MATTAWOMAN INTERCEPTOR
PHASE III CAPACITY STUDY

Prepared for
CHARLES COUNTY, MARYLAND
DEPARTMENT OF PLANNING
AND GROWTH MANAGEMENT

Prepared by

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PGM #VCI 06-1-082
DBF#1813A002A

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Professional Certification. I hereby certify that these documents were prepared or approved by me, and I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 31100, Expiration Date: 01.21.11.

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I. Introduction

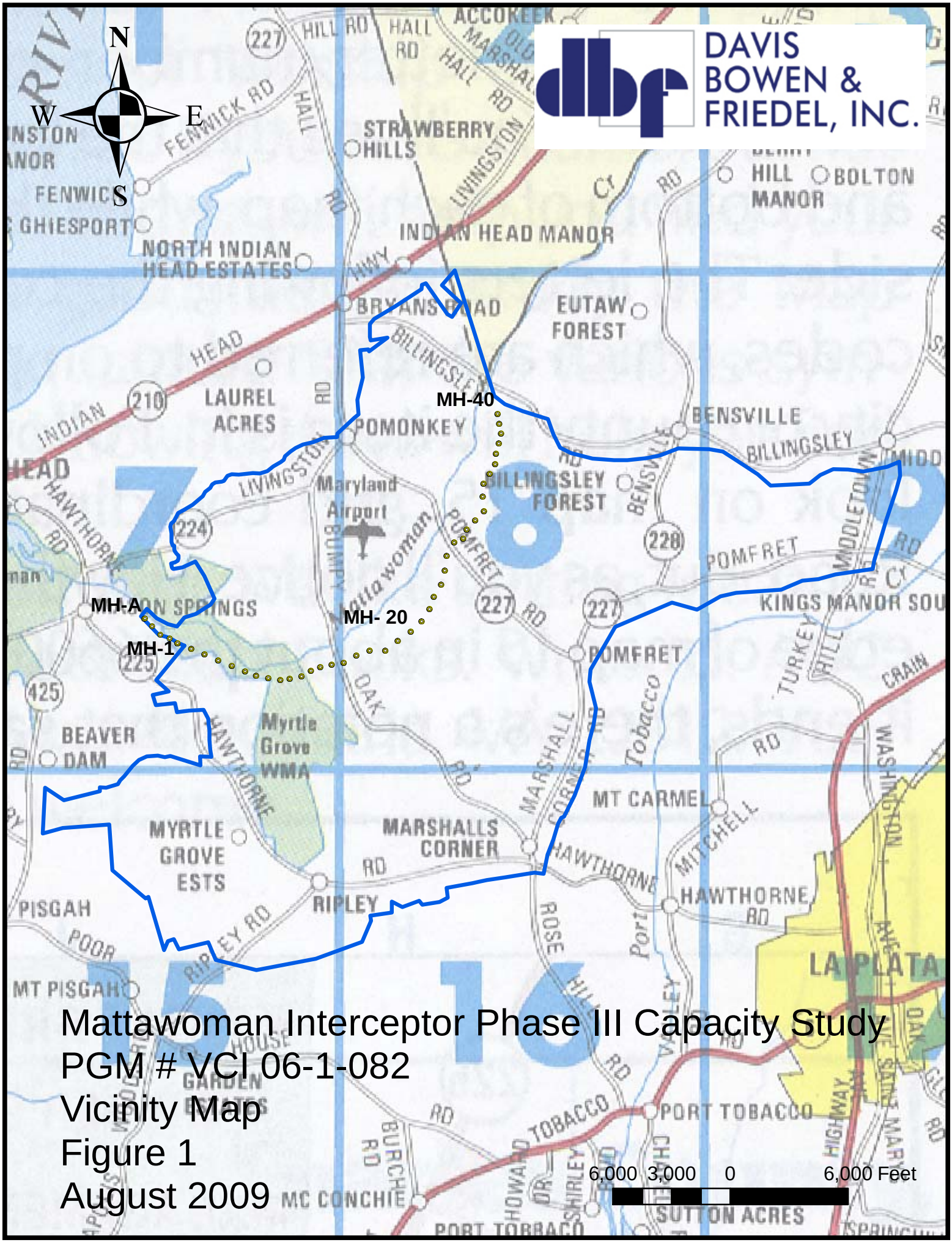
A. Purpose of Study

The existing Mattawoman Interceptor was designed and constructed in the early 1970's based on design criteria and zoning in place during that time. Revisions to the design criteria along with substantial growth in the area have necessitated a feasibility study of the Interceptor. Due to the future growth expected in the area, it is anticipated that the current Interceptor will not be adequate for future wastewater flows and require improvements.

A prior feasibility study (PGM# VCI 06-0082) was completed in July 2007 that examined conditions and capacity of the Interceptor between Manhole #40 and Manhole #125 with subsequent recommendations for that section of sewer; see Appendix B for applicable pages identifying areas studied by the prior feasibility study. This study will build on the previous and further investigate the Interceptor from Manhole #A, junction box between the Bryan's Road and Mattawoman Interceptors, to Manhole #40. This study will examine the current condition and capacity of the Interceptor, estimate future wastewater flows, identify any inadequacies, evaluate alternatives to remedy such inadequacies, and make recommendations to the County for improvements to the Mattawoman Interceptor.

B. Project Location

The Mattawoman Interceptor begins at the Mattawoman Wastewater Treatment Plant located on Hawthorne Road in northwest Charles County. The Interceptor follows a generally eastward direction until Manhole #19, located between Bumpy Oak and Pomfret Road, where it begins a northeasterly direction reaching Manhole #40 southwest of Billingsley Road, the upstream limit of this study. The remaining Interceptor follows a general northeasterly direction along the county line between Charles and Prince George's Counties. The study area will include a large portion of the Mattawoman Sewer Service Area (MSSA) located north and south of the Interceptor. Potential sewersheds within this area that would be projected to drain to the Interceptor will be delineated and be the focus of future growth projections for this study. The study area, or sewer build out area for this portion of the Interceptor, consist of approximately 15,850 acres within Charles County with the approximate limits being southeast of Billingsley Road, west of Middletown Road, north and west of Marshall Corner Road, north of Poorhouse Road, east of Masons Springs Road, and south of Indian Head Highway, see Figure 1-Vicinty Map for approximate limits.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DAVIS BOWEN & FRIEDEL, INC.
MH-40
MH-A
MH- 20
MH-1
Mattawoman Interceptor Phase III Capacity Study
PGM # VCI 06-1-082
Vicinity Map
Figure 1
August 2009
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C. Scope of Work

The Scope of Work as described for the study is as follows:

1. Provide updated field survey of the Interceptor from Manhole #A to Manhole #40
2. Evaluate the existing capacity of the Interceptor
3. Evaluate the condition of the Interceptor via CCTV
4. Determine potential sewersheds for the Interceptor from Manhole #A to Manhole #40
5. Determine future flows within these potential sewersheds
6. Determine inadequacies or deficiencies of the Interceptor
7. Provide alternatives to address identified inadequacies and deficiencies
8. Recommend alternative that will address identified inadequacies and deficiencies

D. Study Approach

To accomplish the Scope of Work as described above, Davis, Bowen & Friedel, Inc. will first perform a field survey of the Interceptor to collect information such as manhole locations, manhole rim and invert elevations, and pipe sizes. This information will be used to create updated drawings of the Interceptor as well as evaluate the existing capacity of the Interceptor.

Capacity evaluations for the existing Interceptor and alternatives will be performed using two (2) methods. The first method will be a desktop calculation utilizing the Manning Formula, $Q = A \times [\{1.49 (R^{2/3} \times S^{1/2})\} / n]$, where Q=flow (cfs), A= pipe cross sectional area (ft^2), R=hydraulic radius (ft), S=pipe slope, and n=Manning's or roughness coefficient; this formula is a standard engineering calculation used to determine pipe flow and as stated in the County Water and Sewer Ordinance Section 8.2(D)(1)(b). Utilizing these results with additional information as provided and required within the County Water and Sewer Ordinance, the sewer pipe capacity will be determined and evaluated. The second method will utilize computer hydraulic modeling software known as XPSWMM. XPSWMM is a link-node, spatially distributed, comprehensive hydraulic modeling software package used for modeling of stormwater, sanitary, and river systems; the County uses this software for reference purposes only. For the purpose of this study, the County's 2004 version of the software will be utilized. The same raw data will be inputted into the model to once again determine pipe capacity and associated evaluations. Note, the first method based strictly on the County Water and Sewer Ordinance will be used as the final determining factor on pipe capacity adequacy.

Utilizing the survey data and other information supplied by the County or obtained by other means, including but not limited to topography, zoning, land use, tax maps, County ordinance, and the previous study, various tasks will be accomplished to complete the Scope of Work. These tasks include determination of potential sewersheds through use of topography and County Sewer maps, calculation of existing Interceptor capacity using the methods described above, calculation of existing and future wastewater flows through the use of tax maps, zoning, land use, and allowable wastewater flows per the County Water and Sewer Ordinance, identification of inadequacies, two (2) recommendations of which will address the inadequacies, and final recommendation for the best alternative for the County.

Ultimately, these tasks and their results will provide the County with information on the existing Interceptor identifying its existing capacity, inadequacies, and recommendation for improvements to be capable of sufficiently conveying future wastewater flows. Knowing the existing capacity will provide the County with a known flow in which to monitor and use in order to initiate improvements prior to achieving such flows.

II. Existing Conditions

A. Mattawoman Sewershed (Manholes #A-#40)

i. Current Land Use

Utilizing GIS data provided by the County, Figure 2-Current Land Use Map identifies the current land uses in the study area. As shown, the study area primarily consists of low and medium density residential, with pockets of open area, crop land, mixed forest, commercial, and institutional.

ii. Current Zoning

Utilizing GIS data provided by the County, Figure 3-Current Zoning Map identifies the current zoning within the study area. As shown, the study area primarily consists of rural conservation and a small area of medium density residential with pockets of neighborhood commercial and general industrial.

iii. Existing Served Properties

Through review of the County Sewer maps and discussions with County personnel, the Mattawoman Interceptor within the study area only conveys

CURRENT LAND USE MAP FIGURE - 2

Legend

- Manholes
- Existing Gravity Sewer
- Study Area
- Drainage Areas

Land Use

- Agricultural buildings
- Bare ground
- Brush
- Commercial
- Cropland
- Deciduous forest
- Evergreen forest
- Extractive
- Feeding operations
- High-density residential
- Industrial
- Institutional
- Low-density residential
- Medium-density residential
- Mixed forest
- Open urban land
- Pasture
- Water
- Wetlands

Area 1
Area 2
Area 3
Area 4
Area 5
Area 6
Area 7
Area 8
Area 9
Area 10

MH-A
MH-1
MH-5
MH-10
MH-15
MH-25
MH-30
MH-35
MH-40

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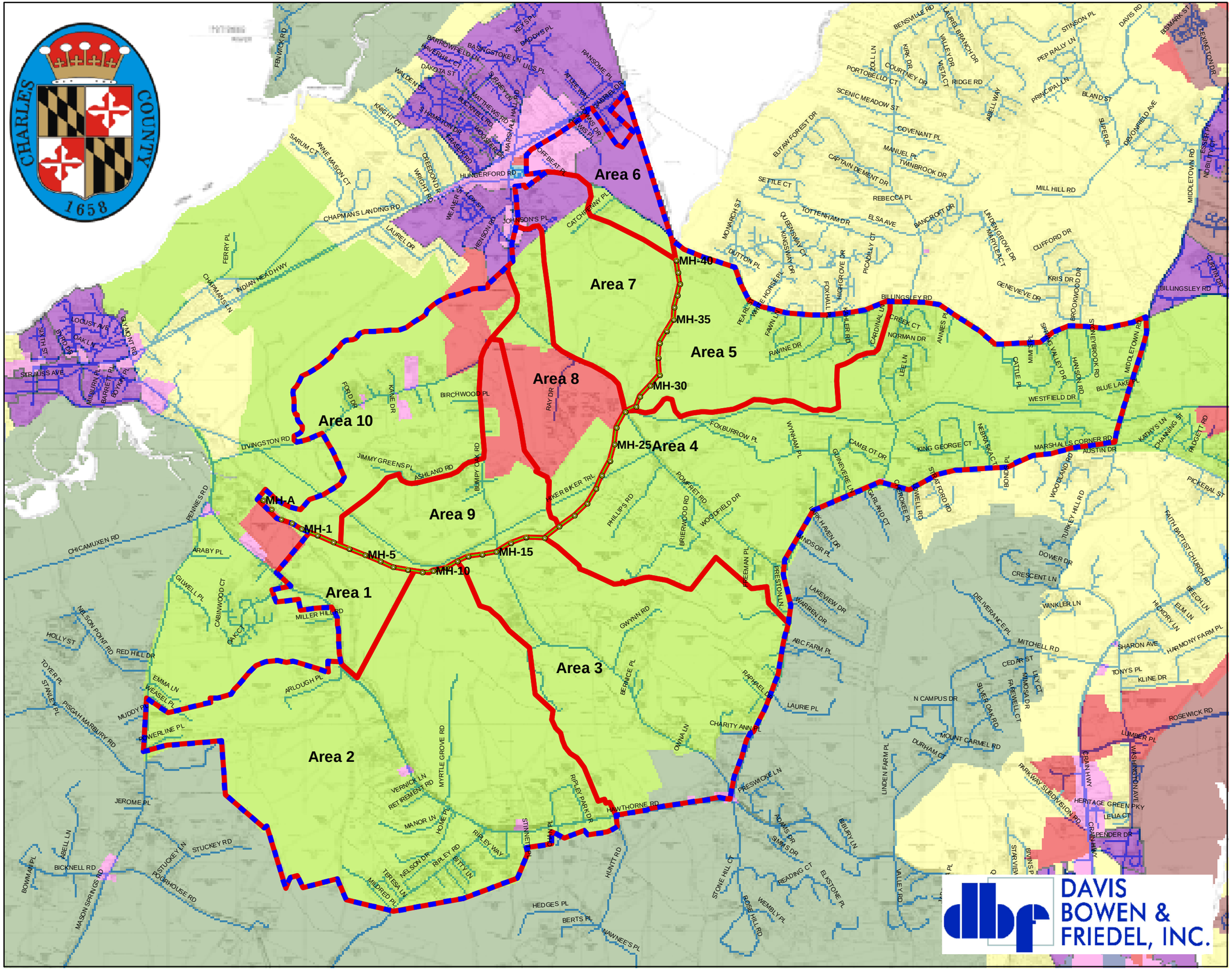
ZONING MAP
FIGURE - 3



Legend

- Existing Manholes
- Existing Gravity Sewer
- Study Area
- Drainage Areas

Zoning

- RL-Low Density Suburban Residential
- CN-Neighborhood Commercial
- IG-Light Industrial
- RC(D)-Rural Conservation
- RR-Rural Residential
- RH-High Density Residential
- RM-Medium Density Suburban Residential
- MX-Planned Mixed Use
- MP-Most Protective

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wastewater flow from the upper reaches of the Interceptor to the Mattawoman Wastewater Treatment Plant; there are no service connections or collection sewers which feed the existing Interceptor within the study area. Therefore existing flows can be derived from the previous study and utilized for existing capacity calculations and modeling. No list of existing properties, residential, commercial, or industrial, which connect to this portion of the Interceptor has been developed; under Future Conditions, a list of potential areas which could utilize this portion of the Interceptor has been provided and used for future flow calculations in the below sections.

iv. Existing Interceptor

As stated above, the Mattawoman Interceptor within the study area currently only conveys wastewater flow from the upper reaches of the Interceptor to the Mattawoman Wastewater Treatment Plant; there are no current service connections or collection sewers which feed the existing Interceptor within the study area. Figure 4-Existing Sewer Map identifies the basic location and alignment of the Interceptor within the study area. For more detailed information see the updated drawings as provided to the County under separate cover or Appendix A which provides manhole and sewer line summary tables.

v. Existing Pump Stations

As previously stated, through review of the County Sewer maps and discussions with County personnel, the Mattawoman Interceptor within the study area only conveys wastewater flow from the upper reaches of the Interceptor to the Mattawoman Wastewater Treatment Plant. There are no existing pump stations which discharge into the existing Interceptor within the study area.

B. Evaluation

i. Field Survey Information

A field survey was completed during the months of December 2008, January 2009, and June 2009 (manhole locations, manhole rim elevations, invert elevations, and pipe sizes) and used to provide an updated set of drawings which has been submitted to the County under separate cover.

EXISTING SEWER MAP FIGURE - 4

Legend

- Future Pump Station
- Existing Manholes
- Existing Gravity Sewer
- Study Area

Drainage Areas

- Area 1
- Area 2
- Area 3
- Area 4
- Area 5
- Area 6
- Area 7
- Area 8
- Area 9
- Area 10

Area 6
Area 7
Area 5
Area 8
Area 10
Area 4
Area 9
Area 1
Area 3
Area 2

MH-40
MH-35
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Proposed College of Southern Maryland Pump Station
(PGM #VCI 08-0069)

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ii. CCTV Inspection

During months of February and March 2009, Closed Circuit Televising (CCTV) was performed on the existing Interceptor from Manhole #40 to Manhole #1 including four (4) additional sections of pipe downstream of Manhole #1 per County Utilities' request. The CCTV report including DVDs and pictures of issues discovered has been submitted to the County under separate cover. Approximately 6,830 feet of 60-inch reinforced concrete pipe (RCP) sewer and 19,930 feet of 66-inch RCP sewer were inspected.

The overall condition of the Interceptor was found to be in very good condition, especially for the age of the sewer pipe. However during the inspection several items of concern were discovered. These items range from minor to major sources of infiltration which include mineral deposits which have formed near sources of infiltration, leaking joints, and longitudinal structural cracks along the crown of the sewer pipe. The table below summarizes the issues found.

Upstream Manhole	Downstream Manhole	Downstream Footage	Observation
40	39	213.4	Deposits in Joint
39	38	n/a	none
38	37	n/a	none
37	36	n/a	none
36	35	n/a	none
35	34	189.0	Joint with Infiltration
34	33	9.9	Deposits
		214.9	Joint with Infiltration
33	32	119.6	Infiltration
		283.6	Infiltration at Joint
		641.8	Heavy Infiltration in MH
32	31	0.0	Infiltration Gusher Leak in MH
		0.0	Infiltration Gusher Leak in MH
		239.7	Line Bend Right 25 Deg
31	30	0.0	Built In Connection Active
30	29	0.0	Ground Water Leak in MH
29	28	0.00	Deposits Attached 5%
		472.5	Deposits Attached 5%
28	27	0.0	Deposits Attached 5%
		0.0	Service Pipe "Break In" Dia 27
		498.3	Deposits Attached 5%

Upstream Manhole	Downstream Manhole	Downstream Footage	Observation
27	26	0.0	Deposits Attached 5%
		482.8	Deposits Attached 5% Encrusted
		661.9	Infiltration Gusher at Joint
		661.8	Deposits Attached 5% Encrusted
		790.5	Deposits Attached 5%
26	25	n/a	none
25	24	197.3	Deposits Attached 5% Encrusted
		197.3	Infiltration Runner at Joint
24	23	n/a	none
23	22	151.1	Deposits Attached 5% Encrusted
		165.9	Infiltration Runner at Joint
		168.8	Deposits Attached 5% Encrusted
22	21	35.6	Infiltration Runner
		35.6	Deposits Attached 5% Encrusted
		214.9	General Observation Root/Crack
		223.3	Roots at Barrel of Pipe
		421.6	Line Right Bend
21	20	429.5	Infiltration Runner at Joint
		429.5	Infiltration Runner at Joint
		578.0	Crack Longitudinal at Crown
		588.0	Crack Longitudinal at Crown
		604.0	Crack Longitudinal at Crown
		630.6	Crack Longitudinal at Joint
		649.5	Crack Longitudinal at Joint
		676.3	Crack Longitudinal at Joint
20	19	35.9	Infiltration Gusher at Joint
		319.9	General Observe Possible Crack
19	18	0.0	Deposits Attached 5%
		37.0	Infiltration Runner at Joint
		153.2	Infiltration Runner at Joint
		595.0	Infiltration Gusher at Joint
		673.9	Infiltration Gusher at Joint
		807.7	Deposits Attached 5%
18	17	446.7	Infiltration Runner at Joint
		446.7	Infiltration Runner at Joint
17	16	0.0	Deposits Attached 5%
		147.1	Line Bend Left 45 Deg
		750.9	Infiltration Run Mouth D/S MH 16
		760.0	Deposits Attached 5%

Upstream Manhole	Downstream Manhole	Downstream Footage	Observation
16	15	0.00	Deposits Attached 5%
		93.1	Infiltration Dripper at Joint
		737.5	Deposits Attached 5%
15	14	258.3	Infiltration Dripper
14	13	n/a	none
13	12	0.0	Deposits Attached 5%
		513.2	Deposits Attached 5%
12	11	0.0	Deposits Attached 5%
		0.0	General Observ Heavy Deposits in MH-12
		406.3	Infiltration Runner at Joint
		534.0	Deposits Attached 5%
11	10	n/a	none
10	9	0.0	General Observation MH Entry Offset
		371.2	Infiltration Runner at Joint
9	8	n/a	none
8	7	5.0	Infiltration Gusher at Joint
		356.6	Infiltration Dripper at Joint
		385.2	Infiltration Runner
7	6	0.0	Deposits Attached 5%
		408.9	Infiltration Runner at Joint
		605.0	Deposits Attached 5%
6	5	0.0	Deposits Attached 5%
		62.5	Infiltration Runner at Joint
		719.1	Deposits Attached 5%
5	4	729.5	Infiltration Gusher at Joint
4	3	0.0	Deposits Attached 5%
		740.2	Deposits Attached 5%
3	2	0.0	Offset in MH Camera in Hole
		0.0	Deposits Attached 5%
		404.3	Infiltration Runner at Joint
		596.0	Infiltration Weeper at Joint
		609.8	Infiltration Gusher at Joint
		745.2	Deposits Attached 5%
2	1	718.2	Infiltration Runner at Joint
1	F	n/a	none
F	E	275.6	Deposits Attached 5%
		331.7	Crack Longitudinal at Joint
		496.2	Built In Connection Active
D	E	n/a	none

A majority of the inadequacies found during the CCTV inspection can be repaired through the use of jetting to remove deposits and chemical

grouting in order to stop the infiltration. However the section of sewer between Manhole #20 and Manhole #21 contains a structural crack along the crown of the pipe which is an indication of continual increase in pressure above the pipe which over time may result in collapse of the sewer pipe. This section should be further investigated to determine the most adequate repair such as sliplining or complete replacement.

iii. Existing Wastewater Flows

As previously stated, the Mattawoman Interceptor within the study area only conveys wastewater flow from the upper reaches of the Interceptor to the Mattawoman Wastewater Treatment Plant. Therefore existing flows can be derived from the previous study and utilized for existing capacity calculations and modeling.

Per the previous study, see Appendix B for applicable pages, the existing average daily flows were determined to be 17.14 million gallons per day (MGD), 26.52 cubic feet per second (cfs), with an existing peak flow including inflow and infiltration of 50.62 MGD, 78.32 cfs. This peak flow, worst case condition, will be used as the minimum wastewater flow in which must be conveyed within the existing Interceptor and used to determine if County requirements of are met. This will be determined by use of desktop calculations and modeling as previously described.

iv. Existing Sewer Capacity Analysis

The County Water and Sewer Ordinance, Section 8.2 Sewer Mains and Appendix "BB", along with field survey data were used to perform the desktop calculations as stated above to estimate the Interceptor's current capacity. Per the County Water and Sewer Ordinance (8.2(D)(2)(a)), interceptor sewers shall be designed to convey a maximum flow when two-thirds (2/3) full, i.e. depth divided by diameter must not exceed .67. The results of these calculations are contained in Appendix C.

Per the results only ten (10) of the forty four (44) existing sewer lines are sized sufficiently to convey the required existing peak wastewater flows of 78.32 cfs; i.e. depth divided by diameter is less than 0.67.

v. Sewer Model

As stated earlier, the County utilizes the hydraulic model XPSWMM for reference purposes only. XPSWMM is typically less conservative then the County Water and Sewer Ordinance because it attempts to model a

more realistic situation by utilizing iterated calculations with additional data including items such as storage within manholes which the County Water and Sewer Ordinance does not take into account.

Utilizing the same raw data as above and indicated in Appendix A, the use of the County's XPSWMM hydraulic modeling software was used to simulate existing peak flows within the existing Interceptor. These results are summarized in Appendix D along with graphics from the model to better illustrate the results. Based on the County's standard of a maximum flow equating to 2/3 full pipe (8.2(D)(2)(a)), thirty five (35) of the forty four (44) sewer lines are sized sufficiently to convey the existing peak flow of 78.32 cfs. As illustrated here, the desktop calculations are more conservative than the model.

C. Summary of Findings

In regards to conveying the existing peak flow and based on the County Water and Sewer Ordinance utilizing desktop calculation and not the model results, the existing Interceptor from Manhole #A to Manhole #40 as a whole is not capable of such; only ten (10) sections of sewer are capable of conveying the existing peak flow. Therefore improvements of some nature to the remaining thirty four (34) sections of sewer or the Interceptor as a whole will be required.

It should be noted that based on field survey information and as shown on the updated drawings that two (2) sections of pipe, Manhole #16 to Manhole #15 and Manhole #14 to Manhole #13, were determined to have a negative slopes. This is most likely due to manhole settlement over the years. This currently does not seem to effect normal daily operations of the Interceptor in regards to conveying flow due to the large amount of headwater upstream capable of pushing through these sections; this is confirmed through the model results. However, it should be noted and addressed during any improvements made to the Interceptor in the future. For study purposes, it will be assumed that these negative slope pipes will be corrected and incorporated within the alternates investigated.

The CCTV reports confirm that the existing Interceptor is in very good condition with the exception of some minor issues, which are to be expected in a sewer of its age, and can be repaired by the use of chemical grouting. However, between Manhole #20 and Manhole #21, a structural crack along the crown of pipe has been identified and considered a severe concern due to the possibility of collapse and failure; sliplining or complete replacement should be considered.

III. Future Conditions

A. Mattawoman Sewershed (Manholes #A-#40)

i. Future Land Use and Zoning

Figure 3-2 of the Charles County Comprehensive Plan, see Appendix E, identifies the future land use based on districts within the County. Per this figure, it appears that the current land use and zoning in effect today will remain. Therefore the use the County's current zoning and Water and Sewer Ordinance, Appendix "V", will be used in determining the future wastewater flow for the study area.

ii. Future Drainage Sewersheds

Potential drainage sewersheds were developed to assist in the determination of areas of future flow. Although future sanitary sewer collection systems, gravity and/or pump stations, are unknown at this time, these potential sewersheds are approximate but do encompass the reasonable areas within the Mattawoman Sewer Service Area (MSSA) that can be collected by Manhole #A through Manhole #40.

Through the use of topography, ten (10) potential sewersheds were delineated along the Interceptor; Figures 2 through 4 above all identify the proposed drainage areas. The total drainage area is approximately 15,857 acres and summarized below.

Drainage Area	Approximate Area (acres)
1	412
2	3,769
3	2,769
4	3,517
5	1,015
6	432
7	921
8	783
9	899
10	1,340
Total	15,857

These sewersheds along with zoning and County Water and Sewer Ordinance Appendix "V" were used to determine future wastewater flows

as described below.

iii. Future Pump Stations

Through discussions with County personnel one (1) future pump station is currently under design which will discharge into the Interceptor within the study area. The College of Southern Maryland Pump Station (PGM# VCI 08-0069) is currently being designed with a pump rate of 480 gpm discharging into the Interceptor at Manhole #15. During peak flow, assuming two (2) pumps will be in operation, the peak flow from this pump station has been determined to be approximately 560 gpm (1.25 cfs) and will be utilized in the future flow calculations.

iv. Future Served Areas

Through review and use of previous information stated above or collected by other means and the previously determined potential sewersheds, future wastewater flows were determined for the study area.

The determination of existing dwelling units was compiled along with their corresponding proposed wastewater flows. Utilizing County GIS information and aerial mapping, the approximate number of structures were determined and converted into equivalent dwelling units; a list of parcels containing such existing dwelling units is provided in Appendix L. Flows were determined using current location, zoning, and the County Water and Sewer Ordinance Appendix "V". The number of existing dwelling units and their corresponding wastewater flows are as follows.

Drainage Area	Existing Dwelling Units	Average Day Flow / DU (gpd)[1]	Average Day Flow (gpd)	Peaking Factor	Peak Day Flow (gpd)[2]
1	16	260	4,160	4	16,640
2	343	260	89,180	4	356,720
3	515	260	133,900	4	535,600
4	942	260	244,920	4	979,680
5	261	260	67,860	4	271,440
6	78	260	20,280	4	81,120
7	36	260	9,360	4	37,440
8	89	260	23,140	4	92,560
9	60	260	15,600	4	62,400
10	235	260	61,100	4	244,400
Total	2575		669,500		2,678,000

(1) Majority of existing dwelling units lie within Zone RC-Rural Conservation = 260 gpd/DU per County Water and Sewer Ordinance Appendix "V"

(2) Peak Day flow will be used in capacity calculations

In addition to existing dwelling units which could ultimately be served by this section of the Interceptor, to determine maximum growth potential, undeveloped areas must be considered as well. Through the use of tax maps and County GIS information, undeveloped properties within the study area were compiled and organized based on sewershed and zoning; a list of undeveloped parcels is provided in Appendix L. Flows again were determined based on zoning and the County Water and Sewer Ordinance Appendix "V".

Several properties of significant size and interest were identified within the study area. The Maryland Department of Natural Resources owns several parcels within the study area, such as the Myrtle Grove Game Park. These areas are currently zoned RC-Rural Conservation but in all likelihood will not ever be developed to the full potential of RC-Rural Conservation. However, the possibility of some structures, such as restrooms, showers, campgrounds, etc., could be constructed and require sewer service. Therefore, rather than utilizing the normal RC-Rural Conservation base density of 0.33 dwelling units per acre, it has been assumed that a 90% decrease in density would be reasonable resulting in a base density of 0.03 dwelling units per acre. A small airport was also identified which is currently zoned IG-General Industrial and requires a base sewer flow of 2,000 gallons per day per acre. Assuming that 75% of the airport's area is reserved for landing strips, a reduction in base sewer flow to 500 gallons per day per acre was used in the determination of future wastewater flow. The total acres of undeveloped land, corresponding number of dwelling units and their corresponding wastewater flows are as follows.

