+00R		1.74	0.97						761.16	757.99	3.00	756.99					0.00	758.31		0.012
D65	33+00R	0.3	0.00	0.00	5.00	6.73	8.49	100	18	761.16	756.53	4.42	755.03	0.0036	3.87	6.85	OK	0.00	0.00	OK	MH-TYPE C
D67	32+00R		1.74	0.97						760.86	756.17	4.48	754.67					0.00	757.43		0.012
D68	32+00R	0.9	0.07	0.06	5.00	0.44	0.55	7	12	760.98	757.81	3.00	756.81	0.0171	6.45	5.07	OK	758.26	758.31	OK	AA-S125A
D67	32+00R		1.81	1.03						760.86	757.69	3.00	756.69					758.19	758.19		0.012
D69	32+00R	0.34	0.43	0.15	9.30	0.80	1.01	10	12	758.60	756.93	1.50	755.93	0.0040	3.12	2.45	OK	757.42	757.43	OK	AA-S133A
D67	32+00R		2.24	1.18						760.86	756.89	3.80	755.89					757.39	757.39		0.012
D67	32+00R	0.3	0.00	0.00	8.70	6.62	8.34	90	18	760.86	756.17	4.48	754.67	0.0034	3.79	6.70	OK	756.05	756.17	OK	MH-TYPE C
D70	60+45L		2.24	1.18						759.92	755.86	3.85	754.36					755.86	755.86		0.012
D70	60+45L	0.84	0.11	0.09	5.00	8.83	11.14	57	18	759.92	755.86	3.85	754.36	0.0061	5.06	8.94	OK	755.74	755.86	OK	AA-S125B
D71	60+45L		2.35	1.27						759.74	755.51	4.02	754.01					755.51	755.51		0.012
D71	60+45R	0.9	0.09	0.08	5.00	9.40	11.86	39	18	759.74	755.51	4.02	754.01	0.0069	5.37	9.49	OK	0.00	0.00	OK	AA-125B
D72	30+19R		2.44	1.35						761.00	755.24	5.55	753.74					0.00	0.00		0.012
D72a	61+55R	0.75	0.41	0.31	8.70	1.73	2.18	101	12	759.39	756.69	2.53	755.69	0.0040	3.10	2.44	OK	0.00	0.00	OK	Ex. CB
D72	30+19R		2.85	1.66						761.00	756.29	4.54	755.29					0.00	0.00		0.012
D72b	61+37R	0.8	0.24	0.19	7.00	1.18	1.49	72	12	759.02	756.87	1.98	755.87	0.0042	3.18	2.50	OK	0.00	0.00	OK	Ex. CB
D72	30+19R		3.09	1.85						761.00	756.57	4.26	755.57					0.00	0.00		0.012
D72	30+19R	0.3	0.00	0.00	5.00	12.88	16.25	112	21	761.00	755.24	5.53	753.49	0.0056	5.37	12.91	OK	0.00	0.00	OK	MH-TYPE C
D73	29+10R		3.09	1.85						759.29	754.61	4.45	752.86					0.00	0.00		0.012
D74	29+10R	0.8	0.12	0.10	5.00	0.67	0.84	7	12	759.41	756.24	3.00	755.24	0.0129	5.59	4.39	OK	0.00	0.00	OK	AA-125A
D73	29+10R		3.21	1.94						759.29	756.15	2.97	755.15					0.00	#REF!		0.012
D73	29+10R	0.3	0.00	0.00	5.00	13.55	17.09	110	21	759.29	754.61	4.45	752.86	0.0063	5.67	13.63	OK	0.00	0.00	OK	MH-TYPE C
D75	28+00R		3.21	1.94						758.76	753.92	4.61	752.17					0.00	756.21		0.012
D76	28+00R	0.9	0.08	0.07	6.10	0.47	0.59	7	12	758.88	755.71	3.00	754.71	0.0171	6.45	5.07	OK	756.16	756.21	OK	AA-125A
D75	28+00R		3.29	2.02						758.76	755.59	3.00	754.59					756.09	756.09		0.012
D77a	28+08R	0.87	0.22	0.19	5.00	1.33	1.68	23	12	757.44	756.26	1.01	755.26	0.0113	5.24	4.11	OK	756.59	756.76	OK	Ex. CB
D77	28+09R		0.22	0.19						758.00	756.00	1.83	755.00					756.50	#REF!		0.012
D77	28+09R	0.3	0.00	0.00	5.00	1.33	1.68	16	12	758.00	754.33	3.50	753.33	0.0187	6.75	5.30	OK	0.00	0.00	OK	MH-TYPE C
D78	28+00R		0.22	0.19						755.20	754.03	1.00	753.03					0.00	754.53		0.012
D78	28+00R	0.3	0.24	0.07	7.50	1.58	0.54	16	12	755.20	754.03	1.00	753.03	0.0038	3.02	2.37	OK	754.49	754.53	OK	AA-S133A
D75	28+00R		0.46	0.26						758.76	753.97	4.62	752.97					754.47	754.47		0.012
D75	28+00R	0.3	0.00	0.00	5.00	15.88	20.04	100	21	758.76	753.92	4.61	752.17	0.0086	6.64	15.96	OK	0.00	0.00	OK	MH-TYPE C
D79	27+00R		3.75	2.28						758.40	753.06	5.11	751.31					0.00	0.00		0.012
D80	27+00R	0.9	0.07	0.06	5.00	0.44	0.55	7	12	758.52	755.35	3.00	754.35	0.0171	6.45	5.07	OK	0.00	0.00	OK	AA-125A
D79	27+00R		3.82	2.34						758.40	755.23	3.00	754.23					0.00	0.00		0.012
D79	27+00R	0.3	0.00	0.00	5.00	16.32	20.59	100	21	758.40	753.06	5.11	751.31	0.0090	6.79	16.33	OK	0.00	0.00	OK	MH-TYPE C
D81	26+00R		3.82	2.34						758.05	752.16	5.66	750.41					0.00	0.00		0.012
D82	26+00R	0.9	0.07	0.06	5.00	0.44	0.55	7	12	758.17	755.00	3.00	754.00	0.0171	6.45	5.07	OK	0.00	0.00	OK	AA-125A
D81	26+00R		3.89	2.41						758.05	754.88	3.00	753.88					0.00	0.00		0.012
D83	26+00R	0.3	0.22	0.07	5.00	0.46	0.58	16	12	754.40	753.23	1.00	752.23	0.0038	3.02	2.37	OK	0.00	0.00	OK	AA-S133A
D81	26+00R		4.11	2.47						758.05	753.17	4.71	752.17					0.00	0.00		0.012
D81	26+00R	0.3	0.00	0.00	5.00	17.22	21.73	128	24	758.05	752.16	5.64	750.16	0.0049	5.49	17.24	OK	0.00	0.00	OK	MH-TYPE C
D84	24+72R		4.11	2.47						757.53	751.53	5.75	749.53					0.00	0.00		0.012
D85	25+00R	0.9	0.07	0.06	5.40	0.43	0.54	29	12	757.82	754.65	3.00	753.65	0.0376	9.55	7.50	OK	0.00	0.00	OK	ODOT CB-6
D84	24+72R		4.18	2.53						757.53	753.56	3.80	752.56					0.00	0.00		0.012
D86a	25+10R	0.82	0.65	0.53	5.00	3.71	4.69	44	12	756.19	755.38	0.64	754.38	0.0050	3.48	2.74	ERROR	0.00	0.00	OK	Ex. CB
D86	24+72R		0.65	0.53						757.00	755.16	1.67	754.16					0.00	0.00		0.012
D86	24+72R	0.3	0.00	0.00	5.00	3.71	4.69	29	12	757.00	755.16	1.67	754.16	0.0103	5.01	3.94	OK	0.00	0.00	OK	MH-TYPE C

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD LEFT SIDE FROM MACSWAY AVE.BACK TO I-270 (INCLUDES FROM SERVICE ROAD 2 BACL TO SERVICE ROAD 1 ON THE RIGHT SIDE)

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Upstream HGL Calc. (HIDE)	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D84	24+72R		0.65	0.53						757.53	754.86	2.50	753.86					0.00	0.00		0.012
D84	24+72R	0.3	0.00	0.00	5.00	21.37	26.97	72	24	757.53	751.53	5.75	749.53	0.0076	6.84	21.48	OK	0.00	0.00	OK	MH-TYPE C
D87	24+00R		4.83	3.07						757.21	750.98	5.98	748.98					0.00	0.00		0.012
D88	24+00R	0.9	0.07	0.06	6.50	0.40	0.50	7	12	757.33	754.16	3.00	753.16	0.0171	6.45	5.07	OK	0.00	0.00	OK	AA-125A
D87	24+00R		4.90	3.13						757.21	754.04	3.00	753.04					0.00	0.00		0.012
D87	24+00R	0.3	0.00	0.00	5.00	21.81	27.52	100	24	757.21	750.98	5.98	748.98	0.0079	6.95	21.84	OK	0.00	0.00	OK	MH-TYPE C
D89	23+00R		4.90	3.13						756.65	750.19	6.21	748.19					0.00	0.00		0.012
D90	23+00R	0.9	0.07	0.06	6.50	0.40	0.50	7	12	756.77	753.60	3.00	752.60	0.0171	6.45	5.07	OK	0.00	0.00	OK	AA-S125A
D89	23+00R		4.97	3.19						756.65	753.48	3.00	752.48					0.00	0.00		0.012
D91	23+00R	0.38	0.23	0.09	5.30	0.60	0.75	14	12	753.20	752.03	1.00	751.03	0.0043	3.23	2.53	OK	0.00	0.00	OK	AA-S133A
D89	23+00R		5.20	3.28						756.65	751.97	4.51	750.97					0.00	0.00		0.012
D89	23+00R	0.3	0.00	0.00	5.00	22.86	28.84	37	24	756.65	750.19	6.21	748.19	0.0089	7.39	23.21	OK	0.00	0.00	OK	MH-TYPE C
D92	15+46L		5.20	3.28						756.29	749.86	6.18	747.86					0.00	0.00		0.012
D95a	16+33L	0.8	0.82	0.66	5.00	4.57	5.77	43	12	756.15	751.00	4.98	750.00	0.0244	7.70	6.05	OK	0.00	0.00	OK	Ex. CB
D95	15+89L		0.82	0.66					8" PVC	756.74	749.95	6.62	748.95					0.00	0.00		0.012
D95	15+89L	0.3	0.00	0.00	5.00	4.57	5.77	45	12	756.74	749.62	6.95	748.62	0.0147	5.97	4.69	OK	0.00	0.00	OK	MH-TYPE C
D92	15+46L		0.82	0.66						756.29	748.96	7.16	747.96					0.00	0.00		0.012
D92	15+46L	0.8	0.12	0.10	5.00	28.10	35.46	51	24	756.29	749.86	6.18	747.86	0.0131	8.97	28.17	OK	0.00	0.00	OK	AA-S125B
D93	15+46R		6.14	4.03						755.92	749.19	6.48	747.19					0.00	0.00		0.012
D93	15+46R	0.73	0.07	0.05	5.30	27.89	35.19	40	24	755.92	749.19	6.48	747.19	0.0130	8.92	28.02	OK	0.00	0.00	OK	AA-S125B
D94	21+77R		6.21	4.08						755.80	748.67	6.88	746.67					0.00	0.00		0.012
D94	21+77R	0.3	0.00	0.00	5.30	27.89	35.19	100	24	755.80	748.67	6.88	746.67	0.0129	8.88	27.91	OK	0.00	0.00	OK	AA-125B
D196	21+70L		6.21	4.08						755.71	747.38	8.08	745.38					0.00	0.00		0.012
D196	21+70L	0.3	0.00	0.00	5.00	43.74	55.19	170	36	755.71	748.03	7.35	745.03	0.0214	14.98	105.87	OK	743.82	746.53	OK	AA-S133A
D260	20+00L		9.21	6.28						750.78	744.40	6.05	741.40					742.90	742.90		0.012
D261	20+00L	0.71	0.28	0.20	6.50	1.26	1.59	7	12	750.01	746.84	3.00	745.84	0.0043	3.23	2.53	OK	0.00	0.00	OK	AA-125A
D260	20+00L		9.49	6.48						750.78	746.81	3.80	745.81					0.00	0.00		0.012
D260	20+00L	0.3	0.00	0.00	5.00	45.13	56.94	130	36	750.78	744.40	6.05	741.40	0.0215	15.02	106.14	OK	0.00	0.00	OK	MH-TYPE C
D262	18+70L		9.49	6.48						747.58	741.61	5.64	738.61					0.00	0.00		0.012
D263	16+33L	0.9	0.03	0.03	5.00	0.19	0.24	29	12	747.26	744.09	3.00	743.09	0.0159	6.21	4.87	OK	0.00	0.00	OK	AA-S123
D264	15+89L		0.03	0.03						746.80	743.63	3.00	742.63					0.00	0.00		0.012
D264	18+70L	0.77	0.20	0.15	5.00	1.26	1.59	7	12	746.80	743.63	3.00	742.63	0.0043	3.23	2.53	OK	0.00	0.00	OK	AA-S125B
D262	18+70L		0.23	0.18						747.58	743.60	3.81	742.60					0.00	0.00		0.012
D262	18+70L	0.3	0.00	0.00	5.00	46.39	58.53	71	36	747.58	741.61	5.64	738.61	0.0214	15.00	106.01	OK	0.00	0.00	OK	MH-TYPE C
D265	17+99L		9.72	6.66						746.24	740.09	5.82	737.09					0.00	0.00		0.012
D234	17+65L	0.79	0.17	0.13	5.00	0.94	1.18	36	12	744.94	741.77	3.00	740.77	0.0039	3.07	2.41	OK	0.00	0.00	OK	AA-S125A
D265	17+99L		9.89	6.79						746.24	741.63	4.44	740.63					0.00	0.00		0.012

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD RIGHT SIDE FROM SERVICE ROAD 2 (OPPOSITE MACSWAY AVE.) AHEAD TO MILLER DITCH

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D1	41+60R	0.9	0.06	0.05	5.00	0.38	0.47	7	12	763.31	761.14	2.00	760.14	0.0171	6.45	5.07	OK	760.88	760.92	OK	AA-S125A
D2	41+60R		0.06	0.05						763.19	761.02	2.00	760.02					760.76	760.87		0.012
D2	41+60R	0.3	0.00	0.00	5.00	0.38	0.47	100	12	763.19	761.02	2.00	760.02	0.0037	3.00	2.35	OK	760.87	760.87	OK	MH-TYPE C
D3	42+60R		0.06	0.05						762.84	760.65	2.02	759.65					760.50	760.68		0.012
D4	41+60R	0.9	0.08	0.07	5.00	0.50	0.63	5	12	762.96	760.79	2.00	759.79	0.0240	7.63	6.00	OK	760.68	760.68	OK	AA-S125B
D3	42+60R		0.14	0.13						762.84	760.67	2.00	759.67					760.56	760.56		0.012
D5	42+60R	0.56	0.68	0.38	9.10	2.10	2.65	8	12	760.96	759.79	1.00	758.79	0.0037	3.02	2.37	OK	759.29	759.34	OK	AA-S133A
D3	42+60R		0.82	0.51						762.84	759.76	2.91	758.76					759.26	761.02		0.012
D3	42+60R	0.3	0.00	0.00	5.00	3.53	4.46	90	15	762.84	759.76	2.89	758.51	0.0028	3.01	3.70	OK	759.76	759.76	OK	MH-TYPE C
D6	43+50R		0.82	0.51						762.57	759.51	2.87	758.26					759.51	761.02		0.012
D7	43+50R	0.9	0.07	0.06	5.00	0.44	0.55	7	12	762.69	760.52	2.00	759.52	0.0171	6.45	5.07	OK	761.02	761.02	OK	AA-S125A
D6	43+50R		0.89	0.57						762.57	760.40	2.00	759.40					760.90	760.90		0.012
D6	43+50R	0.3	0.00	0.00	5.00	3.97	5.01	85	15	762.57	759.51	2.87	758.26	0.0034	3.34	4.10	OK	759.11	759.11	OK	MH-TYPE C
D8	44+35R		0.89	0.57						762.31	759.22	2.90	757.97					758.82	758.82		0.012
D9	44+35R	0.9	0.07	0.06	5.00	0.44	0.55	7	12	762.43	760.26	2.00	759.26	0.0171	6.45	5.07	OK	759.76	759.81	OK	AA-S125A
D8	44+35R		0.96	0.63						762.31	760.14	2.00	759.14					759.64	759.64		0.012
D10	44+35R	0.35	0.35	0.12	8.80	0.69	0.87	7	12	760.46	759.29	1.00	758.29	0.0071	4.16	3.27	OK	758.79	758.81	OK	AA-S133A
D8	44+35R		1.31	0.76						762.31	759.24	2.90	758.24					758.74	758.74		0.012
D8	44+35R	0.3	0.00	0.00	5.00	5.26	6.64	70	15	762.31	759.22	2.90	757.97	0.0059	4.38	5.37	OK	758.60	758.61	OK	MH-TYPE C
D11	45+00R		1.31	0.76						762.10	758.81	3.10	757.56					758.19	760.56		0.012
D12	45+00R	0.9	0.07	0.06	5.00	0.44	0.55	9	12	762.31	759.14	3.00	758.14	0.0233	7.53	5.91	OK	758.64	758.66	OK	ODOT CB-6
D11	45+05R		1.38	0.82						762.10	758.93	3.00	757.93					758.43	760.69		0.012
D13	42+60R	0.9	0.15	0.14	5.00	0.94	1.19	8	12	762.48	760.31	2.00	759.31	0.0150	6.04	4.74	OK	760.56	760.56	OK	AA-S125A
D14	42+60R		0.15	0.14						762.36	760.19	2.00	759.19					760.44	760.69		0.012
D14	42+60R	0.3	0.00	0.00	5.00	0.94	1.19	160	12	762.36	760.19	2.00	759.19	0.0039	3.09	2.43	OK	760.69	760.69	OK	MH-TYPE C
D15	44+20R		0.15	0.14						762.13	759.56	2.40	758.56					760.06	760.06		0.012
D16	44+20R	0.9	0.16	0.14	5.00	1.00	2.45	8	12	762.40	760.23	2.00	759.23	0.0337	9.05	7.11	OK	0.00	0.00	OK	AA-S125A
D15	44+20R		0.31	0.28						762.13	759.96	2.00	758.96					0.00	0.00		0.012
D15	44+20R	0.3	0.00	0.00	5.00	1.94	2.45	105	12	762.13	759.56	2.40	758.56	0.0037	3.00	2.36	OK	0.00	0.00	OK	MH-TYPE C
D11	45+05R		0.31	0.28						762.10	759.17	2.76	758.17					0.00	0.00		0.012
D11	45+05R	0.3	0.00	0.00	5.00	7.64	9.65	75	18	762.10	758.81	3.08	757.31	0.0045	4.35	7.68	OK	0.00	0.00	OK	MH-TYPE C
D17	45+80R		1.69	1.10						761.87	758.47	3.19	756.97					0.00	758.47		0.012
D18	45+80R	0.9	0.07	0.06	5.00	0.44	10.20	7	12	761.99	758.82	3.00	757.82	0.0171	6.45	5.07	OK	0.00	0.00	OK	AA-S125A
D17	45+80R		1.76	1.16						761.87	758.70	3.00	757.70					0.00	759.06		0.012
D21a	45+69R	0.78	0.25	0.20	5.00	1.36	1.71	94	12	763.15	760.47	2.51	759.47	0.0110	5.16	4.05	OK	760.97	760.97	OK	AA-S133A
D21	45+87R		0.25	0.20					Ex. 8" RCP	759.97	759.44	0.36	758.44					759.94	759.94		0.012
D21	45+87R	0.3	0.18	0.05	5.00	0.38	0.47	13	12	759.28	758.11	1.00	757.11	0.0038	3.06	2.40	OK	758.61	758.61	OK	AA-S133A
D17	45+80		0.43	0.25						761.61	758.06	3.38	757.06					758.56	759.06		0.012
D17	45+80R	0.3	0.00	0.00	5.00	9.82	12.39	85	18	761.87	758.47	3.19	756.97	0.0074	5.56	9.82	OK	758.47	758.47	OK	MH-TYPE C
D19	46+65R		2.19	1.41						761.61	757.84	3.56	756.34					757.84	#REF!		0.012
D20	46+65R	0.9	0.07	0.06	5.00	0.44	0.55	7	12	761.73	758.56	3.00	757.56	0.0171	6.45	5.07	OK	759.06	759.06	OK	AA-S125A
D19	46+65R		2.26	1.47						761.61	758.44	3.00	757.44					758.94	758.94		0.012
D19	46+65R	0.3	0.00	0.00	5.00	10.26	12.94	86	18	761.61	757.84	3.56	756.34	0.0081	5.83	10.29	OK	757.84	757.84	OK	MH-TYPE C
D22	85+87R		2.26	1.47						760.02	757.14	2.67	755.64					757.14	757.14		0.012
D23	86+50R	0.79	0.22	0.17	5.00	1.21	1.53	35	12	760.29	758.12	2.00	757.12	0.0069	4.08	3.20	OK	0.00	0.00	OK	AA-125A
D24	86+16R		0.22	0.17						760.23	757.88	2.18	756.88					0.00	0.00		0.012
D24	86+16R	0.88	0.58	0.51	6.60	4.31	5.44	30	12	760.23	757.88	2.18	756.88	0.0130	5.62	4.41	OK	0.00	0.00	OK	ODOT CB 2-3
D22	85+87R		0.80	0.68						760.02	757.49	2.36	756.49					0.00	0.00		0.012
D22	85+87R	0.81	0.19	0.15	5.00	16.10	20.31	51	21	760.02	757.14	2.65	755.39	0.0088	6.72	16.17	OK	0.00	0.00	OK	AA-125B
D25	85+87L		3.25	2.31						760.11	756.69	3.19	754.94					0.00	0.00		0.012
D25	85+87L	0.75	0.30	0.23	5.00	17.66	22.29	76	21	760.11	756.69	3.19	754.94	0.0107	7.39	17.77	OK	0.00	0.00	OK	AA-125B
D26	48+46R		3.55	2.54						761.06	755.88	4.95	754.13					0.00	0.00		0.012
D26	48+46R	0.3	0.00	0.00	5.00	17.66	22.29	79	21	761.06	755.88	4.95	754.13	0.0106	7.38	17.75	OK	0.00	0.00	OK	MH-TYPE C
D27	49+25R		3.55	2.54						760.82	755.04	5.55	753.29					0.00	0.00		0.012
D28	49+25R	0.83	0.08	0.07	5.00	0.46	0.58	7	12	760.94	757.77	3.00	756.77	0.0171	6.45	5.07	OK	0.00	0.00	OK	AA-125A

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD RIGHT SIDE FROM SERVICE ROAD 2 (OPPOSITE MACSWAY AVE.) AHEAD TO MILLER DITCH

