SURVEYOR'S OFFICE
Hamilton County

Kenton C. Ward, CFM
Surveyor of Hamilton County
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Suite 188
One Hamilton County Square
Noblesville, Indiana 46060-2230

August 7, 2020

TO: Hamilton County Drainage Board

RE: Village Farms Arm, Overman Harvey Drain, Adios Pass Reconstruction

Attached is the Village Farms pond and dam drainage study dated June 2020 completed by Clark Dietz, Inc. The study was commissioned by the Board due to chronic flooding problems on Adios Pass and Amkey Way which closes those streets during storm events. The report was reviewed by this office and the City of Westfield. A meeting was held on August 6, 2020 between county, city and Clark Dietz. Minutes of that meeting are also attached. During this meeting the four (4) alternatives were discussed. Upon discussion it was agreed that Alternative 1 was the recommended alternative. Alternative 1 is outlined on pages 8 and 9 of the study.

The cost estimate for this work is as follows:

Construction Estimate	$ 98,000.00
15% Cont.	$ 14,700.00
	$112,700.00
Design	$ 32,600.00
Total Cost	$145,300.00

Construction staking, inspection and asbuilts will be completed with Surveyor's Office personnel.

The Village Farms Arm, Overman Harvey Drain is now part of the Cool Creek Drainage Area. This area collects $426,343.12 annually and has a current balance of $1,752,212.75. I recommend the Board utilized funds from the maintenance fund as allowed under IC 36-9-27-45.5 for the proposed reconstruction hearing.

I recommend a hearing for the proposed reconstruction be set for September 28, 2020.

Kenton C. Ward, CFM
Hamilton County Surveyor

KCW/pll

Cool Creek #345
Village Farms Arm of Overman & Harvey Drain
Adios Pass Rec. (Upgrade inlets on Adios Pass & add 6 structures)
*No change in current maintenance assessment.
*Reconstruction cost to be paid from Cool Creek maintenance fund.
Hearing: September 28, 2020

Construction Estimate:	$98,000.00
15% Contingency:	$14,700.00
Construction Total:	$112,700.00
Design:	$32,600.00
Grand Total:	$145,300.00

Parcel	Owner	Description	Benefit	RecAsmt	MntAsmt	% of Total
99-99-99-99-99-999.010	City of Westfield	S14 T18 R3 Adios Pass & Amkey Way	*	*	*	*
08-09-14-04-02-022.000	Conklin, Gary W Jr & Wendy L	S14 T18 R3 Village Farms Sec 4 Lot 219	*	*	*	*
08-09-14-04-02-023.000	Mangum, William D & Lynette F	S14 T18 R3 Village Farms Sec 4 Lot 220	*	*	*	*
08-09-14-04-02-024.000	Dzurny, Jordan R & Hanan M	S14 T18 R3 Village Farms Sec 4 Lot 221	*	*	*	*
08-09-14-04-02-025.000	Habig, Richard D & Deborah S	S14 T18 R3 Village Farms Sec 4 Lot 222	*	*	*	*
08-09-14-04-03-011.000	Steel, Victoria A Russo & Carl Michael	S14 T18 R3 Village Farms Sec 5 Lot 333	*	*	*	*
08-09-14-04-03-012.000	Hester, Wendy L & Robert A	S14 T18 R3 Village Farms Sec 5 Lot 357	*	*	*	*
08-09-14-04-03-013.000	Cunningham, Tracy Allen & Mary Diana	S14 T18 R3 Village Farms Sec 5 Lot 356	*	*	*	*
08-09-14-04-03-035.000	Clark, Frianna & Harry Whittinghill Clark III	S14 T18 R3 Village Farms Sec 5 Lot 334	*	*	*	*

Clark Dietz
Engineering Quality of Life®

Meeting Minutes

Project: Village Farms Pond and Dam Drainage Study
Date: August 06, 2020, 1:30 p.m.
Attendees: Kent Ward (Hamilton County), Gary Duncan (Hamilton County), Mark Heirbrandt (Hamilton County), Jeremy Lollar (Westfield), Wes Rood (Westfield), Brian Powers (Clark Dietz), Hans Peterson (Clark Dietz)
Copies:

Minutes of this meeting were prepared by Brian Powers, P.E., CFM of Clark Dietz, Inc. Please inform him of corrections or modifications.

The purpose of the meeting was to discuss the design and construction phase of the Village Farms Improvement Project.

We began the meeting with a review of the Hydraulic Study. We discussed the parts of the system that were evaluated. It was concluded that the downstream lake, the pipes downstream of the Village Farms lake, and the storm sewer upstream of the lake all have enough capacity. The road inlets do not have enough capacity and cannot pass a Q10 event when flowing at full capacity. The Lake outlet structure has a 2nd stage that could be lowered to provide a small amount of relief to the lake. The only way to protect the road up to a Q100 event would be to add a lower emergency spill way to the lake.

Alternative 1 - upgrade the inlets on Adios Pass and add 6 additional structures. Cost is approximately $98,000

Alternative 2 - Lower the second stage of the Lake outlet structure. This improvement could be done in combination with Alternative 1. Cost is approximately $43,000. The outlet structure is not part of the legal drain so the HOA would need to be involved for this to proceed.

Alternative 3 - Upgrade the storm sewer. This is not recommended.

Alternative 4 - Provide an emergency spillway to prevent the Q100 from reaching the road. This would be a very expensive alternative. This would need to be done in combination with Alternative 1 to eliminate the problem on Adios Pass. Cost is approximately $293,000.

Westfield is ok with water on Adios Pass for the Q50 and Q100 event if the additional inlets will prevent flooding for smaller storms. Even in the 100-year event, water should be only 1 foot. During the 50-year event, water would barely be above the inlets. We recommend moving forward with Alternative 1 and consider adding Alternative 2 in the future.

Clark Dietz will draft a Task Order to complete the design and construction services to be presented at the 8/10/2020 Drainage Board Meeting. Kent will request a hearing at the meeting.

According to the City of Westfield's Stormwater Coordinator, flooding will occur at the problem area on average 2-3 times a year requiring the road to be closed. Short duration rain events with high intensity rainfall typically result in street flooding. Low intensity rainfalls with long durations have not been the cause of flooding. Following the rain events, the water subsides in a few hours. The water never pools for a full day.

3.0 Hydrologic Analysis

3.1 Site Visit / Field Verification

A site visit was conducted on 4/7/2020 to discuss observed drainage issues with the City of Westfield and examine and confirm the drainage patterns of the contributing watershed. The drainage patterns established with the Hamilton County 1 foot contours were confirmed with site observation. A second site visit was conducted on 4/24/2020 to survey elevations and measure key structures and storm sewer components. The survey points included elevation shots on the Lake outlet structure, across the dam (overflow spillway), inlet structures on Adios Pass and the outlet pipes from the storm sewer into the Lake.

3.2 Watershed Delineation

The 2016 Hamilton County 1 foot contours were used to delineate the watershed for the storm sewer and the subbasins. The watershed includes area in both Washington and Clay townships. The Hamilton County GIS was also used to identify the location and route of storm sewers in the system. Eight subbasins were delineated within the watershed that route stormwater to the Village Farm lake.

On Adios Pass, five inlets are in the flooding area. The drainage areas contributing to each of these inlets were delineated and are shown in Figure 3. The inlet calculations are included in Attachment 3.

Figure 3 – Inlet Locations on Adios Pass

Clark Dietz

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HYDRAULIC STUDY

Village Farms Pond and Dam Drainage Study

Prepared for: Hamilton County Drainage Board

Prepared by: Clark Dietz, Inc.

Date: June 2020

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FIGURES

ATTACHMENTS

Village Farms Pond and Dam Drainage Study

1.0 Executive Summary

This study evaluated the storm sewer, lake, and dam at the Village Farms subdivision in Westfield, Indiana. The neighborhood is located between 156th and 146th Streets on the north and south and Spring Mill and Oak Ridge Roads on the west and east. The lake dam is located on the east side of the development and outlets under Oak Ridge Road.

Flooding has historically occurred in the Village Farms neighborhood. During heavy rain events Adios Pass, located west of the pond, has been observed to pond as much as 2 feet deep, requiring Westfield maintenance staff to temporarily close the road due to cars stalling while attempting to drive through the flooded roadway. The lake outlet structure, existing storm sewer, road inlets, and the downstream lake were all evaluated to identify the cause of the flooding problems. Deficiencies in the system were found in the inflow capacity of the existing inlets near the problem area and the allowable staging of the lake during large storm events.

Our study found that the lake is not the primary cause of the flooding and the storm pipe network generally has adequate capacity; however, the capacity of the inlets to collect flow into the pipe system is lacking. The recommendation of this study is for five inlets to be replaced and six additional inlets to be constructed on Adios Pass. The existing inlet configuration in the problem area does not have enough capacity to capture a Q10 storm event. The proposed configuration will increase the inlet capture rate to the Q100 event. The proposed solution will eliminate road flooding up to a Q25 event and reduce the depth and duration of ponding for events greater than the Q25. This will significantly reduce the frequency of road closures. The depth of flooding during a Q100 event would be reduced by approximately 0.7 feet and ponding water would drain more quickly following the storm event. The estimated cost of the recommended improvements is $98,000.

2.0 Introduction

Clark Dietz was retained by the Hamilton County Drainage Board to prepare a drainage study of the Village Farms Pond, Dam, and upstream storm sewer for the Village Farms subdivision. The Village Farm Lake is located north of 146th Street and west of Oak Ridge Road. The subdivision experiences flooding upstream of the pond on Adios Pass during heavy rainfall events.

The Village Farm Lake has a contributing watershed of 564 acres. The watershed was analyzed by dividing it into 8 contributing subbasins. Figure 1 shows the watershed and subbasins for the Village Farms subdivision.

