WEST MAIN STREET FLOOD STUDY

Preliminary Hydrologic Report

FOR

THE TOWN OF CARRBORO
PUBLIC WORKS DEPARTMENT

UT to Toms Creek at 1100 W. Main Street

PREPARED BY:

SUNGATE DESIGN GROUP, P.A.
905 Jones Franklin Road
Raleigh, NC 27606
Engineering Firm License No. C-890

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

7/1/2020

WEST MAIN STREET FLOOD STUDY

I. Study Location

The West Main Street study area includes approximately 80 acres of urban watershed (**See Appendix A & B**) that is comprised mostly of single and multi-family residential. The drainage basin is generally bounded by Simpson Street on the west, North Greensboro Street to the north, High Street on the east, and West Main Street to the south. The study area drains to West Main Street and terminates at the outlet of an existing 54" pipe under West Main Street, between Simpson Street and Pine Hill Drive, into an Unnamed Tributary to Tom's Creek.

II. Project Background

The purpose of this study is to create a hydrologic model (HydroCAD) for use in the investigation of existing stormwater collection systems and analysis of alternatives for improving and optimizing drainage within several sub-basins of the larger watershed. The hydrologic model extends downstream to the confluence with an Unnamed Tributary to Tom's Creek and simulates past and present conditions for the purpose of analyzing the effects of development on the existing stormwater infrastructure. The current conditions model can be used as a baseline for simulating future improvements and analyzing the impacts of those improvements at points of interest throughout the study area.

In October of 2014, Sungate Design Group drafted a Preliminary Engineering Report for the Town of Carrboro Public Works Department in response to ongoing flooding complaints in the area of 1000 West Main Street. The preliminary report detailed specific complaints and provided possible corrective measures for reducing the frequency of flooding around the affected properties. The existing stormwater infrastructure in this vicinity is privately owned and maintained, and the private property owners have not chosen to make subsequent improvements.

Since the time of the 2014 report, instances of flooding in the vicinity of lower Goldston and Dillard Drive have continued to be reported. Regular maintenance along Goldston Drive has also been required, in part due to drainage systems that appear to be inadequate based on current Town of Carrboro standards. This report serves to develop the foundation for looking holistically at the potential of future drainage and stormwater infrastructure improvements throughout the 80 acre watershed.

III. Preliminary Data Gathering

Sungate obtained property, street, topographic and orthographic data available on the Town of Carrboro GIS and North Carolina Floodplain Mapping websites to generate

base mapping used in the analysis and reporting. Sungate also reviewed the FEMA DFIRM for the study area. There are no FEMA regulated streams within the studied watershed, and no properties in the study area are within a regulated floodplain. The NRCS Soil Survey information for Orange County was referenced to determine the hydrologic soil types for the watershed area. Orthographic imagery from 1998, 2003 and 2019 was obtained and referenced to aid in the analysis of development within the study area (**See Appendix C & D**). Further, the Town of Carrboro provided a map showing the 6 homes/buildings that have been constructed within the study area since 1988. According to the Town, the residence at 106 High Street, constructed in 1988, was the only new structure built between 1988 and 2002. Based on current zoning, the watershed now appears to be fully developed.

IV. Field Reconnaissance and Survey

Sungate conducted thorough field reconnaissance of the contributing drainage area in February and March of 2020. The purpose of the field reconnaissance was to verify drainage areas and obtain supplemental survey data necessary to complete the hydrologic model and develop alternatives for optimizing existing drainage systems. The vertical datum for the project is NAVD 1988, which corresponds with datum used to generate existing contours. All existing drainage systems were observed to confirm that none diverted stormwater outside or into the watershed. Based on the reconnaissance, there was no significant diversion of stormwater into or out of the watershed.

