



ODOT PID 82388

**Cleveland Innerbelt CCG6A and CCG6B - Broadway Avenue Bridge and
ODOT Full Service Maintenance Facility
Results of Conceptual Drainage Analysis**

To: Northeast Ohio Regional Sewer District

Date: September 30, 2016

Prepared By: Michael Baker International for ODOT

Introduction

This memo has been prepared to summarize the conceptual drainage analysis, including PCSWMM modeling software analysis, performed for the Cleveland Innerbelt CCG6B project, Broadway Bridge over I-77. This analysis has also considered proposed flows from Cleveland Innerbelt CCG6A (provided by Richland Engineering, Ltd.) and flows from the ODOT Full Service Maintenance Facility project on Pershing Avenue (provided by GPD Group) affecting the same NEORSD and ODOT facilities as the CCG6B project. Michael Baker previously performed conceptual drainage design for CCG6B, and the conceptual design flow rates are included in Appendix A. These conceptual flow rates, along with the flow rates from the other two projects (included in Appendix B and Appendix C) were input by Michael Baker into the PCSWMM model provided by NEORSD/Wade Trim.

Provided are PDFs of the PCSWMM report showing the nodes that are surcharging and flooding in the system for the 5 year, 6 hour storm event for the Existing and Proposed conditions. Also provided are maps showing which nodes are surcharging in the existing conditions and additional nodes that surcharge in the proposed conditions.

Model Input Parameters

The following describe the model input parameters used to analyze the system:

- Base flows were provided by NEORSD for various nodes throughout the system. Because PCSWMM does not allow flows to be inserted into a subcatchment, they were instead attributed to the nodes each respective subcatchment flows in to. Base flows in nodes SAY1110 and SS7W were deleted because they eventually flowed into node S01A, which had a time series flow instead.
- Time series for the 5-year, 6-hour storms provided by NEORSD were inserted into several nodes based on where the proposed project would outlet stormwater: RA00010, S01A, S1B, S2AW, S2B, S2W, S84A, SS6WF, TA00045, and TA00059. Flows were input at these nodes to ensure that Baker's PCSWMM model was calibrated to correctly reflect NEORSD's Infoworks existing model. NEORSD confirmed the model calibration on September 16, 2016.
- A placeholder rain gage was also added to let the system run. This rain gage was added to every subcatchment and shows no rain being added to the system. Adding no rain to the system

allowed it to reflect reality because the time-series data was used to analyze the effects of the storms on the system.

- To simulate the proposed flows being added to the system in the proposed conditions models, a further baseflow was inserted in nodes S84A, TA00045, S01A and S1B for CCG6B flows, in node TA00049 for CCG6A flows, and in RA00019 for the Maintenance Facility Flows. The proposed flows are included in Appendices A, B, and C for the respective projects.

Model Analysis – CCG6A/CCG6B/Maintenance Facility Combined Flows

Appendix D contains the results of the model simulations for the combined CCG6A, CCG6B, and Maintenance Facility proposed conditions. The exhibits in Appendix D show the nodes that are surcharging and flooding in the 5 year, 6 hour storm simulation. The proposed results for the 5-year storm were compared to the existing model results to describe the impact of project flows on the system. Images have also been included in Appendix D to further describe the surcharged node locations.

- It should be noted that node DPS1 is a pump node and is flooded in every iteration of the model. This may be a general error (in both existing and proposed) as troubleshooting has not been able to resolve the issue.
- The 5-year, 6-hour Proposed report shows 1 additional node surcharging, SAL0010, compared to the 5-year, 6-hour Existing report. This node is northeast of the proposed project area. It is about 5200 feet upstream of the nearest node that receives water from the proposed project, SA00095. SAL0010 is relatively deep and the surcharging is 54.52 feet below the rim. No additional nodes are shown to flood; however the node SAA0025 (northeast of the proposed project area) does flood in both the Existing and Proposed conditions. Hydraulic profiles have been included to show the surcharged node locations.
- While the model shows that surcharging (beyond existing) does occur in the proposed conditions, no additional flooding occurs in the proposed model. Additionally, the further surcharged node occurs only 1 node upstream from a node that is already surcharging in the existing conditions.

NEORSD system node that surcharges in the proposed model (excluding existing surcharging nodes):

Design Storm	Node	Location Description	Hours Surcharged	Min. Depth Below Rim (ft)	Min. Depth in Existing Conditions (ft)
5 year, 6 hour	SAL0010	Northeast of E 68 th St./ Coifax Rd. Intersection	1.10	54.52	54.89

Conclusions – CCG6A/CCG6B/ Maintenance Facility Combined Flows

The model analysis presents that the proposed additional stormwater loads for CCG6A, CCG6B, and the ODOT Maintenance Facility impose minimal adverse hydraulic impacts on the system. The model results show that there is surcharging throughout the system before any additional loads are added. The proposed flows are added to the system as a base flow (meaning they are always present) and they

represent the peak flows for each particular storm. This represents a relatively conservative scenario because it may not be reality that the peak of the proposed flows will enter the system at the moment the existing peak flows are reached. Even given this condition, the system does not show any additional flooding and relatively little additional surcharging for the 5-year storm event.

The proposed flows to the I-77 trunk line (SWO for Drainage Area 1) were included in the model as a flow input at node S1B since the I-77 trunk line eventually outlets into this junction. Because the I-77 trunk line is not an NEORSD facility, the whole trunk line was not included in the model. A CDSS analysis of this trunk line was performed and is included for reference as Appendix E.

This memo represents the results of a conceptual analysis performed for the purpose of preliminary investigations. The CCG6B design-build team is required to perform its own final analysis and coordination with NEORSD during the final design phase of the project per the requirements of the CCG6B design-build project scope.

Appendices

Appendix A - CCG6B Conceptual Drainage Design

Appendix B – CCG6A Drainage from Richland Engineering, Ltd.

Appendix C – Maintenance Facility Drainage from GPD Group

Appendix D – CCG6A/CCG6B/Maintenance Facility Modeling Data, Maps, and Profiles

Appendix E – I-77 ODOT Trunk Line Analysis

APPENDIX A

CCG6B Conceptual Drainage Design

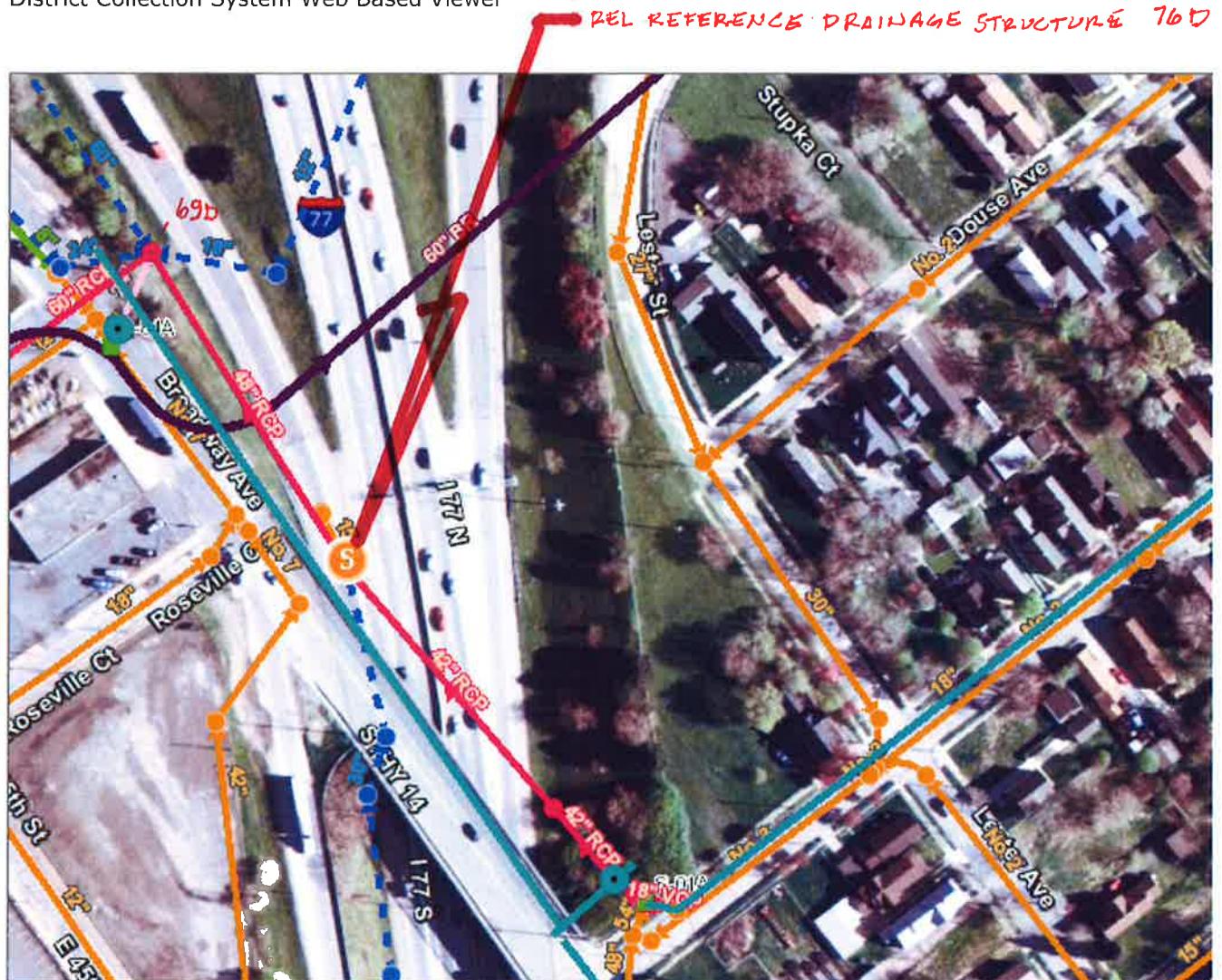


APPENDIX B

CCG6A Drainage from Richland Engineering, Ltd.

NEORSD Collection System Viewer

District Collection System Web Based Viewer



NEORSD | Human Nature, Inc. | Strand Associates, Inc. | GIS Services Northeast Ohio Regional Sewer District
(NEORSD) 3900 Euclid Avenue, Cleveland, Ohio 44115 (216-881-6600)

105040 - CUY-77-14.35 - CCG6A

PID No. 13567

Pre and Post Construction Flow Comparison

LOCATION CDSS #D	PRE-CONSTRUCTION						POST-CONSTRUCTION				DISCHARGE DIFFERENTIAL *1yr 5yr 10yr 25yr
	TOTAL AREA	WEIGHTED RUNOFF COEFF	SUM CA	TC FROM 10YR CDSS CALC. IN MIN.	*1 YEAR INTENSITY CALCULATED FROM NOAA DATA	CDSS DISCHARGE *1yr 5yr 10yr 25yr	TOTAL AREA	WEIGHTED RUNOFF COEFF	SUM CA	CDSS DISCHARGE *1yr 5yr 10yr 25yr	
12D TO 17D	6.40	0.76	4.89	14.63	2.48	12.1	6.53	0.77	5.00	12.4	0.3
						17.7				18.2	0.5
						20.7				24.4	0.7
						25.6				26.7	1.1
76D TO 69D	53.00	0.75	39.64	16.54	2.35	93.3	53.14	0.75	39.79	93.7	0.4
						136.5				137.1	0.6
						158.0				158.7	0.7
						193.4				194.2	0.8

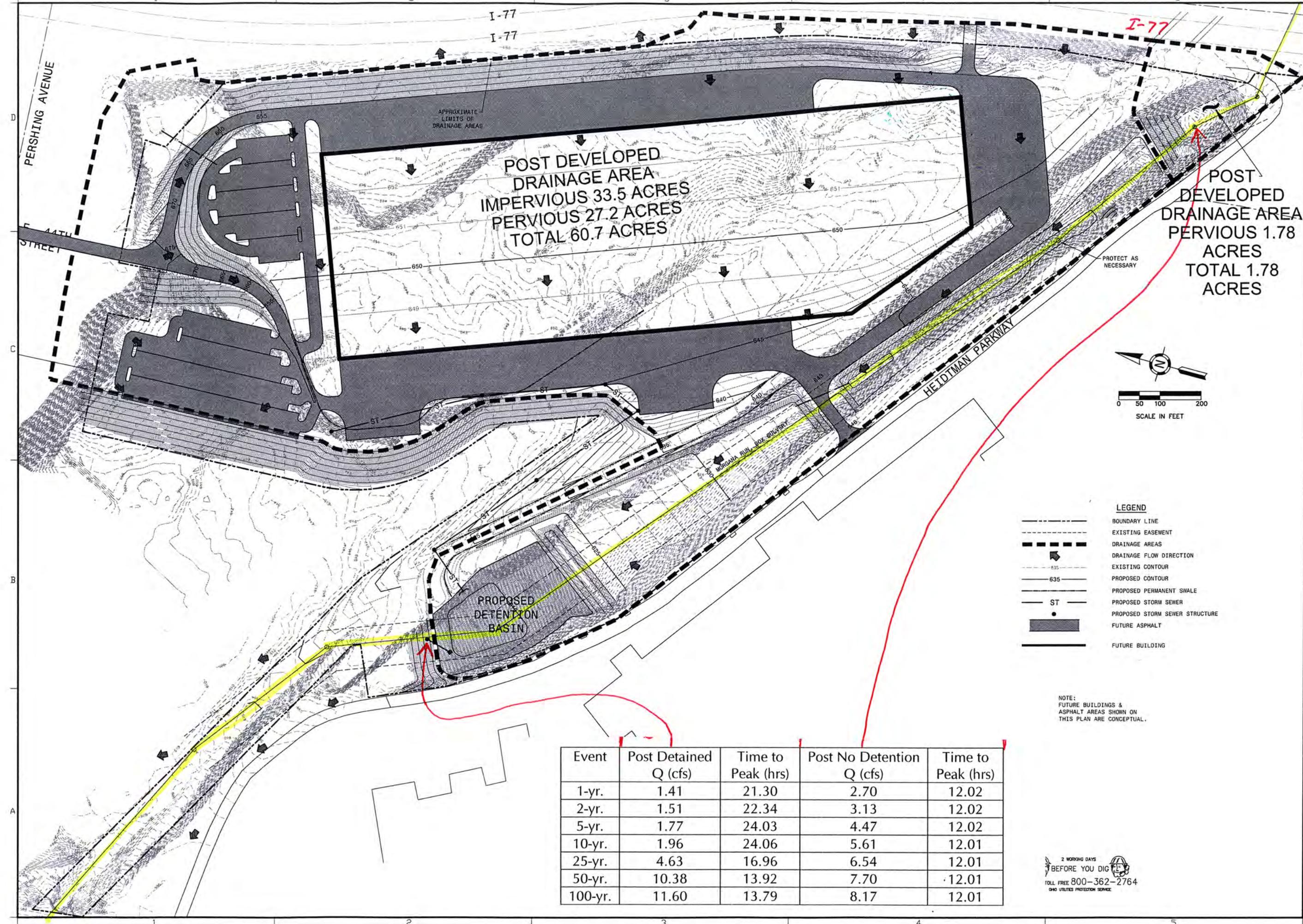
Based on ODOT review comments dated 6/30/2016 the flow to the above highlighted drainage structures 12D to 17D is no longer affected by the proposed project. There will be no increase in flow to the Morgana Run sewer system from the CUY-77-14.34 - CCG6A project.

APPENDIX C

Maintenance Facility Drainage from GPD Group

TRIBUTARY AREA DRAINAGE MAP
FOR THE
CUYAHOGA VALLEY INDUSTRIAL CENTER
CONSTRUCTION ACTIVITIES

CLEVELAND, OHIO



ODOT Full Service Maintenance Facility

3263 E. 44th Street

Parcel ID: 13114001

Stormwater Peak Time Analysis – Pre vs. Post

Date: 6/03/16

During the coordination meeting at the NEORSD offices on May 26, 2016 there was some discussion and concern about the timing of the peak flows in the pre and post conditions. We looked at the pre and post hydrograph models for the ODOT facility and for the regional detention basin designed for the overall site. The hydrographs are based on a SCS Type II, 24-hour rain event. The results are summarized in the table below:

ODOT Full Service Maintenance Facility (FSMF)

Event	Existing Q (cfs)	Time to Peak (hrs)	Proposed Q (cfs)	Time to Peak (hrs)
1-yr.	36.03	11.98	4.55	12.15
2-yr.	43.56	11.98	12.71	12.08
5-yr.	54.90	11.98	22.98	12.08
10-yr.	63.90	11.98	30.80	12.08
25-yr.	77.27	11.98	40.62	12.08
50-yr.	88.14	11.98	44.85	12.08
100-yr.	99.76	11.98	45.58	12.08

CVIC Property (Regional Detention Basin)

Event	Existing Q (cfs)	Time to Peak (hrs)		
1-yr.	17.54	12.30		
2-yr.	22.87	12.29		
5-yr.	41.16	12.28		
10-yr.	58.38	12.27		
25-yr.	73.00	12.26		
50-yr.	92.13	12.26		
100-yr.	100.00	12.26		

CVIC Property – Post-Developed Conditions

Event	Post Detained Q (cfs)	Time to Peak (hrs)	Post No Detention Q (cfs)	Time to Peak (hrs)
1-yr.	1.41	21.30	2.70	12.02
2-yr.	1.51	22.34	3.13	12.02
5-yr.	1.77	24.03	4.47	12.02
10-yr.	1.96	24.06	5.61	12.01
25-yr.	4.63	16.96	6.54	12.01
50-yr.	10.38	13.92	7.70	12.01
100-yr.	11.60	13.79	8.17	12.01

For the ODOT Facility, the post peak timing remains unchanged; right around the 12-hour mark. For the regional detention basin, the post-developed peak is delayed for the more frequent events up to the 25-year critical storm. For the less frequent 50 and 100-year events, the pre and post peaks are similar. The delay in the time for the regional basin is likely due to the large storage volume being held and released at a much slower rate.

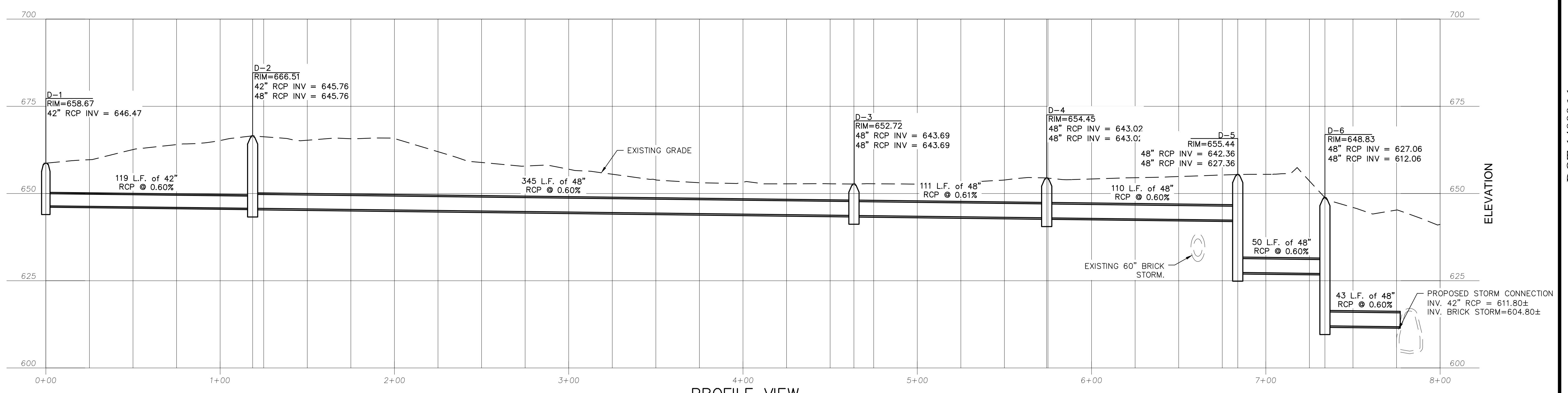
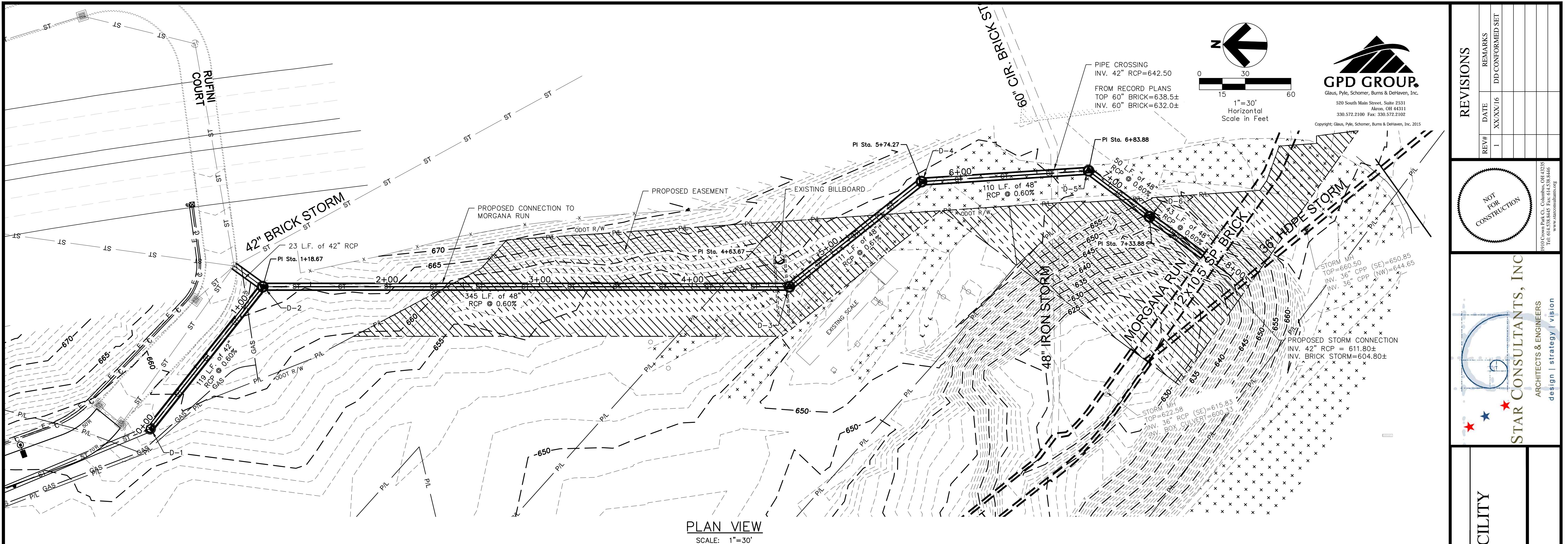
A plan and profile, sheet C5.5, has been prepared for the stormwater outlet from the ODOT maintenance facility to the Morgana Run culvert. The current plan incorporates the runoff from the ODOT facility and incorporates a storm connection for the mainline I-77 as well. Based on record plans, it appears we have enough room to clear the top of the existing 60" brick overflow line. Drop manholes will be utilized to make the transitional drop to the culvert connection. At this time, we are looking for approval on the alignment and concept with additional details on the connections to follow.

Prepared by:



520 South Main Street, Suite 2531
Akron, Ohio 44311
330-572-2100 Fax 330-572-2101

Project Number: 2015204.02



Underground Utilities

HORIZONTAL: 1"=30'
VERTICAL: 1"=15'

2 Working Days
Before You Dig
Call 800-362-2764 (Toll Free)
Ohio Utilities Protection Service

Non-members
Must Be Called Directly

Call 800-925-0988 (Toll Free)

Oil & Gas Producers Utility Protection Service

BENCHMARKS:

BENCHMARK 1
5/8 REBAR 30"
W/ GPD CAP
N 657534.8687
E 2198816.8364
ELEVATION=680.93

BENCHMARK 2
5/8 REBAR 30"
W/ GPD CAP
N 656896.57
E 2199053.3086
ELEVATION=677.30

PJT #: 2015204.01

DATE: REVIEW 1.13.16

DRN. BY: BK

DGN. BY: TS

REV. BY: BP

SHEET

C5.5

Cleveland Full Service Maintenance Facility

ODOT DOT-14006.2

East 44th Street
Cleveland, OH

Stormwater Report

Date: 11/4/15

Revised: -



520 South Main Street, Suite 2531
Akron, Ohio 44311
330-572-2100 Fax 330-572-2101

Project Number: 2015204.02

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Project Narrative

1. Pre-Construction Site Conditions
2. Post-Construction Site Conditions & Stormwater Detention Summary
3. EPA Phase 2 Water Quality Calculations
4. Post-Construction Stormwater Quality Maintenance Plan

Project Narrative

Introduction/Site Characteristics

The site is a 14.5 Ac. ± tract that has frontage along Ohio State Highway Route 77 and 44th Street in the City of Cleveland, Cuyahoga County, Ohio. The tract is currently undeveloped and cleared. The tract has been receiving imported slag from nearby steel mills. Stormwater runoff currently flows across the tract in a westerly direction.

This report includes the data and summaries from the Hydraflow computer model used to design the detention basins and control structures for the site.

1. Pre-Construction Site Conditions

The existing site is a vacant, undeveloped and currently receiving slag from nearby steel mills. Previously, the site was utilized as a portion of a steel mill and slag storage. The runoff sheet flows across the tract in a westerly direction onto the neighboring property.