Figure 1 – Watershed and Subbasin Map

Subbasins 1, 2, and 4 include detention ponds upstream of the Village Farms Lake. Subbasin 1 is routed through subbasin 5 to the Lake. Subbasin 2 is routed to subbasin 7, then to the Lake. Subbasins 3, 4, 6, and 8 are routed directly to the Lake.

Flooding has historically occurred in the Village Farms neighborhood. During heavy rain events Adios Pass has been observed to pond with 2 feet of water that results in temporary closure of the road. Ponding water in the road has been deep enough to stall cars attempting to pass. The approximate extent of the flooding problem area is shown in Figure 2.

Figure 2 – Historic Flooding Location

According to the City of Westfield's Stormwater Coordinator, flooding will occur at the problem area on average 2-3 times a year requiring the road to be closed. Short duration rain events with high intensity rainfall typically result in street flooding. Low intensity rainfalls with long durations have not been the cause of flooding. Following the rain events, the water subsides in a few hours. The water never pools for a full day.

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On Adios Pass, five inlets are in the flooding area. The drainage areas contributing to each of these inlets were delineated and are shown in Figure 3. The inlet calculations are included in Attachment 3.

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3.3 Hydrologic Calculations

For each subbasin a Time of Concentration and a Travel Path were established. Aerial photography was used to establish land use. The USDA web soil survey was used to establish the soil types through the project area. The soil type and land use were used to establish the runoff curve numbers (CN).

The peak flows to the inlets were calculated using the rational method. A time of concentration and a travel path was established. Aerial photography was used to determine the land use and C-values. These calculations were performed to analyze the flow and capacity of the existing inlets along Adios Pass.

3.4 Hydrologic Model

The Innovyze program XPSWMM 2019.1 was used to calculate the hydrologic flow inputs by using the SCS Method. Per the Hamilton County Stormwater Management Technical Standards Manual, hydrographs were established based on the 24-hour NRCS Type 2 Rainfall Distribution for the 10, 25, 50 and 100-year design storms. XPSWMM was used to analyze the overall watershed and flow contributions to the Village Farms lake and dam.

4.0 Existing Storm Sewer Hydraulic Analysis

4.1 Existing System

A hydraulic model was created in XPSWMM to evaluate the flow of stormwater to the Village Farm lake and through the outlet structure at the dam. The hydrologic flow inputs described above were used in the model. Overland flow paths and the capacity of the lake were established using the Hamilton County 1 foot contours. The size and slope of the storm sewer were established using information from the Hamilton County GIS and field survey. Elevation information for the outlet control structure for the lake was established by field survey and the as-built drawing for the lake, dam, and spillway.

The Village Farm lake was designed with a normal pool elevation of 876.50 feet according to the original design plans from 1979. The primary outlet of the lake was designed as a 6 foot diameter riser pipe connected to 36 inch diameter pipe located at the bottom of the riser. The 36 inch outlet pipe runs east under the dam embankment, (116 feet in length) and outlets into the ditch upstream of the culvert under Oak Ridge Road. A 200 foot wide emergency spillway was included in the design. The spillway was designed at an overflow elevation of 880.25. feet (the 1979 design plans use the NGVD29 vertical datum).

Since the original construction, the outlet structure has been modified. The normal pool of the lake is currently set at an elevation of 874.01 feet, approximately 2.5 feet lower than the original design. The emergency spill way has also been modified. Per field survey the existing emergency spill way has a length of 90 feet with a weir top elevation of 878.19 feet (approximately 2 feet lower than the original design plans). The survey and Hamilton County GIS are set to the NAVD88 vertical datum.

The inlet flow capacities were evaluated separately from the hydraulic model. A spreadsheet computation sheet was created to determine the peak discharge at the inlets of interest for the 10, 25, 50, and 100 year storm events. The spreadsheet also calculated the flow capture for each inlet and the flow bypassing to the next downstream inlet.

4.2 System Deficiencies

Lake and Dam

The lake and dam outlet structure were evaluated to determine if they were contributing to the flooding issues on Adios Pass. The normal pool of the lake is set at an elevation of 874.01 and covers 16 acres. With the outlet structure functioning at full capacity the pond would stage to the following elevations during storm events:

- Q10 Storm Stage Elevation = 875.59
- Q25 Storm Stage Elevation = 876.12
- Q50 Storm Stage Elevation = 876.60
- Q100 Storm State Elevation = 877.18

The sag inlets, located at the lowest point on Adios pass, have a rim elevation of 876.56. The inlet on the west side of the road has an invert elevation of 874.47 feet and the inlet on the east side of the road has an invert elevation of 874.36 feet. The inlets are connected to an 18" diameter RCP that outlets to the lake at an elevation of 873.85. Figure 4 shows how the lake stages up into this segment of the storm sewer during large storm events.

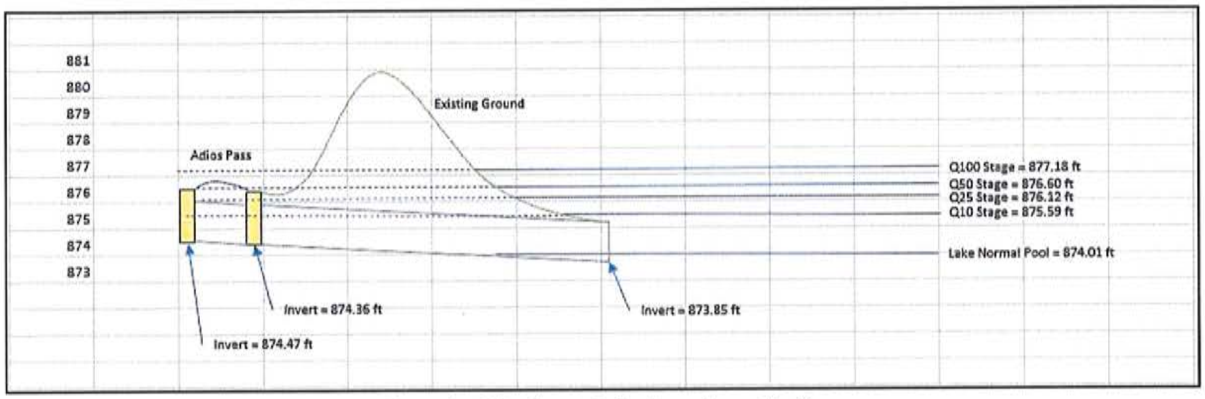

Figure 4 –Adios Pass to Lake Storm Sewer Profile

During a Q10 storm event the storm sewer outlet is completely submerged. The flood stage for the Q50 event is higher than the road inlets on Adios Pass. The flood stage for the Q100 event is higher than the center of the road on Adios Pass at the sag inlets (about 1 foot deep over the rim of the inlets). As shown in Figure 4, the homes along Adios Pass are well above this elevation and are not in danger of flooding (even under current conditions).

Lake Outlet Structure

The capacity of the lake outlet structure was evaluated using the XPSWMM model. The downstream receiving lake was also evaluated. The primary outlet for the lake is a 6 foot diameter riser pipe. A low weir was cut into the riser pipe and is set at an elevation of 874.01 over half of the riser pipe opening. A high weir is set at an elevation of 876.34 over the other half of the riser pipe. The bottom of the riser pipe is at an elevation of 868.50 feet. A 36 inch diameter RCP routes flow from the bottom of the riser pipe to an open ditch west of Oak Ridge Road. Flow is then conveyed through 2 five foot diameter arch pipes to the downstream lake. The normal pool of the downstream lake is at an elevation or 865.94 feet, well below the elevation of the Village Farms lake. The outlet structure of the pond would need to be blinded to 25% of its design capacity to simulate flooding on Adios Pass for small storm events such as a Q10 or smaller. It is possible this occurs during certain times of the year when twigs and leaves are present. Prevailing winds from the west would tend to blow floating debris in the lake toward the outlet structure on the east end of the lake. The outlet structure is shown in Figure 5.

Figure 5 – Lake Outlet Structure

The 36 inch diameter RCP from the outlet wet well has enough capacity to convey flows up to a Q100 event assuming the downstream lake does not stage up and create a tailwater condition that would reduce the capacity of the pipe.

The downstream lake has an outlet structure and an emergency overflow weir both set at the elevation of the normal pool for the lake. Even if the outlet structure were to become blinded the overflow weir would prevent the lake from staging up to create a tailwater condition for the Village Farms Lake. Therefore, the downstream lake has no impact on flood stages in the Village Farm lake or on the flooding along Adios Pass.

Inlet Capacity

Five inlets in the vicinity of the road flooding on Adios Pass were evaluated to determine if they have enough inflow capacity. The Q10 peak discharge for all the five inlets exceeds their inflow capacity. Furthermore, the flow from 3 of the inlets bypasses the structure and collects at the sag point on the road. This spreadsheet analysis assumes that the inlets are functioning at full capacity. It is reasonable to assume that in the spring and fall seasons that debris could collect and partially blind these inlets further reducing their inflow capacity.

5.0 Alternative Analysis

This study investigated four alternatives to solve the flooding problem in the subdivision. The alternatives included adding inlet structures on Adios Pass, increasing the capacity of the lake outlet structure, increasing the capacity of the storm sewer pipes upstream of the lake, and lowering the emergency spillway weir. The goal of the analysis is to provide a solution that will reduce the flooding risk on Adios Pass and not create any adverse downstream impacts.