Development within the watershed was also observed to determine whether any significant impervious area had been added. Increase in impervious area evaluation was limited to sub-catchments 1S through 8S. Observation of orthographic images within the areas of sub-catchment 9S, 10S and 11S did not indicate any new development. Based on inspection of past and present orthographic imagery, and information provided by the Town of Carrboro, increases in impervious area due to development was determined for the time frames of 1988 to 2002 and 2002 to 2019 (**See Appendix C & D**). Demolition of existing structures on lots that were improved was taken into account when determining net increase in impervious area. Also, in alignment with the Town of Carrboro's latest land use ordinance, all gravel surfaces were tabulated as impervious surface. In 1988, the total impervious area for sub-catchments 1S through 8S was 7.3 acres, and approximately 26% of the total 27.9 acre drainage area. See Table 1 below for total impervious area and percentage increases over the duration of the study period.

Table 1: Impervious Area (1S – 8S)

Timeframe	Increase in IA (acres)	Total IA (acres)	% Impervious Area
Prior to 1988	N/A	7.25	26.0 %
1988 to 2002	0.07	7.32	26.2 %
2002 to 2019	0.57	7.89	28.3 %

V. Preliminary Engineering Evaluation

Hydrologic Study:

The drainage area of the entire watershed was first delineated using the latest available LiDAR contours, along with available GIS property data and supplemental surveys performed by Sungate. The watershed was then subdivided into smaller sub-catchments. The base maps in appendix A and B include the locations and number of each sub-catchment. The soil types were then determined for each sub-catchment, referencing NRCS Soil Survey data for Orange County. For sub-catchments 1S through 11S, GIS data and orthographic imagery was used to delineate past and present ground cover within each sub-catchment. Since sub-catchment 12S is largely disconnected from a majority of the watershed, the sub-areas within the larger sub-catchment were divided by lot size and considered to be fully developed for the purposes of this study.

A hydrologic model of the drainage basin was completed using HydroCAD software. HydroCAD is a computer aided design tool that uses local NOAA rainfall data to model hydrology and hydraulics of stormwater runoff. The program is based on hydrology techniques developed by the SCS/NRCS and models complex watersheds to determine peak flows for a given rainfall event. These techniques are used to generate hydrographs throughout the watershed.

For the purpose of comparing the effects of development on peak flow rates, three separate HydroCAD models were set up to simulate watershed conditions from 1988, 2002 and 2019. Further, the model from 2019 was utilized as a baseline for comparing the effects of drainage system upgrades at multiple points of interest throughout the watershed.

Results of Hydrologic Study:

Three points of interest, within the watershed, were selected to determine the effects of increased impervious area on peak flow rates. The first point of intertest is at the dead end of Goldston Drive, where sub-catchments 1S through 5S converge at an existing 24” pipe on private property. The second point of interest is in the area of 1000 West Main Street, where sub-catchments 1S through 9S converge at a 42” pipe junction at the existing West Main Street drainage system. The third point of interest is at the outfall of the West Main Street drainage system, where all 12 sub-catchments converge and discharge through a 54” pipe to the Unnamed Tributary to Tom’s Creek. See Table 2 for a summary of peak discharge at each point of interest for 1988, 2002 and 2019 watershed conditions. The 25-year storm event is used for comparisons throughout report.

Table 2: Peak Discharge - 25 Year Storm Event

Point of Interest	25yr – 1988 (cfs)	25yr – 2002 (cfs)	25yr – 2019 (cfs)
#1 (Goldston Dr)	70.6	71.4	73.0
#2 (W. Main St)	98.7	99.6	101.2
#3 (UT to Tom's Cr)	218.2	219.0	220.7

Based on the results of the study, development within the watershed, since 1988, has not had a significant impact on peak discharge at the noted points of interest.

Optimization of Existing Drainage Systems:

Alternative #1

This design directs stormwater from the east side of High Street, sub-catchment 5S, to the existing drainage system at West Main Street (**See Appendix E**). This alternative will allow for 3.9 acres of drainage area to bypass Goldston Drive, where inadequate drainage has required ongoing maintenance within public right of way. Further, flooding due to undersized drainage systems on private properties just downstream of Goldston Drive has been well documented. See Table 3 for a summary of effect on peak discharge, at the three points of interest, if alternative #1 is implemented.