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D27	49+25R		3.63	2.60						**760.82**	757.65	3.00	**756.65**					0.00	755.53		0.012
D27	49+25R	0.3	0.00	0.00	5.00	18.13	22.87	**100**	**24**	**760.82**	755.04	5.53	**753.04**	0.0055	5.80	***18.22***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D29	50+25R		3.63	2.60						**760.52**	754.49	5.78	**752.49**					0.00	758.46		0.012
D30	50+25R	0.37	0.27	0.10	6.10	0.65	0.82	**11**	**12**	**758.20**	755.03	3.00	**754.03**	0.0045	3.32	***2.61***	**OK**	755.53	755.53	**OK**	AA-S133A
D29	50+25R		3.90	2.70						**760.52**	754.98	5.37	**753.98**					755.48	757.97		0.012
D31	50+25R	0.9	0.02	0.02	5.00	0.13	0.16	**30**	**12**	**761.13**	757.96	3.00	**756.96**	0.0163	6.30	***4.95***	**OK**	758.46	758.46	**OK**	AA-S123
D32	50+25R		0.02	0.02						**760.64**	757.47	3.00	**756.47**					757.97	757.97		0.012
D32	50+25R	0.9	0.07	0.06	5.00	0.56	0.71	**7**	**12**	**760.64**	757.47	3.00	**756.47**	0.0171	6.45	***5.07***	**OK**	757.97	757.97	**OK**	AA-125A
D29	50+25R		0.09	0.08						**760.52**	757.35	3.00	**756.35**					757.85	757.85		0.012
D29	50+25R	0.3	0.00	0.00	5.00	19.39	24.46	**90**	**24**	**760.52**	754.49	5.78	**752.49**	0.0063	6.22	***19.56***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D33	51+15R		3.99	2.78						**760.25**	753.92	6.08	**751.92**					0.00	0.00		0.012
D34	51+15R	0.9	0.07	0.06	5.00	0.44	0.55	**7**	**12**	**760.37**	757.20	3.00	**756.20**	0.0171	6.45	***5.07***	**OK**	0.00	0.00	**OK**	AA-125A
D33	51+15R		4.06	2.85						**760.25**	757.08	3.00	**756.08**					0.00	0.00		0.012
D33	51+15R	0.3	0.00	0.00	5.00	19.83	25.02	**75**	**24**	**760.25**	753.92	6.08	**751.92**	0.0065	6.32	***19.86***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D35	51+90R		4.06	2.85						**760.02**	753.43	6.34	**751.43**					0.00	0.00		0.012
D36	51+90R	0.9	0.07	0.06	5.00	0.44	0.55	**7**	**12**	**760.14**	756.97	3.00	**755.97**	0.0171	6.45	***5.07***	**OK**	0.00	0.00	**OK**	AA-125A
D35	51+90R		4.13	2.91						**760.02**	756.85	3.00	**755.85**					0.00	0.00		0.012
D37	51+90R	0.35	0.22	0.08	7.50	0.46	0.58	**20**	**12**	**757.04**	753.87	3.00	**752.87**	0.0040	3.12	***2.45***	**OK**	0.00	0.00	**OK**	AA-S133A
D35	51+90R		4.35	2.99						**760.02**	753.79	6.06	**752.79**					0.00	0.00		0.012
D35	51+90R	0.3	0.00	0.00	5.00	20.80	26.25	**160**	**27**	**760.02**	753.43	6.32	**751.18**	0.0042	5.52	***21.93***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D38	53+50R		4.35	2.99						**758.48**	752.75	5.46	**750.50**					0.00	0.00		0.012
D39	53+50R	0.85	0.13	0.11	5.00	0.77	0.97	**7**	**12**	**758.60**	755.43	3.00	**754.43**	0.0171	6.45	***5.07***	**OK**	0.00	0.00	**OK**	AA-125B
D38	53+50R		4.48	3.10						**758.48**	755.31	3.00	**754.31**					0.00	0.00		0.012
D40	53+50R	0.35	0.33	0.12	5.40	0.78	0.99	**17**	**12**	**756.40**	753.23	3.00	**752.23**	0.0041	3.16	***2.48***	**OK**	0.00	0.00	**OK**	AA-S133A
D38	53+50R		4.81	3.21						**758.48**	753.16	5.15	**752.16**					0.00	0.00		0.012
D38	53+50R	0.3	0.00	0.00	5.00	22.38	28.24	**166**	**27**	**758.48**	752.75	5.46	**750.50**	0.0046	5.76	***22.91***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D41	55+14R		4.81	3.21						**756.75**	751.98	4.50	**749.73**					0.00	0.00		0.012
D42	55+00R	0.9	0.13	0.12	5.00	0.82	1.03	**34**	**12**	**757.10**	753.93	3.00	**752.93**	0.0103	5.00	***3.93***	**OK**	0.00	0.00	**OK**	AA-125A
D41	55+14R		4.94	3.33						**756.75**	753.58	3.00	**752.58**					0.00	0.00		0.012
D43	55+70R	0.9	0.08	0.07	5.00	0.50	0.63	**64**	**12**	**756.79**	753.62	3.00	**752.62**	0.0038	3.02	***2.37***	**OK**	0.00	0.00	**OK**	ODOT CB-6
D41	55+14R		5.02	3.40						**756.75**	753.38	3.20	**752.38**					0.00	0.00		0.012
D41a	55+13R	0.74	0.37	0.27	6.50	1.74	2.19	**61**	**12**	**755.74**	752.84	2.73	**751.84**	0.0016	2.00	***1.57***	**ERROR**	0.00	0.00	**OK**	Existing CB
D41	55+14R		5.39	3.67						**756.75**	752.74	3.84	**751.74**					0.00	0.00		0.012
D41	55+14R	0.4	0.06	0.02	12.00	18.02	22.67	**137**	**27**	**756.75**	751.98	4.50	**749.73**	0.0031	4.68	***18.63***	**OK**	0.00	0.00	**OK**	AA-S133B
D44	56+50R		5.45	3.70						**753.38**	751.56	1.55	**749.31**					0.00	0.00		0.012
D45	56+50R	0.9	0.08	0.07	5.00	0.50	0.63	**23**	**12**	**756.26**	753.09	3.00	**752.09**	0.1252	17.44	***13.69***	**OK**	0.00	0.00	**OK**	AA-125A
D44	56+50R		5.53	3.77						**753.38**	750.21	3.00	**749.21**					0.00	0.00		0.012
D44	56+50R	0.43	0.09	0.04	5.00	26.54	33.49	**100**	**27**	**753.38**	751.46	1.65	**749.21**	0.0064	6.77	***26.91***	**OK**	0.00	0.00	**OK**	AA-S133B
D46	57+50R		5.62	3.81						**753.20**	750.82	2.11	**748.57**					0.00	0.00		0.012
D47	57+50R	0.9	0.08	0.07	5.00	0.50	0.63	**23**	**12**	**755.73**	752.56	3.00	**751.56**	0.1100	16.34	***12.84***	**OK**	0.00	0.00	**OK**	AA-125A
D46	57+50R		5.70	3.88						**753.20**	750.03	3.00	**749.03**					0.00	0.00		0.012
D46	57+50R	0.62	0.28	0.17	5.00	28.25	35.65	**57**	**27**	**753.20**	750.82	2.11	**748.57**	0.0075	7.35	***29.22***	**OK**	0.00	0.00	**OK**	AA-S133B
OUTLET	58+08R		5.98	4.05						**754.16**	750.39	3.50	**748.14**					0.00	0.00		0.012

OUTLETS TO THE DOWNSTREAM CHAMBER OF THE MILLER DITCH STRUCTURE, Hamilton Road Rt. 72"x112" RCP (SE) El. 745.74

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD LEFT SIDE FROM MACSWAY AVE. AHEAD TO MILLER DITCH

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D100	41+50L	0.9	0.05	0.05	5.00	0.31	0.40	**13**	**12**	**763.22**	760.78	2.27	**759.78**	0.0038	3.06	***2.40***	**OK**	760.52	760.52	**OK**	AA-S125A
D101	41+50L		0.05	0.05						**761.90**	760.73	1.00	**759.73**					760.47	760.58		0.012
D101	41+50L	0.5	0.06	0.03	5.00	0.52	0.66	**85**	**12**	**761.90**	760.73	1.00	**759.73**	0.0038	3.02	***2.37***	**OK**	760.58	760.58	**OK**	AA-S133A
D102	42+35R		0.11	0.08						**761.90**	760.41	1.32	**759.41**					760.26	760.67		0.012
D103	42+35L	0.9	0.08	0.07	5.00	0.50	0.63	**12**	**12**	**762.92**	760.78	1.97	**759.78**	0.0042	3.18	***2.50***	**OK**	760.67	760.67	**OK**	AA-S125A
D102	42+35L		0.19	0.15						**761.90**	760.73	1.00	**759.73**					760.62	760.62		0.012
D102	42+35L	0.5	0.06	0.03	9.10	0.98	1.23	**75**	**12**	**761.90**	760.41	1.32	**759.41**	0.0037	3.01	***2.36***	**OK**	759.91	759.91	**OK**	AA-S133A
D104	43+10L		0.25	0.18						**761.96**	760.13	1.66	**759.13**					759.63	760.63		0.012
D105	43+10L	0.9	0.07	0.06	5.00	0.44	0.55	**10**	**12**	**762.66**	760.83	1.66	**759.83**	0.0040	3.12	***2.45***	**OK**	761.08	761.08	**OK**	AA-S125A
D104	43+10L		0.32	0.24						**761.96**	760.79	1.00	**759.79**					761.04	761.04		0.012
D104	43+10L	0.5	0.01	0.01	5.00	1.71	2.15	**75**	**12**	**761.96**	760.13	1.66	**759.13**	0.0037	3.01	***2.36***	**OK**	760.63	760.63	**OK**	AA-S133A
D106	43+85L		0.33	0.25						**761.73**	759.85	1.71	**758.85**					760.35	760.35		0.012
D107	43+85L	0.9	0.07	0.06	5.00	0.44	0.55	**10**	**12**	**762.39**	760.60	1.62	**759.60**	0.0040	3.12	***2.45***	**OK**	760.32	760.32	**OK**	AA-S125A
D106	43+85L		0.40	0.31						**761.73**	760.56	1.00	**759.56**					760.28	760.28		0.012
D106	43+85L	0.54	0.05	0.03	5.00	2.33	2.95	**66**	**12**	**761.73**	759.85	1.71	**758.85**	0.0038	3.03	***2.38***	**OK**	759.35	759.52	**OK**	AA-S133A
D108	44+50L		0.45	0.34						**762.17**	759.60	2.40	**758.60**					759.10	759.39		0.012
D109	44+50L	0.9	0.07	0.06	8.80	0.35	0.44	**14**	**12**	**762.19**	760.52	1.50	**759.52**	0.0043	3.23	***2.53***	**OK**	760.02	760.02	**OK**	AA-S125A
D108	44+50L		0.52	0.40						**762.17**	760.46	1.54	**759.46**					759.96	759.96		0.012
D108	44+50L	0.3	0.00	0.00	5.00	2.77	3.50	**79**	**12**	**762.17**	759.60	2.40	**758.60**	0.0052	3.55	***2.79***	**OK**	759.10	759.39	**OK**	MH-TYPE C
D110	45+28L		0.52	0.40						**761.85**	759.19	2.49	**758.19**					758.69	759.19		0.012
D111	45+10L	0.9	0.07	0.06	5.00	0.44	0.55	**23**	**12**	**762.02**	760.35	1.50	**759.35**	0.0039	3.08	***2.42***	**OK**	759.85	759.85	**OK**	AA-S125A
D110	45+28L		0.59	0.46						**761.85**	760.26	1.42	**759.26**					759.76	759.76		0.012
D110a	45+28L	0.78	0.45	0.35	8.20	2.03	2.55	**33**	**12**	**760.63**	759.98	0.48	**758.98**	0.0058	3.74	***2.94***	**OK**	759.48	759.49	**OK**	Ex. CB
D110	45+28L		1.04	0.81						**761.85**	759.79	1.89	**758.79**					759.29	760.63		0.012
D110	45+28L	0.3	0.00	0.00	5.00	5.66	7.14	**57**	**15**	**761.85**	759.19	2.47	**757.94**	0.0067	4.67	***5.73***	**OK**	759.19	759.19	**OK**	MH-TYPE C
D112	45+85L		1.04	0.81						**761.26**	758.81	2.26	**757.56**					758.81	758.81		0.012
D113	45+85L	0.9	0.07	0.06	5.00	0.44	0.55	**10**	**12**	**761.79**	760.13	1.49	**759.13**	0.0040	3.12	***2.45***	**OK**	760.63	760.63	**OK**	AA-S125A
D112	45+85L		1.11	0.88						**761.26**	760.09	1.00	**759.09**					760.59	760.59		0.012
D112	45+85L	0.55	0.12	0.07	5.00	6.56	8.27	**75**	**15**	**761.26**	758.81	2.26	**757.56**	0.0088	5.36	***6.58***	**OK**	0.00	0.00	**OK**	AA-S133A
D114	46+60L		1.23	0.94						**760.84**	758.15	2.50	**756.90**					0.00	0.00		0.012
D115	46+60L	0.9	0.07	0.06	5.00	0.44	0.55	**10**	**12**	**761.56**	759.71	1.68	**758.71**	0.0040	3.12	***2.45***	**OK**	0.00	0.00	**OK**	AA-S125A
D114	46+60L		1.30	1.00						**760.84**	759.67	1.00	**758.67**					0.00	0.00		0.012
D114	46+60L	0.42	0.10	0.04	5.00	7.29	9.20	**37**	**15**	**760.84**	758.15	2.50	**756.90**	0.0108	5.95	***7.30***	**OK**	0.00	0.00	**OK**	AA-S133A
D116	46+70L		1.40	1.05						**761.18**	757.75	3.24	**756.50**					0.00	0.00		0.012
D116a	46+70L	0.78	0.85	0.66	5.00	4.62	5.83	**32**	**12**	**759.94**	759.07	0.70	**758.07**	0.0056	3.70	***2.90***	**ERROR**	0.00	0.00	**OK**	Ex. CB
D116	46+70L		2.25	1.71						**761.18**	758.89	2.12	**757.89**					0.00	757.12		0.012
D116	46+70L	0.3	0.00	0.00	5.00	11.91	15.02	**57**	**18**	**761.18**	757.75	3.22	**756.25**	0.0111	6.79	***12.00***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D117	84+14R		2.25	1.71						**760.81**	757.12	3.48	**755.62**					0.00	757.94		0.012
D117	84+14R	0.86	0.15	0.13	5.00	12.81	16.16	**45**	**18**	**760.81**	757.12	3.48	**755.62**	0.0127	7.27	***12.84***	**OK**	757.12	757.12	**OK**	AA-S125A
D118	84+14L		2.40	1.84						**761.46**	756.55	4.70	**755.05**					756.55	757.94		0.012
D118	84+14L	0.9	0.02	0.02	5.00	12.93	16.32	**80**	**18**	**761.46**	756.55	4.70	**755.05**	0.0129	7.33	***12.95***	**OK**	756.55	756.55	**OK**	AA-S125A
D119	48+51L		2.42	1.86						**761.60**	755.52	5.87	**754.02**					755.52	755.52		0.012
D120	84+43L	0.84	0.31	0.26	5.00	1.81	2.29	**44**	**12**	**760.61**	757.44	3.00	**756.44**	0.0039	3.06	***2.41***	**OK**	757.94	757.94	**OK**	AA-S133A
D119	48+50L		2.73	2.12						**761.60**	757.27	4.16	**756.27**					757.77	757.77		0.012
D119	48+50L	0.3	0.07	0.02	14.50	9.49	11.93	**62**	**18**	**761.60**	755.52	5.87	**754.02**	0.0069	5.38	***9.50***	**OK**	755.52	755.52	**OK**	ODOT CB 2-3
D121	49+10L		2.80	2.14						**761.50**	755.09	6.20	**753.59**					755.09	755.09		0.012
D122	49+10L	0.83	0.08	0.07	5.00	0.46	0.58	**30**	**12**	**760.84**	758.67	2.00	**757.67**	0.0040	3.12	***2.45***	**OK**	0.00	0.00	**OK**	AA-125B
D121	49+10L		2.88	2.20						**761.50**	758.55	2.78	**757.55**					0.00	0.00		0.012
D121	49+10L	0.3	0.00	0.00	5.00	15.35	19.37	**107**	**21**	**761.50**	755.09	6.18	**753.34**	0.0080	6.42	***15.43***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D123	50+16L		2.88	2.20						**760.65**	754.23	6.19	**752.48**					0.00	0.00		0.012
D124	49+85L	0.83	0.08	0.07	5.00	0.46	0.58	**44**	**12**	**760.62**	758.45	2.00	**757.45**	0.0039	3.06	***2.41***	**OK**	0.00	0.00	**OK**	AA-S125A
D123	50+16L		2.96	2.27						**760.65**	758.28	2.20	**757.28**					0.00	0.00		0.012
D123a	81+35L	0.77	0.92	0.71	5.40	4.81	6.06	**299**	**18**	**760.01**	757.96	1.84	**756.46**	0.0014	2.42	***4.28***	**ERROR**	0.00	0.00	**OK**	Ex. CB
D123	50+16L		3.88	2.98						**760.65**	757.54	2.90	**756.04**					0.00	0.00		0.012
D123	50+16L	0.3	0.00	0.00	5.00	20.75	26.19	**55**	**24**	**760.65**	754.23	6.17	**752.23**	0.0073	6.67	***20.96***	**OK**	0.00	0.00	**OK**	MH-TYPE C

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD LEFT SIDE FROM MACSWAY AVE. AHEAD TO MILLER DITCH

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D125	50+71L		3.88	2.98						**760.50**	753.83	6.42	**751.83**					0.00	0.00		0.012
D125a	50+71L	0.82	0.98	0.80	5.30	5.49	6.92	**15**	**12**	**759.67**	758.12	1.38	**757.12**	0.0327	8.91	***6.99***	**OK**	0.00	0.00	**OK**	Ex. CB
D125	50+71L		4.86	3.78						**760.50**	757.63	2.70	**756.63**					0.00	752.66		0.012
D126	50+55L	0.9	0.07	0.06	5.00	0.44	0.55	**12**	**12**	**760.40**	758.23	2.00	**757.23**	0.0042	3.18	***2.50***	**OK**	0.00	0.00	**OK**	AA-S125A
D127	50+50L		0.07	0.06						**759.40**	758.18	1.05	**757.18**					0.00	0.00		0.012
D127	50+50L	0.47	0.25	0.12	9.50	0.64	0.80	**30**	**12**	**759.40**	758.18	1.05	**757.18**	0.0040	3.12	***2.45***	**OK**	0.00	0.00	**OK**	AA-S125A
D125	50+71L		0.32	0.18						**760.50**	758.06	2.27	**757.06**					0.00	761.53		0.012
D125	50+71L	0.3	0.00	0.00	5.00	27.61	34.84	**91**	**30**	**760.50**	753.83	6.38	**751.33**	0.0038	5.63	***27.63***	**OK**	0.00	0.00	**OK**	AA-S125A
D128	51+62L		5.18	3.96						**760.60**	753.48	6.83	**750.98**					0.00	761.53		0.012
D129	51+35L	0.9	0.07	0.06	5.00	0.44	0.55	**41**	**12**	**760.16**	757.99	2.00	**756.99**	0.0039	3.08	***2.42***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D128	51+62L		5.25	4.03						**760.60**	757.83	2.60	**756.83**					0.00	752.66		0.012
D128a	92+35R	0.76	1.82	1.38	5.00	9.64	12.16	**273**	**15**	**760.75**	757.90	2.66	**756.65**	0.0044	3.78	***4.63***	**ERROR**	758.15	761.53	**ERROR**	Ex. CB
D128	51+62L		7.07	5.41						**760.60**	756.71	3.70	**755.46**					756.96	758.79		0.012
D128	51+62L	0.9	0.02	0.02	5.00	37.81	47.71	**88**	**30**	**760.60**	753.48	6.83	**750.98**	0.0073	7.74	***38.00***	**OK**	752.66	752.66	**OK**	AA-S123
D130	52+50L		7.09	5.43						**761.10**	752.84	7.97	**750.34**					752.02	752.02		0.012
D131	52+50L	0.85	0.11	0.09	5.00	0.65	0.82	**31**	**12**	**759.46**	758.29	1.00	**757.29**	0.0039	3.07	***2.41***	**OK**	758.79	758.79	**OK**	AA-S125A
D130	52+50L		7.20	5.52						**761.10**	758.17	2.76	**757.17**					758.67	758.67		0.012
D130	52+50L	0.3	0.00	0.00	5.00	38.46	48.53	**75**	**30**	**761.10**	752.84	7.97	**750.34**	0.0075	7.84	***38.50***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D132	53+25L		7.20	5.52						**761.00**	752.28	8.43	**749.78**					0.00	0.00		0.012
D133	53+25L	0.75	0.12	0.09	5.00	0.63	0.79	**31**	**12**	**758.71**	757.54	1.00	**756.54**	0.0039	3.07	***2.41***	**OK**	0.00	0.00	**OK**	AA-S125A
D132	53+25L		7.32	5.61						**761.00**	757.42	3.41	**756.42**					0.00	0.00		0.012
D132	53+25L	0.3	0.00	0.00	5.00	39.09	49.32	**75**	**30**	**761.00**	752.28	8.43	**749.78**	0.0077	7.98	***39.18***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D134	54+00L		7.32	5.61						**759.80**	751.70	7.81	**749.20**					0.00	0.00		0.012
D135	54+00L	0.75	0.12	0.09	5.00	0.63	0.79	**31**	**12**	**757.96**	756.79	1.00	**755.79**	0.0039	3.07	***2.41***	**OK**	0.00	0.00	**OK**	AA-S125A
D134	54+00L		7.44	5.70						**759.80**	756.67	2.96	**755.67**					0.00	0.00		0.012
D134	54+00L	0.3	0.00	0.00	7.50	34.17	43.06	**43**	**30**	**759.80**	751.70	7.81	**749.20**	0.0060	7.06	***34.65***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D136	54+42L		7.44	5.70						**758.10**	751.44	6.37	**748.94**					0.00	0.00		0.012
D137	54+50L	0.77	0.09	0.07	5.00	0.48	0.61	**31**	**12**	**757.46**	756.29	1.00	**755.29**	0.0039	3.07	***2.41***	**OK**	0.00	0.00	**OK**	AA-S125A
D136	54+42L		7.53	5.77						**758.10**	756.17	1.76	**755.17**					0.00	0.00		0.012
D138	94+46R	0.78	0.10	0.08	5.00	0.54	0.69	**39**	**12**	**757.10**	755.93	1.00	**754.93**	0.0038	3.06	***2.40***	**OK**	0.00	0.00	**OK**	AA-S125B
D136	54+42L		7.63	5.85						**758.10**	755.78	2.15	**754.78**					0.00	0.00		0.012
D139a	93+72R	0.71	1.81	1.29	12.10	6.24	7.84	**43**	**15**	**758.59**	756.09	2.31	**754.84**	0.0051	4.09	***5.02***	**ERROR**	0.00	0.00	**OK**	Existing CB
D139	1+97C		1.81	1.29						**758.14**	755.87	2.08	**754.62**					0.00	0.00		0.012
D139	1+97C	0.71	0.22	0.16	5.00	10.04	12.67	**14**	**15**	**758.14**	755.87	2.08	**754.62**	0.0207	8.23	***10.10***	**OK**	0.00	0.00	**OK**	ODOT CB-6
D136	54+42L		2.03	1.44						**758.10**	755.58	2.33	**754.33**					0.00	0.00		0.012
D136	54+42L	0.3	0.00	0.00	5.00	50.78	64.08	**118**	**36**	**758.10**	751.44	6.33	**748.44**	0.0049	7.19	***50.79***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D140	55+60L		9.66	7.29						**757.92**	750.86	6.73	**747.86**					0.00	0.00		0.012
D141	94+46L	0.77	0.19	0.15	5.00	1.02	1.29	**36**	**12**	**756.71**	755.54	1.00	**754.54**	0.0039	3.07	***2.41***	**OK**	0.00	0.00	**OK**	AA-S125B
D140	55+60L		9.85	7.44						**757.92**	755.40	2.35	**754.40**					0.00	0.00		0.012
D142	55+60L	0.85	0.11	0.09	5.00	0.65	0.82	**31**	**12**	**756.62**	755.45	1.00	**754.45**	0.0039	3.07	***2.41***	**OK**	0.00	0.00	**OK**	AA-S125B
D140	55+60L		9.96	7.53						**757.92**	755.33	2.42	**754.33**					0.00	0.00		0.012
D143	3+15C	0.79	0.11	0.09	5.00	0.61	0.76	**14**	**12**	**757.78**	754.61	3.00	**753.61**	0.0043	3.23	***2.53***	**OK**	0.00	0.00	**OK**	ODOT CB-2-3
D140	55+60L		10.07	7.62						**757.92**	754.55	3.20	**753.55**					0.00	0.00		0.012
D140	55+60L	0.3	0.00	0.00	5.00	53.06	66.95	**70**	**36**	**757.92**	750.86	6.73	**747.86**	0.0054	7.55	***53.38***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D144	56+30L		10.07	7.62						**759.10**	750.48	8.29	**747.48**					0.00	0.00		0.012
D145	56+30L	0.7	0.12	0.08	5.00	0.59	0.74	**31**	**12**	**756.23**	755.06	1.00	**754.06**	0.0039	3.07	***2.41***	**OK**	0.00	0.00	**OK**	AA-S125B
D144	56+30L		10.19	7.70						**759.10**	754.94	3.99	**753.94**					0.00	0.00		0.012
D144	56+30L	0.3	0.00	0.00	5.00	53.64	67.69	**70**	**36**	**759.10**	750.48	8.29	**747.48**	0.0056	7.65	***54.08***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D146	57+00L		10.19	7.70						**759.30**	750.09	8.88	**747.09**					0.00	#REF!		0.012
D147	57+00L	0.75	0.12	0.09	5.00	0.63	0.79	**31**	**12**	**755.83**	754.66	1.00	**753.66**	0.0039	3.07	***2.41***	**OK**	0.00	0.00	**OK**	AA-S125A
D146	57+00L		10.31	7.79						**759.30**	754.54	4.59	**753.54**					0.00	#REF!		0.012
D146	57+00L	0.3	0.00	0.00	5.00	54.27	68.48	**100**	**36**	**759.30**	750.09	8.88	**747.09**	0.0057	7.74	***54.70***	**OK**	0.00	#REF!	**#REF!**	MH-TYPE C
D150	58+00L		10.31	7.79						**758.30**	749.52	8.45	**746.52**					0.00	#REF!		0.012
D149	57+60L	0.72	0.10	0.07	5.00	0.50	0.63	**51**	**12**	**755.53**	754.36	1.00	**753.36**	0.0037	3.01	***2.36***	**OK**	0.00	0.00	**OK**	AA-S125A
D150	D1		10.41	7.86						**758.30**	754.17	3.96	**753.17**					0.00	0.00		0.012