Given the existing uses, we have analyzed the property to have 100% impervious coverage.

2. Post- Construction Site Conditions & Stormwater Detention Summary

The post-developed site will include construction of an office/maintenance building, salt storage facilities, a cold storage building, material storage areas, a fueling island, a brine production facility and supporting parking areas. The office building will be about 10,600 square feet (SF). A salt storage facility will cover about 18,460 SF. The cold storage building will be about 12,800 SF. The material storage areas will cover about 6,822 SF. The fueling island will cover about 3,400 SF. The brine production facility will cover about 2,800 SF. Adjacent parking facilities will have parking stalls for 69 vehicles.

Given the underlying soil conditions, we analyzed the proposed conditions to be 100% impervious.

Two interconnected extended detention basins have been designed each with a control structure so that the more frequent storm events will be detained for a longer period of time allowing fines and sediment to settle out of the water before being released. For all the storm events, the post-developed release rates will not exceed the pre-developed conditions. Since the underlying soil conditions will not change, a critical storm calculation was not performed. The projected release rates along with the corresponding high water elevations have been summarized in this section for the 1-100 year storm events.

Event	Existing Q (cfs)	Proposed Q (cfs)	Basin 1 Peak Elevation (ft)	Basin 1 Peak Elevation (ft)
1-yr.	36.03	4.55	652.36	649.70
2-yr.	43.56	12.71	652.55	649.90
5-yr.	54.90	22.98	652.80	650.17
10-yr.	63.90	30.80	652.98	650.44
25-yr.	77.27	40.62	653.14	650.83
50-yr.	88.14	44.85	653.23	651.13
100-yr.	99.76	45.58	653.30	651.48

3. EPA Phase 2 Water Quality Calculations

The site has been designed to comply with the current EPA Phase 2 regulations for improving the quality of the stormwater released from the site. The site improvements will include an extended stormwater detention basin which will serve as a post-construction Best Management Practice (BMP). The initial runoff from the site, the Water Quality Volume, has been calculated in accordance with current EPA requirements. This volume of water will be collected in the detention basin and released over a period of not less than 48-hours. This extended detention time will allow for fines and silts suspended in the runoff to settle out prior to being released.

4. Post-Construction Stormwater Quality Maintenance Plan

In order for the detention basin to function properly and continue to protect the site and surrounding areas, it must be properly maintained. This section includes a general guideline for proper maintenance of the basin. The property owner will be required to maintain the basin and keep records of such maintenance. Proof of proper maintenance shall be submitted to the local stormwater authority upon request.

Hydrograph Report

1

ODOT FSMF - Pre Pre

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

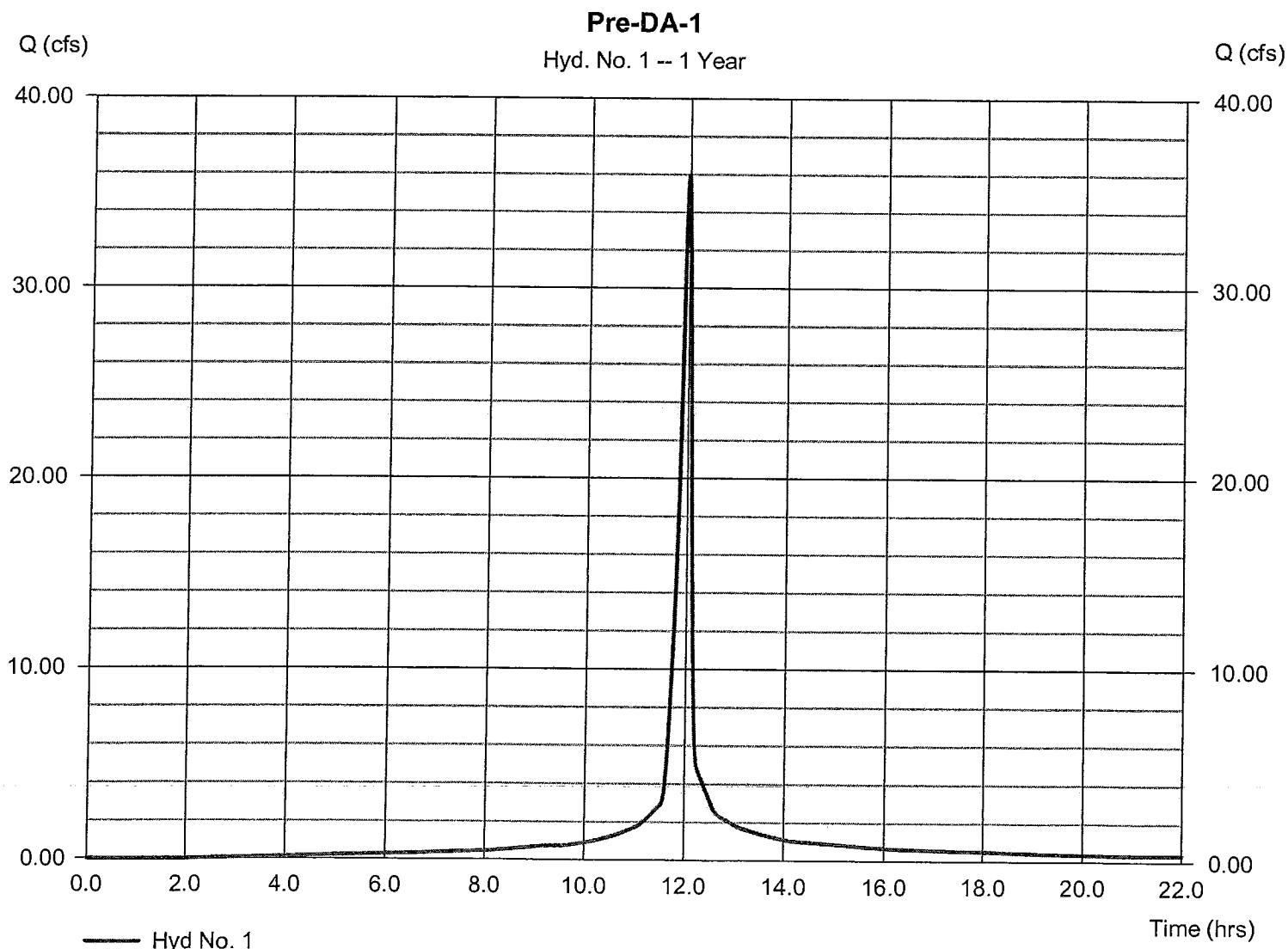
Sunday, 11 / 29 / 2015

Hyd. No. 1

Pre-DA-1

Hydrograph type	= SCS Runoff	Peak discharge	= 36.03 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.98 hrs
Time interval	= 1 min	Hyd. volume	= 91,244 cuft
Drainage area	= 14.490 ac	Curve number	= 98*
Basin Slope	= 1.0 %	Hydraulic length	= 100 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 1.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(16.250 \times 98)] / 14.490$



Hydrograph Report

ODOT F5MF - Pre

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

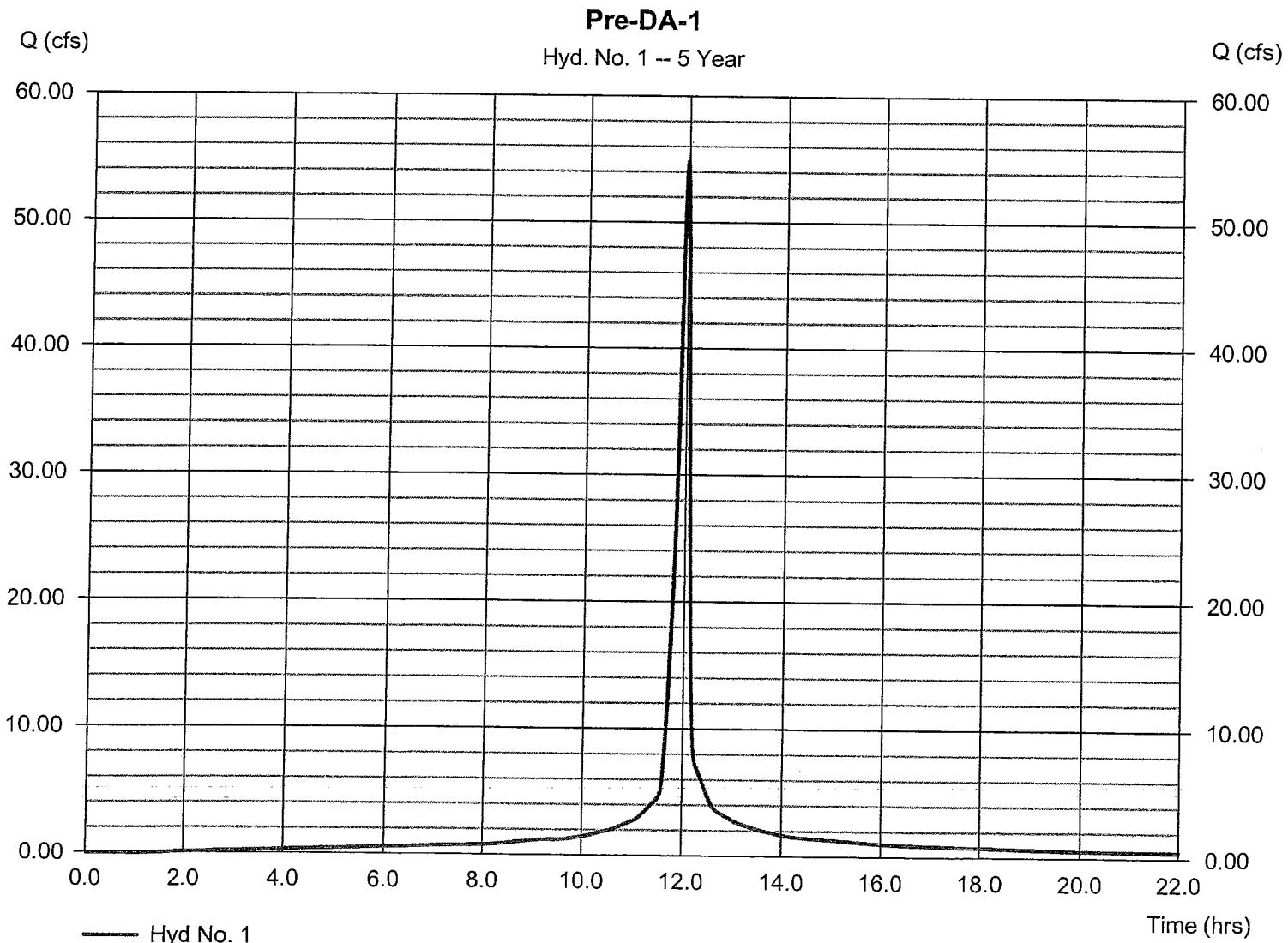
Sunday, 11 / 29 / 2015

Hyd. No. 1

Pre-DA-1

Hydrograph type	= SCS Runoff	Peak discharge	= 54.90 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.98 hrs
Time interval	= 1 min	Hyd. volume	= 142,465 cuft
Drainage area	= 14.490 ac	Curve number	= 98*
Basin Slope	= 1.0 %	Hydraulic length	= 100 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(16.250 x 98)] / 14.490



Hydrograph Report

ODOT FSHF - Post

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

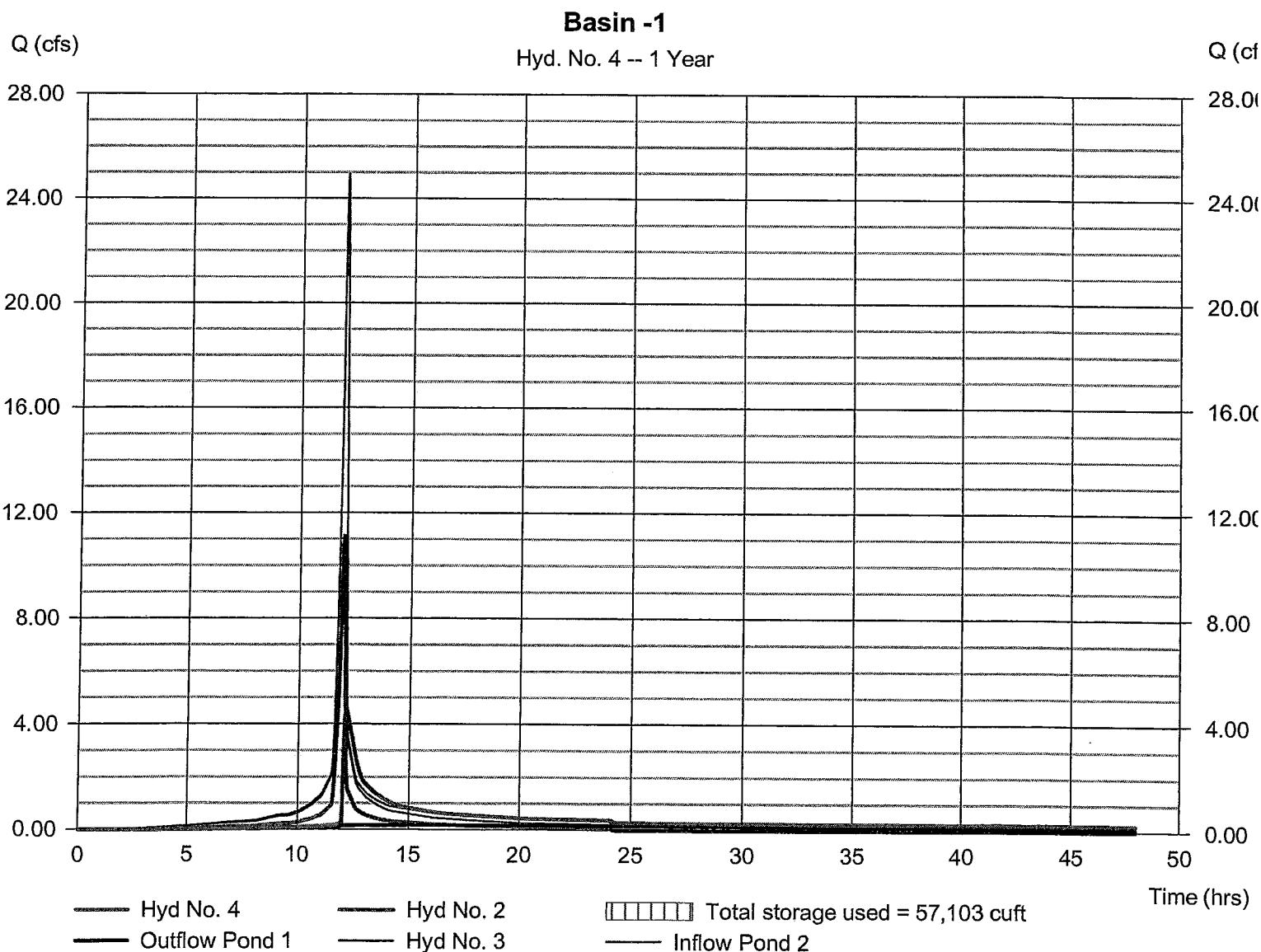
Sunday, 11 / 29 / 2015

Hyd. No. 4

Basin -1

Hydrograph type	= Reservoir (Interconnected)	Peak discharge	= 4.553 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.15 hrs
Time interval	= 1 min	Hyd. volume	= 59,162 cuft
Basin Pond	= Basin-1	Pond Pond	= Basin-2
Inflow hyd.	= 2 - DA-1	Other Inflow hyd.	= 3 - DA-2
Max. Elevation	= 652.36 ft	Max. Elevation	= 649.70 ft
Max. Storage	= 20,262 cuft	Max. Storage	= 36,841 cuft

Interconnected Pond Routing. Storage Indication method used.



Hydrograph Report

ODOT FS MF - Post

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Sunday, 11 / 29 / 2015

Hyd. No. 4

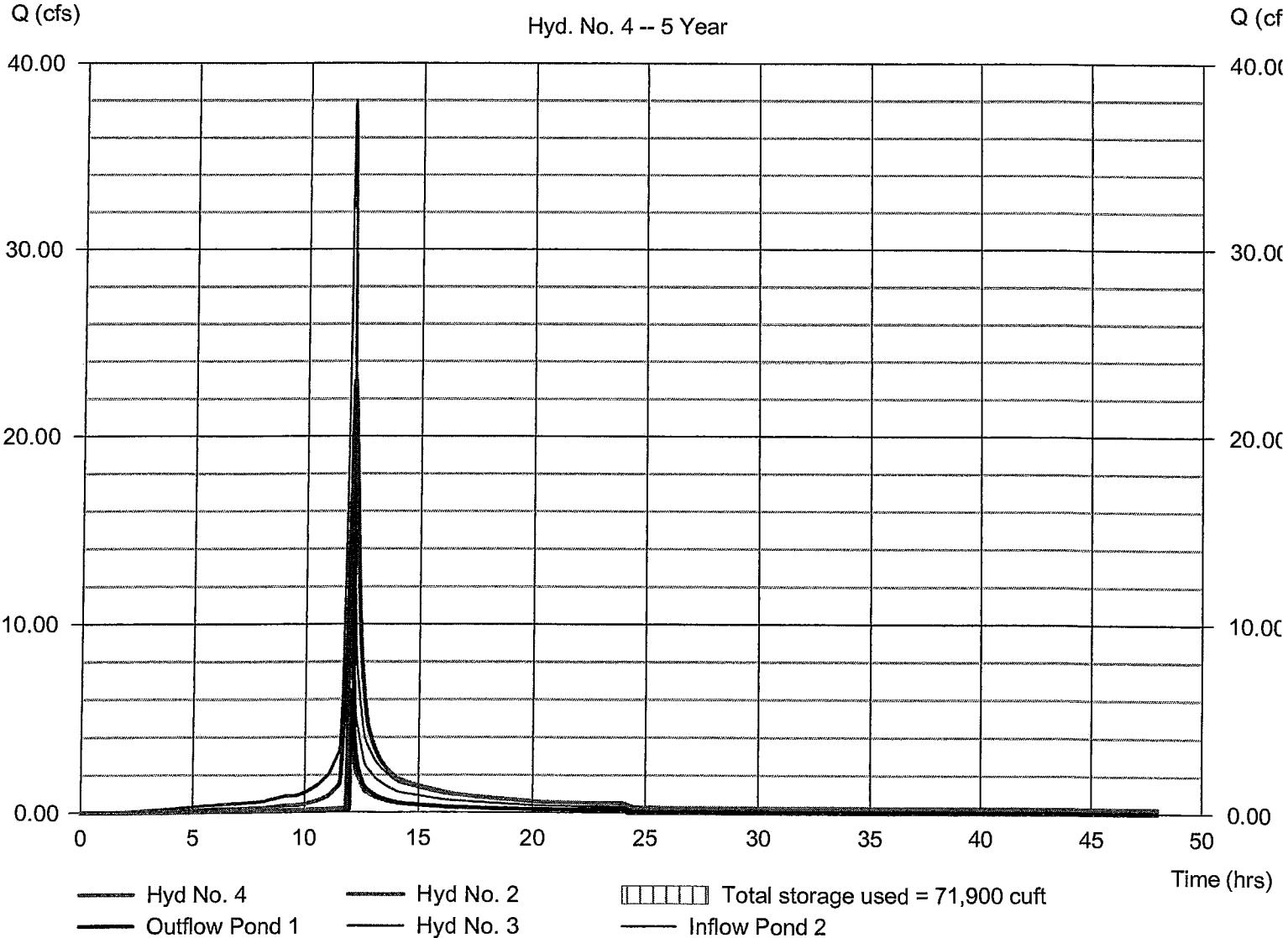
Basin -1

Hydrograph type	= Reservoir (Interconnected)	Peak discharge	= 22.98 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.08 hrs
Time interval	= 1 min	Hyd. volume	= 107,089 cuft
Open Pond	= Basin-1	Pond	= Basin-2
Inflow hyd.	= 2 - DA-1	Other Inflow hyd.	= 3 - DA-2
Max. Elevation	= 652.80 ft	Max. Elevation	= 650.17 ft
Max. Storage	= 23,741 cuft	Max. Storage	= 48,159 cuft

Interconnected Pond Routing. Storage Indication method used.

Basin -1

Hyd. No. 4 -- 5 Year



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CVIC Overall - Post
Pre

Type II 24-hr 1-year Rainfall=2.20"

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Page 1

Summary for Subcatchment 1S: pre-development

Runoff = 17.54 cfs @ 12.30 hrs, Volume= 2.166 af, Depth= 0.45"

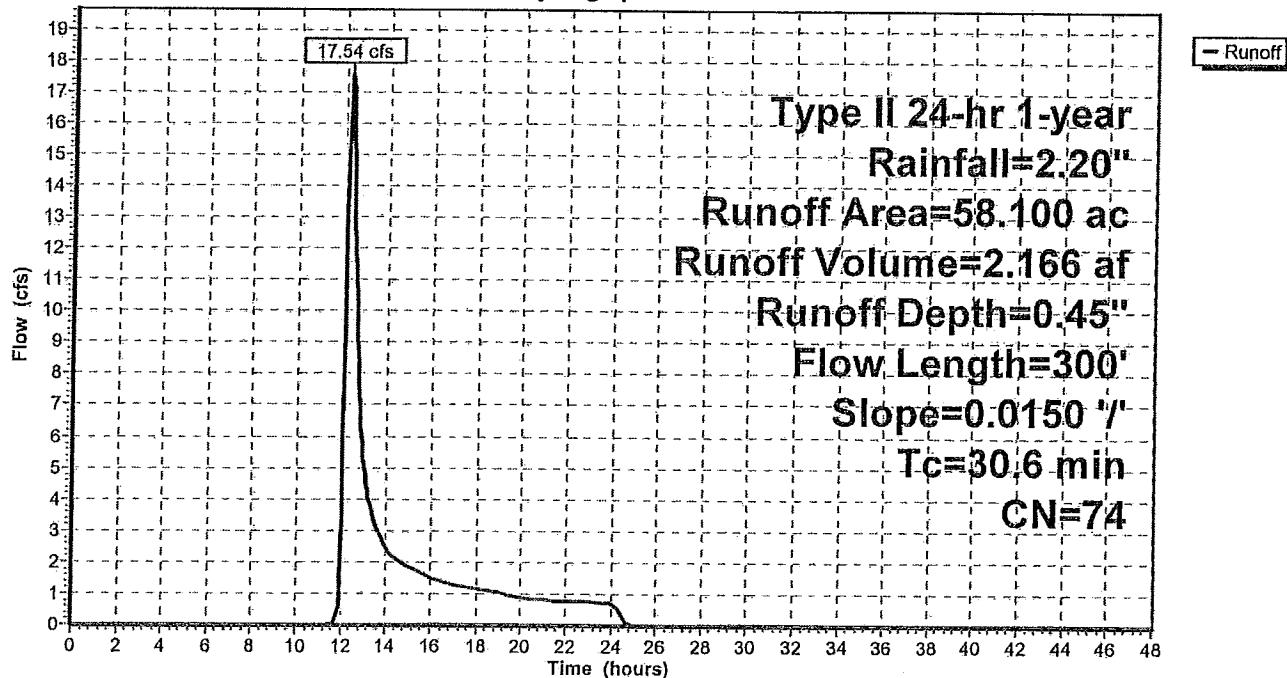
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-year Rainfall=2.20"

Area (ac)	CN	Description
43.700	74	>75% Grass cover, Good, HSG C
14.400	74	>75% Grass cover, Good, HSG C
58.100	74	Weighted Average
58.100		Pervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
30.6	300	0.0150	0.16	Sheet Flow, Area A	
				Grass: Short n= 0.150 P2= 2.40"	

Subcatchment 1S: pre-development

Hydrograph



GRT003_040711

Type II 24-hr 5-year Rainfall=3.00"

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Page 11

Summary for Subcatchment 1S: pre-development

Runoff = 41.16 cfs @ 12.28 hrs, Volume= 4.397 af, Depth= 0.91"