Table 3: Alternative #1 Effect on Peak Discharge - 25 Year Storm Event

Point of Interest	25yr – Existing (cfs)	25yr – Alt. #1 (cfs)	% Decrease
#1 (Goldston Dr)	73.0	59.8	18%
#2 (W. Main St)	101.2	101.2	0%
#3 (UT to Tom's Cr)	220.7	220.0	0.3%

Based on the modeling results of alternative #1, the 25-year peak discharge at point of interest #1 (Goldston Drive) can be reduced by approximately 18%, while peak discharge at points of interest #2 and #3 are maintained or slightly reduced. Implementation of alternative #1 would require excavation of approximately 185ft of new ditch, upsizing of approximately 85ft of existing 18" pipe to 24" and replacement or adjustment of 2 drop inlets and 2 catch basins at the intersection of High Street and West Main Street. It is also anticipated that easement along the east side of High Street will be required for construction and maintenance of these improvements. Property surveys performed during a final design stage will determine extent of easement needed, and the cost of easements are not included in the probable cost of construction estimate. Further, coordination with NCDOT will be required for any alterations to the existing drainage system on West Main Street. The preliminary probable cost of construction for alternative #1 is $93,830 (**See Appendix F**).

Alternative #2

This design improves the drainage system at Goldston Drive by increasing capacity of the existing roadway ditch, upsizing the existing cross pipe under Goldston Drive and improving downstream conveyance, through several private parcels, to the existing drainage system at West Main Street **(See Appendix G)**. Implementing improvements detailed in alternative #2 will also significantly reduce the occurrence of flooding at point of interest #1. See Table 4 for a summary of effect on peak discharge, at the three points of interest, if alternative #2 is implemented.

Table 4: Alternative #2 Effect on Peak Discharge - 25 Year Storm Event

Point of Interest	25yr – Existing (cfs)	25yr – Alt. #2 (cfs)	% Decrease
#1 (Goldston Dr)	73.0	73.0	0%
#2 (W. Main St)	101.2	94.0	7.1%
#3 (UT to Tom's Cr)	220.7	215.9	2.2%

Based on the modeling results of alternative #2, the 25-year peak discharge at point of interest #1 (Goldston Dr) is maintained, while peak discharge at points of interest #2 and #3 are reduced as a result of drainage improvements. Implementation of alternative #2 would require excavation of approximately 760ft of new ditch and installation of approximately 80ft of 24", 200ft of 30" and 60ft of 42" pipe. Finally, successful implementation of alternative #2 would require that improvements either be pursued by private property owners on private properties, or easements be offered to and accepted by the Town of Carrboro for construction and maintenance. Financial responsibility and possibility of cost sharing has yet to be determined. The preliminary probable cost of construction for alternative #2 is $194,866 (**See Appendix H**).

Alternative #3

This design involves implementing both alternative #1 and alternate #2, where the drainage area east of High Street is directed to the West Main Street drainage system, and drainage improvements are made along and downstream of Goldston Drive **(See Appendix I)**. See Table 5 for a summary of effect on peak discharge, at the three points of interest, if alternative #3 is implemented.

Table 5: Alternative #3 Effect on Peak Discharge - 25 Year Storm Event

Point of Interest	25yr – Existing (cfs)	25yr – Alt. #3 (cfs)	% Decrease
#1 (Goldston Dr)	73.0	59.8	18%
#2 (W. Main St)	101.4	93.4	7.9%
#3 (UT to Tom's Cr)	220.7	215.4	2.4%

Based on the modeling results of alternative #3, the 25-year peak discharge at point of interest #1 (Goldston Drive), can be reduced by approximately 18%, while peak discharge at points of interest #2 and #3 are reduced by 7.9% and 2.4% respectively. The preliminary probable cost of construction for alternative #3 is $288,696.