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD LEFT SIDE FROM MACSWAY AVE. AHEAD TO MILLER DITCH

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D151	58+00L	0.73	0.07	0.05	5.00	0.36	0.45	**31**	**12**	**755.43**	754.26	1.00	**753.26**	0.0039	3.07	***2.41***	**OK**	0.00	0.00	**OK**	AA-S125A
D150	58+00L		10.48	7.91						**758.30**	754.14	3.99	**753.14**					0.00	0.00		0.012
D150	58+00L	0.3	0.00	0.00	5.00	55.13	69.56	**75**	**36**	**758.30**	749.52	8.45	**746.52**	0.0060	7.94	***56.12***	**OK**	0.00	0.00	**OK**	MH-TYPE C
D154	58+75L		10.48	7.91						**756.70**	749.07	7.30	**746.07**					0.00	#REF!		0.012
D155	58+75L	0.9	0.03	0.03	5.00	0.19	0.24	**7**	**12**	**755.44**	753.27	2.00	**752.27**	0.0043	3.23	***2.53***	**OK**	0.00	0.00	**OK**	AA-S125A
D156	58+75L		0.03	0.03						**754.70**	753.24	1.29	**752.24**					0.00	0.00		0.012
D153	58+33L	0.73	0.07	0.05	5.00	0.36	0.45	**31**	**12**	**755.40**	754.23	1.00	**753.23**	0.0319	8.81	***6.92***	**OK**	0.00	0.00	**OK**	AA-125B
D156	58+75L		0.10	0.08						**754.70**	753.24	1.29	**752.24**					0.00	0.00		0.012
D156	58+75L	0.67	0.13	0.09	5.00	0.61	0.77	**23**	**12**	**754.70**	753.24	1.29	**752.24**	0.0039	3.08	***2.42***	**OK**	0.00	0.00	**OK**	AA-S133A
D154	58+75L		0.16	0.11						**756.70**	753.15	3.38	**752.15**					0.00	0.00		0.012
D154	58+75L	0.3	0.00	0.00	5.00	55.92	70.57	**34**	**36**	**756.70**	749.07	7.30	**746.07**	0.0062	8.06	***56.94***	**OK**	0.00	0.00	**OK**	MH-TYPE C
OUTLET	59+01L		10.64	8.03						**755.00**	748.86	5.81	**745.86**					0.00	0.00		0.012

OUTLETS INTO THE SIDE OF THE MILLER DITCH STRUCTURE, Hamilton Road Lt. Incoming culvert 52"x83" RCP (SE) El. 745.68

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD RIGHT SIDE FROM SERVICE ROAD 2 (OPOSITE MACSWAY AVE.) AHEAD TO MILLER DITCH

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D-306	104+30R	0.94	0.07	0.07	5.00	0.46	0.58	14	12	759.01	757.19	1.65	756.19	0.0057	3.72	2.93	OK	756.69	756.69	OK	AA-S125B
D-347	104+31R		0.07	0.07						759.28	757.11	2.00	756.11					756.61	756.61		0.012
D-347	104+31R	0.90	0.05	0.05	5.00	0.78	0.98	59	15	759.28	757.09	2.00	755.84	0.0031	3.16	3.88	OK	756.47	756.47	OK	AA-S133A
D-348	104+90R		0.12	0.11						759.85	756.91	2.75	755.66					756.29	756.63		0.012
D-309	105+07R	0.94	0.09	0.08	5.00	0.57	0.72	21	12	759.25	757.13	1.95	756.13	0.0057	3.72	2.93	OK	756.63	756.63	OK	AA-S125B
D-308	104+86R		0.21	0.19						759.18	757.01	2.00	756.01					756.51	756.51		0.012
D-308	104+86R	0.76	0.04	0.03	5.00	0.23	0.29	12	12	759.18	757.01	2.00	756.01	0.0067	4.02	3.16	OK	756.51	756.51	OK	AA-S125A
D-348	104+90R		0.25	0.23						759.85	756.93	2.75	755.93					756.43	756.43		0.012
D-348	104+90R	0.00	0.00	0.00	5.00	2.35	2.96	82	15	759.85	756.91	2.75	755.66	0.0030	3.16	3.87	OK	756.29	756.29	OK	MH-TYPE C
D-349	105+60R		0.37	0.34						759.88	756.66	3.03	755.41					756.04	756.28		0.012
D-311	105+60R	0.80	0.05	0.04	5.00	0.26	0.33	14	12	759.80	756.78	2.85	755.78	0.0071	4.16	3.27	OK	756.28	756.28	OK	AA-S125A
D-349	105+60R		0.05	0.04						759.88	756.68	3.03	755.68					756.18	756.18		0.012
D-349	105+60R	0.30	0.00	0.00	5.00	2.61	3.29	72	15	759.88	756.66	3.03	755.41	0.0028	3.01	3.70	OK	756.04	756.04	OK	MH-TYPE C
D-350	106+41R		0.42	0.37						758.33	756.46	1.68	755.21					755.84	755.84		0.012
D-307	104+60L	0.84	0.05	0.04	5.00	0.31	0.39	70	15	759.10	756.06	2.85	754.81	0.0030	3.13	3.84	OK	755.44	755.44	OK	AA-S125A
D-310	105+30L		0.05	0.04						759.32	755.85	3.28	754.60					755.23	755.47		0.012
D-310	105+30L	0.85	0.05	0.04	5.00	0.28	0.36	57	15	759.32	755.85	3.28	754.60	0.0030	3.12	3.83	OK	755.23	755.23	OK	AA-S125A
D-312	105+87L		0.10	0.08						759.43	755.68	3.56	754.43					755.06	755.39		0.012
D-339	12+85	0.70	2.07	1.45	13.32	6.73	8.46	98	18	760.49	757.28	3.00	755.78	0.0135	7.49	13.24	OK	756.53	756.53	OK	AA-S133B
D-345	105+82L		2.07	1.45						758.60	755.96	2.43	754.46					755.21	#REF!		0.012
D-345	105+82L	0.93	0.29	0.27	5.00	12.02	15.17	28	24	758.60	756.46	1.89	754.46	0.0025	3.91	12.29	OK	755.46	755.47	OK	AA-S133B
D-312	105+87L		2.36	1.73						759.43	756.39	2.79	754.39					755.39	#REF!		0.012
D-365	105+87L	0.93	0.08	0.07	5.00	0.50	0.63	14	12	759.48	756.06	3.25	755.06	0.0057	3.72	2.93	OK	755.56	755.56	OK	AA-S120
D-351	63+95L		0.08	0.07						760.00	755.98	3.85	754.98					755.48	#REF!		0.012
D-312	105+87L	0.92	0.08	0.08	5.00	0.52	0.66	56	24	759.43	756.39	2.79	754.39	0.0016	3.14	9.85	OK	755.39	755.39	OK	AA-S125B
D-351	63+95L		2.62	1.96						760.00	756.30	3.45	754.30					755.30	#REF!		0.012
D-322	114+03R	0.85	0.03	0.03	5.00	0.18	0.23	30	12	765.46	762.29	3.00	761.29	0.0060	3.82	3.00	OK	761.79	761.79	OK	AA-S125A
D-321	114+03L		0.03	0.03						765.46	762.11	3.18	761.11					761.61	762.34		0.012
D-321	114+03L	0.90	0.03	0.03	5.00	0.37	0.46	96	15	765.46	762.09	3.18	760.84	0.0029	3.09	3.79	OK	761.47	761.47	OK	AA-S125A
D-357	113+09L		0.06	0.05						765.10	761.81	3.10	760.56					761.19	764.30		0.012
EX. 18"	113+09L	0.65	1.77	1.14	5.00	8.32	10.50	200	18	766.00	762.34	3.45	760.84	0.0103	6.57	11.61	OK	762.34	762.34	OK	AA-S133A
D-357	113+09L		1.83	1.19						765.10	760.27	4.62	758.77					760.27	760.47		0.012
D-357	113+09L	0.48	0.82	0.40	5.00	2.75	14.44	174	15	765.10	761.81	3.10	760.56	0.0057	4.33	5.32	OK	761.19	764.30	OK	AA-S134A
D-359	111+35L		2.70	1.64						764.00	760.81	3.00	759.56					760.19	760.19		0.012
D-387	111+50R	0.66	0.75	0.50	5.00	3.46	4.37	55	12	763.00	761.33	1.50	760.33	0.0089	4.65	3.65	OK	760.83	761.08	OK	AA-S133A
D-320	111+47R		0.75	0.50						764.28	760.84	3.27	759.84					760.34	760.34		0.012
D-320	111+47R	0.87	0.09	0.08	5.00	4.00	5.05	55	15	764.28	761.09	3.00	759.84	0.0071	4.81	5.91	OK	760.47	760.47	OK	AA-S125A
D-319	111+35L		0.84	0.57						763.95	760.70	3.06	759.45					760.08	760.08		0.012
D-319	111+35L	0.90	0.16	0.14	5.00	0.98	1.23	17	15	763.95	760.70	3.06	759.45	0.0047	3.92	4.81	OK	760.08	760.08	OK	MH-TYPE C
D-359	111+35L		0.99	0.71						764.96	760.62	4.15	759.37					760.00	760.65		0.012
D-359	111+35L	0.00	0.00	0.00	5.00	0.00	0.00	53	15	764.96	760.62	4.15	759.37	0.0172	7.49	9.19	OK	760.00	760.00	OK	MH-TYPE C
D-358	110+82L		3.69	2.36						762.90	759.71	3.00	758.46					759.09	759.18		0.012
D-360	11+75	0.75	0.12	0.09	5.00	0.63	0.80	125	15	764.46	761.27	3.00	760.02	0.0164	7.32	8.99	OK	760.65	760.65	OK	AA-S133A
D-357A	10+50		0.12	0.09						762.71	759.22	3.30	757.97					758.60	758.60		0.012
D-358	110+82L	0.68	0.35	0.24	5.00	18.06	22.78	29	15	762.90	759.71	3.00	758.46	0.0669	14.79	18.15	OK	759.09	759.18	OK	AA-S134A
D-357A	10+50		4.04	2.59						762.71	757.77	4.75	756.52					757.15	757.21		0.012
D-357A	10+50	0.87	0.19	0.17	5.00	19.85	25.05	77	21	762.71	757.98	4.50	756.23	0.0194	9.95	23.94	OK	757.11	757.11	OK	AA-S134A
D-355	109+76L		4.35	2.85						762.51	756.49	5.79	754.74					755.62	756.99		0.012
D-356	109+83L	0.83	0.12	0.10	5.00	0.72	0.91	9	12	762.88	757.71	5.00	756.71	0.1522	19.23	15.10	OK	757.21	757.21	OK	AA-S125A
D-355	109+76L		0.12	0.10						762.51	756.34	6.00	755.34					755.84	756.39		0.012
D-318	110+14R	0.80	0.18	0.15	5.00	1.02	1.29	77	12	762.63	759.46	3.00	758.46	0.0256	7.88	6.19	OK	758.96	758.96	OK	AA-S125A
D-317	109+60L		0.18	0.15						761.66	757.49	4.00	756.49					756.99	756.99		0.012
D-317	109+60L	0.82	0.08	0.06	5.00	1.46	1.84	20	12	761.66	757.49	4.00	756.49	0.0325	8.88	6.98	OK	756.99	756.99	OK	AA-S125A
D-355	109+76L		0.26	0.21						762.51	756.84	5.50	755.84					756.34	756.34		0.012
D-316	108+80R	0.88	0.13	0.11	5.00	0.77	0.98	62	12	760.71	757.54	3.00	756.54	0.0105	5.05	3.96	OK	757.04	757.04	OK	AA-S125A
D-315	108+50L		0.13	0.11						760.06	756.89	3.00	755.89					756.39	756.39		0.012
D-315	108+50L	0.87	0.11	0.10	5.00	1.45	1.83	6	12	760.06	756.89	3.00	755.89	0.0100	4.93	3.87	OK	756.39	756.39	OK	AA-S125A
D-354	108+50L		0.24	0.21						760.00	756.83	3.00	755.83					756.33	756.33		0.012

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD RIGHT SIDE FROM SERVICE ROAD 2 (OPOSITE MACSWAY AVE.) AHEAD TO MILLER DITCH

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D-355	109+76L	0.00	0.00	0.00	5.00	0.00	0.00	126	30	762.51	757.24	4.98	754.74	0.0011	3.03	14.85	OK	755.99	755.99	OK	MH-TYPE C
D-354	108+50L		4.74	3.16						760.82	757.10	3.43	754.60					755.85	761.16		0.012
D-354	108+50L	0.00	0.00	0.00	5.00	23.48	29.63	25	30	760.82	757.10	3.43	754.60	0.0028	4.80	23.58	OK	755.85	755.85	OK	MH-TYPE C
D-364	108+25L		4.97	3.37						760.45	757.03	3.13	754.53					755.78	759.60		0.012
D-361	13+75	0.80	0.10	0.08	5.00	0.58	0.73	100	12	764.83	761.66	3.00	760.66	0.0156	6.15	4.83	OK	761.16	761.16	OK	AA-S133A
D-362	14+75		0.10	0.08						763.77	760.10	3.50	759.10					759.60	759.60		0.012
D-362	14+75	0.78	0.15	0.12	5.00	1.39	1.75	27	12	763.77	760.10	3.50	759.10	0.0870	14.54	11.42	OK	759.60	759.60	OK	AA-S133A
D-363	15+00		0.25	0.20						763.37	757.75	5.45	756.75					757.25	757.25		0.012
EX. 18"	15+00		2.17	0.00	5.00	1.39	1.75	30	18	764.66	757.95	6.50	756.45	0.0080	5.78	10.21	OK	757.95	757.95	OK	MH-TYPE C
D-363	15+00		2.43	0.20						763.37	757.71	5.45	756.21					757.71	757.71		0.012
EX. 10"	108+25L	0.00	0.95	0.00	5.00	0.00	0.00	40	12	760.52	757.07	3.28	756.07	0.0078	4.34	3.41	OK	756.90	756.90	OK	MH-TYPE C
D-364	108+25L		0.95	0.00						760.25	756.76	3.32	755.76					756.59	756.59		0.012
EX. 6"	108+25L	0.00	0.29	0.00	5.00	0.00	0.00	7	12	760.37	757.20	3.00	756.20	0.0600	12.07	9.48	OK	756.70	756.70	OK	MH-TYPE C
D-364	108+25L		0.29	0.00						760.45	756.78	3.50	755.78					756.28	760.56		0.012
D-364	108+25L	0.00	0.00	0.00	5.00	23.48	29.63	26	30	760.45	757.03	3.13	754.53	0.0031	5.03	24.71	OK	755.78	755.78	OK	MH-TYPE C
D-390	108+00L		6.21	3.37						759.50	756.95	2.26	754.45					755.70	756.33		0.012
D-363	15+00	0.00	0.00	0.00	5.00	0.00	0.00	242	18	763.77	760.56	3.00	759.06	0.0074	5.57	9.84	OK	760.56	760.56	OK	MH-TYPE C
D-390	108+00L		2.43	0.20						763.37	758.76	4.40	757.26					758.76	758.76		0.012
D-390	108+00L	0.00	0.00	0.00	5.00	0.00	0.00	31	30	759.50	756.95	2.26	754.45	0.0013	3.26	16.00	OK	756.33	756.33	OK	MH-TYPE C
D-353	107+70L		8.64	3.57						760.02	756.91	2.82	754.41					756.29	756.29		0.012
D-313	107+75R	0.88	0.09	0.08	5.00	0.56	0.70	48	12	760.66	757.49	3.00	756.49	0.0090	4.66	3.66	OK	756.99	756.99	OK	AA-S125A
D-389	108+05L		0.09	0.08						760.23	757.06	3.00	756.06					756.56	756.56		0.012
D389	108+05L	0.00	0.00	0.00	5.00	0.00	0.00	34	12	760.23	757.06	3.00	756.06	0.0165	6.32	4.97	OK	756.56	756.56	OK	MH-TYPE C
D-314	107+84L		0.09	0.08						759.67	756.50	3.00	755.50					756.00	756.00		0.012
D-314	107+84L	0.88	0.08	0.07	5.00	0.47	0.59	24	12	759.67	756.50	3.00	755.50	0.0062	3.90	3.06	OK	756.00	756.00	OK	AA-S125B
D-353	107+70L		0.17	0.15						760.02	756.35	3.50	755.35					755.85	755.85		0.012
D-353	107+70L	0.55	1.23	1.68	5.00	37.62	47.47	18	30	760.02	756.91	2.82	754.41	0.0072	7.71	37.86	OK	755.66	755.66	OK	AA-S134B
D-352	64+10R		10.04	5.40						758.48	756.78	1.41	754.28					755.53	755.53		0.012
D-334	68+35R	0.91	0.03	0.02	5.00	0.17	0.21	14	12	767.82	764.65	3.00	763.65	0.0229	7.45	5.85	OK	764.15	764.15	OK	AA-S125A
D-377	68+35R		0.03	0.02						767.50	764.33	3.00	763.33					763.83	763.83		0.012
D-332	67+55R	0.91	0.07	0.07	5.00	0.47	0.60	14	12	765.97	762.80	3.00	761.80	0.0400	9.86	7.74	OK	762.30	762.30	OK	AA-S125A
D-378	67+55R		0.07	0.07						765.41	762.24	3.00	761.24					761.74	761.74		0.012
D-377	68+35R	0.00	0.00	0.00	5.00	0.00	0.00	80	12	767.50	764.33	3.00	763.33	0.0261	7.96	6.26	OK	763.83	763.83	OK	MH-TYPE C
D-378	67+55R		0.03	0.02						765.41	762.24	3.00	761.24					761.74	761.74		0.012
D-330	66+70R	0.91	0.07	0.07	5.00	0.47	0.60	14	12	764.55	761.38	3.00	760.38	0.0371	9.50	7.46	OK	760.88	760.88	OK	AA-125B
D-379	66+70R		0.07	0.07						764.03	760.86	3.00	759.86					760.36	760.36		0.012
D-378	67+55R	0.00	0.00	0.00	5.00	0.00	0.00	85	12	765.41	762.24	3.00	761.24	0.0162	6.28	4.93	OK	761.74	761.74	OK	MH-TYPE C
D-379	66+70R		0.10	0.09						764.03	760.86	3.00	759.86					760.36	760.36		0.012
D-328	65+95R	0.92	0.08	0.08	5.00	0.53	0.67	14	12	763.34	760.17	3.00	759.17	0.0171	6.45	5.07	OK	759.67	759.67	OK	AA-S125B
D-380	65+95R		0.08	0.08						763.10	759.93	3.00	758.93					759.43	759.43		0.012
D-379	66+70R	0.00	0.00	0.00	5.00	0.00	0.00	75	12	764.03	760.86	3.00	759.86	0.0124	5.49	4.31	OK	760.36	760.36	OK	MH-TYPE C
D-380	65+95R		0.18	0.17						763.10	759.93	3.00	758.93					759.43	759.43		0.012
D-326	65+15R	0.91	0.08	0.07	5.00	0.49	0.62	14	12	762.03	758.86	3.00	757.86	0.0143	5.89	4.63	OK	758.36	758.36	OK	AA-S125B
D-381	65+15R		0.08	0.07						761.83	758.66	3.00	757.66					758.16	758.16		0.012
D-380	65+95R	0.00	0.00	0.00	5.00	0.00	0.00	80	12	763.10	759.93	3.00	758.93	0.0159	6.21	4.88	OK	759.43	759.43	OK	MH-TYPE C
D-381	65+15R		0.27	0.24						761.83	758.66	3.00	757.66					758.16	758.16		0.012
D-323	64+34R	0.91	0.08	0.07	5.00	0.50	0.64	19	12	760.68	757.51	3.00	756.51	0.0363	9.39	7.38	OK	757.01	757.01	OK	AA-S125B
D-382	64+34R		0.08	0.07						759.99	756.82	3.00	755.82					756.32	756.32		0.012
D-381	65+15R	0.00	0.00	0.00	5.00	0.00	0.00	81	12	761.83	758.66	3.00	757.66	0.0227	7.43	5.83	OK	758.16	758.16	OK	MH-TYPE C
D-382	64+34R		0.34	0.31						759.99	756.82	3.00	755.82					756.32	756.32		0.012
D-382	64+34R	0.00	0.00	0.00	5.00	0.00	0.00	25	12	759.99	756.82	3.00	755.82	0.0604	12.11	9.51	OK	756.32	756.32	OK	MH-TYPE C
D-352	64+10R		0.42	0.39						758.48	755.31	3.00	754.31					754.81	766.89		0.012
D-366	64+03R	0.94	0.13	0.12	5.00	0.83	1.04	12	12	760.01	756.84	3.00	755.84	0.0858	14.44	11.34	OK	756.34	756.34	OK	MH-TYPE C
D-352	64+10R		0.13	0.12						758.48	755.81	2.50	754.81					755.31	763.54		0.012
D-352	64+10R	0.00	0.00	0.00	5.00	0.00	0.00	114	30	758.48	756.78	1.41	754.28	0.0050	6.42	31.51	OK	755.53	755.53	OK	MH-TYPE C
D-351	63+95L		10.59	5.91						760.00	756.21	3.50	753.71					754.96	763.54		0.012
D-336	69+22L	0.92	0.11	0.10	5.00	0.69	0.87	15	12	770.56	767.39	3.00	766.39	0.1053	15.99	12.56	OK	766.89	766.89	OK	AA-S125B
D-370	69+22L		0.11	0.10						768.98	765.81	3.00	764.81					765.31	765.31		0.012

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD RIGHT SIDE FROM SERVICE ROAD 2 (OPOSITE MACSWAY AVE.) AHEAD TO MILLER DITCH

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D-333	68+16L	0.92	0.12	0.11	5.00	0.74	0.94	**20**	**12**	**767.21**	764.04	3.00	**763.04**	0.0550	11.56	***9.08***	**OK**	763.54	763.54	**OK**	AA-S125B
D-371	68+16L		0.12	0.11						**766.11**	762.94	3.00	**761.94**					762.44	762.44		0.012
D-370	69+22L	0.00	0.00	0.00	5.00	0.00	0.00	**107**	**12**	**768.98**	765.81	3.00	**764.81**	0.0268	8.07	***6.34***	**OK**	765.31	765.31	**OK**	MH-TYPE C
D-371	68+16L		0.11	0.10						**766.11**	762.94	3.00	**761.94**					762.44	762.44		0.012
D-331	67+40L	0.92	0.08	0.07	5.00	0.50	0.63	**19**	**12**	**765.57**	762.40	3.00	**761.40**	0.0153	6.09	***4.78***	**OK**	761.90	761.90	**OK**	AA-S125B
D-372	67+40L		0.08	0.07						**765.28**	762.11	3.00	**761.11**					761.61	761.61		0.012
D-371	68+16L	0.00	0.00	0.00	5.00	0.00	0.00	**76**	**12**	**766.11**	762.94	3.00	**761.94**	0.0109	5.15	***4.04***	**OK**	762.44	762.44	**OK**	MH-TYPE C
D-372	67+40L		0.22	0.21						**765.28**	762.11	3.00	**761.11**					761.61	761.61		0.012
D-329	66+64L	0.92	0.08	0.07	5.00	0.52	0.65	**19**	**12**	**764.33**	761.16	3.00	**760.16**	0.0053	3.57	***2.81***	**OK**	760.66	760.66	**OK**	AA-S125B
D-373	66+64L		0.08	0.07						**765.23**	761.06	4.00	**760.06**					760.56	760.56		0.012
D-372	67+40L	0.00	0.00	0.00	5.00	0.00	0.00	**76**	**12**	**765.28**	762.11	3.00	**761.11**	0.0138	5.79	***4.55***	**OK**	761.61	761.61	**OK**	MH-TYPE C
D-373	66+64L		0.30	0.28						**765.23**	761.06	4.00	**760.06**					760.56	760.56		0.012
D-327	65+87L	0.92	0.08	0.07	5.00	0.52	0.66	**19**	**12**	**763.09**	759.92	3.00	**758.92**	0.0095	4.80	***3.77***	**OK**	759.42	759.42	**OK**	AA-S125B
D-374	65+87L		0.08	0.07						**764.56**	759.74	4.65	**758.74**					759.24	759.24		0.012
D-373	66+64L	0.00	0.00	0.00	5.00	0.00	0.00	**77**	**12**	**765.23**	761.06	4.00	**760.06**	0.0171	6.45	***5.07***	**OK**	760.56	760.56	**OK**	MH-TYPE C
D-374	65+87L		0.38	0.35						**764.56**	759.74	4.65	**758.74**					759.24	759.24		0.012
D-325	65+10L	0.92	0.08	0.07	5.00	0.52	0.66	**19**	**12**	**761.83**	758.76	2.90	**757.76**	0.0074	4.23	***3.32***	**OK**	758.26	758.26	**OK**	AA-S125B
D-375	65+10L		0.08	0.07						**763.44**	758.62	4.65	**757.62**					758.12	758.12		0.012
D-374	65+87L	0.00	0.00	0.00	5.00	0.00	0.00	**77**	**12**	**764.56**	759.74	4.65	**758.74**	0.0061	3.85	***3.02***	**OK**	759.24	759.24	**OK**	MH-TYPE C
D-375	65+10L		0.47	0.43						**763.44**	759.27	4.00	**758.27**					758.77	758.77		0.012
D-324	64+39L	0.93	0.08	0.07	5.00	0.50	0.63	**14**	**12**	**760.64**	757.47	3.00	**756.47**	0.0886	14.66	***11.52***	**OK**	756.97	756.97	**OK**	AA-S125B
D-376	64+39L		0.25	0.22						**759.40**	756.23	3.00	**755.23**					755.73	755.73		0.012
D-375	65+10L	0.00	0.00	0.00	5.00	0.00	0.00	**71**	**24**	**763.44**	759.19	4.00	**757.19**	0.0393	15.51	***48.71***	**OK**	758.19	758.19	**OK**	MH-TYPE C
D-376	64+39L		0.55	0.50						**759.40**	756.40	2.75	**754.40**					755.40	755.40		0.012
D-376	64+39L	0.00	0.00	0.00	5.00	0.00	0.00	**45**	**24**	**759.40**	756.40	2.75	**754.40**	0.0022	3.69	***11.58***	**OK**	755.40	755.40	**OK**	MH-TYPE C
D-351	63+95L		0.79	0.72						**760.00**	756.30	3.45	**754.30**					755.30	755.30		0.012
D-351	63+95L	0.00	0.00	0.00	5.00	0.00	0.00	**95**	**30**	**760.00**	756.21	3.50	**753.71**	0.0018	3.84	***18.85***	**OK**	754.96	754.96	**OK**	MH-TYPE C
D-350	106+41L		14.00	8.58						**758.33**	756.04	2.00	**753.54**					754.79	755.81		0.012
D-350	63+00L	0.00	0.00	0.00	5.00	60.67	76.56	**37**	**30**	**758.33**	756.04	2.00	**753.54**	0.0186	12.40	***60.84***	**OK**	754.79	754.79	**OK**	MH-TYPE C
D-291	62+65L		14.00	8.71						**758.00**	755.35	2.36	**752.85**					754.10	754.10		0.012
D-290	62+60L	0.83	0.18	0.15	5.00	1.04	1.31	**8**	**12**	**757.98**	756.31	1.50	**755.31**	0.0037	3.02	***2.37***	**OK**	755.81	755.81	**OK**	AA-S125A
D-291	62+65L		14.18	8.87						**758.00**	756.28	1.55	**755.28**					755.78	755.78		0.012
D-291	62+65L	0.30	0.00	0.00	5.00	61.78	77.96	**101**	**30**	**758.00**	755.35	2.36	**752.85**	0.0193	12.61	***61.91***	**OK**	754.10	754.10	**OK**	MH-TYPE C
D-292	61+65L		14.18	8.87						**756.52**	753.40	2.83	**750.90**					752.15	752.15		0.012
D-293	61+65L	0.85	0.10	0.09	5.00	0.59	0.75	**10**	**12**	**757.11**	755.44	1.50	**754.44**	0.0090	4.67	***3.67***	**OK**	754.94	754.94	**OK**	AA-S125A
D-292	61+65L		14.28	8.95						**756.52**	755.35	1.00	**754.35**					754.85	754.85		0.012
D-292	61+65L	0.45	0.08	0.04	5.00	62.62	79.02	**80**	**36**	**756.52**	753.40	2.79	**750.40**	0.0075	8.88	***62.74***	**OK**	751.90	751.90	**OK**	ODOT 2-3
D-294	60+85L		14.36	8.99						**755.92**	752.80	2.79	**749.80**					751.30	751.30		0.012
D-295	60+85L	0.90	0.08	0.07	5.00	0.50	0.63	**10**	**12**	**756.44**	753.82	2.45	**752.82**	0.0070	4.12	***3.24***	**OK**	753.32	753.32	**OK**	AA-S125A
D-294	60+85L		14.44	9.06						**755.92**	753.75	2.00	**752.75**					753.25	753.25		0.012
D-294	60+85L	0.60	0.12	0.07	5.00	63.63	80.29	**95**	**36**	**755.92**	752.80	2.79	**749.80**	0.0078	9.05	***63.94***	**OK**	751.30	751.30	**OK**	ODOT 2-3
D-296	59+90L		14.56	9.13						**756.80**	752.06	4.41	**749.06**					750.56	750.56		0.012
D-297	59+90L	0.90	0.08	0.07	5.00	0.50	0.63	**10**	**12**	**756.44**	753.27	3.00	**752.27**	0.0040	3.12	***2.45***	**OK**	752.77	752.77	**OK**	AA-S125B
D-296	59+90L		14.64	9.20						**756.80**	753.23	3.40	**752.23**					752.73	752.73		0.012
D-296	59+90L	0.30	0.00	0.00	5.00	64.13	80.92	**54**	**36**	**756.80**	752.06	4.41	**749.06**	0.0080	9.15	***64.65***	**OK**	750.56	750.56	**OK**	MH-TYPE C
D-298	59+36L		14.64	9.20						**756.40**	751.63	4.44	**748.63**					750.13	#REF!		0.012
D-298	59+36L	0.30	0.00	0.00	5.00	64.13	80.92	**5**	**36**	**756.40**	751.63	4.44	**748.63**	0.0080	9.17	***64.80***	**OK**	750.13	750.22	**OK**	MH-TYPE C
OUTLET	59+32L		14.64	9.20						**756.00**	751.59	4.08	**748.59**					750.09	#REF!		0.012