Drainage Area	County Zoning	Acres	Dwelling Units / Acre[1]	Dwelling Units	Average Day Flow / DU (gpd)[1]	Average Day Flow / Acre (gpd)[1]	Average Day Flow (gpd)	Peaking Factor	Peak Day Flow (gpd)
1	RC	234.6	0.33	77	260	N/A	20,020	4	80,080
2	RC	765.0	0.33	252	260	N/A	65,520	4	262,080
	CN	8.1	N/A	N/A	N/A	2,000	16,200	4	64,800
MD DNR[2]		1,391.5	0.03	41	260	N/A	10,660	4	42,640
Subtotal		2,164.5		293.0			92,380		369,520
3	RC	816.2	0.33	269	260	N/A	69,940	4	279,760
	CN	7.4	N/A	N/A	N/A	2,000	14,800	4	59,200
MD DNR[2]		129.6	0.03	3	260	N/A	780	4	3,120
Subtotal		953.2		272.0			85,520		342,080
4	RC	1,083.2	0.33	357	260	N/A	92,820	4	371,280
	CN	1.0	N/A	N/A	N/A	2,000	2,000	4	8,000
MD DNR[2]		99.6	0.03	2	260	N/A	520	4	2,080
Subtotal		1,183.8		359.0			95,340		381,360
5	RC	412.4	0.33	136	260	N/A	35,360	4	141,440
6	RM	244.7	3	734	202	N/A	148,268	4	593,072
	CN	52.2	N/A	N/A	N/A	2,000	104,400	4	417,600
Subtotal		296.9		734.0			252,668		1,010,672
7	RC	580.9	0.33	191	260	N/A	49,660	4	198,640
	RM	55.3	3	165	202	N/A	33,330	4	133,320
MD DNR[2]		15.5	0.03	1	260	N/A	260	4	1,040
Subtotal		651.7		357.0			83,250		333,000
8	RC	81.0	0.33	26	260	N/A	6,760	4	27,040
	IG	143.4	N/A	N/A	N/A	2,000	286,800	4	1,147,200
MD DNR[2]		22.8	0.03	1	260	N/A	260	4	1,040
Airport[3]		77.5	N/A	N/A	N/A	500	38,750	4	155,000
Subtotal		324.7		27.0			332,570		1,330,280
9	RC	264.3	0.33	87	260	N/A	22,620	4	90,480
	IG	153.8	N/A	N/A	N/A	2,000	307,600	4	1,230,400
MD DNR[2]		34.9	0.03	2	260	N/A	520	4	2,080
Airport[3]		200.0	N/A	N/A	N/A	500	100,000	4	400,000
Subtotal		653.0		89.0			430,740		1,722,960
10	RC	142.0	0.33	46	260	N/A	11,960	4	47,840
	CN	26.9	N/A	N/A	N/A	2,000	53,800	4	215,200
	IG	150.0	N/A	N/A	N/A	2,000	300,000	4	1,200,000
MD DNR[2]		744.6	0.03	23	260	N/A	5,980	4	23,920
Subtotal		1,063.5		69.0			371,740		1,486,960
Total		14,166.1					1,799,588		7,198,352

(1) Per County Water and Sewer Ordinance Appendix "V")

(2) Maryland Department of Natural Resources Property; wastewater flow assumed on 10% of area based on current zoning of RC.

(3) Airport property assuming 75% area dedicated for landing strips

The total peak day flows as determined by above calculations for existing dwelling units and undeveloped areas along with consideration for infiltration/inflow per the County Water and Sewer Ordinance (8.2(B)(6)), 400 gallons per day per acre, is as follows.

Drainage Area	Existing Dwelling Units		Undeveloped Land		I&I[1]	Total Average Day[2]	Total Peak Day[3]	Total Peak Day	Manhole Entry Point		
	Average Day (gpd)	Peak Day (gpd)	Average Day (gpd)	Peak Day (gpd)	(gpd)	(gpd)	(gpd)	(cfs)	Existing Interceptor[4]	Alternate I[5]	Alternate II[6]
1	4,160	16,640	20,020	80,080	164,800	24,180	261,520	0.40	8	8	8
2	89,180	356,720	92,380	369,520	1,507,600	181,560	2,233,840	3.46	12	12	12
3	133,900	535,600	85,520	342,080	1,107,600	219,420	1,985,280	3.07	18	18	18
4	244,920	979,680	95,340	381,360	1,406,800	340,260	2,767,840	4.28	27	27	27
5	67,860	271,440	35,360	141,440	406,000	103,220	818,880	1.27	40	40	40
6	20,280	81,120	252,668	1,010,672	172,800	272,948	1,264,592	1.96	40	40	40
7	9,360	37,440	83,250	333,000	368,400	92,610	738,840	1.14	40	40	40
8	23,140	92,560	332,570	1,330,280	313,200	355,710	1,736,040	2.69	27	27	27-2
9	15,600	62,400	430,740	1,722,960	359,600	446,340	2,144,960	3.32	19	19	19-2
10	61,100	244,400	371,740	1,486,960	536,000	432,840	2,267,360	3.51	3	3	3-2
Total	669,500	2,678,000	1,799,588	7,198,352	6,342,800	2,469,088	16,219,152	25.10			

(1) I&I calculations as determined by County Water and Sewer Ordinance 8.2(B)(6).

(2) Total Average Day = Existing Dwelling Units Average Day + Undeveloped Land Average Day

(3) Total Peak Day = Existing Dwelling Units Peak Day + Undeveloped Land Peak Day + I&I

(4) Existing manhole in which drainage area would discharge into.

(5) Manole in which drainage area would discharg into unde Alternate I, see more detailed description later in the report.

(6) Manole in which drainage area would discharg into unde Alternate II, see more detailed description later in the report.

Assuming ultimate build out of the study area, future peak day flows have been determined to be 16,219,152 gpd or 25.10 cfs. For the purpose of the capacity analysis of the existing Interceptor and to lean to the side of conservatism, each sewershed's peak day flow will be assumed to enter the Interceptor at the furthest most upstream manhole located in such sewershed. In addition to the future peak day flows for the study area, the future peak day flow as determined from the previous study, 130.9 cfs see Appendix B, will be assumed to enter at Manhole #40 and the future College of Southern Maryland Pump Station peak flow of 1.2 cfs will enter Manhole #15. Assuming ultimate buildout of the Mattawoman Interceptor drainage area, the total peak day flow for the Interceptor as seen at Manhole #A will be 157.25 cfs.

B. Evaluation

i. Future Sewer Capacity Analysis

Again, utilizing the County Water and Sewer Ordinance, Section 8.2 Sewer Mains and Appendix "BB", along with field survey data, the same desktop calculations were performed as earlier to estimate the Interceptor's capacity in relation to future peak day flows. Results from the desktop calculations are contained in Appendix F.

As noted in Appendix F, and based on the County's standard of a maximum of 2/3 full pipe, the Interceptor is not sized sufficiently to convey the required future peak flows.

ii. Sewer Model

As performed earlier with existing peak flows, the use of the County's XPSWMM hydraulic modeling software was used to simulate future peak flows within the existing Interceptor. These results are summarized in Appendix G along with graphics from the model to better illustrate the results. Based on the County's standard of a maximum of 2/3 full pipe, the Interceptor is not sized sufficiently to convey the required future peak flows. The Interceptor cannot convey the necessary flow and results in full pipe flow upstream of Manhole #3 and a sanitary sewer overflow situation at Manhole #40. However, this overflow situation may not occur because the collection system upstream of Manhole #40 is not included in this model and therefore could provide some additional storage which would prevent the overflow at this point.

C. Summary of Findings

Using the future peak day flow as calculated above for the study area and the County Water and Sewer Ordinance, both the desktop calculations and the XPSWMM model show that the existing Interceptor is not sized sufficiently for future peak day flows. The results show full pipe flow and the likelihood of sewer overflows upstream of the study area.

In order to adequately convey the future peak day flows, improvements to the Interceptor are required. The following sections will identify two (2) possible alternatives.

IV. Sewer Alternatives

A. Criteria

As identified above, the existing Interceptor cannot convey the necessary future peak day flow. Two (2) alternatives, complete replacement and new paralleling sewer, are further discussed below in which each will be capable of conveying the future peak day flow. It should be noted that the existing Interceptor does not meet current County Water and Sewer Ordinance 8.2(E)(1)(d)(i)(C) manhole spacing is greater than 600 feet, and also contains long radius horizontal pipe curves. Both alternatives stated below mirror the existing Interceptor in some fashion. Therefore, should the County move forward to the design phase on this project, it will most likely be necessary for the design engineer to request waivers in regards to County Water and Sewer Ordinance 8.2(E)(1)(d)(i)(C), manhole spacing, and Ordinance 8.2(E)(2)(d)(i), long radius horizontal pipe curves.

B. Alternate I

Alternate I will consist of replacing the existing Interceptor with a new Interceptor parallel to the existing and sized sufficiently to convey the future peak day flow; the existing Interceptor will be abandoned in place.

i. Sewer Capacity Analysis

Utilizing the future peak day flows as previously identified along with the County Water and Sewer Ordinance and assuming similar sewer alignment and updated invert elevations to eliminate the negative pipe slopes, desktop calculations were performed to determine the adequate size of new RCP sewer that would be required to convey the future peak day flow. It was determined that 1,022 feet of 84-inch RCP, 10,141 feet of 90-inch RCP, and 16,665 feet of 96-inch RCP would be required. Alternate I sewer line summary and capacity analyses are summarized in Appendix H.

ii. Sewer Model

Similar to as performed earlier, XPSWMM was used to model the future peak flows within the proposed Alternate I sewer alignment. As expected the model results confirm the adequacy of Alternate I in relation to future peak flows. These results are summarized in Appendix I along with graphics from the model to better illustrate the results.

iii. Impacts

Alternate I will be installed adjacent to the existing Interceptor and therefore will not impact sewer flow, minimal by-pass pumping would be required during connection to Manhole #A and Manhole #40.

Environmental impacts which must be addressed will be construction within the 100-year flood plain, wetlands, forest conservation, and endangered/sensitive species areas.

iv. Easements

An existing 50 foot wide sewer easement exists for the existing Interceptor. However the existing Interceptor is not centered in this easement, it is offset from the southern easement line by 12.5 feet leaving 37.5 feet to the northern line (see updated drawings). In order to adequately construct and maintain a replacement parallel Interceptor a portion of this existing easement could be utilized but additional sewer easement will be necessary. For large diameter pipes and per the County's Plan Preparation Package Section II.M.6, the sewer easement width shall be a minimum of two (2) times the depth plus the pipe diameter plus two (2) feet rounded up to the nearest five (5) foot interval. Therefore, assuming worst case for Alternate I, a pipe diameter of 96 inches (8 feet) at a depth of 25 feet, the required sewer easement width would be 60 foot. Therefore, an additional 10 foot of sewer easement would be required along and 40 foot of temporary construction easement would be recommended for constructability. The existing easement should be maintained in order to provide sufficient access to the existing Interceptor however crossing it during construction should be limited and necessary precautions made in order to prevent damage to the existing Interceptor. These easement widths should be further investigated during the design and discussed with Utilities.

v. Permits

Preliminary investigation has determined that the following permits would be required:

-Maryland Department of the Environment Construction Permit
-Maryland Department of the Environment Wetlands/Construction within the 100 year flood plain
-Maryland State Highway Administration Permit
-Forest Conservation Permit

-U.S. Fish and Wildlife Permit for rare, threatened, and endangered species
-Charles County Soil Conservation District Permit
-Charles County Development Services (CPIS) Permit
-Electric or Gas Utility Permits

vi. O&M

Operation and maintenance is assumed to be basic maintenance of the sewer and manholes along with maintaining access within the existing easement, i.e. mowing, clearing, etc. Maintenance required for Alternate I would be similar if not identical to the existing Interceptor. The length of sewer would remain approximately same and the number of manholes would not change. It is not anticipated that additional O&M would be required.

vii. Feasibility

General construction of a large sewer pipe such as Alternate I will have obstacles to overcome as with any project of this size. However, due to the location of the project and adjacent environmental areas, design and construction methods must be elevated to a higher level than typical sanitary sewer projects. These obstacles can be overcome resulting in a successful project that will provide the County the necessary sewer collection capability required.

Additional items that should be considered, in particular during the design phase, is the location of the County's existing 16-inch reclaimed waterline and proposed 18-inch reclaimed waterline. Although unlikely to conflict with Alternate I due to the depth of the sewer as compared to that of the reclaimed waterline, this should be further investigated by the design engineer to ensure alignments do not conflict. Also, with construction of the walking trail along the existing Interceptor's alignment, adequate construction details should be provided in order to ensure that the reconstruction of this trail due to construction related to Alternate I is adequate. Finally, a new interceptor sewer, the Old Woman's Run, from the Piney Branch area has been discussed by the County. This new interceptor is intended to relieve the Piney Branch Interceptor which connects to the Mattawoman Interceptor at Manhole #82 and divert some wastewater flow directly to Manhole #28 of the Mattawoman Interceptor. This will relieve some of the capacity issues between Manholes #28 and #82, but not downstream of Manhole #28. Based on the alignment and size of this interceptor, it could accept flow from some of the potential

southern drainage areas which would impact capacity of the Mattawoman Sewer as described in this study. It would be recommended that an additional study similar to this one be performed on the Old Woman's Run Interceptor in order to provide the County the most cost effective solution to future wastewater conveyance.

viii. Cost Estimate

The Preliminary Estimate of Probable Costs for Alternate I was derived through use of the County's Standard Pricing List in conjunction with manufacturer's budgetary cost estimates for items such as manholes, pipe, and bypass pumping. Costs for Alternate I, including easement acquisition, bypassing pumping, hydrogen sulfide damage prevention, engineering, and contingencies comes to a total of $31,319,196, please see Appendix M for details regarding this cost estimate.

C. Alternate II

Alternate II will consist of installation of a new sewer parallel to the existing Interceptor sized to sufficiently to make up for the deficient flow in which the existing Interceptor cannot convey. The combined capacity of these two (2) sewers will be capable of conveying the future peak day flow.

The new parallel sewer will connect at Manhole #40 at which time Manhole #40 would be replaced with a new structure that will contain a flow diversion to split the incoming peak flow of 157.25 cfs. It will remain isolated from the existing Interceptor until reconnecting at Manhole #A. All future flow to the south of the existing Interceptor will connect with the existing Interceptor while all future flow to the north will connect with the new parallel sewer.

i. Sewer Capacity Analysis

Utilizing the future peak day flows as previously identified along with the County Water and Sewer Ordinance and assuming similar sewer alignment and updated invert elevations to eliminate the negative pipe slopes, desktop calculations were performed to determine the adequate size of new parallel RCP sewer that would be required to convey the future peak day flow. It was determined that 2,098 feet of 66-inch RCP would be required to correct the current negative slopes and section of pipe in which the crown is cracking in the existing Interceptor, 8,376 feet of 72-inch RCP, and 2,862 feet of 78-inch RCP, and 16,740 feet of 84-inch RCP would be required. Alternate II sewer line summary and capacity analyses are summarized in Appendix J.

ii. Sewer Model

Similar to as performed earlier, XPSWMM was used to model the future peak flows within the proposed Alternate II sewer alignment. As expected the model results confirm the adequacy of Alternate II in relation to future peak flows. These results are summarized in Appendix K along with graphics from the model to better illustrate the results.

iii. Impacts

Similar to Alternate I, Alternate II will be installed adjacent to the existing Interceptor and therefore will not impact sewer flow, minimal by-pass pumping would be required during connection to Manhole #A and Manhole #40.

Environmental impacts which must be addressed will be construction within the 100-year flood plain, wetlands, forest conservation, and endangered/sensitive species areas.

iv. Easements

Similar to Alternate I, use of the existing 50 foot wide sewer easement should be fully utilized. However, in order to adequately construct and maintain a parallel Interceptor additional easement will be necessary. Utilizing the County's Plan Preparation Package requirements as identified above, the existing Interceptor with a pipe diameter of 66-inches (5.5 feet) at a depth of 25 feet would require a 60 foot sewer easement. The new parallel Interceptor at 84-inches (7 feet) at a depth of 25 feet would also require a 60 foot sewer easement, equating to a total of 120 foot sewer easement requiring an additional 70 feet of sewer easement. However, as stated in the Plan Preparation Package Section II.M.6, easements containing multiple pipes will be determined on a case by case basis.

Since the existing Interceptor is installed 12.5 feet from the current easement boundary with no known issues, it can be assumed that the new Interceptor, slightly larger in diameter, could be installed 15 feet from the opposite side of the future easement boundary. Allowing for approximately 50 feet between sewers for maintenance and installation purposes, an additional 30 foot of sewer easement for a total sewer easement width of 80 foot with an additional 40 foot temporary construction easement would be recommended. Precautions should be

made in order to prevent damage to the existing Interceptor during installation of the new sewer. These easement widths should be further investigated during the design and discussed with Utilities.

v. Permits

Preliminary investigation has determined that the following permits would be required:

-Maryland Department of the Environment Construction Permit
-Maryland Department of the Environment Wetlands/Construction within the 100 year flood plain
-Maryland State Highway Administration Permit
-Forest Conservation Permit
-U.S. Fish and Wildlife Permit for rare, threatened, and endangered species
-Charles County Soil Conservation District Permit
-Charles County Development Services (CPIS) Permit
-Electric or Gas Utility Permits

vi. O&M

Operation and maintenance is assumed to be basic maintenance of the sewer and manholes along with maintaining access within the existing easement, i.e. mowing, clearing, etc. Maintenance required for Alternate II would be similar if not identical to the existing Interceptor. However the length of sewer and number of manholes would approximately double resulting in twice the normal work. However, since the parallel sewer will be located adjacent to the existing Interceptor and wider easement required, additional easement maintenance is also anticipated. Therefore, O&M for Alternate II would double as compared to the current O&M.

vii. Feasibility

Alternate II is similar to Alternate I in that general construction of a large sewer pipe such as this will have obstacles to overcome as with any project of this size. However, due to the location of the project and adjacent environmental areas, design and construction methods must be elevated to a higher level than typical sanitary sewer projects. These obstacles can be overcome resulting in a successful project that will provide the County the necessary sewer collection capability required.

In addition to construction of the new sewer, repairs to the existing

Interceptor will be required which include removal of the current negative slopes, replacement of the section of pipe with the structural crack along the crown, and repair of several points of infiltration. This work will be more intrusive due to working with the active Interceptor and will require substantial amount of by-pass pumping.

Additional items that should be considered, in particular during the design phase, is the location of the County's existing 16-inch reclaimed waterline and proposed 18-inch reclaimed waterline. Although unlikely to conflict with Alternate I due to the depth of the sewer as compared to that of the reclaimed waterline, this should be further investigated by the design engineer to ensure alignments do not conflict. Also, with construction of the walking trail along the existing Interceptor's alignment, adequate construction details should be provided in order to ensure that the reconstruction of this trail due to construction related to Alternate I is adequate. Finally, a new interceptor sewer, the Old Woman's Run, from the Piney Branch area has been discussed by the County. This new interceptor is intended to relieve the Piney Branch Interceptor which connects to the Mattawoman Interceptor at Manhole #82 and divert some wastewater flow directly to Manhole #28 of the Mattawoman Interceptor. This will relieve some of the capacity issues between Manholes #28 and #82, but not downstream of Manhole #28. Based on the alignment and size of this interceptor, it could accept flow from some of the potential southern drainage areas which would impact capacity of the Mattawoman Sewer as described in this study. It would be recommended that an additional study similar to this one be performed on the Old Woman's Run Interceptor in order to provide the County the most cost effective solution to future wastewater conveyance.

viii. Cost Estimate

The Preliminary Estimate of Probable Costs for Alternate II again was derived through use of the County's Standard Pricing List in conjunction with manufacturer's budgetary cost estimates for items such as manholes, pipe, and bypass pumping. Costs for Alternate II, including easement acquisition, bypassing pumping, hydrogen sulfide damage prevention, rehabilitation of the existing Interceptor, engineering, and contingencies comes to a total of $40,730,036, please see Appendix M for details regarding this cost estimate.

D. Environmental Features

As described above, the majority of permits required for either alternative are

environmentally related. Therefore, with the assistance of the County and use of County GIS information, Figures 5 and 6 have been developed to better illustrated areas of environmental impact this project will have. As shown, the primary impact will be to work within the 100 year flood plain, wetlands, existing forest stands, and rare, endangered, or threatened species. Although these impacts are of great concern, with the proper design and working with the pertained State and Federal agencies, the necessary permits and remediation requirements can be accomplished.

Figure 5
Environmental Features

POTOMAC RIVER

MH-40
MH-35
MH-30
MH-25
MH-20
MH-15
MH-10
MH-5
MH-1
MH-A

Legend

- Study Area
- Existing Manholes
- Critical Area
- Wetlands

Floodplain

ZONE

- 100-yr Floodplain
- 500-yr Floodplain

DAVIS BOWEN & FRIEDEL, INC.

N
W E
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4,000 2,000 0 4,000 Feet

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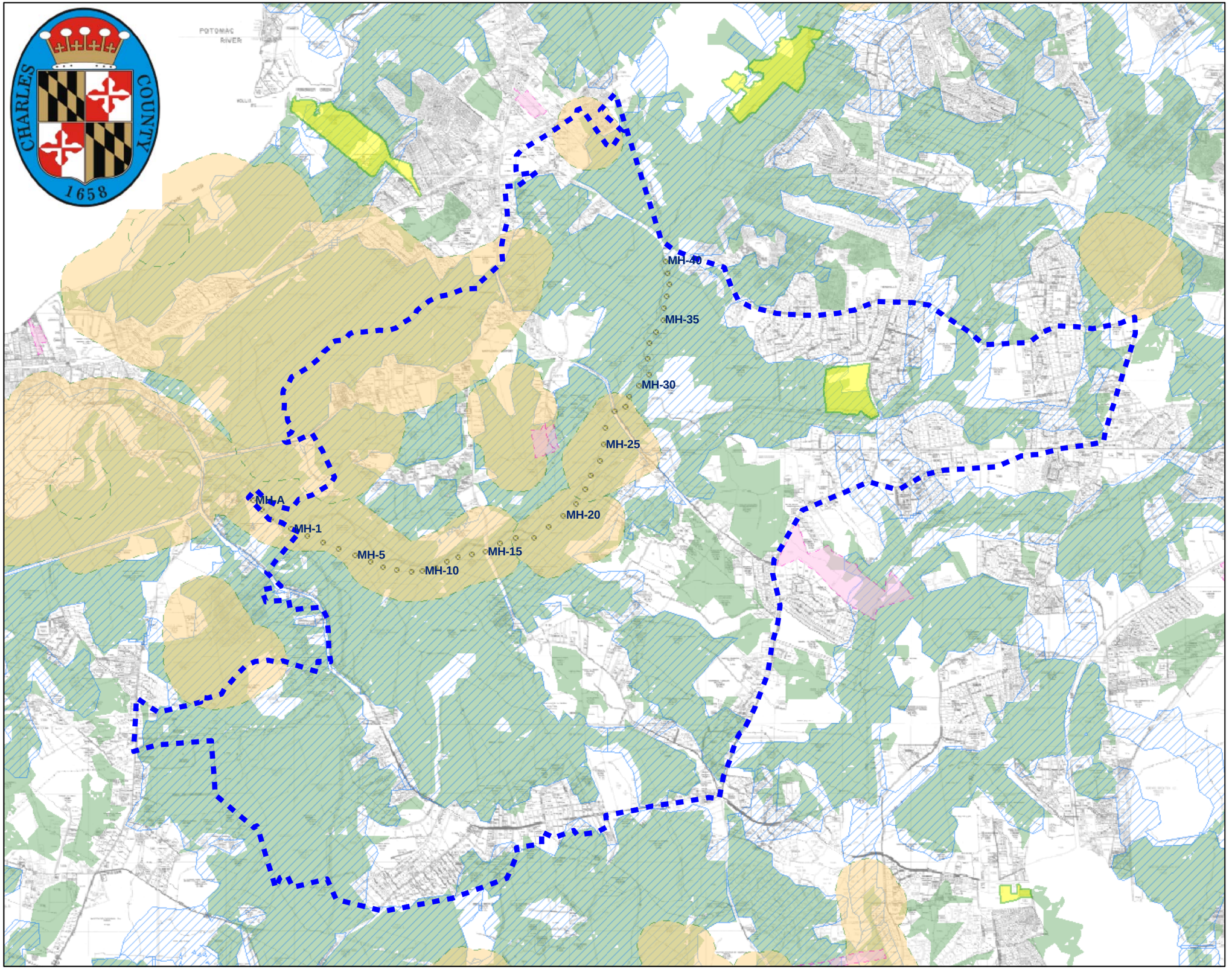
PGM #VCI 06-1-082

Figure 6
Environmental Features



Legend

- Study Area
- Existing Manholes
- Environmental Trust Easements
- Sensitive Species Project Review Areas
- County parks
- Green Infrastructure Hubs and Corridors
- Forest Interior Dwelling Species - Potential Habitat

DAVIS BOWEN & FRIEDEL, INC.

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DBF #1813A002A
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E. Hydrogen Sulfide Analysis

An ongoing County concern is that of hydrogen sulfide deterioration of the concrete within the County's collection system. This would include manholes as well as RCP sewers. Based on the CCTV inspection reports, the section of existing Mattawoman Interceptor did not show any signs of significant signs of deterioration due to hydrogen sulfide.

To eliminate this concern, two options for future concrete which is in contact with wastewater would be use of bitumastic coating of the interior piping, both manholes and sewer lines, or use of Type 5 cement which is more durable in regards to chemical deterioration but also more expensive.

F. Recommended Alternative

Alternate I and Alternate II in comparison are similar in location of the project, environmental impacts, permits, and constructability. Less O&M is associated with Alternate I because of the single pipeline. Additional construction on the existing Interceptor is required with Alternate II in order to remove the current negative slopes, replace the section of pipe with the structural crack along the crown, and repair of several points of infiltration. Based on these highlights and the Preliminary Estimate of Probable Costs in Appendix M, Alternate I, a new Interceptor, would be the recommendation of this study.

Appendix A

- Existing Interceptor Details

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Mattawoman Interceptor
Existing Manhole Summary
Manholes #A through #40

Manhole	Model	Coordinates		Rim	Invert Elevations			Pipe Sizes (in)		
Number	Identifier	Northing	Easting	Elevation	In	Out	Other [1]	In	Out	Other [1]
40	MH40	345056.613	1298642.230	57.26	39.81	39.66	42.16	60	60	12
39	MH39	344536.010	1298720.310	56.20	38.65	38.40		60	60	
38	MH38	344050.540	1298817.838	55.34	37.19	37.04		60	60	
37	MH37	343539.767	1298691.391	54.42	36.37	36.27		60	60	
36	MH36	343005.810	1298558.761	53.66	35.51	35.16		60	60	
35	MH35	342478.209	1298526.193	55.92	34.02	33.77		60	60	
34	MH34	341977.771	1298228.501	51.32	32.87	32.72	35.22	60	60	12
33	MH33	341464.328	1297924.754	51.88	31.81	31.68		60	60	
32	MH32	340818.365	1297872.036	49.18	30.08	29.98		60	60	
31	MH31	340076.481	1297932.350	48.67	28.52	28.37	32.29	60	60	10
30	MH30	339606.502	1297496.330	48.17	27.17	27.02		60	60	
29	MH29	339125.359	1297048.067	46.43	26.03	25.73		60	60	
28	MH28	338669.816	1296884.216	46.41	24.86	24.51	27.51	60	66	27
27	MH27	338466.734	1296420.751	47.31	23.86	23.61		66	66	
26	MH26	337772.744	1296033.297	43.81	22.36	22.11		66	66	
25	MH25	337025.164	1295939.141	42.04	21.24	21.04		66	66	
24	MH24	336313.115	1295761.840	40.50	20.25	20.05		66	66	
23	MH23	335680.624	1295385.401	39.71	19.21	18.86		66	66	
22	MH22	335095.260	1295156.676	38.60	17.80	17.40		66	66	
21	MH21	334441.409	1294753.294	36.56	16.76	16.35		66	66	
20	MH20	333937.410	1294195.815	36.76	15.51	15.21		66	66	
19	MH19	333441.744	1293545.644	34.06	14.21	13.91		66	66	
18	MH18	332945.315	1292889.429	33.77	12.71	12.27	16.41	66	66	15
17	MH17	332970.316	1292097.827	31.35	11.44	11.14		66	66	
16	MH16	332716.976	1291409.662	28.75	10.25	10.05		66	66	
15	MH15	332348.533	1290775.645	30.21	10.30	10.02		66	66	
14	MH14	332242.619	1290160.980	28.01	8.31	8.01		66	66	
13	MH13	332136.804	1289571.125	27.15	8.09	7.70		66	66	
12	MH12	331925.766	1289092.856	24.57	6.97	6.77		66	66	
11	MH10	331648.570	1288624.492	25.21	5.06	4.96		66	66	
10	MH9	331519.548	1288018.452	23.30	4.11	3.90		66	66	
9	MH8	331465.101	1287543.804	22.41	3.36	3.21		66	66	
8	MH7	331566.831	1286909.249	22.56	2.46	2.26		66	66	
7	MH6	331666.060	1286289.661	20.92	1.27	1.12		66	66	
6	MH6	331912.413	1285726.229	20.12	0.17	-0.13		66	66	
5	MH5	332192.352	1285049.648	18.55	-0.85	-1.10		66	66	
4	MH4	332475.455	1284355.161	16.90	-2.55	-2.75		66	66	
3	MH3	332763.195	1283660.980	14.92	-3.83	-3.98		66	66	
2	MH2	333050.942	1282967.098	13.80	-4.75	-4.90		66	66	
1	MH1	333340.521	1282268.013	12.17	-6.28	-7.05		66	66	
F	MHF	333597.242	1281873.153	12.14	-8.86	-8.96		66	66	
E	MHE	333768.452	1281394.694	11.50	-10.70	-10.80		66	66	
D	MHD	334201.098	1280980.225	10.99	-12.69	-12.79		66	66	
C[2][4]	MHC	334599.581	1280619.207	9.21	-14.09	-14.09		66	66	
A[2][3][4]	MHA	334586.098	1280583.174	10.24	-14.76	-14.76	-14.76	66	78	60

(1) Other refers to previously installed stub outs not currently in use.