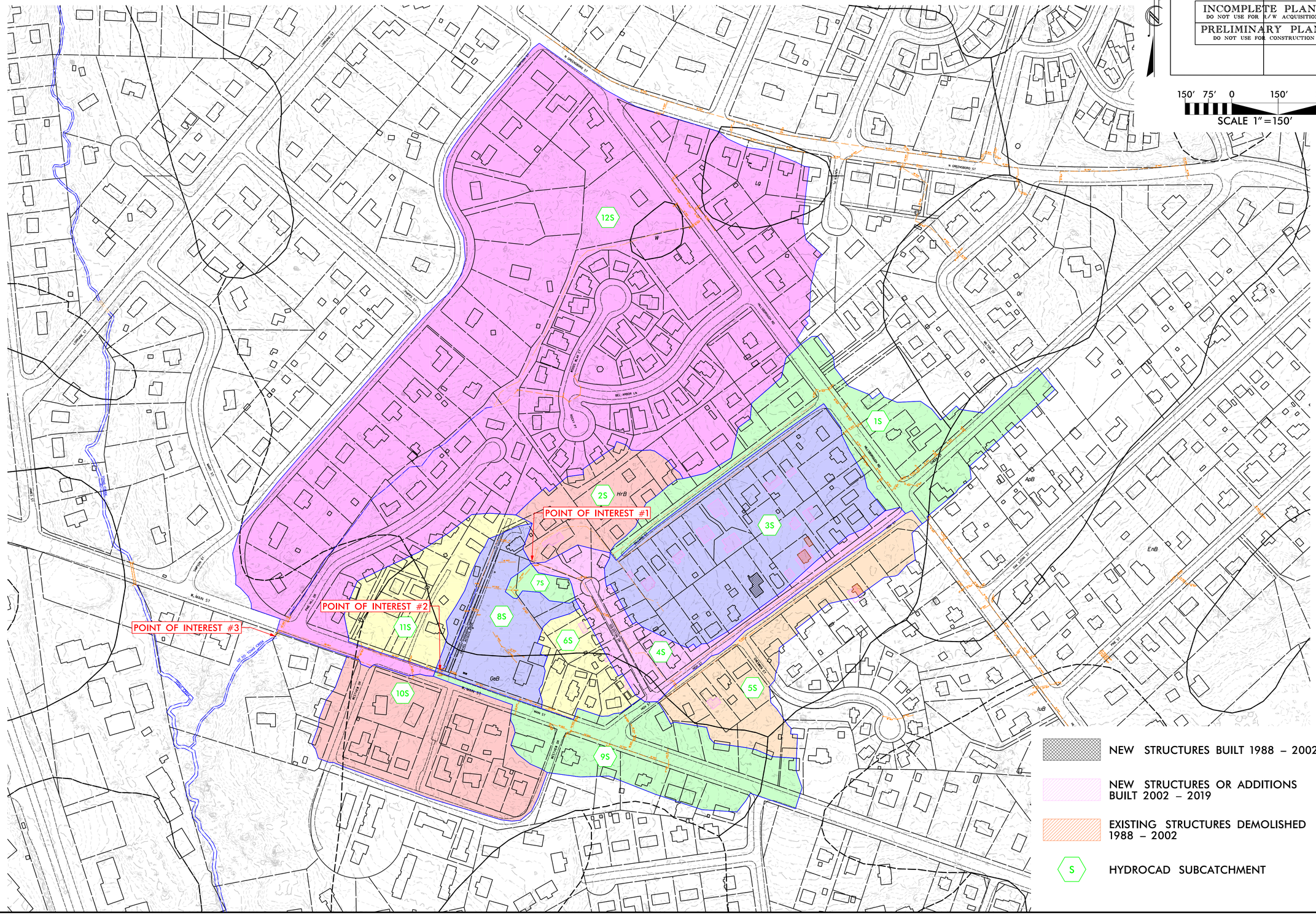
UT TO TOMS CREEK DRAINAGE AREA MAP – APPENDIX A

PROJECT REFERENCE NO.	SHEET NO.
W. MAIN FLOOD STUDY	PSH_01
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

150′ 75′ 0 150′ 300′
SCALE 1″=150′



NEW STRUCTURES BUILT 1988 – 2002

NEW STRUCTURES OR ADDITIONS BUILT 2002 – 2019

EXISTING STRUCTURES DEMOLISHED 1988 – 2002

S HYDROCAD SUBCATCHMENT

REVISIONS

8/17/99

6/26/2020
Appendix A_1020 MAIN_Hyd_PSH01_DA.dgn
Region

UT TO TOMS CREEK DRAINAGE AREA MAP – APPENDIX B

2019 ORTHO IMAGE

PROJECT REFERENCE NO.	SHEET NO.
W.MAIN FLOOD STUDY	PSH_02
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

150′ 75′ 0 150′ 300′

SCALE 1″=150′

NEW STRUCTURES BUILT 1988 – 2002

NEW STRUCTURES OR ADDITIONS BUILT 2002 – 2019

EXISTING STRUCTURES DEMOLISHED 1988 – 2002

S HYDROCAD SUB–CATCHMENTS

REVISIONS

8/17/99

6/30/2020
Appendix B_1020 MAIN_Hyd_PSH02_DA.dgn
Design

WATERSHED DEVELOPMENT MAP 1988 to 2002 – APPENDIX C

1998 ORTHO IMAGE

PROJECT REFERENCE NO.	SHEET NO.