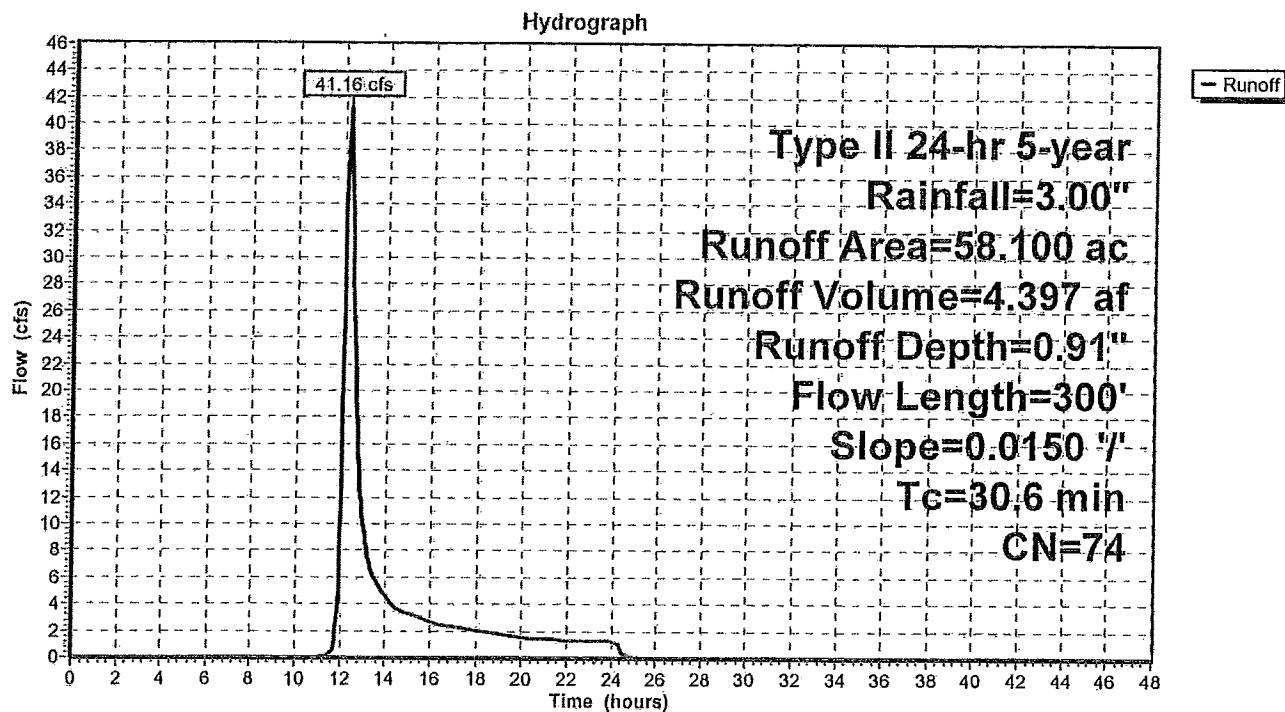
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-year Rainfall=3.00"

Area (ac)	CN	Description
43.700	74	>75% Grass cover, Good, HSG C
14.400	74	>75% Grass cover, Good, HSG C

58.100 74 Weighted Average
58.100 Pervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
30.6	300	0.0150	0.16		Sheet Flow, Area A Grass: Short n= 0.150 P2= 2.40"

Subcatchment 1S: pre-development



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CVTC Overall - Post

Type II 24-hr 1-year Rainfall=2.20"

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Page 4

Summary for Pond 5P: Detention Pond

Inflow Area = 60.700 ac, 55.19% Impervious, Inflow Depth = 1.20" for 1-year event
Inflow = 109.77 cfs @ 12.02 hrs, Volume= 6.049 af
Outflow = 1.41 cfs @ 21.30 hrs, Volume= 3.800 af, Atten= 99%, Lag= 556.9 min
Primary = 1.41 cfs @ 21.30 hrs, Volume= 3.800 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 614.44' @ 21.30 hrs Surf.Area= 48,749 sf Storage= 202,314 cf

Plug-Flow detention time= 1,016.3 min calculated for 3.800 af (63% of inflow)
Center-of-Mass det. time= 905.3 min (1,732.8 - 827.5)

Volume	Invert	Avail.Storage	Storage Description
#1	608.00'	634,566 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	611.75'	961 cf	36.0"D x 136.00'L Horizontal Cylinder S= 0.0215 '/'
#3	614.75'	2,121 cf	36.0"D x 300.00'L Horizontal Cylinder S= 0.0100 '/'
#4	617.85'	2,121 cf	36.0"D x 300.00'L Horizontal Cylinder S= 0.0100 '/'
		639,768 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
608.00	5,850	0	0
609.00	13,350	9,600	9,600
610.00	22,175	17,763	27,363
611.00	31,900	27,038	54,400
612.00	41,275	36,588	90,988
613.00	45,420	43,348	134,335
614.00	47,510	46,465	180,800
615.00	49,618	48,564	229,364
616.00	51,794	50,706	280,070
617.00	53,900	52,847	332,917
618.00	56,086	54,993	387,910
619.00	58,309	57,198	445,108
620.00	60,619	59,464	504,572
621.00	64,490	62,555	567,126
622.00	70,389	67,440	634,566

Device	Routing	Invert	Outlet Devices
#1	Primary	607.00'	12.0" x 141.0' long Culvert Ke= 0.500 Outlet Invert= 597.10' S= 0.0702 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean
#2	Device 1	612.50'	1.50' W x 0.50' H Vert. Orifice/Grate C= 0.600
#3	Device 2	619.00'	1.50' x 1.50' Horiz. Orifice/Grate Limited to weir flow C= 0.600
#4	Device 1	610.50'	4.0" Vert. Orifice/Grate C= 0.600
#5	Device 1	608.00'	3.0" Vert. Orifice/Grate C= 0.600
#6	Secondary	621.50'	20.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65

GRT003_040711

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Type II 24-hr 1-year Rainfall=2.20"

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2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=1.41 cfs @ 21.30 hrs HW=614.44' (Free Discharge)

1=Culvert (Passes 1.41 cfs of 9.96 cfs potential flow)

2=Orifice/Grate (Passes 0.00 cfs of 4.69 cfs potential flow)

3=Orifice/Grate (Controls 0.00 cfs)

4=Orifice/Grate (Orifice Controls 0.82 cfs @ 9.35 fps)

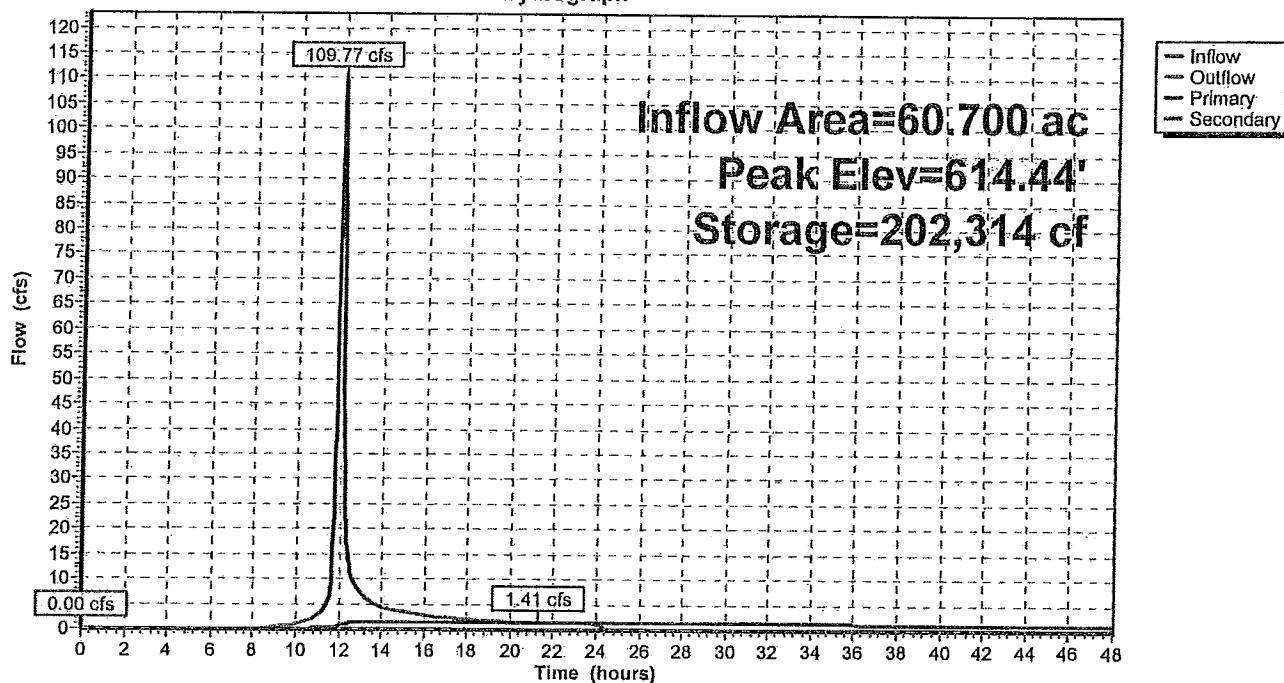
5=Orifice/Grate (Orifice Controls 0.59 cfs @ 12.10 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=608.00' (Free Discharge)

6=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 5P: Detention Pond

Hydrograph



GRT003_040711

Type II 24-hr 5-year Rainfall=3.00"

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Summary for Pond 5P: Detention Pond

Inflow Area = 60.700 ac, 55.19% Impervious, Inflow Depth = 1.90" for 5-year event
 Inflow = 172.40 cfs @ 12.01 hrs, Volume= 9.610 af
 Outflow = 1.77 cfs @ 24.03 hrs, Volume= 4.965 af, Atten= 99%, Lag= 721.2 min
 Primary = 1.77 cfs @ 24.03 hrs, Volume= 4.965 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 617.09' @ 24.03 hrs Surf.Area= 54,736 sf Storage= 339,410 cf

Plug-Flow detention time= 1,046.6 min calculated for 4.965 af (52% of inflow)
 Center-of-Mass det. time= 932.6 min (1,746.9 - 814.3)

Volume	Invert	Avail.Storage	Storage Description
#1	608.00'	634,566 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	611.75'	961 cf	36.0"D x 136.00'L Horizontal Cylinder S= 0.0215 '/"
#3	614.75'	2,121 cf	36.0"D x 300.00'L Horizontal Cylinder S= 0.0100 '/"
#4	617.85'	2,121 cf	36.0"D x 300.00'L Horizontal Cylinder S= 0.0100 '/"
		639,768 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
608.00	5,850	0	0
609.00	13,350	9,600	9,600
610.00	22,175	17,763	27,363
611.00	31,900	27,038	54,400
612.00	41,275	36,588	90,988
613.00	45,420	43,348	134,335
614.00	47,510	46,465	180,800
615.00	49,618	48,564	229,364
616.00	51,794	50,706	280,070
617.00	53,900	52,847	332,917
618.00	56,086	54,993	387,910
619.00	58,309	57,198	445,108
620.00	60,619	59,464	504,572
621.00	64,490	62,555	567,126
622.00	70,389	67,440	634,566

Device	Routing	Invert	Outlet Devices
#1	Primary	607.00'	12.0" x 141.0' long Culvert Ke= 0.500 Outlet Invert= 597.10' S= 0.0702 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean
#2	Device 1	612.50'	1.50' W x 0.50' H Vert. Orifice/Grate C= 0.600
#3	Device 2	619.00'	1.50' x 1.50' Horiz. Orifice/Grate Limited to weir flow C= 0.600
#4	Device 1	610.50'	4.0" Vert. Orifice/Grate C= 0.600
#5	Device 1	608.00'	3.0" Vert. Orifice/Grate C= 0.600
#6	Secondary	621.50'	20.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65

2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=1.77 cfs @ 24.03 hrs HW=617.09' (Free Discharge)

1=Culvert (Passes 1.77 cfs of 11.28 cfs potential flow)

2=Orifice/Grate (Passes 0.00 cfs of 7.52 cfs potential flow)

3=Orifice/Grate (Controls 0.00 cfs)

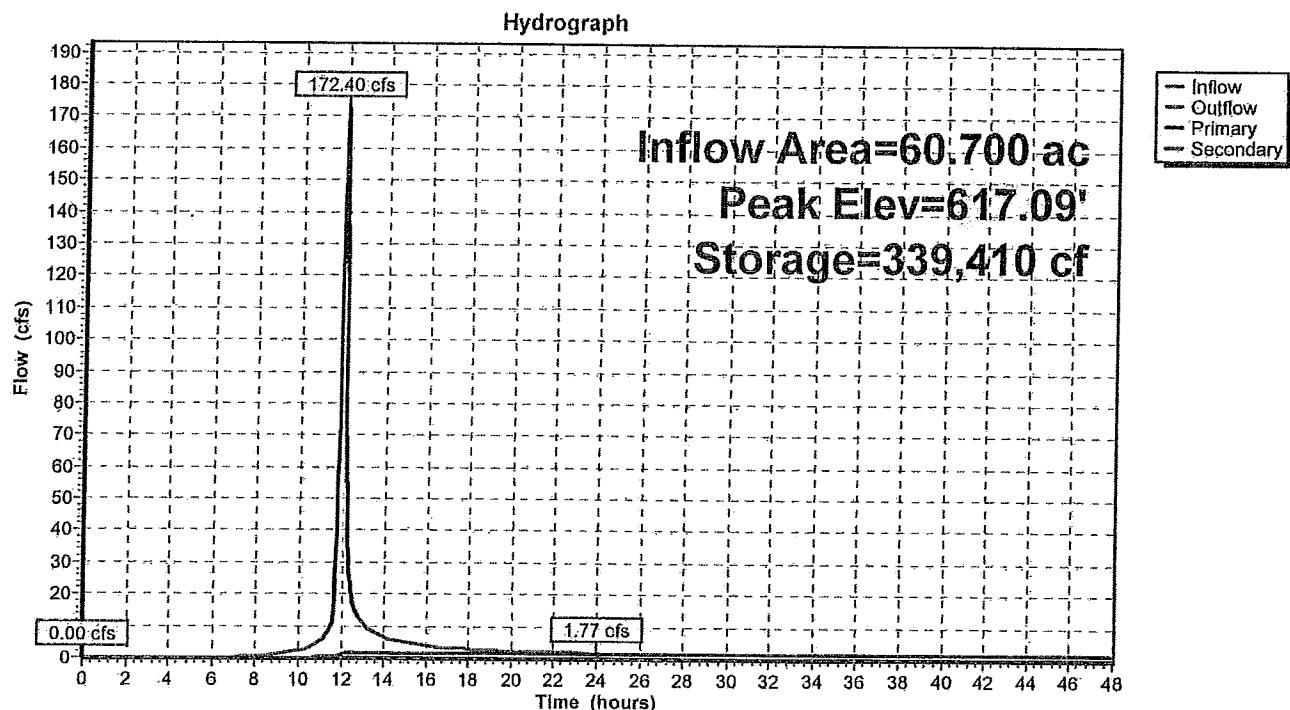
4=Orifice/Grate (Orifice Controls 1.07 cfs @ 12.20 fps)

5=Orifice/Grate (Orifice Controls 0.71 cfs @ 14.42 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=608.00' (Free Discharge)

6=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 5P: Detention Pond



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Type II 24-hr 1-year Rainfall=2.20"

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Summary for Subcatchment 6S: post-dev to morgana

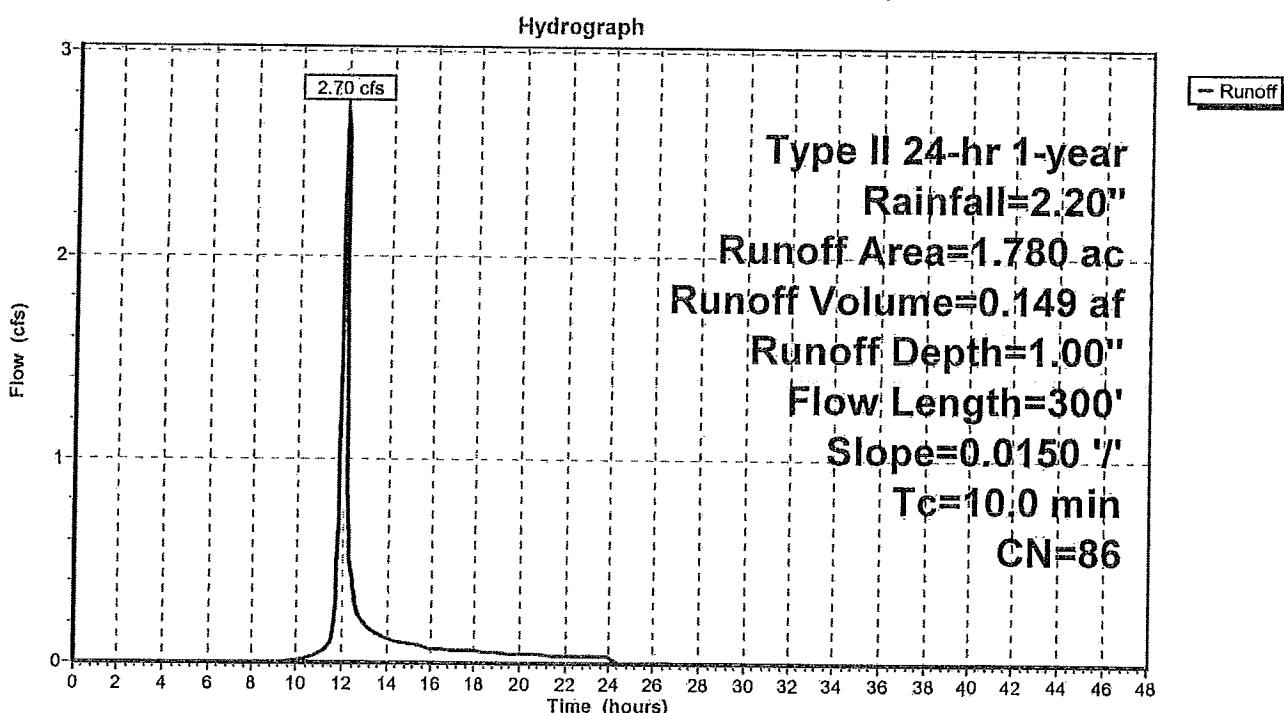
Runoff = 2.70 cfs @ 12.02 hrs, Volume= 0.149 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-year Rainfall=2.20"

Area (ac)	CN	Description
1.780	86	<50% Grass cover, Poor, HSG C
1.780		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	300	0.0150	1.32		Sheet Flow, Area A Smooth surfaces n= 0.011 P2= 2.40"
3.8	300	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: post-dev to morgana



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Type II 24-hr 5-year Rainfall=3.00"

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Summary for Subcatchment 6S: post-dev to morgana

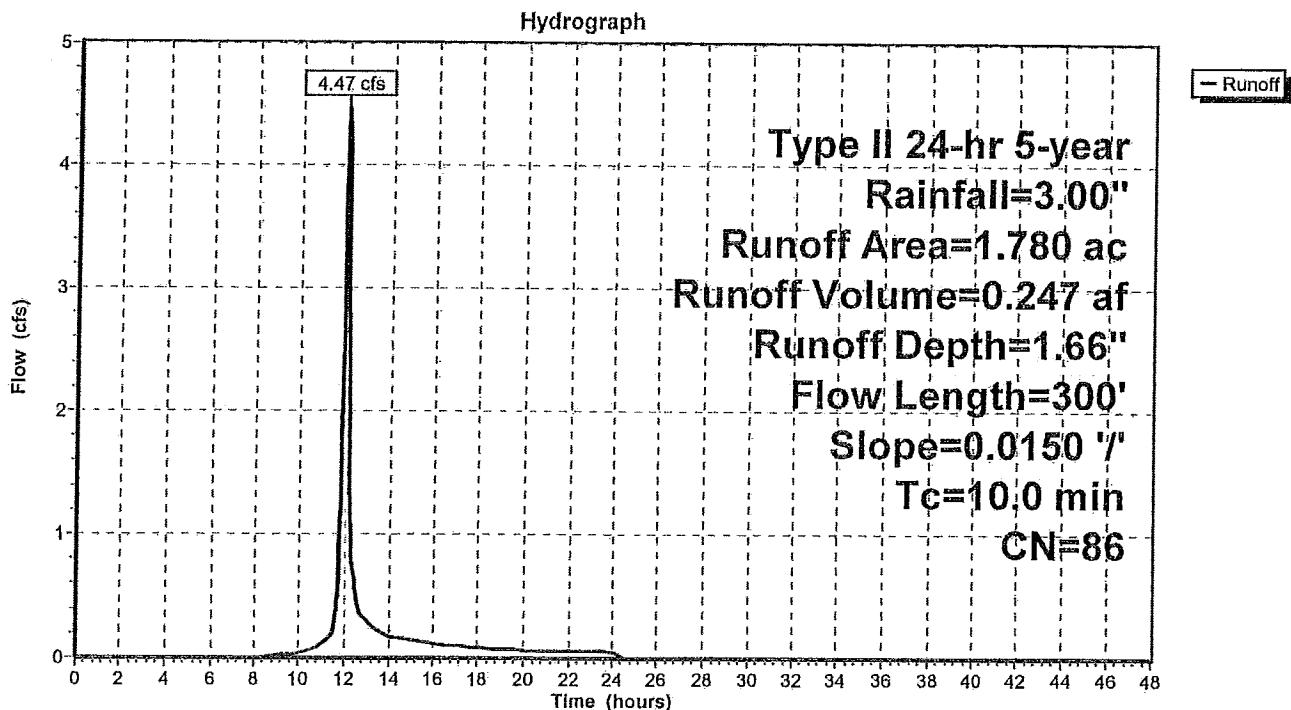
Runoff = 4.47 cfs @ 12.02 hrs, Volume= 0.247 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-year Rainfall=3.00"

Area (ac)	CN	Description
1.780	86	<50% Grass cover, Poor, HSG C
1.780		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	300	0.0150	1.32		Sheet Flow, Area A Smooth surfaces n= 0.011 P2= 2.40"
3.8	300	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: post-dev to morgana



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Thursday, 06 / 16 / 2016

Hyd. No. 4

Basin -1

Hydrograph type	= Reservoir (Interconnected)	Peak discharge	= 5.432 cfs
Storm frequency	= 1 yrs	Time to peak	= 730 min
Time interval	= 1 min	Hyd. volume	= 60,871 cuft
Upper Pond			Lower Pond
Pond name	= Basin-1	Pond name	= Basin-2
Inflow hyd.	= 2 - DA-1	Other Inflow hyd.	= 3 - DA-2
Max. Elevation	= 652.43 ft	Max. Elevation	= 649.72 ft
Max. Storage	= 20,834 cuft	Max. Storage	= 37,413 cuft

Interconnected Pond Routing. Storage Indication method used.

Hydrograph Discharge Table

(Printed values >= 0.10% of Qp. Print interval = 15)

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
285	0.061	649.06	0.000	0.000	0.136	648.03	----	0.006
300	0.067	649.08	0.000	0.000	0.150	648.04	----	0.008
315	0.073	649.09	0.000	0.000	0.163	648.04	----	0.009
330	0.080	649.10	0.001	0.001	0.177	648.05	----	0.010
345	0.086	649.12	0.006	0.006	0.191	648.06	----	0.012
360	0.092	649.13	0.010	0.010	0.205	648.07	----	0.013
375	0.098	649.15	0.015	0.015	0.219	648.08	----	0.015
390	0.104	649.17	0.019	0.019	0.232	648.09	----	0.017
405	0.111	649.18	0.024	0.024	0.246	648.10	----	0.019
420	0.117	649.20	0.029	0.029	0.260	648.11	----	0.023
435	0.123	649.22	0.032	0.032	0.274	648.12	----	0.029
450	0.129	649.23	0.034	0.034	0.287	648.13	----	0.034

Continues on next page...

Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
465	0.135	649.25	0.037	0.037	0.301	648.14	----	0.040
480	0.141	649.27	0.040	0.040	0.315	648.16	----	0.045
495	0.155	649.29	0.043	0.043	0.344	648.17	----	0.051
510	0.174	649.31	0.046	0.046	0.388	648.19	----	0.058
525	0.195	649.34	0.049	0.049	0.434	648.20	----	0.065
540	0.216	649.37	0.052	0.052	0.481	648.22	----	0.072
555	0.228	649.40	0.055	0.055	0.508	648.24	----	0.079
570	0.232	649.44	0.058	0.058	0.516	648.26	----	0.087
585	0.251	649.47	0.062	0.062	0.559	648.29	----	0.094
600	0.284	649.51	0.068	0.068	0.633	648.31	----	0.102
615	0.327	649.55	0.069	0.069	0.728	648.34	----	0.108
630	0.377	649.61	0.072	0.072	0.841	648.37	----	0.117
645	0.446	649.67	0.074	0.074	0.994	648.41	----	0.126
660	0.531	649.75	0.078	0.078	1.183	648.45	----	0.135
675	0.679	649.85	0.081	0.081	1.513	648.51	----	0.146
690	0.884	649.98	0.086	0.086	1.969	648.58	----	0.157
705	3.676	650.27	0.095	0.095	8.187	648.75	----	0.184
720	10.96	651.39	0.126	0.126	24.41	649.42	----	0.264

Continues on next page...

Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
735	1.481	651.98	0.154	0.154	3.299	649.73	----	4.892
750	0.986	652.10	0.163	0.163	2.195	649.68	----	3.475
765	0.698	652.17	0.167	0.167	1.555	649.64	----	2.417
780	0.585	652.22	0.170	0.170	1.303	649.61	----	1.851
795	0.500	652.26	0.172	0.172	1.114	649.60	----	1.621
810	0.439	652.29	0.173	0.173	0.978	649.59	----	1.435
825	0.388	652.32	0.173	0.173	0.863	649.58	----	1.276
840	0.344	652.34	0.174	0.174	0.766	649.57	----	1.143
855	0.316	652.36	0.175	0.175	0.703	649.56	----	1.032
870	0.300	652.37	0.175	0.175	0.669	649.55	----	0.954
885	0.285	652.39	0.176	0.176	0.635	649.55	----	0.896
900	0.270	652.40	0.176	0.176	0.601	649.55	----	0.849
915	0.255	652.41	0.176	0.176	0.567	649.54	----	0.808
930	0.239	652.42	0.176	0.176	0.533	649.54	----	0.770
945	0.224	652.42	0.177	0.177	0.499	649.54	----	0.734
960	0.209	652.43	0.177	0.177	0.465	649.53	----	0.699
975	0.199	652.43	0.177	0.177	0.443	649.53	----	0.666
990	0.193	652.43	0.177	0.177	0.430	649.53	----	0.642

Continues on next page...

Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
1005	0.188	652.43	0.177	0.177	0.418	649.53	----	0.623
1020	0.182	652.43 <<	0.177	0.177	0.406	649.53	----	0.608
1035	0.177	652.43 <<	0.177	0.177	0.394	649.53	----	0.593
1050	0.171	652.43 <<	0.177	0.177	0.382	649.52	----	0.580
1065	0.166	652.43	0.177	0.177	0.370	649.52	----	0.567
1080	0.161	652.43	0.177	0.177	0.357	649.52	----	0.555
1095	0.155	652.43	0.177	0.177	0.345	649.52	----	0.543
1110	0.150	652.43	0.177	0.177	0.333	649.52	----	0.530
1125	0.144	652.42	0.177	0.177	0.321	649.52	----	0.518
1140	0.139	652.42	0.177	0.177	0.309	649.52	----	0.506
1155	0.133	652.41	0.176	0.176	0.297	649.52	----	0.493
1170	0.128	652.41	0.176	0.176	0.284	649.52	----	0.481
1185	0.122	652.40	0.176	0.176	0.272	649.52	----	0.469
1200	0.117	652.40	0.176	0.176	0.260	649.51	----	0.456
1215	0.114	652.39	0.176	0.176	0.253	649.51	----	0.445
1230	0.113	652.38	0.175	0.175	0.251	649.51	----	0.437
1245	0.111	652.38	0.175	0.175	0.248	649.51	----	0.431
1260	0.110	652.37	0.175	0.175	0.246	649.51	----	0.427

Continues on next page...

Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
1275	0.109	652.36	0.175	0.175	0.243	649.51	----	0.424
1290	0.108	652.35	0.175	0.175	0.241	649.51	----	0.420
1305	0.107	652.35	0.174	0.174	0.238	649.51	----	0.417
1320	0.106	652.34	0.174	0.174	0.236	649.51	----	0.415
1335	0.105	652.33	0.174	0.174	0.234	649.51	----	0.412
1350	0.104	652.32	0.174	0.174	0.231	649.51	----	0.409
1365	0.103	652.32	0.173	0.173	0.229	649.51	----	0.406
1380	0.102	652.31	0.173	0.173	0.226	649.51	----	0.404
1395	0.100	652.30	0.173	0.173	0.224	649.51	----	0.401
1410	0.099	652.29	0.173	0.173	0.221	649.51	----	0.398
1425	0.098	652.28	0.172	0.172	0.219	649.51	----	0.396
1440	0.097	652.28	0.172	0.172	0.217	649.51	----	0.393
1455	0.000	652.26	0.172	0.172	0.000	649.50	----	0.331
1470	0.000	652.24	0.171	0.171	0.000	649.50	----	0.271
1485	0.000	652.22	0.170	0.170	0.000	649.50	----	0.271
1500	0.000	652.20	0.170	0.170	0.000	649.49	----	0.271
1515	0.000	652.18	0.169	0.169	0.000	649.49	----	0.270
1530	0.000	652.17	0.169	0.169	0.000	649.48	----	0.270

Continues on next page...

Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
1545	0.000	652.15	0.168	0.168	0.000	649.48	----	0.269
1560	0.000	652.13	0.167	0.167	0.000	649.48	----	0.269
1575	0.000	652.11	0.167	0.167	0.000	649.47	----	0.269
1590	0.000	652.09	0.166	0.166	0.000	649.47	----	0.268
1605	0.000	652.07	0.165	0.165	0.000	649.46	----	0.268
1620	0.000	652.05	0.165	0.165	0.000	649.46	----	0.268
1635	0.000	652.04	0.164	0.164	0.000	649.46	----	0.267
1650	0.000	652.02	0.164	0.164	0.000	649.45	----	0.267
1665	0.000	652.00	0.163	0.163	0.000	649.45	----	0.266
1680	0.000	651.98	0.162	0.162	0.000	649.44	----	0.266
1695	0.000	651.96	0.162	0.162	0.000	649.44	----	0.266
1710	0.000	651.93	0.161	0.161	0.000	649.44	----	0.265
1725	0.000	651.91	0.160	0.160	0.000	649.43	----	0.265
1740	0.000	651.89	0.159	0.159	0.000	649.43	----	0.264
1755	0.000	651.87	0.159	0.159	0.000	649.42	----	0.264
1770	0.000	651.85	0.158	0.158	0.000	649.42	----	0.264
1785	0.000	651.83	0.157	0.157	0.000	649.41	----	0.263
1800	0.000	651.81	0.156	0.156	0.000	649.41	----	0.263

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Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
1815	0.000	651.79	0.156	0.156	0.000	649.41	----	0.262
1830	0.000	651.77	0.155	0.155	0.000	649.40	----	0.262
1845	0.000	651.75	0.154	0.154	0.000	649.40	----	0.262
1860	0.000	651.73	0.154	0.154	0.000	649.39	----	0.261
1875	0.000	651.71	0.153	0.153	0.000	649.39	----	0.261
1890	0.000	651.69	0.152	0.152	0.000	649.39	----	0.260
1905	0.000	651.67	0.151	0.151	0.000	649.38	----	0.260
1920	0.000	651.65	0.151	0.151	0.000	649.38	----	0.259
1935	0.000	651.63	0.150	0.150	0.000	649.37	----	0.259
1950	0.000	651.61	0.149	0.149	0.000	649.37	----	0.259
1965	0.000	651.59	0.148	0.148	0.000	649.36	----	0.258
1980	0.000	651.57	0.148	0.148	0.000	649.36	----	0.258
1995	0.000	651.55	0.147	0.147	0.000	649.36	----	0.257
2010	0.000	651.53	0.146	0.146	0.000	649.35	----	0.257
2025	0.000	651.51	0.146	0.146	0.000	649.35	----	0.256
2040	0.000	651.49	0.145	0.145	0.000	649.34	----	0.256
2055	0.000	651.47	0.144	0.144	0.000	649.34	----	0.255
2070	0.000	651.46	0.143	0.143	0.000	649.33	----	0.255

Continues on next page...

Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
2085	0.000	651.44	0.143	0.143	0.000	649.33	----	0.254
2100	0.000	651.42	0.142	0.142	0.000	649.33	----	0.254
2115	0.000	651.40	0.141	0.141	0.000	649.32	----	0.253
2130	0.000	651.38	0.141	0.141	0.000	649.32	----	0.253
2145	0.000	651.36	0.140	0.140	0.000	649.31	----	0.253
2160	0.000	651.34	0.139	0.139	0.000	649.31	----	0.252
2175	0.000	651.33	0.138	0.138	0.000	649.30	----	0.252
2190	0.000	651.31	0.138	0.138	0.000	649.30	----	0.251
2205	0.000	651.29	0.137	0.137	0.000	649.29	----	0.251
2220	0.000	651.27	0.136	0.136	0.000	649.29	----	0.250
2235	0.000	651.25	0.135	0.135	0.000	649.29	----	0.250
2250	0.000	651.24	0.135	0.135	0.000	649.28	----	0.249
2265	0.000	651.22	0.134	0.134	0.000	649.28	----	0.249
2280	0.000	651.20	0.133	0.133	0.000	649.27	----	0.248
2295	0.000	651.18	0.133	0.133	0.000	649.27	----	0.248
2310	0.000	651.17	0.132	0.132	0.000	649.26	----	0.247
2325	0.000	651.15	0.131	0.131	0.000	649.26	----	0.247
2340	0.000	651.13	0.130	0.130	0.000	649.25	----	0.246

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Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
2355	0.000	651.12	0.130	0.130	0.000	649.25	----	0.246
2370	0.000	651.10	0.129	0.129	0.000	649.25	----	0.245
2385	0.000	651.08	0.128	0.128	0.000	649.24	----	0.245
2400	0.000	651.06	0.127	0.127	0.000	649.24	----	0.244
2415	0.000	651.05	0.127	0.127	0.000	649.23	----	0.243
2430	0.000	651.03	0.126	0.126	0.000	649.23	----	0.243
2445	0.000	651.01	0.125	0.125	0.000	649.22	----	0.242
2460	0.000	651.00	0.125	0.125	0.000	649.22	----	0.242
2475	0.000	650.98	0.124	0.124	0.000	649.21	----	0.241
2490	0.000	650.96	0.123	0.123	0.000	649.21	----	0.241
2505	0.000	650.94	0.122	0.122	0.000	649.20	----	0.240
2520	0.000	650.92	0.121	0.121	0.000	649.20	----	0.240
2535	0.000	650.90	0.120	0.120	0.000	649.20	----	0.239
2550	0.000	650.88	0.119	0.119	0.000	649.19	----	0.239
2565	0.000	650.86	0.119	0.119	0.000	649.19	----	0.238
2580	0.000	650.85	0.118	0.118	0.000	649.18	----	0.238
2595	0.000	650.83	0.117	0.117	0.000	649.18	----	0.237
2610	0.000	650.81	0.116	0.116	0.000	649.17	----	0.237

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Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
2625	0.000	650.79	0.115	0.115	0.000	649.17	----	0.236
2640	0.000	650.77	0.114	0.114	0.000	649.16	----	0.236
2655	0.000	650.76	0.113	0.113	0.000	649.16	----	0.235
2670	0.000	650.74	0.112	0.112	0.000	649.15	----	0.235
2685	0.000	650.72	0.112	0.112	0.000	649.15	----	0.234
2700	0.000	650.70	0.111	0.111	0.000	649.14	----	0.234
2715	0.000	650.69	0.110	0.110	0.000	649.14	----	0.233
2730	0.000	650.67	0.109	0.109	0.000	649.13	----	0.233
2745	0.000	650.65	0.108	0.108	0.000	649.13	----	0.232
2760	0.000	650.63	0.107	0.107	0.000	649.12	----	0.232
2775	0.000	650.62	0.106	0.106	0.000	649.12	----	0.231
2790	0.000	650.60	0.106	0.106	0.000	649.11	----	0.231
2805	0.000	650.59	0.105	0.105	0.000	649.11	----	0.230
2820	0.000	650.57	0.104	0.104	0.000	649.10	----	0.230
2835	0.000	650.55	0.103	0.103	0.000	649.10	----	0.229
2850	0.000	650.54	0.102	0.102	0.000	649.10	----	0.228
2865	0.000	650.52	0.101	0.101	0.000	649.09	----	0.228
2880	0.000	650.50	0.000	0.000	0.000	649.09	----	0.227

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Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Thursday, 06 / 16 / 2016

Hyd. No. 4

Basin -1

Hydrograph type	= Reservoir (Interconnected)	Peak discharge	= 23.55 cfs
Storm frequency	= 5 yrs	Time to peak	= 727 min
Time interval	= 1 min	Hyd. volume	= 110,584 cuft
Upper Pond			Lower Pond
Pond name	= Basin-1	Pond name	= Basin-2
Inflow hyd.	= 2 - DA-1	Other Inflow hyd.	= 3 - DA-2
Max. Elevation	= 652.82 ft	Max. Elevation	= 650.19 ft
Max. Storage	= 23,910 cuft	Max. Storage	= 48,605 cuft

Interconnected Pond Routing. Storage Indication method used.

Hydrograph Discharge Table

(Printed values >= 0.10% of Qp. Print interval = 15)

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
315	0.145	649.20	0.034	0.034	0.323	648.11	----	0.025
330	0.154	649.22	0.037	0.037	0.344	648.13	----	0.032
345	0.163	649.25	0.040	0.040	0.364	648.14	----	0.038
360	0.173	649.27	0.043	0.043	0.384	648.16	----	0.046
375	0.182	649.30	0.046	0.046	0.405	648.17	----	0.053
390	0.191	649.32	0.049	0.049	0.425	648.19	----	0.061
405	0.200	649.35	0.052	0.052	0.445	648.21	----	0.068
420	0.208	649.38	0.055	0.055	0.464	648.23	----	0.074
435	0.217	649.41	0.058	0.058	0.484	648.25	----	0.081
450	0.226	649.44	0.061	0.061	0.503	648.27	----	0.088
465	0.235	649.47	0.064	0.064	0.523	648.29	----	0.096
480	0.243	649.50	0.067	0.067	0.542	648.31	----	0.102

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Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
495	0.264	649.54	0.065	0.065	0.588	648.33	----	0.108
510	0.296	649.58	0.067	0.067	0.658	648.36	----	0.114
525	0.328	649.63	0.069	0.069	0.730	648.39	----	0.121
540	0.361	649.68	0.072	0.072	0.804	648.42	----	0.128
555	0.378	649.73	0.074	0.074	0.842	648.45	----	0.135
570	0.381	649.79	0.076	0.076	0.850	648.49	----	0.141
585	0.411	649.85	0.079	0.079	0.915	648.52	----	0.148
600	0.463	649.92	0.081	0.081	1.031	648.56	----	0.154
615	0.529	650.00	0.084	0.084	1.177	648.60	----	0.161
630	0.607	650.08	0.086	0.086	1.351	648.66	----	0.169
645	0.713	650.16	0.089	0.089	1.588	648.71	----	0.178
660	0.844	650.27	0.092	0.092	1.879	648.79	----	0.189
675	1.072	650.41	0.096	0.096	2.388	648.87	----	0.200
690	1.386	650.58	0.104	0.104	3.086	648.99	----	0.215
705	5.697	651.02	0.119	0.119	12.69	649.23	----	0.243
720	16.69	652.48	0.158	0.158	37.17	650.09	----	18.63
735	2.244	652.69	3.794	3.794	4.997	650.09	----	18.56
750	1.492	652.62	1.876	1.876	3.322	649.84	----	8.525

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Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
765	1.056	652.59	1.273	1.273	2.352	649.74	----	5.093
780	0.884	652.57	1.030	1.030	1.970	649.70	----	3.819
795	0.756	652.55	0.855	0.855	1.684	649.67	----	3.070
810	0.664	652.54	0.737	0.737	1.478	649.64	----	2.583
825	0.586	652.54	0.643	0.643	1.304	649.63	----	2.225
840	0.519	652.53	0.569	0.569	1.157	649.62	----	1.950
855	0.477	652.53	0.509	0.509	1.062	649.61	----	1.768
870	0.454	652.52	0.474	0.474	1.011	649.60	----	1.656
885	0.431	652.52	0.448	0.448	0.959	649.60	----	1.559
900	0.408	652.52	0.424	0.424	0.908	649.59	----	1.471
915	0.384	652.52	0.401	0.401	0.856	649.59	----	1.389
930	0.361	652.52	0.378	0.378	0.805	649.58	----	1.310
945	0.338	652.51	0.355	0.355	0.753	649.58	----	1.234
960	0.315	652.51	0.331	0.331	0.702	649.57	----	1.158
975	0.300	652.51	0.311	0.311	0.668	649.56	----	1.086
990	0.292	652.51	0.299	0.299	0.650	649.56	----	1.029
1005	0.283	652.51	0.290	0.290	0.631	649.56	----	0.986
1020	0.275	652.51	0.281	0.281	0.613	649.55	----	0.950

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Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
1035	0.267	652.51	0.273	0.273	0.594	649.55	----	0.918
1050	0.259	652.51	0.265	0.265	0.576	649.55	----	0.888
1065	0.250	652.51	0.256	0.256	0.558	649.55	----	0.860
1080	0.242	652.51	0.248	0.248	0.539	649.54	----	0.832
1095	0.234	652.50	0.240	0.240	0.521	649.54	----	0.805
1110	0.226	652.50	0.231	0.231	0.502	649.54	----	0.778
1125	0.217	652.50	0.223	0.223	0.484	649.54	----	0.751
1140	0.209	652.50	0.215	0.215	0.466	649.54	----	0.725
1155	0.201	652.50	0.207	0.207	0.447	649.53	----	0.698
1170	0.193	652.50	0.198	0.198	0.429	649.53	----	0.671
1185	0.184	652.50	0.190	0.190	0.410	649.53	----	0.645
1200	0.176	652.50	0.182	0.182	0.392	649.53	----	0.618
1215	0.171	652.50	0.178	0.178	0.382	649.53	----	0.593
1230	0.170	652.50	0.178	0.178	0.378	649.52	----	0.577
1245	0.168	652.50	0.178	0.178	0.374	649.52	----	0.566
1260	0.166	652.50	0.178	0.178	0.371	649.52	----	0.559
1275	0.165	652.50	0.178	0.178	0.367	649.52	----	0.553
1290	0.163	652.49	0.178	0.178	0.363	649.52	----	0.548

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Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
1305	0.161	652.49	0.178	0.178	0.359	649.52	----	0.544
1320	0.160	652.49	0.178	0.178	0.356	649.52	----	0.540
1335	0.158	652.49	0.178	0.178	0.352	649.52	----	0.536
1350	0.156	652.49	0.178	0.178	0.348	649.52	----	0.532
1365	0.155	652.48	0.177	0.177	0.345	649.52	----	0.528
1380	0.153	652.48	0.177	0.177	0.341	649.52	----	0.525
1395	0.151	652.48	0.177	0.177	0.337	649.52	----	0.521
1410	0.150	652.47	0.177	0.177	0.334	649.52	----	0.517
1425	0.148	652.47	0.177	0.177	0.330	649.52	----	0.513
1440	0.147	652.47	0.177	0.177	0.326	649.52	----	0.510
1455	0.000	652.46	0.177	0.177	0.000	649.51	----	0.417
1470	0.000	652.44	0.176	0.176	0.000	649.50	----	0.308
1485	0.000	652.42	0.175	0.175	0.000	649.50	----	0.271
1500	0.000	652.40	0.175	0.175	0.000	649.49	----	0.271
1515	0.000	652.38	0.174	0.174	0.000	649.49	----	0.270
1530	0.000	652.36	0.174	0.174	0.000	649.49	----	0.270
1545	0.000	652.34	0.173	0.173	0.000	649.48	----	0.270
1560	0.000	652.32	0.172	0.172	0.000	649.48	----	0.269

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Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
1575	0.000	652.30	0.172	0.172	0.000	649.48	----	0.269
1590	0.000	652.28	0.171	0.171	0.000	649.47	----	0.269
1605	0.000	652.26	0.170	0.170	0.000	649.47	----	0.268
1620	0.000	652.24	0.170	0.170	0.000	649.46	----	0.268
1635	0.000	652.22	0.169	0.169	0.000	649.46	----	0.268
1650	0.000	652.20	0.169	0.169	0.000	649.46	----	0.267
1665	0.000	652.19	0.168	0.168	0.000	649.45	----	0.267
1680	0.000	652.17	0.167	0.167	0.000	649.45	----	0.266
1695	0.000	652.15	0.167	0.167	0.000	649.44	----	0.266
1710	0.000	652.13	0.166	0.166	0.000	649.44	----	0.266
1725	0.000	652.11	0.166	0.166	0.000	649.44	----	0.265
1740	0.000	652.09	0.165	0.165	0.000	649.43	----	0.265
1755	0.000	652.07	0.164	0.164	0.000	649.43	----	0.265
1770	0.000	652.06	0.164	0.164	0.000	649.43	----	0.264
1785	0.000	652.04	0.163	0.163	0.000	649.42	----	0.264
1800	0.000	652.02	0.162	0.162	0.000	649.42	----	0.264
1815	0.000	652.00	0.162	0.162	0.000	649.41	----	0.263
1830	0.000	651.98	0.161	0.161	0.000	649.41	----	0.263

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Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
1845	0.000	651.96	0.160	0.160	0.000	649.41	----	0.262
1860	0.000	651.94	0.160	0.160	0.000	649.40	----	0.262
1875	0.000	651.92	0.159	0.159	0.000	649.40	----	0.262
1890	0.000	651.90	0.158	0.158	0.000	649.39	----	0.261
1905	0.000	651.88	0.157	0.157	0.000	649.39	----	0.261
1920	0.000	651.86	0.157	0.157	0.000	649.39	----	0.260
1935	0.000	651.83	0.156	0.156	0.000	649.38	----	0.260
1950	0.000	651.81	0.155	0.155	0.000	649.38	----	0.259
1965	0.000	651.79	0.155	0.155	0.000	649.37	----	0.259
1980	0.000	651.77	0.154	0.154	0.000	649.37	----	0.259
1995	0.000	651.75	0.153	0.153	0.000	649.37	----	0.258
2010	0.000	651.73	0.152	0.152	0.000	649.36	----	0.258
2025	0.000	651.71	0.152	0.152	0.000	649.36	----	0.257
2040	0.000	651.69	0.151	0.151	0.000	649.35	----	0.257
2055	0.000	651.67	0.150	0.150	0.000	649.35	----	0.256
2070	0.000	651.65	0.150	0.150	0.000	649.34	----	0.256
2085	0.000	651.63	0.149	0.149	0.000	649.34	----	0.256
2100	0.000	651.62	0.148	0.148	0.000	649.34	----	0.255

Continues on next page...

Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
2115	0.000	651.60	0.147	0.147	0.000	649.33	----	0.255
2130	0.000	651.58	0.147	0.147	0.000	649.33	----	0.254
2145	0.000	651.56	0.146	0.146	0.000	649.32	----	0.254
2160	0.000	651.54	0.145	0.145	0.000	649.32	----	0.253
2175	0.000	651.52	0.144	0.144	0.000	649.32	----	0.253
2190	0.000	651.50	0.144	0.144	0.000	649.31	----	0.252
2205	0.000	651.48	0.143	0.143	0.000	649.31	----	0.252
2220	0.000	651.46	0.142	0.142	0.000	649.30	----	0.252
2235	0.000	651.44	0.142	0.142	0.000	649.30	----	0.251
2250	0.000	651.43	0.141	0.141	0.000	649.29	----	0.251
2265	0.000	651.41	0.140	0.140	0.000	649.29	----	0.250
2280	0.000	651.39	0.139	0.139	0.000	649.29	----	0.250
2295	0.000	651.37	0.139	0.139	0.000	649.28	----	0.249
2310	0.000	651.35	0.138	0.138	0.000	649.28	----	0.249
2325	0.000	651.33	0.137	0.137	0.000	649.27	----	0.248
2340	0.000	651.32	0.136	0.136	0.000	649.27	----	0.248
2355	0.000	651.30	0.136	0.136	0.000	649.26	----	0.247
2370	0.000	651.28	0.135	0.135	0.000	649.26	----	0.247

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Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
2385	0.000	651.26	0.134	0.134	0.000	649.26	----	0.246
2400	0.000	651.25	0.134	0.134	0.000	649.25	----	0.246
2415	0.000	651.23	0.133	0.133	0.000	649.25	----	0.245
2430	0.000	651.21	0.132	0.132	0.000	649.24	----	0.245
2445	0.000	651.19	0.131	0.131	0.000	649.24	----	0.244
2460	0.000	651.18	0.131	0.131	0.000	649.23	----	0.244
2475	0.000	651.16	0.130	0.130	0.000	649.23	----	0.243
2490	0.000	651.14	0.129	0.129	0.000	649.22	----	0.243
2505	0.000	651.13	0.129	0.129	0.000	649.22	----	0.242
2520	0.000	651.11	0.128	0.128	0.000	649.22	----	0.242
2535	0.000	651.09	0.127	0.127	0.000	649.21	----	0.241
2550	0.000	651.08	0.126	0.126	0.000	649.21	----	0.241
2565	0.000	651.06	0.126	0.126	0.000	649.20	----	0.240
2580	0.000	651.04	0.125	0.125	0.000	649.20	----	0.240
2595	0.000	651.03	0.124	0.124	0.000	649.19	----	0.239
2610	0.000	651.01	0.123	0.123	0.000	649.19	----	0.239
2625	0.000	650.99	0.123	0.123	0.000	649.18	----	0.238
2640	0.000	650.97	0.122	0.122	0.000	649.18	----	0.238

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Hydrograph Discharge Table

Time (min)	<---- Inflow cfs	Upper Pond Elevation ft	-----> Outflow cfs	<----- Inflow cfs	Other Inflow cfs	Lower Pond Elevation ft	Exfil cfs	-----> Outflow cfs
2655	0.000	650.95	0.121	0.121	0.000	649.18	----	0.237
2670	0.000	650.94	0.120	0.120	0.000	649.17	----	0.237
2685	0.000	650.92	0.119	0.119	0.000	649.17	----	0.236
2700	0.000	650.90	0.118	0.118	0.000	649.16	----	0.236
2715	0.000	650.88	0.117	0.117	0.000	649.16	----	0.235
2730	0.000	650.86	0.117	0.117	0.000	649.15	----	0.235
2745	0.000	650.84	0.116	0.116	0.000	649.15	----	0.234
2760	0.000	650.82	0.115	0.115	0.000	649.14	----	0.234
2775	0.000	650.81	0.114	0.114	0.000	649.14	----	0.233
2790	0.000	650.79	0.113	0.113	0.000	649.13	----	0.233
2805	0.000	650.77	0.112	0.112	0.000	649.13	----	0.232
2820	0.000	650.75	0.111	0.111	0.000	649.13	----	0.232
2835	0.000	650.74	0.111	0.111	0.000	649.12	----	0.231
2850	0.000	650.72	0.110	0.110	0.000	649.12	----	0.231
2865	0.000	650.70	0.109	0.109	0.000	649.11	----	0.230
2880	0.000	650.69	0.000	0.000	0.000	649.11	----	0.230