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Mattawoman Interceptor
Existing Sewer Line Summary
Manholes #A through #40

Upstream Manhole	Downstream Manhole	Model Identifier	Pipe Size (in)	Length (ft)	Upstream Invert[(1)]	Downstream Invert[(1)]	Slope %
40	39	L44	60	526.42	39.66	38.65	0.19%
39	38	L43	60	495.17	38.40	37.19	0.24%
38	37	L42	60	526.19	37.04	36.37	0.13%
37	36	L41	60	550.18	36.27	35.51	0.14%
36	35	L40	60	528.46	35.16	34.02	0.22%
35	34	L39	60	582.44	33.77	32.87	0.15%
34	33	L38	60	596.56	32.72	31.81	0.15%
33	32	L37	60	654.41	31.68	30.08	0.24%
32	31	L36	60	750.85	29.98	28.52	0.19%
31	30	L35	60	641.09	28.37	27.17	0.19%
30	29	L34	60	657.60	27.02	26.03	0.15%
29	28	L33	60	484.11	25.73	24.86	0.18%
28	27	L32	66	506.01	24.51	23.86	0.13%
27	26	L31	66	801.08	23.61	22.36	0.16%
26	25	L30	66	753.51	22.11	21.24	0.12%
25	24	L29	66	743.90	21.04	20.25	0.11%
24	23	L28	66	736.05	20.05	19.21	0.11%
23	22	L27	66	628.47	18.86	17.80	0.17%
22	21	L26	66	781.07	17.40	16.76	0.08%
21	20	L25	66	751.59	16.35	15.51	0.11%
20	19	L24	66	817.57	15.21	14.21	0.12%
19	18	L23	66	822.83	13.91	12.71	0.14%
18	17	L22	66	798.73	12.27	11.44	0.10%
17	16	L21	66	777.39	11.14	10.25	0.11%
16	15	L20	66	747.72	10.05	10.30	-0.03%
15	14	L19	66	623.73	10.02	8.31	0.27%
14	13	L18	66	599.27	8.01	8.09	-0.01%
13	12	L17	66	522.76	7.70	6.97	0.14%
12	11	L16	66	543.94	6.77	5.06	0.31%
11	10	L15	66	619.95	4.96	4.11	0.14%
10	9	L14	66	477.74	3.90	3.36	0.11%
9	8	L13	66	642.66	3.21	2.46	0.12%
8	7	L12	66	627.49	2.26	1.27	0.16%
7	6	L11	66	614.93	1.12	0.17	0.15%
6	5	L10	66	732.21	-0.13	-0.85	0.10%
5	4	L9	66	749.97	-1.10	-2.55	0.19%
4	3	L8	66	751.46	-2.75	-3.83	0.14%
3	2	L7	66	751.18	-3.98	-4.75	0.10%
2	1	L6	66	756.68	-4.90	-6.28	0.18%
1	F	L5	66	470.98	-7.05	-8.86	0.38%
F	E	L4	66	508.17	-8.96	-10.70	0.34%
E	D	L3	66	599.14	-10.80	-12.69	0.32%
D	C	L2	66	537.70	-12.79	-14.09	0.24%
C	A	L1	66	38.47	-14.09	-14.76	1.74%

(1) Manhole invert elevations for Manholes A and C supplied by Charles County Department of Utilities.
(2) Manhole A is the junction box of the Mattawoman and Bryan's Road Interceptors.
(3) Manhole B is located on the Bryan's Road Interceptor.

Appendix B

- Relevant Pages from Previous Study

MATTAWOMAN INTERCEPTOR

PHASE 1 & 2 CAPACITY STUDY

Prepared for:

CHARLES COUNTY DEPARTMENT OF PLANNING AND GROWTH MANAGEMENT

VCI 06-0082

WALDORF SANITARY DISTRICT NUMBER ONE

4th ELECTION DISTRICT

Prepared by:

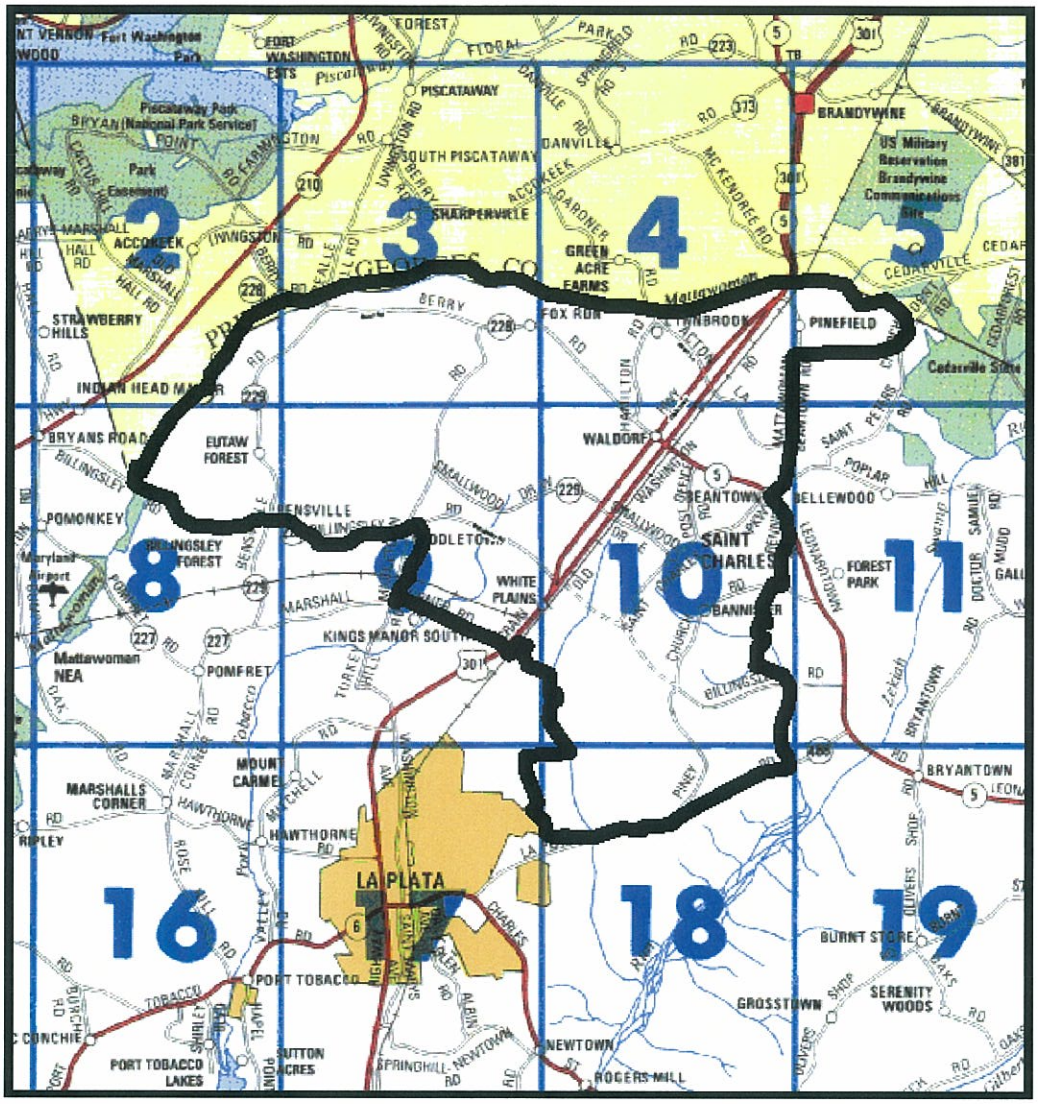
KCI TECHNOLOGIES, INC.
10 North Park Drive,
Hunt Valley, Maryland 21030

7/24/07

July 2007

100% Report

"PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 14364 EXPIRATION DATE: 3/29/07."



Mattawoman Interceptor Phase 1 & 2 Capacity Study
PGM # VCI 06-0082

Vicinity Map

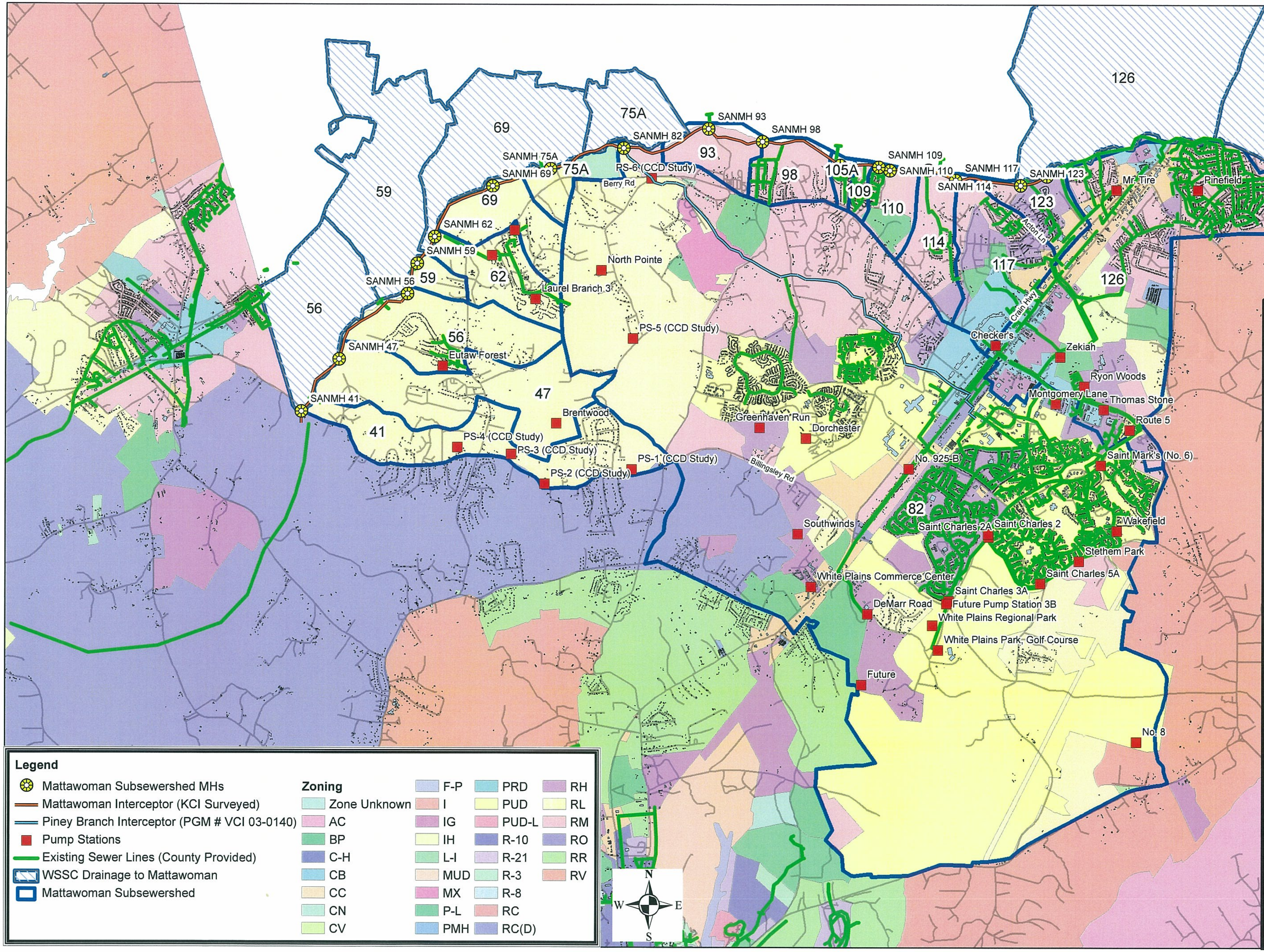
February 2008

10,000 5,000 0 10,000 Feet

N
W E
S

KCI

Figure 1



Mattawoman Interceptor Phase 1 & 2 Capacity Study

PGM # VCI 06-0082

Zoning Map

February 2008

5,000 2,500 0 5,000 Feet

Appendix B

KCI TECHNOLOGIES

Table 5: Subsewershed Design Flow Calculation

Existing- Sorted by MH Subsewershed, (MDP Residential parcels + GIS Commercial & Industrial parcels+ WSSC Contribution)

A		B	"Appendix V" , Charles County Water and Sewer Ordinance							
			C	D	E	F	G	H	I	J
MH Sub-sewershed	County Collection Area (Acres)	WSSC Collection Area (Acres)	Avg. Flow based on Q/EDU or Q/Acre (gpd)	Avg. Flow (cfs)	Cum Avg Flow (cfs)	Cumulative Avg (gpd)	Peak Factor	Cumulative Peak (gpd)	Cumulative I/I (gpd)	Cumulative Existing Peak Q +I/I (gpd)
126	3,496	7,724	5,179,083	8.0	8.0	5,179,083	2.4	12,599,714	4,488,040	17,087,754
123	333		241,479	0.4	8.4	5,420,562	2.4	13,087,406	4,621,120	17,708,526
117	814		1,420,892	2.2	10.6	6,841,454	2.3	15,889,381	4,946,880	20,836,261
114	499		125,151	0.2	10.8	6,966,605	2.3	16,131,236	5,146,480	21,277,716
110	282		387,114	0.6	11.4	7,353,719	2.3	16,874,821	5,259,280	22,134,101
109	72		36,086	0.1	11.4	7,389,805	2.3	16,943,799	5,288,160	22,231,959
105A	63		13,938	0.0	11.5	7,403,743	2.3	16,970,427	5,313,520	22,283,947
98	344		87,588	0.1	11.6	7,491,331	2.3	17,137,566	5,451,240	22,588,806
93	300		51,102	0.1	3.7	7,542,433	2.3	17,234,930	5,571,360	22,806,290
82	18,655		8,581,309	13.3	24.9	16,123,742	2.0	32,461,719	13,033,320	45,495,039
75A	283	432	228,420	0.4	25.3	16,352,162	2.0	32,844,498	13,319,480	46,163,978
69	500	1,120	74,580	0.1	25.4	16,426,742	2.0	32,969,283	13,967,360	46,936,643
62	534		85,020	0.1	25.5	16,511,762	2.0	33,111,422	14,180,800	47,292,222
59	134	1,407	123,520	0.2	25.7	16,635,282	2.0	33,317,708	14,797,000	48,114,708
56	843	899	187,880	0.3	26.0	16,823,162	2.0	33,630,991	15,493,960	49,124,951
47	1,278		150,020	0.2	26.3	16,973,182	2.0	33,880,726	16,005,200	49,885,926
41	1,130		167,860	0.3	26.5	17,141,042	2.0	34,159,722	16,457,360	50,617,082
	29,561	**11,582**				**27 cfs**		**53 cfs**		**78 cfs**

Future- Sorted by MH Subsewershed, (MDP Future Residential parcels + GIS Future Commercial & Industrial parcels+ WSSC Contribution)

A		B	"Appendix V" , Charles County Water and Sewer Ordinance							
			C	D	E	F	G	H	I	J
MH Sub-sewershed	County Collection Area (Acres)	WSSC Collection Area (Acres)	Avg. Flow based on Q/EDU or Q/Acre (gpd)	Avg. Flow (cfs)	Cum Avg Flow (cfs)	Cumulative Avg (gpd)	Peak Factor	Cumulative Peak (gpd)	Cumulative I/I (gpd)	Cumulative Future Peak Q +I/I (gpd)
126	3,496	7,724	10,113,066	15.6	15.6	10,113,066	2.2	22,006,569	4,488,040	26,494,609
123	333		352,700	0.5	16.2	10,465,766	2.2	22,644,314	4,621,120	27,265,434
117	814		2,623,165	4.1	20.3	13,088,931	2.1	27,283,712	4,946,880	32,230,592
114	499		190,912	0.3	20.5	13,279,843	2.1	27,614,939	5,146,480	32,761,419
110	282		760,434	1.2	21.7	14,040,277	2.1	28,926,532	5,259,280	34,185,812
109	72		43,690	0.1	21.8	14,083,967	2.1	29,001,523	5,288,160	34,289,683
105A	63		21,412	0.0	21.8	14,105,379	2.1	29,038,261	5,313,520	34,351,781
98	344		132,150	0.2	22.0	14,237,529	2.1	29,264,796	5,451,240	34,716,036
93	300		60,996	0.1	22.1	14,298,525	2.1	29,369,238	5,571,360	34,940,598
82	18,655		17,323,180	26.8	48.9	31,621,705	2.0	63,243,410	13,033,320	76,276,730
75A	283	432	545,540	0.8	49.8	32,167,245	2.0	64,334,490	13,319,480	77,653,970
69	500	1,120	355,680	0.6	50.3	32,522,925	2.0	65,045,850	13,967,360	79,013,210
62	534		161,460	0.2	50.6	32,684,385	2.0	65,368,770	14,180,800	79,549,570
59	134	1,407	268,360	0.4	51.0	32,952,745	2.0	65,905,490	14,797,000	80,702,490
56	843	899	375,360	0.6	51.6	33,328,105	2.0	66,656,210	15,493,960	82,150,170
47	1,278		494,000	0.8	52.3	33,822,105	2.0	67,644,210	16,005,200	83,649,410
41	1,130		248,042	0.4	52.7	34,070,147	2.0	68,140,294	16,457,360	84,597,654
	29,561	**11,582**				**53 cfs**		**105 cfs**		**131 cfs**

Peak Factor: For cumulative Q_a = 0.25 to 16 MGD, $Q_p = 3.2 \times Q_a^{5/6}$, Qa > 16 MGD, $Qp = 2.0 \times Qa^{5/6}$

I/I = 400 gpd/acre in drainage basin.

M:\2006\01065913\Engr\[TotalFlow Calc.xls] Summary-Ex. & Fut.

Appendix C

- Existing Sewer Analysis-Existing Peak Flows

Charles County
Department of Planning & Growth Management
Mattawoman Interceptor Phase III Capacity Study
PGM #VCI 06-1-082
DBF #1813A002A
Final Report

Mattawoman Interceptor
Existing Sewer Capacity Analysis
Per County Water & Sewer Ordiance
Manholes #A through #40

			Pipe Size			Full Pipe	Wetted	Hydraulic	Full Pipe	Full Pipe Flow				**County Design Capacity d/D = .67[1]** Velocity				
Upstream Manhole	Downstream Manhole	Model Identifier	Size (in)	n Factor	Slope %	Flow Area (ft2)	Perimeter (ft)	Radius	Velocity (fps)	(cfs)	(gpm)	(gpd)	(MGD)	v/V=.94[2] (fps)	Pipe Flow q/Q=.67[2] (cfs)	(gpm)	(gpd)	(MGD)
40	39	L44	60	0.015	0.19%	19.63	15.71	1.25	5.04	98.87	44,375	63,900,312	63.90	4.73	66.24	29,731	42,813,209	42.81
39	38	L43	60	0.015	0.24%	19.63	15.71	1.25	5.68	111.58	50,080	72,114,734	72.11	5.34	74.76	33,553	48,316,872	48.32
38	37	L42	60	0.015	0.13%	19.63	15.71	1.25	4.10	80.54	36,150	52,056,455	52.06	3.86	53.96	24,221	34,877,825	34.88
37	36	L41	60	0.015	0.14%	19.63	15.71	1.25	4.27	83.89	37,653	54,220,421	54.22	4.02	56.21	25,228	36,327,682	36.33
36	35	L40	60	0.015	0.22%	19.63	15.71	1.25	5.34	104.84	47,054	67,757,106	67.76	5.02	70.24	31,526	45,397,261	45.40
35	34	L39	60	0.015	0.15%	19.63	15.71	1.25	4.52	88.73	39,824	57,346,134	57.35	4.25	59.45	26,682	38,421,910	38.42
34	33	L38	60	0.015	0.15%	19.63	15.71	1.25	4.49	88.16	39,568	56,977,333	56.98	4.22	59.07	26,510	38,174,813	38.17
33	32	L37	60	0.015	0.24%	19.63	15.71	1.25	5.68	111.61	50,093	72,134,581	72.13	5.34	74.78	33,563	48,330,169	48.33
32	31	L36	60	0.015	0.19%	19.63	15.71	1.25	5.07	99.53	44,673	64,329,225	64.33	4.76	66.69	29,931	43,100,581	43.10
31	30	L35	60	0.015	0.19%	19.63	15.71	1.25	4.97	97.66	43,831	63,116,020	63.12	4.68	65.43	29,366	42,287,734	42.29
30	29	L34	60	0.015	0.15%	19.63	15.71	1.25	4.46	87.58	39,308	56,603,747	56.60	4.19	58.68	26,336	37,924,510	37.92
29	28	L33	60	0.015	0.18%	19.63	15.71	1.25	4.87	95.69	42,947	61,843,788	61.84	4.58	64.11	28,775	41,435,338	41.44
28	27	L32	66	0.015	0.13%	23.76	17.28	1.38	4.39	104.31	46,817	67,416,485	67.42	4.13	69.89	31,367	45,169,045	45.17
27	26	L31	66	0.015	0.16%	23.76	17.28	1.38	4.84	114.96	51,599	74,302,947	74.30	4.55	77.03	34,572	49,782,975	49.78
26	25	L30	66	0.015	0.12%	23.76	17.28	1.38	4.16	98.89	44,386	63,915,192	63.92	3.91	66.26	29,738	42,823,178	42.82
25	24	L29	66	0.015	0.11%	23.76	17.28	1.38	3.99	94.84	42,568	61,297,850	61.30	3.75	63.54	28,521	41,069,560	41.07
24	23	L28	66	0.015	0.11%	23.76	17.28	1.38	4.14	98.32	44,128	63,544,061	63.54	3.89	65.87	29,566	42,574,521	42.57
23	22	L27	66	0.015	0.17%	23.76	17.28	1.38	5.03	119.52	53,646	77,250,204	77.25	4.73	80.08	35,943	51,757,637	51.76
22	21	L26	66	0.015	0.08%	23.76	17.28	1.38	3.51	83.31	37,391	53,843,587	53.84	3.30	55.82	25,052	36,075,204	36.08
21	20	L25	66	0.015	0.11%	23.76	17.28	1.38	4.10	97.30	43,669	62,883,706	62.88	3.85	65.19	29,258	42,132,083	42.13
20	19	L24	66	0.015	0.12%	23.76	17.28	1.38	4.28	101.78	45,684	65,784,943	65.78	4.03	68.20	30,608	44,075,912	44.08
19	18	L23	66	0.015	0.14%	23.76	17.28	1.38	4.58	108.90	48,875	70,380,605	70.38	4.31	72.96	32,747	47,155,005	47.16
18	17	L22	66	0.015	0.10%	23.76	17.28	1.38	3.95	93.82	42,108	60,635,649	60.64	3.71	62.86	28,212	40,625,885	40.63
17	16	L21	66	0.015	0.11%	23.76	17.28	1.38	4.14	98.47	44,198	63,645,032	63.65	3.90	65.98	29,613	42,642,171	42.64
16	15	L20	66	0.015	-0.03%	23.76	17.28	1.38	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15	14	L19	66	0.015	0.27%	23.76	17.28	1.38	6.41	152.39	68,395	98,489,225	98.49	6.03	102.10	45,825	65,987,780	65.99
14	13	L18	66	0.015	-0.01%	23.76	17.28	1.38	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13	12	L17	66	0.015	0.14%	23.76	17.28	1.38	4.58	108.76	48,813	70,290,921	70.29	4.30	72.87	32,705	47,094,917	47.09
12	11	L16	66	0.015	0.31%	23.76	17.28	1.38	6.87	163.18	73,240	105,465,772	105.47	6.46	109.33	49,071	70,662,067	70.66
11	10	L15	66	0.015	0.14%	23.76	17.28	1.38	4.54	107.76	48,368	69,649,838	69.65	4.26	72.20	32,407	46,665,391	46.67
10	9	L14	66	0.015	0.11%	23.76	17.28	1.38	4.12	97.85	43,916	63,239,737	63.24	3.87	65.56	29,424	42,370,624	42.37
9	8	L13	66	0.015	0.12%	23.76	17.28	1.38	4.18	99.42	44,624	64,258,262	64.26	3.93	66.61	29,898	43,053,036	43.05
8	7	L12	66	0.015	0.16%	23.76	17.28	1.38	4.87	115.60	51,885	74,714,204	74.71	4.57	77.45	34,763	50,058,516	50.06
7	6	L11	66	0.015	0.15%	23.76	17.28	1.38	4.81	114.39	51,342	73,932,934	73.93	4.53	76.64	34,399	49,535,066	49.54
6	5	L10	66	0.015	0.10%	23.76	17.28	1.38	3.84	91.26	40,961	58,984,432	58.98	3.61	61.15	27,444	39,519,569	39.52
5	4	L9	66	0.015	0.19%	23.76	17.28	1.38	5.39	127.97	57,437	82,708,670	82.71	5.06	85.74	38,483	55,414,809	55.41
4	3	L8	66	0.015	0.14%	23.76	17.28	1.38	4.64	110.33	49,521	71,309,587	71.31	4.37	73.92	33,179	47,777,423	47.78
3	2	L7	66	0.015	0.10%	23.76	17.28	1.38	3.92	93.18	41,822	60,222,993	60.22	3.69	62.43	28,020	40,349,405	40.35
2	1	L6	66	0.015	0.18%	23.76	17.28	1.38	5.23	124.29	55,784	80,329,006	80.33	4.92	83.27	37,375	53,820,434	53.82
1	F	L5	66	0.015	0.38%	23.76	17.28	1.38	7.59	180.42	80,978	116,607,648	116.61	7.14	120.88	54,255	78,127,124	78.13
F	E	L4	66	0.015	0.34%	23.76	17.28	1.38	7.17	170.30	76,436	110,067,497	110.07	6.74	114.10	51,212	73,745,223	73.75
E	D	L3	66	0.015	0.32%	23.76	17.28	1.38	6.88	163.46	73,366	105,646,648	105.65	6.47	109.52	49,155	70,783,254	70.78
D	C	L2	66	0.015	0.24%	23.76	17.28	1.38	6.02	143.10	64,229	92,489,118	92.49	5.66	95.88	43,033	61,967,709	61.97
C	A	L1	66	0.015	1.74%	23.76	17.28	1.38	16.17	384.08	172,386	248,236,299	248.24	15.20	257.33	115,499	166,318,320	166.32

(1) Per County Water and Sewer Ordinance 8.2D(2)(a); maximum pipe flow of 2/3 full.
(2) Ratios per Charles County Water and Sewer Ordinance Appendix BB.

Charles County
Department of Planning & Growth Management
Mattawoman Interceptor Phase III Capacity Study
PGM #VCI 06-1-082
DBF #1813A002A
Final Report

Mattawoman Interceptor
Existing Sewer Capacity Existing Peak Flow Analysis
Per County Water & Sewer Ordiance
Manholes #A through #40

Upstream Manhole	Downstream Manhole	Model Identifier	Cummulative Peak Sewer Flow (cfs)[1]	Sewer Capacity (cfs)	Adequate to Convey Peak Flow YES/NO	Additional Capaciy Required (cfs)
40	39	L44	78.32	66.24	**NO**	12.08
39	38	L43	78.32	74.76	**NO**	3.56
38	37	L42	78.32	53.96	**NO**	24.36
37	36	L41	78.32	56.21	**NO**	22.11
36	35	L40	78.32	70.24	**NO**	8.08
35	34	L39	78.32	59.45	**NO**	18.87
34	33	L38	78.32	59.07	**NO**	19.25
33	32	L37	78.32	74.78	**NO**	3.54
32	31	L36	78.32	66.69	**NO**	11.63
31	30	L35	78.32	65.43	**NO**	12.89
30	29	L34	78.32	58.68	**NO**	19.64
29	28	L33	78.32	64.11	**NO**	14.21
28	27	L32	78.32	69.89	**NO**	8.43
27	26	L31	78.32	77.03	**NO**	1.29
26	25	L30	78.32	66.26	**NO**	12.06
25	24	L29	78.32	63.54	**NO**	14.78
24	23	L28	78.32	65.87	**NO**	12.45
23	22	L27	78.32	80.08	YES	0.00
22	21	L26	78.32	55.82	**NO**	22.50
21	20	L25	78.32	65.19	**NO**	13.13
20	19	L24	78.32	68.20	**NO**	10.12
19	18	L23	78.32	72.96	**NO**	5.36
18	17	L22	78.32	62.86	**NO**	15.46
17	16	L21	78.32	65.98	**NO**	12.34
16	15	L20	78.32	N/A	**NO**	N/A
15	14	L19	78.32	102.10	YES	0.00
14	13	L18	78.32	N/A	**NO**	N/A
13	12	L17	78.32	72.87	**NO**	5.45
12	11	L16	78.32	109.33	YES	0.00
11	10	L15	78.32	72.20	**NO**	6.12
10	9	L14	78.32	65.56	**NO**	12.76
9	8	L13	78.32	66.61	**NO**	11.71
8	7	L12	78.32	77.45	**NO**	0.87
7	6	L11	78.32	76.64	**NO**	1.68
6	5	L10	78.32	61.15	**NO**	17.17
5	4	L9	78.32	85.74	YES	0.00
4	3	L8	78.32	73.92	**NO**	4.40
3	2	L7	78.32	62.43	**NO**	15.89
2	1	L6	78.32	83.27	YES	0.00
1	F	L5	78.32	120.88	YES	0.00
F	E	L4	78.32	114.10	YES	0.00
E	D	L3	78.32	109.52	YES	0.00
D	C	L2	78.32	95.88	YES	0.00
C	A	L1	78.32	257.33	YES	0.00

(1) Peak sewer flow per previous study upstream of Manhole #40, see Appendix B.