5.1 Alternative 1 – Add Inlet Structures at Adios Pass

Alternative 1 investigated the benefit of adding inlets on Adios Pass to increase the capture rate of stormwater on the road. The five inlets that were evaluated on Adios Pass do not have enough inflow capacity to capture the flow produced by a Q10 event. The flow that is not initially captured by the inlets will collect at the sag point of the road and pool until the two inlets at the sag can convey the flow to the lake. As was discussed in the previous chapter the lake will stage up during storm events. As the lake stages up the capacity of the storm sewer downstream of the inlets will be reduced. The flow on the street needs to be captured before the lake stages up.

A spreadsheet analysis of inlet inflow capacity determined that six additional inlets should be added to the system to capture the stormwater. Five existing inlets also need to be replaced to accommodate the new connections. These inlets will have the capacity to capture all the road flow up to a Q100 event and provide a factor of safety to capture smaller storm events when debris may be partially obstructing the grates. Capturing additional flow at Amkey Way is important because the 30" storm sewer connected to these inlets has more capacity than the 18" sewer connected to the inlets at the sag point. Figure 6 shows the proposed location of the new inlets. The total cost for this alternative is estimated to be $98,000.

Figure 6 –Alternative 1, Add Inlet Structures

The inlet improvements will not prevent the lake from backing up in the storm sewer and onto Adios Pass for the Q50 and Q100 storm events. The location of the 100 year floodplain on Adios Pass after the Alternative 1 improvements are implemented is shown in Figure 7. The ponding area is much smaller and shallower than existing conditions.

Figure 7 –Alternative 1, 100 Year Floodplain

5.2 Alternative 2 - Increase the Capacity of the Lake Outlet Structure

Alternative 2 investigated the benefit of increasing the outflow capacity of the lake outlet structure. During large storm events the lake will stage up and reduce the capacity of the upstream storm sewers. By increasing the capacity of the outlet structure the pond will not stage as high and allow for greater capacity in the system upstream.

The riser pipe outlet structure, which currently has half of its weir set at an elevation of 874.0 feet and half at an elevation of 876.34 feet, could be modified to a single weir at an elevation of 874.0 feet. This would double the weir length at the elevation of 874.0 feet. The modification to the outlet structure is shown in Figure 8. The outlet structure modification would reduce the peak stage of the lake during large storm events by the following amounts:

- Q100 would be reduced from 877.18 feet to 876.99 feet (reduction of 0.19 feet)
- Q50 would be reduced from 876.60 feet to 876.27 feet (reduction of 0.33 feet)
- Q25 would be reduced from 876.12 feet to 875.76 feet (reduction of 0.36 feet)
- Q10 would be reduced from 875.59 feet to 875.32 feet (reduction of 0.24 feet)

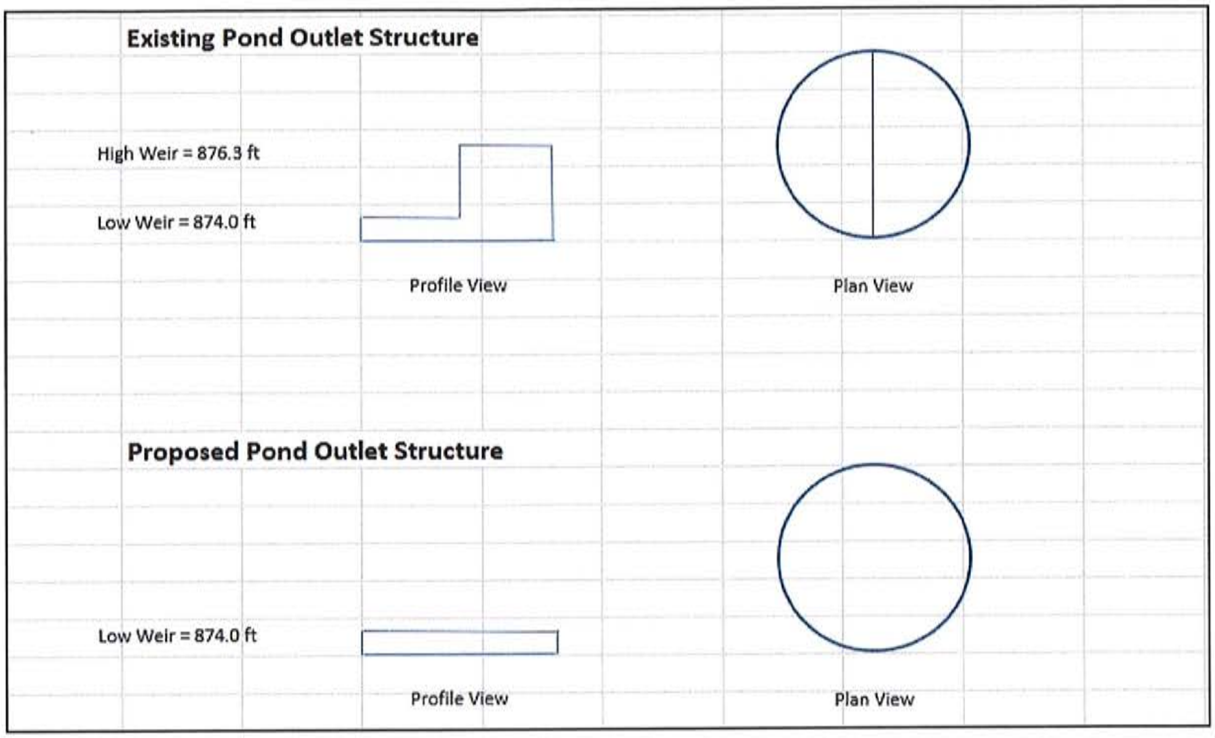

Figure 8 –Alternative 2, Modify Lake Outlet Structure

This modification would also reduce the time the pond is staged higher than the normal pool level for all storm events. With this improvement the max stage of the lake for the Q50 event would be lower than the sag point on Adios Pass. The Q100 max stage of the lake would still be above the sag point on Adios Pass. The peak discharge from the Lake routed to the Oakridge Road Culvert would increase by the following:

- Existing Q10 = 56 cfs Proposed Q10 = 85 cfs
- Existing Q25 = 86 cfs Proposed Q25 = 128 cfs
- Existing Q50 = 122 cfs Proposed Q50 = 143 cfs
- Existing Q100 = 152 cfs Proposed Q100 = 152 cfs

The overall benefit of this improvement would be a slight reduction of the max stage of the lake during storm events. The cost of making this improvement is $43,000.

5.3 Alternative 3 - Increase Storm Sewer Capacity

Alternative 3 investigated the benefit of increasing the capacity of the storm sewer pipes connecting the inlets on Adios Pass to the lake. The storm sewer pipes are 18" and 30" in diameter.

The hydraulic model indicates that these pipes are sized appropriately and have enough existing capacity. The inflow to the inlets is the restricting factor, not the capacity of the pipes. Increasing the size of these pipes will not provide any benefit to the community and therefore this alternative is not recommended.

5.4 Alternative 4 – Lower the Emergency Spillway Weir

Alternative 4 investigated the benefit lowering the emergency spillway weir at the east end of the lake to prevent flooding on Adios Pass up to the Q100 event. The existing emergency spillway weir is set at an elevation of 878.0 feet. A 30 foot wide spillway lowered to an elevation of 875.0 feet would result in the Q100 stage of the lake to be below 876.5 feet, which is the sag elevation of Adios Pass.

The existing Q100 stage of the lake would be lowered from 877.18 feet to 876.49 feet. The volume of water stored by the lake during a Q100 event would be reduced by 12 acre-feet and routed downstream. The peak discharge from the Lake routed to the Oakridge Road Culvert would increase by the following:

- Existing Q10 = 56 cfs Proposed Q10 = 78 cfs
- Existing Q25 = 86 cfs Proposed Q25 = 136 cfs
- Existing Q50 = 122 cfs Proposed Q50 = 191 cfs
- Existing Q100 = 152 cfs Proposed Q100 = 275 cfs

The Q100 stage of the Lake does not overtop the existing emergency overflow weir. If the weir is lowered to an elevation of 875.0 feet, it would be activated anytime the pond staged up over 1 foot, which would occur for storms smaller than a Q10 event. The spillway would need to be armored with concrete to protect against erosion of the dam.

Lowering the emergency spillway weir alone will not eliminate flooding on Adios Pass. The primary reason for flooding on Adios Pass is inlets with insufficient capacity. Alternative 4 would have to be constructed with the improvements recommended in Alternative 1. The total cost for this alternative is estimated to be $293,000.

6.0 Recommendations

The recommendation of this study is to replace five existing inlets and add six additional new inlets along Adios Pass as discussed in Alterative 1. The existing inlets do not have enough capacity to capture a Q10 storm event. The proposed configuration will increase the inlet capture rate to the Q100 event. The proposed solution will eliminate road flooding up to a Q25 event and reduce the amount of ponding and total time of ponding for events greater than the Q25. Some ponding will still occur during a Q100 event, but the extent and depth will be much less, allowing vehicles to pass through at a slow speed. The ponding will subside as the lake level subsides following a Q100 event.

The estimated cost of the recommended improvements is $98,000. A detailed breakdown of the cost estimate for each of the viable alternatives is included in Attachment 4. Hamilton County should work with the City of Westfield and the Village Farms Homeowners Association to determine how the project will be financed.