...End

APPENDIX D

CCG6A/CCG6B/ODOT Maintenance Facility Modeling Data, Maps, and Profiles

5 year, 6 hour Existing

CSO039	OUTFALL	0.000	133.008	0	10:02	0.000	5.736
CSO040	OUTFALL	0.000	0.052	0	22:00	0.000	0.036
KED0074	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
KED0078	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
KED0084	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
KED0094	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
KED0099	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
MC00800	OUTFALL	0.000	1.335	0	01:26	0.000	1.196
MC3B	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
PT11-18	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
PT1118X	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
PT_1-10	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
S21B	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
SOWWTC	OUTFALL	0.000	11.478	0	11:07	0.000	3.932
CVA00002	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
DILLEPS	STORAGE	0.000	0.649	0	01:19	0.000	0.573
I_77	STORAGE	0.000	0.000	0	00:00	0.000	0.000
SAP1050	STORAGE	0.000	0.000	0	00:00	0.000	0.000

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
350000	JUNCTION	8.60	2.685	1.305
DPS1	JUNCTION	20.58	54.980	0.000
SA00080	JUNCTION	19.31	3.361	75.299
SA00082	JUNCTION	19.58	6.501	67.189
SA00085	JUNCTION	19.65	10.519	63.681
SA00090	JUNCTION	19.67	13.124	51.636
SA00095	JUNCTION	15.62	9.427	51.223
SA00100	JUNCTION	14.50	9.116	58.184
SA00105	JUNCTION	14.03	8.544	27.546
SA00107	JUNCTION	15.97	9.771	17.949
SA00110	JUNCTION	9.98	4.083	17.187
SA00115	JUNCTION	0.23	0.091	32.909
SAA0005	JUNCTION	14.47	9.068	57.132
SAA0010	JUNCTION	12.84	7.354	38.256
SAA0015	JUNCTION	11.82	6.223	41.617
SAA0020	JUNCTION	10.31	4.422	53.722
SAA0025	JUNCTION	9.56	3.510	0.000
SAA0030	JUNCTION	9.05	3.040	1.510
SAA0035	JUNCTION	10.72	4.909	2.731
SAA0040	JUNCTION	8.81	2.843	2.817
SAA0044	JUNCTION	6.30	1.957	5.013
SAA0045	JUNCTION	3.67	1.207	4.973
SAA0050	JUNCTION	1.78	0.453	2.977
SAA0055	JUNCTION	0.08	0.042	2.978
SAB0005	JUNCTION	5.81	1.819	0.484
SAL0002	JUNCTION	7.73	2.319	1.311
SAL0005	JUNCTION	2.56	0.746	54.132
SB00045	JUNCTION	20.13	0.291	13.689
SB00050	JUNCTION	20.28	0.670	13.210
SB00065	JUNCTION	20.21	0.528	14.472
SB00068	JUNCTION	20.07	0.370	14.230
SB00070	JUNCTION	0.12	0.031	13.969
SB00073	JUNCTION	19.75	0.017	13.683
SB00080	JUNCTION	20.38	0.504	16.346

SB00081	JUNCTION	20.41	0.544	16.256
SB00082	JUNCTION	20.52	0.915	13.945
SB00085	JUNCTION	20.57	1.116	13.244
SB00090	JUNCTION	20.46	2.282	12.378
SB00095	JUNCTION	20.39	2.789	12.211
SB00099	JUNCTION	20.29	2.586	10.164
SB00100	JUNCTION	20.29	2.624	10.026
SB00105	JUNCTION	19.90	2.032	7.528
SBE0005	JUNCTION	19.93	2.163	7.437
SBE0010	JUNCTION	18.26	0.763	10.537
SC00015	JUNCTION	13.79	6.716	52.114
SC00045	JUNCTION	12.62	4.439	54.371
SC00050	JUNCTION	5.24	1.614	51.766

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

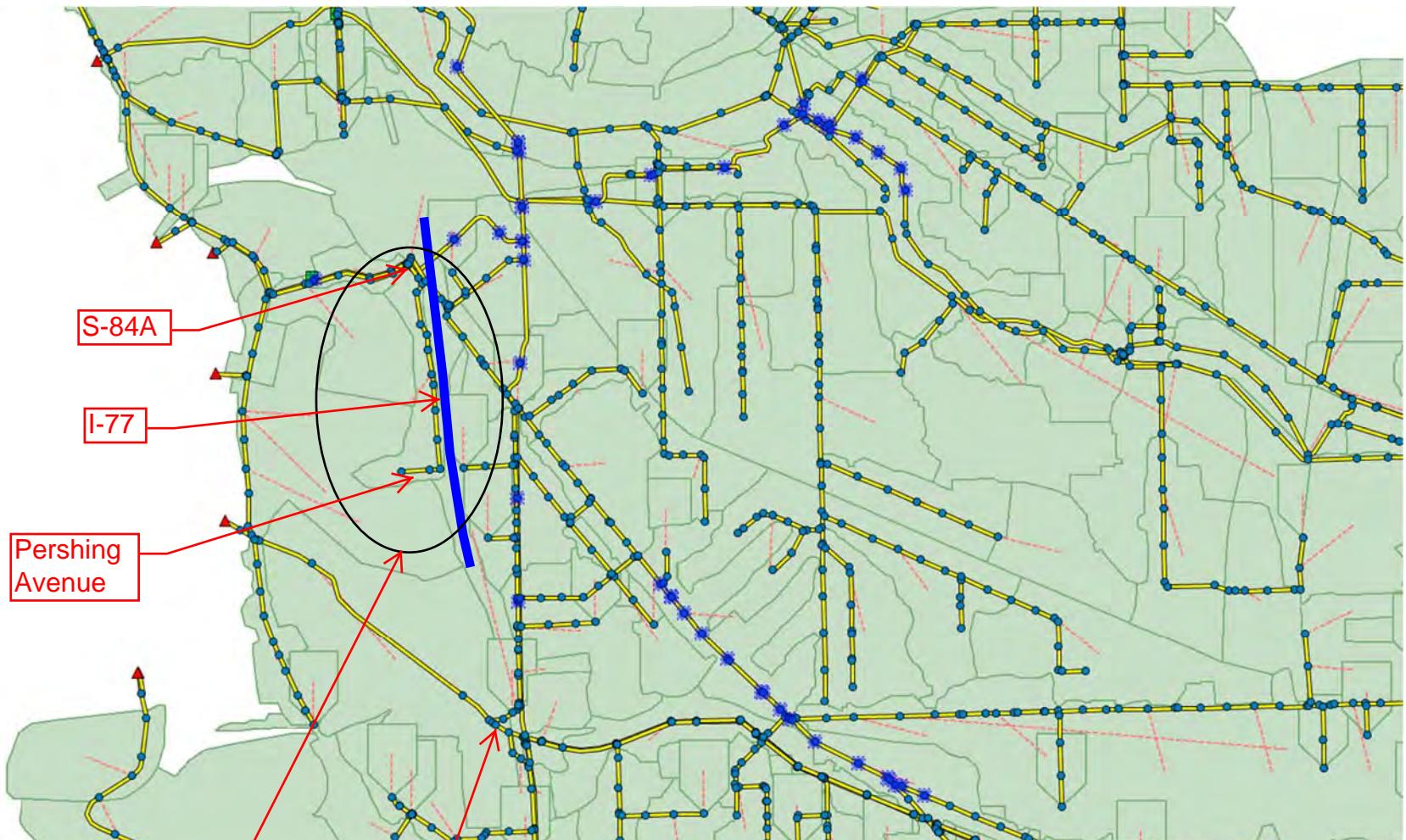
Node	Hours Flooded	Maximum	Time of Max	Total	Maximum
		Rate MGD	Occurrence days hr:min	Flood Volume 10^6 gal	Ponded Depth Feet
DPS1	4.07	1.631	0 10:34	0.034	83.34
SAA0025	1.05	1.006	0 21:44	0.017	8.51

Storage Volume Summary

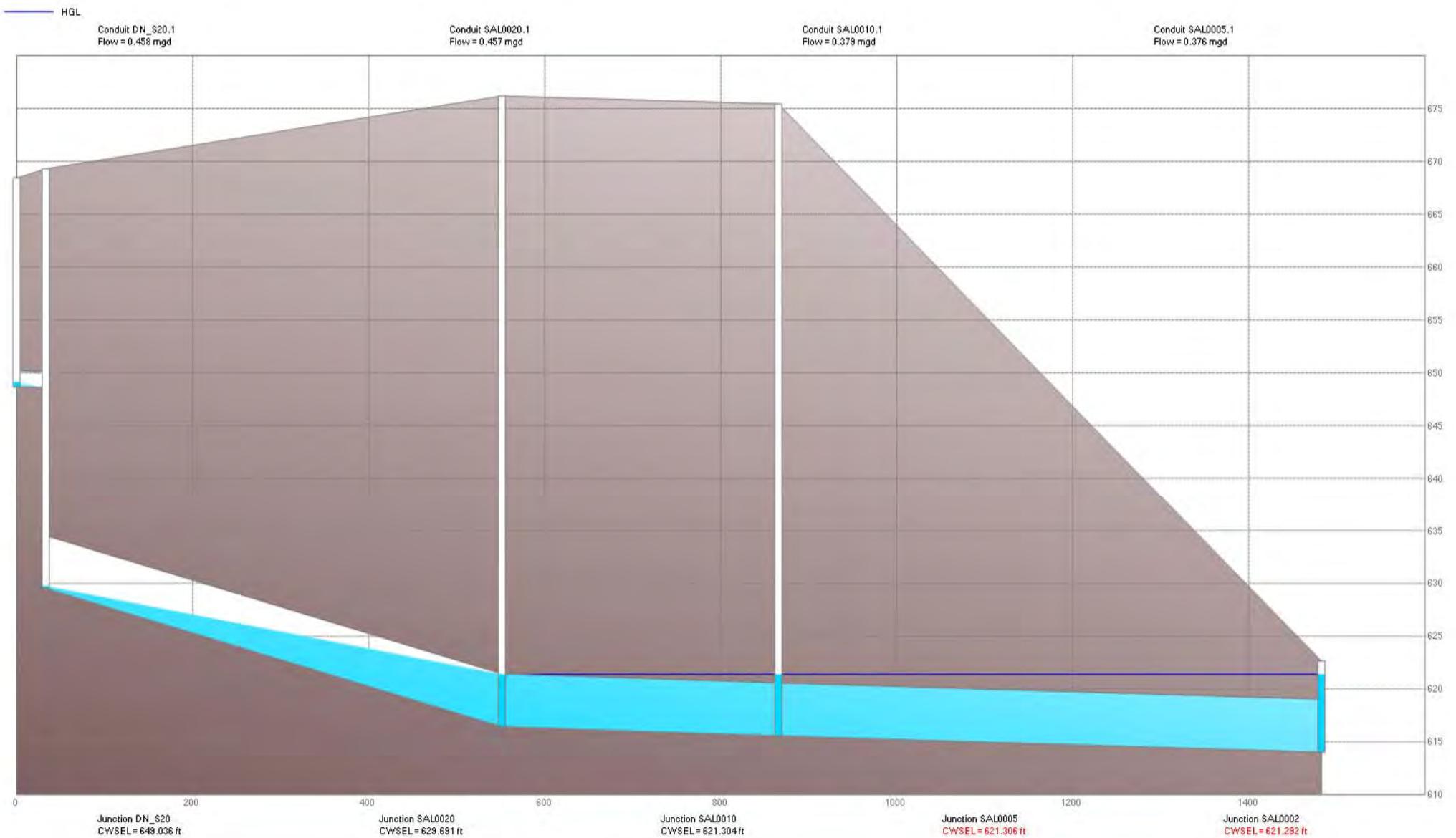
Storage Unit	Average	Avg	E&I	Maximum	Max	Time of Max	Maximum
	Volume 1000 ft3	Pcnt Full	Pcnt Loss	Volume 1000 ft3	Pcnt Full	Occurrence days hr:min	Outflow MGD
DILLEPS	1.346	5	0	2.439	9	0 02:09	2.160
I_77	0.000	0	0	0.000	0	0 00:00	0.000
SAP1050	0.000	0	0	0.000	0	0 00:00	0.000

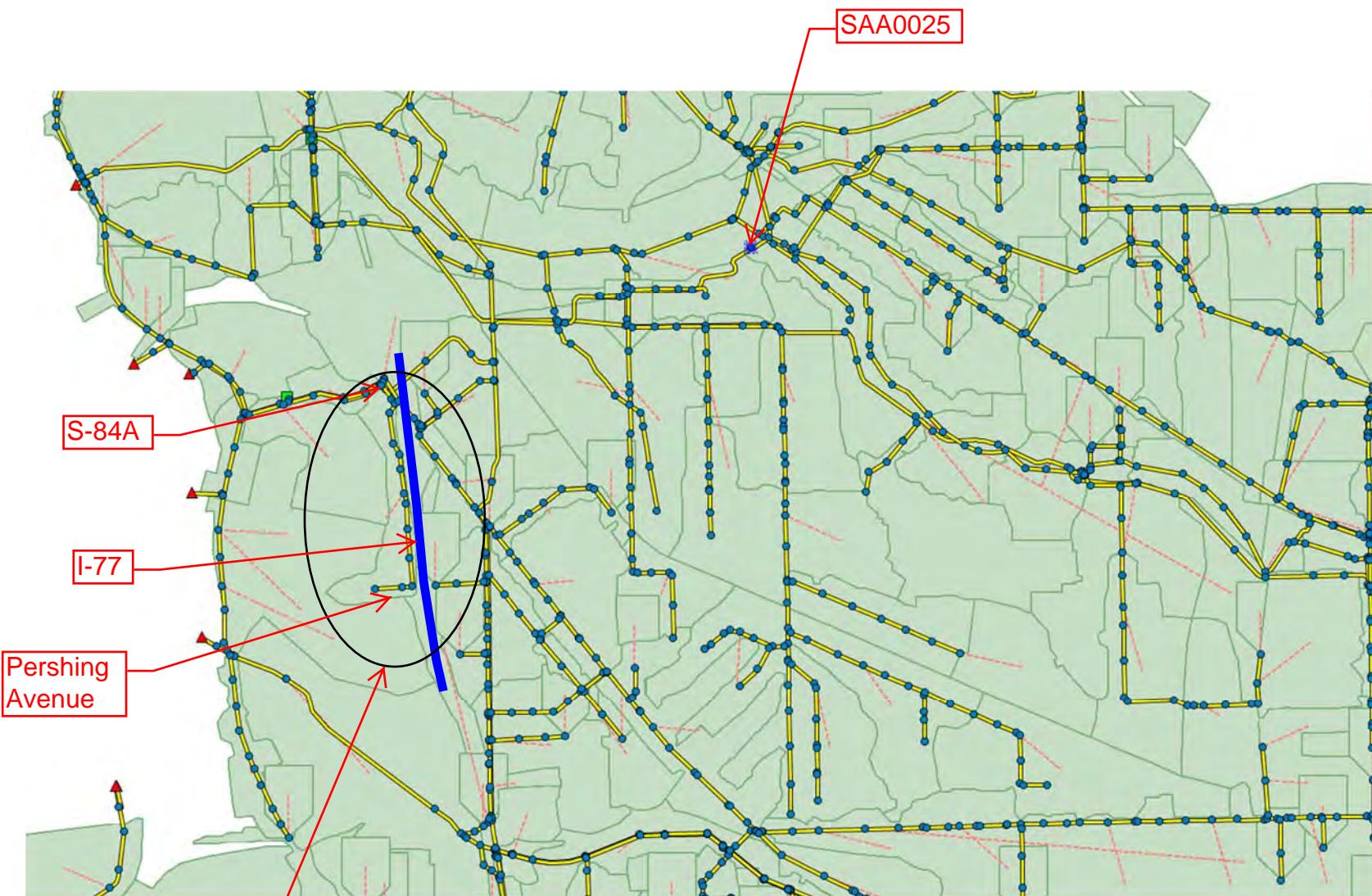
Outfall Loading Summary

Outfall Node	Flow Freq.	Avg. Flow	Max. Flow	Total Volume
	Pcnt.	MGD	MGD	10^6 gal
018	0.00	0.000	0.000	0.000
033	0.00	0.000	0.000	0.000
037	0.00	0.000	0.000	0.000
072	0.00	0.000	0.000	0.000
250	0.00	0.000	0.000	0.000
CSO035A	74.84	0.005	0.005	0.003
CSO035B	74.83	0.004	0.005	0.003
CSO036	97.27	83.209	1076.493	71.311
CSO038	0.00	0.000	0.000	0.000
CSO039	34.66	18.765	133.008	5.736
CSO040	88.64	0.046	0.052	0.036



5 year, 6 hour Existing





5 year, 6 hour Existing Conditions

Flooding Nodes

5 year, 6 hour Proposed

CSO039	OUTFALL	0.000	134.312	0	10:01	0.000	7.219
CSO040	OUTFALL	0.000	0.052	0	22:00	0.000	0.036
KED0074	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
KED0078	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
KED0084	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
KED0094	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
KED0099	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
MC00800	OUTFALL	0.000	1.334	0	01:26	0.000	1.196
MC3B	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
PT11-18	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
PT1118X	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
PT_1-10	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
S21B	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
SOWWTC	OUTFALL	0.000	11.502	0	11:07	0.000	3.947
CVA00002	OUTFALL	0.000	0.000	0	00:00	0.000	0.000
DILLEPS	STORAGE	0.000	0.649	0	01:19	0.000	0.573
I_77	STORAGE	0.000	0.000	0	00:00	0.000	0.000
SAP1050	STORAGE	0.000	0.000	0	00:00	0.000	0.000

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown	Min. Depth Below Rim
350000	JUNCTION	8.93	3.048	0.942
DPS1	JUNCTION	20.58	54.980	0.000
SA00080	JUNCTION	19.45	4.908	73.752
SA00082	JUNCTION	19.61	6.684	67.006
SA00085	JUNCTION	19.68	10.862	63.338
SA00090	JUNCTION	19.69	13.564	51.196
SA00095	JUNCTION	15.85	9.838	50.812
SA00100	JUNCTION	14.83	9.451	57.849
SA00105	JUNCTION	14.24	8.913	27.177
SA00107	JUNCTION	16.15	10.131	17.589
SA00110	JUNCTION	10.17	4.449	16.821
SA00115	JUNCTION	2.27	0.507	32.493
SAA0005	JUNCTION	14.78	9.440	56.760
SAA0010	JUNCTION	13.01	7.706	37.904
SAA0015	JUNCTION	11.99	6.594	41.246
SAA0020	JUNCTION	10.50	4.790	53.354
SAA0025	JUNCTION	9.78	3.873	0.000
SAA0030	JUNCTION	9.32	3.414	1.136
SAA0035	JUNCTION	10.91	5.261	2.379
SAA0040	JUNCTION	9.12	3.209	2.451
SAA0044	JUNCTION	7.65	2.335	4.635
SAA0045	JUNCTION	5.29	1.590	4.590
SAA0050	JUNCTION	3.54	0.835	2.595
SAA0055	JUNCTION	1.93	0.391	2.629
SAB0005	JUNCTION	7.02	2.180	0.123
SAL0002	JUNCTION	8.43	2.692	0.938
SAL0005	JUNCTION	4.27	1.113	53.765
SAL0010	JUNCTION	1.10	0.240	54.520
SB00045	JUNCTION	20.13	0.291	13.689
SB00050	JUNCTION	20.28	0.669	13.211
SB00065	JUNCTION	20.21	0.526	14.474
SB00068	JUNCTION	20.07	0.372	14.228
SB00070	JUNCTION	0.12	0.031	13.969
SB00073	JUNCTION	19.74	0.017	13.683

Additional
Surcharged node
from 5-yr, 6hr
Existing

SB00080	JUNCTION	20.38	0.506	16.344
SB00081	JUNCTION	20.41	0.546	16.254
SB00082	JUNCTION	20.52	0.915	13.945
SB00085	JUNCTION	20.57	1.116	13.244
SB00090	JUNCTION	20.46	2.282	12.378
SB00095	JUNCTION	20.39	2.703	12.297
SB00099	JUNCTION	20.29	2.585	10.165
SB00100	JUNCTION	20.29	2.624	10.026
SB00105	JUNCTION	19.90	2.031	7.529
SBE0005	JUNCTION	19.93	2.166	7.434
SBE0010	JUNCTION	18.26	0.762	10.538
SC00015	JUNCTION	13.84	7.133	51.697
SC00045	JUNCTION	12.82	4.846	53.964
SC00050	JUNCTION	7.66	2.018	51.362

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate MGD	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Depth Feet
DPS1	4.05	1.631	0 16:27	0.034	83.34
SAA0025	2.82	1.260	0 19:14	0.053	8.87

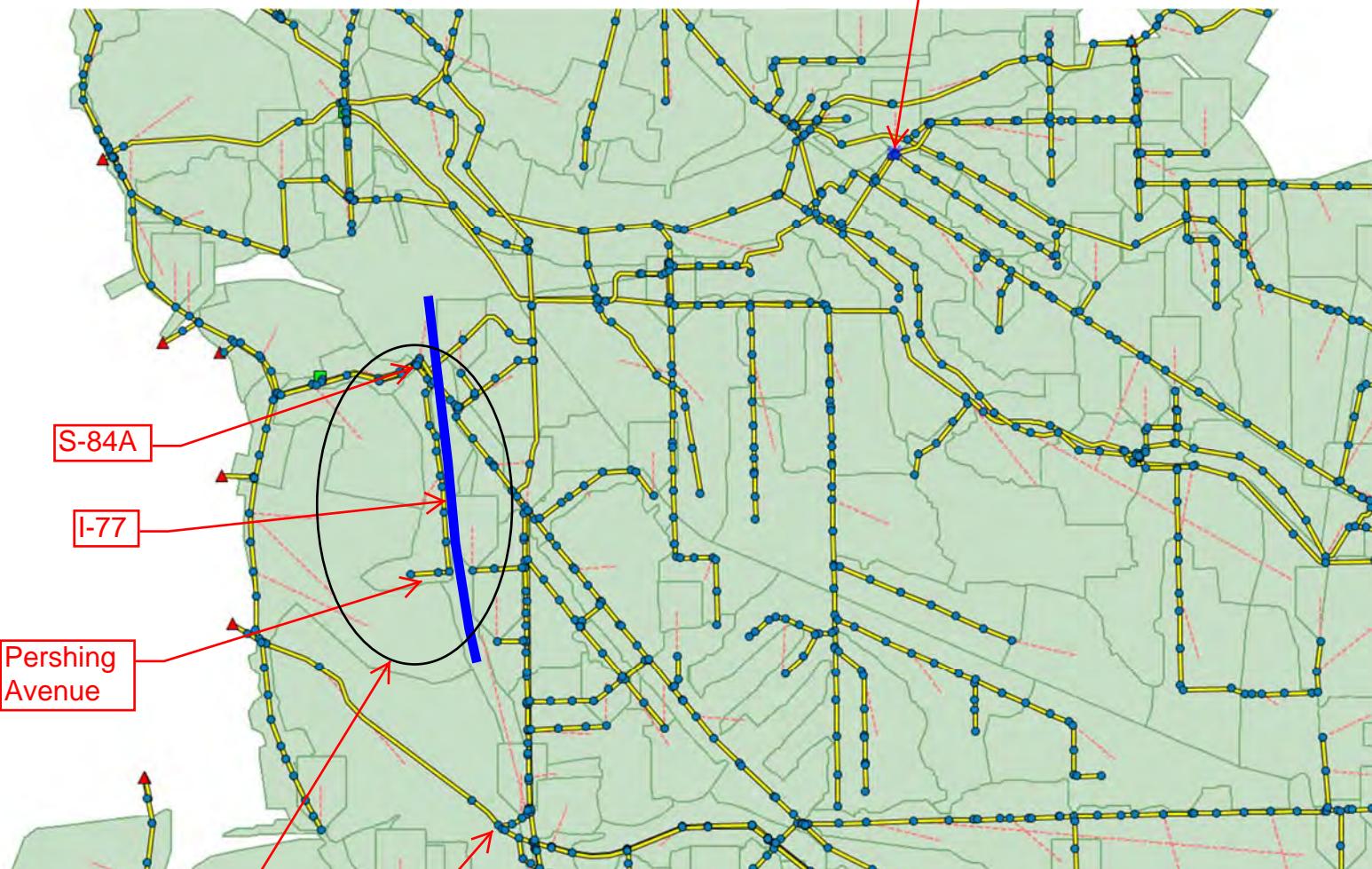
Storage Volume Summary

No additional flooded nodes from 5 year, 6 hour Existing

Storage Unit	Average Volume 1000 ft3	Avg. Pcnt Full	E&I Pcnt	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow MGD
DILLEPS	1.346	5	0	2.440	9	0 02:09	2.160
I_77	0.000	0	0	0.000	0	0 00:00	0.000
SAP1050	0.000	0	0	0.000	0	0 00:00	0.000