Appendix D

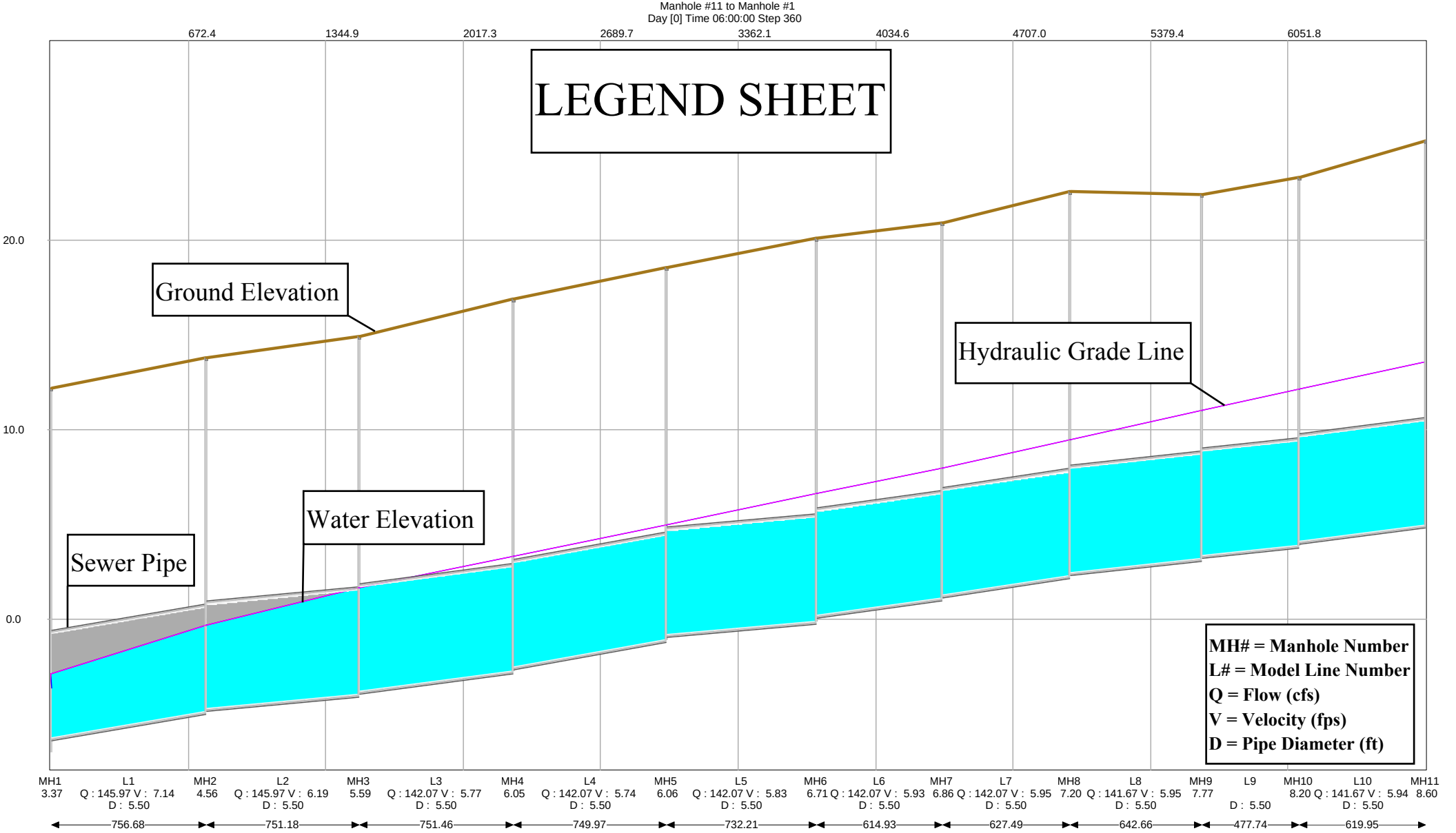
- Model Results-Existing Sewer Analysis Existing Peak Flows

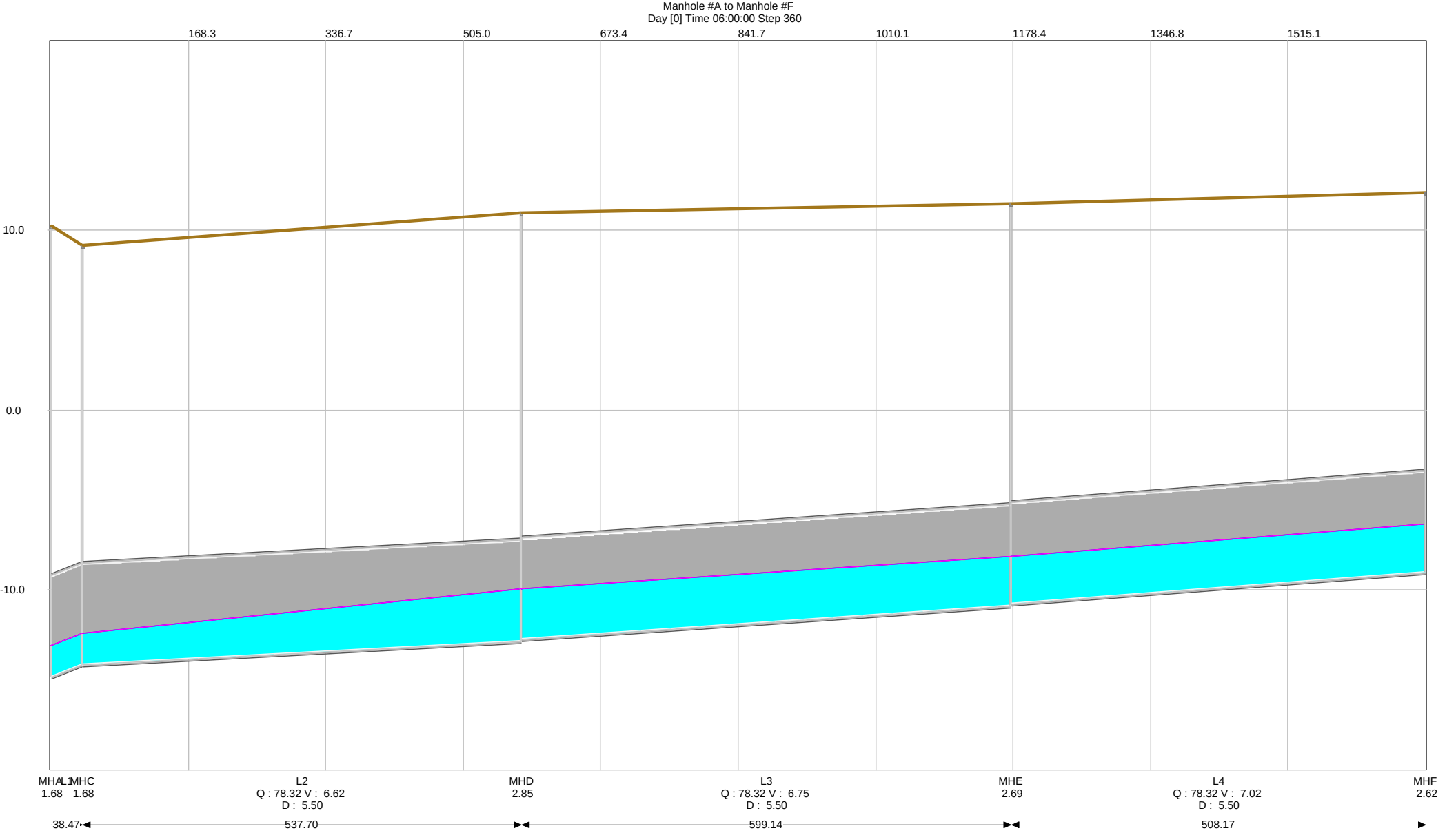
Charles County
Department of Planning & Growth Management
Mattawoman Interceptor Phase III Capacity Study
PGM #VCI 06-1-082
DBF #1813A002A
Final Report

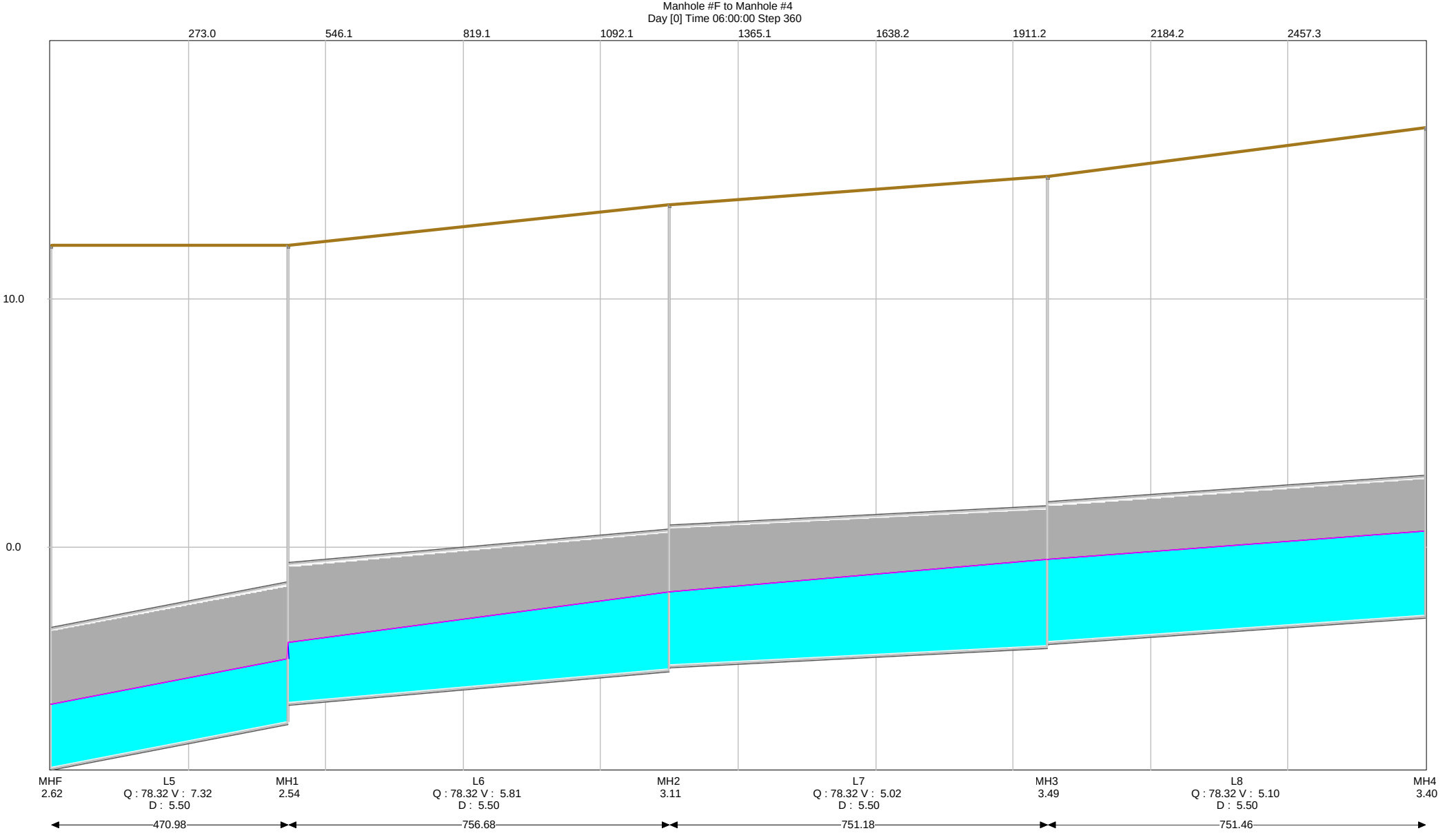
Mattawoman Interceptor
XPSWMM Model Results
Per County Water & Sewer Ordiance Maximum d/D = 0.67
Existing Peak Wastewater Flows within Existing Interceptor

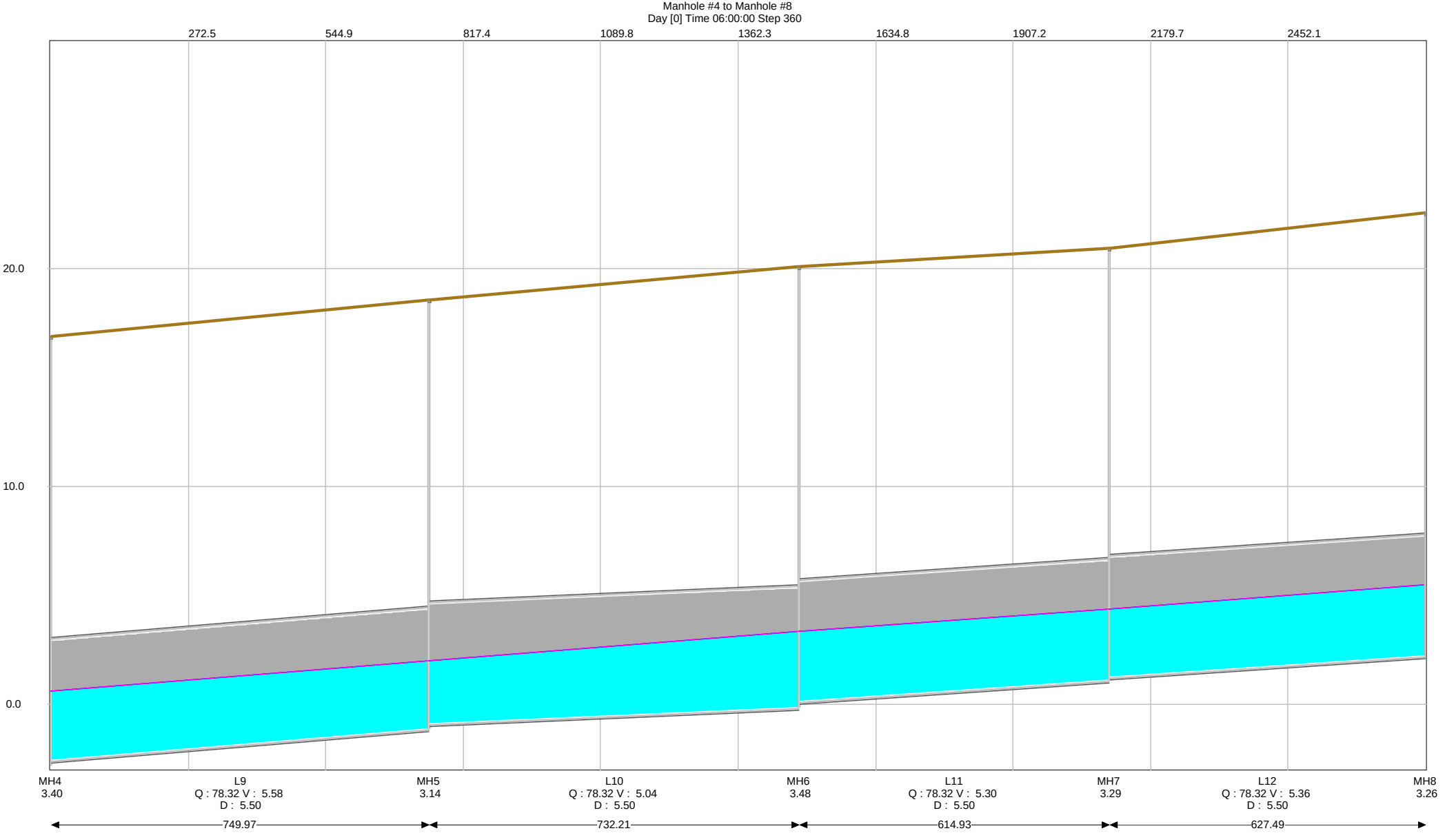
Model Identifier	Upstream Manhole	Downstream Manhole	Pipe Size Size (in)	n Factor	Slope %	Full Pipe Flow (cfs)	Maximum Pipe Flow[1] (cfs)	Design Depth (ft)	Maximum Depth (ft)	Maximum d/D	Meets County Ordinance[2]
L44	40	39	60	0.015	0.19%	98.87	78.32	3.35	3.25	0.65	YES
L43	39	38	60	0.015	0.24%	111.58	78.32	3.35	3.45	0.69	**NO**
L42	38	37	60	0.015	0.13%	80.54	78.32	3.35	3.60	0.72	**NO**
L41	37	36	60	0.015	0.14%	83.89	78.32	3.35	3.42	0.68	**NO**
L40	36	35	60	0.015	0.22%	104.84	78.32	3.35	3.24	0.65	YES
L39	35	34	60	0.015	0.15%	88.73	78.32	3.35	3.49	0.70	**NO**
L38	34	33	60	0.015	0.15%	88.16	78.32	3.35	3.42	0.68	**NO**
L37	33	32	60	0.015	0.24%	111.61	78.32	3.35	3.22	0.64	YES
L36	32	31	60	0.015	0.19%	99.53	78.32	3.35	3.32	0.66	YES
L35	31	30	60	0.015	0.19%	97.66	78.32	3.35	3.36	0.67	**NO**
L34	30	29	60	0.015	0.15%	87.58	78.32	3.35	3.44	0.69	**NO**
L33	29	28	60	0.015	0.18%	95.69	78.32	3.35	3.28	0.66	YES
L32	28	27	66	0.015	0.13%	104.31	78.32	3.69	3.34	0.61	YES
L31	27	26	66	0.015	0.16%	114.96	78.32	3.69	3.33	0.61	YES
L30	26	25	66	0.015	0.12%	98.89	78.32	3.69	3.55	0.65	YES
L29	25	24	66	0.015	0.11%	94.84	78.32	3.69	3.55	0.65	YES
L28	24	23	66	0.015	0.11%	98.32	78.32	3.69	3.42	0.62	YES
L27	23	22	66	0.015	0.17%	119.52	78.32	3.69	3.25	0.59	YES
L26	22	21	66	0.015	0.08%	83.31	78.32	3.69	3.64	0.66	YES
L25	21	20	66	0.015	0.11%	97.30	78.32	3.69	3.50	0.64	YES
L24	20	19	66	0.015	0.12%	101.78	78.32	3.69	3.44	0.63	YES
L23	19	18	66	0.015	0.14%	111.14	78.32	3.69	3.36	0.61	YES
L22	18	17	66	0.015	0.10%	93.82	78.32	3.69	3.65	0.66	YES
L21	17	16	66	0.015	0.11%	98.47	78.32	3.69	3.74	0.68	**NO**
L20	16	15	66	0.015	-0.03%	53.22	78.32	3.69	3.69	0.67	**NO**
L19	15	14	66	0.015	0.27%	152.39	78.32	3.69	3.44	0.63	YES
L18	14	13	66	0.015	-0.01%	33.63	78.32	3.69	3.66	0.67	YES
L17	13	12	66	0.015	0.14%	108.76	78.32	3.69	3.18	0.58	YES
L16	12	11	66	0.015	0.31%	163.18	78.32	3.69	3.29	0.60	YES
L15	11	10	66	0.015	0.14%	107.76	78.32	3.69	3.39	0.62	YES
L14	10	9	66	0.015	0.11%	97.85	78.32	3.69	3.47	0.63	YES
L13	9	8	66	0.015	0.12%	99.42	78.32	3.69	3.42	0.62	YES
L12	8	7	66	0.015	0.16%	115.60	78.32	3.69	3.26	0.59	YES
L11	7	6	66	0.015	0.15%	114.39	78.32	3.69	3.29	0.60	YES
L10	6	5	66	0.015	0.10%	91.26	78.32	3.69	3.48	0.63	YES
L9	5	4	66	0.015	0.19%	127.97	78.32	3.69	3.20	0.58	YES
L8	4	3	66	0.015	0.14%	110.33	78.32	3.69	3.40	0.62	YES
L7	3	2	66	0.015	0.10%	93.18	78.32	3.69	3.49	0.64	YES
L6	2	1	66	0.015	0.18%	124.29	78.32	3.69	3.11	0.57	YES
L5	1	F	66	0.015	0.38%	180.42	78.32	3.69	2.54	0.46	YES
L4	F	E	66	0.015	0.34%	170.3	78.32	3.69	2.62	0.48	YES
L3	E	D	66	0.015	0.32%	163.46	78.32	3.69	2.75	0.50	YES
L2	D	C	66	0.015	0.24%	143.1	78.32	3.69	2.85	0.52	YES
L1	C	A	66	0.015	1.74%	384.08	78.32	3.69	1.68	0.31	YES

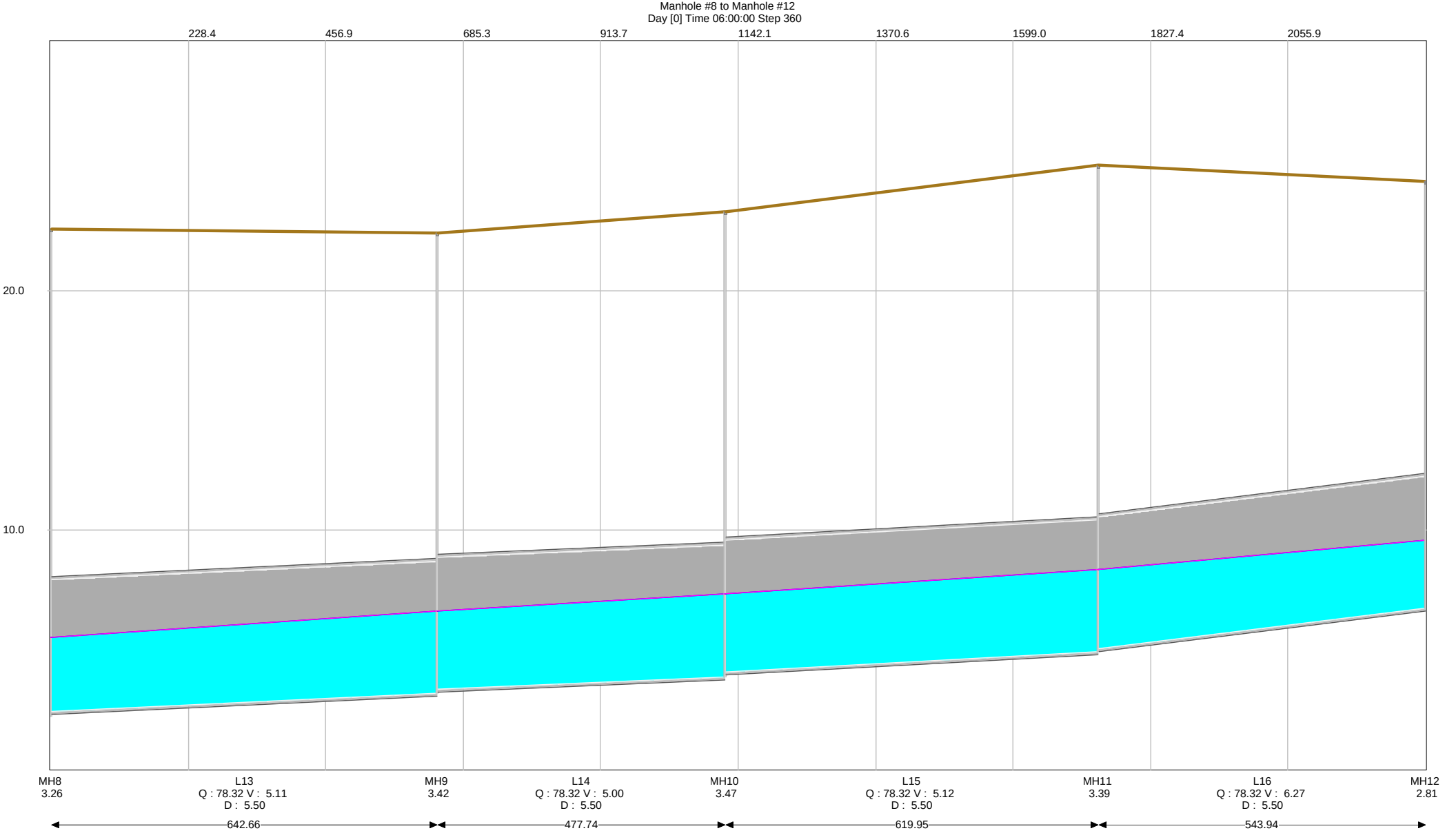
(1) Peak sewer flow per previous study upstream of Manhole #40, see Appendix B.
(2) Per County Water and Sewer Ordinance 8.2D(2)(a); maximum pipe flow of 2/3 full.

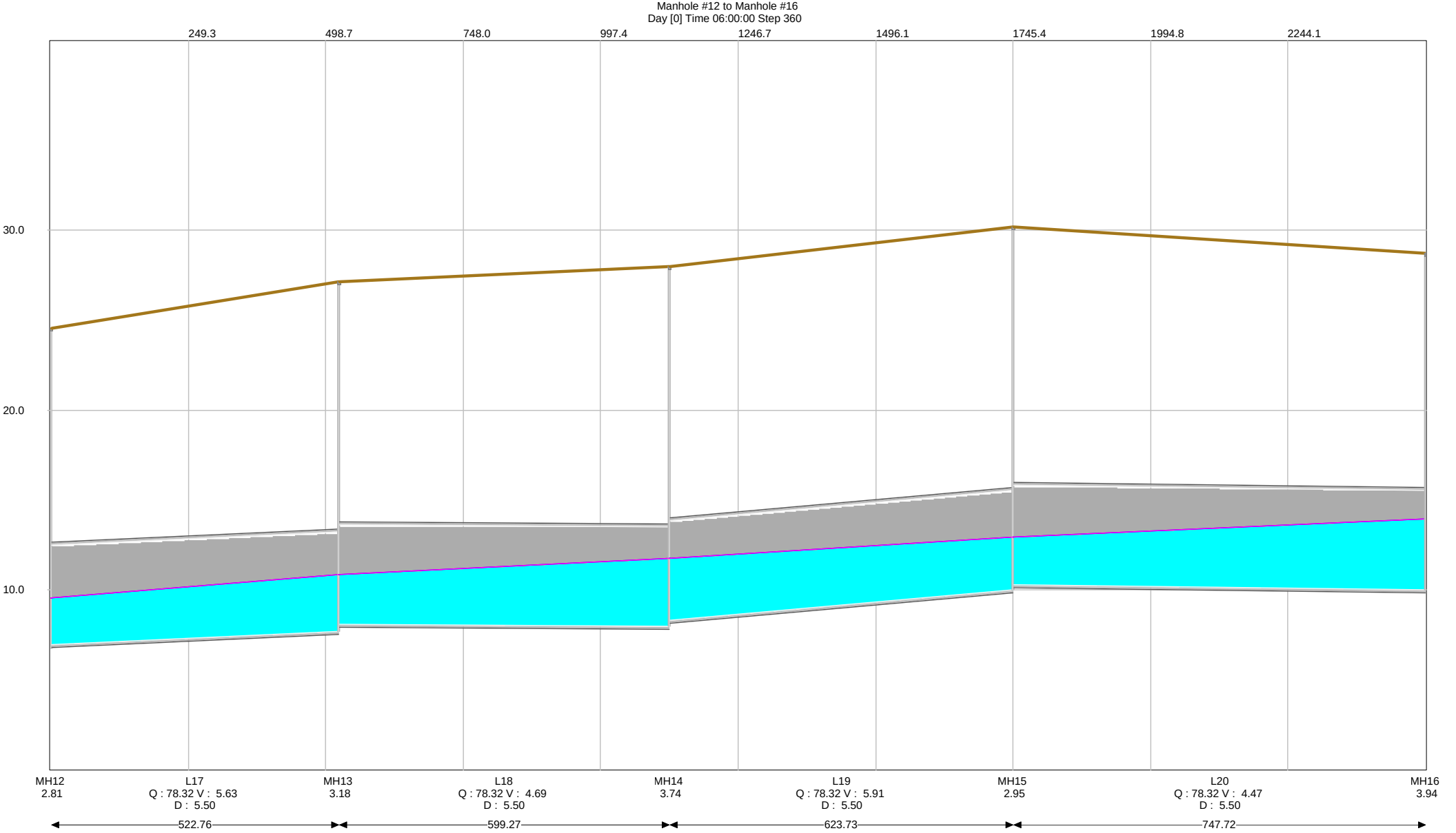

Manhole #11 to Manhole #1
Day [0] Time 06:00:00 Step 360
672.4
1344.9
2017.3
2689.7
3362.1
4034.6
4707.0
5379.4
6051.8
LEGEND SHEET
20.0
10.0
0.0
Ground Elevation
Hydraulic Grade Line
Water Elevation
Sewer Pipe
MH# = Manhole Number
L# = Model Line Number
Q = Flow (cfs)
V = Velocity (fps)
D = Pipe Diameter (ft)
MH1 3.37
L1 Q : 145.97 V : 7.14 D : 5.50
MH2 4.56
L2 Q : 145.97 V : 6.19 D : 5.50
MH3 5.59
L3 Q : 142.07 V : 5.77 D : 5.50
MH4 6.05
L4 Q : 142.07 V : 5.74 D : 5.50
MH5 6.06
L5 Q : 142.07 V : 5.83 D : 5.50
MH6 6.71
L6 Q : 142.07 V : 5.93 D : 5.50
MH7 6.86
L7 Q : 142.07 V : 5.95 D : 5.50
MH8 7.20
L8 Q : 141.67 V : 5.95 D : 5.50
MH9 7.77
L9 D : 5.50
MH10 8.20
L10 Q : 141.67 V : 5.94 D : 5.50
MH11 8.60
756.68
751.18
751.46
749.97
732.21
614.93
627.49
642.66
477.74
619.95

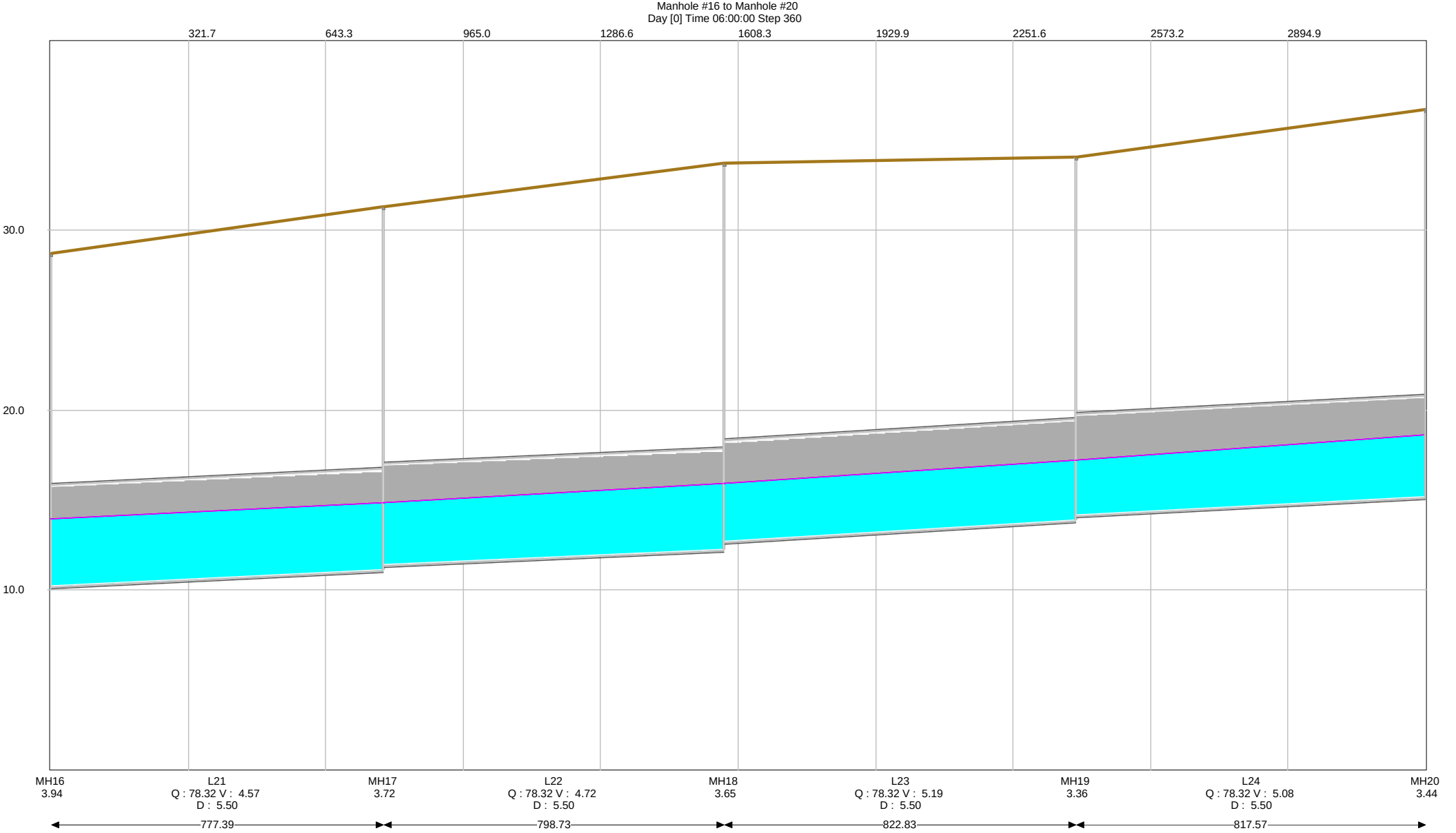

Manhole #A to Manhole #F
Day [0] Time 06:00:00 Step 360
168.3
336.7
505.0
673.4
841.7
1010.1
1178.4
1346.8
1515.1
10.0
0.0
-10.0
MHA
1.68
L1
MHC
1.68
L2
Q : 78.32 V : 6.62
D : 5.50
MHD
2.85
L3
Q : 78.32 V : 6.75
D : 5.50
MHE
2.69
L4
Q : 78.32 V : 7.02
D : 5.50
MHF
2.62
38.47
537.70
599.14
508.17