ATTACHMENT 1:

Hydrologic Calculations

ClarkDietz

Project//	Village Farms		
Project No.//	H0210360		
Subject//	Discharge Calculation	Page//	of
Prepared By//	BEP	Date//	4/16/2020
Checked By//	HJP	Date//	6/1/2020

Watershed Site Data: Area 1

Geographic Area Descriptions	Soil Type	Runoff Curve (C)	Area (Sq. Ft.)	Area (acres) (A)	CxA
Road / Pond	N/A	98	332000	7.62	746.92
Agriculture	A	67		0.00	0.00
Forest	A	36		0.00	0.00
HD-Residential	A	54		0.00	0.00
LD-Residential	A	46		0.00	0.00
Agriculture	B	76		0.00	0.00
Commercial	B	92		0.00	0.00
Forest	B	65		0.00	0.00
Grass/Pasture	B	69		0.00	0.00
HD-Residential	B	85		0.00	0.00
LD-Residential 1/4 ac	B	75	1057954	24.29	1821.55
Agriculture	C	83		0.00	0.00
Commercial	C	94		0.00	0.00
Forest	C	70		0.00	0.00
Grass/Pasture	C	79		0.00	0.00
HD-Residential	C	90		0.00	0.00
LD-Residential 1/4 ac	C	83	1237974	28.42	2358.86
Commercial	D	95		0.00	0.00
Forest	D	79		0.00	0.00
Grass/Pasture	D	84		0.00	0.00
LD-Residential	D	82		0.00	0.00
		Totals =	2,627,928	60.33	4927.33
		Area Sq. Mi. =	0.0943		

Weighted C = 81.7

Note - Curve Numbers taken from *Urban Hydrology for Small Watersheds,* Technical Release TR 55, United States of Agriculture, Natural Resources Conservation Service, Table 2-2a, 1986

Project//	Village Farms		
Project No.//	H0210360		
Subject//	Discharge Calculation	Page//	of
Prepared By//	BEP	Date//	4/16/2020
Checked By//	HJP	Date//	6/1/2020

Time of Concentration: Area 1

Sheet Flow (Applicable to Tc only)

1	Surface Description	Smooth	
2	Manning's Roughness Coeff.,...n (See Figure 202-2B)	0.011	
	Max. Flow Elev.(ft)=	915.2	
	Min. Flow Elev. (ft)=	913.3	
3	Flow length, L ....ft.	100.0	
4	Two-yr 24hr Rainfall[1], P2...in.	2.90	
5	Land Slope (ft/ft)=	0.0190	
6	Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.	0.022 hr	

Shallow Concentration Flow

7	Surface description (paved or unpaved)..........	unpaved	
	Max. Elevation, ...ft	913.30	
	Min Elevation, ...ft	907.80	
8	Flow length, L.........................ft.	566.0	
9	Watercourse slope, s.................ft/ft	0.0097	
10	Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)	1.59	
11	Tt = L/(3600 V)..........Computed Tt..hr.	0.099 hr	

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	Cross sectional flow area, a..........ft^2	3.14	
13	Wetted perimeter, Pw...................ft	6.28	
14	Hydraulic radius, r=a/Pw Compute r....ft	0.50	
	Max. Elev of channel, ...(ft) =	903.22	
	Min. Elev of channel, ...(ft) =	896.97	
15	Channel slope length,s......ft/ft	0.00725	
16	Manning's roughness coeff.,n .Based on stream type	0.013	
17	V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s	6.15	
18	Flow length from shallow to Structure, L ....ft.	862	
19	Tt = L/(3600 V)..........Computed Tt..hr.	0.039 hr	
20	Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)	**0.159 hr**	

or

9.6 min

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

ClarkDietz

Project//	Village Farms		
Project No.//	H0210360		
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Prepared By//	BEP	Date//	4/16/2020
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Watershed Site Data: Area 2

Geographic Area Descriptions	Soil Type	Runoff Curve (C)	Area (Sq. Ft.)	Area (acres) (A)	CxA
Road / Pond	N/A	98	140270	3.22	315.58
Agriculture	A	67		0.00	0.00
Forest	A	36		0.00	0.00
HD-Residential	A	54		0.00	0.00
LD-Residential	A	46		0.00	0.00
Agriculture	B	76		0.00	0.00
Commercial	B	92		0.00	0.00
Forest	B	65		0.00	0.00
Grass/Pasture	B	61	194278	4.46	272.06
HD-Residential	B	85	465839	10.69	909.01
LD-Residential 1/2 acre	B	70	100188	2.30	161.00
Agriculture	C	83		0.00	0.00
Commercial	C	94		0.00	0.00
Forest	C	70		0.00	0.00
Grass/Pasture	C	74	209088	4.80	355.20
HD-Residential	C	90	640332	14.70	1323.00
LD-Residential	C	83		0.00	0.00
Commercial	D	95		0.00	0.00
Forest	D	79		0.00	0.00
Grass/Pasture	D	84		0.00	0.00
LD-Residential	D	82		0.00	0.00
		Totals =	1,749,995	40.17	3335.84
		Area Sq. Mi. =	0.0628		

Weighted C = 83.0

Note - Curve Numbers taken from *Urban Hydrology for Small Watersheds,* Technical Release TR 55, United States of Agriculture, Natural Resources Conservation Service, Table 2-2a, 1986

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Time of Concentration: Area 2

Sheet Flow (Applicable to Tc only)

1	*Surface Description ....*	*S Grass*	
2	*Manning's Roughness Coeff.,...n (See Figure 202-2B)*	*0.150*	
	Max. Flow Elev.(ft)=	*904.1*	
	Min. Flow Elev. (ft)=	*903.5*	
3	*Flow length, L ....ft.*	*70.9*	
4	*Two-yr 24hr Rainfall*[1], P2...in.	*2.90*	
5	*Land Slope (ft/ft)=*	*0.0085*	
6	*Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.*	*0.184 hr*	

Shallow Concentration Flow

7	*Surface description (paved or unpaved)...........*	*unpaved*	
	Max. Elevation, ...ft	*903.50*	
	Min Elevation, ...ft	*897.00*	
8	*Flow length, L.........................ft.*	*358.5*	
9	*Watercourse slope, s.................ft/ft*	*0.0181*	
10	*Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)*	*2.17*	
11	*Tt = L/(3600 V)...........Computed Tt..hr.*	*0.046 hr*	

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	*Cross sectional flow area, a..........ft^2*	*3.14*	
13	*Wetted perimeter, Pw....................ft*	*6.28*	
14	*Hydraulic radius, r=a/Pw Compute r....ft*	*0.50*	
	Max. Elev of channel, ...(ft) =	*891.00*	
	Min. Elev of channel, ...(ft) =	*879.17*	
15	*Channel slope length,s......ft/ft*	*0.00820*	
16	*Manning's roughness coeff.,n .Based on stream type*	*0.013*	
17	*V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s*	*6.54*	
18	*Flow length from shallow to Structure, L ....ft.*	*1443*	
19	*Tt = L/(3600 V)...........Computed Tt..hr.*	*0.061 hr*	
20	*Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)*	***0.291 hr***	
		or	
		17.5 min	

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

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Watershed Site Data: Area 3

Geographic Area Descriptions	Soil Type	Runoff Curve (C)	Area (Sq. Ft.)	Area (acres) (A)	CxA
Road / Pond	N/A	98	636840	14.62	1432.74
Agriculture	A	67		0.00	0.00
Forest	A	36		0.00	0.00
HD-Residential	A	54		0.00	0.00
LD-Residential	A	46		0.00	0.00
Agriculture	B	76		0.00	0.00
Commercial	B	92		0.00	0.00
Forest	B	65		0.00	0.00
Grass/Pasture	B	61		0.00	0.00
HD-Residential	B	85		0.00	0.00
LD-Residential 1/2 ac	B	70	1884623	43.26	3028.55
Agriculture	C	83		0.00	0.00
Commercial	C	94		0.00	0.00
Forest	C	70		0.00	0.00
Grass/Pasture	C	74		0.00	0.00
HD-Residential	C	90		0.00	0.00
LD-Residential 1/2 ac	C	80	2582961	59.30	4743.73
Commercial	D	95		0.00	0.00
Forest	D	79		0.00	0.00
Grass/Pasture	D	84		0.00	0.00
LD-Residential	D	82		0.00	0.00
		Totals =	5,104,424	117.18	9205.02
		Area Sq. Mi. =	0.1831		

Weighted C = 78.6

Note - Curve Numbers taken from *Urban Hydrology for Small Watersheds*, Technical Release TR 55, United States of Agriculture, Natural Resources Conservation Service, Table 2-2a, 1986

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Time of Concentration: Area 3

Sheet Flow (Applicable to Tc only)

1	*Surface Description ....*	*S Grass*	
2	*Manning's Roughness Coeff.,...n (See Figure 202-2B)*	*0.150*	
	Max. Flow Elev.(ft)=	*892.0*	
	Min. Flow Elev. (ft)=	*889.0*	
3	*Flow length, L ....ft.*	*100.0*	
4	*Two-yr 24hr Rainfall*[1], P2...in.	*2.90*	
5	*Land Slope (ft/ft)=*	*0.0300*	
6	*Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.*	*0.146 hr*	

Shallow Concentration Flow

7	*Surface description (paved or unpaved)...........*		
	Max. Elevation, ...ft		
	Min Elevation, ...ft		
8	*Flow length, L.........................ft.*		
9	*Watercourse slope, s.................ft/ft*		
10	*Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)*		
11	*Tt = L/(3600 V)...........Computed Tt..hr.*		