OUTLETS INTO THE SIDE OF THE PROPOSED MILLER DITCH STRUCTURE. LIMITING ELEVATION IS 52" x 83" ELLIPTICAL PIPE INCOMING AT El. 745.68

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

HAMILTON ROAD RIGHT SIDE FROM GROVES ROAD BACK TO MILLER DITCH

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D270	62+45R	0.88	0.16	0.14	5.00	0.98	1.24	**10**	**12**	**757.96**	754.29	3.50	**753.29**	0.0160	6.23	***4.90***	**OK**	754.03	754.03	**OK**	AA-S125A
D271	62+45R		0.16	0.14						**757.30**	754.13	3.00	**753.13**					753.87	753.98		0.012
D271	62+45R	0.3	0.06	0.02	6.10	1.03	1.30	**110**	**12**	**757.30**	754.13	3.00	**753.13**	0.0147	5.98	***4.70***	**OK**	753.98	753.98	**OK**	AA-S133A
D272	61+35R		0.22	0.16						**755.68**	752.51	3.00	**751.51**					752.36	752.72		0.012
D273	61+35R	0.9	0.10	0.09	5.00	0.63	0.79	**11**	**12**	**757.00**	752.83	4.00	**751.83**	0.0291	8.40	***6.60***	**OK**	752.72	752.72	**OK**	AA-S125A
D272	61+35R		0.32	0.25						**755.68**	752.51	3.00	**751.51**					752.40	752.40		0.012
D272	61+35R	0.9	0.00	0.00	5.00	1.73	2.19	**52**	**12**	**755.68**	752.51	3.00	**751.51**	0.0327	8.91	***7.00***	**OK**	752.01	752.01	**OK**	MH-TYPE C
D274	60+84R		0.32	0.25						**754.00**	750.81	3.02	**749.81**					750.31	752.54		0.012
D274a	61+20R	0.83	0.62	0.51	5.00	3.59	4.52	**77**	**12**	**755.70**	753.34	2.19	**752.34**	0.0045	3.32	***2.61***	**ERROR**	752.84	753.59	**OK**	Ex. CB
D274	60+84R		0.94	0.76						**754.00**	752.99	0.84	**751.99**					752.49	#REF!		0.012
D274	60+84R	0.73	0.62	0.45	9.00	3.90	4.91	**55**	**15**	**754.00**	750.81	3.00	**749.56**	0.0031	3.18	***3.90***	**OK**	750.81	750.81	**OK**	AA-S133A
D275	60+30R		0.94	0.70						**754.89**	750.64	4.06	**749.39**					750.64	752.54		0.012
D276	60+30R	0.9	0.09	0.08	5.00	0.56	0.71	**11**	**12**	**756.21**	752.04	4.00	**751.04**	0.0291	8.40	***6.60***	**OK**	752.54	752.54	**OK**	AA-S125A
D275	60+30R		1.03	0.78						**754.89**	751.72	3.00	**750.72**					752.22	752.22		0.012
D275	60+30R	0.3	0.00	0.00	5.00	5.45	6.88	**83**	**15**	**754.89**	750.64	4.06	**749.39**	0.0061	4.48	***5.50***	**OK**	750.24	750.25	**OK**	MH-TYPE C
D277	59+47R		1.03	0.78						**755.00**	750.13	4.68	**748.88**					749.73	749.73		0.012
D278	59+50R	0.9	0.07	0.06	5.00	0.44	0.55	**11**	**12**	**755.94**	751.92	3.85	**750.92**	0.0082	4.46	***3.50***	**OK**	751.42	751.42	**OK**	ODOT CB-6
D277	59+47R		1.10	0.85						**755.00**	751.83	3.00	**750.83**					751.33	751.33		0.012
D277	59+47R	0.9	0.00	0.00	5.00	5.89	7.43	**74**	**15**	**755.00**	750.13	4.68	**748.88**	0.0072	4.84	***5.94***	**OK**	749.51	749.53	**OK**	MH-TYPE C
D279	58+74R		1.10	0.85						**754.20**	749.60	4.41	**748.35**					748.98	749.23		0.012
D279a	58+75R	0.9	0.82	0.74	5.00	5.14	6.49	**48**	**12**	**753.67**	751.27	2.23	**750.27**	0.0221	7.32	***5.75***	**OK**	750.77	751.28	**OK**	Ex. CB
D279	58+74R		1.92	1.58						**754.20**	750.21	3.82	**749.21**					749.71	#REF!		0.012
D280	58+80R	0.9	0.06	0.05	5.00	0.38	0.47	**12**	**12**	**755.60**	751.43	4.00	**750.43**	0.0333	9.00	***7.07***	**OK**	750.93	750.93	**OK**	AA-S125A
D279	58+74R		1.98	1.64						**754.20**	751.03	3.00	**750.03**					750.53	#REF!		0.012
D279	58+74R	0.3	0.15	0.05	5.00	11.35	14.32	**25**	**15**	**754.20**	749.60	4.41	**748.35**	0.0264	9.29	***11.40***	**OK**	748.98	749.23	**OK**	AA-S133A
OUTLET	58+50R		2.07	1.63						**754.00**	748.94	4.87	**747.69**					748.32	#REF!		0.012

OUTLETS TO THE DOWNSTREAM CHAMBER OF THE MILLER DITCH STRUCTURE, Hamilton Road Rt. LIMITING ELEVATION 72" x 113" RCP (SE) El. 745.74

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

KIMBERLY PARKWAY HEADING WEST, AWAY FROM HAMILTON ROAD, LEFT SIDE

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D270	81+60L	0.86	0.68	0.58	5.00	4.07	5.14	**229**	**12**	**760.11**	757.94	2.00	**756.94**	0.0111	5.19	***4.08***	**OK**	757.68	759.31	**OK**	AA-S125A
D272	79+50L		0.68	0.58						**759.20**	755.40	3.63	**754.40**					755.14	#REF!		0.012
D272	79+50L	0.3	0.00	0.00	5.00	4.07	5.14	**69**	**12**	**759.20**	755.40	3.63	**754.40**	0.0112	5.21	***4.09***	**OK**	755.14	755.70	**OK**	AA-S125A
D272a	78+83L		0.68	0.58						**758.88**	754.63	4.08	**753.63**					754.37	#REF!		0.012

OUTLETS INTO THE No. 7 STRUCTURE OF EXISTING STORM SEWER D2627, Outgoing 27" (W) El. 752.20

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/EASTLAND **DATE:** 10 March 2016

DESIGNER: Schuster **CHECKED:** **CONSULTANT:** ms consultants, inc.

KIMBERLY PARKWAY HEADING WEST, AWAY FROM HAMILTON ROAD, RIGHT SIDE

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Full Capacity Q_f (cfs)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D271	81+50R	0.73	0.28	0.20	5.00	1.42	1.80	**96**	**12**	**759.97**	757.80	2.00	**756.80**	0.0038	3.02	***2.37***	**OK**	757.54	757.54	**OK**	AA-S125A
D271a	80+54R		0.28	0.20					**Ex. 10"**	**759.47**	757.44	1.86	**756.44**					757.18	#REF!		0.012

OUTLETS INTO THE No. 2 STRUCTURE OF EXISTING STORM SEWER CC6070, Outgoing 10" PVC (W) El. 756.21

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/REFUGEE **DATE:** June 6, 2016

DESIGNER: Goodnight **CHECKED:** **CONSULTANT:** Woolpert

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Pipe Area, A (ft^2)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D-337	104+10L	0.85	0.14	0.12	5.00	0.81	1.02	61	12	0.7854	758.85	755.68	3.00	754.68	0.0066	3.99	OK	755.18	755.18	OK	AA-S133A
D-305	103+50L		0.14	0.12							758.75	755.28	3.30	754.28				754.78	#REF!		0.012
D-305	103+50L	0.87	0.06	0.05	5.00	1.18	1.49	16	12	0.7854	758.75	755.28	3.30	754.28	0.0281	8.26	OK	754.78	754.78	OK	AA-S125A
PR. HW			0.20	0.17							755.00	754.83	0.00	753.83				754.33	756.30		0.012
D-338	11+80	0.69	0.13	0.09	5.00	0.64	0.81	102	12	0.7854	759.97	756.80	3.00	755.80	0.0130	5.63	OK	756.30	756.30	OK	AA-S133A
D-344	10+75		0.13	0.09							758.64	755.47	3.00	754.47				754.97	756.31		0.012
D-344	10+75	0.70	0.24	0.17	5.00	1.84	2.33	61	12	0.7854	758.64	755.47	3.00	754.47	0.0310	8.67	OK	754.97	754.97	OK	AA-S133A
D-343	10+53L		0.38	0.26							756.75	753.58	3.00	752.58				753.08	754.70		0.012
D-342	11+00L	0.93	0.29	0.27	5.00	1.91	2.41	89	12	0.7854	759.98	756.81	3.00	755.81	0.0181	6.63	OK	756.31	756.31	OK	AA-S125A
D-340	10+61L		0.29	0.27							758.37	755.20	3.00	754.20				754.70	754.70		0.012
D-340	10+61L	0.90	0.08	0.07	5.00	2.41	3.04	21	12	0.7854	758.37	755.20	3.00	754.20	0.0271	8.12	OK	754.70	754.70	OK	AA-S125A
D-343	10+53L		0.37	0.35							757.80	754.63	3.00	753.63				754.13	765.15		0.012
D-300	104+94L	0.81	0.10	0.08	5.00	0.57	0.72	36	12	0.7854	759.45	756.28	3.00	755.28	0.0067	4.02	OK	755.78	755.78	OK	AA-S125A
D-301	102+00R		0.10	0.08							759.41	756.04	3.20	755.04				755.54	755.54		0.012
D-301	102+00R	0.89	0.06	0.06	5.00	0.96	1.21	15	12	0.7854	759.45	756.08	3.20	755.08	0.0227	7.42	OK	755.58	755.58	OK	AA-S125A
PR. HW	102+00R		0.16	0.14								755.74	3.50	754.74				755.24	755.24		0.012
D-302	102+75R	0.90	0.04	0.04	5.00	0.25	0.31	12	12	0.7854	759.05	755.88	3.00	754.88	0.0117	5.32	OK	755.38	755.38	OK	AA-S125A
PR. HW	102+79R		0.04	0.04								755.74	3.50	754.74				755.24	755.24		0.012
D-303	102+98L	0.87	0.09	0.08	5.00	0.54	0.69	27	12	0.7854	758.99	755.82	3.00	754.82	0.0122	5.45	OK	755.32	755.32	OK	AA-S125B
PR. HW	103+00L		0.09	0.08								755.49	3.75	754.49				754.99	754.99		0.012
D-304	103+50R	0.89	0.10	0.09	5.00	0.64	0.81	13	12	0.7854	758.75	755.58	3.00	754.58	0.1362	18.18	OK	755.08	755.08	OK	AA-S125A
D-346	103+50R		0.10	0.09							756.98	753.81	3.00	752.81				753.31	753.31		0.012
D-346	103+50R	0.00	0.00	0.00	5.00	0.64	0.81	13	12	0.7854	756.98	753.81	3.00	752.81	0.0131	5.63	OK	753.31	753.31	OK	AA-S125B
PR. HW	102+79R		0.10	0.09								753.64	5.60	752.64				753.14	753.14		0.012
D-335	68+50R	0.00	0.00	0.00	5.00	0.64	0.81	60	12	0.7854	768.82	765.65	3.00	764.65	0.0060	3.82	OK	765.15	765.15	OK	AA-S125B
PR. HW	68+50R		0.10	0.09								765.29	3.36	764.29				764.79	764.79		0.012
D-400	109+00L	0.75	0.07	0.05	5.00	0.37	0.46	6	12	0.7854	754.72	751.55	3.00	750.55	0.0133	5.69	OK	751.05	751.05	OK	AA-S125A
D-401	109+00L		0.07	0.05							755.24	751.47	3.60	750.47				750.97	750.97		0.012
D-402	108+70L	0.75	0.07	0.05	5.00	0.37	0.46	6	12	0.7854	754.08	750.91	3.00	749.91	0.0133	5.69	OK	750.41	750.41	OK	AA-S125A
D-403	108+70L		0.07	0.05							754.60	750.83	3.60	749.83				750.33	750.33		0.012
D-401	109+00L	0.00	0.00	0.00	5.00	0.37	0.46	30	12	0.7854	755.24	751.47	3.60	750.47	0.0213	7.20	OK	750.97	750.97	OK	MH-TYPE C
D-403	108+70L		0.07	0.05							754.60	750.83	3.60	749.83				750.33	750.33		0.012
D-404	108+40L	0.90	0.03	0.03	5.00	0.19	0.24	32	12	0.7854	754.43	751.26	3.00	750.26	0.0159	6.22	OK	750.76	750.76	OK	AA-S125A
D-405	108+25L		0.03	0.03							753.92	750.75	3.00	749.75				750.25	750.25		0.012
D-405	108+25L	0.75	0.07	0.05	5.00	0.55	0.70	6	12	0.7854	753.92	750.75	3.00	749.75	0.0133	5.69	OK	750.25	750.25	OK	AA-S125A
D-406	108+25L		0.10	0.08							754.44	750.67	3.60	749.67				750.17	750.17		0.012
D-403	108+70L	0.00	0.00	0.00	5.00	0.73	0.92	45	12	0.7854	754.60	750.83	3.60	749.83	0.0069	4.09	OK	750.33	750.33	OK	MH-TYPE C
D-406	108+25L		0.14	0.11							754.44	750.52	3.75	749.52				750.02	750.02		0.012
D-407	107+75L	0.90	0.03	0.03	5.00	0.19	0.24	45	12	0.7854	754.20	751.03	3.00	750.03	0.0100	4.93	OK	750.53	750.53	OK	AA-S125A
D-408	107+80L		0.03	0.03							753.75	750.58	3.00	749.58				750.08	750.08		0.012
D-408	107+80L	0.75	0.07	0.05	5.00	0.55	0.70	6	12	0.7854	753.75	750.58	3.00	749.58	0.0100	4.93	OK	750.08	750.08	OK	AA-S129
D-409	107+80L		0.10	0.08							754.19	750.52	3.50	749.52				750.02	750.02		0.012
D-406	108+25L	0.00	0.00	0.00	5.00	1.29	1.62	45	12	0.7854	754.44	750.52	3.75	749.52	0.0056	3.67	OK	750.02	750.02	OK	MH-TYPE C
D-409	107+80L		0.24	0.18							754.19	750.27	3.75	749.27				749.77	749.77		0.012
D-441	107+11L	0.90	0.03	0.03	5.00	0.19	0.24	30	12	0.7854	753.98	750.81	3.00	749.81	0.0147	5.97	OK	750.31	750.31	OK	AA-S125A
D-440	107+19L		0.03	0.03							753.54	750.37	3.00	749.37				749.87	749.87		0.012
D-440	107+19L	0.75	0.07	0.05	5.00	0.55	0.70	13	12	0.7854	753.54	750.37	3.00	749.37	0.0038	3.06	OK	749.87	749.87	OK	AA-S125A
D-439	107+30L		0.10	0.08							754.09	750.32	3.60	749.32				749.82	749.82		0.012
D-409	107+80L	0.00	0.00	0.00	5.00	1.29	1.62	50	12	0.7854	754.19	750.27	3.75	749.27	0.0070	4.12	OK	749.77	749.77	OK	MH-TYPE C
D-439	107+30L		0.24	0.18							754.09	749.92	4.00	748.92				749.42	749.42		0.012
D-439	108+70L	0.00	0.00	0.00	5.00	1.84	2.32	80	12	0.7854	754.09	749.92	4.00	748.92	0.0091	4.71	OK	749.42	749.42	OK	MH-TYPE C
D-410	107+20R		0.34	0.26							753.91	749.19	4.55	748.19				748.69	748.69		0.012
D-470	109+00R	0.90	0.16	0.14	5.00	1.00	1.27	60	12	0.7854	754.43	751.26	3.00	750.26	0.0052	3.54	OK	750.76	750.76	OK	AA-S125B
D-471	108+40R		0.16	0.14							754.22	750.95	3.10	749.95				750.45	750.45		0.012

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/REFUGEE **DATE:** June 6, 2016

DESIGNER: Goodnight **CHECKED:** **CONSULTANT:** Woolpert

MH or CB No.	STATION From / To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Pipe Area, A (ft^2)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D-471	108+40R	0.86	0.08	0.07	5.00	1.48	1.87	9	12	0.7854	754.22	750.95	3.10	749.95	0.0044	3.29	OK	750.45	750.45	OK	AA-S125A
D-472	108+40R		0.24	0.21							754.38	750.91	3.30	749.91				750.41	750.41		0.012
EX. 18"		0.00	0.00	0.00	5.00	0.00	0.00	77	18	1.7671	754.60	751.49	2.90	749.99	0.0031	3.60	OK	751.49	751.49	OK	AA-S125A
D-472	108+40R		0.00	0.00							754.38	751.25	2.92	749.75				751.25	751.25		0.012
D-472	108+40R	0.00	0.00	0.00	5.00	1.48	1.87	77	18	1.7671	754.38	751.25	2.92	749.75	0.0226	9.71	OK	750.50	750.50	OK	MH-TYPE C
D-473	107+63R		0.24	0.21							754.08	749.51	4.36	748.01				748.76	748.76		0.012
D-474	107+63R	0.86	0.08	0.07	5.00	0.48	0.60	9	12	0.7854	753.94	750.77	3.00	749.77	0.0122	5.45	OK	750.27	750.27	OK	AA-S125A
D-473	107+63R		0.08	0.07							754.08	750.66	3.25	749.66				750.16	750.16		0.012
D-473	107+63R	0.00	0.00	0.00	5.00	1.96	2.48	43	18	1.7671	754.08	749.51	4.36	748.01	0.0360	12.26	OK	748.76	748.76	OK	MH-TYPE C
D-410	107+20R		0.32	0.28							753.91	747.96	5.74	746.46				747.21	747.21		0.012
D-410	107+20R	0.00	0.00	0.00	5.00	3.80	4.80	27	18	1.7671	753.91	747.96	5.74	746.46	0.0030	3.51	OK	747.21	747.21	OK	MH-TYPE C
D-412	106+95R		0.66	0.55							754.19	747.88	6.10	746.38				747.13	747.13		0.012
D-445	106+60L	0.85	0.08	0.07	5.00	0.47	0.60	9	12	0.7854	753.20	750.03	3.00	749.03	0.0100	4.93	OK	749.53	749.53	OK	AA-S125A
D-446	106+60L		0.08	0.07							753.71	749.94	3.60	748.94				749.44	749.44		0.012
D-444	106+20R	0.90	0.03	0.03	5.00	0.19	0.24	44	12	0.7854	753.73	750.56	3.00	749.56	0.0170	6.43	OK	750.06	750.06	OK	AA-S125A
D-447	106+10L		0.03	0.03							752.98	749.81	3.00	748.81				749.31	749.31		0.012
D-447	106+10L	0.80	0.08	0.06	5.00	0.63	0.80	6	12	0.7854	752.98	749.81	3.00	748.81	0.0150	6.04	OK	749.31	749.31	OK	AA-S125A
D-448	106+10L		0.11	0.09							753.49	749.72	3.60	748.72				749.22	749.22		0.012
D-446	106+60L	0.00	0.00	0.00	5.00	0.47	0.60	50	12	0.7854	753.71	749.94	3.60	748.94	0.0044	3.27	OK	749.44	749.44	OK	MH-TYPE C
D-448	106+10L		0.08	0.07							753.49	749.72	3.60	748.72				749.22	749.22		0.012
D-448	106+10L	0.00	0.00	0.00	5.00	1.11	1.40	50	12	0.7854	753.49	749.72	3.60	748.72	0.0046	3.34	OK	749.22	749.22	OK	MH-TYPE C
D-450	105+60L		0.19	0.16							753.31	749.49	3.65	748.49				748.99	748.99		0.012
D-449	105+60L	0.80	0.08	0.06	5.00	0.92	1.16	7	12	0.7854	752.80	749.63	3.00	748.63	0.0129	5.59	OK	749.13	749.13	OK	AA-S125A
D-450	105+60L		0.16	0.13							753.31	749.54	3.60	748.54				749.04	749.04		0.012
D-451	105+19L	0.08	0.07	0.01	5.00	0.04	0.05	6	12	0.7854	752.64	749.47	3.00	748.47	0.0117	5.32	OK	748.97	748.97	OK	AA-S125A
D-452	105+19L		0.07	0.01							753.17	749.40	3.60	748.40				748.90	748.90		0.012
D-450	105+60L	0.00	0.00	0.00	5.00	2.03	2.56	41	12	0.7854	753.31	749.49	3.65	748.49	0.0046	3.35	OK	748.99	749.00	OK	MH-TYPE C
D-452	105+19L		0.35	0.29							753.17	749.30	3.70	748.30				748.80	748.80		0.012
D-453	104+38L	0.90	0.08	0.07	5.00	0.50	0.63	6	12	0.7854	752.38	749.21	3.00	748.21	0.0150	6.04	OK	748.71	748.71	OK	AA-S125B
D-454	104+38L		0.08	0.07							752.89	749.12	3.60	748.12				748.62	748.62		0.012
D-452	105+19L	0.00	0.00	0.00	5.00	2.95	3.72	81	15	1.2272	753.17	749.55	3.43	748.30	0.0074	4.92	OK	748.93	748.93	OK	MH-TYPE C
D-454	104+38L		0.51	0.42							752.89	748.95	3.75	747.70				748.33	748.33		0.012
D-455	103+60L	0.90	0.08	0.07	5.00	0.50	0.63	6	12	0.7854	752.13	748.96	3.00	747.96	0.0150	6.04	OK	748.46	748.46	OK	AA-S125B
D-456	103+60L		0.08	0.07							752.64	748.87	3.60	747.87				748.37	748.37		0.012
D-454	104+38L	0.00	0.00	0.00	5.00	3.45	4.35	79	15	1.2272	752.89	748.95	3.75	747.70	0.0032	3.22	OK	748.33	748.33	OK	MH-TYPE C
D-456	103+60L		0.59	0.50							752.64	748.70	3.75	747.45				748.08	748.08		0.012
D-458	102+80L	0.90	0.07	0.06	5.00	0.44	0.55	31	12	0.7854	751.85	748.68	3.00	747.68	0.0039	3.07	OK	748.18	748.18	OK	AA-S125A
D-457	103+10L		0.07	0.06							752.48	748.56	3.75	747.56				748.06	748.06		0.012
D-456	103+60L	0.00	0.00	0.00	5.00	3.95	4.98	49	15	1.2272	752.64	748.70	3.75	747.45	0.0033	3.27	OK	748.08	748.08	OK	MH-TYPE C
D-457	103+10L		0.67	0.57							752.48	748.54	3.75	747.29				747.92	747.92		0.012
D-457	103+10L	0.00	0.00	0.00	5.00	4.39	5.54	87	18	1.7671	752.48	748.52	3.75	747.02	0.0023	3.10	OK	747.77	747.77	OK	MH-TYPE C
D-425	102+70R		0.74	0.63							752.53	748.32	4.00	746.82				747.57	747.57		0.012
D-411	106+95R	0.86	0.07	0.06	5.00	0.42	0.53	6	12	0.7854	753.68	750.51	3.00	749.51	0.0150	6.04	OK	750.01	750.01	OK	AA-S125A
D-412	106+95R		0.07	0.06							754.19	750.42	3.60	749.42				749.92	749.92		0.012
D-413	106+30R	0.86	0.07	0.06	5.00	0.42	0.53	6	12	0.7854	753.42	750.25	3.00	749.25	0.0133	5.69	OK	749.75	749.75	OK	AA-S125A
D-414	106+30R		0.07	0.06							753.94	750.17	3.60	749.17				749.67	749.67		0.012
D-412	106+95R	0.00	0.00	0.00	5.00	4.22	5.33	65	18	1.7671	754.19	747.88	6.10	746.38	0.0023	3.10	OK	747.13	747.13	OK	MH-TYPE C
D-414	106+30R		0.73	0.61							753.94	747.73	6.00	746.23				746.98	746.98		0.012
D-415	105+70R	0.86	0.07	0.06	5.00	0.42	0.53	6	12	0.7854	753.17	750.00	3.00	749.00	0.0150	6.04	OK	749.50	749.50	OK	AA-S125A
D-416	105+69R		0.07	0.06							753.68	749.91	3.60	748.91				749.41	749.41		0.012
D-414	106+30R	0.00	0.00	0.00	5.00	4.64	5.86	62	18	1.7671	753.94	747.73	6.00	746.23	0.0042	4.18	OK	746.98	746.98	OK	MH-TYPE C
D-416	105+69R		0.80	0.67							753.68	747.47	6.00	745.97				746.72	746.72		0.012
D-417	105+23R	0.86	0.05	0.04	5.00	0.30	0.38	6	12	0.7854	753.12	749.95	3.00	748.95	0.0133	5.69	OK	749.45	749.45	OK	AA-S125A
D-418	105+23R		0.05	0.04							753.64	749.87	3.60	748.87				749.37	749.37		0.012
D-416	105+69R	0.00	0.00	0.00	5.00	5.06	6.38	47	18	1.7671	753.68	747.47	6.00	745.97	0.0062	5.07	OK	746.72	746.72	OK	MH-TYPE C