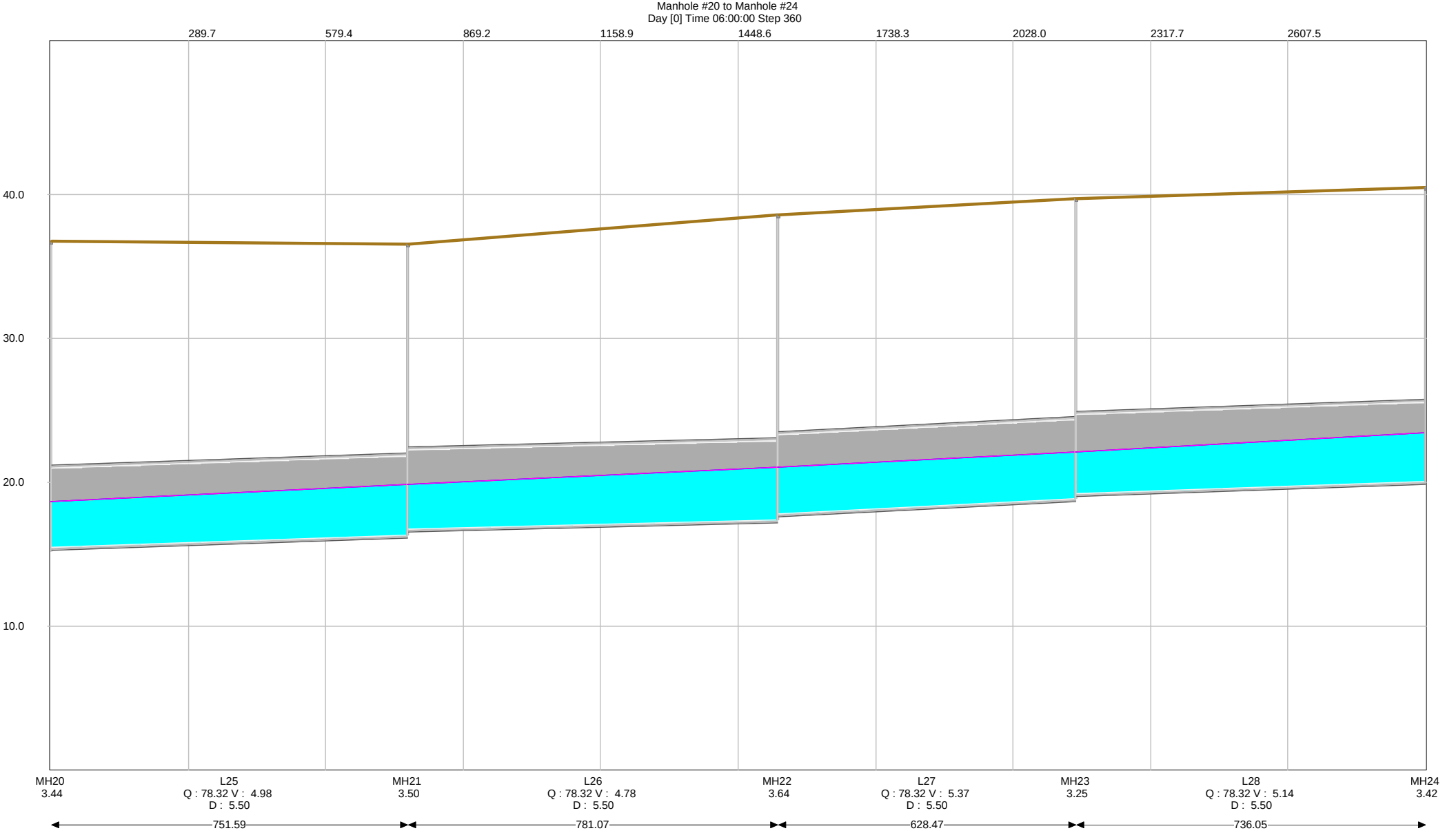

Manhole #F to Manhole #4
Day [0] Time 06:00:00 Step 360
273.0
546.1
819.1
1092.1
1365.1
1638.2
1911.2
2184.2
2457.3
10.0
0.0
MHF
2.62
L5
Q : 78.32 V : 7.32
D : 5.50
MH1
2.54
L6
Q : 78.32 V : 5.81
D : 5.50
MH2
3.11
L7
Q : 78.32 V : 5.02
D : 5.50
MH3
3.49
L8
Q : 78.32 V : 5.10
D : 5.50
MH4
3.40
470.98
756.68
751.18
751.46


Manhole #4 to Manhole #8
Day [0] Time 06:00:00 Step 360
272.5
544.9
817.4
1089.8
1362.3
1634.8
1907.2
2179.7
2452.1
20.0
10.0
0.0
MH4
3.40
L9
Q : 78.32 V : 5.58
D : 5.50
MH5
3.14
L10
Q : 78.32 V : 5.04
D : 5.50
MH6
3.48
L11
Q : 78.32 V : 5.30
D : 5.50
MH7
3.29
L12
Q : 78.32 V : 5.36
D : 5.50
MH8
3.26
749.97
732.21
614.93
627.49

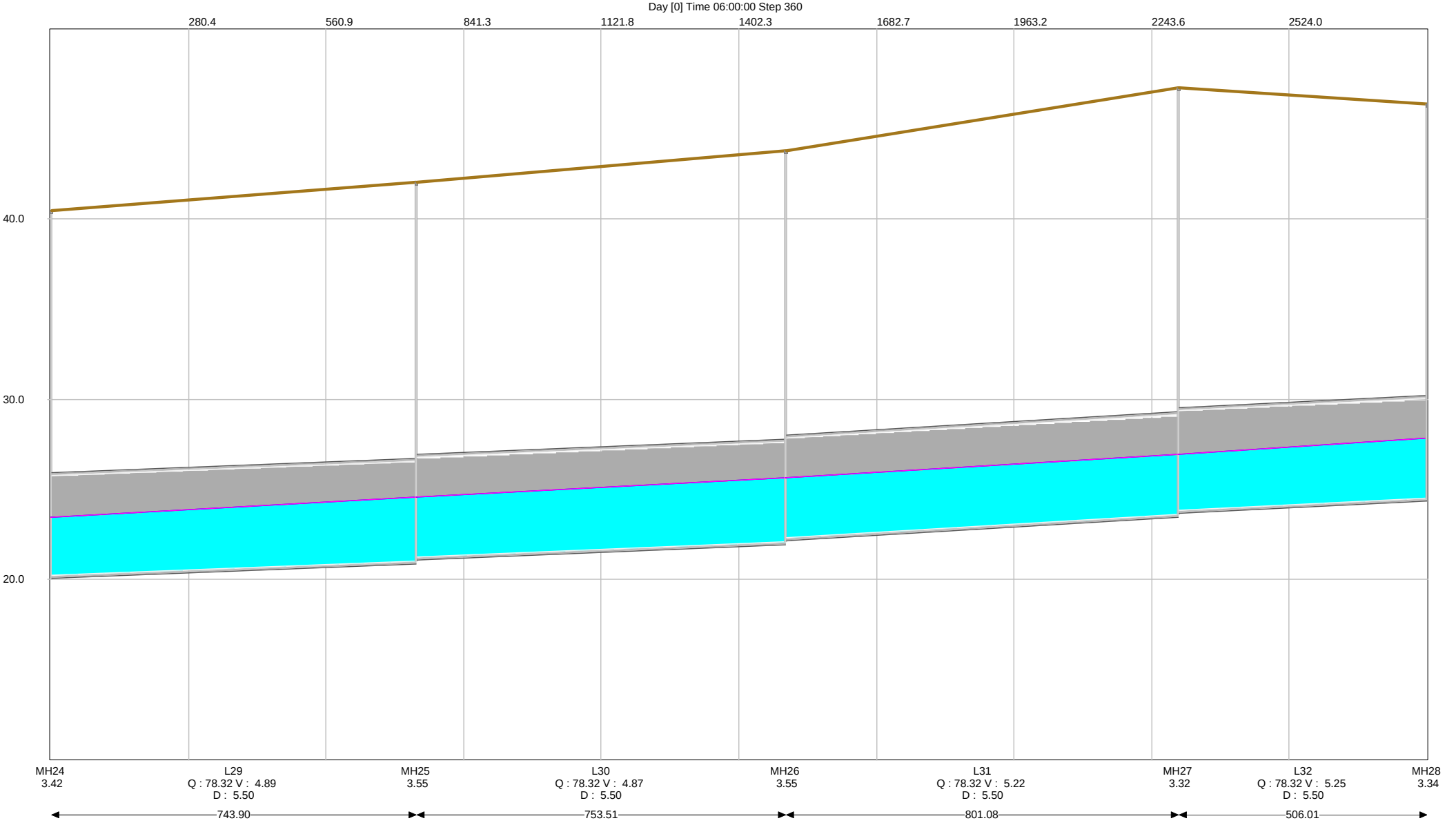

Manhole #8 to Manhole #12
Day [0] Time 06:00:00 Step 360
228.4
456.9
685.3
913.7
1142.1
1370.6
1599.0
1827.4
2055.9
20.0
10.0
MH8
3.26
L13
Q : 78.32 V : 5.11
D : 5.50
642.66
MH9
3.42
L14
Q : 78.32 V : 5.00
D : 5.50
477.74
MH10
3.47
L15
Q : 78.32 V : 5.12
D : 5.50
619.95
MH11
3.39
L16
Q : 78.32 V : 6.27
D : 5.50
543.94
MH12
2.81

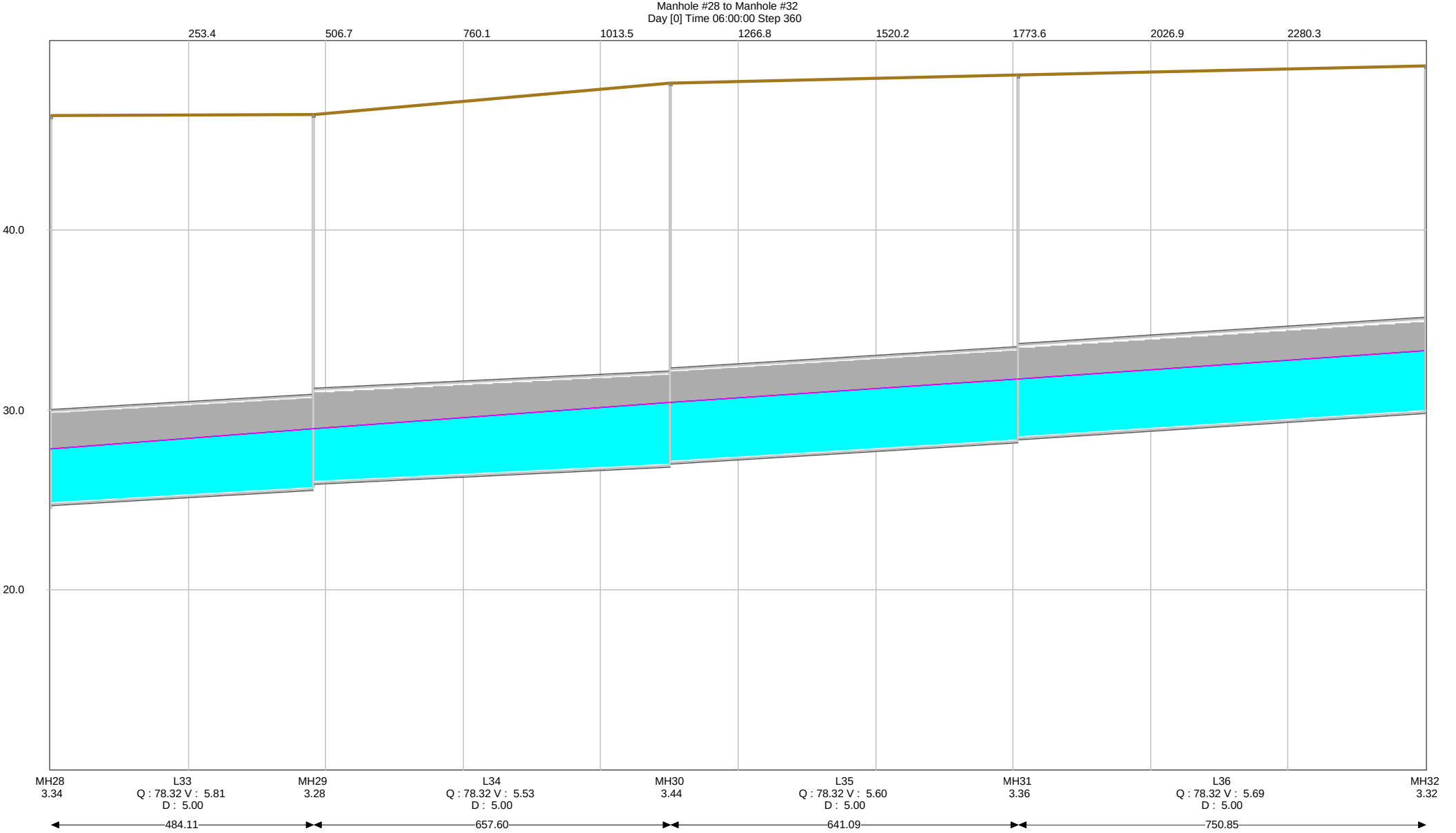

Manhole #12 to Manhole #16
Day [0] Time 06:00:00 Step 360
249.3
498.7
748.0
997.4
1246.7
1496.1
1745.4
1994.8
2244.1
30.0
20.0
10.0
MH12
2.81
L17
Q : 78.32 V : 5.63
D : 5.50
MH13
3.18
L18
Q : 78.32 V : 4.69
D : 5.50
MH14
3.74
L19
Q : 78.32 V : 5.91
D : 5.50
MH15
2.95
L20
Q : 78.32 V : 4.47
D : 5.50
MH16
3.94
522.76
599.27
623.73
747.72

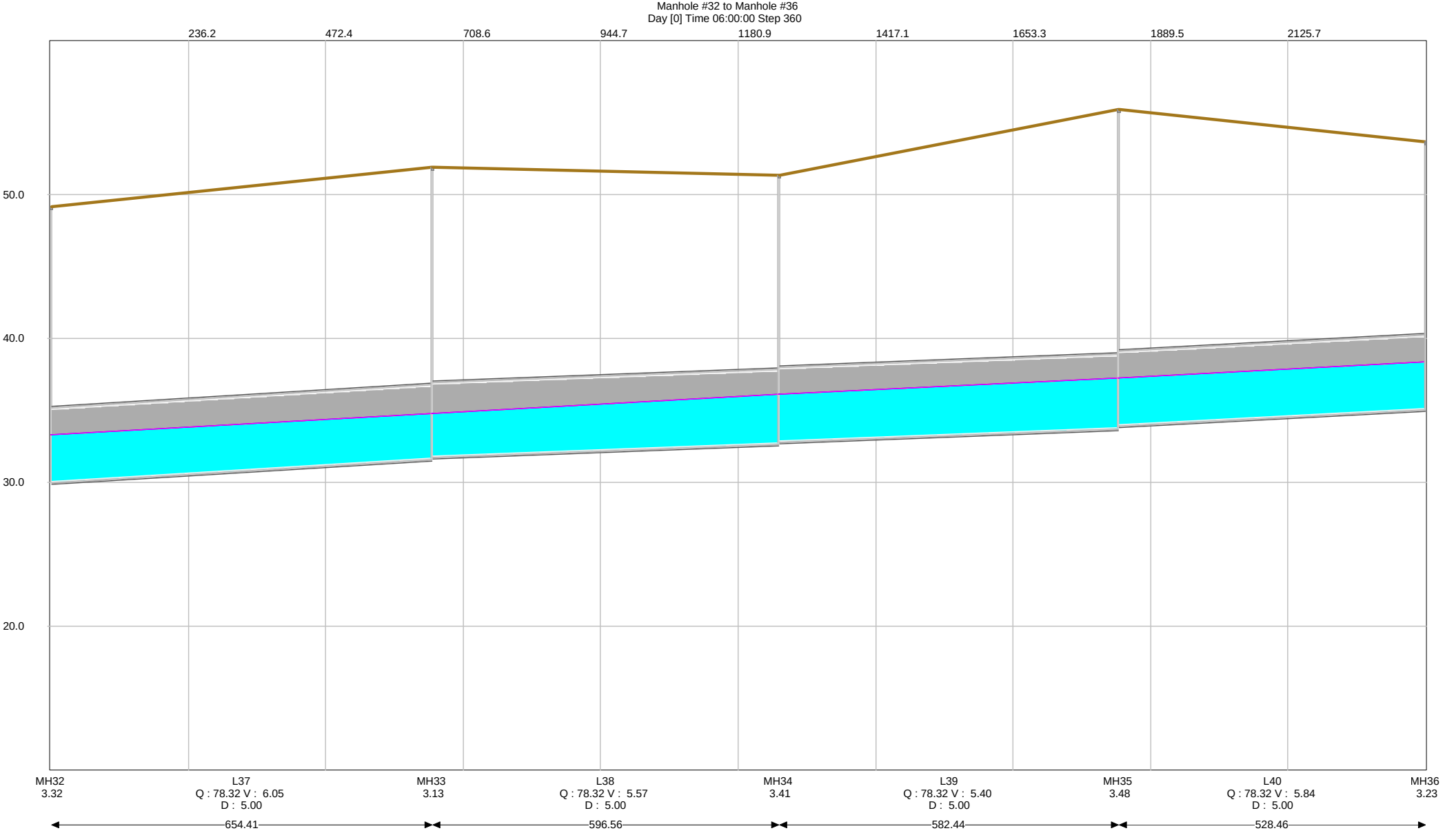

Manhole #16 to Manhole #20
Day [0] Time 06:00:00 Step 360
321.7
643.3
965.0
1286.6
1608.3
1929.9
2251.6
2573.2
2894.9
30.0
20.0
10.0
MH16
3.94
L21
Q : 78.32 V : 4.57
D : 5.50
MH17
3.72
L22
Q : 78.32 V : 4.72
D : 5.50
MH18
3.65
L23
Q : 78.32 V : 5.19
D : 5.50
MH19
3.36
L24
Q : 78.32 V : 5.08
D : 5.50
MH20
3.44
777.39
798.73
822.83
817.57

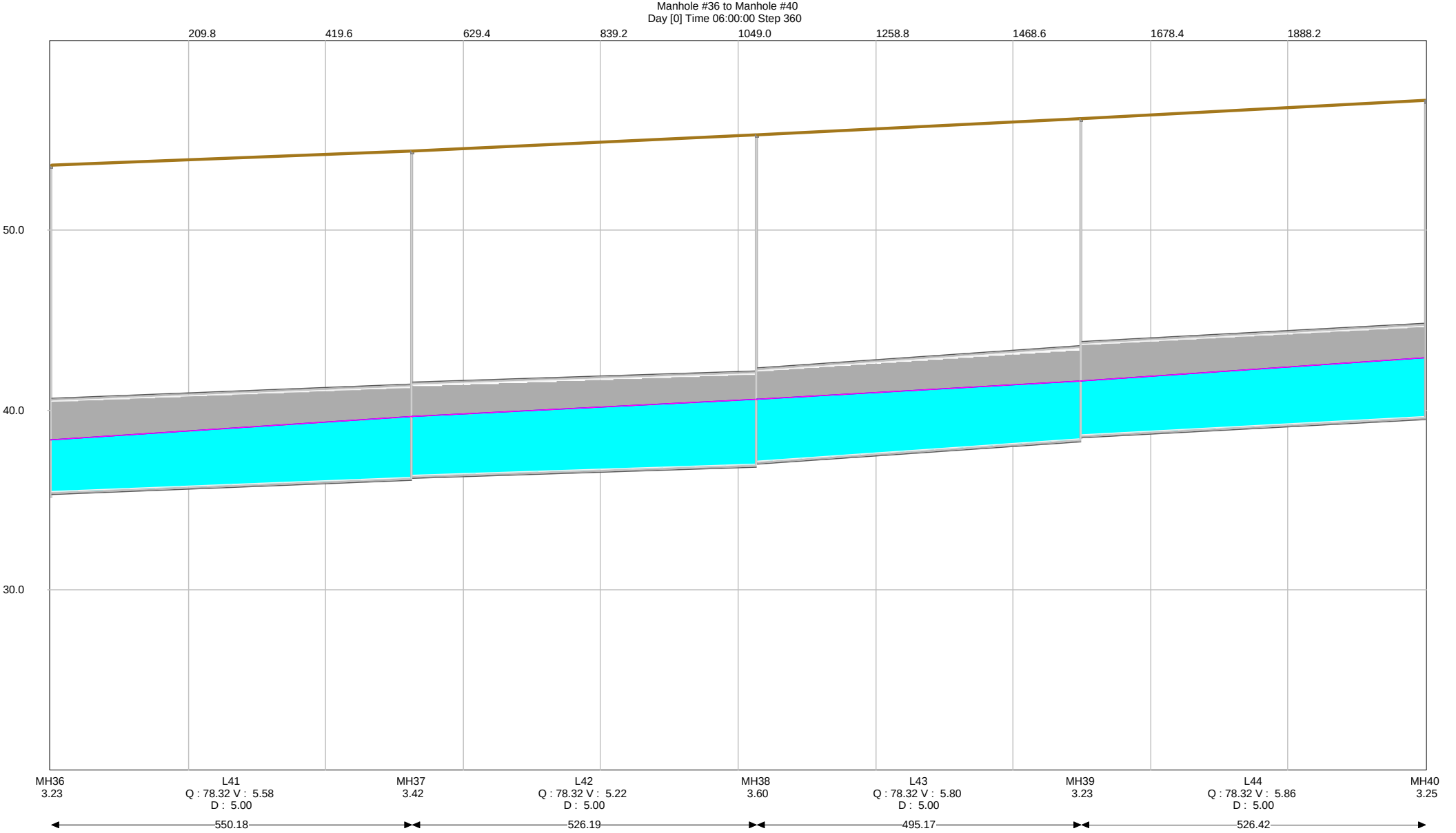

Manhole #20 to Manhole #24
Day [0] Time 06:00:00 Step 360
289.7
579.4
869.2
1158.9
1448.6
1738.3
2028.0
2317.7
2607.5
40.0
30.0
20.0
10.0
MH20
3.44
L25
Q : 78.32 V : 4.98
D : 5.50
MH21
3.50
L26
Q : 78.32 V : 4.78
D : 5.50
MH22
3.64
L27
Q : 78.32 V : 5.37
D : 5.50
MH23
3.25
L28
Q : 78.32 V : 5.14
D : 5.50
MH24
3.42
751.59
781.07
628.47
736.05

Manhole #24 to Manhole #28
Day [0] Time 06:00:00 Step 360




Manhole #28 to Manhole #32
Day [0] Time 06:00:00 Step 360
253.4
506.7
760.1
1013.5
1266.8
1520.2
1773.6
2026.9
2280.3
40.0
30.0
20.0
MH28
3.34
L33
Q : 78.32 V : 5.81
D : 5.00
MH29
3.28
L34
Q : 78.32 V : 5.53
D : 5.00
MH30
3.44
L35
Q : 78.32 V : 5.60
D : 5.00
MH31
3.36
L36
Q : 78.32 V : 5.69
D : 5.00
MH32
3.32
484.11
657.60
641.09
750.85


Manhole #32 to Manhole #36
Day [0] Time 06:00:00 Step 360
236.2
472.4
708.6
944.7
1180.9
1417.1
1653.3
1889.5
2125.7
50.0
40.0
30.0
20.0
MH32
3.32
L37
Q : 78.32 V : 6.05
D : 5.00
654.41
MH33
3.13
L38
Q : 78.32 V : 5.57
D : 5.00
596.56
MH34
3.41
L39
Q : 78.32 V : 5.40
D : 5.00
582.44
MH35
3.48
L40
Q : 78.32 V : 5.84
D : 5.00
528.46
MH36
3.23

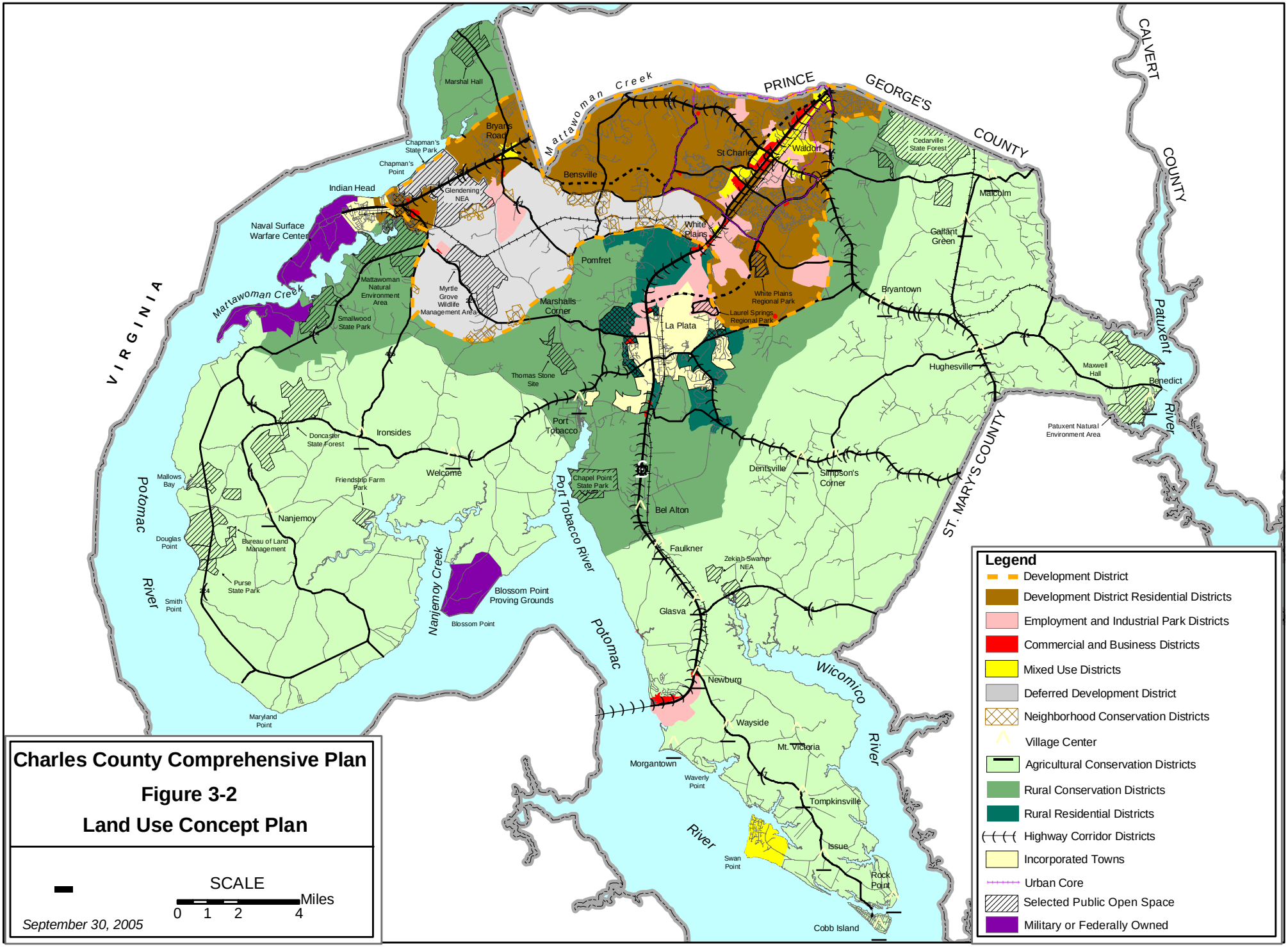

Manhole #36 to Manhole #40
Day [0] Time 06:00:00 Step 360
209.8
419.6
629.4
839.2
1049.0
1258.8
1468.6
1678.4
1888.2
50.0
40.0
30.0
MH36
3.23
L41
Q : 78.32 V : 5.58
D : 5.00
MH37
3.42
L42
Q : 78.32 V : 5.22
D : 5.00
MH38
3.60
L43
Q : 78.32 V : 5.80
D : 5.00
MH39
3.23
L44
Q : 78.32 V : 5.86
D : 5.00
MH40
3.25
550.18
526.19
495.17
526.42

Max Depth and Max d/D

Name	Max d/D (depth/diameter)	Max Depth (ft, m)
L44	0.649	3.25
L43	0.691	3.45
L42	0.721	3.60
L41	0.684	3.42
L40	0.647	3.24
L39	0.697	3.49
L38	0.683	3.42
L37	0.644	3.22
L36	0.664	3.32
L35	0.672	3.36
L34	0.688	3.44
L33	0.656	3.28
L32	0.607	3.34
L31	0.605	3.33
L30	0.645	3.55
L29	0.646	3.55
L28	0.622	3.42
L27	0.591	3.25
L26	0.662	3.64
L25	0.636	3.50
L24	0.625	3.44
L23	0.610	3.36
L22	0.663	3.65
L21	0.680	3.74
L20	0.671	3.69
L19	0.626	3.44
L18	0.666	3.66
L17	0.578	3.18
L16	0.598	3.29
L15	0.617	3.39
L14	0.631	3.47
L13	0.622	3.42
L12	0.593	3.26
L11	0.598	3.29
L10	0.633	3.48
L9	0.581	3.20
L8	0.618	3.40
L7	0.635	3.49
L6	0.565	3.11
L5	0.461	2.54
L4	0.477	2.62
L3	0.501	2.75
L2	0.519	2.85
L1	0.306	1.68

Appendix E

- Land Use Concept Map


Charles County Comprehensive Plan
Figure 3-2
Land Use Concept Plan
SCALE
Miles
0 1 2 4
September 30, 2005
Legend
Development District
Development District Residential Districts
Employment and Industrial Park Districts
Commercial and Business Districts
Mixed Use Districts
Deferred Development District
Neighborhood Conservation Districts
Village Center
Agricultural Conservation Districts
Rural Conservation Districts
Rural Residential Districts
Highway Corridor Districts
Incorporated Towns
Urban Core
Selected Public Open Space
Military or Federally Owned
VIRGINIA
PRINCE GEORGE'S COUNTY
CALVERT COUNTY
ST. MARY'S COUNTY
Mattawoman Creek
Potomac River
Port Tobacco River
Nanjemoy Creek
Wicomico River
Patuxent River
Marshal Hall
Bryans Road
Chapman's State Park
Chapman's Point
Indian Head
Naval Surface Warfare Center
Glendening NEA
Bensville
St Charles
Waldorf
Cedarville State Forest
Malcolm
Gallant Green
White Plains
Pomfret
Mattawoman Natural Environment Area
Myrtle Grove Wildlife Management Area
Smallwood State Park
Marshalls Corner
White Plains Regional Park
Laurel Springs Regional Park
La Plata
Bryantown
Hughesville
Maxwell Hall
Benedict
Patuxent Natural Environment Area
Thomas Stone Site
Port Tobacco
Doncaster State Forest
Ironsides
Welcome
Mallows Bay
Friendship Farm Park
Chapel Point State Park
Dentsville
Simpson's Corner
Nanjemoy
Douglas Point
Bureau of Land Management
Purse State Park
Smith Point
Maryland Point
Bel Alton
Faulkner
Zekiah Swamp NEA
Blossom Point Proving Grounds
Blossom Point
Glasva
Newburg
Wayside
Mt. Victoria
Morgantown
Waverly Point
Tompkinsville
Issue
Swan Point
Rock Point
Cobb Island