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	*Cross sectional flow area, a..........ft^2*	*3.14*	*4.91*
13	*Wetted perimeter, Pw....................ft*	*6.28*	*7.85*
14	*Hydraulic radius, r=a/Pw Compute r....ft*	*0.50*	*0.63*
	Max. Elev of channel, ...(ft) =	*883.71*	*878.40*
	Min. Elev of channel, ...(ft) =	*878.40*	*873.97*
15	*Channel slope length,s......ft/ft*	*0.00309*	*0.00382*
16	*Manning's roughness coeff.,n .Based on stream type*	*0.013*	*0.013*
17	*V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s*	*4.01*	*5.18*
18	*Flow length from shallow to Structure, L ....ft.*	*1720*	*1160*
19	*Tt = L/(3600 V)...........Computed Tt..hr.*	*0.119 hr*	*0.062 hr*
20	*Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)*	***0.327 hr***	

or

19.6 min

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

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Watershed Site Data: Area 4

Geographic Area Descriptions	Soil Type	Runoff Curve (C)	Area (Sq. Ft.)	Area (acres) (A)	CxA
Road / Pond	N/A	98	226944	5.21	510.57
Agriculture	A	67		0.00	0.00
Forest	A	36		0.00	0.00
HD-Residential	A	54		0.00	0.00
LD-Residential	A	46		0.00	0.00
Agriculture	B	76		0.00	0.00
Commercial	B	92		0.00	0.00
Forest	B	65		0.00	0.00
Grass/Pasture	B	61		0.00	0.00
HD-Residential	B	85		0.00	0.00
LD-Residential 1/2 ac	B	70	1051053	24.13	1689.02
Agriculture	C	83		0.00	0.00
Commercial	C	94		0.00	0.00
Forest	C	70		0.00	0.00
Grass/Pasture	C	74		0.00	0.00
HD-Residential	C	90		0.00	0.00
LD-Residential 1/2 ac	C	80	982278	22.55	1804.00
Commercial	D	95		0.00	0.00
Forest	D	79		0.00	0.00
Grass/Pasture	D	84		0.00	0.00
LD-Residential	D	82		0.00	0.00
		Totals =	2,260,275	51.89	4003.59
		Area Sq. Mi. =	0.0811		

Weighted C = 77.2

Note - Curve Numbers taken from *Urban Hydrology for Small Watersheds,* Technical Release TR 55, United States of Agriculture, Natural Resources Conservation Service, Table 2-2a, 1986

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Time of Concentration: Area 4

Sheet Flow (Applicable to Tc only)

1	*Surface Description ....*	*S Grass*	
2	*Manning's Roughness Coeff.,...n (See Figure 202-2B)*	*0.150*	
	Max. Flow Elev.(ft)=	*894.2*	
	Min. Flow Elev. (ft)=	*892.0*	
3	*Flow length, L ....ft.*	*61.4*	
4	*Two-yr 24hr Rainfall*[1]*, P2...in.*	*2.90*	
5	*Land Slope (ft/ft)=*	*0.0358*	
6	*Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.*	*0.092 hr*	

Shallow Concentration Flow

7	*Surface description (paved or unpaved)...........*	*paved*	
	Max. Elevation, ...ft	*892.00*	
	Min Elevation, ...ft	*890.00*	
8	*Flow length, L.........................ft.*	*303.8*	
9	*Watercourse slope, s.................ft/ft*	*0.0066*	
10	*Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)*	*1.65*	
11	*Tt = L/(3600 V)...........Computed Tt..hr.*	*0.051 hr*	

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	*Cross sectional flow area, a..........ft^2*	*3.97*	
13	*Wetted perimeter, Pw...................ft*	*7.07*	
14	*Hydraulic radius, r=a/Pw Compute r....ft*	*0.56*	
	Max. Elev of channel, ...(ft) =	*888.00*	
	Min. Elev of channel, ...(ft) =	*883.00*	
15	*Channel slope length,s......ft/ft*	*0.00492*	
16	*Manning's roughness coeff.,n .Based on stream type*	*0.013*	
17	*V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s*	*5.47*	
18	*Flow length from shallow to Structure, L ....ft.*	*1017*	
19	*Tt = L/(3600 V)...........Computed Tt..hr.*	*0.052 hr*	
20	*Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)*	***0.195 hr***	

or

11.7 min

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

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Watershed Site Data: Area 5

Geographic Area Descriptions	Soil Type	Runoff Curve (C)	Area (Sq. Ft.)	Area (acres) (A)	CxA
Road / Pond	N/A	98	751500	17.25	1690.70
Agriculture	A	67		0.00	0.00
Forest	A	36		0.00	0.00
HD-Residential	A	54		0.00	0.00
LD-Residential	A	46		0.00	0.00
Agriculture	B	76		0.00	0.00
Commercial	B	92		0.00	0.00
Forest	B	65		0.00	0.00
Grass/Pasture	B	61		0.00	0.00
HD-Residential	B	85		0.00	0.00
LD-Residential 1/2 ac	B	70	3697373	84.88	5941.60
Agriculture	C	83		0.00	0.00
Commercial	C	94		0.00	0.00
Forest	C	70		0.00	0.00
Grass/Pasture	C	74		0.00	0.00
HD-Residential	C	90		0.00	0.00
LD-Residential 1/2 ac	C	80	3069152	70.46	5636.64
Commercial	D	95		0.00	0.00
Forest	D	79		0.00	0.00
Grass/Pasture	D	84		0.00	0.00
LD-Residential	D	82		0.00	0.00
		Totals =	7,518,025	172.59	13268.95
		Area Sq. Mi. =	0.2697		

Weighted C = 76.9

Note - Curve Numbers taken from *Urban Hydrology for Small Watersheds,* Technical Release TR 55, United States of Agriculture, Natural Resources Conservation Service, Table 2-2a, 1986

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Time of Concentration: Area 5

Sheet Flow (Applicable to Tc only)

1	*Surface Description ....*	*S Grass*	
2	*Manning's Roughness Coeff.,...n (See Figure 202-2B)*	*0.150*	
	Max. Flow Elev.(ft)=	*907.1*	
	Min. Flow Elev. (ft)=	*905.0*	
3	*Flow length, L ....ft.*	*70.0*	
4	*Two-yr 24hr Rainfall*[1], P2...in.	*2.90*	
5	*Land Slope (ft/ft)=*	*0.0300*	
6	*Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.*	*0.110 hr*	

Shallow Concentration Flow

7	*Surface description (paved or unpaved)..........*	*unpaved*	
	Max. Elevation, ...ft	*905.00*	
	Min Elevation, ...ft	*899.90*	
8	*Flow length, L.........................ft.*	*509.3*	
9	*Watercourse slope, s.................ft/ft*	*0.0100*	
10	*Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)*	*1.61*	
11	*Tt = L/(3600 V)..........Computed Tt..hr.*	*0.088 hr*	

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	*Cross sectional flow area, a..........ft^2*	*9.62*	
13	*Wetted perimeter, Pw...................ft*	*10.99*	
14	*Hydraulic radius, r=a/Pw Compute r....ft*	*0.88*	
	Max. Elev of channel, ...(ft) =	*897.39*	
	Min. Elev of channel, ...(ft) =	*876.50*	
15	*Channel slope length,s......ft/ft*	*0.00512*	
16	*Manning's roughness coeff.,n .Based on stream type*	*0.013*	
17	*V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s*	*7.50*	
18	*Flow length from shallow to Structure, L ....ft.*	*4082*	
19	*Tt = L/(3600 V)..........Computed Tt..hr.*	*0.151 hr*	
20	*Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)*	***0.348 hr***	

or

20.9 min

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

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Watershed Site Data: Area 6

Geographic Area Descriptions	Soil Type	Runoff Curve (C)	Area (Sq. Ft.)	Area (acres) (A)	CxA
Road / Pond	N/A	98	136800	3.14	307.77
Agriculture	A	67		0.00	0.00
Forest	A	36		0.00	0.00
HD-Residential	A	54		0.00	0.00
LD-Residential	A	46		0.00	0.00
Agriculture	B	76		0.00	0.00
Commercial	B	92		0.00	0.00
Forest	B	65		0.00	0.00
Grass/Pasture	B	61		0.00	0.00
HD-Residential	B	85		0.00	0.00
LD-Residential 1/2 ac	B	70	667077	15.31	1071.98
Agriculture	C	83		0.00	0.00
Commercial	C	94		0.00	0.00
Forest	C	70		0.00	0.00
Grass/Pasture	C	74		0.00	0.00
HD-Residential	C	90		0.00	0.00
LD-Residential 1/2 ac	C	80	398523	9.15	731.91
Commercial	D	95		0.00	0.00
Forest	D	79		0.00	0.00
Grass/Pasture	D	84		0.00	0.00
LD-Residential	D	82		0.00	0.00
		Totals =	1,202,400	27.60	2111.65
		Area Sq. Mi. =	0.0431		

Weighted C = 76.5

Note - Curve Numbers taken from *Urban Hydrology for Small Watersheds,* Technical Release TR 55, United States of Agriculture, Natural Resources Conservation Service, Table 2-2a, 1986

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Time of Concentration: Area 6

Sheet Flow (Applicable to Tc only)

1	*Surface Description ....*	*S Grass*	
2	*Manning's Roughness Coeff.,...n (See Figure 202-2B)*	*0.150*	
	Max. Flow Elev.(ft)=	*895.0*	
	Min. Flow Elev. (ft)=	*893.0*	
3	*Flow length, L ....ft.*	*94.0*	
4	*Two-yr 24hr Rainfall[1], P2...in.*	*2.90*	
5	*Land Slope (ft/ft)=*	*0.0213*	
6	*Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.*	*0.159 hr*	

Shallow Concentration Flow

7	*Surface description (paved or unpaved)...........*	*paved*	
	Max. Elevation, ...ft	*893.00*	
	Min Elevation, ...ft	*891.05*	
8	*Flow length, L.........................ft.*	*300.0*	
9	*Watercourse slope, s.................ft/ft*	*0.0065*	
10	*Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)*	*1.64*	
11	*Tt = L/(3600 V)...........Computed Tt..hr.*	*0.051 hr*	