STORM SEWER CHECK SHEET

PROJECT: HAMILTON ROAD/REFUGEE **DATE:** June 6, 2016

DESIGNER: Goodnight **CHECKED:** **CONSULTANT:** Woolpert

MH or CB No.	STATION From To	C-Value	ΔArea Σ Area (acres)	Δ CA Σ CA (acres)	Time Σ t (min.)	Discharge (cfs) 10-yr	Discharge (cfs) 25-yr	Pipe Length (ft.)	Pipe Diameter (in.)	Pipe Area, A (ft^2)	Cover In/Out (ft.)	Crown Elev. In/Out	Cover Minus Crown	Invert Elev. In/Out (ft.)	Pipe Slope (ft/ft)	Velocity (fps)	Capacity Check	Critical Elev.	HGL Elev. In/Out (ft)	Cover - Hygr Elev. Check	Structure Type Manning's 'n'
D-418	105+23R		0.87	0.73							**753.64**	747.18	6.25	**745.68**				746.43	746.43		0.012
D-419	104+77R	0.86	0.07	0.06	5.00	0.42	0.53	**6**	**12**	0.7854	**752.93**	749.76	3.00	**748.76**	0.0217	7.25	**OK**	749.26	749.26	**OK**	AA-S129
D-420	104+77R		0.07	0.06							**753.30**	749.63	3.50	**748.63**				749.13	749.13		0.012
D-418	105+23R	0.00	0.00	0.00	5.00	5.36	6.76	**47**	**18**	1.7671	**753.64**	747.18	6.25	**745.68**	0.0072	5.49	**OK**	746.43	746.43	**OK**	MH-TYPE C
D-420	104+77R		0.92	0.77							**753.30**	746.84	6.25	**745.34**				746.09	746.09		0.012
D-421	104+00R	0.86	0.06	0.05	5.00	0.36	0.45	**6**	**12**	0.7854	**752.49**	749.32	3.00	**748.32**	0.0150	6.04	**OK**	748.82	748.82	**OK**	AA-S125A
D-422	104+00R		0.06	0.05							**753.00**	749.23	3.60	**748.23**				748.73	748.73		0.012
D-420	104+77R	0.00	0.00	0.00	5.00	5.78	7.29	**77**	**18**	1.7671	**753.30**	746.84	6.25	**745.34**	0.0039	4.03	**OK**	746.09	746.09	**OK**	MH-TYPE C
D-422	104+00R		0.99	0.83							**753.00**	746.54	6.25	**745.04**				745.79	745.79		0.012
D-423	103+35R	0.86	0.07	0.06	5.00	0.42	0.53	**6**	**12**	0.7854	**752.25**	749.08	3.00	**748.08**	0.0133	5.69	**OK**	748.58	748.58	**OK**	AA-S125A
D-424	103+35R		0.07	0.06							**752.77**	749.00	3.60	**748.00**				748.50	748.50		0.012
D-422	104+00R	0.00	0.00	0.00	5.00	6.14	7.75	**65**	**18**	1.7671	**753.00**	746.54	6.25	**745.04**	0.0035	3.84	**OK**	745.79	745.79	**OK**	MH-TYPE C
D-424	103+35R		1.05	0.88							**752.77**	746.31	6.25	**744.81**				745.56	745.56		0.012
D-426	102+65R	0.86	0.06	0.05	5.00	0.36	0.45	**8**	**12**	0.7854	**752.00**	748.83	3.00	**747.83**	0.0088	4.61	**OK**	748.33	748.33	**OK**	AA-S125A
D-425	102+70R		0.06	0.05							**752.53**	748.76	3.60	**747.76**				748.26	748.26		0.012
D-424	103+35R	0.00	0.00	0.00	5.00	6.56	8.27	**65**	**18**	1.7671	**752.77**	746.31	6.25	**744.81**	0.0037	3.92	**OK**	745.56	745.56	**OK**	AA-S125A
D-425	102+70R		1.12	0.94							**752.53**	746.07	6.25	**744.57**				745.32	745.32		0.012
D-425	102+70R	0.00	0.00	0.00	5.00	11.31	14.27	**78**	**18**	1.7671	**752.53**	746.07	6.25	**744.57**	0.0388	12.73	**OK**	745.32	745.32	**OK**	MH-TYPE C
D-427	102+19R		1.92	1.62							**746.25**	743.04	3.00	**741.54**				742.29	742.29		0.012
D-428	102+36R	0.50	0.32	0.16	5.00	1.11	1.41	**18**	**24**	3.1416		742.75	1.00	**740.92**	0.0050	5.53	**OK**	741.92	741.92	**OK**	AA-S133A
D-427	102+19R		0.32	0.16							**746.25**	742.83	3.17	**740.83**				741.83	741.83		0.012
D-427	102+19R	0.00	0.00	0.00	5.00	12.42	15.67	**66**	**24**	3.1416	**746.25**	742.83	3.17	**740.83**	0.0055	5.78	**OK**	741.83	741.83	**OK**	MH-TYPE C
OUTLET	101+51.5R		2.24	1.78										**740.47**				741.47	741.47		0.012

Ditch Analysis

FRA-SR 317-10.63
CIP NO. 530103-100052
HAMILTON ROAD
I-70 TO REFUGEE ROAD

June 13, 2016

ms consultants, inc.
engineers, architects, planners
2221 Schrock Road
Columbus, Ohio 43229-1547

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 25+50 back to 23+04 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
25+50	23+04	L	246.00	4.00	4.00	4.00	0.0042	0.15	0.15	0.54	0.08	Seed	3.91	5	0.030	15.69	0.67	0.03	0.32	0.11	4.86
												Seed	4.26	10	0.040	16.58	0.57	0.03	0.35	0.13	5.07

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 52+00 back to 50+50 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
52+00	50+50	L	150.00	4.00	4.00	4.00	0.0040	0.13	0.13	0.47	0.06	Seed	4.17	5	0.030	13.82	0.60	0.02	0.25	0.10	4.77
												Seed	4.55	10	0.040	14.48	0.53	0.03	0.28	0.12	4.95

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 49+50 ahead to 50+50 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
49+50	50+50	L	100.00	4.00	4.00	4.00	0.0040	0.13	0.13	0.47	0.06	Seed	4.36	5	0.030	12.55	0.63	0.02	0.27	0.10	4.77
												Seed	4.78	10	0.040	12.98	0.53	0.03	0.29	0.12	4.99

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 45+85 ahead to 46+60 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
45+85	46+60	L	75.00	4.00	4.00	4.00	0.0056	0.10	0.10	0.42	0.04	Seed	4.45	5	0.030	12.00	0.63	0.02	0.19	0.07	4.56
												Seed	4.89	10	0.040	12.30	0.52	0.03	0.21	0.09	4.73

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 44+50 ahead to 45+85 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
44+50	45+85	L	135.00	4.00	4.00	4.00	0.0035	0.12	0.12	0.55	0.07	Seed	4.21	5	0.030	13.55	0.62	0.02	0.28	0.10	4.82
												Seed	4.61	10	0.040	14.08	0.52	0.03	0.30	0.13	5.03

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 44+50 back to 43+85 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
44+50	43+85	L	65.00	4.00	4.00	4.00	0.0011	0.02	0.02	0.54	0.01	Seed	4.04	5	0.030	14.71	0.24	0.00	0.04	0.04	4.34
												Seed	4.45	10	0.040	15.17	0.18	0.00	0.05	0.06	4.52

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 43+10 ahead to 43+85 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
43+10	43+85	L	75.00	4.00	4.00	4.00	0.0031	0.03	0.03	0.54	0.02	Seed	4.20	5	0.030	13.62	0.38	0.01	0.07	0.04	4.34
												Seed	4.62	10	0.040	13.98	0.30	0.01	0.07	0.06	4.47

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 43+00 ahead to 43+10 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
43+00	43+10	L	10.00	4.00	4.00	4.00	0.0040	0.01	0.01	0.50	0.01	Seed	4.70	5	0.030	10.61	0.27	0.01	0.02	0.02	4.17
												Seed	5.16	10	0.040	10.83	0.19	0.01	0.03	0.03	4.26

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 43+00 back to 42+35 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
43+00	42+35	L	65.00	4.00	4.00	4.00	0.0015	0.02	0.02	0.50	0.01	Seed	4.14	5	0.030	14.03	0.23	0.00	0.04	0.04	4.34
												Seed	4.39	10	0.040	15.59	0.19	0.01	0.04	0.05	4.43

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 42+00 ahead to 42+35 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
42+00	42+35	L	35.00	4.00	4.00	4.00	0.0040	0.03	0.03	0.50	0.02	Seed	4.55	5	0.030	11.45	0.38	0.01	0.07	0.04	4.34
												Seed	5.01	10	0.040	11.65	0.33	0.01	0.08	0.05	4.43

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 42+00 back to 41+50 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
42+00	41+50	L	50.00	4.00	4.00	4.00	0.0040	0.03	0.03	0.50	0.02	Seed	4.44	5	0.030	12.07	0.37	0.01	0.07	0.04	4.34
												Seed	4.88	10	0.040	12.36	0.32	0.01	0.07	0.05	4.43

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 41+00 ahead to 40+50 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
41+00	41+50	L	50.00	4.00	4.00	4.00	0.0040	0.03	0.03	0.50	0.02	Seed	4.44	5	0.030	12.07	0.37	0.01	0.07	0.04	4.34
												Seed	4.88	10	0.040	12.36	0.32	0.01	0.07	0.05	4.43

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 41+00 back to 40+00 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
41+00	40+00	L	100.00	4.00	4.00	4.00	0.0050	0.07	0.07	0.57	0.04	Seed	4.32	5	0.030	12.80	0.58	0.02	0.17	0.07	4.56
												Seed	4.72	10	0.040	13.33	0.50	0.03	0.19	0.09	4.69

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 38+58 back to 38+08 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
38+58	38+08	L	50.00	4.00	4.00	12.00	0.0030	0.05	0.05	0.56	0.03	Seed	4.46	5	0.030	11.97	0.43	0.01	0.12	0.06	5.03
												Seed	4.90	10	0.040	12.25	0.34	0.02	0.14	0.09	5.38

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 38+08 ahead to 38+20 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
38+08	38+20	L	12.00	4.00	4.00	12.00	0.0029	0.02	0.02	0.56	0.01	Seed	4.69	5	0.030	10.69	0.28	0.01	0.05	0.04	4.69
												Seed	5.16	10	0.040	10.80	0.24	0.01	0.06	0.05	4.86

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 37+90 back to 37+35 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
37+90	37+35	L	55.00	4.00	4.00	7.00	0.0109	0.05	0.05	0.45	0.02	Seed	4.53	5	0.030	11.54	0.56	0.03	0.10	0.04	4.47
												Seed	4.99	10	0.040	11.77	0.49	0.04	0.11	0.05	4.59

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 37+00 ahead to 37+35 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
37+00	37+35	L	35.00	4.00	4.00	7.00	0.0029	0.03	0.03	0.45	0.01	Seed	4.52	5	0.030	11.63	0.33	0.01	0.06	0.04	4.47
												Seed	4.97	10	0.040	11.87	0.29	0.01	0.07	0.05	4.59

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 36+50 back to 35+85 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
36+50	35+85	L	65.00	6.00	4.00	7.00	0.0031	0.07	0.07	0.46	0.03	Seed	4.35	5	0.030	12.61	0.39	0.01	0.14	0.06	6.62
												Seed	4.77	10	0.040	13.05	0.34	0.01	0.15	0.07	6.77

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 35+50 ahead to 35+85 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
35+50	35+85	L	35.00	10.00	4.00	10.00	0.0057	0.04	0.04	0.46	0.02	Seed	4.49	5	0.030	11.80	0.30	0.01	0.08	0.03	10.38
												Seed	4.95	10	0.040	11.96	0.28	0.01	0.09	0.03	10.45

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 35+50 back to 35+00 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
35+50	35+00	L	50.00	12.00	4.00	5.00	0.0040	0.05	0.05	0.48	0.02	Seed	4.32	5	0.030	12.82	0.29	0.01	0.10	0.03	12.27
												Seed	4.78	10	0.040	12.99	0.25	0.01	0.11	0.04	12.34

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 25+50 ahead to 26+70 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
34+00	35+00	L	100.00	8.00	4.00	5.00	0.0081	0.09	0.09	0.47	0.04	Seed	4.28	5	0.030	13.06	0.51	0.02	0.18	0.04	8.39
												Seed	4.71	10	0.040	13.45	0.45	0.03	0.20	0.05	8.48

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 33+17 back to 32+50 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
33+17	32+50	L	67.00	10.00	4.00	4.00	0.0040	0.06	0.06	0.50	0.03	Seed	4.27	5	0.030	13.16	0.34	0.01	0.13	0.04	10.30
												Seed	4.71	10	0.040	13.45	0.30	0.01	0.14	0.05	10.37

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 32+50 back to 31+61 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
32+50	31+61	L	89.00	10.00	4.00	4.00	0.0039	0.08	0.08	0.45	0.04	Seed	4.18	5	0.030	13.74	0.37	0.01	0.15	0.04	10.32
												Seed	4.55	10	0.040	14.46	0.31	0.01	0.16	0.05	10.41

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 30+17 back to 26+70 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
30+17	26+70	L	347.00	4.00	4.00	7.00	0.0040	0.29	0.29	0.47	0.14	Seed	3.76	5	0.030	16.93	0.77	0.04	0.51	0.14	5.54
												Seed	4.07	10	0.040	18.20	0.65	0.04	0.55	0.17	5.89

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 25+50 ahead to 26+70 LT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
25+50	26+70	L	120.00	4.00	4.00	7.00	0.0042	0.09	0.09	0.47	0.04	Seed	4.21	5	0.030	13.51	0.54	0.02	0.18	0.08	4.83
												Seed	4.60	10	0.040	14.14	0.47	0.02	0.19	0.09	5.00

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 24+60 back to 23+00 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
24+60	23+00	R	160.00	4.00	4.00	4.00	0.0038	0.23	0.23	0.38	0.09	Seed	4.19	5	0.030	13.68	0.69	0.03	0.37	0.12	4.95
												Seed	4.58	10	0.040	14.29	0.58	0.04	0.40	0.15	5.20

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 60+99 RT on Eastland Dr. back to 28+00 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
60+99	28+00	R	233.00	4.00	4.00	4.00	0.0245	0.24	0.24	0.30	0.07	Seed	4.26	5	0.030	13.21	1.17	0.09	0.31	0.06	4.49
												Seed	4.67	10	0.040	13.66	1.00	0.12	0.34	0.08	4.62

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 58+33 (sag with thru curb) back to 57+50 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:** 0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:** 3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00			

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
58+33	57+50	R	83.00	4.00	4.00	4.00	0.0104	0.25	0.25	0.63	0.16	Seed	4.61	5	0.030	11.12	1.22	0.09	0.73	0.13	5.05
												Seed	5.07	10	0.040	11.31	1.04	0.11	0.80	0.17	5.32

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 56+00 ahead to 56+50 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
56+00	56+50	R	50.00	4.00	4.00	4.00	0.0104	0.09	0.09	0.43	0.04	Seed	4.61	5	0.030	11.12	0.71	0.04	0.18	0.06	4.47
												Seed	5.07	10	0.040	11.31	0.63	0.05	0.20	0.07	4.58

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 51+90 ahead to 53+50 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
51+90	53+50	R	160.00	4.00	4.00	4.00	0.0040	0.33	0.33	0.35	0.12	Seed	4.24	5	0.030	13.31	0.77	0.03	0.49	0.14	5.12
												Seed	4.64	10	0.040	13.88	0.67	0.04	0.54	0.17	5.38

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 48+50 ahead to 50+25 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
48+50	50+25	R	175.00	4.00	4.00	4.00	0.0046	0.27	0.27	0.37	0.10	Seed	4.20	5	0.030	13.61	0.76	0.04	0.42	0.12	4.99
												Seed	4.58	10	0.040	14.26	0.66	0.04	0.46	0.15	5.20

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 42+60 ahead to 44+35 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
42+60	44+35	R	175.00	4.00	4.00	4.00	0.0029	0.35	0.35	0.35	0.12	Seed	4.15	5	0.030	13.98	0.71	0.03	0.51	0.16	5.25
												Seed	4.53	10	0.040	14.60	0.60	0.03	0.56	0.19	5.55

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 40+70 ahead to 42+60 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
40+70	42+60	R	190.00	4.00	4.00	4.00	0.0055	0.68	0.68	0.56	0.38	Seed	4.39	5	0.030	12.37	1.30	0.09	1.67	0.26	6.05
												Seed	4.81	10	0.040	12.80	1.10	0.11	1.83	0.32	6.54

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 40+70 back to 40+00 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
40+70	40+00	R	70.00	4.00	4.00	4.00	0.0186	0.30	0.30	0.34	0.10	Seed	4.64	5	0.030	10.92	1.27	0.10	0.47	0.09	4.69
												Seed	5.11	10	0.040	11.06	1.08	0.13	0.52	0.11	4.87

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 38+50 back to 36+00 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
38+50	36+00	R	250.00	4.00	4.00	4.00	0.0040	0.41	0.41	0.31	0.13	Seed	4.00	5	0.030	14.99	0.78	0.04	0.51	0.14	5.14
												Seed	4.36	10	0.040	15.87	0.66	0.04	0.55	0.18	5.42

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 36+00 back to 34+00 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
36+00	34+00	R	200.00	4.00	4.00	4.00	0.0040	0.32	0.32	0.36	0.12	Seed	4.12	5	0.030	14.15	0.76	0.03	0.47	0.14	5.10
												Seed	4.49	10	0.040	14.86	0.65	0.04	0.52	0.17	5.35

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 34+00 back to 32+00 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
34+00	32+00	R	200.00	4.00	4.00	4.00	0.0040	0.43	0.43	0.34	0.15	Seed	4.17	5	0.030	13.81	0.83	0.04	0.61	0.16	5.27
												Seed	4.55	10	0.040	14.47	0.71	0.05	0.67	0.20	5.57

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 31+50 ahead to 32+00 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
31+50	32+00	R	50.00	4.00	4.00	4.00	0.0040	0.09	0.09	0.34	0.03	Seed	4.51	5	0.030	11.69	0.50	0.02	0.14	0.06	4.52
												Seed	4.96	10	0.040	11.91	0.44	0.02	0.15	0.08	4.64

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 28+00 back to 26+00 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

	Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
28+00	26+00	R	200.00	4.00	4.00	4.00	0.0040	0.17	0.17	0.30	0.05	Seed	3.95	5	0.030	15.40	0.58	0.02	0.20	0.08	4.64
												Seed	4.27	10	0.040	16.49	0.48	0.03	0.22	0.10	4.82

DITCH ANALYSIS

PID : 95570 **Date :** 05/31/2016 **Project :** FRA-SR317-10.63 **Location :** Hamilton Road

Description : Ditch section Sta. 25+50 ahead to 26+00 RT Hamilton Road **Designer :** Schuster

Rainfall Area : C

Allowable Shears

		Seed:	0.40	**Jute Mat:**	0.45	**Temporary Mat:**	1.00
	Permanent Mat	**Type 1:**	2.00	**Type 2:**	3.00	**Type 3:**	5.00
	RCP	**Type B:**	6.00				

(*) Warning: Grade is steeper than allowable. If value is parantheses, design parameters have been exceeded. - See user manual.