W. MAIN FLOOD STUDY	PSH_03
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

100′ 50′ 0 100′ 200′

SCALE 1″=100′

POINT OF INTEREST #1

POINT OF INTEREST #2

POINT OF INTEREST #3

NEW STRUCTURES BUILT 1988–2002
0.07AC IMPERVIOUS AREA ADDED

REVISIONS

8/17/99

6/26/2020
Appendix C_1020 MAIN_Hyd_PSH03_DA_1988-2002.dgn
Default

WATERSHED DEVELOPMENT MAP 2002 to 2019 – APPENDIX D

2019 ORTHO IMAGE

PROJECT REFERENCE NO.	SHEET NO.
W.MAIN FLOOD STUDY	PSH_04
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

100′ 50′ 0 100′ 200′
SCALE 1″=100′

POINT OF INTEREST #1

POINT OF INTEREST #2

POINT OF INTEREST #3

NEW STRUCTURES BUILT 2002–2019
0.57AC IMPERVIOUS AREA

REVISIONS

8/17/99

6/26/2020
Appendix D_1020 MAIN_Hyd_PSH04_DA_2002-2019.dgn
Bentley

ALTERNATIVE #1 – APPENDIX E

DIRECT DRAINAGE EAST OF HIGH STREET TO EXISTING WEST MAIN STREET SYSTEM

PROJECT REFERENCE NO.	SHEET NO.
W. MAIN FLOOD STUDY	ALT-1
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

30 15 0 30 60
SCALE 1" = 30'