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	*Cross sectional flow area, a..........ft^2*	*4.91*	
13	*Wetted perimeter, Pw....................ft*	*7.85*	
14	*Hydraulic radius, r=a/Pw Compute r....ft*	*0.63*	
	Max. Elev of channel, ………..(ft) =	*886.57*	
	Min. Elev of channel, ………..(ft) =	*875.78*	
15	*Channel slope length,s......ft/ft*	*0.00618*	
16	*Manning's roughness coeff.,n .Based on stream type*	*0.013*	
17	*V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s*	*6.59*	
18	*Flow length from shallow to Structure, L ....ft.*	*1745*	
19	*Tt = L/(3600 V)...........Computed Tt..hr.*	*0.074 hr*	
20	*Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)*	***0.284 hr***	

or

17.0 min

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

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Watershed Site Data: Area 7

Geographic Area Descriptions	Soil Type	Runoff Curve (C)	Area (Sq. Ft.)	Area (acres) (A)	CxA
Road / Pond	N/A	98	201600	4.63	453.55
Agriculture	A	67		0.00	0.00
Forest	A	36		0.00	0.00
HD-Residential	A	54		0.00	0.00
LD-Residential	A	46		0.00	0.00
Agriculture	B	76		0.00	0.00
Commercial	B	92		0.00	0.00
Forest	B	65		0.00	0.00
Grass/Pasture	B	61	100188	2.30	140.30
HD-Residential	B	85		0.00	0.00
LD-Residential 1/2 ac	B	70	2156437	49.50	3465.35
Agriculture	C	83		0.00	0.00
Commercial	C	94		0.00	0.00
Forest	C	70		0.00	0.00
Grass/Pasture	C	74		0.00	0.00
HD-Residential	C	90		0.00	0.00
LD-Residential 1/2 ac	C	80	1599059	36.71	2936.75
Commercial	D	95		0.00	0.00
Forest	D	79		0.00	0.00
Grass/Pasture	D	84		0.00	0.00
LD-Residential	D	82		0.00	0.00
		Totals =	4,057,284	93.14	6995.95
		Area Sq. Mi. =	0.1455		

Weighted C = 75.1

Note - Curve Numbers taken from *Urban Hydrology for Small Watersheds*, Technical Release TR 55, United States of Agriculture, Natural Resources Conservation Service, Table 2-2a, 1986

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Time of Concentration: Area 7

Sheet Flow (Applicable to Tc only)

1	Surface Description	S Grass	
2	Manning's Roughness Coeff.,...n (See Figure 202-2B)	0.150	
	Max. Flow Elev.(ft)=	903.1	
	Min. Flow Elev. (ft)=	899.0	
3	Flow length, L ....ft.	99.2	
4	Two-yr 24hr Rainfall[1], P2...in.	2.90	
5	Land Slope (ft/ft)=	0.0413	
6	Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.	0.127 hr	

Shallow Concentration Flow

7	Surface description (paved or unpaved)...........	unpaved	paved
	Max. Elevation, ...ft	899.00	897.00
	Min Elevation, ...ft	897.00	894.90
8	Flow length, L.........................ft.	243.5	197.9
9	Watercourse slope, s.................ft/ft	0.0082	0.0106
10	Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)	1.46	2.09
11	Tt = L/(3600 V)...........Computed Tt..hr.	0.046 hr	0.026 hr

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	Cross sectional flow area, a..........ft^2	9.62	
13	Wetted perimeter, Pw...................ft	10.99	
14	Hydraulic radius, r=a/Pw Compute r....ft	0.88	
	Max. Elev of channel, ………..(ft) =	890.01	
	Min. Elev of channel, ………...(ft) =	879.50	
15	Channel slope length,s......ft/ft	0.00262	
16	Manning's roughness coeff.,n .Based on stream type	0.013	
17	V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s	5.36	
18	Flow length from shallow to Structure, L ....ft.	4018	
19	Tt = L/(3600 V)...........Computed Tt..hr.	0.208 hr	
20	Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)	**0.408 hr**	

or

24.5 min

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

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Project//	Village Farms			
Project No.//	H0210360			
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Prepared By//	BEP	Date//	4/16/2020	
Checked By//	HJP	Date//	6/1/2020	

Watershed Site Data: Area 8

Geographic Area Descriptions	Soil Type	Runoff Curve (C)	Area (Sq. Ft.)	Area (acres) (A)	CxA
Road / Pond	N/A	98	12000	0.28	27.00
Agriculture	A	67		0.00	0.00
Forest	A	36		0.00	0.00
HD-Residential	A	54		0.00	0.00
LD-Residential	A	46		0.00	0.00
Agriculture	B	76		0.00	0.00
Commercial	B	92		0.00	0.00
Forest	B	65		0.00	0.00
Grass/Pasture	B	61		0.00	0.00
HD-Residential	B	85		0.00	0.00
LD-Residential 1/2 ac	B	70	126803	2.91	203.77
Agriculture	C	83		0.00	0.00
Commercial	C	94		0.00	0.00
Forest	C	70		0.00	0.00
Grass/Pasture	C	74		0.00	0.00
HD-Residential	C	90		0.00	0.00
LD-Residential 1/2 ac	C	80	112385	2.58	206.40
Commercial	D	95		0.00	0.00
Forest	D	79		0.00	0.00
Grass/Pasture	D	84		0.00	0.00
LD-Residential	D	82		0.00	0.00
		Totals =	251,188	5.77	437.17
		Area Sq. Mi. =	0.0090		

Weighted C = 75.8

Note - Curve Numbers taken from *Urban Hydrology for Small Watersheds,* Technical Release TR 55, United States of Agriculture, Natural Resources Conservation Service, Table 2-2a, 1986

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Time of Concentration: Area 8

Sheet Flow (Applicable to Tc only)

1	Surface Description	S Grass	
2	Manning's Roughness Coeff.,...n (See Figure 202-2B)	0.150	
	Max. Flow Elev.(ft)=	886.0	
	Min. Flow Elev. (ft)=	884.0	
3	Flow length, L ....ft.	91.0	
4	Two-yr 24hr Rainfall[1], P2...in.	2.90	
5	Land Slope (ft/ft)=	0.0220	
6	Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.	0.153 hr	

Shallow Concentration Flow

7	Surface description (paved or unpaved)...........	unpaved	
	Max. Elevation, ...ft	884.00	
	Min Elevation, ...ft	879.90	
8	Flow length, L.........................ft.	486.6	
9	Watercourse slope, s.................ft/ft	0.0084	
10	Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)	1.48	
11	Tt = L/(3600 V)...........Computed Tt..hr.	0.091 hr	

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	Cross sectional flow area, a..........ft^2		
13	Wetted perimeter, Pw...................ft		
14	Hydraulic radius, r=a/Pw Compute r....ft		
	Max. Elev of channel, ...(ft) =		
	Min. Elev of channel, ...(ft) =		
15	Channel slope length,s......ft/ft		
16	Manning's roughness coeff.,n .Based on stream type		
17	V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s		
18	Flow length from shallow to Structure, L ....ft.		
19	Tt = L/(3600 V)...........Computed Tt..hr.		
20	Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)	**0.244 hr**	
		or	
		14.7 min	

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

ATTACHMENT 2:

Rainfall Distribution

NRCS Type-2 Rainfall Distribution

% Time	% Storm
0	0.000
5	0.010
10	0.025
15	0.040
20	0.060
25	0.080
30	0.100
35	0.130
40	0.165
45	0.220
50	0.640
55	0.780
60	0.835
65	0.870
70	0.895
75	0.920
80	0.940
85	0.960
90	0.980
95	0.990
100	1.000

10-Year 24-hour = 3.83 inches
25-Year 24-hour = 4.72
50-Year 24-hour = 5.52
100-Year 24-hour = 6.46 inches

Table 201-3 Rainfall Depths for Various Return Periods

ATTACHMENT 3:

Inlet Calculations

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Project//	Village Farms		
Project No.//	H0210360		
Subject//	Discharge Calculation	Page//	of
Prepared By //	BEP	Date//	5/14/2020
Checked By//	HJP	Date//	6/1/2020

Watershed Site Data: Area 1 - Inlet

Time of Concentration:

Sheet Flow (Applicable to Tc only)

1	*Surface Description ....*	S Grass	
2	*Manning's Roughness Coeff.,...n (See Figure 202-2B)*	0.150	
	Max. Flow Elev.(ft)=	884.2	
	Min. Flow Elev. (ft)=	881.0	
3	*Flow length, L ....ft.*	77.0	
4	*Two-yr 24hr Rainfall*[1], P2...in.	2.90	
5	*Land Slope (ft/ft)=*	0.0416	
6	*Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.*	0.104 hr	

Shallow Concentration Flow

7	*Surface description (paved or unpaved)...........*	unpaved	Paved
	Max. Elevation, ...ft	881.00	879.00
	Min Elevation, ...ft	879.00	877.60
8	*Flow length, L.........................ft.*	430.0	140.0
9	*Watercourse slope, s.................ft/ft*	0.0047	0.0100
10	*Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)*	1.10	2.03
11	*Tt = L/(3600 V)...........Computed Tt..hr.*	0.109 hr	0.019 hr

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	*Cross sectional flow area, a..........ft^2*		
13	*Wetted perimeter, Pw....................ft*		
14	*Hydraulic radius, r=a/Pw Compute r....ft*		
	Max. Elev of channel, ...(ft) =		
	Min. Elev of channel, ...(ft) =		
15	*Channel slope length,s......ft/ft*		
16	*Manning's roughness coeff.,n .Based on stream type*		
17	*V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s*		
18	*Flow length from shallow to Structure, L ....ft.*		
19	*Tt = L/(3600 V)...........Computed Tt..hr.*		
20	*Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)*	**0.232 hr**	

or

13.9 min

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

Clark Dietz

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Watershed Site Data: Area 2 - Inlet

Time of Concentration:

Sheet Flow (Applicable to Tc only)