STATION BEGIN	STATION END	SIDE	LENGTH (ft.)	RADIUS WIDTH (ft.)	IN SLOPE (ft./ft.)	BACK SLOPE (ft./ft.)	GRADE (ft./ft.)	AREA (acres)	AREA SUM (acres)	RUNOFF COEFF.	CA (Sum)	PROTECT TYPE	RAIN INT. (in./hr.)	STORM FREQ. (yrs.)	MANN. COEFF.	TIME FLOW (min.)	VEL. FLOW (fps.)	SHEAR (lbs./ sq.ft.)	DESIGN FLOW (cfs.)	DEPTH FLOW (ft.)	WIDTH FLOW (ft.)
25+50	26+00	R	50.00	4.00	4.00	4.00	0.0040	0.05	0.05	0.30	0.02	Seed	4.44	5	0.030	12.07	0.37	0.01	0.07	0.04	4.34
												Seed	4.88	10	0.040	12.36	0.32	0.01	0.07	0.05	4.43

Culvert Calculations

FRA-SR 317-10.63
CIP NO. 530103-100052
HAMILTON ROAD
I-70 TO REFUGEE ROAD

June 13, 2016

ms consultants, inc.
engineers, architects, planners
2221 Schrock Road
Columbus, Ohio 43229-1547

CULVERT ANALYSIS

PID : 95570 **Date :** 05/13/2016 **Project :** Hamilton Road-Eastland **Location :** Eastland area, Columbus, Ohio

Description : Analysis of existing 54" culvert under Groves Road just west of Hamilton Road **Designer :** Schuster

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Pipe Number : 1 **Use HW :** 0 **Inlet Invert Elevation (ft.) :** 751.07 **Outlet Invert Elevation (ft.) :** 750.84
Pipe Quantity : 1

Culvert Type : Circular Smooth **Pipe Length (ft.) :** 55.20 **Culvert Slope (ft./ft.) :** 0.0042
Corrugation Type :
Pipe Size : 48 in.
Design Manning 'n' : (default) **Buried Manning 'n' :** N/A

Entrance Type : Square Edge with Headwall **Loss Coef. Ke :** 0.5000 **K :** 0.0098 **M :** 2.00 **Max. Q :** 3.30
CD : 0.6251 **c :** 0.0398 **Y :** 0.6700 **Min. Q :** 3.40

FLOW (cfs.)	HEAD LOSS (ft.)	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	BURIED DEPTH (ft.)	TAILWATER ELEVATION (ft.)
73.69	0.99	755.13	N/A	1 - C	8.73	2.55	2.60	0.0120	INLET	0.00	751.09
78.69	1.14	755.33	N/A	1 - C	8.85	2.67	2.69	0.0120	INLET	0.00	751.16
83.69	2.11	755.52	755.72	1 - A	9.00	2.79	2.77	0.0120	OUTLET*	0.00	751.23
88.69	2.19	755.72	755.88	2 - F	9.24	2.92	2.85	0.0120	OUTLET*	0.00	751.31
93.69	2.27	755.95	756.05	2 - F	9.48	3.06	2.93	0.0120	OUTLET*	0.00	751.38

UNIVERSAL CULVERT DESIGN

PID : 95570 **Date :** 05/16/2016 **Project :** Hamilton - Eastland **Location :** Eastland area of Columbus, ohio

Description : Proposed culvert extension at Sta. 103+34.29 Groves Road **Designer :** Schuster

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 751.14 **Outlet Invert Elevation (ft.) :** 750.84 **Tailwater Elevation (ft.) :** 751.09 **Overflow Elevation (ft.) :** 759.08

Allowable Headwater Elevation (ft.) : 757.76 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 74.30 **Culvert Slope (ft./ft.) :** 0.0040 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 74.00 @ 25 yrs. **Flood Discharge (cfs) :** 92.00 @ 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Full Headwall								**Entrance Loss (Ke) :** 0.20		
74.00	1	42 in.	755.40	755.45	2 - F	9.32	3.50	2.69	0.0120	OUTLET*	0.00	D	0.00
74.00	1	36 in.	756.55	756.51	2 - E	10.47	3.00	2.71	0.0120	INLET	0.00	D - 1	0.00
74.00	1	48 in.	754.96	N/A	1 - C	8.63	2.58	2.60	0.0120	INLET	0.00	D + 1	0.00
92.00	1	42 in.	756.36	756.31	2 - E	9.56	3.50	2.97	0.0120	INLET	0.00	F	0.00
92.00	1	36 in.	758.29	758.12	2 - E	13.02	3.00	2.86	0.0120	INLET	0.00	F - 1	0.00
92.00	1	48 in.	755.58	755.67	1 - A	9.40	3.05	2.91	0.0120	OUTLET*	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Full Headwall								**Entrance Loss (Ke) :** 0.25		
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
74.00	1	42 in.	755.81	756.41	2 - F	9.32	3.50	2.69	0.0237	OUTLET**	0.00	D	0.00
74.00	1	36 in.	757.38	758.95	2 - F	11.02	3.00	2.71	0.0241	OUTLET**	0.00	D - 1	0.00
74.00	1	48 in.	755.17	755.39	1 - A	8.55	3.65	2.60	0.0235	OUTLET*	0.00	D + 1	0.00

UNIVERSAL CULVERT DESIGN

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
92.00	1	42 in.	757.03	757.90	2 - F	10.57	3.50	2.97	0.0237	OUTLET**	0.00	F	0.00
74.80	1	36 in.	759.69	761.89	2 - F	11.11	3.00	2.72	0.0241	OUTLET**	17.20	F - 1	0.00
92.00	1	48 in.	755.94	756.32	2 - F	9.40	4.00	2.91	0.0235	OUTLET**	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
74.00	1	48 in.	755.17	755.49	1 - A	8.55	3.65	2.60	0.0275	OUTLET*	0.00	D	0.00
74.00	1	42 in.	755.81	756.91	2 - F	9.32	3.50	2.69	0.0278	OUTLET**	0.00	D - 1	0.00
68.20	1	36 in.	757.38	760.07	2 - F	10.37	3.00	2.63	0.0281	OUTLET**	5.80	D - 2	0.00
74.00	1	54 in.	754.85	755.15	1 - A	8.11	4.11	2.51	0.0273	OUTLET*	0.00	D + 1	0.00
92.00	1	48 in.	755.94	756.69	2 - F	9.40	4.00	2.91	0.0275	OUTLET**	0.00	F	0.00
92.00	1	42 in.	757.03	758.68	2 - F	10.57	3.50	2.97	0.0278	OUTLET**	0.00	F - 1	0.00
68.20	1	36 in.	759.69	763.62	2 - F	10.37	3.00	2.63	0.0281	OUTLET**	23.80	F - 2	0.00
92.00	1	54 in.	755.43	755.78	1 - A	8.79	4.11	2.81	0.0273	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
74.00	1	60 in.	754.64	755.08	1 - A	7.81	4.57	2.43	0.0332	OUTLET*	0.00	D	0.00
74.00	1	66 in.	754.48	754.89	1 - A	7.59	4.00	2.36	0.0330	OUTLET*	0.00	D + 1	0.00
92.00	1	60 in.	755.14	755.63	1 - A	8.41	4.57	2.72	0.0332	OUTLET*	0.00	F	0.00
92.00	1	66 in.	754.94	755.37	1 - A	8.14	5.02	2.65	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
74.00	1	60 in.	754.64	754.90	1 - A	7.81	3.69	2.43	0.0260	OUTLET*	0.00	D	0.00
74.00	1	66 in.	754.48	754.74	1 - A	7.59	3.37	2.36	0.0260	OUTLET*	0.00	D + 1	0.00
92.00	1	60 in.	755.14	755.41	1 - A	8.41	4.57	2.72	0.0260	OUTLET*	0.00	F	0.00
92.00	1	66 in.	754.94	755.20	1 - A	8.14	3.94	2.65	0.0260	OUTLET*	0.00	F + 1	0.00

Drainage Area Maps

FRA-SR 317-10.63
CIP NO. 530103-100052
HAMILTON ROAD
I-70 TO REFUGEE ROAD

June 13, 2016

ms consultants, inc.
engineers, architects, planners
2221 Schrock Road
Columbus, Ohio 43229-1547

34" x 22"

Model: Sheet View: SHEET
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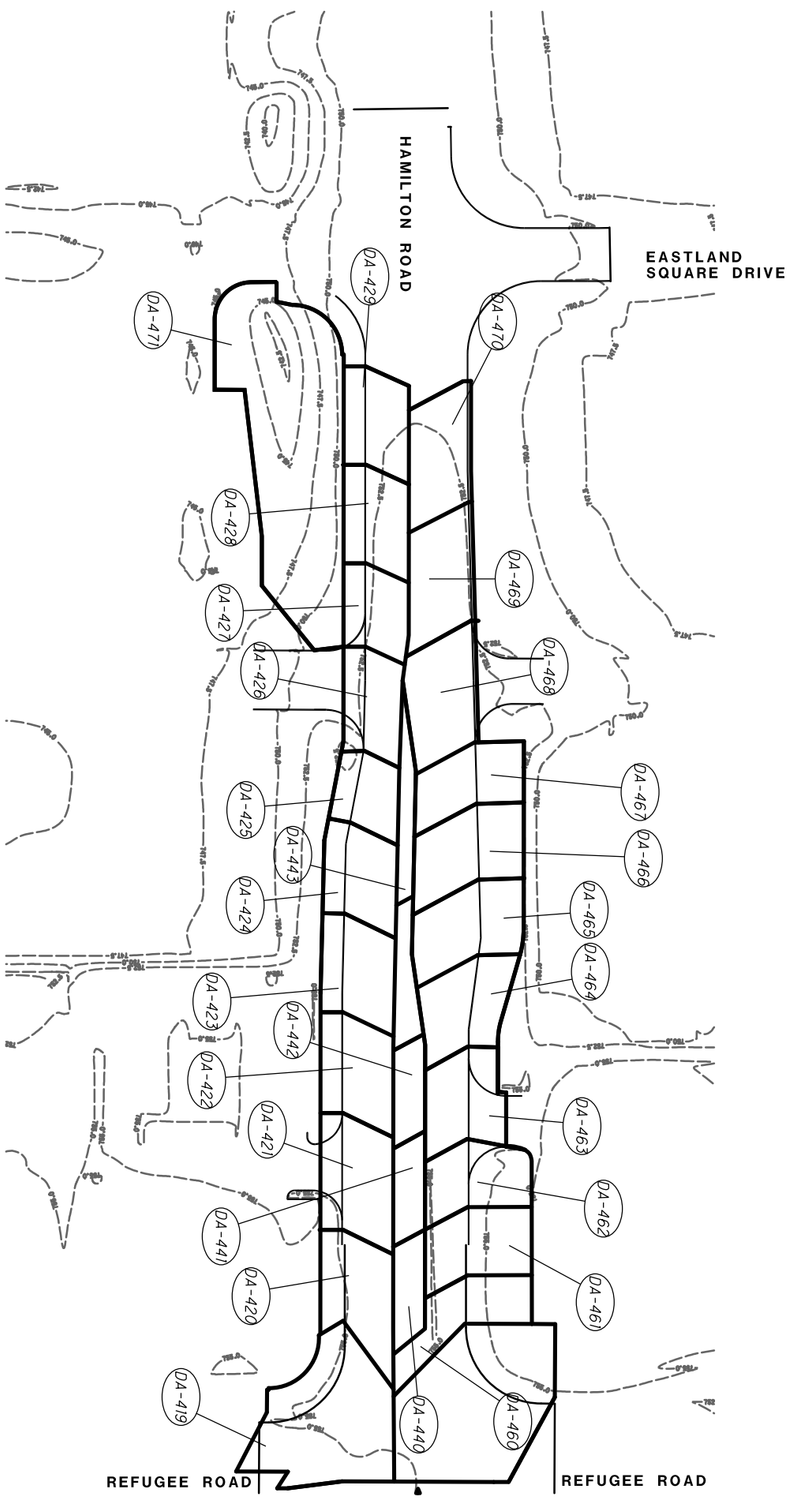

DA-419 TO STRUCTURE D-470
STA. 109+00.19, 50.4' RT
C = 0.9, A = 0.16 AC.

DA-420 TO STRUCTURE D-471
STA. 108+40.19, 50.6' RT
C = 0.86, A = 0.08 AC.

DA-421 TO STRUCTURE D-474
STA. 107+63.19, 50.9' RT
C = 0.86, A = 0.08 AC.

DA-422 TO STRUCTURE D-411
STA. 106+96.64, 51.1' RT
C = 0.86, A = 0.07 AC.

DA-423 TO STRUCTURE D-413
STA. 106+31.57, 50.1' RT
C = 0.86, A = 0.07 AC.

DA-424 TO STRUCTURE D-415
STA. 105+71.42, 46.6' RT
C = 0.86, A = 0.07 AC.

DA-425 TO STRUCTURE D-417
STA. 105+24.11, 37.9' RT
C = 0.86, A = 0.05 AC.

DA-426 TO STRUCTURE D-419
STA. 104+77.23, 36.9' RT
C = 0.86, A = 0.07 AC.

DA-427 TO STRUCTURE D-421
STA. 104+00.23, 37.2' RT
C = 0.86, A = 0.06 AC.

DA-428 TO STRUCTURE D-423
STA. 103+35.23, 37.5' RT
C = 0.86, A = 0.07 AC.

DA-429 TO STRUCTURE D-426
STA. 102+65.23, 37.7' RT
C = 0.86, A = 0.06 AC.

DA-440 TO STRUCTURE D-404
STA. 108+39.98, 3.9' LT
C = 0.9, A = 0.03 AC.

DA-441 TO STRUCTURE D-407
STA. 107+74.99, 3.7' LT
C = 0.9, A = 0.03 AC.

DA-442 TO STRUCTURE D-441
STA. 107+10.99, 2.4' LT
C = 0.9, A = 0.03 AC.

DA-443 TO STRUCTURE D-444
STA. 106+20.08, 4.8' RT
C = 0.9, A = 0.03 AC.

DA-460 TO STRUCTURE D-402
STA. 108+69.88, 32.5' LT
C = 0.75, A = 0.07 AC.

DA-461 TO STRUCTURE D-305
STA. 108+24.88, 32.4' LT
C = 0.75, A = 0.07 AC.

DA-462 TO STRUCTURE D-408
STA. 107+79.88, 32.2' LT
C = 0.75, A = 0.07 AC.

DA-463 TO STRUCTURE D-440
STA. 107+18.88, 32.0' LT
C = 0.75, A = 0.07 AC.

DA-464 TO STRUCTURE D-445
STA. 106+58.69, 38.2' LT
C = 0.85, A = 0.08 AC.

DA-465 TO STRUCTURE D-447
STA. 106+08.66, 38.4' LT
C = 0.8, A = 0.08 AC.

DA-466 TO STRUCTURE D-449
STA. 105+58.68, 36.8' LT
C = 0.8, A = 0.08 AC.

DA-467 TO STRUCTURE D-451
STA. 105+18.21, 35.4' LT
C = 0.8, A = 0.07 AC.

DA-468 TO STRUCTURE D-453
STA. 104+37.97, 32.8' LT
C = 0.9, A = 0.08 AC.

DA-469 TO STRUCTURE D-455
STA. 103+59.98, 30.2' LT
C = 0.9, A = 0.08 AC.

DA-470 TO STRUCTURE D-458
STA. 102+79.98, 29.3' LT
C = 0.9, A = 0.07 AC.

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UCF: ohdot1V8i
PCF: 60-06748_Columbus

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View: SHEET
By: mschuster

34" x 22"

DA-1a TO STRUCTURE D-220
STA. 11+15.00, 33.5' LT
C = 0.83, A = 0.07 AC.

DA-1b TO STRUCTURE D-223
STA. 11+95.00, 33.5' LT
C = 0.81, A = 0.13 AC.

DA-1c TO STRUCTURE D-224
STA. 12+70.00, 33.5' LT
C = 0.73, A = 0.21 AC.

DA-1d TO STRUCTURE D-226
STA. 13+50.00, 32.8' LT
C = 0.78, A = 0.25 AC.

DA-1e TO STRUCTURE D-229
STA. 14+50.00, 29.8' LT
C = 0.78, A = 0.20 AC.

DA-1f TO STRUCTURE D-231
STA. 16+00.00, 29.8' LT
C = 0.79, A = 0.151 AC.

DA-1 SAG TO STRUCTURE D-233
STA. 16+75.00, 29.8' LT
C = 0.79, A = 0.21 AC.

DA-1i TO STRUCTURE D-234
STA. 17+65.00, 29.8' LT
C = 0.79, A = 0.17 AC.

DA-1h TO STRUCTURE D-264
STA. 12+70.00, 33.5' LT
C = 0.77, A = 0.20 AC.

DA-1g TO STRUCTURE D-261
STA. 20+00.00, 33.5' LT
C = 0.71, A = 0.28 AC.

DA-1+ SAG TO STRUCTURE D-223
STA. 11+56.15, 30.3' RT*
C = 0.82, A = 0.05 AC.

* SOUTH MALL ENTRANCE

DA-4a TO STRUCTURE D-206
STA. 12+70.00, 11.0' RT
C = 0.9, A = 0.05 AC.

DA-4b TO STRUCTURE D-211
STA. 14+50.00, 6.8' RT
C = 0.9, A = 0.04 AC.

DA-5a TO STRUCTURE D-263
STA. 18+70.00, 3.4' LT
C = 0.9, A = 0.03 AC.

DA-6a TO STRUCTURE D-200
STA. 11+15.00, 39.5' RT
C = 0.8, A = 0.06 AC.

DA-6b TO STRUCTURE D-223
STA. 11+95.00, 33.5' RT
C = 0.68, A = 0.08 AC.

DA-6c TO STRUCTURE D-204
STA. 12+45.00, 39.5' RT
C = 0.78, A = 0.10 AC.

DA-6d TO STRUCTURE D-208
STA. 13+50.00, 39.5' RT
C = 0.73, A = 0.18 AC.

DA-6 PL 1 TO STRUCTURE D-207a
STA. 12+84.66, 202.3' RT
C = 0.86, A = 0.70 AC.

DA-6e TO STRUCTURE D-212
STA. 14+50.00, 36.7' RT
C = 0.74, A = 0.14 AC.

DA-6 PL 2 TO STRUCTURE D-209a
STA. 14+77.55, 173.5' RT
C = 0.88, A = 2.56 AC.

DA-6f TO STRUCTURE D-213
STA. 15+45.00, 33.7' RT
C = 0.7 A = 0.18 AC.

DA-6 D 1 TO STRUCTURE D-218a
STA. 15+39.68, 84.2' RT
C = 0.57, A = 3.34 AC.

DA-6g TO STRUCTURE D-216
STA. 16+30.00, 33.2' RT
C = 0.73, A = 0.07 AC.

DA-6 SAG TO STRUCTURE D-204
STA. 16+75.00, 33.2' RT
C = 0.9, A = 0.16 AC.

DA-6k TO STRUCTURE D-241
STA. 17+75.00, 33.2' RT
C = 0.75, A = 0.13 AC.

DA-6j TO STRUCTURE D-254
STA. 18+50.00, 31.7' RT
C = 0.63, A = 0.16 AC.

DA-6i TO STRUCTURE D-253
STA. 19+00.00, 30.3' RT
C = 0.51, A = 0.28 AC.

DA-6 D 2 TO STRUCTURE D-242a
STA. 19+08.24, 79.6' RT
C = 0.66, A = 2.38 AC.

DA-6h TO STRUCTURE D-250
STA. 20+00.00, 29.5' RT
C = 0.71, A = 0.30 AC.

DA-6+ SAG TO STRUCTURE D-93
STA. 15+46.19, 25.5' RT#
C = 0.73, A = 0.21 AC.

\# SERVICE ROAD ENTRANCE 1

N

0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED | CHECKED

DRAINAGE MAP
HAMILTON ROAD AND GROVES ROAD

FRA-SR317-10.63

2
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1" 0.5" 0

UCF: ohdot1V8i
PCF: 60-06748_Columbus

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View: SHEET
By: mschuster

34" x 22"

DA-2 SAG — TO STRUCTURE D-194
STA. 11+48.77, 39.7' LT*
C = 0.9, A = 0.11 AC.

DA-2 D 2 — TO STRUCTURE D-191
STA. 23+10.00, 52.2' LT
C = 0.54, A = 0.15 AC.

DA-2f — TO STRUCTURE D-192
STA. 23+10.00, 43.5' LT
C = 0.88, A = 0.27 AC.

DA-2e — TO STRUCTURE D-190
STA. 25+50.00, 43.5' LT
C = 0.85, A = 0.11 AC.

DA-2d — TO STRUCTURE D-187
STA. 26+70.00, 33.5' LT
C = 0.9, A = 0.07 AC.

DA-2 D 1 — TO STRUCTURE D-188
STA. 26+70.00, 50.1' LT
C = 0.47, A = 0.38 AC.

DA-2c — TO STRUCTURE D-185
STA. 27+50.00, 33.5' LT
C = 0.9, A = 0.07 AC.

DA-2b — TO STRUCTURE D-183
STA. 28+30.00, 33.5' LT
C = 0.84, A = 0.10 AC.

DA-2a — TO STRUCTURE D-181
STA. 29+50.00, 33.5' LT
C = 0.84, A = 0.10 AC.

DA-2+ SAG — TO STRUCTURE D-179
STA. 44+54.00, 48.3' RT**
C = 0.9, A = 0.08 AC.

* SOUTH MALL ENTRANCE
** EASTLAND ONE
\# SERVICE ROAD ENTRANCE 1
\#\# EASTLAND DRIVE

DA-7 SAG — TO STRUCTURE D-92
STA. 15+46.19, 25.5' LT#
C = 0.8, A = 0.12 AC.

DA-7 PL 5 — TO STRUCTURE D-95a
STA. 16+32.64, 29.9' LT##
C = 0.8, A = 0.82 AC.

DA-7g — TO STRUCTURE D-90
STA. 23+00.00, 29.5' RT
C = 0.9, A = 0.07 AC.

DA-7 D 3 — TO STRUCTURE D-91
STA. 23+00.00, 50.9' RT
C = 0.38, A = 0.23 AC.

DA-7f — TO STRUCTURE D-88
STA. 24+00.00, 29.5' RT
C = 0.9, A = 0.07 AC.

DA-7e — TO STRUCTURE D-85
STA. 25+00.00, 29.5' RT
C = 0.9, A = 0.07 AC.

DA-7 PL 4 — TO STRUCTURE D-86a
STA. 25+09.44, 87.2' RT
C = 0.82, A = 0.65 AC.

DA-7d — TO STRUCTURE D-82
STA. 26+00.00, 29.5' RT
C = 0.9, A = 0.07AC.

DA-7 D 2 — TO STRUCTURE D-83
STA. 26+00.00, 51.8' RT
C = 0.3, A = 0.22 AC.

DA-7c — TO STRUCTURE D-80
STA. 27+00.00, 29.5' RT
C = 0.9, A = 0.07 AC.

DA-7b — TO STRUCTURE D-76
STA. 28+00.00, 29.5' RT
C = 0.9, A = 0.08 AC.

DA-7 D 1 — TO STRUCTURE D-78
STA. 28+00.00, 51.3' RT
C = 0.3, A = 0.24 AC.

DA-7 PL 3 — TO STRUCTURE D-77a
STA. 28+07.93, 87.7' RT
C = 0.87, A = 0.22 AC.

DA-7a — TO STRUCTURE D-74
STA. 29+10.00, 29.5' RT
C = 0.8, A = 0.12 AC.

DA-7 PL 2 — TO STRUCTURE D-72b
STA. 61+36.75, 66.3' RT##
C = 0.8, A = 0.24 AC.

DA-7+ SAG — TO STRUCTURE D-71
STA. 60+45.28, 29.0' RT
C = 0.9, A = 0.09 AC.

DA-7 PL 1 — TO STRUCTURE D-72a
STA. 61+54.51, 17.2' RT
C = 0.75, A = 0.31 AC.

DA-13a — TO STRUCTURE D-281
STA. 41+50.00, 16.5' RT**
C = 0.87, A = 0.20 AC.

DA-14a — TO STRUCTURE D-280
STA. 41+50.00, 19.5' LT
C = 0.55, A = 0.24 AC.

DA-3 D 3 — TO STRUCTURE D-168
STA. 35+85.00, 47.0' LT
C = 0.46, A = 0.11 AC.

DA-3e — TO STRUCTURE D-171
STA. 35+00.00, 37.5' LT
C = 0.9, A = 0.08 AC.

DA-3 D 4 — TO STRUCTURE D-170
STA. 35+00.00, 50.0' LT
C = 0.48, A = 0.13 AC.

DA-3f — TO STRUCTURE D-173
STA. 34+00.00, 43.5' LT
C = 0.9, A = 0.11 AC.

DA-3g — TO STRUCTURE D-175
STA. 32+50.00, 43.5' LT
C = 0.86, A = 0.17 AC.

DA-3 D 5 — TO STRUCTURE D-174
STA. 32+50.00, 53.0' LT
C = 0.5, A = 0.06 AC.

DA-3h — TO STRUCTURE D-177
STA. 31+61.00, 43.5' LT
C = 0.9, A = 0.10 AC.

DA-3 D 6 — TO STRUCTURE D-176
STA. 31+61.00, 53.0' LT
C = 0.45, A = 0.08 AC.

DA-3 SAG — TO STRUCTURE D-178
STA. 44+49.17, 38.5' LT**
C = 0.9, A = 0.10 AC.

STRUCTURE D-265
STA. 17+98.98, 40.8' LT
SHOWN ON PREVIOUS SHEET
IS THE OUTLET FOR ALL
DRAINAGE AREAS ON THIS SHEET

DA-8d — TO STRUCTURE D-61
STA. 35+00.00, 29.5' RT
C = 0.9, A = 0.07 AC.

DA-8e — TO STRUCTURE D-63
STA. 34+00.00, 29.5' RT
C = 0.9, A = 0.06 AC.

DA-8 D 2 — TO STRUCTURE D-64
STA. 34+00.00, 45.2' RT
C = 0.36, A = 0.32 AC.

DA-8f — TO STRUCTURE D-66
STA. 33+00.00, 29.5' RT
C = 0.9, A = 0.07 AC.

DA-8g — TO STRUCTURE D-68
STA. 32+00.00, 29.5' RT
C = 0.86, A = 0.17 AC.

DA-8 D 3 — TO STRUCTURE D-69
STA. 32+00.00, 46.0' RT
C = 0.34, A = 0.43 AC.

DA-8 SAG — TO STRUCTURE D-70
STA. 60+44.78, 27.7' LT##
C = 0.84, A = 0.11 AC.

N

0 25 50 100
HORIZONTAL
SCALE IN FEET

CALCULATED | CHECKED

DRAINAGE MAP
HAMILTON ROAD AND GROVES ROAD

FRA-SR317-10.63

3
7

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Ohio DOT Workspace
Meridian Road Corridor

UCF: ohdot1V8i
PCF: 60-06748_Columbus

Batchplot Spec: \\0330share\n\60\06748\standards\plotdrv\batchplt.spc
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View: SHEET
By: mschuster

34" x 22"

DA-3a — TO STRUCTURE D-163
STA. 38+15.00, 33.5' LT
C = 0.9, A = 0.06 AC.

DA-3 D 1 — TO STRUCTURE D-162
STA. 38+20.00, 47.0' LT
C = 0.56, A = 0.07 AC.

DA-3 D 2 — TO STRUCTURE D-164
STA. 37+35.00, 50.0' LT
C = 0.45, A = 0.08 AC.

DA-3b — TO STRUCTURE D-165
STA. 37+35.00, 33.5' LT
C = 0.9, A = 0.07 AC.

DA-3c — TO STRUCTURE D-167
STA. 36+65.00, 33.5' LT
C = 0.9, A = 0.07 AC.