REVISIONS
8/17/99

GOLDSTON DR

GRAVEL ACCESS DRIVE

W. MAIN ST

HIGH ST

REMOVE EXTG 24" RCP

SPEC LAT 2' BASE DITCH

24" RCP–III

24" RCP–IV

2GI CB

CB

Conv. 2GI To JB w/MH

RETAIN

6/30/2020
Appendix E_1020 MAIN_Hyd_PSH_ALT1.dgn
bbeam

PRELIMINARY PROBABLE COST OF CONSTRUCTION - APPENDIX F

West Main Street Flood Study 6/26/2020

Alternative #1 - Ditch East of High Street and W. Main System Improvements

ITEM DESCRIPTION	QUANTITY		COST PER UNIT		TOTAL COST
1. Site Demolition					
A. Tree Protection Fence	200	LF	4.00	LF	800.00
B. Pipe Removal	40	LF	35.00	LF	1,400.00
C. Select Tree Removal	5	EA	2500.00	EA	12,500.00
			Subtotal Site Demolition:		**14,700.00**
2. Earthwork					
A. Clearing & Grubbing	0.05	AC	15,000.00	AC	750.00
B. Foundation Conditioning Material (Pipe Bedding & Backfill)	15	TON	40.00	TON	600.00
C. Drainage Ditch Excavation	165	CY	40.00	CY	6,600.00
			Subtotal Earthwork:		**7,950.00**
3. Erosion Control					
A. Seeding & Mulching	0.10	AC	6,000.00	AC	600.00
B. Silt Fence	150	LF	4.00	LF	600.00
C. Coir Fiber Wattle	60	LF	15.00	LF	900.00
D. Sediment Control Stone	25	TON	40.00	TON	1,000.00
E. 1/4" Hardware Cloth	120	LF	8.00	LF	960.00
			Subtotal Erosion Control:		**4,060.00**
4. Construction Surveying, Layout & As-Built	1	LS	2,000.00	LS	2,000.00
			Subtotal Surveying & Layout:		**2,000.00**
5. Storm Drainage					
A. 24" R.C. Pipe Culvert, Class IV	32	LF	100.00	LF	3,200.00
B. 24" R.C. Pipe Culvert, Class III	56	LF	95.00	LF	5,320.00
C. 24" Drainage Pipe	24	LF	85.00	LF	2,040.00
D. Convert 2GI to JB w/ MH	1	EA	1,900.00	EA	1,900.00
E. Masonry Drainage Structure	3	EA	3,200.00	EA	9,600.00
F. Frame w/ Cover (840.54)	1	EA	550.00	EA	550.00
G. Frame w/ 2 Grates (840.24)	1	EA	650.00	EA	650.00
H. Frame, Grates and Hood (840.03)	2	EA	750.00	EA	1,500.00
			Subtotal Storm Drainage:		**24,760.00**
6. Curb, Stone Base and Paving					
A. Patching Existing Pavement	12	TONS	145.00	TONS	1,740.00
			Subtotal Curb, Stone Base and Paving:		**1,740.00**
7. Utilities					
A. Utility Coordination	1	LS	2,500.00	LS	2,500.00
			Subtotal Curb, Stone Base and Paving:		**2,500.00**
8. Miscellaneous					
A. Mobilization (5% Max)	1	LS	3,000.00	LS	3,000.00
B. Traffic Control	1	LS	4,000.00	LS	4,000.00
			Subtotal Miscellaneous:		**7,000.00**

	Subtotal of Items 1 - 8:	**$64,710.00**
	25% Engineering:	**$16,177.50**
	20% Contingency:	**$12,942.00**
	TOTAL OF PROBABLE COST OF CONSTRUCTION:	**$93,829.50**

ALTERNATIVE #2 – APPENDIX G

IMPROVE DRAINAGE SYSTEM ALONG GOLDSTON DR WITH IMPROVED DOWNSTREAM CONVEYANCE

PROJECT REFERENCE NO.	SHEET NO.
W. MAIN FLOOD STUDY	ALT-2
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

30 15 0 30 60
SCALE 1" = 30'

REMOVE
RETAIN
APPROX. 1.0FT COVER OVER EXTG. 24" RCP
STANDARD BASE DITCH
REMOVE
RETAIN
RETAIN
REMOVE
SPEC LAT 2FT BASE DITCH
HW
GOLDSTON DR
GRAVEL ACCESS DRIVE
W. MAIN ST
HIGH ST