1	Surface Description	S Grass	
2	Manning's Roughness Coeff.,...n (See Figure 202-2B)	0.150	
	Max. Flow Elev.(ft)=	883.5	
	Min. Flow Elev. (ft)=	880.0	
3	Flow length, L ....ft.	71.0	
4	Two-yr 24hr Rainfall[1], P2...in.	2.90	
5	Land Slope (ft/ft)=	0.0493	
6	Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.	0.091 hr	

Shallow Concentration Flow

7	Surface description (paved or unpaved)...........	Paved	
	Max. Elevation, ...ft	880.00	
	Min Elevation, ...ft	877.90	
8	Flow length, L.........................ft.	250.0	
9	Watercourse slope, s.................ft/ft	0.0084	
10	Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)	1.86	
11	Tt = L/(3600 V)...........Computed Tt..hr.	0.037 hr	

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	Cross sectional flow area, a..........ft^2		
13	Wetted perimeter, Pw....................ft		
14	Hydraulic radius, r=a/Pw Compute r....ft		
	Max. Elev of channel, ...(ft) =		
	Min. Elev of channel, ...(ft) =		
15	Channel slope length,s......ft/ft		
16	Manning's roughness coeff.,n .Based on stream type		
17	V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s		
18	Flow length from shallow to Structure, L ....ft.		
19	Tt = L/(3600 V)...........Computed Tt..hr.		
20	Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)	**0.128 hr**	

or

7.7 min

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

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Watershed Site Data: Area 3 - Inlet

Time of Concentration:

Sheet Flow (Applicable to Tc only)

1	*Surface Description ....*	S Grass	
2	*Manning's Roughness Coeff.,...n (See Figure 202-2B)*	0.150	
	Max. Flow Elev.(ft)=	883.2	
	Min. Flow Elev. (ft)=	881.0	
3	*Flow length, L ....ft.*	100.0	
4	*Two-yr 24hr Rainfall*[1], P2...in.	2.90	
5	*Land Slope (ft/ft)=*	0.0220	
6	*Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.*	0.165 hr	

Shallow Concentration Flow

7	*Surface description (paved or unpaved)...........*	Paved	
	Max. Elevation, ...ft	881.00	
	Min Elevation, ...ft	876.50	
8	*Flow length, L.........................ft.*	330.0	
9	*Watercourse slope, s.................ft/ft*	0.0136	
10	*Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)*	2.37	
11	*Tt = L/(3600 V)...........Computed Tt..hr.*	0.039 hr	

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	*Cross sectional flow area, a..........ft^2*		
13	*Wetted perimeter, Pw....................ft*		
14	*Hydraulic radius, r=a/Pw Compute r....ft*		
	Max. Elev of channel, ...(ft) =		
	Min. Elev of channel, ...(ft) =		
15	*Channel slope length,s......ft/ft*		
16	*Manning's roughness coeff.,n .Based on stream type*		
17	*V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s*		
18	*Flow length from shallow to Structure, L ....ft.*		
19	*Tt = L/(3600 V)...........Computed Tt..hr.*		
20	*Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)*	**0.204 hr**	

or

12.2 min

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

Clark Dietz

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Checked By//	HJP	Date//	6/1/2020

Watershed Site Data: Area 4 - Inlet

Time of Concentration:

Sheet Flow (Applicable to Tc only)

1	Surface Description	S Grass	
2	Manning's Roughness Coeff.,...n (See Figure 202-2B)	0.150	
	Max. Flow Elev.(ft)=	882.0	
	Min. Flow Elev. (ft)=	880.2	
3	Flow length, L ....ft.	76.0	
4	Two-yr 24hr Rainfall[1], P2...in.	2.90	
5	Land Slope (ft/ft)=	0.0237	
6	Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.	0.129 hr	

Shallow Concentration Flow

7	Surface description (paved or unpaved)...........	Paved	
	Max. Elevation, ...ft	880.20	
	Min Elevation, ...ft	878.00	
8	Flow length, L.........................ft.	290.0	
9	Watercourse slope, s.................ft/ft	0.0076	
10	Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)	1.77	
11	Tt = L/(3600 V)...........Computed Tt..hr.	0.045 hr	

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	Cross sectional flow area, a..........ft^2		
13	Wetted perimeter, Pw....................ft		
14	Hydraulic radius, r=a/Pw Compute r....ft		
	Max. Elev of channel, ...(ft) =		
	Min. Elev of channel, ...(ft) =		
15	Channel slope length,s......ft/ft		
16	Manning's roughness coeff.,n .Based on stream type		
17	V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s		
18	Flow length from shallow to Structure, L ....ft.		
19	Tt = L/(3600 V)...........Computed Tt..hr.		
20	Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)	**0.174 hr**	

or

10.5 min

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

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Project//	Village Farms		
Project No.//	H0210360		
Subject//	Discharge Calculation	Page//	of
Prepared By//	BEP	Date//	5/14/2020
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Watershed Site Data: Area 5 - Inlet

Time of Concentration:

Sheet Flow (Applicable to Tc only)

1	*Surface Description ....*	*S Grass*	
2	*Manning's Roughness Coeff.,...n (See Figure 202-2B)*	*0.150*	
	Max. Flow Elev.(ft)=	*883.5*	
	Min. Flow Elev. (ft)=	*881.5*	
3	*Flow length, L ....ft.*	*70.0*	
4	*Two-yr 24hr Rainfall*[1], P2...in.	2.90	
5	*Land Slope (ft/ft)=*	*0.0286*	
6	*Tt = 0.007 (nL)^0.8/P2^0.5 * S^0.4 Computed Tt....hr.*	*0.112 hr*	

Shallow Concentration Flow

7	*Surface description (paved or unpaved)...........*	*Paved*	
	Max. Elevation, ...ft	*881.50*	
	Min Elevation, ...ft	*876.50*	
8	*Flow length, L.........................ft.*	*330.0*	
9	*Watercourse slope, s.................ft/ft*	*0.0152*	
10	*Average velocity, V ..ft/s(INDOT eq 29-7.7 or7.8)*	*2.50*	
11	*Tt = L/(3600 V)...........Computed Tt..hr.*	*0.037 hr*	

Channel Flow

Trapezoidal Channel Geometry (Estimated from Survey/Quad maps)

		1	2
12	*Cross sectional flow area, a..........ft^2*		
13	*Wetted perimeter, Pw...................ft*		
14	*Hydraulic radius, r=a/Pw Compute r....ft*		
	Max. Elev of channel, ...(ft) =		
	Min. Elev of channel, ...(ft) =		
15	*Channel slope length,s......ft/ft*		
16	*Manning's roughness coeff.,n .Based on stream type*		
17	*V =(1.49 r^2/3 s^1/2)/n Computed V...ft/s*		
18	*Flow length from shallow to Structure, L ....ft.*		
19	*Tt = L/(3600 V)...........Computed Tt..hr.*		
20	*Watershed or Subarea Tc or Tt (add Tt in steps 6, 11, and 19)*	***0.148 hr***	

or

8.9 min

Notes

1) - 2-year 24 hour rainfall was taken from NOAA Atlas 14, Volume 2

JOB: H0210360 Village Farms
ITEM: Inlet Spacing

DES. BEP DATE: 14-May-20
CHK. HP DATE:

EXISTING INLET COMPUTATION SHEET

LOCATION						GUTTER DISCHARGE						INLET DISCHARGE			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Structure #	Event	Drainage Area "A"	C	i	Q = CIA Eqn 29-8.1	Grade "S_0"	Cross Slope S_x	Previous Runby	Total Gutter Flow	Depth "d" T/W	Total Spread "T"	Structure Type	Intercept "Q_i"	Runby "Q_r"	Remarks
		ac		in/hr	cfs	ft/ft	ft/ft	cfs	cfs	ft	dt		cfs	cfs	
1	10-yr	3.140	0.425	4.890	6.526	0.0066	0.020	0.000	6.526	0.160	8.00	2'x2'	2.170	4.356	
1	25-yr	3.140	0.425	5.580	7.447	0.0066	0.020	0.000	7.447	0.160	8.00	2'x2'	2.170	5.277	
1	50-yr	3.140	0.425	6.120	8.167	0.0066	0.020	0.000	8.167	0.160	8.00	2'x2'	2.170	5.997	
1	100-yr	3.140	0.425	6.650	8.874	0.0066	0.020	0.000	8.874	0.160	8.00	2'x2'	2.170	6.704	
2	10-yr	0.670	0.425	6.460	1.839	0.0066	0.020	4.356	6.195	0.160	8.00	2'x2'	2.170	4.025	
2	25-yr	0.670	0.425	7.390	2.104	0.0066	0.020	5.277	7.381	0.160	8.00	2'x2'	2.170	5.211	
2	50-yr	0.670	0.425	8.130	2.315	0.0066	0.020	5.997	8.312	0.160	8.00	2'x2'	2.170	6.142	
2	100-yr	0.670	0.425	8.840	2.517	0.0066	0.020	6.704	9.222	0.160	8.00	2'x2'	2.170	7.052	
3	10-yr	1.770	0.425	5.240	3.942	0.0066	0.020	4.025	7.967	0.160	8.00	2'x2'	2.170	5.797	Sag
3	25-yr	1.770	0.425	5.970	4.491	0.0066	0.020	5.211	9.702	0.160	8.00	2'x2'	2.170	7.532	Sag
3	50-yr	1.770	0.425	6.540	4.920	0.0066	0.020	6.142	11.062	0.160	8.00	2'x2'	2.170	8.892	Sag
3	100-yr	1.770	0.425	7.100	5.341	0.0066	0.020	7.052	12.393	0.160	8.00	2'x2'	2.170	10.223	Sag
4	10-yr	1.010	0.425	5.690	2.442	0.0066	0.020	0.000	2.442	0.160	8.00	2'x2'	2.170	0.272	
4	25-yr	1.010	0.425	6.470	2.777	0.0066	0.020	0.000	2.777	0.160	8.00	2'x2'	2.170	0.607	
4	50-yr	1.010	0.425	7.090	3.043	0.0066	0.020	0.000	3.043	0.160	8.00	2'x2'	2.170	0.873	
4	100-yr	1.010	0.425	7.690	3.301	0.0066	0.020	0.000	3.301	0.160	8.00	2'x2'	2.170	1.131	
5	10-yr	1.240	0.425	6.060	3.194	0.0066	0.020	0.272	3.466	0.160	8.00	2'x2'	2.170	1.296	Sag
5	25-yr	1.240	0.425	6.910	3.642	0.0066	0.020	0.607	4.249	0.160	8.00	2'x2'	2.170	2.079	Sag
5	50-yr	1.240	0.425	7.590	4.000	0.0066	0.020	0.873	4.873	0.160	8.00	2'x2'	2.170	2.703	Sag
5	100-yr	1.240	0.425	8.240	4.342	0.0066	0.020	1.131	5.473	0.160	8.00	2'x2'	2.170	3.303	Sag