DA-3d — TO STRUCTURE D-169
STA. 35+85.00, 33.5' LT
C = 0.9, A = 0.07 AC.

DA-11+ — TO STRUCTURE D-160
STA. 40+00.00, 33.5' LT
C = 0.9, A = 0.05 AC.

DA-11 OFF. — TO STRUCTURE D-161
STA. 40+00.00, 47.4' LT
C = 0.47, A = 0.07 AC.

DA-11a — TO STRUCTURE D-100
STA. 41+50.00, 36.4' LT
C = 0.9, A = 0.05 AC.

DA-11 D 1 — TO STRUCTURE D-101
STA. 41+50.00, 48.7' LT
C = 0.5, A = 0.06 AC.

DA-11 D 2 — TO STRUCTURE D-102
STA. 42+35.00, 49.3' LT
C = 0.5, A = 0.06 AC.

DA-11b — TO STRUCTURE D-103
STA. 42+35.00, 38.2' LT
C = 0.9, A = 0.08 AC.

DA-11c — TO STRUCTURE D-105
STA. 43+10.00, 39.8' LT
C = 0.9, A = 0.07 AC.

DA-11 D 3 — TO STRUCTURE D-104
STA. 43+10.00, 49.3' LT
C = 0.5, A = 0.01 AC.

DA-11d — TO STRUCTURE D-107
STA. 43+85.00, 41.4' LT
C = 0.9, A = 0.07 AC.

DA-11 D 4 — TO STRUCTURE D-106
STA. 43+85.00, 50.2' LT
C = 0.54, A = 0.05 AC.

DA-11e — TO STRUCTURE D-109
STA. 44+50.00, 41.5' LT
C = 0.9, A = 0.07 AC.

DA-11f — TO STRUCTURE D-111
STA. 45+10.00, 41.5' LT
C = 0.9, A = 0.07 AC.

DA-11 PL 1 — TO STRUCTURE D-110a
STA. 45+27.50, 87.1' LT
C = 0.78, A = 0.45 AC.

DA-11g — TO STRUCTURE D-113
STA. 45+85.00, 41.5' LT
C = 0.9, A = 0.07 AC.

DA-11 D 5 — TO STRUCTURE D-112
STA. 45+35.00, 46.9' LT
C = 0.55, A = 0.12 AC.

DA-11h — TO STRUCTURE D-115
STA. 46+60.00, 41.5' LT
C = 0.9, A = 0.07 AC.

DA-11 D 6 — TO STRUCTURE D-114
STA. 46+60.00, 51.4' LT
C = 0.42, A = 0.10 AC.

DA-11 PL 2 — TO STRUCTURE D-116a
STA. 46+70.17, 117.7' LT
C = 0.78, A = 0.85 AC.

DA-11i — TO STRUCTURE D-117
STA. 84+13.59, 37.5' RT
KIMBERLY PARKWAY
C = 0.86, A = 0.15 AC.

DA-18a — TO STRUCTURE D-118
STA. 84+13.59, 7.0' LT
KIMBERLY PARKWAY
C = 0.45, A = 0.08 AC.

DA-12+ SAG — TO STRUCTURE D-120
STA. 84+42.03, 53.4' LT
KIMBERLY PARKWAY
C = 0.84, A = 0.31 AC.

DA-12 D 1 — TO STRUCTURE D-119
STA. 48+50.00, 87.0' LT
C = 0.3, A = 0.07 AC.

DA-12b — TO STRUCTURE D-122
STA. 49+10.00, 41.5' LT
C = 0.83, A = 0.08 AC.

DA-12c — TO STRUCTURE D-124
STA. 49+85.00, 41.5' LT
C = 0.83, A = 0.08 AC.

DA-12 PL 1 — TO STRUCTURE D-123a
STA. 81+35.20, 275.9' LT
KIMBERLY PARKWAY
C = 0.77, A = 0.92 AC.

DA-12 D 2 — TO STRUCTURE D-127
STA. 50+50.00, 52.6' LT
C = 0.47, A = 0.25 AC.

DA-12d — TO STRUCTURE D-126
STA. 50+55.00, 41.5' LT
C = 0.9, A = 0.07 AC.

DA-15a — TO STRUCTURE D-271
STA. 81+50.00, 35.1' RT
KIMBERLY PARKWAY
C = 0.45, A = 0.08 AC.

DA-15b — TO EXISTING STRUCTURE
STA. 78+81.13, 24.9' RT
KIMBERLY PARKWAY
C = 0.45, A = 0.08 AC.

DA-16a — TO STRUCTURE D-270
STA. 81+60.00, 33.6' LT
KIMBERLY PARKWAY
C = 0.45, A = 0.08 AC.

DA-16b — TO EXISTING STRUCTURE
STA. 78+83.69, 24.3' LT
KIMBERLY PARKWAY
C = 0.45, A = 0.08 AC.

DA-12a not used

DA-9 D 2 — TO STRUCTURE D-10
STA. 44+35.00, 47.4' RT
C = 0.9, A = 0.07 AC.

DA-9e — TO STRUCTURE D-12
STA. 45+00.00, 32.5' RT
C = 0.9, A = 0.07 AC.

DA-9 PL 3 — TO STRUCTURE D-21a
STA. 45+69.01, 179.3' RT
C = 0.36, A = 0.32 AC.

DA-9f — TO STRUCTURE D-18
STA. 42+60.00, 46.5' RT
C = 0.9, A = 0.07 AC.

DA-9 D 3 — TO STRUCTURE D-21
STA. 45+86.67, 47.2' RT
C = 0.36, A = 0.32 AC.

STRUCTURE D-265
STA. 17+98.98, 40.8' LT
INDICATED ON PREVIOUS SHEETS
IS THE OUTLET FOR
DRAINAGE AREAS 3 AND 8

STRUCTURE D-265, STA. 17+98.98, 40.8' LT AS INDICATED ON PREVIOUS SHEETS, IS THE OUTLET FOR DRAINAGE AREAS 3 AND 8. OTHER AREAS ON HAMILTON ROAD OUTLET TO THE NEW STRUCTURE OVER MILLER DITCH (FRA-317-1190)

MACSWAY AVENUE

HAMILTON ROAD

KIMBERLY PARKWAY

KINGSLAND AVENUE

SERVICE ROAD ENTRANCE 2

DA-8+ SAG — TO STRUCTURE D-52
STA. 80+70.49, 29.7' RT
KINGSLAND AVENUE
C = 0.86, A = 0.14 AC.

DA-8a — TO STRUCTURE D-54
STA. 38+00.00, 29.5' RT
C = 0.83, A = 0.08 AC.

DA-8b — TO STRUCTURE D-56
STA. 37+00.00, 29.5' RT
C = 0.9, A = 0.07 AC.

DA-8c — TO STRUCTURE D-58
STA. 36+00.00, 29.5' RT
C = 0.9, A = 0.07 AC.

DA-8 D 1 — TO STRUCTURE D-59
STA. 36+00.00, 44.4' RT
C = 0.31, A = 0.41 AC.

DA-8 EXT. — TO STRUCTURE D-50
STA. 40+00.00, 47.2' RT
C = 0.34, A = 0.30 AC.

DA-9+ SAG — TO STRUCTURE D-51
STA. 80+70.63, 13.1' LT
C = 0.86, A = 0.15 AC.

DA-9a — TO STRUCTURE D-1
STA. 46+60.00, 29.6' RT
C = 0.95, A = 0.06 AC.

DA-9b — TO STRUCTURE D-4
STA. 42+60.00, 32.5' RT
C = 0.9, A = 0.07 AC.

DA-9 D 1 — TO STRUCTURE D-5
STA. 42+60.00, 46.5' RT
C = 0.9, A = 0.06 AC.

DA-9 PL 1 — TO STRUCTURE D-13
STA. 42+60.00, 107.6' RT
C = 0.36, A = 0.32 AC.

DA-9c — TO STRUCTURE D-7
STA. 43+50.00, 32.5' RT
C = 0.9, A = 0.07 AC.

DA-9 PL 2 — TO STRUCTURE D-16
STA. 44+20.00, 108.5' RT
C = 0.9, A = 0.07 AC.

DA-9d — TO STRUCTURE D-9
STA. 44+35.00, 32.5' RT
C = 0.9, A = 0.07 AC.

DA-10+ SAG — TO STRUCTURE D-25
STA. 85+86.75, 20.5' RT###
C = 0.88, A = 0.58 AC.

DA-10a — TO STRUCTURE D-28
STA. 49+25.00, 32.5' RT
C = 0.79, A = 0.22 AC.

DA-10b — TO STRUCTURE D-32
STA. 50+25.00, 32.5' RT
C = 0.79, A = 0.22 AC.

DA-10 D 1 — TO STRUCTURE D-30
STA. 50+25.00, 49.3' RT
C = 0.79, A = 0.22 AC.

DA-9g — TO STRUCTURE D-20
STA. 46+65.00, 32.5' RT
C = 0.9, A = 0.07 AC.

DA-9 SAG — TO STRUCTURE D-22
STA. 85+87.00, 30.6' RT###
C = 0.81, A = 0.19 AC.

DA-9i — TO STRUCTURE D-24
STA. 86+16.45, 33.1' RT
C = 0.88, A = 0.58 AC.

DA-9h — TO STRUCTURE D-23
STA. 86+50.00, 23.9' RT
C = 0.79, A = 0.22 AC.

HORIZONTAL SCALE IN FEET
0 25 50 100

CALCULATED | CHECKED

DRAINAGE MAP
HAMILTON ROAD AND GROVES ROAD

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4
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PCF: 60-06748_Columbus

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View: SHEET
By: mschuster

34" x 22"

DA-12 PL 2 — TO STRUCTURE D-125a
STA. 50+71.27, 86.3' LT
C = 0.82, A = 0.98 AC.

DA-12e — TO STRUCTURE D-129
STA. 51+35.00, 41.5' LT
C = 0.9, A = 0.07 AC.

DA-12f — TO STRUCTURE D-131
STA. 52+50.00, 41.5' LT
C = 0.85, A = 0.11 AC.

DA-12 PL 3 — TO STRUCTURE D-128a
STA. 52+79.11, 265.9' LT
C = 0.76, A = 1.82 AC.

DA-12g — TO STRUCTURE D-133
STA. 53+25.00, 41.5' LT
C = 0.75, A = 0.12 AC.

DA-12h — TO STRUCTURE D-135
STA. 54+00.00, 41.5' LT
C = 0.75, A = 0.12 AC.

DA-12 PL 4 — TO STRUCTURE D-139a
STA. 1+96.33, 42.5' LT SS 1
C = 0.71, A = 1.81 AC.

DA-12 SS 1 — TO STRUCTURE D-139a
STA. 1+97.24, ℄ SERVICE STREET
C = 0.71, A = 0.22 AC.

DA-12i — TO STRUCTURE D-137
STA. 54+50.00, 41.5' LT
C = 0.77, A = 0.09 AC.

DA-12i SAG — TO STRUCTURE D-138
STA. 94+45.63, 21.0' RT EASTPOINT DR.
C = 0.77, A = 0.09 AC.

DA-12j SAG — TO STRUCTURE D-141
STA. 94+45.56, 31.2' LT EASTPOINT DR.
C = 0.77, A = 0.09 AC.

DA-12j — TO STRUCTURE D-142
STA. 55+60.00, 41.5' LT
C = 0.85, A = 0.11 AC.

DA-12 SS 2 — TO STRUCTURE D-143
STA. 3+15.19, ℄ SERVICE STREET
C = 0.79, A = 0.11 AC.

DA-12k — TO STRUCTURE D-145
STA. 56+30.00, 41.5' LT
C = 0.7, A = 0.12 AC.

DA-12l — TO STRUCTURE D-147
STA. 57+00.00, 41.5' LT
C = 0.75, A = 0.12 AC.

DA-12m — TO STRUCTURE D-149
STA. 57+60.00, 41.5' LT
C = 0.72, A = 0.10 AC.

DA-12n — TO STRUCTURE D-151
STA. 58+00.00, 41.5' LT
C = 0.73, A = 0.07 AC.

DA-12 SAG — TO STRUCTURE D-153
STA. 58+33.08, 41.5' LT
C = 0.71, A = 0.16 AC.

DA-12t — TO STRUCTURE D-155
STA. 58+75.00, 41.5' LT
C = 0.75, A = 0.08 AC.

DA-12s — TO STRUCTURE D-156 (PASS THRU D-158)
STA. 58+75.00, 49.0' LT
C = 0.72, A = 0.10 AC.

DA-12r — TO STRUCTURE D-137
STA. 54+50.00, 41.5' LT
C = 0.84, A = 0.10 AC.

DA-12q — TO STRUCTURE D-295
STA. 60+85.00, 41.5' LT
C = 0.9, A = 0.08 AC.

DA-12 D 3 — TO STRUCTURE D-294
STA. 60+85.00, 51.0' LT
C = 0.6, A = 0.12 AC.

DA-12p — TO STRUCTURE D-293
STA. 61+65.00, 41.5' LT
C = 0.85, A = 0.11 AC.

DA-12 D 4 — TO STRUCTURE D-292
STA. 61+65.00, 50.8' LT
C = 0.45, A = 0.08 AC.

DA-12o — TO STRUCTURE D-290
STA. 52+50.00, 41.5' LT
C = 0.85, A = 0.18 AC.

DA-10c — TO STRUCTURE D-34
STA. 51+15.00, 32.5' RT
C = 0.9, A = 0.07 AC.

DA-10d — TO STRUCTURE D-36
STA. 51+90.00, 32.5' RT
C = 0.9, A = 0.07 AC.

DA-10 D 2 — TO STRUCTURE D-37
STA. 51+90.00, 51.8' RT
C = 0.35, A = 0.22 AC.

DA-10e — TO STRUCTURE D-39
STA. 53+50.00, 32.5' RT
C = 0.85, A = 0.13 AC.

DA-10 D 3 — TO STRUCTURE D-40
STA. 53+50.00, 48.5' RT
C = 0.35, A = 0.33 AC.

DA-10f — TO STRUCTURE D-42
STA. 55+00.00, 32.5' RT
C = 0.9, A = 0.13 AC.

DA-10 D 4 — TO STRUCTURE D-41
STA. 55+14.09, 32.5' RT
C = 0.4, A = 0.06 AC.

DA-10 PL 1 — TO STRUCTURE D-341a
STA. 55+12.95, 125.1' RT
C = 0.74, A = 0.37 AC.

DA-10g — TO STRUCTURE D-43
STA. 55+70.00, 32.5' RT
C = 0.9, A = 0.08 AC.

DA-10h — TO STRUCTURE D-45
STA. 56+50.00, 32.5' RT
C = 0.9, A = 0.08 AC.

DA-10 D 5 — TO STRUCTURE D-44
STA. 56+50.00, 58.0' RT
C = 0.43, A = 0.09 AC.

DA-10i — TO STRUCTURE D-47
STA. 57+50.00, 32.5' RT
C = 0.9, A = 0.08 AC.

DA-10 D 6 — TO STRUCTURE D-46
STA. 57+50.00, 56.0' RT
C = 0.39, A = 0.13 AC.

DA-10 SAG — TO STRUCTURE D-46 (PASS THRU D-48)
STA. 57+50.00, 56.0' RT
C = 0.9, A = 0.12 AC.

DA-10 D 7 — TO STRUCTURE D-279
STA. 58+73.92, 42.7' RT
C = 0.3, A = 0.15 AC.

DA-10 PL 2 — TO STRUCTURE D-279a
STA. 58+74.80, 90.8' RT
C = 0.9, A = 0.82 AC.

DA-10n — TO STRUCTURE D-341a
STA. 55+12.95, 125.1' RT
C = 0.9, A = 0.06 AC.

DA-10m — TO STRUCTURE D-278
STA. 59+50.00, 32.5' RT
C = 0.9, A = 0.07 AC.

TO STRUCTURE D-278
STA. 59+50.00, 32.5' RT
C = 0.9, A = 0.07 AC.

DA-10l — TO STRUCTURE D-276
STA. 60+30.00, 32.5' RT
C = 0.9, A = 0.09 AC.

DA-10 D 8 — TO STRUCTURE D-274
STA. 60+84.00, 48.8' RT
C = 0.73, A = 0.62 AC.

DA-10 PL 3 — TO STRUCTURE D-274a
STA. 61+19.99, 116.5' RT
C = 0.83, A = 0.62 AC.

DA-10k — TO STRUCTURE D-273
STA. 61+35.00, 32.5' RT
C = 0.9, A = 0.10 AC.

DA-10j — TO STRUCTURE D-270
STA. 62+45.00, 32.5' RT
C = 0.86, A = 0.16 AC.

DA-10 D 9 — TO STRUCTURE D-271
STA. 62+45, 42.4' RT
C = 0.3, A = 0.06 AC.

DRAINAGE MAP
HAMILTON ROAD AND GROVES ROAD

FRA-SR317-10.63

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HORIZONTAL SCALE IN FEET
0 25 50 100

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Meridian Road Corridor

UCF: ohdot1V8i
PCF: 60-06748_Columbus

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34" x 22"

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View: SHEET
By: mschuster

DA-304 A — TO STRUCTURE D-338
STA. 105+12.89, 88.6' LT
A = 0.14 AC.

DA-309 — TO STRUCTURE D-312
STA. 105+87.00, 27.3' LT
A = 0.08 AC.

DA-310 — TO STRUCTURE D-324
STA. 64+39.00, 51.5' LT
A = 0.08 AC.

DA-310 A — TO STRUCTURE D-325
STA. 65+10.00, 51.5' LT
A = 0.08 AC.

DA-305 — TO STRUCTURE D-339
STA. 65+03.99, 109.2' LT
A = 2.07 AC.

DA-310 B — TO STRUCTURE D-327
STA. 65+87.00, 51.5' LT
A = 0.08 AC.

DA-311 — TO STRUCTURE D-329
STA. 66+64.00, 51.5' LT
A = 0.08 AC.

DA-311 A — TO STRUCTURE D-331
STA. 67+40.00, 51.5' LT
A = 0.08 AC.

DA-312 — TO STRUCTURE D-333
STA. 68+16.00, 51.5' LT
A = 0.12 AC.

DA-312 A — TO STRUCTURE D-336
STA. 69+22.00, 43.3' LT
A = 0.11 AC.

71.6 ACRES CONTRIBUTING TO THE 54" CULVERT UNDER GROVES ROAD AT STA. 103+34.29

ALL AREAS OUTLET TO THE NEW STRUCTURE OVER MILLER DITCH (FRA-317-1190)

DA-319 — TO STRUCTURE D-314
STA. 107+83.37, 32.5' LT
A = 0.13 AC.

DA-318 — TO STRUCTURE D-323
STA. 64+34.00, 32.5' RT
A = 0.08 AC.

DA-317 A — TO STRUCTURE D-326
STA. 65+15.00, 32.5' RT
A = 0.08 AC.

DA-317 — TO STRUCTURE D-328
STA. 65+95.00, 32.5' RT
A = 0.08 AC.

DA-316 B — TO STRUCTURE D-330
STA. 66+70.00, 32.5' RT
A = 0.07 AC.

DA-316 A — TO STRUCTURE D-332
STA. 67+55.00, 32.5' RT
A = 0.08 AC.

DA-316 — TO STRUCTURE D-334
STA. 68+35.00, 32.5' RT
A = 0.03 AC.

DA-313 — TO STRUCTURE D-335
STA. 68+50.00, 4' RT
A = 0.04 AC.

DA-320 — TO STRUCTURE D-353
STA. 107+70.43, 52.7' LT
A = 1.23 AC.

DA-321 — TO STRUCTURE D-390
STA. 108+00.30, 44.1' LT
A = 0.95 AC.

DA-321 A — TO STRUCTURE D-362
STA. 14+75.00, ℄ SERV. RD. EAST
A = 0.15 AC.

N

0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED | CHECKED

DRAINAGE MAP
HAMILTON ROAD AND GROVES ROAD

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PCF: 60-06748_Columbus

1" 0.5" 0

34" x 22"

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View: SHEET
By: mschuster

DA-300 TO STRUCTURE D-300
STA. 101+94.00, 17.5' LT
A = 0.10 AC.

DA-301 TO STRUCTURE D-303
STA. 102+98.00, 20.3' LT
A = 0.09 AC.

DA-302 TO STRUCTURE D-305
STA. 103+50.00, 22.1' LT
A = 0.04 AC.

DA-303 TO STRUCTURE D-305
STA. 103+50.00, 22.1' LT
A = 0.04 AC.

DA-303 B TO STRUCTURE D-337
STA. 104+10.00, 31.0' LT
A = 0.06 AC.

DA-303 A TO STRUCTURE D-337
STA. 104+10.00, 31.0' LT
A = 0.06 AC.

DA-304 A TO STRUCTURE D-338
STA. 11+70.00, ℄ SERV. RD. WEST
A = 0.11 AC.

DA-304 TO STRUCTURE D-344
STA. 10+71.76, ℄ SERV. RD. WEST
A = 0.07 AC.

DA-307 TO STRUCTURE D-307
STA. 104+60.00, 22.5' LT
A = 0.05 AC.

DA-308 TO STRUCTURE D-310
STA. 105+30.00, 22.5' LT
A = 0.05 AC.

DA-330 TO STRUCTURE D-301
STA. 102+00.00, 18.8' RT
A = 0.06 AC.

DA-331 TO STRUCTURE D-302
STA. 102+75.01, 22.5' RT
A = 0.04 AC.

DA-331 A TO STRUCTURE D-304
STA. 103+50.00, 22.5' RT
A = 0.04 AC.

DA-331 B TO STRUCTURE D-304
STA. 103+50.00, 22.5' RT
A = 0.04 AC.

DA-333 TO STRUCTURE D-306
STA. 104+30.00, 22.5' RT
A = 0.07 AC.

DA-332 TO STRUCTURE D-347
STA. 104+31.00, 36.6' RT
A = 0.05 AC.

DA-333 A TO STRUCTURE D-308
STA. 104+86.00, 22.5' RT
A = 0.04 AC.

DA-334 TO STRUCTURE D-309
STA. 105+07.00, 22.5' RT
A = 0.09 AC.

DA-336 TO STRUCTURE D-311
STA. 105+66.00, 22.5' RT
A = 0.04 AC.

DA-337 TO STRUCTURE D-313
STA. 107+75.00, 32.8' RT
A = 0.09 AC.

DA-338 TO STRUCTURE D-316
STA. 108+80.00, 22.5' RT
A = 0.13 AC.

DA-339 TO STRUCTURE D-318
STA. 110+14.08, 22.5' RT
A = 0.18 AC.

DA-340 TO STRUCTURE D-320
STA. 111+47.40, 21.6' RT
A = 0.09 AC.

DA-341 TO STRUCTURE D-387
STA. 111+50.00, 32.0' RT
A = 0.75 AC.

DA-340 A TO STRUCTURE D-322
STA. 114+03.24, 12.8' RT
A = 0.03 AC.

DA-337 A TO STRUCTURE D-314
STA. 107+83.37, 32.5' LT
A = 0.08 AC.

DA-327 TO STRUCTURE D-315
STA. 108+50.00, 32.5' LT
A = 0.11 AC.

DA-324 A TO STRUCTURE D-317
STA. 109+60.00, 32.5' LT
A = 0.08 AC.

DA-324 TO STRUCTURE D-356
STA. 109+83.00, 50.5' LT
A = 0.13 AC.

DA-324 B TO STRUCTURE D-387
STA. 10+50.00, ℄ SERV. RD. EAST
A = 0.10 AC.

DA-335 TO STRUCTURE D-358
STA. 110+82.00, 46.9' LT
A = 0.35 AC.

DA-325 A TO STRUCTURE D-319
STA. 111+35.00, 32.5' LT
A = 0.16 AC.

DA-325 B TO STRUCTURE D-321
STA. 114+03.24, 18.1' LT
A = 0.03 AC.

DA-326 TO STRUCTURE D-357
STA. 113+08.75, 37.2' LT
A = 0.82 AC.

DA-328 TO STRUCTURE D-357
STA. 113+08.75, 37.2' LT
A = 1.77 AC.

DA-329 TO EXISTING STRUCTURES
A = 5.61 AC.

DA-323 A TO STRUCTURE D-360
STA. 11+75.00 ℄ SERV. RD. EAST
A = 0.12 AC.

DA-322 TO STRUCTURE D-361
STA. 13+75.00 ℄ SERV. RD. EAST
A = 0.10 AC.

71.6 ACRES CONTRIBUTING TO THE 54" CULVERT
UNDER GROVES ROAD AT STA. 103+34.29

HORIZONTAL SCALE IN FEET
0 25 50 100

CALCULATED | CHECKED

DRAINAGE MAP
HAMILTON ROAD AND GROVES ROAD

FRA-SR317-10.63

7
7

ms consultants, inc.

BMP Alternatives Analysis Report

FRA-SR 317-10.63
CIP NO. 530103-100052
HAMILTON ROAD
I-70 TO REFUGEE ROAD

June 13, 2016

ms consultants, inc.
engineers, architects, planners
2221 Schrock Road
Columbus, Ohio 43229-1547

Background

ms consultants is preparing the BMP design for the Hamilton Road project and are presenting four alternative approaches for consideration by the City. We have prepared preliminary comparisons for the four scenarios to facilitate the review and determination by the City for which alternative will be implemented for the detailed design.