REVISIONS

8/17/99

6/30/2020
Appendix G_1020 MAIN_Hyd_PSH_ALT2.dgn
bbeam

PRELIMINARY PROBABLE COST OF CONSTRUCTION - APPENDIX H

West Main Street Flood Study 6/26/2020

Alternative #2 - Goldston Drive Drainage and Downstream Improvements

ITEM DESCRIPTION	QUANTITY		COST PER UNIT		TOTAL COST
1. Site Demolition					
A. Tree Protection Fence	250	LF	4.00	LF	1,000.00
B. Pipe Removal	90	LF	35.00	LF	3,150.00
C. Select Tree Removal	4	EA	2500.00	EA	10,000.00
			Subtotal Site Demolition:		**14,150.00**
2. Earthwork					
A. Clearing & Grubbing	0.30	AC	15,000.00	AC	4,500.00
B. Foundation Conditioning Material (Pipe Bedding & Backfill)	40	TON	40.00	TON	1,600.00
C. Drainage Ditch Excavation	930	CY	40.00	CY	37,200.00
			Subtotal Earthwork:		**43,300.00**
3. Erosion Control					
A. Seeding & Mulching	0.30	AC	6,000.00	AC	1,800.00
B. Silt Fence	250	LF	4.00	LF	1,000.00
C. Coir Fiber Wattle	100	LF	15.00	LF	1,500.00
D. Sediment Control Stone	15	TON	40.00	TON	600.00
E. Erosion Control Stone, Class B	40	TON	60.00	TON	2,400.00
F. 1/4" Hardware Cloth	50	LF	8.00	LF	400.00
			Subtotal Erosion Control:		**7,700.00**
4. Construction Surveying, Layout & As-Built	1	LS	2,000.00	LS	2,000.00
			Subtotal Surveying & Layout:		**2,000.00**
5. Storm Drainage					
A. 30" R.C. Pipe Culvert, Class IV	68	LF	120.00	LF	8,160.00
B. 42" R.C. Pipe Culvert, Class IV	60	LF	250.00	LF	15,000.00
C. 24" Drainage Pipe	76	LF	85.00	LF	6,460.00
D. 30" Drainage Pipe	136	LF	90.00	LF	12,240.00
E. Reinforced Concrete Headwall	5	CY	1,500.00	CY	6,750.00
F. Masonry Drainage Structure	1	EA	3,200.00	EA	3,200.00
G. Frame w/ 2 Grates (840.24)	1	EA	650.00	EA	650.00
H. Class 'B' Rip Rap	8	TON	60.00	TON	480.00
			Subtotal Storm Drainage:		**52,940.00**
6. Curb, Stone Base and Paving					
A. Gravel Surface Repair - #57 Stone	30	TON	120.00	TON	3,600.00
			Subtotal Curb, Stone Base and Paving:		**3,600.00**
7. Utilities					
A. Utility Coordination	1	LS	2,500.00	LS	2,500.00
			Subtotal Curb, Stone Base and Paving:		**2,500.00**
8. Miscellaneous					
A. Mobilization (5% Max)	1	LS	6,200.00	LS	6,200.00
B. Traffic Control	1	LS	2,000.00	LS	2,000.00
			Subtotal Miscellaneous:		**8,200.00**

	Subtotal of Items 1 - 8:	**$134,390.00**
	25% Engineering:	**$33,597.50**
	20% Contingency:	**$26,878.00**
	TOTAL OF PROBABLE COST OF CONSTRUCTION:	**$194,865.50**

8/17/99

REVISIONS

ALTERNATIVE #3 – APPENDIX I

IMPLEMENT ALTERNATIVE #1 AND ALTERNATIVE #2: DITCH EAST HIGH STREET TO WEST MAIN STREET AND IMPROVE DRAINAGE SYSTEM ALONG GOLDSTON DRIVE WITH IMPROVED DOWNSTREAM CONVEYANCE

PROJECT REFERENCE NO.	SHEET NO.
W. MAIN FLOOD STUDY	ALT-3
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

30 15 0 30 60
SCALE 1" = 30'

GOLDSTON DR
GRAVEL ACCESS DRIVE
W. MAIN ST
HIGH ST

18" RCP-IV
18"
2GI
SPEC LAT 2FT BASE DITCH
REMOVE
RETAIN
24" RCP
APPROX. 1.0FT COVER OVER EXTG. 24" RCP
STANDARD BASE DITCH
12" HDPE
12" RCP
15" HDPE
42" RCP-IV
HW
REMOVE EXTG 24" RCP
SPEC LAT 2' BASE DITCH
15" RCP
RETAIN
Conv. 2GI To JB w/MH
24" RCP-III
2GI
24" RCP-III
24" RCP-IV
CB

6/30/2020
Appendix I.1020 MAIN_Hyd_PSH_ALT3.dgn
bbeam