JOB: H0210360 Village Farms
ITEM: Inlet Spacing

DES. BEP DATE: 14-May-20
CHK. HP DATE:

PROPOSED INLET COMPUTATION SHEET

LOCATION						GUTTER DISCHARGE						INLET DISCHARGE			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Structure #	Event	Drainage Area "A"	C	i	Q = CIA Eqn 29-8.1	Grade "S_0"	Cross Slope S_x	Previous Runby	Total Gutter Flow	Depth "d" T/W	Total Spread "T"	Structure Type	Intercept "Q_i"	Runby "Q_r"	Remarks
		ac		in/hr	cfs	ft/ft	ft/ft	cfs	cfs	ft	dt		cfs	cfs	
1	10-yr	3.140	0.425	4.890	6.526	0.0066	0.020	0.000	6.526	0.160	8.00	2'x2'	6.510	0.016	Add (2) inlets
1	25-yr	3.140	0.425	5.580	7.447	0.0066	0.020	0.000	7.447	0.160	8.00	2'x2'	6.510	0.937	
1	50-yr	3.140	0.425	6.120	8.167	0.0066	0.020	0.000	8.167	0.160	8.00	2'x2'	6.510	1.657	
1	100-yr	3.140	0.425	6.650	8.874	0.0066	0.020	0.000	8.874	0.160	8.00	2'x2'	6.510	2.364	
2	10-yr	0.670	0.425	6.460	1.839	0.0066	0.020	0.016	1.855	0.160	8.00	2'x2'	4.340	0.000	
2	25-yr	0.670	0.425	7.390	2.104	0.0066	0.020	0.937	3.041	0.160	8.00	2'x2'	4.340	0.000	
2	50-yr	0.670	0.425	8.130	2.315	0.0066	0.020	1.657	3.972	0.160	8.00	2'x2'	4.340	0.000	
2	100-yr	0.670	0.425	8.840	2.517	0.0066	0.020	2.364	4.882	0.160	8.00	2'x2'	4.340	0.542	
3	10-yr	1.770	0.425	5.240	3.942	0.0066	0.020	0.000	3.942	0.160	8.00	2'x2'	4.340	0.000	Sag
3	25-yr	1.770	0.425	5.970	4.491	0.0066	0.020	0.000	4.491	0.160	8.00	2'x2'	4.340	0.151	Sag
3	50-yr	1.770	0.425	6.540	4.920	0.0066	0.020	0.000	4.920	0.160	8.00	2'x2'	4.340	0.580	Sag
3	100-yr	1.770	0.425	7.100	5.341	0.0066	0.020	0.542	5.883	0.160	8.00	2'x2'	4.340	1.543	Sag

4	10-yr	1.010	0.425	5.690	2.442	0.0066	0.020	0.000	2.442	0.160	8.00	2'x2'	4.340	0.000	
4	25-yr	1.010	0.425	6.470	2.777	0.0066	0.020	0.000	2.777	0.160	8.00	2'x2'	4.340	0.000	
4	50-yr	1.010	0.425	7.090	3.043	0.0066	0.020	0.000	3.043	0.160	8.00	2'x2'	4.340	0.000	
4	100-yr	1.010	0.425	7.690	3.301	0.0066	0.020	0.000	3.301	0.160	8.00	2'x2'	4.340	0.000	

5	10-yr	1.240	0.425	6.060	3.194	0.0066	0.020	0.000	3.194	0.160	8.00	2'x2'	4.340	0.000	Sag
5	25-yr	1.240	0.425	6.910	3.642	0.0066	0.020	0.000	3.642	0.160	8.00	2'x2'	4.340	0.000	Sag
5	50-yr	1.240	0.425	7.590	4.000	0.0066	0.020	0.000	4.000	0.160	8.00	2'x2'	4.340	0.000	Sag
5	100-yr	1.240	0.425	8.240	4.342	0.0066	0.020	0.000	4.342	0.160	8.00	2'x2'	4.340	0.000	Sag

ATTACHMENT 4:

Cost Estimate

HAMILTON COUNTY DRAINAGE BOARD
VILLAGE FARMS POND AND DAM DRAINAGE STUDY

ENGINEER'S ESTIMATE

6/22/2020

ALTERNATIVE 1 - ADD INLET STRUCTURES AT ADIOS PASS

Contract Item No.	Description	Estimated Quantity	Prices In Figures	
			Unit Price	Total Price for Item
1	CONSTRUCTION ENGINEERING	1 LS	$ 2,500.00	$ 2,500
2	MOBILIZATION AND DEMOBILIZATION	1 LS	$ 5,000.00	$ 5,000
3	MAINTAINING TRAFFIC	1 LS	$ 2,500.00	$ 2,500
4	SODDING	150 SYS	$ 30.00	$ 4,500
5	CURB CONCRETE, A	175 LFT	$ 25.00	$ 4,375
6	HMA ROAD PATCH	14 TON	$ 250.00	$ 3,500
7	PIPE, RCP, CIRCULAR, 12 IN.	152 LFT	$ 65.00	$ 9,880
8	INLET STRUCTURE	11 EA	$ 2,000.00	$ 22,000
9	DEMOLITION, REMOVAL AND DISPOSAL OF EX. STORM PIPE	40 LFT	$ 20.00	$ 800
10	EROSION CONTROL	1 LS	$ 1,000.00	$ 1,000
11	CONTINGENCY (20%)	1 LS	$ 9,700.00	$ 9,700

Construction Subtotal =	**$**	**65,755**
Legal Costs =	$	2,500
Design and Bidding Services =	$	25,000
Construction Engineering and Observation Services =	$	5,000
Total Project Cost =	**$**	**98,255**

HAMILTON COUNTY DRAINAGE BOARD
VILLAGE FARMS POND AND DAM DRAINAGE STUDY

ENGINEER'S ESTIMATE

6/22/2020

ALTERNATIVE 2 - INCREASE THE CAPACITY OF THE LAKE OUTLET STRUCTURE

Contract Item No.	Description	Estimated Quantity	Prices In Figures	
			Unit Price	Total Price for Item
1	CONSTRUCTION ENGINEERING	1 LS	$ 1,000.00	$ 1,000
2	MOBILIZATION AND DEMOBILIZATION	1 LS	$ 2,000.00	$ 2,000
3	INLET STRUCTURE MODIFICATION	1 LS	$ 6,000.00	$ 6,000
4	EROSION CONTROL	1 LS	$ 500.00	$ 500
5	CONTINGENCY (20%)	1 LS	$ 1,300.00	$ 1,300

Construction Subtotal =	**$ 10,800**
Legal Costs =	$ 2,500
Design and Bidding Services =	$ 25,000
Construction Engineering and Observation Services =	$ 5,000
Total Project Cost =	**$ 43,300**

HAMILTON COUNTY DRAINAGE BOARD
VILLAGE FARMS POND AND DAM DRAINAGE STUDY

ENGINEER'S ESTIMATE
6/22/2020

ALTERNATIVE 4 - LOWER THE EMERGENCY SPILLWAY WEIR

Contract Item No.	Description	Estimated Quantity	Prices In Figures	
			Unit Price	Total Price for Item
1	CONSTRUCTION ENGINEERING	1 LS	$ 2,500.00	$ 2,500
2	MOBILIZATION AND DEMOBILIZATION	1 LS	$ 5,000.00	$ 5,000
3	MAINTAINING TRAFFIC	1 LS	$ 2,500.00	$ 2,500
4	COMMON EXCAVATION	433 CYS	$ 40.00	$ 17,320
5	FINE GRADING	530 SYS	$ 50.00	$ 26,500
6	CONCRETE SPILLWAY ARMOR	530 SYS	$ 200.00	$ 106,000
7	SODDING	150 SYS	$ 30.00	$ 4,500
8	CURB CONCRETE, A	175 LFT	$ 25.00	$ 4,375
9	HMA ROAD PATCH	14 TON	$ 250.00	$ 3,500
10	PIPE, RCP, CIRCULAR, 12 IN.	152 LFT	$ 65.00	$ 9,880
11	INLET STRUCTURE	11 EA	$ 2,000.00	$ 22,000
12	DEMOLITION, REMOVAL AND DISPOSAL OF EX. STORM PIPE	40 LFT	$ 20.00	$ 800
13	EROSION CONTROL	1 LS	$ 1,000.00	$ 1,000
14	CONTINGENCY (20%)	1 LS	$ 39,700.00	$ 39,700

Construction Subtotal =	**$ 245,575**
Legal Costs =	$ 2,500
Design and Bidding Services =	$ 40,000
Construction Engineering and Observation Services =	$ 5,000
Total Project Cost =	**$ 293,075**

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ClarkDietz

Engineering Quality of Life™