The Preliminary Engineering report was prepared including the concept of bioretention cells being installed along the corridor. The concept has been developed over time with influence from the past intent of the project to contain a strong landscaping component which would be complementary with the bioretention cells. (see attached Figure which was developed for the project Feasability Study). More recently the project focus has been adjusted to include fewer aesthetic and landscaping elements and there is an opportunity to reconsider the BMP facilities to ensure that the most appropriate and cost effective measures are used.

With the reduction of the proposed landscaping layout along the corridor and upon further developing the anticipated maintenance needs for the implementation of BMP facilities, vegetated biofilters are also being considered for implementation in lieu of the bioretention cells.

The requirement for treating the water quantity volumes for the project are planned to be addressed by either upsizing pipes within the proposed drainage system to provide the remaining storage, constructing additional bioretention areas with increased storage capacity or a combination these measures.

It is estimated that 12 bioretention cells or 8 vegitated biofilters can be used in the project corridor to meet the requirements. It is noted that as more facilities are located along the corridor, the difficulty of capturing the optimal flows and meeting site grading requirements will increase and impact to other elements of the project including utilities may also increase.

Alternatives Evaluated

The options for treating the project stormwater quality and quantity have been evaluated for the project corridor. Four alternatives have been evaluated for cost associated with their application to the project.

Alternative 1 – Vegitated Biofilter (Quality) & Storage in Oversized Stormwater Pipes (Quantity)

Alternative 2 – Bioretention Cells (Quality) & Storage in Oversized Stormwater Pipes (Quantity)

Alternative 3 – Bioretention Cells (Quality) & (Quantity)

Alternative 4 – Bioretention Cells (Quality) & (Quantity) With Remaining Storage in Oversized Stormwater Pipes (Quantity)

BMP Treatment Requirement Calculations

The project area and proposed improvements have been measured and the calculations have been performed to determine the required treatment for water quality and quantity. The treatment amount for the BMP facilities have been estimated for this evaluation. During the detailed design placement and final calculations for the BMP treatments will vary by location, grading and site specific characteristics however the estimated values will allow for the comparison of the alternatives.
The calculations for the BMP treatment volumes are attached and indicate that the required treatment amounts are:

- Water Quality Flow (WQf) = 3.73 CFS
- Water Quantity Volume (WQv) = 0.16 Acre Feet

Vegetated Biofilters – It is estimated that each vegetated biofilter will treat approximately 0.6 CFS and that 8 locations are needed to meet the WQf treatment requirement.

- 10'x100' Ditch Filter @ .6 CFS Treatment per location x 8 locations = 4.8 CFS

Bioretention Cells - It is estimated that each bioretention cell will treat approximately 0.9 CFS and that 6 cells are needed to meet the WQf treatment requirement.

- 15' x 50' Cells @ 0.75 CFS Treatment per cell x 5 cells = 4.5 CFS

Cost Estimates for Alternatives

Estimated Unit Costs Used

o Vegetated Biofilter (10'x100')	$3,200 EA or $32.50 / LF
o Bioretention Cell (15'x50')	$15,000 EA or $20.00 / SF
o Bioretention Cell w/ 3' Stone Storage (15'x50')	$18,750 EA or $25.00 / SF
o Pipe Storage (Upsizing)	$16.00 / CF

Alternative 1 – Vegetated Biofilter (Quality) & Storage in Oversized Stormwater Pipes (Quantity)

	Qty	Unit	Unit Cost	Total Cost
Vegetated Biofilter	8	EA	$3,200	$25,600
Pipe Storage	91,000	CF	$16	$1,456,000
			Total	**$1,481,600**

Anticipated Maintenance:

- Normal mowing with surrounding grass areas

Advantages:

+ Low cost of vegetated biofilter
+ Easy maintance
+ Less impact on existing underground utilities

Disadvantages:

- High cost of pipe storage

Alternative 2 – Bioretention Cells (Quality) & Storage in Oversized Stormwater Pipes (Quantity)

	Qty	Unit	Unit Cost	Total Cost
Bioretention Cell	6	EA	$15,000	$90,000
Pipe Storage	88,300 (1)	CF	$16	$1,412,800
			Total	**$1,502,800**

Anticipated Maintenance:

- Planting and weeding of plants – semi-annually
- Mulch – annually and inspect after significant storm event
- Replace media soil – 5 to 10 years or as needed

Advantages:

+ Fewer cell locations / area of impact

Disadvantages:

- Some impact on existing underground utilities
- High cost of pipe storage
- More maintenance and long term cost

(1) Reduced due to portion of WQv treated by Bioretention Cells

Alternative 3 – Bioretention Cells (Quality) & (Quantity)

	Qty	Unit	Unit Cost	Total Cost
Bioretention Cell w/ Stone Storage	42500 (2)	SF	$25	$1,062,500
			Total	**$1,062,500**

Anticipated Maintenance:

- Planting and weeding of plants – semi-annually
- Mulch – annually and inspect after significant storm event
- Replace media soil – 5 to 10 years or as needed

Advantages:

+ Lower overall cost of BMP measures

Disadvantages:

- More impact on existing underground utilities
- Redesign of other storm system required (additional cost)
- More maintenance and long term cost

(2) Area required to meet water quantity treatment volume cannot be achieved without significant redesign of storm sewer system to redirect flows. This alternative would also impact more existing utilities at additional project cost.

Alternative 4 – Bioretention Cells (Quality) & (Quantity) With Remaining Storage in Oversized Stormwater Pipes (Quantity)

	Qty	Unit	Unit Cost	Total Cost
Bioretention Cell w/ Stone Storage	34,600	SF	$25	$865,000
Pipe Storage	17,000	CF	$16	$272,000
			Total	**$1,137,000**

Anticipated Maintenance:

- Planting and weeding of plants – semi-annually
- Mulch – annually and inspect after significant storm event
- Replace media soil – 5 to 10 years or as needed

Advantages:

+ Lower overall cost of BMP measures
+ Maximize stone storage with only minor storm redesign
+ Reduced pipe storage costs

Disadvantages:

- Some impact on existing underground utilities
- Some redesign of other storm system required (additional cost)

- More maintenance and long term cost

Summary and Recommendation

Alternative	BMP Cost	Maintenance	Design & Utility Impact	Recommendation
1	$1,481,600	Minimal	Low ($20,000)	1
2	$1,502,800	Low	Med ($100,000)	2
3	$1,062,500	Very High	High ($300,000)	4
4	$1,137,000	High	High ($250,000)	3

The alternative are summarized in the table above for a comparative evaluation. Alternative 3 is not considered viable due to the inability to direct sufficient flow to the bioretention cell area for water quantity volume control. Alternative 4 is anticipated to need higher maintenance and utility relocation costs that, although not specifically estimated, would likely negate much if not all of the cost difference with Alternative 1. ***Due to the lower impact and maintenance needs Alternative 1 is recommended.***

Documents attached for reference and information include:

(1) Project site plan with conceptual BMP locations shown
(2) Copy of Concept BMP layout from Feasibility Study
(3) Concept view of Bioretention Cell
(4) Concept view of Vegetated Biofilter
(5) Data sheet for proposed curb inlet structure for biofilter use
(6) Calculation for project WQv and WQf
(7) Calculation for unit cost items

Estimated Unit Costs

- Vegetated Biofilter (10'x100') $3,252.50 EA or $32.53 / LF
- Bioretention Cell (15'x50') $15,000 EA or $20.00 / SF
- Bioretention Cell w/ 3' Stone Storage (15'x50') $18,750 EA or $25.00 / SF
- Pipe Storage (Upsizing) $16.00 / CF

ASSUMPTION OF COSTS FOR VEGETATED BIOFILTER					
ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT COST**	**TOTAL**
653.02	TOPSOIL, 4" THICK	CY	25.00	$ 65.00	$ 1,625.00
671	EROSION CONTROL MAT	SY	217.00	$ 7.50	$ 1,627.50
	Total				**$ 3,252.50**
	Cost per Linear Foot of Vegetated Biofilter				**$ 32.53**

ASSUMPTION OF COSTS FOR 15'X50' BIORETENTION CELL						
	ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT COST**	**TOTAL**
FILTER MEDIA	703.06	SAND	CY	34.72	$ 65.00	$ 2,256.94
	653.02	TOPSOIL	CY	17.36	$ 65.00	$ 1,128.47
	659.06	COMPOST	CY	17.36	$ 50.00	$ 868.06
STORAGE LAYER	703.06	SAND	CY	14.44	$ 65.00	$ 938.89
		FILTER FABRIC	SY	50.00	$ 15.00	$ 750.00
	703.01	WASHED NO 2 AGGREGATE	CY	41.67	$ 65.00	$ 2,708.33
	720.07	6" PERFORATED WALL PVC PIPE	LF	50.00	$ 20.00	$ 1,000.00
UNDERDRAIN	720.08	6" SOLID WALL PVC PIPE	LF	4.00	$ 20.00	$ 80.00
	604	3'X3' CATCH BASIN	EA	1.00	$ 4,500.00	$ 4,500.00
		Total				**$ 14,230.69**
		Cost per Square Foot of Media				**$ 18.97**

ASSUMPTION OF COSTS FOR 15'X50' BIORETENTION CELL WITH EXTRA STONE STORAGE						
	ITEM	**DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT COST**	**TOTAL**
FILTER MEDIA	703.06	SAND	CY	34.72	$ 65.00	$ 2,256.94
	653.02	TOPSOIL	CY	17.36	$ 65.00	$ 1,128.47
	659.06	COMPOST	CY	17.36	$ 50.00	$ 868.06
STORAGE LAYER	703.06	SAND	CY	14.44	$ 65.00	$ 938.89
		FILTER FABRIC	SY	50.00	$ 15.00	$ 750.00
	703.01	WASHED NO 2 AGGREGATE	CY	55.56	$ 65.00	$ 3,611.11
	703.01	WASHED NO. 57 AGGREGATE	CY	27.78	$ 65.00	$ 1,805.56
UNDERDRAIN	720.07	6" PERFORATED WALL PVC PIPE	LF	50.00	$ 20.00	$ 1,000.00
	720.08	6" SOLID WALL PVC PIPE	LF	4.00	$ 20.00	$ 80.00
	604	3'X3' CATCH BASIN	EA	1.00	$ 4,500.00	$ 4,500.00
		Total				**$ 16,939.03**
		Cost per Square Foot of Media				**$ 22.59**

34" x 22"
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Ohio DOT Workspace
Meridian Road Corridor
0 1" 0.5"
ms consultants, inc.
msconsultants.com
www.msconsultants.com
PLOTTED

MATCH LINE STA. 20+00

SERVICE RD ENTRANCE 1

EASTLAND SOUTH ENTRANCE

HAMILTON ROAD

EASTLAND DRIVE

EASTLAND ONE (NORTH MALL ENTRANCE)

BMP-7

SERVICE RD ENTRANCE 2

MACSWAY AVE

KINGSLAND AVE

KIMBERLY PKWY

MATCH LINE STA. 49+00

SEE SHEET 3

LEGEND

BIORETENTION CELL CONCEPT
PRELIMINARY LOCATIONS
15' x 50'

HELSEL PARK ENTRANCE

KROGER SHOPPING PLAZA ENTRANCE

EASTLAND SQUARE DR

REFUGEE ROAD

HAMILTON ROAD

I-270 NB

I-270 SB

EX. FRA-270-4470 L
SFN 2514370

EX. FRA-270-4470 R
SFN 2514346

MATCH LINE STA. 20+00

3303-E

ms consultants, inc.

2

FRA-SR317-10.63

CONCEPTUAL BMP LAYOUT EXHIBIT
HAMILTON ROAD

CALCULATED

CHECKED

0 100
50 200
HORIZONTAL SCALE IN FEET

N

34" x 22"

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PCF: 60-06748_Columbus

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Ohio DOT Workspace
Meridian Road Corridor

ms consultants, inc.
msconsultants.com

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MATCH LINE STA. 49+00
SEE SHEET 2

LEGEND

BIORETENTION CELL CONCEPT
PRELIMINARY LOCATIONS
15' x 50'

EASTPOINT DR

HAMILTON ROAD

GROVES ROAD

GROVES ROAD

SERVICE ROAD ENTRANCE 4

SERVICE ROAD ENTRANCE 3

CONRAIL RAILROAD

BMP-8

3303-E

BMP DESIGN SPREADSHEET CITY OF COLUMBUS

PROJECT NAME	HAMILTON ROAD EASTLAND
FILE #	60-06748-00
DATE	5/4/2016
BY	CAB
CHECKED	

PROJECT SUMMARY

TOTAL EDA	18.69	ACRES
EDA IN EXISTING R/W	18.49	ACRES
EDA IN PROP R/W	0.20	ACRES
C	0.63	
TREATMENT FACTOR (T)	0.21	

WQv CALCULATION

C	0.63	
P	0.75	IN
A	18.69	A
WQv Req'd	**0.75**	**A-FT**
WQv with T%	**0.16**	**A-FT**

=C*P*A/12

WQf CALCULATION

C	0.63	
I	1.5	IN/HR
A	18.69	A
WQf Req'd	**17.77**	**CFS**
WQf with T%	**3.73**	**CFS**

=C*I*A

RUNOFF COEFFICIENT TABLE

LAND USE	C	AREA
IMPERVIOUS	0.9	20.21
COMMERCIAL	0.8	
HIGH DES RES (1/8A)	0.5	
MED DES RES (1/4A)	0.4	
LOW DENS RES (1/2A)	0.3	16.12
UNDEVELOPED	0.2	
TOTAL	**0.63**	**36.33**

TOTAL PROPOSED R/W	36.33
TOTAL AREA TO BE TREATED	3.92

PROJECT INFORMATION

Will project create one acre or less new impervious area in new permanent right of way being acquired for the project?	y
(previously fully impervious with no new creation of impervious surface?	n
Does project directly discharge to	n
Water Quality Control Req'd?	**yes**
City of Columbus requires Water Quantity Controls for this project.	

ms consultants, inc.
engineers, architects, planners

ODOT STORMWATER MANAGEMENT WORKSHEET

conducted by ms consultants, Inc

PROJECT INFORMATION

Project Name	Hamilton Rd. Eastland Area Imp.
County-Route-Section	FRA-SR317-10.63
PID	**95570**

ms File: **60-06748-10**

PROJECT DATA

Routine Maintenance (Y/N)	No
Redevelopment (Y/N)	No
New Construction (Y/N)	Yes
Earth Disturbed Area, EDA (Acres)	**18.69**
NOI needed (Y/N)	Yes
Existing R/W (Acres)	34.88
Proposed R/W (Acres)	1.45
Existing Impervious Area (Acres)	22.30
Proposed Impervious area (Acres)	20.21
Proposed impervious area in new R/W (Acres)	0.20

TREATMENT EVALUATION

Water Quality treatment required (Y/N)	Yes
Water Quantity treatment required (Y/N)	No
Justification for not needing quantity treatment	A

TREATMENT CALCULATOR

Existing impervious area (Aix)	34.88
New impervious area (Ain)	0.20
Required Treatment Percentage (T)	**21**
EDA acreage needing treatment (Acres)	**3.92**

ADDITIONAL DATA (for Project Site Plan)

Total R/W	36.33
Pre-construction runoff coefficient, c	0.67
Post-construction runoff coefficient, c	0.63
Estimated Contractor EDA, (Acres)	1.00
NOI EDA	19.69

EXEMPTIONS FROM QUANTITY TREATMENT

A: ≤ 1 Acre *new* impervious in *new* R/W

B: 100 % impervious already (e.g. Ultra-urban with existing storm system)

C: Directly discharges to a 4th order river (100 sq. miles watershed) et al.

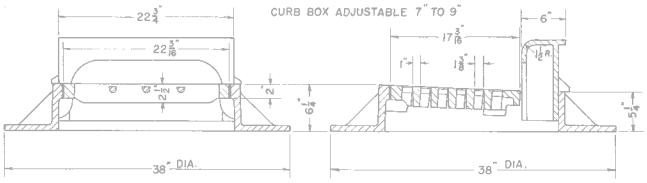
Work performed by: Matt Schuster Date: 2/5/2016

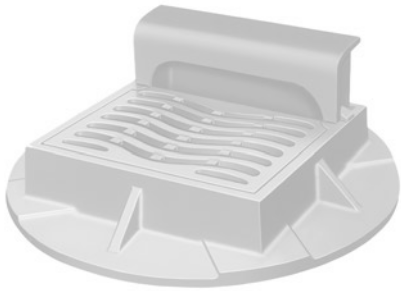
Work checked by: Chad Boyer Date: 2/5/2016

Additional NDPES requirements: **None**

R-3161
Combination Inlet Frame, Grate, Curb Box

Heavy Duty

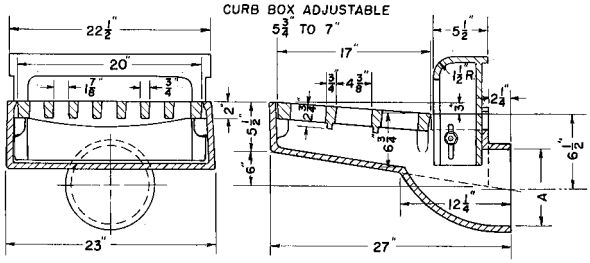




CATALOG NUMBER	GRATE TYPE	SQ. FT. OPEN	WEIR PERIMETER LINEAL FEET
R-3161	S	1.3	4.7

R-3165
Combination Inlet Frame, Grate, Curb Box

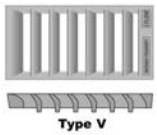
Heavy Duty



Furnished standard with Ductile Iron grate.
For use where conditions do not permit catch basin under inlet.
Drainage is to catch basin behind curb.
Available with 8", 10" or 12" rear outlet – specify when ordering.

CATALOG NUMBER	GRATE TYPE	SQ. FT. OPEN	WEIR PERIMETER LINEAL FEET
R-3165	A	1.4	4.5
R-3165	V	1.2	4.5

Standard Grate (shown): Type A
Alternate Grate(s):

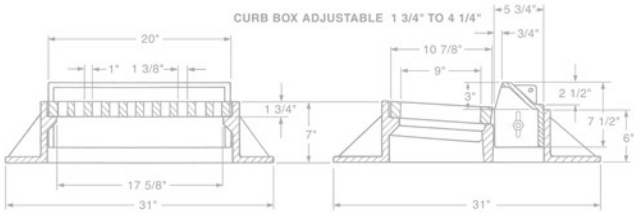

Type V

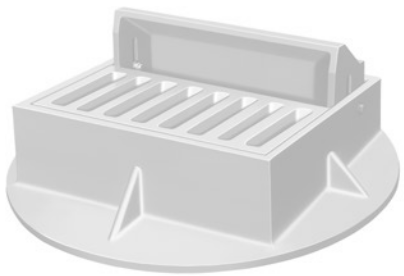
CURB INLET PROPOSED FOR USE WITH BMP FACILITIES

Available Curb Boxes: 1-1/2" open (shown), 3" open
Available with Curb Plate

R-3169
Combination Inlet Frame, Grate, Curb Box

Heavy Duty





CATALOG NUMBER	GRATE TYPE	SQ. FT. OPEN	WEIR PERIMETER LINEAL FEET
R-3169	B	0.7	3.5
R-3169	P	0.2	3.5
R-3169	S	0.5	3.5

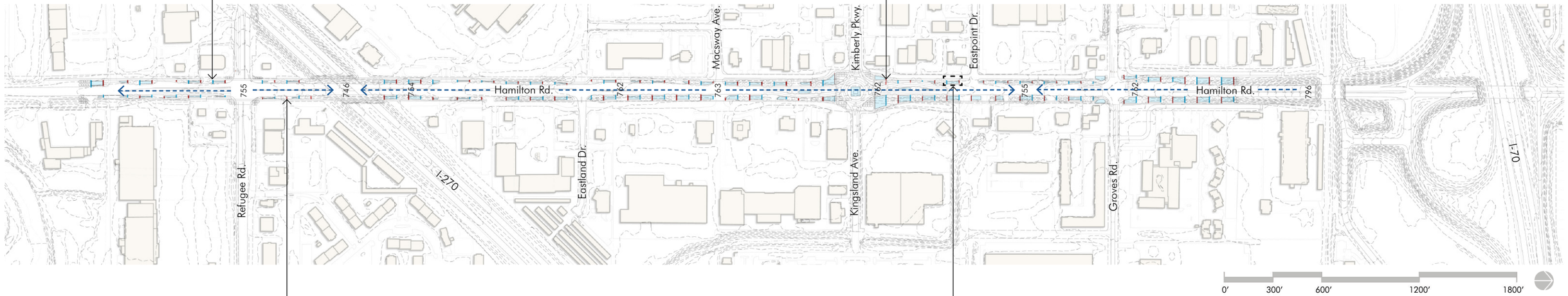
Standard Grate (shown): Type B
Alternate Grate(s):

Type P

Type S

Storm water runoff is directed into bioswales via curb openings, set on consistent intervals

Check dams and curb openings are arranged in an alternating pattern that is coordinated with the lighting and landscape treatments

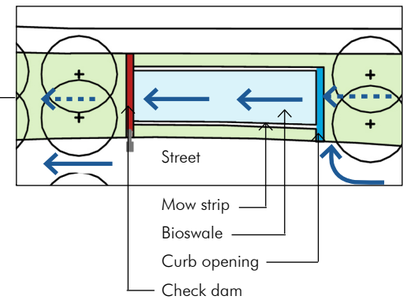


Low check dams slow down storm water runoff to reduce erosion and allow the water to percolate into the soil

Legend

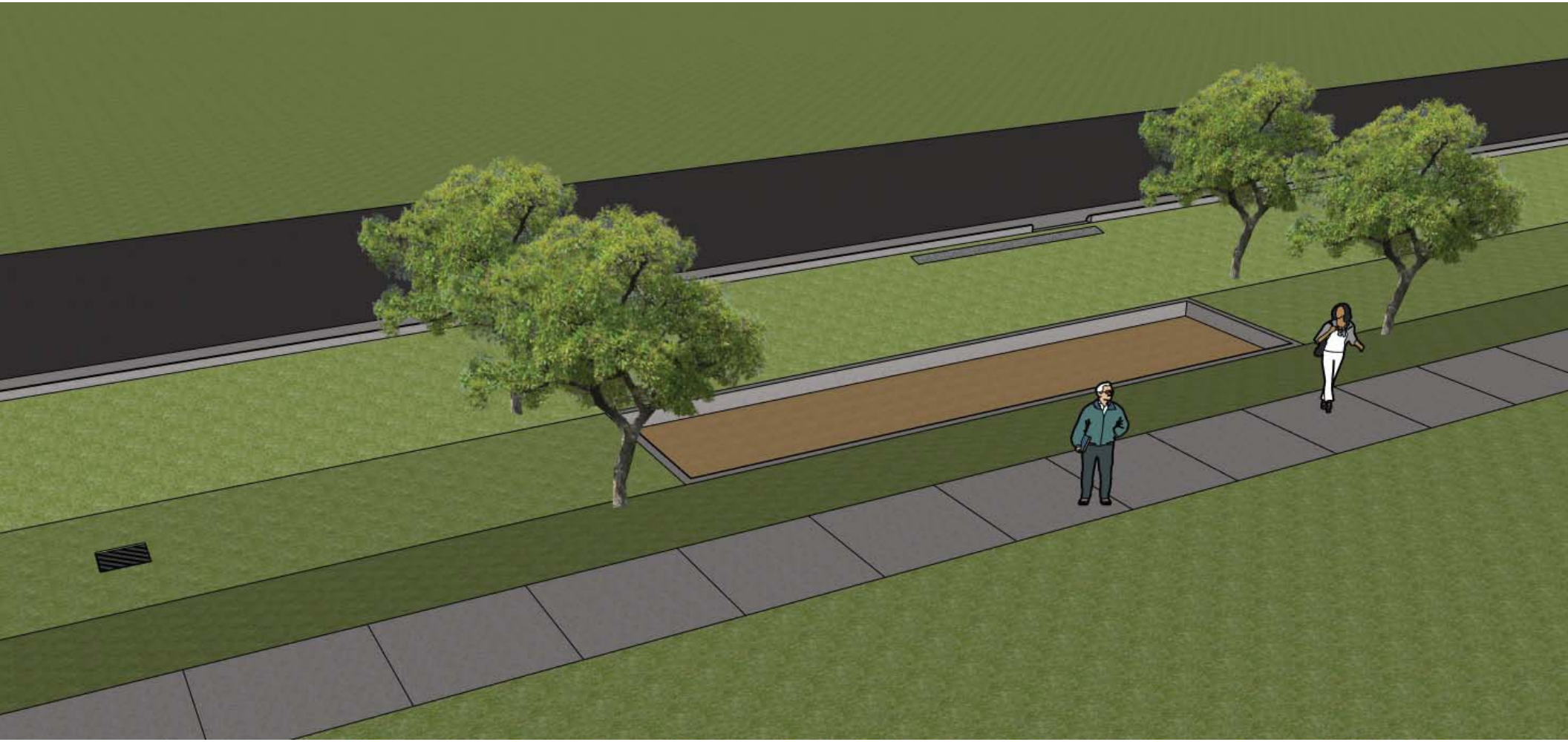
- Check Dam
- Curb Opening
- Bioswale
- Flow Direction

Typical Drainage Pattern



Bioswales/Curb Openings/Check Dams

HAMILTON ROAD
CONCEPT BMP TREATMENT
BIORETENTION CELL
15' WIDE X 50' LONG



HAMILTON ROAD
CONCEPT BMP TREATMENT
VEGITATED BIOFILTER
10' WIDE X 100' LONG