Outfall Loading Summary

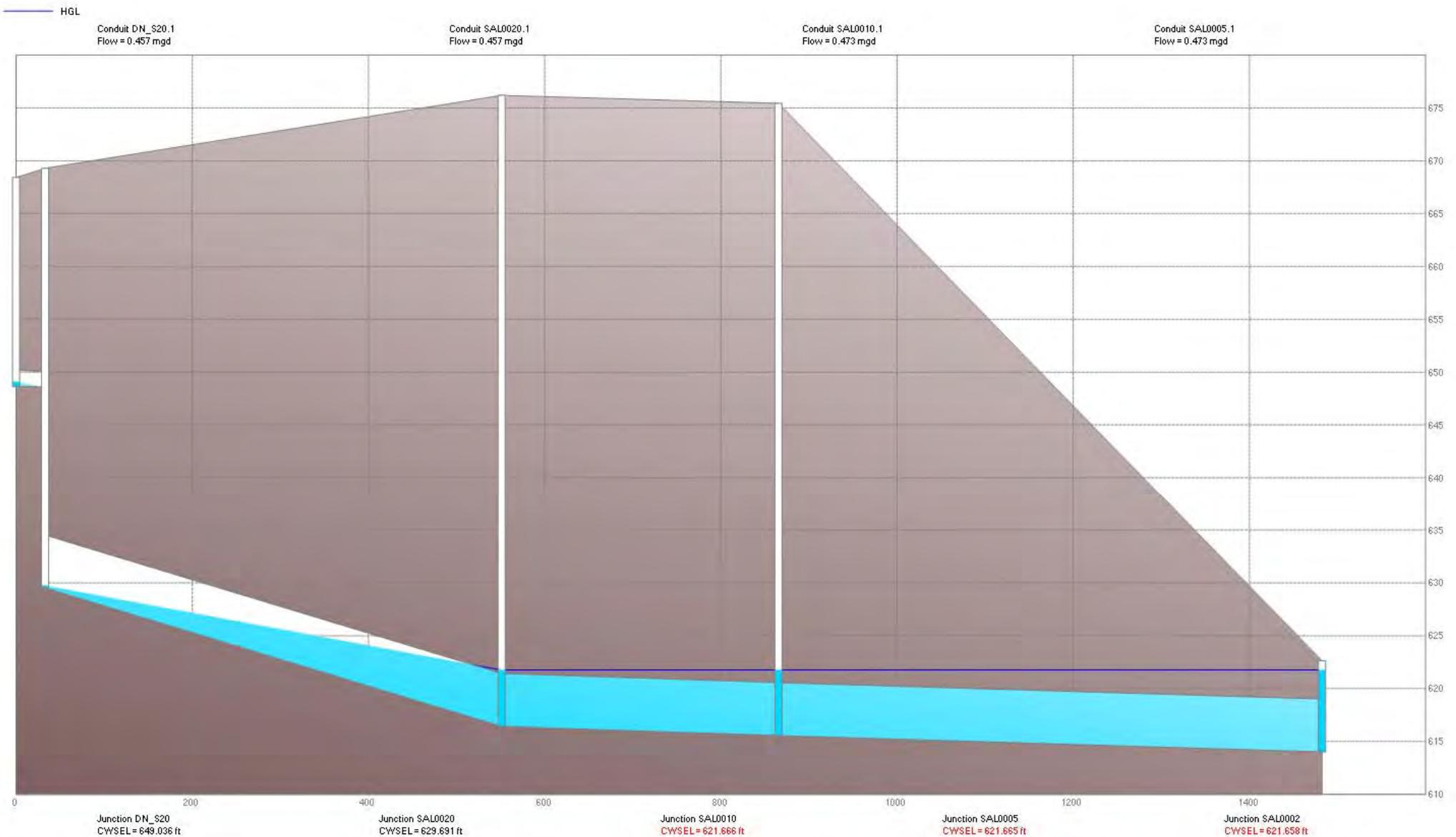
Outfall Node	Flow Freq. Pcnt.	Avg. Flow MGD	Max. Flow MGD	Total Volume 10^6 gal
018	0.00	0.000	0.000	0.000
033	0.00	0.000	0.000	0.000
037	0.00	0.000	0.000	0.000
072	0.00	0.000	0.000	0.000
250	0.00	0.000	0.000	0.000
CSO035A	74.85	0.005	0.005	0.003
CSO035B	74.84	0.004	0.005	0.003
CSO036	99.61	97.600	1092.853	86.187
CSO038	0.00	0.000	0.000	0.000
CSO039	99.54	8.166	134.312	7.219



5 year, 6 hour Proposed Conditions

New Surcharging Nodes

5 year, 6 hour Proposed



APPENDIX E
I-77 ODOT Trunk Line Analysis

I-77 ODOT Trunk line Drainage Analysis | CCG6A/CCG6B and Cleveland FSMF

May 23, 2016

CDSS Model 1: Analysis of Existing I-77 trunk line for existing conditions

The existing 42" trunkline located in the median of I-77 was analyzed based on the drainage areas shown in the attached area map. The attached CDSS calculations indicate that the entire system performs with no surcharge of stormwater for a 25 yr rainfall event. However, there are 9 pipe runs that function under capacity for the 10 yr event as depicted in the CDSS calculations. Models 1-3 tie in the NEORSD Morgana Run (CSO036AA010) outfall at node 14.

For all four models, using FHWA HEC-22 Table 7-3 (Page 7-9) methodology, a 5 yr event was used for the tailwater elevation conditions, based on the 100:1 order of magnitude drainage area ratio between Morgana Run (2400 acres) and the I-77 system (18 acres).

CDSS Model 2: Analysis of Existing I-77 trunk line for proposed conditions

This CDSS model includes the 10 yr peak flow of 0.7 cfs contributed from the CCG6A project (provided by Richland Engineering on 5/11/16) upstream of the existing 42" trunkline system as well as the proposed CCG6B flows entering the existing system just north of Pershing Avenue, indicated as "SWO flows" on the three-page CCG6B Preliminary Drainage Area Concept contained herein. Analysis of the existing 42" trunkline for the proposed conditions based on the attached drainage area map reveals that the slight increase in the 25 yr peak flow has a minimal impact on the hydraulic grade line. The system still functions with no flooding. The 9 pipe runs that function under capacity for this model are the same as the existing conditions. A 50 yr hydraulic grade line at the low point located close to the beginning of the run was checked for flooding. The results included herein indicate that the system functions with no flooding.

CDSS Model 3: Analysis of existing I-77 trunk line with added peak flow from the Maintenance Facility

In addition to the proposed flows in CDSS Model 2, this model includes the 10 yr peak flow (obtained from the GPD Group Storm Report) contributed from the proposed Cleveland Full Service Maintenance Facility. As reported in the Storm Report, a 10 yr peak flow of 30.8 cfs was added to the CDSS model at node 12. The results of the model show that there is a significant impact on the hydraulic grade line but the entire 42" trunkline still functions with no flooding. However, the system experiences flooding when a 50 yr hydraulic grade line was checked at the low point.

CDSS Model 4: Analysis of existing I-77 trunk line with added peak flow from the maintenance facility and installation of new trunkline system downstream of the maintenance facility.

This CDSS model indicates that a new 48" storm trunkline is required downstream of the maintenance facility to minimize the adverse hydraulic grade line impacts caused by the addition of 30.8 cfs contributed from the maintenance facility. The system functions with no surcharge for a 50 yr hydraulic grade line at the low point. This model ties to the NEORSD Morgana Run (CSO036AA005) outfall at node 16. The system functions with no surcharge for a 50 yr hydraulic grade line at the low point. The new 48" storm pipe will run under the existing 48"/60" storm sewer in order to avoid crossing conflicts. This connection is feasible since node 16 (CSO36AA005) is approximately 50 feet deep.



CDSS MODEL 1

STORM SEWER SYSTEM

PID : 82388

Date : 05/05/2016 Project : CUY-77-13.80

Location : Cleveland, OH

Description : Existing 42" : Pershing Ave to Morgana Run-Existing Conditions

Designer : AK

Rainfall Area: A

Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 25

Minimum Pipe Size : 0.00

Tailwater Elevation (ft.): 642.80

JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE		
From	To	From	To	Σ AREA (acres)	Σ CA	TIME (min.)	INTENSITY (10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	IN / OUT (ft.)	VEL (fps.)	CAPACITY (cfs.)	SLOPE (ft./ft.)	IN / OUT (ft.)	IN / OUT (ft.)	MINUS HY GR	MINUS CROWN	'n'
1	2	48+92	2.81	2.25	15.00	4.13	3.21	9.3	7.2	30	280.0	0.0011	651.47	2.67	12.72	0.0004	655.29	660.85	5.56	6.88	MH 3	
begin		46+12	2.81	2.25									651.16				655.18	660.04			0.015	
2	3	46+12	1.93	1.54	16.75	3.91	3.21	14.8	12.2	30	45.0	0.0011	651.16	3.02	12.75	0.0012	655.18	660.04	4.86	6.38	MH 3	
		199+75	4.74	3.79									651.11				655.12	660.36			0.015	
3	4	199+75	1.39	1.06	17.00	3.88	3.21	18.8	15.6	36	289.0	0.0009	651.11	2.66	18.29	0.0007	655.12	660.36	5.24	6.25	MH 3	
		196+86	6.13	4.85									650.86				654.91	662.61			0.015	
4	5	196+86	2.04	1.61	18.81	3.68	3.21	23.8	20.8	36	200.0	0.0032	650.86	5.08	35.45	0.0013	654.91	662.61	7.70	8.75	MH 3	
		194+86	8.17	6.46									650.21				654.66	665.78			0.015	
5	6	194+86	1.80	1.44	19.46	3.61	3.21	28.5	25.4	42	200.0	0.0006	650.21	2.97	22.98	0.0008	654.66	665.78	11.12	12.07	MH 3	
		192+86	9.97	7.90									650.09				654.49	670.65			0.015	
6	7	192+86	0.34	0.29	20.59	3.51	3.21	28.7	26.3	42	300.0	0.0003	650.09	2.98	17.12	0.0009	654.49	670.65	16.16	17.06	MH 3	
		189+86	10.31	8.19									649.99				654.21	676.30			0.015	
7	8	189+86	0.50	0.43	22.26	3.36	3.21	28.9	27.7	42	286.0	0.0003	649.99	3.01	17.54	0.0010	654.21	676.30	22.09	22.81	MH 3	
		187+00	10.81	8.62									649.89				653.93	678.67			0.015	
8	9	187+00	0.58	0.50	23.85	3.23	3.21	29.4	29.3	42	300.0	0.0016	649.89	4.03	37.13	0.0011	653.93	678.67	24.74	25.28	MH 3	
		184+00	11.39	9.12									649.42				653.59	680.29			0.015	



STORM SEWER SYSTEM

JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST	FULL	FRICt	HYGR EL.	COVER	COVER	COVER	INLET TYPE
From	To	From	To	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S 'n'	
				(acres)	(min.)	(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	HY GR	CROWN	
9	10	184+00	1.44	1.20	25.09	3.13	3.21	32.3	33.2	42	250.0	0.0020	649.42	4.53	41.95	0.0014	653.59	680.29	26.70	27.37	MH 3 0.015
		181+50	12.83	10.31									648.92				653.23	681.71			
10	11	181+50	0.96	0.80	26.01	3.07	3.21	34.1	35.7	42	325.0	0.0010	648.92	3.54	30.34	0.0017	653.23	681.71	28.48	29.29	MH 4 0.015
		178+25	13.79	11.11						Warning			648.58				652.68	683.63			
11	12	178+25	0.93	0.82	27.54	2.96	3.21	35.4	38.3	42	287.0	0.0008	648.58	3.68	26.55	0.0019	652.68	683.63	30.95	31.55	MH 3 0.015
		175+50	14.72	11.93						Warning			648.35				652.13	664.42			
12	13	175+50	0.88	0.70	28.84	2.88	3.21	36.4	40.6	42	234.0	0.0010	648.35	3.79	29.41	0.0022	652.13	664.42	12.29	12.57	MH 3 0.015
		173+30	15.60	12.63						Warning			648.12				651.62	682.90			
13	14	173+30	0.95	0.86	29.87	2.82	3.21	38.1	43.4	42	251.0	0.0010	648.12	3.96	30.19	0.0025	651.62	682.90	31.28	31.28	MH 3 0.015
	final	170+79	16.55	13.49						Warning			647.86				650.64	680.00			



CDSS MODEL 2

STORM SEWER SYSTEM

PID : 82388

Date : 05/05/2016 Project : CUY-77-13.80

Location : Cleveland, OH

Description : Existing 42" : Pershing Ave to Morgana Run-Proposed Conditions

Designer : AK

Rainfall Area: A

Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 25

Minimum Pipe Size : 0.00

Tailwater Elevation (ft.): 642.80

JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE		
From	To	From	To	Σ AREA (acres)	Σ CA	TIME (min.)	INTENSITY (10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	IN / OUT (ft.)	VEL (fps.)	CAPACITY (cfs.)	SLOPE (ft./ft.)	IN / OUT (ft.)	IN / OUT (ft.)	MINUS HY GR	MINUS CROWN	MANNING'S 'n'
1	2	48+92	3.46	2.74	15.00	4.13	3.32	11.3	9.1	30	280.0	0.0011	651.47	2.74	12.72	0.0007	656.59	660.85	4.26	6.88	MH 3	
begin		46+12	3.46	2.74									651.16				656.40	660.04			0.015	
2	3	46+12	2.47	1.98	16.70	3.92	3.32	18.5	15.7	30	45.0	0.0011	651.16	3.76	12.75	0.0019	656.40	660.04	3.64	6.38	MH 3	
		199+75	5.93	4.72									651.11				656.32	660.36			0.015	
3	4	199+75	1.62	1.25	16.90	3.89	3.32	23.2	19.8	36	289.0	0.0009	651.11	3.28	18.29	0.0012	656.32	660.36	4.04	6.25	MH 3	
		196+86	7.55	5.96									650.86				655.98	662.61			0.015	
4	5	196+86	2.04	1.61	18.37	3.73	3.32	28.2	25.1	36	200.0	0.0032	650.86	5.24	35.45	0.0019	655.98	662.61	6.63	8.75	MH 3	
		194+86	9.59	7.57									650.21				655.60	665.78			0.015	
5	6	194+86	1.80	1.44	19.00	3.66	3.32	33.0	29.9	42	200.0	0.0006	650.21	3.43	22.98	0.0012	655.60	665.78	10.18	12.07	MH 3	
		192+86	11.39	9.01									650.09				655.36	670.65			0.015	
6	7	192+86	0.34	0.29	19.98	3.56	3.32	33.2	30.9	42	300.0	0.0003	650.09	3.45	17.12	0.0013	655.36	670.65	15.29	17.06	MH 3	
		189+86	11.73	9.30									649.99				654.99	676.30			0.015	
7	8	189+86	0.50	0.43	21.43	3.43	3.32	33.4	32.3	42	286.0	0.0003	649.99	3.47	17.54	0.0014	654.99	676.30	21.31	22.81	MH 3	
		187+00	12.23	9.73									649.89				654.60	678.67			0.015	
8	9	187+00	0.58	0.50	22.80	3.31	3.32	33.9	34.0	42	300.0	0.0016	649.89	4.09	37.13	0.0015	654.60	678.67	24.07	25.28	MH 3	
		184+00	12.81	10.23									649.42				654.14	680.29			0.015	



STORM SEWER SYSTEM

JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST FULL	FRICt	HYGR EL.	COVER	COVER	COVER	INLET TYPE		
From	To	From	To	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S 'n'		
				(acres)	(min.)	(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	HY GR	CROWN		
9	10	184+00		1.44	1.20	24.02	3.21	3.32	36.7	37.9	42	250.0	0.0020	649.42	4.61	41.95	0.0019	654.14	680.29	26.15	27.37	MH 3
		181+50		14.25	11.43									648.92				653.67	681.71			0.015
10	11	181+50		0.96	0.80	24.93	3.15	3.32	38.4	40.6	42	325.0	0.0010	648.92	4.00	30.34	0.0022	653.67	681.71	28.04	29.29	MH 4
		178+25		15.21	12.22									648.58				652.97	683.63			0.015
11	12	178+25		0.93	0.82	26.28	3.05	3.32	39.8	43.3	42	287.0	0.0008	648.58	4.13	26.55	0.0025	652.97	683.63	30.66	31.55	MH 3
		175+50		16.14	13.04									648.35				652.26	664.42			0.015
12	13	175+50		0.88	0.70	27.44	2.97	3.32	40.8	45.6	42	234.0	0.0010	648.35	4.25	29.41	0.0027	652.26	664.42	12.16	12.57	MH 3
		173+30		17.02	13.75									648.12				651.62	682.90			0.015
13	14	173+30		0.95	0.86	28.36	2.91	3.32	42.5	48.5	42	251.0	0.0010	648.12	4.42	30.19	0.0031	651.62	682.90	31.28	31.28	MH 3
	final	170+79		17.97	14.60									647.86				650.70	680.00			0.015



CDSS MODEL 2

STORM SEWER SYSTEM

PID : 82388

Date : 05/05/2016 Project : CUY-77-13.80

Location : Cleveland, OH

Description : Existing 42" : Pershing Ave to Morgana Run-Proposed Conditions

Designer : AK

Rainfall Area: A

Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 50

Minimum Pipe Size : 0.00

Tailwater Elevation (ft.): 642.80

JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE		
From	To	From	To	Σ AREA (acres)	Σ CA	TIME (min.)	INTENSITY (10 yrs.)	(50 yrs.)	(10 yrs.)	(50 yrs.)	DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	IN / OUT (ft.)	VEL (fps.)	CAPACITY (cfs.)	SLOPE (ft./ft.)	IN / OUT (ft.)	IN / OUT (ft.)	MINUS HY GR	MINUS CROWN	MANNING'S 'n'
1	2	48+92	3.46	2.74	15.00	4.13	3.67	11.3	10.0	30	280.0	0.0011	651.47	2.74	12.72	0.0008	657.76	660.85	3.09	6.88	MH 3	
begin		46+12	3.46	2.74									651.16				657.54	660.04			0.015	
2	3	46+12	2.47	1.98	16.70	3.92	3.67	18.5	17.3	30	45.0	0.0011	651.16	3.76	12.75	0.0024	657.54	660.04	2.50	6.38	MH 3	
		199+75	5.93	4.72									651.11				657.43	660.36			0.015	
3	4	199+75	1.62	1.25	16.90	3.89	3.67	23.2	21.9	36	289.0	0.0009	651.11	3.28	18.29	0.0014	657.43	660.36	2.93	6.25	MH 3	
		196+86	7.55	5.96									650.86				657.02	662.61			0.015	
4	5	196+86	2.04	1.61	18.37	3.73	3.67	28.2	27.8	36	200.0	0.0032	650.86	5.24	35.45	0.0023	657.02	662.61	5.59	8.75	MH 3	
		194+86	9.59	7.57									650.21				656.56	665.78			0.015	
5	6	194+86	1.80	1.44	19.00	3.66	3.67	33.0	33.1	42	200.0	0.0006	650.21	3.43	22.98	0.0014	656.56	665.78	9.22	12.07	MH 3	
		192+86	11.39	9.01									650.09				656.27	670.65			0.015	
6	7	192+86	0.34	0.29	19.98	3.56	3.67	33.2	34.1	42	300.0	0.0003	650.09	3.45	17.12	0.0015	656.27	670.65	14.38	17.06	MH 3	
		189+86	11.73	9.30									649.99				655.81	676.30			0.015	
7	8	189+86	0.50	0.43	21.43	3.43	3.67	33.4	35.7	42	286.0	0.0003	649.99	3.47	17.54	0.0017	655.81	676.30	20.49	22.81	MH 3	
		187+00	12.23	9.73									649.89				655.33	678.67			0.015	
8	9	187+00	0.58	0.50	22.80	3.31	3.67	33.9	37.5	42	300.0	0.0016	649.89	4.09	37.13	0.0018	655.33	678.67	23.34	25.28	MH 3	
		184+00	12.81	10.23									649.42				654.78	680.29			0.015	



STORM SEWER SYSTEM

JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST FULL	FRICt	HYGR EL.	COVER	COVER	COVER	INLET TYPE		
From	To	From	To	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S 'n'		
				(acres)	(min.)	(10 yrs.)	(50 yrs.)	(10 yrs.)	(50 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	HY GR	CROWN		
9	10	184+00		1.44	1.20	24.02	3.21	3.67	36.7	41.9	42	250.0	0.0020	649.42	4.61	41.95	0.0023	654.78	680.29	25.51	27.37	MH 3
		181+50		14.25	11.43									648.92				654.20	681.71			0.015
10	11	181+50		0.96	0.80	24.93	3.15	3.67	38.4	44.8	42	325.0	0.0010	648.92	4.00	30.34	0.0026	654.20	681.71	27.51	29.29	MH 4
		178+25		15.21	12.22									648.58				653.34	683.63			0.015
11	12	178+25		0.93	0.82	26.28	3.05	3.67	39.8	47.8	42	287.0	0.0008	648.58	4.13	26.55	0.0030	653.34	683.63	30.29	31.55	MH 3
		175+50		16.14	13.04									648.35				652.48	664.42			0.015
12	13	175+50		0.88	0.70	27.44	2.97	3.67	40.8	50.4	42	234.0	0.0010	648.35	4.25	29.41	0.0033	652.48	664.42	11.94	12.57	MH 3
		173+30		17.02	13.75									648.12				651.70	682.90			0.015
13	14	173+30		0.95	0.86	28.36	2.91	3.67	42.5	53.5	42	251.0	0.0010	648.12	4.42	30.19	0.0038	651.70	682.90	31.20	31.28	MH 3
	final	170+79		17.97	14.60									647.86				650.75	680.00			0.015



CDSS MODEL 3

STORM SEWER SYSTEM

PID : 82388

Date : 05/05/2016 Project : CUY-77-13.80

Location : Cleveland, OH

Description : Existing 42" : Pershing Ave to Morgana Run-Proposed-Garage Flow to Ex. 42"

Designer : AK

Rainfall Area: A

Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 25

Minimum Pipe Size : 0.00

Tailwater Elevation (ft.): 642.80

JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE		
From	To	From	To	Σ AREA (acres)	Σ CA	TIME (min.)	INTENSITY (10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	IN / OUT (ft.)	VEL (fps.)	CAPACITY (cfs.)	SLOPE (ft./ft.)	IN / OUT (ft.)	IN / OUT (ft.)	MINUS HY GR	MINUS CROWN	MANNING'S 'n'
1	2	48+92	3.46	2.74	15.00	4.13	3.37	11.3	9.2	30	280.0	0.0011	651.47	2.74	12.72	0.0007	659.96	660.85	0.89	6.88	MH 3	
begin		46+12	3.46	2.74									651.16				659.77	660.04			0.015	
2	3	46+12	2.47	1.98	16.70	3.92	3.37	18.5	15.9	30	45.0	0.0011	651.16	3.76	12.75	0.0020	659.77	660.04	0.27	6.38	MH 3	
		199+75	5.93	4.72									651.11				659.68	660.36			0.015	
3	4	199+75	1.62	1.25	16.90	3.89	3.37	23.2	20.1	36	289.0	0.0009	651.11	3.28	18.29	0.0012	659.68	660.36	0.68	6.25	MH 3	
		196+86	7.55	5.96									650.86				659.33	662.61			0.015	
4	5	196+86	2.04	1.61	18.37	3.73	3.37	28.2	25.6	36	200.0	0.0032	650.86	5.24	35.45	0.0020	659.33	662.61	3.28	8.75	MH 3	
		194+86	9.59	7.57									650.21				658.94	665.78			0.015	
5	6	194+86	1.80	1.44	19.00	3.66	3.37	33.0	30.4	42	200.0	0.0006	650.21	3.43	22.98	0.0012	658.94	665.78	6.84	12.07	MH 3	
		192+86	11.39	9.01									650.09				658.69	670.65			0.015	
6	7	192+86	0.34	0.29	19.98	3.56	3.37	33.2	31.4	42	300.0	0.0003	650.09	3.45	17.12	0.0013	658.69	670.65	11.96	17.06	MH 3	
		189+86	11.73	9.30									649.99				658.31	676.30			0.015	
7	8	189+86	0.50	0.43	21.43	3.43	3.37	33.4	32.8	42	286.0	0.0003	649.99	3.47	17.54	0.0014	658.31	676.30	17.99	22.81	MH 3	
		187+00	12.23	9.73									649.89				657.90	678.67			0.015	
8	9	187+00	0.58	0.50	22.80	3.31	3.37	33.9	34.5	42	300.0	0.0016	649.89	4.09	37.13	0.0016	657.90	678.67	20.77	25.28	MH 3	
		184+00	12.81	10.23									649.42				657.43	680.29			0.015	



STORM SEWER SYSTEM

JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST FULL	FRICt	HYGR EL.	COVER	COVER	COVER	INLET TYPE		
From	To	From	To	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S 'n'		
				(acres)	(min.)	(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	HY GR	CROWN		
9	10	184+00		1.44	1.20	24.02	3.21	3.37	36.7	38.6	42	250.0	0.0020	649.42	4.61	41.95	0.0020	657.43	680.29	22.86	27.37	MH 3
		181+50		14.25	11.43									648.92				656.94	681.71			0.015
10	11	181+50		0.96	0.80	24.93	3.15	3.37	38.4	41.2	42	325.0	0.0010	648.92	4.00	30.34	0.0022	656.94	681.71	24.77	29.29	MH 4
		178+25		15.21	12.22									648.58				656.22	683.63			0.015
11	12	178+25		0.93	0.82	26.28	3.05	3.37	39.8	44.0	42	287.0	0.0008	648.58	4.13	26.55	0.0025	656.22	683.63	27.41	31.55	MH 3
		175+50		16.14	13.04									648.35				655.49	664.42			0.015
12	13	175+50		16.88	11.26	27.44	2.97	3.37	72.2	82.0	42	234.0	0.0010	648.35	7.51	29.41	0.0088	655.49	664.42	8.93	12.57	MH 3
		173+30		33.02	24.31									648.12				653.42	682.90			0.015
13	14	173+30		0.95	0.86	27.96	2.94	3.37	73.9	84.9	42	251.0	0.0010	648.12	7.68	30.19	0.0095	653.42	682.90	29.48	31.28	MH 3
	final	170+79		33.97	25.16									647.86				651.05	680.00			0.015