Appendix F

- Existing Sewer Analysis-Future Peak Flows

Charles County
Department of Planning & Growth Management
Mattawoman Interceptor Phase III Capacity Study
PGM #VCI 06-1-082
DBF #1813A002A
Final Report

Mattawoman Interceptor
Existing Sewer Capacity Future Peak Flow Analysis
Per County Water & Sewer Ordiance
Manholes #A through #40

Upstream Manhole	Downstream Manhole	Model Identifier	Incremental Peak Sewer Inflow (cfs)	Incremental Peak Sewer Inflow Source	Cummulative Peak Sewer Inflow (cfs)	Sewer Capacity (cfs)	Adequate to Convey Peak Flow YES/NO	Additional Capacity Required (cfs)
40	39	L44	130.90	Upstream of MH 40[(1)]	130.90			
			1.27	Drainage Area 5	132.17			
			1.96	Drainage Area 6	134.13			
			1.14	Drainage Area 7	135.27	66.24	**NO**	69.03
39	38	L43	0.00		135.27	74.76	**NO**	60.51
38	37	L42	0.00		135.27	53.96	**NO**	81.31
37	36	L41	0.00		135.27	56.21	**NO**	79.06
36	35	L40	0.00		135.27	70.24	**NO**	65.03
35	34	L39	0.00		135.27	59.45	**NO**	75.82
34	33	L38	0.00		135.27	59.07	**NO**	76.20
33	32	L37	0.00		135.27	74.78	**NO**	60.49
32	31	L36	0.00		135.27	66.69	**NO**	68.58
31	30	L35	0.00		135.27	65.43	**NO**	69.84
30	29	L34	0.00		135.27	58.68	**NO**	76.59
29	28	L33	0.00		135.27	64.11	**NO**	71.16
28	27	L32	0.00		135.27	69.89	**NO**	65.38
27	26	L31	4.28	Drainage Area 4	139.55			
			2.69	Drainage Area 8	142.24	77.03	**NO**	65.21
26	25	L30	0.00		142.24	66.26	**NO**	75.98
25	24	L29	0.00		142.24	63.54	**NO**	78.70
24	23	L28	0.00		142.24	65.87	**NO**	76.37
23	22	L27	0.00		142.24	80.08	**NO**	62.16
22	21	L26	0.00		142.24	55.82	**NO**	86.42
21	20	L25	0.00		142.24	65.19	**NO**	77.05
20	19	L24	0.00		142.24	68.20	**NO**	74.04
19	18	L23	3.32	Drainage Area 9	145.56	72.96	**NO**	72.60
18	17	L22	3.07	Drainage Area 3	148.63	62.86	**NO**	85.77
17	16	L21	0.00		148.63	65.98	**NO**	82.65
16	15	L20	0.00		148.63	N/A	**NO**	N/A
15	14	L19	1.25	CSM PS	149.88	102.10	**NO**	47.78
14	13	L18	0.00		149.88	N/A	**NO**	N/A
13	12	L17	0.00		149.88	72.87	**NO**	77.01
12	11	L16	3.46	Drainage Area 2	153.34	109.33	**NO**	44.01
11	10	L15	0.00		153.34	72.20	**NO**	81.14
10	9	L14	0.00		153.34	65.56	**NO**	87.78
9	8	L13	0.00		153.34	66.61	**NO**	86.73
8	7	L12	0.40	Drainage Area 1	153.74	77.45	**NO**	76.29
7	6	L11	0.00		153.74	76.64	**NO**	77.10
6	5	L10	0.00		153.74	61.15	**NO**	92.59
5	4	L9	0.00		153.74	85.74	**NO**	68.00
4	3	L8	0.00		153.74	73.92	**NO**	79.82
3	2	L7	3.51	Drainage Area 10	157.25	62.43	**NO**	94.82
2	1	L6	0.00		157.25	83.27	**NO**	73.98
1	F	L5	0.00		157.25	120.88	**NO**	36.37
F	E	L4	0.00		157.25	114.10	**NO**	43.15
E	D	L3	0.00		157.25	109.52	**NO**	47.73
D	C	L2	0.00		157.25	95.88	**NO**	61.37
C	A	L1	0.00		157.25	257.33	**YES**	-100.08

(1) Peak sewer flow of 130.9 cfs per previous study will enter Manhole #40, see Appendix B.

Appendix G

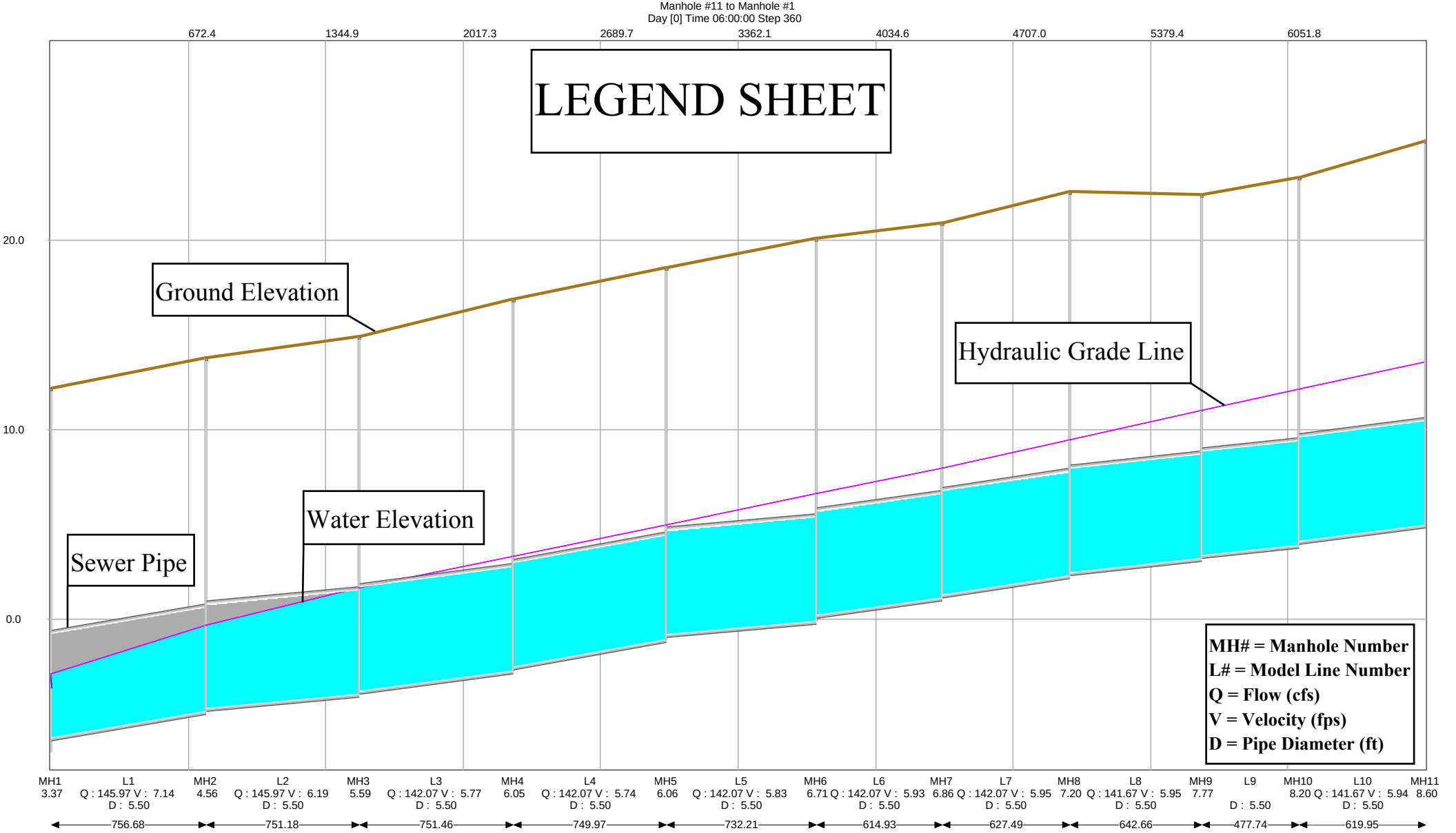
- Model Results-Existing Sewer Analysis-Future Peak Flows

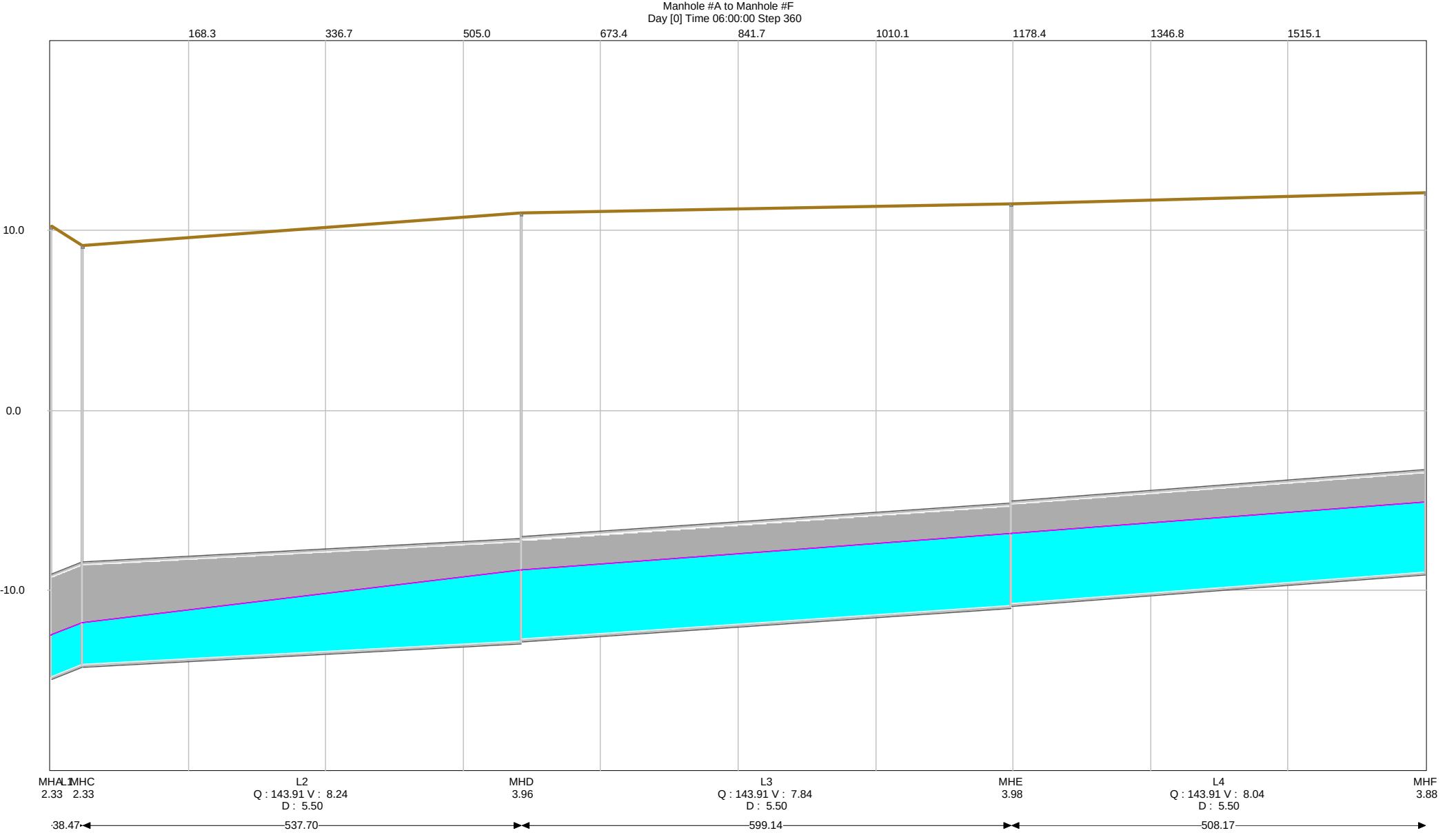
Charles County
Department of Planning & Growth Management
Mattawoman Interceptor Phase III Capacity Study
PGM #VCI 06-1-082
DBF #1813A002A
Final Report

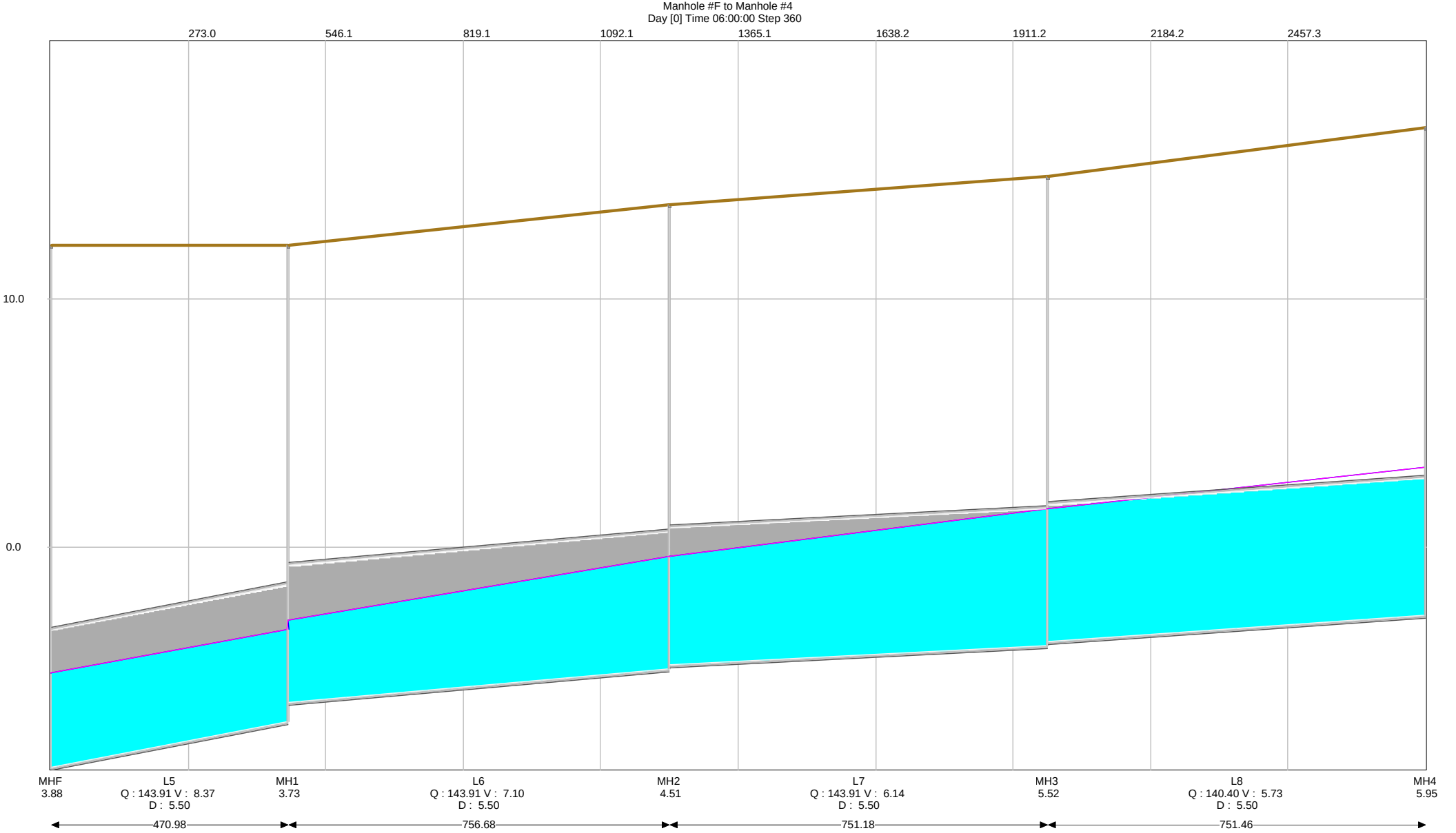
Mattawoman Interceptor
XPSWMM Model Results
Per County Water & Sewer Ordiance Maximum d/D = 0.67
Future Peak Wastewater Flows within Existing Interceptor

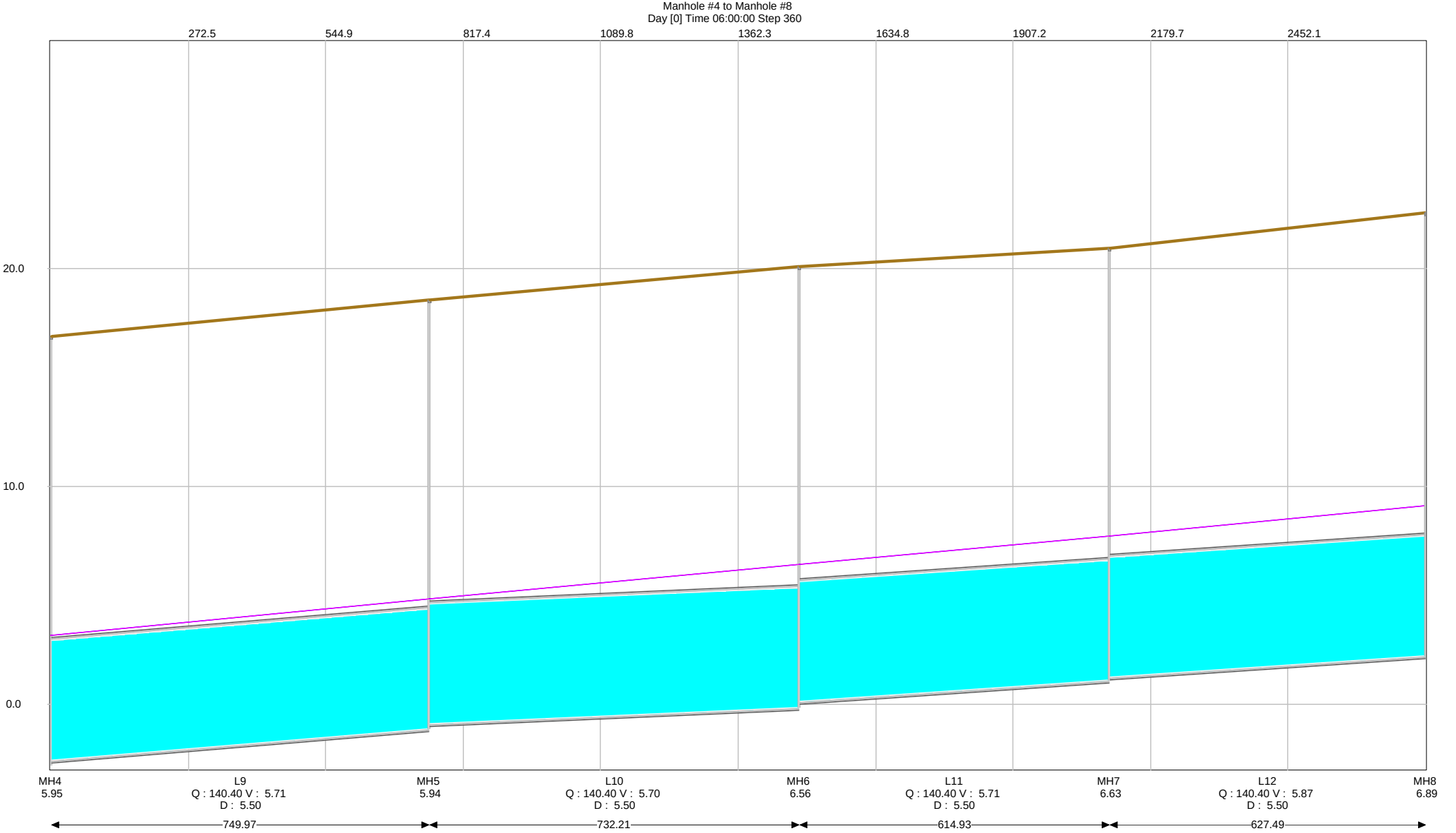
Model Identifier	Upstream Manhole	Downstream Manhole	Pipe Size Size (in)	n Factor	Slope %	Incremental Peak Sewer Inflow (cfs)	Incremental Peak Sewer Inlow Source	Cummulative Peak Sewer Inflow (cfs)	Full Pipe Flow (cfs)	Maximum Pipe Flow (cfs)[2]	Design Depth (ft)	Maximum Depth	Maximum d/D	Meets County Ordinance[3]
L44	40	39	60	0.015	0.19%	130.90	Upstream of MH 40[1]	135.27	98.87	135.43	3.35	17.60	3.52	**NO**
						1.27	Drainage Area 5							
						1.96	Drainage Area 6							
						1.14	Drainage Area 7							
L43	39	38	60	0.015	0.24%	0.00		135.27	111.58	135.25	3.35	17.37	3.47	**NO**
L42	38	37	60	0.015	0.13%	0.00		135.27	80.54	135.23	3.35	17.33	3.47	**NO**
L41	37	36	60	0.015	0.14%	0.00		135.27	83.89	135.22	3.35	16.61	3.32	**NO**
L40	36	35	60	0.015	0.22%	0.00		135.27	104.84	135.20	3.35	16.16	3.23	**NO**
L39	35	34	60	0.015	0.15%	0.00		135.27	88.73	135.18	3.35	16.05	3.21	**NO**
L38	34	33	60	0.015	0.15%	0.00		135.27	88.16	135.16	3.35	15.44	3.09	**NO**
L37	33	32	60	0.015	0.24%	0.00		135.27	111.61	135.14	3.35	14.79	2.96	**NO**
L36	32	31	60	0.015	0.19%	0.00		135.27	99.53	135.12	3.35	14.62	2.93	**NO**
L35	31	30	60	0.015	0.19%	0.00		135.27	97.66	135.09	3.35	14.09	2.82	**NO**
L34	30	29	60	0.015	0.15%	0.00		135.27	87.58	135.07	3.35	13.61	2.72	**NO**
L33	29	28	60	0.015	0.18%	0.00		135.27	95.69	135.05	3.35	13.02	2.61	**NO**
L32	28	27	66	0.015	0.13%	0.00		135.27	104.31	134.78	3.69	12.86	2.34	**NO**
L31	27	26	66	0.015	0.16%	4.28	Drainage Area 4	142.24	114.96	141.61	3.69	12.89	2.34	**NO**
						2.69	Drainage Area 8							
L30	26	25	66	0.015	0.12%	0.00		142.24	98.89	141.55	3.69	12.84	2.34	**NO**
L29	25	24	66	0.015	0.11%	0.00		142.24	94.84	141.20	3.69	12.46	2.27	**NO**
L28	24	23	66	0.015	0.11%	0.00		142.24	98.32	139.26	3.69	12.01	2.18	**NO**
L27	23	22	66	0.015	0.17%	0.00		142.24	119.52	137.68	3.69	11.78	2.14	**NO**
L26	22	21	66	0.015	0.08%	0.00		142.24	83.31	137.39	3.69	12.02	2.19	**NO**
L25	21	20	66	0.015	0.11%	0.00		142.24	97.30	136.08	3.69	11.56	2.10	**NO**
L24	20	19	66	0.015	0.12%	0.00		142.24	101.78	135.11	3.69	11.24	2.04	**NO**
L23	19	18	66	0.015	0.14%	3.32	Drainage Area 9	145.56	111.14	137.82	3.69	10.96	1.99	**NO**
L22	18	17	66	0.015	0.10%	3.07	Drainage Area 3	148.63	93.82	140.82	3.69	10.92	1.99	**NO**
L21	17	16	66	0.015	0.11%	0.00		148.63	98.47	140.18	3.69	10.35	1.88	**NO**
L20	16	15	66	0.015	-0.03%	0.00		148.63	53.22	139.03	3.69	9.52	1.73	**NO**
L19	15	14	66	0.015	0.27%	1.25	CSM PS	149.88	152.39	138.60	3.69	8.55	1.55	**NO**
L18	14	13	66	0.015	-0.01%	0.00		149.88	33.63	138.16	3.69	8.77	1.59	**NO**
L17	13	12	66	0.015	0.14%	0.00		149.88	108.76	137.28	3.69	7.85	1.43	**NO**
L16	12	11	66	0.015	0.31%	3.46	Drainage Area 2	153.34	163.18	140.58	3.69	8.09	1.47	**NO**
L15	11	10	66	0.015	0.14%	0.00		153.34	107.76	140.54	3.69	8.19	1.49	**NO**
L14	10	9	66	0.015	0.11%	0.00		153.34	97.85	140.48	3.69	7.82	1.42	**NO**
L13	9	8	66	0.015	0.12%	0.00		153.34	99.42	140.25	3.69	7.41	1.35	**NO**
L12	8	7	66	0.015	0.16%	0.40	Drainage Area 1	153.74	115.60	140.49	3.69	6.89	1.25	**NO**
L11	7	6	66	0.015	0.15%	0.00		153.74	114.39	140.45	3.69	6.63	1.21	**NO**
L10	6	5	66	0.015	0.10%	0.00		153.74	91.26	140.40	3.69	6.56	1.19	**NO**
L9	5	4	66	0.015	0.19%	0.00		153.74	127.97	140.40	3.69	5.94	1.08	**NO**
L8	4	3	66	0.015	0.14%	0.00		153.74	110.33	140.40	3.69	5.95	1.08	**NO**
L7	3	2	66	0.015	0.10%	3.51	Drainage Area 10	157.25	93.18	143.91	3.69	5.52	1.00	**NO**
L6	2	1	66	0.015	0.18%	0.00		157.25	124.29	143.91	3.69	4.51	0.82	**NO**
L5	1	F	66	0.015	0.38%	0.00		157.25	180.42	143.91	3.69	3.78	0.69	**NO**
L4	F	E	66	0.015	0.34%	0.00		157.25	170.30	143.91	3.69	3.88	0.71	**NO**
L3	E	D	66	0.015	0.32%	0.00		157.25	163.46	143.91	3.69	3.98	0.72	**NO**
L2	D	C	66	0.015	0.24%	0.00		157.25	143.10	143.91	3.69	3.96	0.72	**NO**
L1	C	A	66	0.015	1.74%	0.00		157.25	384.08	143.91	3.69	2.33	0.42	**YES**

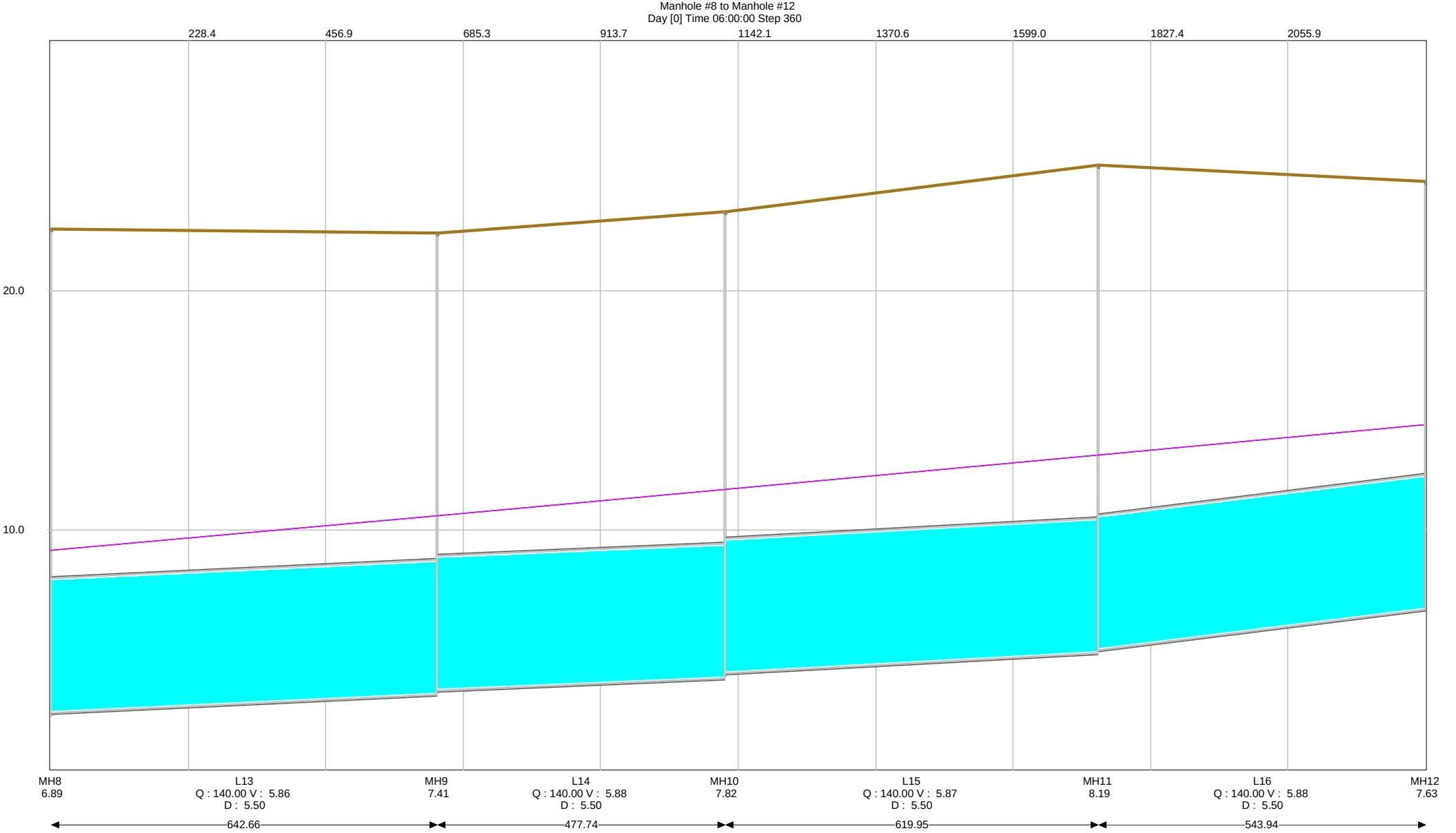
(1) Peak sewer flow of 130.9 cfs per previous study will enter Manhole #40, see Appendix B.
(2) Maximum Pipe Flow does not equal Cummulative Peak Sewer Inflow due to loss of water from surcharging manholes.
(3) Per County Water and Sewer Ordinance 8.2D(2)(a); maximum pipe flow of 2/3 full.

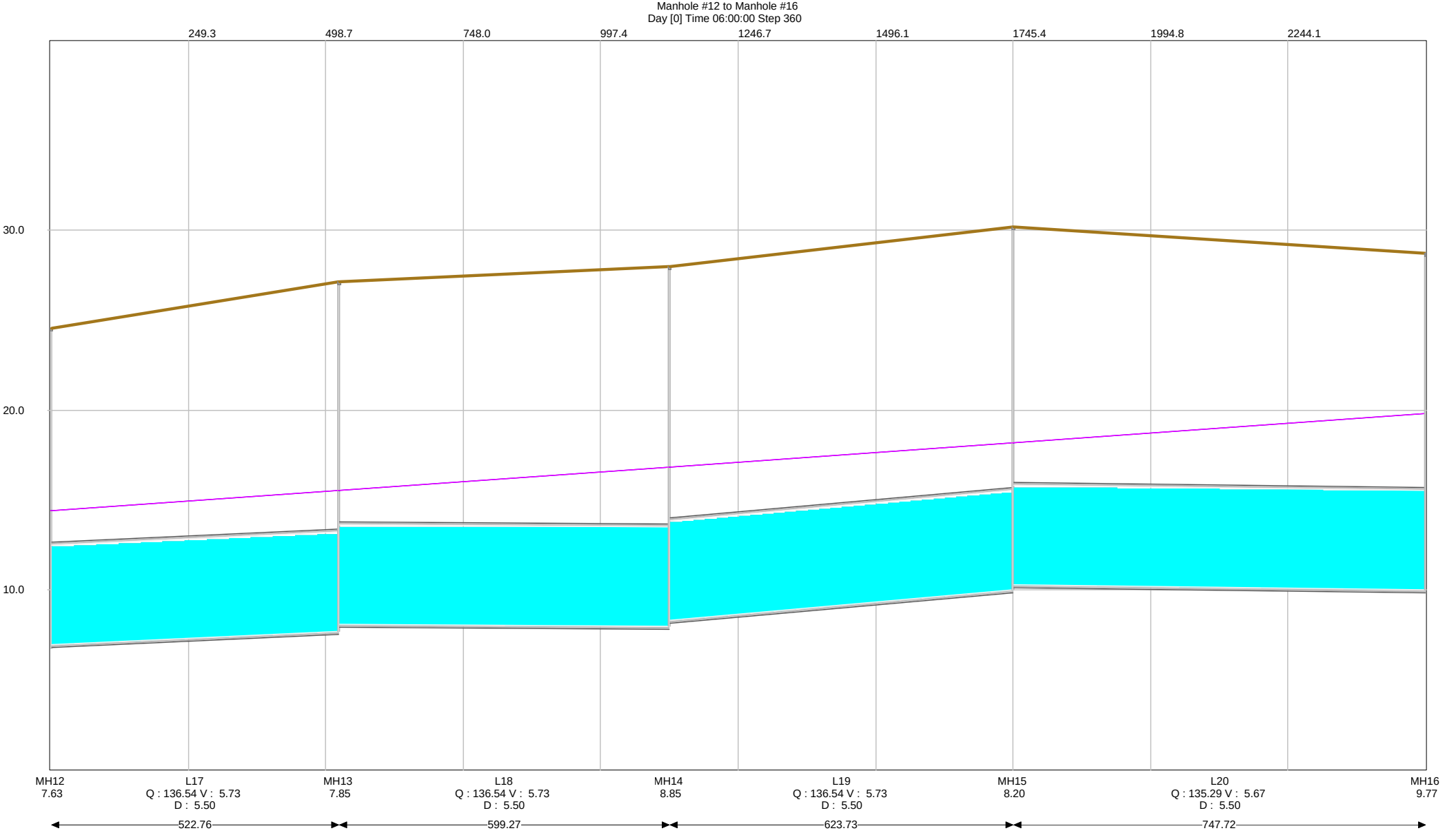

Manhole #11 to Manhole #1
Day [0] Time 06:00:00 Step 360
672.4
1344.9
2017.3
2689.7
3362.1
4034.6
4707.0
5379.4
6051.8
LEGEND SHEET
20.0
10.0
0.0
Ground Elevation
Hydraulic Grade Line
Water Elevation
Sewer Pipe
MH# = Manhole Number
L# = Model Line Number
Q = Flow (cfs)
V = Velocity (fps)
D = Pipe Diameter (ft)
MH1 3.37
L1 Q : 145.97 V : 7.14 D : 5.50
MH2 4.56
L2 Q : 145.97 V : 6.19 D : 5.50
MH3 5.59
L3 Q : 142.07 V : 5.77 D : 5.50
MH4 6.05
L4 Q : 142.07 V : 5.74 D : 5.50
MH5 6.06
L5 Q : 142.07 V : 5.83 D : 5.50
MH6 6.71
L6 Q : 142.07 V : 5.93 D : 5.50
MH7 6.86
L7 Q : 142.07 V : 5.95 D : 5.50
MH8 7.20
L8 Q : 141.67 V : 5.95 D : 5.50
MH9 7.77
L9 D : 5.50
MH10 8.20
L10 Q : 141.67 V : 5.94 D : 5.50
MH11 8.60
756.68
751.18
751.46
749.97
732.21
614.93
627.49
642.66
477.74
619.95

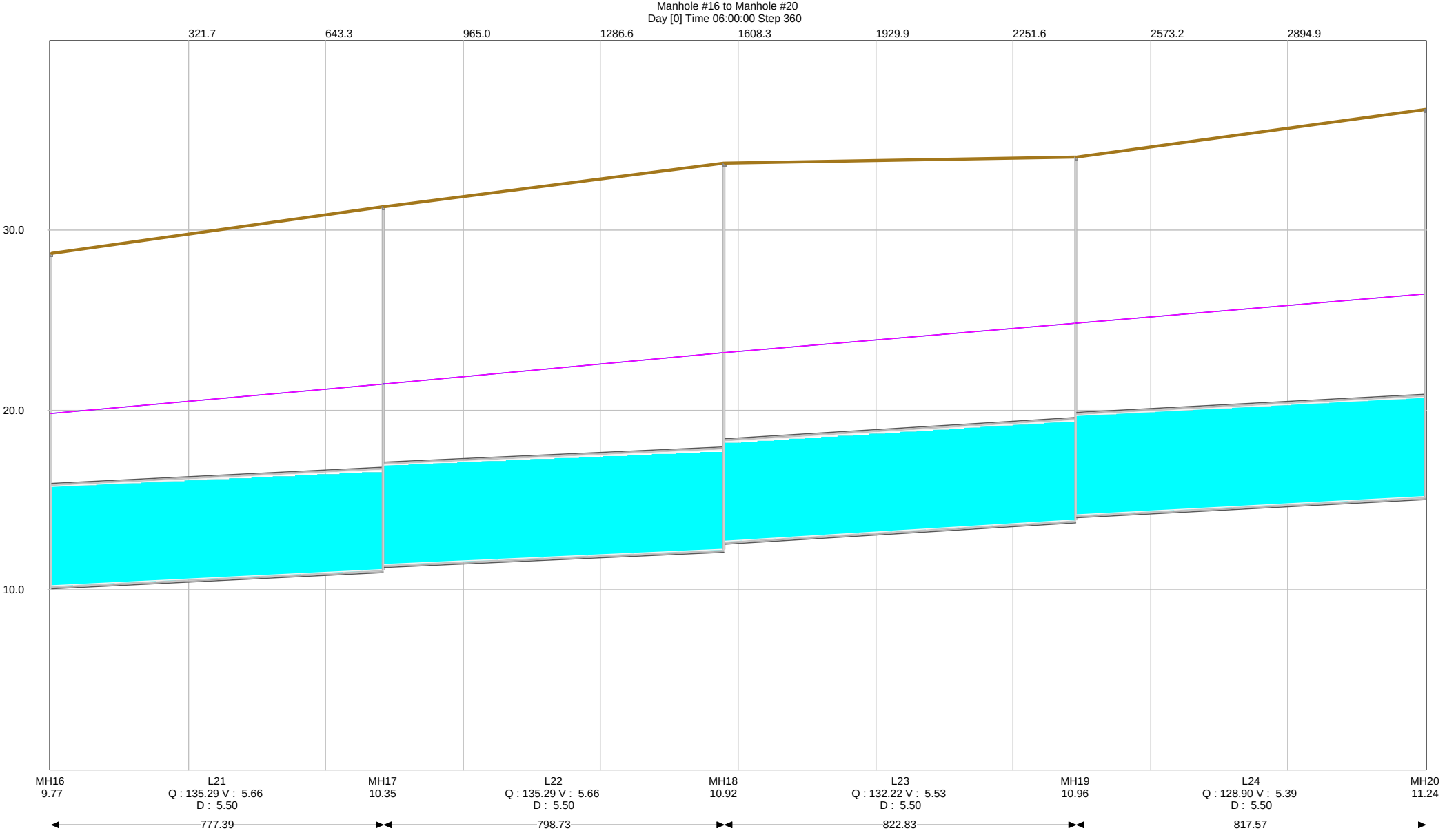

Manhole #A to Manhole #F
Day [0] Time 06:00:00 Step 360
168.3
336.7
505.0
673.4
841.7
1010.1
1178.4
1346.8
1515.1
10.0
0.0
-10.0
MHA
2.33
L1
MHC
2.33
L2
Q : 143.91 V : 8.24
D : 5.50
MHD
3.96
L3
Q : 143.91 V : 7.84
D : 5.50
MHE
3.98
L4
Q : 143.91 V : 8.04
D : 5.50
MHF
3.88
38.47
537.70
599.14
508.17

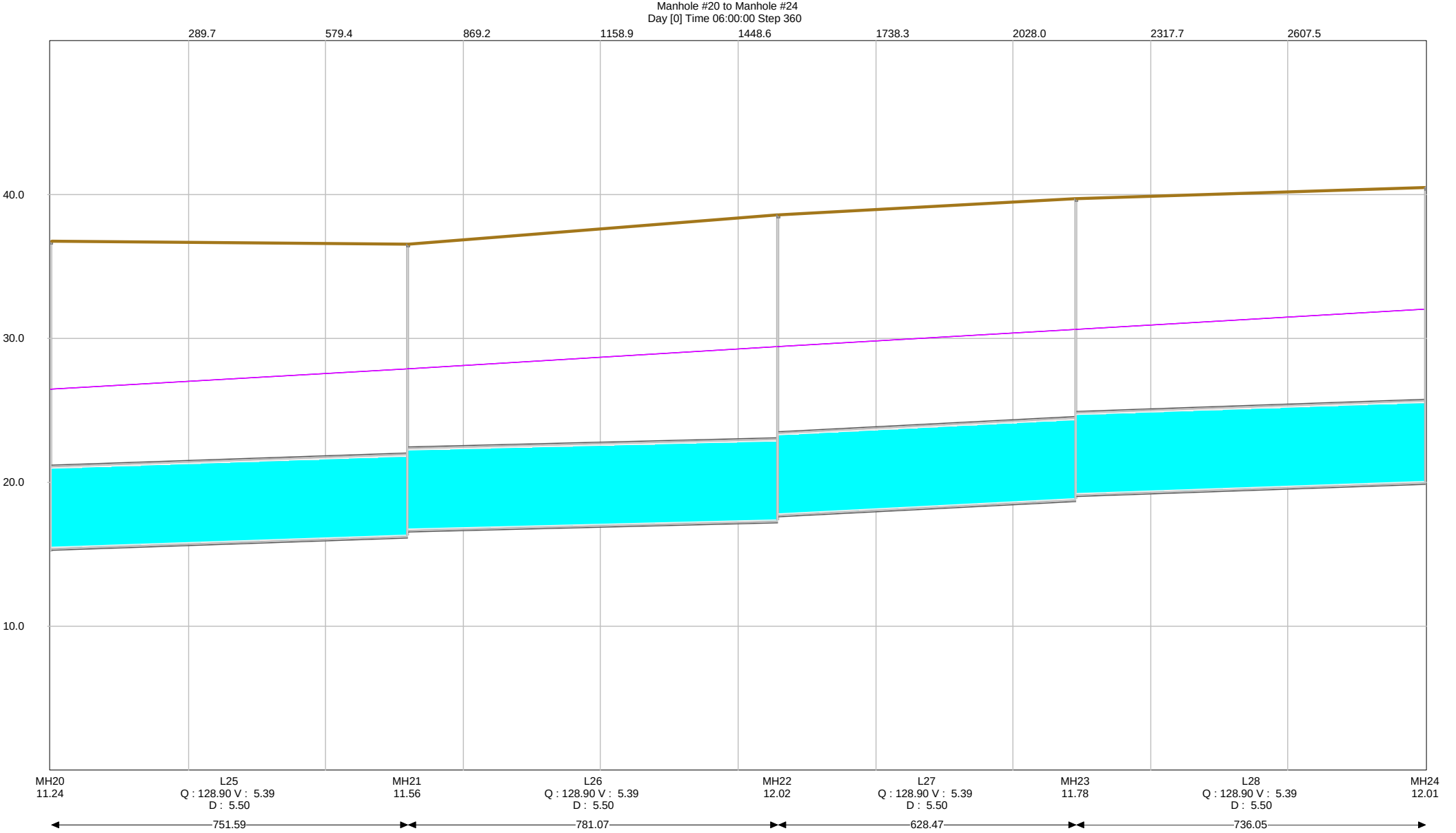

Manhole #F to Manhole #4
Day [0] Time 06:00:00 Step 360
273.0
546.1
819.1
1092.1
1365.1
1638.2
1911.2
2184.2
2457.3
10.0
0.0
MHF
3.88
L5
Q : 143.91 V : 8.37
D : 5.50
MH1
3.73
L6
Q : 143.91 V : 7.10
D : 5.50
MH2
4.51
L7
Q : 143.91 V : 6.14
D : 5.50
MH3
5.52
L8
Q : 140.40 V : 5.73
D : 5.50
MH4
5.95
470.98
756.68
751.18
751.46


Manhole #4 to Manhole #8
Day [0] Time 06:00:00 Step 360
272.5
544.9
817.4
1089.8
1362.3
1634.8
1907.2
2179.7
2452.1
20.0
10.0
0.0
MH4
5.95
L9
Q : 140.40 V : 5.71
D : 5.50
MH5
5.94
L10
Q : 140.40 V : 5.70
D : 5.50
MH6
6.56
L11
Q : 140.40 V : 5.71
D : 5.50
MH7
6.63
L12
Q : 140.40 V : 5.87
D : 5.50
MH8
6.89
749.97
732.21
614.93
627.49

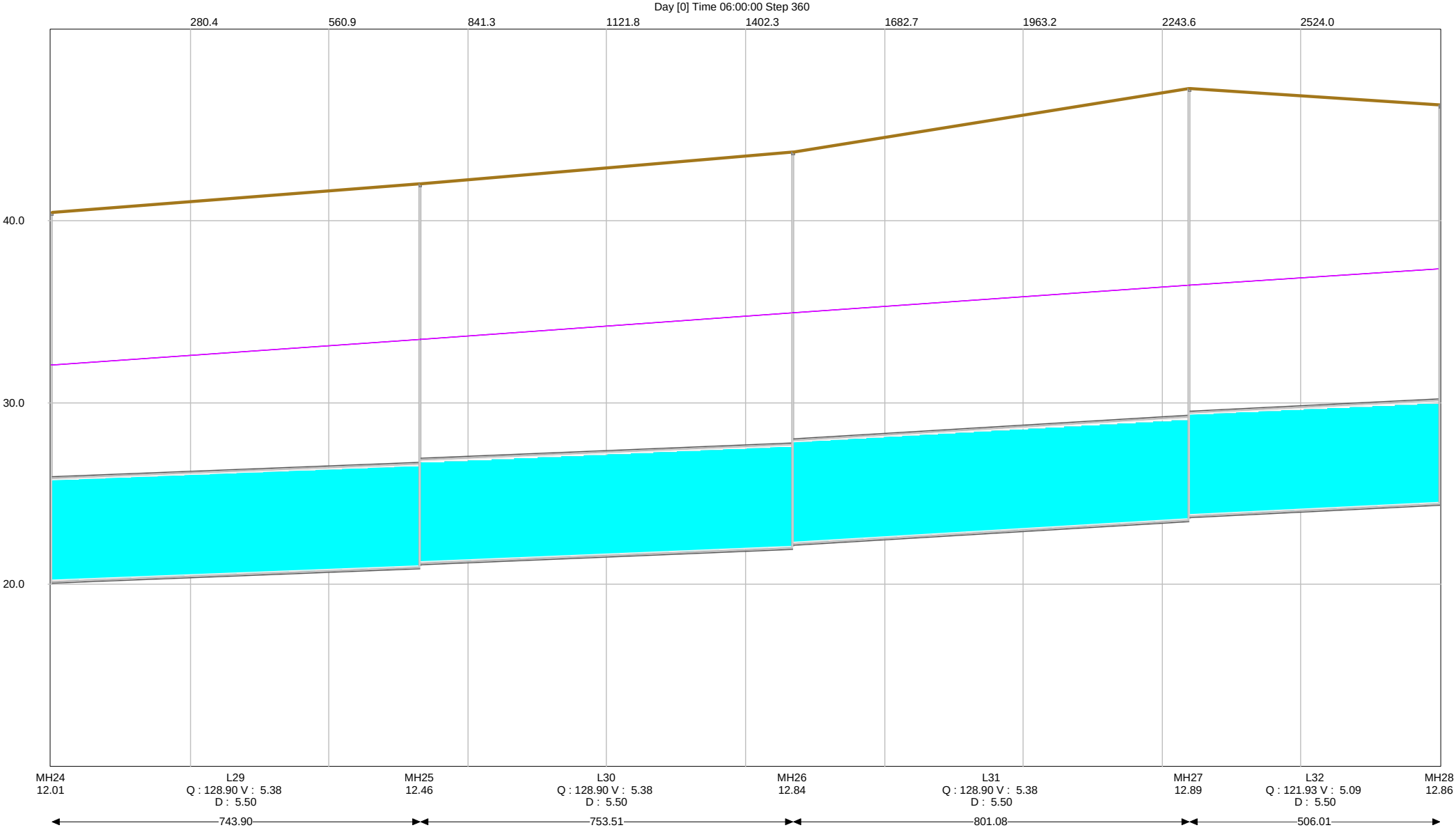

Manhole #8 to Manhole #12
Day [0] Time 06:00:00 Step 360
228.4
456.9
685.3
913.7
1142.1
1370.6
1599.0
1827.4
2055.9
20.0
10.0
MH8
6.89
L13
Q : 140.00 V : 5.86
D : 5.50
642.66
MH9
7.41
L14
Q : 140.00 V : 5.88
D : 5.50
477.74
MH10
7.82
L15
Q : 140.00 V : 5.87
D : 5.50
619.95
MH11
8.19
L16
Q : 140.00 V : 5.88
D : 5.50
543.94
MH12
7.63

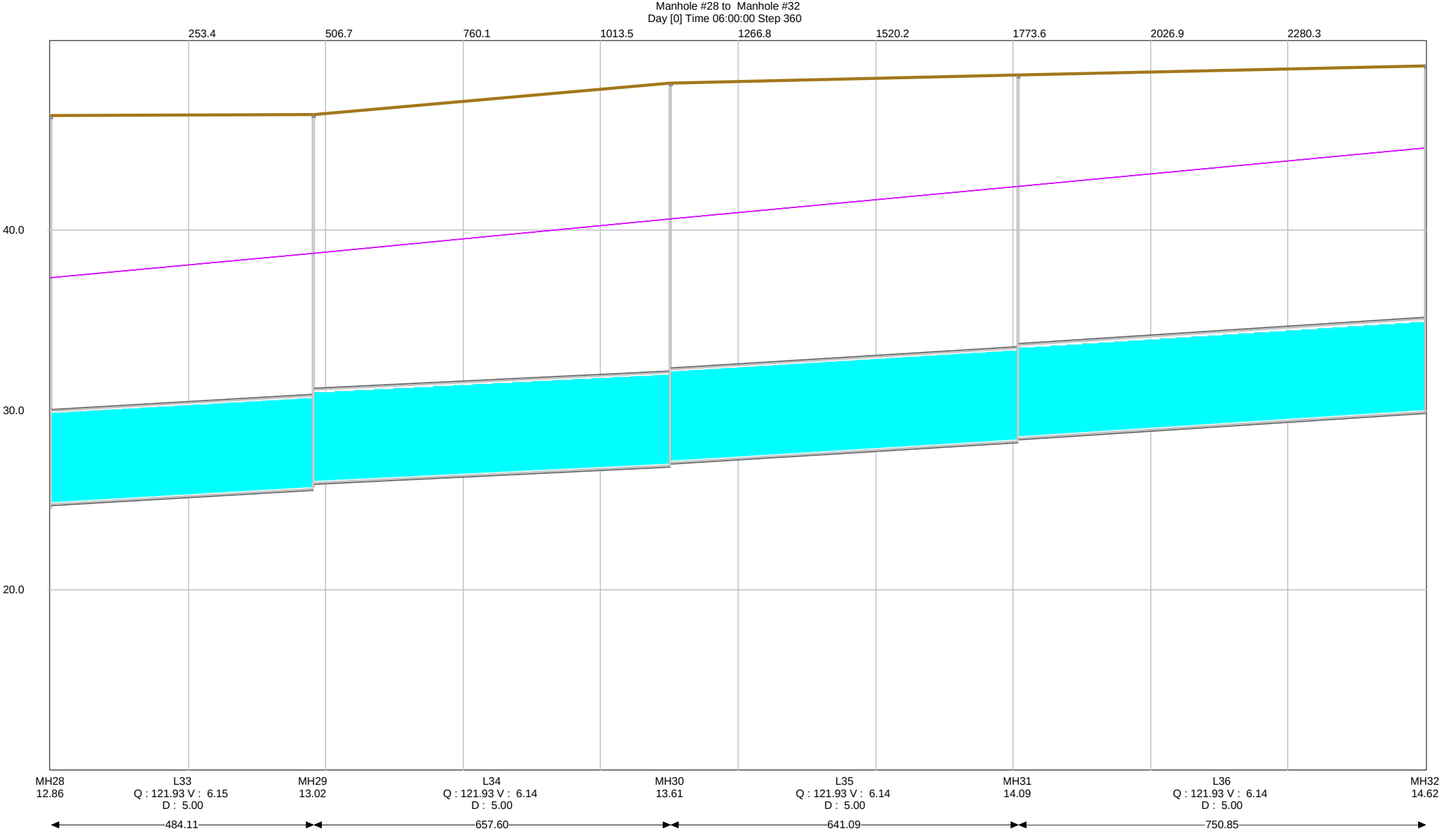

Manhole #12 to Manhole #16
Day [0] Time 06:00:00 Step 360
249.3
498.7
748.0
997.4
1246.7
1496.1
1745.4
1994.8
2244.1
30.0
20.0
10.0
MH12
7.63
L17
Q : 136.54 V : 5.73
D : 5.50
MH13
7.85
L18
Q : 136.54 V : 5.73
D : 5.50
MH14
8.85
L19
Q : 136.54 V : 5.73
D : 5.50
MH15
8.20
L20
Q : 135.29 V : 5.67
D : 5.50
MH16
9.77
522.76
599.27
623.73
747.72


Manhole #16 to Manhole #20
Day [0] Time 06:00:00 Step 360
321.7
643.3
965.0
1286.6
1608.3
1929.9
2251.6
2573.2
2894.9
30.0
20.0
10.0
MH16
9.77
L21
Q : 135.29 V : 5.66
D : 5.50
MH17
10.35
L22
Q : 135.29 V : 5.66
D : 5.50
MH18
10.92
L23
Q : 132.22 V : 5.53
D : 5.50
MH19
10.96
L24
Q : 128.90 V : 5.39
D : 5.50
MH20
11.24
777.39
798.73
822.83
817.57

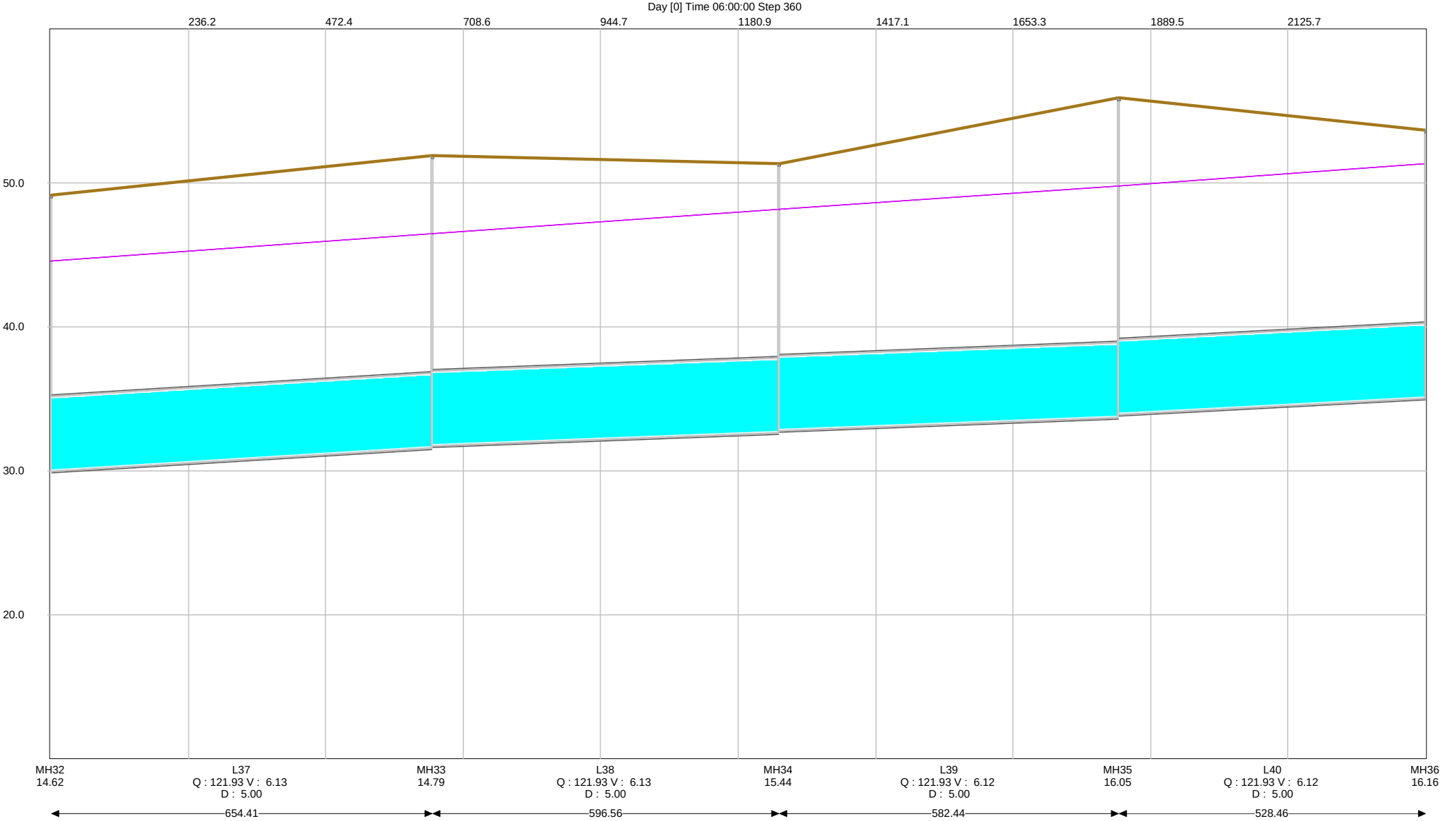

Manhole #20 to Manhole #24
Day [0] Time 06:00:00 Step 360
289.7
579.4
869.2
1158.9
1448.6
1738.3
2028.0
2317.7
2607.5
40.0
30.0
20.0
10.0
MH20
11.24
L25
Q : 128.90 V : 5.39
D : 5.50
751.59
MH21
11.56
L26
Q : 128.90 V : 5.39
D : 5.50
781.07
MH22
12.02
L27
Q : 128.90 V : 5.39
D : 5.50
628.47
MH23
11.78
L28
Q : 128.90 V : 5.39
D : 5.50
736.05
MH24
12.01

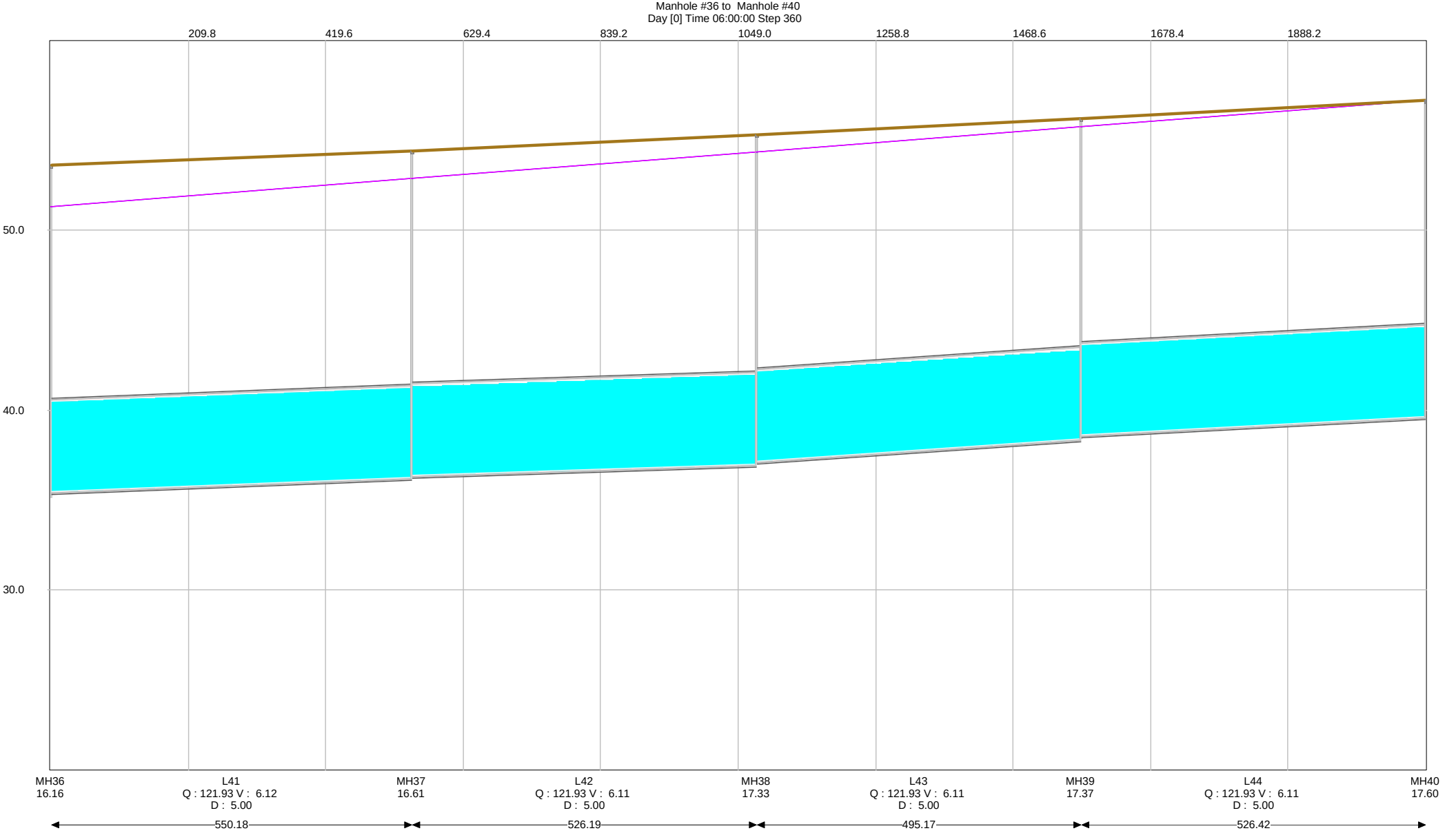
Manhole #24 to Manhole #28
Day [0] Time 06:00:00 Step 360




Manhole #28 to Manhole #32
Day [0] Time 06:00:00 Step 360
253.4
506.7
760.1
1013.5
1266.8
1520.2
1773.6
2026.9
2280.3
40.0
30.0
20.0
MH28
12.86
L33
Q : 121.93 V : 6.15
D : 5.00
MH29
13.02
L34
Q : 121.93 V : 6.14
D : 5.00
MH30
13.61
L35
Q : 121.93 V : 6.14
D : 5.00
MH31
14.09
L36
Q : 121.93 V : 6.14
D : 5.00
MH32
14.62
484.11
657.60
641.09
750.85

Manhole #32 to Manhole #36
Day [0] Time 06:00:00 Step 360




Manhole #36 to Manhole #40
Day [0] Time 06:00:00 Step 360
209.8
419.6
629.4
839.2
1049.0
1258.8
1468.6
1678.4
1888.2
50.0
40.0
30.0
MH36
16.16
L41
Q : 121.93 V : 6.12
D : 5.00
MH37
16.61
L42
Q : 121.93 V : 6.11
D : 5.00
MH38
17.33
L43
Q : 121.93 V : 6.11
D : 5.00
MH39
17.37
L44
Q : 121.93 V : 6.11
D : 5.00
MH40
17.60
550.18
526.19
495.17
526.42

Max Depth and Max d/D

Name	Max d/D (depth/diameter)	Max Depth (ft, m)
L44	3.520	17.60
L43	3.474	17.37
L42	3.466	17.33
L41	3.322	16.61
L40	3.232	16.16
L39	3.210	16.05
L38	3.089	15.44
L37	2.957	14.79
L36	2.925	14.62
L35	2.819	14.09
L34	2.723	13.61
L33	2.605	13.02
L32	2.338	12.86
L31	2.343	12.89
L30	2.335	12.84
L29	2.265	12.46
L28	2.183	12.01
L27	2.141	11.78
L26	2.185	12.02
L25	2.102	11.56
L24	2.044	11.24
L23	1.993	10.96
L22	1.986	10.92
L21	1.881	10.35
L20	1.731	9.52
L19	1.554	8.55
L18	1.594	8.77
L17	1.427	7.85
L16	1.471	8.09
L15	1.489	8.19
L14	1.422	7.82
L13	1.348	7.41
L12	1.253	6.89
L11	1.206	6.63
L10	1.193	6.56
L9	1.081	5.94
L8	1.081	5.95
L7	1.003	5.52
L6	0.820	4.51
L5	0.687	3.78
L4	0.705	3.88
L3	0.723	3.98
L2	0.721	3.96
L1	0.424	2.33

Appendix H

- Alternate I Sewer Capacity Analysis

ALTERNATE SEWER ALIGNMENT 1

Legend

- Alternate Manholes Aligment
- Alternate Sewer Alignment
- Existing Manholes
- Existing Gravity Sewer
- Study Area
- Drainage Areas

DAVIS BOWEN & FRIEDEL, INC.