CDSS MODEL 3

STORM SEWER SYSTEM

PID : 82388

Date : 05/05/2016 Project : CUY-77-13.80

Location : Cleveland, OH

Description : Existing 42" : Pershing Ave to Morgana Run-Proposed-Garage Flow to Ex. 42"

Designer : AK

Rainfall Area: A

Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 50

Minimum Pipe Size : 0.00

Tailwater Elevation (ft.): 642.80

JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE		
From	To	From	To	Σ AREA (acres)	Σ CA	TIME (min.)	INTENSITY (10 yrs.)	(50 yrs.)	(10 yrs.)	(50 yrs.)	DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	IN / OUT (ft.)	VEL (fps.)	CAPACITY (cfs.)	SLOPE (ft./ft.)	IN / OUT (ft.)	IN / OUT (ft.)	MINUS HY GR	MINUS CROWN	MANNING'S 'n'
1	2	48+92	3.46	2.74	15.00	4.13	3.73	11.3	10.2	30	280.0	0.0011	651.47	2.74	12.72	0.0008	661.97	660.85	-1.12	6.88	MH 3	
begin		46+12	3.46	2.74									651.16				661.74	660.04			0.015	
2	3	46+12	2.47	1.98	16.70	3.92	3.73	18.5	17.6	30	45.0	0.0011	651.16	3.76	12.75	0.0024	661.74	660.04	-1.70	6.38	MH 3	
		199+75	5.93	4.72									651.11				661.63	660.36			0.015	
3	4	199+75	1.62	1.25	16.90	3.89	3.73	23.2	22.2	36	289.0	0.0009	651.11	3.28	18.29	0.0015	661.63	660.36	-1.27	6.25	MH 3	
		196+86	7.55	5.96									650.86				661.21	662.61			0.015	
4	5	196+86	2.04	1.61	18.37	3.73	3.73	28.2	28.2	36	200.0	0.0032	650.86	5.24	35.45	0.0024	661.21	662.61	1.40	8.75	MH 3	
		194+86	9.59	7.57									650.21				660.73	665.78			0.015	
5	6	194+86	1.80	1.44	19.00	3.66	3.73	33.0	33.6	42	200.0	0.0006	650.21	3.43	22.98	0.0015	660.73	665.78	5.05	12.07	MH 3	
		192+86	11.39	9.01									650.09				660.43	670.65			0.015	
6	7	192+86	0.34	0.29	19.98	3.56	3.73	33.2	34.7	42	300.0	0.0003	650.09	3.45	17.12	0.0016	660.43	670.65	10.22	17.06	MH 3	
		189+86	11.73	9.30									649.99					659.96	676.30			0.015
7	8	189+86	0.50	0.43	21.43	3.43	3.73	33.4	36.3	42	286.0	0.0003	649.99	3.47	17.54	0.0017	659.96	676.30	16.34	22.81	MH 3	
		187+00	12.23	9.73									649.89					659.47	678.67			0.015
8	9	187+00	0.58	0.50	22.80	3.31	3.73	33.9	38.1	42	300.0	0.0016	649.89	4.09	37.13	0.0019	659.47	678.67	19.20	25.28	MH 3	
		184+00	12.81	10.23									649.42					658.89	680.29			0.015



STORM SEWER SYSTEM

JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST FULL	FRICt	HYGR EL.	COVER	COVER	COVER	INLET TYPE		
From	To	From	To	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S 'n'		
				(acres)	(min.)	(10 yrs.)	(50 yrs.)	(10 yrs.)	(50 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	HY GR	CROWN		
9	10	184+00		1.44	1.20	24.02	3.21	3.73	36.7	42.6	42	250.0	0.0020	649.42	4.61	41.95	0.0024	658.89	680.29	21.40	27.37	MH 3
		181+50		14.25	11.43									648.92				658.30	681.71			0.015
10	11	181+50		0.96	0.80	24.93	3.15	3.73	38.4	45.5	42	325.0	0.0010	648.92	4.00	30.34	0.0027	658.30	681.71	23.41	29.29	MH 4
		178+25		15.21	12.22									648.58				657.41	683.63			0.015
11	12	178+25		0.93	0.82	26.28	3.05	3.73	39.8	48.6	42	287.0	0.0008	648.58	4.13	26.55	0.0031	657.41	683.63	26.22	31.55	MH 3
		175+50		16.14	13.04									648.35				656.52	664.42			0.015
12	13	175+50		16.88	11.26	27.44	2.97	3.73	72.2	90.5	42	234.0	0.0010	648.35	7.51	29.41	0.0108	656.52	664.42	7.90	12.57	MH 3
		173+30		33.02	24.31									648.12				654.00	682.90			0.015
13	14	173+30		0.95	0.86	27.96	2.94	3.73	73.9	93.7	42	251.0	0.0010	648.12	7.68	30.19	0.0115	654.00	682.90	28.90	31.28	MH 3
	final	170+79		33.97	25.16									647.86				651.11	680.00			0.015



CDSS MODEL 4

STORM SEWER SYSTEM

PID : 82388

Date : 05/05/2016 Project : CUY-77-13.80

Location : Cleveland, OH

Description : Existing 42" : Pershing Ave to Morgana Run-Proposed-Garage flow to CSO036AA005

Designer : AK

Rainfall Area: A

Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 25

Minimum Pipe Size : 0.00

Tailwater Elevation (ft.): 635.44

JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE		
From	To	From	To	Σ AREA (acres)	Σ CA	TIME (min.)	INTENSITY (10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	DIAM. (in.)	LENGTH (ft.)	SLOPE (ft./ft.)	IN / OUT (ft.)	VEL (fps.)	CAPACITY (cfs.)	SLOPE (ft./ft.)	IN / OUT (ft.)	IN / OUT (ft.)	MINUS HY GR	MINUS CROWN	MANNING'S 'n'
1	2	48+92	3.46	2.74	15.00	4.13	3.45	11.3	9.4	30	280.0	0.0011	651.47	2.74	12.72	0.0007	655.99	660.85	4.86	6.88	MH 3	
begin		46+12	3.46	2.74									651.16				655.79	660.04			0.015	
2	3	46+12	2.47	1.98	16.70	3.92	3.45	18.5	16.3	30	45.0	0.0011	651.16	3.76	12.75	0.0021	655.79	660.04	4.25	6.38	MH 3	
		199+75	5.93	4.72									651.11				655.70	660.36			0.015	
3	4	199+75	1.62	1.25	16.90	3.89	3.45	23.2	20.6	36	289.0	0.0009	651.11	3.28	18.29	0.0013	655.70	660.36	4.66	6.25	MH 3	
		196+86	7.55	5.96									650.86				655.33	662.61			0.015	
4	5	196+86	2.04	1.61	18.37	3.73	3.45	28.2	26.1	36	200.0	0.0032	650.86	5.24	35.45	0.0020	655.33	662.61	7.28	8.75	MH 3	
		194+86	9.59	7.57									650.21				654.92	665.78			0.015	
5	6	194+86	1.80	1.44	19.00	3.66	3.45	33.0	31.1	42	200.0	0.0006	650.21	3.43	22.98	0.0013	654.92	665.78	10.86	12.07	MH 3	
		192+86	11.39	9.01									650.09				654.67	670.65			0.015	
6	7	192+86	0.34	0.29	19.98	3.56	3.45	33.2	32.1	42	300.0	0.0003	650.09	3.45	17.12	0.0014	654.67	670.65	15.98	17.06	MH 3	
		189+86	11.73	9.30									649.99				654.26	676.30			0.015	
7	8	189+86	0.50	0.43	21.43	3.43	3.45	33.4	33.6	42	286.0	0.0003	649.99	3.47	17.54	0.0015	654.26	676.30	22.04	22.81	MH 3	
		187+00	12.23	9.73									649.89				653.84	678.67			0.015	
8	9	187+00	0.58	0.50	22.80	3.31	3.45	33.9	35.3	42	300.0	0.0016	649.89	4.09	37.13	0.0016	653.84	678.67	24.83	25.28	MH 3	
		184+00	12.81	10.23									649.42				653.35	680.29			0.015	



STORM SEWER SYSTEM

JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST	FULL	FRICt	HYGR EL.	COVER	COVER	COVER	INLET TYPE
From	To	From	To	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S 'n'	
				(acres)	(min.)	(10 yrs.)	(25 yrs.)	(10 yrs.)	(25 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	HY GR	CROWN	
9	10	184+00	1.44	1.20	24.02	3.21	3.45	36.7	39.4	42	250.0	0.0020	649.42	4.61	41.95	0.0020	653.35	680.29	26.94	27.37	MH 3 0.015
		181+50	14.25	11.43									648.92				652.84	681.71			
10	11	181+50	0.96	0.80	24.93	3.15	3.45	38.4	42.2	42	325.0	0.0010	648.92	4.00	30.34	0.0023	652.84	681.71	28.87	29.29	MH 4 0.015
		178+25	15.21	12.22									648.58				652.08	683.63			
11	12	178+25	0.93	0.82	26.28	3.05	3.45	39.8	45.0	42	287.0	0.0008	648.58	4.13	26.55	0.0027	652.08	683.63	31.55	31.55	MH 3 0.015
		175+50	16.14	13.04									648.35				651.15	664.42			
12	13	175+50	16.88	11.26	27.44	2.97	3.34	72.2	81.2	48	317.0	0.0040	645.92	7.11	84.70	0.0043	649.48	664.42	14.94	14.50	MH 3 0.015
		172+35	33.02	24.31									644.65				648.14	652.80			
13	14	172+35	0.00	0.00	28.18	2.92	3.34	71.1	81.2	48	111.0	0.0040	644.65	7.06	84.31	0.0043	648.14	652.80	4.66	4.15	MH 3 0.015
		171+55	33.02	24.31									644.21				647.66	654.00			
14	15	171+55	0.00	0.00	28.45	2.91	3.34	70.7	81.2	48	202.0	0.0040	644.21	7.10	84.80	0.0043	647.66	654.00	6.34	5.79	MH 3 0.015
		169+55	33.02	24.31									643.40				646.81	657.00			
15	16	169+65	0.00	0.00	28.92	2.88	3.34	70.0	81.2	48	20.0	0.0040	643.40	7.08	84.70	0.0043	646.81	657.00	10.19	9.60	MH 3 0.015
	final	169+45	33.02	24.31									643.32				646.68	628.00			



CDSS MODEL 4

STORM SEWER SYSTEM

PID : 82388

Date : 05/05/2016 Project : CUY-77-13.80

Location : Cleveland, OH

Description : Existing 42" : Pershing Ave to Morgana Run-Proposed-Garage flow to CSO036AA005

Designer : AK

Rainfall Area: A

Just Full Capacity Frequency (yrs.) : 10

Hydraulic Gradient Frequency (yrs.) : 50

Minimum Pipe Size : 0.00

Tailwater Elevation (ft.): 635.44

JUNCTION From	STATION To	Δ AREA Σ AREA (acres)	Δ CA Σ CA	BEGIN TIME (min.)	RAINFALL (10 yrs.)	DISCHARGE (50 yrs.)	PIPE DIAM. (in.)	F/L PIPE LENGTH (ft.)	MEAN SLOPE (ft./ft.)	JUST FULL CAPACITY (cfs.)	FRICT SLOPE (ft./ft.)	HYGR EL. IN / OUT (ft.)	COVER IN / OUT (ft.)	COVER MINUS HY GR	COVER MINUS CROWN	INLET TYPE 'n'					
1	2	48+92	3.46	2.74	15.00	4.13	3.81	11.3	10.4	30	280.0	0.0011	651.47	2.74	12.72	0.0009	656.89	660.85	3.96	6.88	MH 3
begin		46+12	3.46	2.74									651.16				656.65	660.04			0.015
2	3	46+12	2.47	1.98	16.70	3.92	3.81	18.5	17.9	30	45.0	0.0011	651.16	3.76	12.75	0.0025	656.65	660.04	3.39	6.38	MH 3
		199+75	5.93	4.72									651.11				656.53	660.36			0.015
3	4	199+75	1.62	1.25	16.90	3.89	3.81	23.2	22.7	36	289.0	0.0009	651.11	3.28	18.29	0.0015	656.53	660.36	3.83	6.25	MH 3
		196+86	7.55	5.96									650.86				656.09	662.61			0.015
4	5	196+86	2.04	1.61	18.37	3.73	3.81	28.2	28.8	36	200.0	0.0032	650.86	5.24	35.45	0.0025	656.09	662.61	6.52	8.75	MH 3
		194+86	9.59	7.57									650.21				655.59	665.78			0.015
5	6	194+86	1.80	1.44	19.00	3.66	3.81	33.0	34.3	42	200.0	0.0006	650.21	3.43	22.98	0.0015	655.59	665.78	10.19	12.07	MH 3
		192+86	11.39	9.01									650.09				655.28	670.65			0.015
6	7	192+86	0.34	0.29	19.98	3.56	3.81	33.2	35.4	42	300.0	0.0003	650.09	3.45	17.12	0.0016	655.28	670.65	15.37	17.06	MH 3
		189+86	11.73	9.30									649.99				654.79	676.30			0.015
7	8	189+86	0.50	0.43	21.43	3.43	3.81	33.4	37.0	42	286.0	0.0003	649.99	3.47	17.54	0.0018	654.79	676.30	21.51	22.81	MH 3
		187+00	12.23	9.73									649.89				654.27	678.67			0.015
8	9	187+00	0.58	0.50	22.80	3.31	3.81	33.9	38.9	42	300.0	0.0016	649.89	4.09	37.13	0.0020	654.27	678.67	24.40	25.28	MH 3
		184+00	12.81	10.23									649.42				653.68	680.29			0.015



STORM SEWER SYSTEM

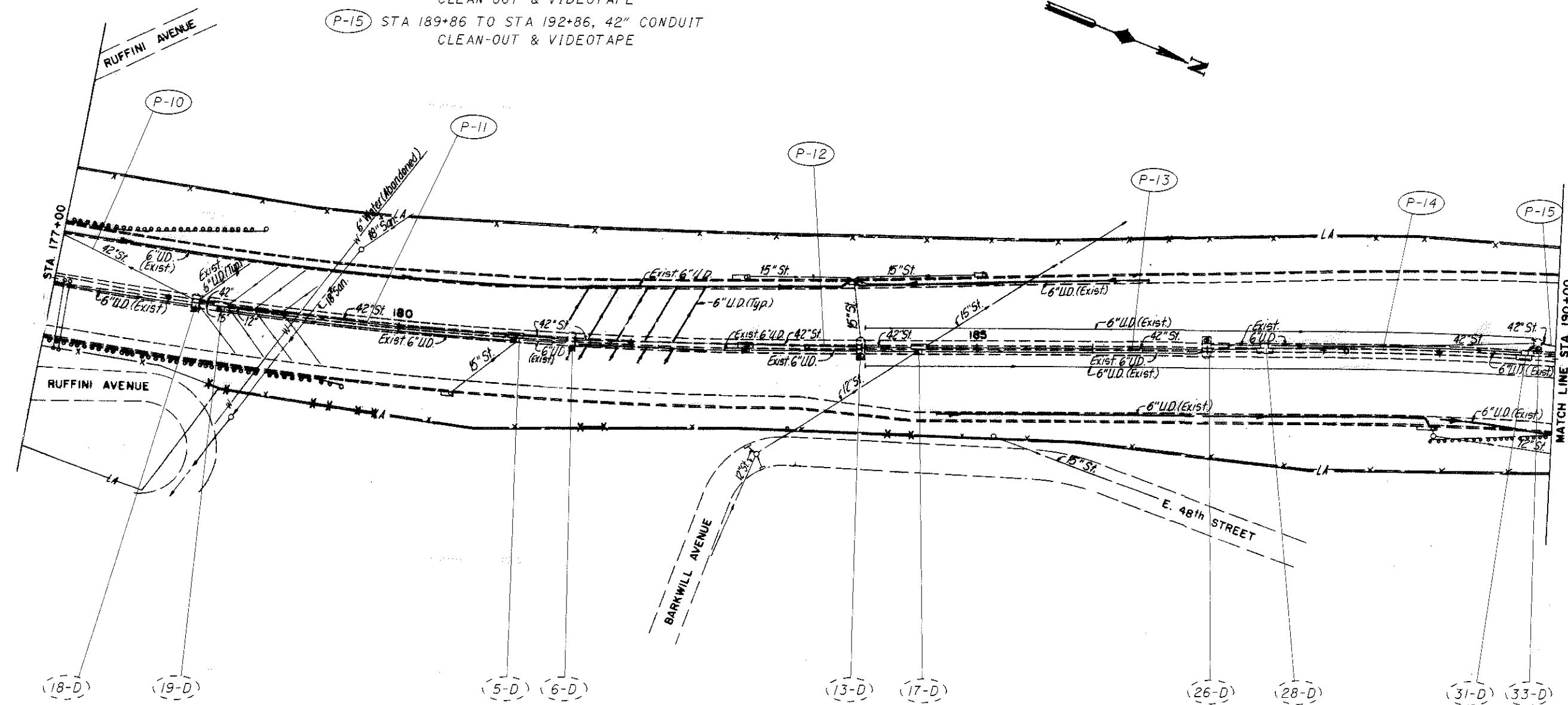
JUNCTION		STATION		Δ AREA	Δ CA	BEGIN	RAINFALL	DISCHARGE	PIPE			F/L PIPE	MEAN	JUST FULL	FRICT	HYGR EL.	COVER	COVER	COVER	INLET TYPE	
From	To	From	To	Σ AREA	Σ CA	TIME	INTENSITY	(cfs.)	DIAM.	LENGTH	SLOPE	IN / OUT	VEL	CAPACITY	SLOPE	IN / OUT	IN / OUT	MINUS	MINUS	MANNING'S 'n'	
				(acres)	(min.)	(10 yrs.)	(50 yrs.)	(10 yrs.)	(50 yrs.)	(in.)	(ft.)	(ft./ft.)	(ft.)	(fps.)	(cfs.)	(ft./ft.)	(ft.)	(ft.)	HY GR	CROWN	
9	10	184+00	1.44	1.20	24.02	3.21	3.81	36.7	43.5	42	250.0	0.0020	649.42	4.61	41.95	0.0025	653.68	680.29	26.61	27.37	MH 3 0.015
		181+50	14.25	11.43									648.92				653.05	681.71			
10	11	181+50	0.96	0.80	24.93	3.15	3.81	38.4	46.5	42	325.0	0.0010	648.92	4.00	30.34	0.0028	653.05	681.71	28.66	29.29	MH 4 0.015
		178+25	15.21	12.22									648.58				652.13	683.63			
11	12	178+25	0.93	0.82	26.28	3.05	3.81	39.8	49.6	42	287.0	0.0008	648.58	4.13	26.55	0.0032	652.13	683.63	31.50	31.55	MH 3 0.015
		175+50	16.14	13.04									648.35				651.20	664.42			
12	13	175+50	16.88	11.26	27.44	2.97	3.69	72.2	89.7	48	317.0	0.0040	645.92	7.11	84.70	0.0052	650.67	664.42	13.75	14.50	MH 3 0.015
		172+35	33.02	24.31									644.65				649.02	652.80			
13	14	172+35	0.00	0.00	28.18	2.92	3.69	71.1	89.7	48	111.0	0.0040	644.65	7.06	84.31	0.0052	649.02	652.80	3.78	4.15	MH 3 0.015
		171+55	33.02	24.31									644.21				648.45	654.00			
14	15	171+55	0.00	0.00	28.45	2.91	3.69	70.7	89.7	48	202.0	0.0040	644.21	7.10	84.80	0.0052	648.45	654.00	5.55	5.79	MH 3 0.015
		169+55	33.02	24.31									643.40				647.40	657.00			
15	16	169+65	0.00	0.00	28.92	2.88	3.69	70.0	89.7	48	20.0	0.0040	643.40	7.08	84.70	0.0052	647.40	657.00	9.60	9.60	MH 3 0.015
	final	169+45	33.02	24.31									643.32				646.76	628.00			

I-77 Trunk Line Evaluation

Drainage Area	CDSS Node	Drains to Conduit Size	Drains to MH with Rim ELEV.	Start Invert	End Invert	Start STA	End STA	Length	Slope	Existing Drainage Area (acres)	Proposed Drainage Area (acres)	Existing Pervious Area (acres)	Proposed Pervious Area (acres)	Impervious Area (Existing)	Impervious Area (Proposed)	Pre Runoff Coefficient	Post Runoff Coefficient
A	1	30	660.85	651.47	651.16	48+92	46+12	280	0.11%	2.81	3.16	1.37	1.50	1.44	1.66	0.80	0.81
B	2	30	660.04	651.16	651.11	46+12	199+75	45	0.11%	1.93	2.47	1.00	1.22	0.93	1.25	0.80	0.80
C	3	36	660.36	651.11	650.86	199+75	196+86	289	0.09%	1.39	1.62	0.94	1.02	0.45	0.60	0.76	0.77
D	4	36	662.61	650.86	650.21	196+86	194+86	200	0.33%	2.04	2.04	1.13	1.13	0.91	0.91	0.79	0.79
E	5	42	665.78	650.21	650.09	194+86	192+86	200	0.06%	1.80	1.80	0.86	0.86	0.94	0.94	0.80	0.80
F	6	42	670.65	650.09	649.99	192+86	189+86	300	0.03%	0.34	0.34	0.09	0.09	0.25	0.25	0.85	0.85
G	7	42	676.3	649.99	649.89	189+86	187+00	286	0.04%	0.50	0.50	0.09	0.09	0.41	0.41	0.86	0.86
H	8	42	678.67	649.89	649.42	187+00	184+00	300	0.16%	0.58	0.58	0.13	0.13	0.45	0.45	0.86	0.86
I	9	42	680.29	649.42	648.92	184+00	181+50	250	0.20%	1.44	1.44	0.49	0.49	0.95	0.95	0.83	0.83
J	10	42	681.71	648.92	648.58	181+50	178+25	325	0.11%	0.96	0.96	0.34	0.34	0.62	0.62	0.83	0.83
K	11	42	683.63	648.58	648.35	178+25	175+50 (LT)	287	0.08%	0.93	0.93	0.07	0.07	0.86	0.86	0.88	0.88
L	12	42	664.42	648.35	648.12	175+50 (LT)	173+30	234	0.10%	0.88	0.88	0.45	0.45	0.43	0.43	0.80	0.80
M	13	42	682.9	648.12	647.86	173+30	170+79	251	0.10%	0.95	0.95	0.00	0.00	0.95	0.95	0.90	0.90



RECORD DRAWINGS FOR I-77 TRUNK LINE





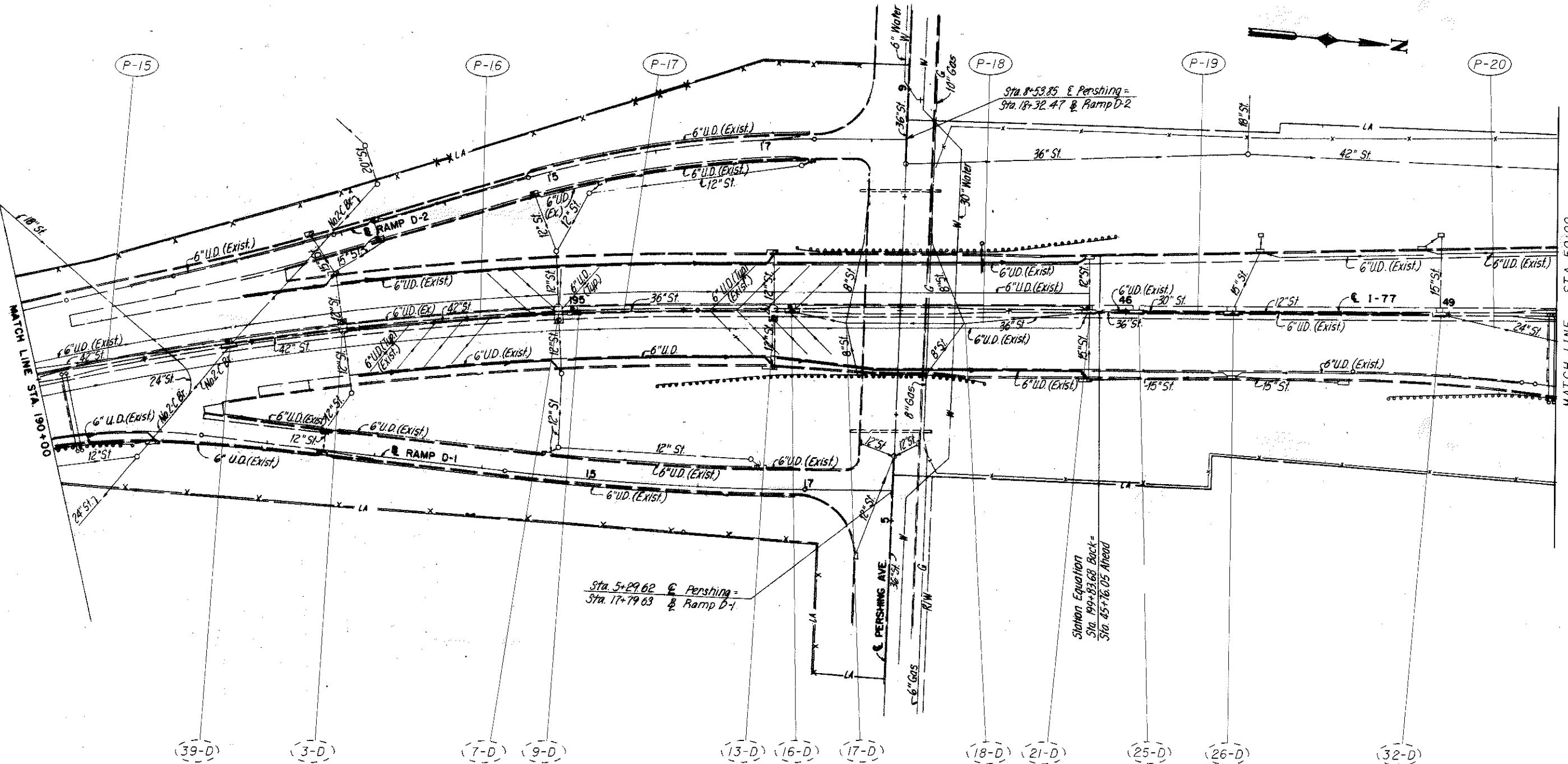
PLAN SHEET

STA 190+00 TO STA 50+00

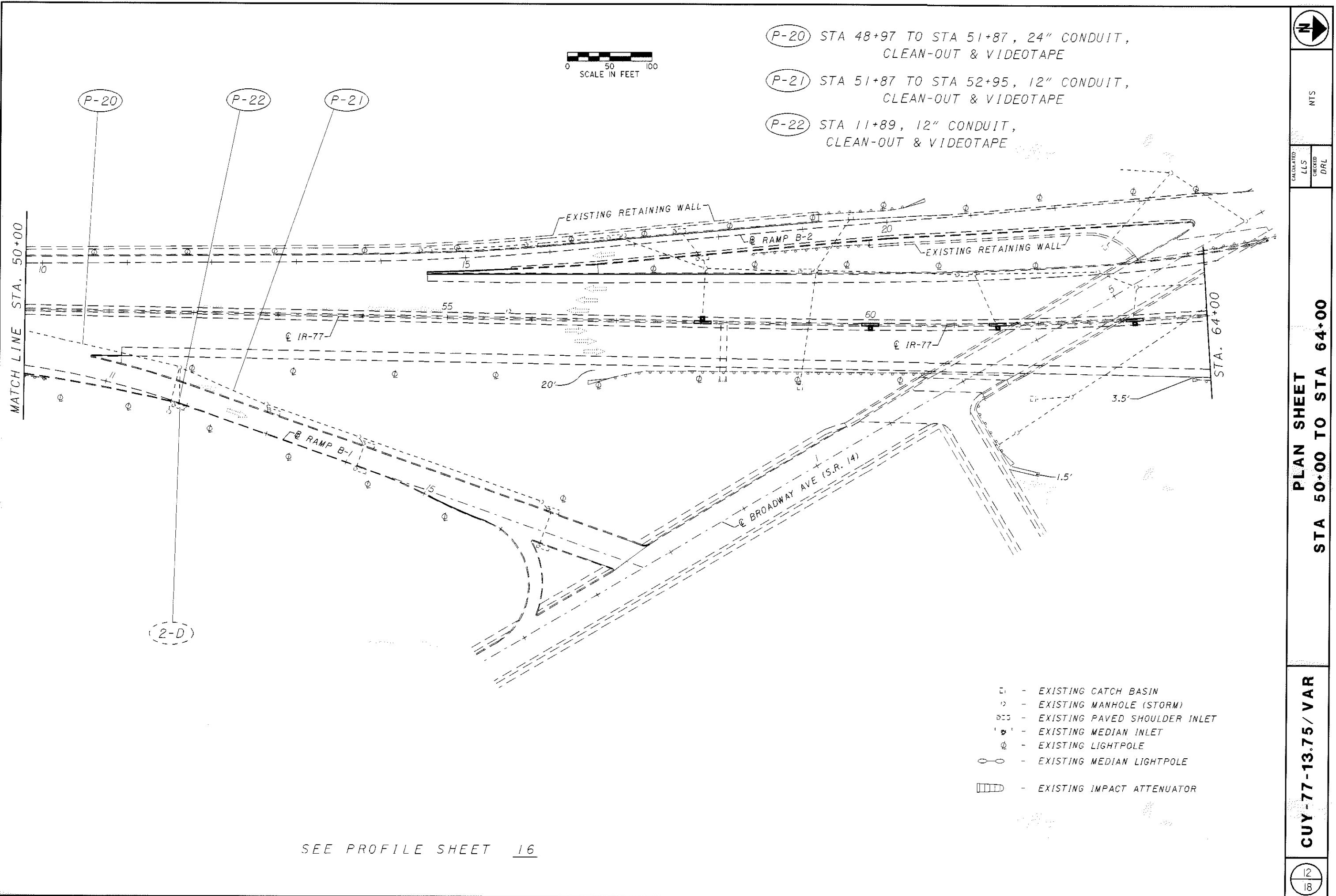
CUY-77-13.75 / VAR

11
18

NTS

CALCULATED
LLSCHECKED
DRL

- (P-15) STA 189+86 TO STA 192+86, 42" CONDUIT, CLEAN-OUT & VIDEOTAPE
- (P-16) STA 192+86 TO STA 194+86, 42" CONDUIT, CLEAN-OUT & VIDEOTAPE
- (P-17) STA 194+86 TO STA 196+86, 36" CONDUIT, CLEAN-OUT & VIDEOTAPE
- (P-18) STA 196+86 TO STA 199+75, 36" CONDUIT, CLEAN-OUT & VIDEOTAPE
- (P-19) STA 199+75 TO STA 48+92, 30" CONDUIT, CLEAN-OUT & VIDEOTAPE
- (P-20) STA 48+92 TO STA 51+87, 24" CONDUIT, CLEAN-OUT & VIDEOTAPE



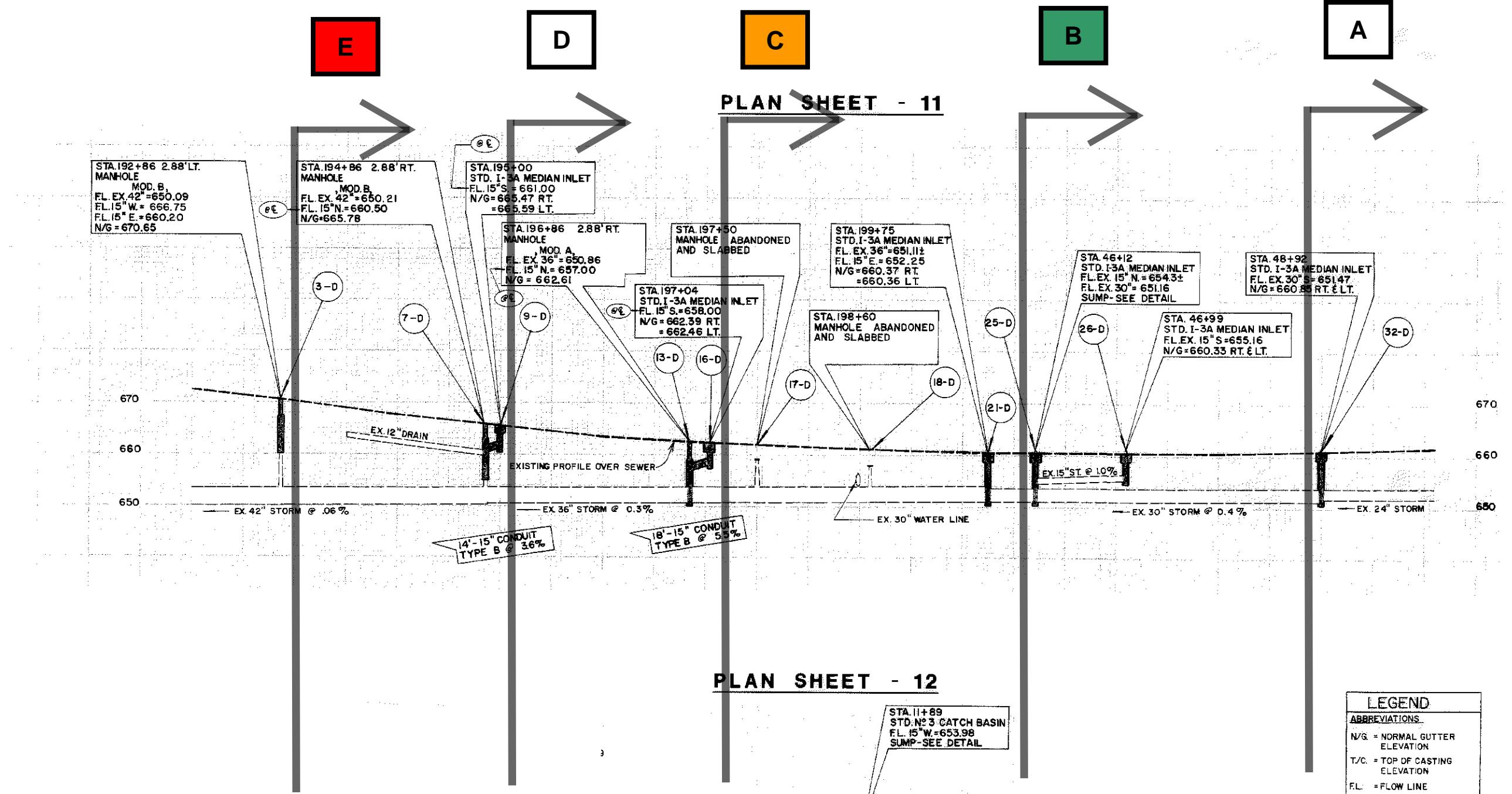
CALCULATED
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SEWER PROFILE DETAIL SHEET

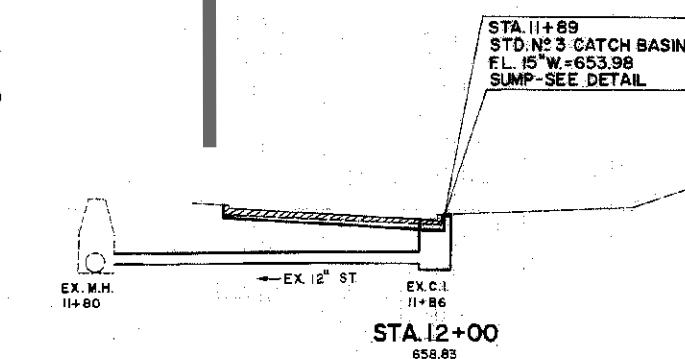
PLAN SHEETS - 11, 12

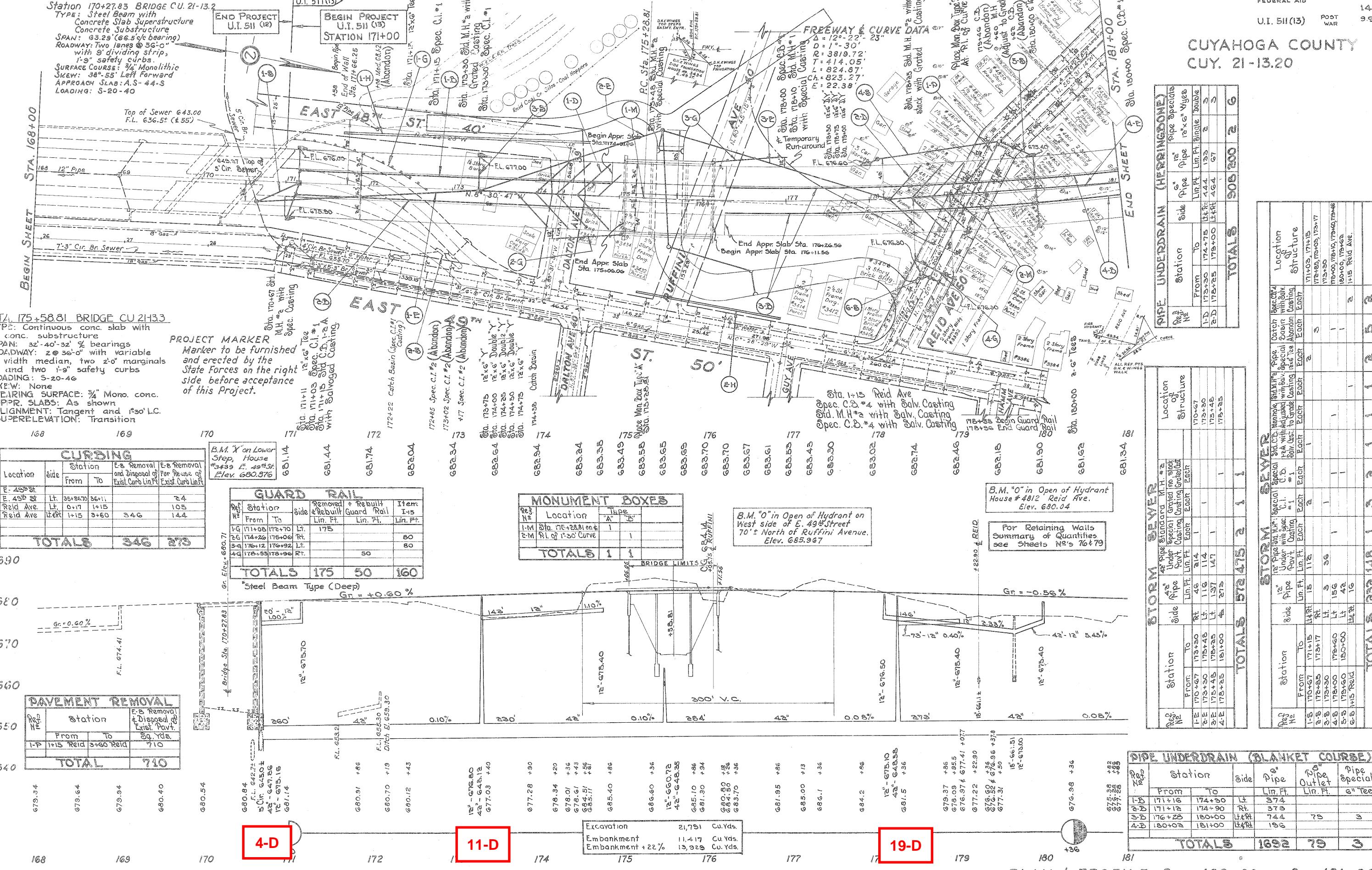
LEGEND	
ABBREVIATIONS	
N/G	= NORMAL GUTTER ELEVATION
T/C.	= TOP OF CASTING ELEVATION
F.L.	= FLOW LINE
C.B.	= CATCH BASIN
I.B.	= INLET BASIN
M.H.	= MANHOLE
U.D.	= UNDERDRAIN
O.O.O	= OFFSET TO CENTER RT, LT, OF STRUCTURE
N.D.	= NORMAL DITCH
ELEVATIONS IN RESURFACED AREAS DO NOT INCLUDE PRELEVELING COURSE	
O.O.O RT OR LT	SEWER OR OFFSET AT STRUCTURE

PLAN SHEET - 11

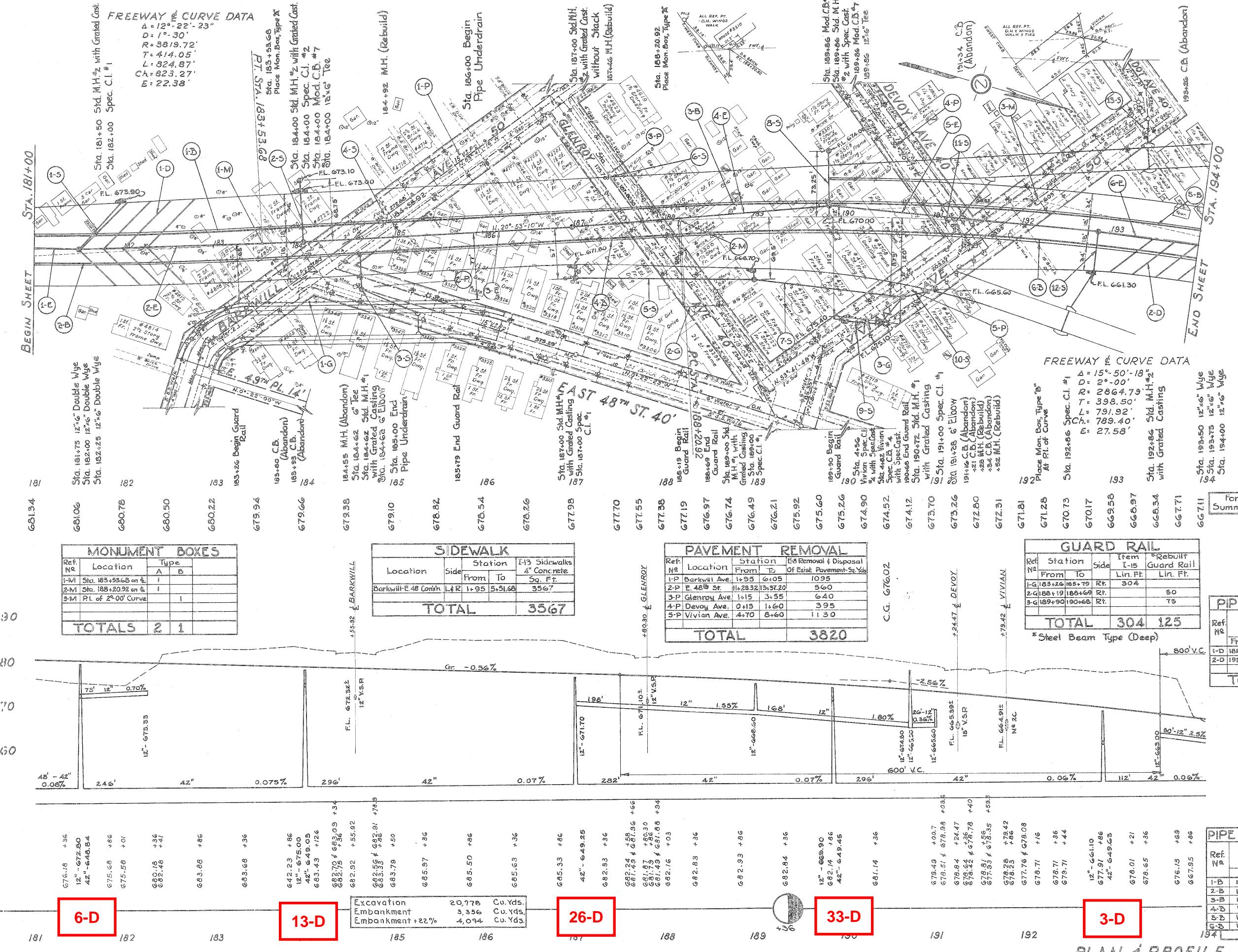


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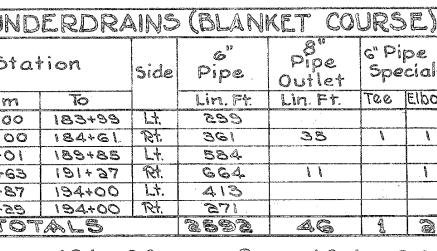
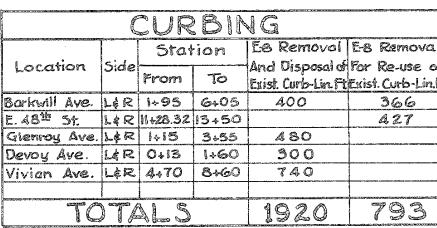
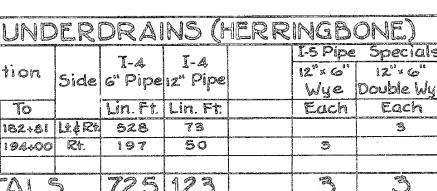




PLAN & PROFILE STA. 168+00 TO STA. 181+00

CUYAHOGA COUNTY
CUY. 21-13.20

Ref. No.	Station	Side	8" Pipe	8" Pipe Outlet	6" Pipe Specials	Location
1-E	181+50	From	181+50	48	4800	181+50
2-E	184+00	To	187+00	48	4800	184+00
3-E	189+40	From	192+86	Lt.	191.6	192+86
4-E	192+86	To	194+00	Rt.	78	192+86
5-E	193+40	From	194+00	Lt.	112	193+40
6-E	192+86	To	194+00	Rt.	112	192+86

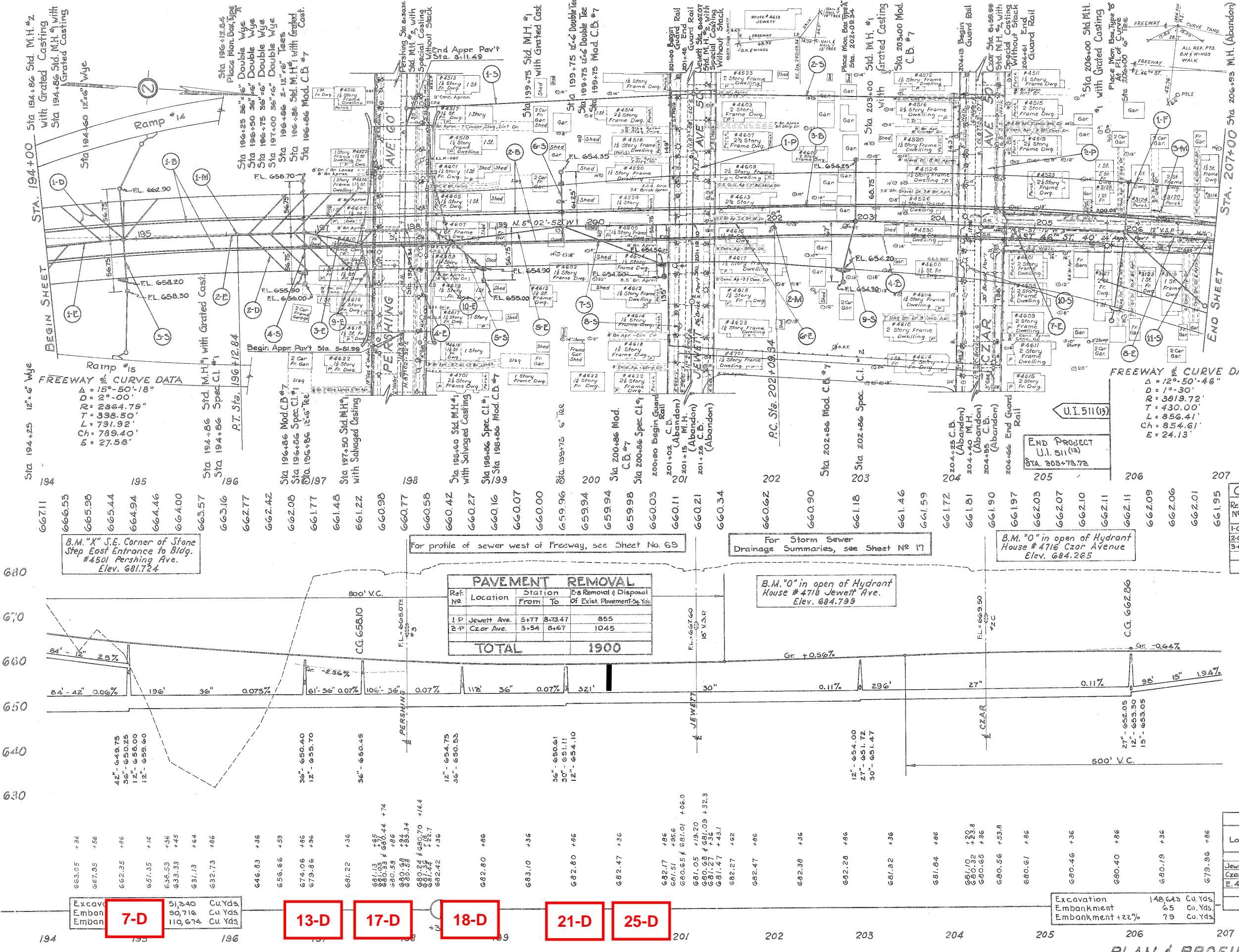


CUYAHOGA COUNTY
CUY. 21-13.20

PROJECT MARKER
Marker to be furnished and
erected by the State Forces
on the left side before
acceptance of this Project.

GUARD RAIL			
Ref No	Station	Side	Item I-15
	From	To	Lin. Ft.
I-G	201+00	201+48	Lt. 48
Z-G	200+90	204+66	Rt. 368
S-G	204+13	204+61	Lt. 48
TOTAL			464

MONUMENT BOXES		
Ref No	Location	Type A B
1-M	S12. 156+12.56 on E	1
2-M	S12. 202+09.34 on E	1
3-M	P1. of F50° Curve	1
TOTAL		2 1



PLAN & PROFILE STA. 194+00 TO STA. 207+00