N
W E
S

1,500 750 0 1,500 Feet

DBF #1813A002A
PGM #VCI 06-1-082

Area 1
Area 2
Area 3
Area 4
Area 5
Area 6
Area 7
Area 8
Area 9
Area 10

MH-A
MH-1
MH2-1
MH5-1
MH-5
MH10-1
MH15-1
MH-15
MH20-1
MH-20
MH25-1
MH-25
MH30-1
MH-30
MH35-1
MH-35
MH39-1
MH-40

DAN HEAD HWY
WILDERNESS RUN PL
LAUREL DR
LAUREL PL
OAKWOOD CIR
HENSON RD
EDCT
JOHNSON'S PL
HARGROVE PL
WAIKO PL
BILLINGSLEY RD
MOUNT ZEPHYR FARM PL
RAY DR
FOXBURROW PL
POMPEREE RD
GATHERING PL
HIKER BIKER TRL
PHILLIPS RD
BRIERWOOD RD
BIRCHWOOD PL
FRIENDLY OAK PL
DIXON'S PL
BUMPY OAK RD
JEANNETTE PL
JIMMY GREENS PL
MAGGIE PL
ASHLAND RD
LIVINGSTON RD
BARNETT SMITH PL
BAILEY CLARK PL
KANE DR
GREENHOW MARSHALL PL
MARBURY FREELAND PL
BAKER ST
FORD DR
GREENWAY DR
HAWTHORNE RD
MYRTLE PL
VALLEYVIEW PL
HAWTHORNE RD

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Replace Existing Interceptor with New Parallel Interceptor

Upstream Manhole	Downstream Manhole	Model Identifier	Pipe Size (in)	Length (ft)	Upstream Invert	Downstream Invert	Slope %
40	39-1	L44-1	84	526.42	39.66	38.65	0.19%
39-1	38-1	L43-1	84	495.17	38.40	37.19	0.24%
38-1	37-1	L42-1	90	526.19	37.04	36.37	0.13%
37-1	36-1	L41-1	90	550.18	36.27	35.51	0.14%
36-1	35-1	L40-1	90	528.46	35.16	34.02	0.22%
35-1	34-1	L39-1	90	582.44	33.77	32.87	0.15%
34-1	33-1	L38-1	90	596.56	32.72	31.81	0.15%
33-1	32-1	L37-1	90	654.41	31.68	30.08	0.24%
32-1	31-1	L36-1	90	750.85	29.98	28.52	0.19%
31-1	30-1	L35-1	90	641.09	28.37	27.17	0.19%
30-1	29-1	L34-1	90	657.60	27.02	26.03	0.15%
29-1	28-1	L33-1	90	484.11	25.73	24.86	0.18%
28-1	27-1	L32-1	90	506.01	24.51	23.86	0.13%
27-1	26-1	L31-1	90	801.08	23.61	22.36	0.16%
26-1	25-1	L30-1	90	753.51	22.11	21.24	0.12%
25-1	24-1	L29-1	90	743.90	21.04	20.25	0.11%
24-1	23-1	L28-1	90	736.05	20.05	19.21	0.11%
23-1	22-1	L27-1	90	628.47	18.86	17.80	0.17%
22-1	21-1	L26-1	96	781.07	17.40	16.76	0.08%
21-1	20-1	L25-1	96	751.59	16.35	15.51	0.11%
20-1	19-1	L24-1	96	817.57	15.21	14.21	0.12%
19-1	18-1	L23-1	96	822.83	13.91	12.71	0.14%
18-1	17-1	L22-1	96	798.73	12.27	11.44	0.10%
17-1	16-1	L21-1	96	777.39	11.14	10.25	0.11%
16-1	15-1	L20-1	96	747.72	10.15	9.35	0.11%
15-1	14-1	L19-1	96	623.73	9.25	8.55	0.11%
14-1	13-1	L18-1	96	599.27	8.45	7.80	0.11%
13-1	12-1	L17-1	96	522.76	7.70	6.97	0.14%
12-1	11-1	L16-1	96	543.94	6.77	5.06	0.31%
11-1	10-1	L15-1	96	619.95	4.96	4.11	0.14%
10-1	9-1	L14-1	96	477.74	3.90	3.36	0.11%
9-1	8-1	L13-1	96	642.66	3.21	2.46	0.12%
8-1	7-1	L12-1	96	627.49	2.26	1.27	0.16%
7-1	6-1	L11-1	96	614.93	1.12	0.17	0.15%
6-1	5-1	L10-1	96	732.21	-0.13	-0.85	0.10%
5-1	4-1	L9-1	96	749.97	-1.10	-2.55	0.19%
4-1	3-1	L8-1	96	751.46	-2.75	-3.83	0.14%
3-1	2-1	L7-1	96	751.18	-3.98	-4.75	0.10%
2-1	1-1	L6-1	96	756.68	-4.90	-6.28	0.18%
1-1	F-1	L5-1	96	470.98	-7.05	-8.86	0.38%
F-1	E-1	L4-1	96	508.17	-8.96	-10.70	0.34%
E-1	D-1	L3-1	96	599.14	-10.80	-12.69	0.32%
D-1	C-1	L2-1	96	537.70	-12.79	-14.09	0.24%
C-1	A	L1-1	96	38.47	-14.09	-14.76	1.74%

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Per County Water & Sewer Ordiance
Replace Existing Interceptor with New Parallel Interceptor

			Pipe Size			Full Pipe	Wetted	Hydraulic	Full Pipe	Full Pipe Flow				County Design Capacity d/D = .67[1] Velocity		Pipe Flow		
Upstream Manhole	Downstream Manhole	Model Identifier	Size (in)	n Factor	Slope %	Flow Area (ft2)	Perimeter (ft)	Radius	Velocity (fps)	(cfs)	(gpm)	(gpd)	(MGD)	v/V=.94[2] (fps)	(cfs)	q/Q=.67[2] (gpm)	(gpd)	(MGD)
40	39-1	L44-1	84	0.015	0.19%	38.48	21.99	1.75	6.30	242.51	108,847	156,739,243	156.74	5.92	162.48	72,927	105,015,293	105.02
39-1	38-1	L43-1	84	0.015	0.24%	38.48	21.99	1.75	7.11	273.69	122,839	176,888,162	176.89	6.68	183.37	82,302	118,515,069	118.52
38-1	37-1	L42-1	90	0.015	0.13%	44.18	23.56	1.88	5.38	237.47	106,583	153,479,820	153.48	5.05	159.10	71,411	102,831,480	102.83
37-1	36-1	L41-1	90	0.015	0.14%	44.18	23.56	1.88	5.60	247.34	111,014	159,859,913	159.86	5.26	165.72	74,379	107,106,142	107.11
36-1	35-1	L40-1	90	0.015	0.22%	44.18	23.56	1.88	7.00	309.09	138,730	199,770,585	199.77	6.58	207.09	92,949	133,846,292	133.85
35-1	34-1	L39-1	90	0.015	0.15%	44.18	23.56	1.88	5.92	261.60	117,414	169,075,560	169.08	5.57	175.27	78,667	113,280,625	113.28
34-1	33-1	L38-1	90	0.015	0.15%	44.18	23.56	1.88	5.88	259.92	116,658	167,988,212	167.99	5.53	174.14	78,161	112,552,102	112.55
33-1	32-1	L37-1	90	0.015	0.24%	44.18	23.56	1.88	7.45	329.06	147,692	212,676,843	212.68	7.00	220.47	98,954	142,493,485	142.49
32-1	31-1	L36-1	90	0.015	0.19%	44.18	23.56	1.88	6.64	293.45	131,711	189,664,046	189.66	6.24	196.61	88,246	127,074,911	127.07
31-1	30-1	L35-1	90	0.015	0.19%	44.18	23.56	1.88	6.52	287.92	129,227	186,087,113	186.09	6.13	192.91	86,582	124,678,366	124.68
30-1	29-1	L34-1	90	0.015	0.15%	44.18	23.56	1.88	5.84	258.21	115,894	166,886,755	166.89	5.49	173.00	77,649	111,814,126	111.81
29-1	28-1	L33-1	90	0.015	0.18%	44.18	23.56	1.88	6.39	282.12	126,622	182,336,148	182.34	6.00	189.02	84,837	122,165,219	122.17
28-1	27-1	L32-1	90	0.015	0.13%	44.18	23.56	1.88	5.40	238.52	107,053	154,156,664	154.16	5.07	159.81	71,726	103,284,965	103.28
27-1	26-1	L31-1	90	0.015	0.16%	44.18	23.56	1.88	5.95	262.88	117,989	169,903,466	169.90	5.59	176.13	79,052	113,835,322	113.84
26-1	25-1	L30-1	90	0.015	0.12%	44.18	23.56	1.88	5.12	226.13	101,493	146,150,496	146.15	4.81	151.51	68,001	97,920,832	97.92
25-1	24-1	L29-1	90	0.015	0.11%	44.18	23.56	1.88	4.91	216.87	97,337	140,165,601	140.17	4.61	145.30	65,216	93,910,952	93.91
24-1	23-1	L28-1	90	0.015	0.11%	44.18	23.56	1.88	5.09	224.82	100,904	145,301,856	145.30	4.78	150.63	67,606	97,352,243	97.35
23-1	22-1	L27-1	90	0.015	0.17%	44.18	23.56	1.88	6.19	273.31	122,669	176,642,756	176.64	5.82	183.12	82,188	118,350,647	118.35
22-1	21-1	L26-1	96	0.015	0.08%	50.27	25.13	2.00	4.50	226.27	101,557	146,242,448	146.24	4.23	151.60	68,043	97,982,440	97.98
21-1	20-1	L25-1	96	0.015	0.11%	50.27	25.13	2.00	5.26	264.26	118,608	170,795,957	170.80	4.94	177.05	79,468	114,433,291	114.43
20-1	19-1	L24-1	96	0.015	0.12%	50.27	25.13	2.00	5.50	276.45	124,080	178,675,895	178.68	5.17	185.22	83,134	119,712,850	119.71
19-1	18-1	L23-1	96	0.015	0.14%	50.27	25.13	2.00	5.88	295.77	132,749	191,157,991	191.16	5.53	198.16	88,942	128,075,854	128.08
18-1	17-1	L22-1	96	0.015	0.10%	50.27	25.13	2.00	5.07	254.81	114,368	164,690,098	164.69	4.77	170.73	76,627	110,342,365	110.34
17-1	16-1	L21-1	96	0.015	0.11%	50.27	25.13	2.00	5.32	267.46	120,044	172,863,765	172.86	5.00	179.20	80,430	115,818,723	115.82
16-1	15-1	L20-1	96	0.015	0.11%	50.27	25.13	2.00	5.14	258.56	116,049	167,110,575	167.11	4.84	173.23	77,753	111,964,085	111.96
15-1	14-1	L19-1	96	0.015	0.11%	50.27	25.13	2.00	5.27	264.81	118,855	171,150,882	171.15	4.95	177.42	79,633	114,671,091	114.67
14-1	13-1	L18-1	96	0.015	0.11%	50.27	25.13	2.00	5.18	260.33	116,845	168,257,274	168.26	4.87	174.42	78,286	112,732,374	112.73
13-1	12-1	L17-1	96	0.015	0.14%	50.27	25.13	2.00	5.88	295.39	132,579	190,914,403	190.91	5.52	197.91	88,828	127,912,650	127.91
12-1	11-1	L16-1	96	0.015	0.31%	50.27	25.13	2.00	8.82	443.21	198,925	286,451,431	286.45	8.29	296.95	133,279	191,922,459	191.92
11-1	10-1	L15-1	96	0.015	0.14%	50.27	25.13	2.00	5.82	292.69	131,370	189,173,182	189.17	5.47	196.11	88,018	126,746,032	126.75
10-1	9-1	L14-1	96	0.015	0.11%	50.27	25.13	2.00	5.29	265.76	119,280	171,762,960	171.76	4.97	178.06	79,917	115,081,183	115.08
9-1	8-1	L13-1	96	0.015	0.12%	50.27	25.13	2.00	5.37	270.04	121,201	174,529,336	174.53	5.05	180.93	81,205	116,934,655	116.93
8-1	7-1	L12-1	96	0.015	0.16%	50.27	25.13	2.00	6.25	313.98	140,922	202,928,307	202.93	5.87	210.36	94,418	135,961,966	135.96
7-1	6-1	L11-1	96	0.015	0.15%	50.27	25.13	2.00	6.18	310.69	139,449	200,806,331	200.81	5.81	208.17	93,431	134,540,242	134.54
6-1	5-1	L10-1	96	0.015	0.10%	50.27	25.13	2.00	4.93	247.87	111,254	160,205,293	160.21	4.64	166.08	74,540	107,337,546	107.34
5-1	4-1	L9-1	96	0.015	0.19%	50.27	25.13	2.00	6.91	347.57	156,001	224,641,761	224.64	6.50	232.87	104,521	150,509,980	150.51
4-1	3-1	L8-1	96	0.015	0.14%	50.27	25.13	2.00	5.96	299.67	134,501	193,681,162	193.68	5.60	200.78	90,116	129,766,379	129.77
3-1	2-1	L7-1	96	0.015	0.10%	50.27	25.13	2.00	5.03	253.08	113,590	163,569,299	163.57	4.73	169.56	76,105	109,591,431	109.59
2-1	1-1	L6-1	96	0.015	0.18%	50.27	25.13	2.00	6.72	337.57	151,513	218,178,451	218.18	6.31	226.17	101,514	146,179,562	146.18
1-1	F-1	L5-1	96	0.015	0.38%	50.27	25.13	2.00	9.75	490.03	219,940	316,713,440	316.71	9.16	328.32	147,360	212,198,005	212.20
F-1	E-1	L4-1	96	0.015	0.34%	50.27	25.13	2.00	9.20	462.55	207,604	298,949,996	298.95	8.65	309.91	139,095	200,296,497	200.30
E-1	D-1	L3-1	96	0.015	0.32%	50.27	25.13	2.00	8.83	443.97	199,266	286,942,702	286.94	8.30	297.46	133,508	192,251,610	192.25
D-1	C-1	L2-1	96	0.015	0.24%	50.27	25.13	2.00	7.73	388.67	174,449	251,206,051	251.21	7.27	260.41	116,881	168,308,054	168.31
C-1	A	L1-1	96	0.015	1.74%	50.27	25.13	2.00	20.75	1043.18	468,212	674,224,838	674.22	19.51	698.93	313,702	451,730,641	451.73

(1) Per County Water and Sewer Ordinance 8.2D(2)(a); maximum pipe flow of 2/3 full.
(2) Ratios per Charles County Water and Sewer Ordinance Appendix BB.

Charles County
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Alternate I Sewer Capacity Peak Flow Analysis
Per County Water & Sewer Ordiance
Replace Existing Interceptor with New Parallel Interceptor

Upstream Manhole	Downstream Manhole	Model Identifier	Incremental Peak Sewer Inflow (cfs)	Incremental Peak Sewer Inflow Source	Cummulative Peak Sewer Flow (cfs)	Sewer Capaciy (cfs)	Adequate to Convey Peak Flow YES/NO	Additional Capaciy Provided (cfs)
40	39-1	L44-1	130.90	Upstream of MH 40[(1)]				
			1.27	Drainage Area 5				
			1.96	Drainage Area 6				
			1.14	Drainage Area 7	135.27	162.48	YES	27.21
39-1	38-1	L43-1	0.00		135.27	183.37	YES	48.10
38-1	37-1	L42-1	0.00		135.27	159.10	YES	23.83
37-1	36-1	L41-1	0.00		135.27	165.72	YES	30.45
36-1	35-1	L40-1	0.00		135.27	207.09	YES	71.82
35-1	34-1	L39-1	0.00		135.27	175.27	YES	40.00
34-1	33-1	L38-1	0.00		135.27	174.14	YES	38.87
33-1	32-1	L37-1	0.00		135.27	220.47	YES	85.20
32-1	31-1	L36-1	0.00		135.27	196.61	YES	61.34
31-1	30-1	L35-1	0.00		135.27	192.91	YES	57.64
30-1	29-1	L34-1	0.00		135.27	173.00	YES	37.73
29-1	28-1	L33-1	0.00		135.27	189.02	YES	53.75
28-1	27-1	L32-1	0.00		135.27	159.81	YES	24.54
27-1	26-1	L31-1	4.28	Drainage Area 4		176.13	YES	176.13
			2.69	Drainage Area 8	142.24			
26-1	25-1	L30-1	0.00		142.24	151.51	YES	9.27
25-1	24-1	L29-1	0.00		142.24	145.30	YES	3.06
24-1	23-1	L28-1	0.00		142.24	150.63	YES	8.39
23-1	22-1	L27-1	0.00		142.24	183.12	YES	40.88
22-1	21-1	L26-1	0.00		142.24	151.60	YES	9.36
21-1	20-1	L25-1	0.00		142.24	177.05	YES	34.81
20-1	19-1	L24-1	0.00		142.24	185.22	YES	42.98
19-1	18-1	L23-1	3.32	Drainage Area 9	145.56	198.16	YES	52.60
18-1	17-1	L22-1	3.07	Drainage Area 3	148.63	170.73	YES	22.10
17-1	16-1	L21-1	0.00		148.63	179.20	YES	30.57
16-1	15-1	L20-1	0.00		148.63	173.23	YES	24.60
15-1	14-1	L19-1	1.25	CSM PS	149.88	177.42	YES	27.54
14-1	13-1	L18-1	0.00		149.88	174.42	YES	24.54
13-1	12-1	L17-1	0.00		149.88	197.91	YES	48.03
12-1	11-1	L16-1	3.46	Drainage Area 2	153.34	296.95	YES	143.61
11-1	10-1	L15-1	0.00		153.34	196.11	YES	42.77
10-1	9-1	L14-1	0.00		153.34	178.06	YES	24.72
9-1	8-1	L13-1	0.00		153.34	180.93	YES	27.59
8-1	7-1	L12-1	0.40	Drainage Area 1	153.74	210.36	YES	56.62
7-1	6-1	L11-1	0.00		153.74	208.17	YES	54.43
6-1	5-1	L10-1	0.00		153.74	166.08	YES	12.34
5-1	4-1	L9-1	0.00		153.74	232.87	YES	79.13
4-1	3-1	L8-1	0.00		153.74	200.78	YES	47.04
3-1	2-1	L7-1	3.51	Drainage Area 10	157.25	169.56	YES	12.31
2-1	1-1	L6-1	0.00		157.25	226.17	YES	68.92
1-1	F-1	L5-1	0.00		157.25	328.32	YES	171.07
F-1	E-1	L4-1	0.00		157.25	309.91	YES	152.66
E-1	D-1	L3-1	0.00		157.25	297.46	YES	140.21
D-1	C-1	L2-1	0.00		157.25	260.41	YES	103.16
C-1	A	L1-1	0.00		157.25	698.93	YES	541.68

(1) Peak sewer flow of 130.9 cfs per previous study will enter Manhole #40, see Appendix B.

Appendix I

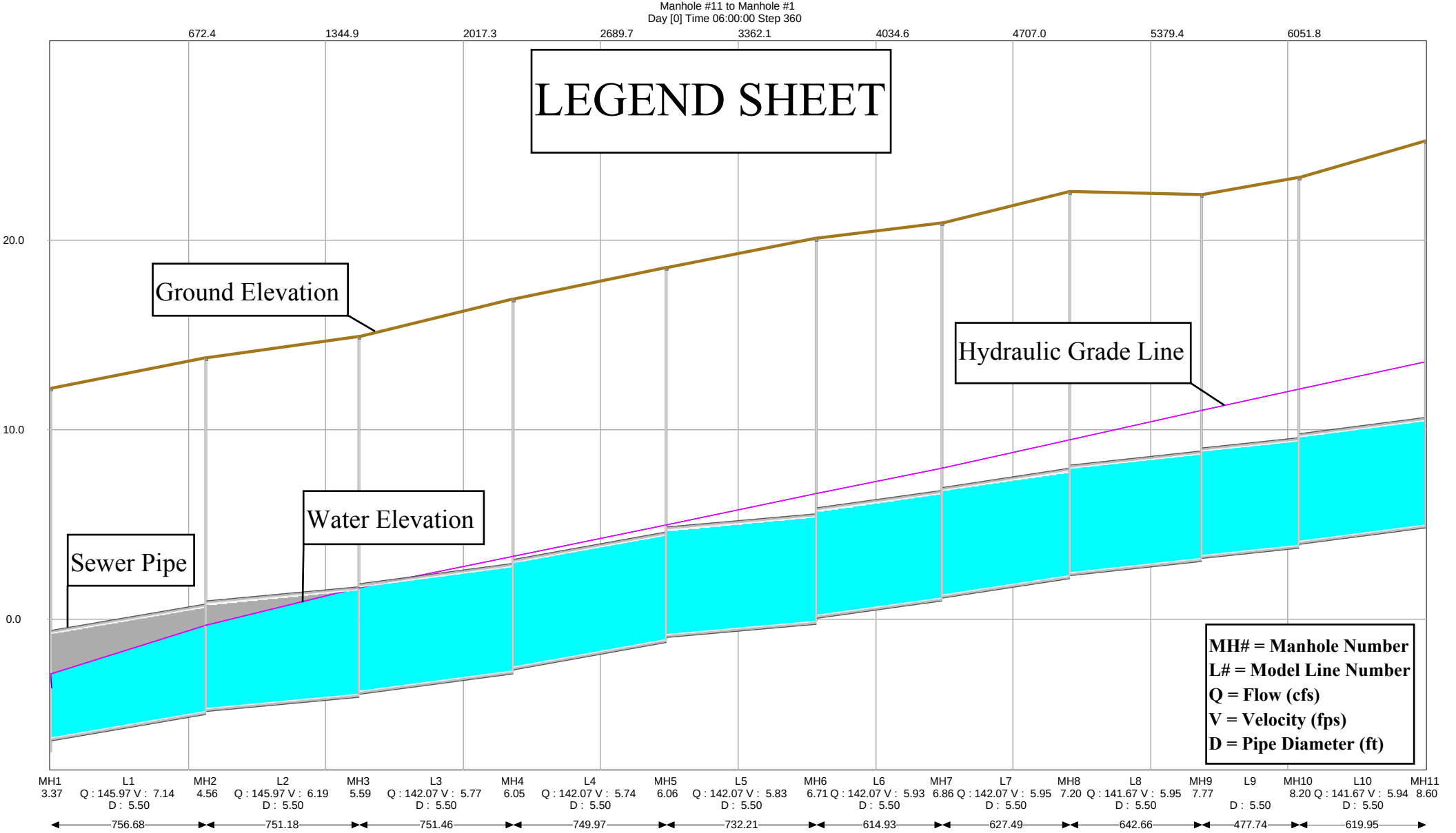
- Alternate I Model Results

Charles County
Department of Planning & Growth Management
Mattawoman Interceptor Phase III Capacity Study
PGM #VCI 06-1-082
DBF #1813A002A
Final Report

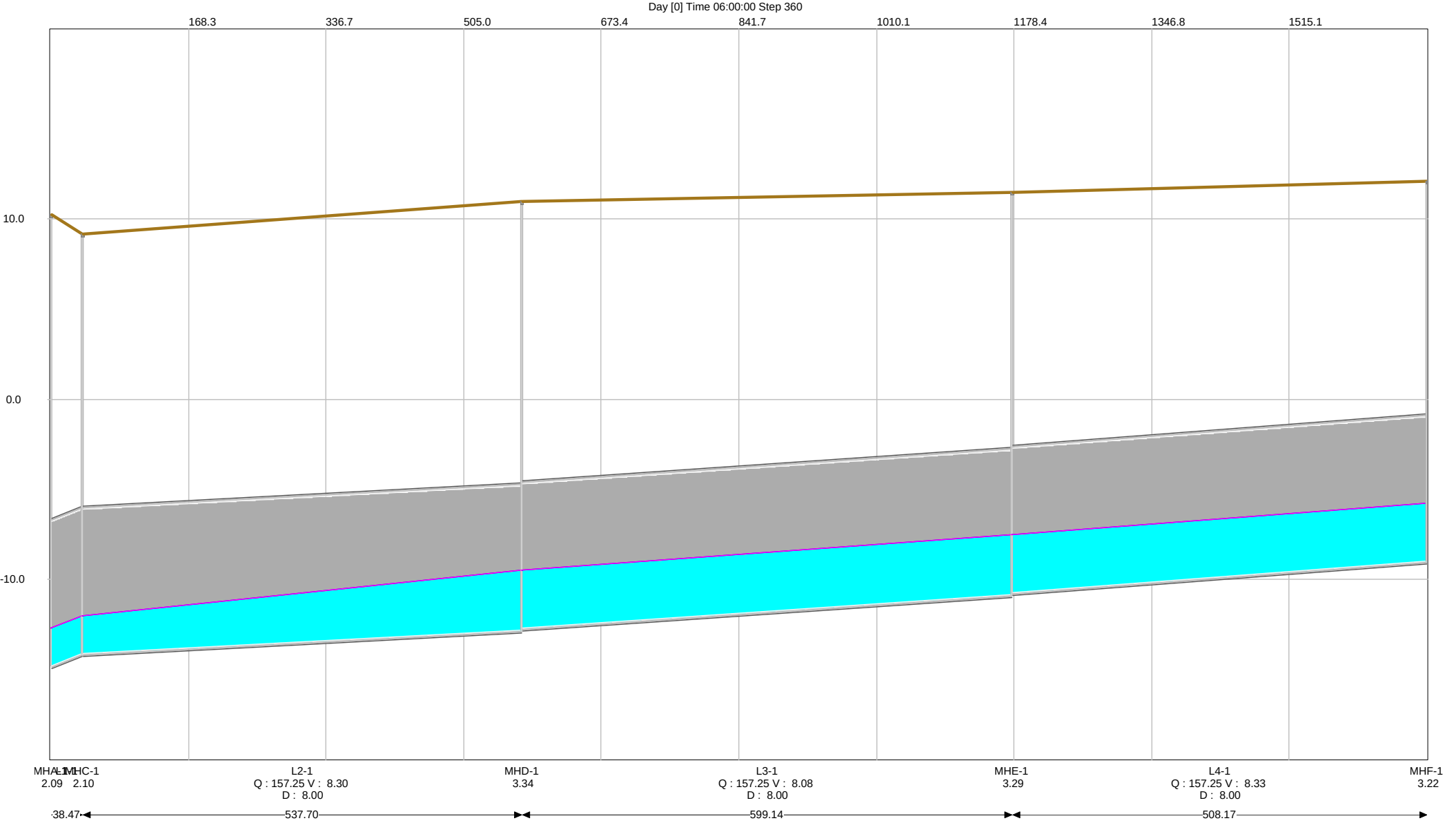
Mattawoman Interceptor
XPSWMM Alternate I Model Results
Replace Existing Interceptor with New Parallel Interceptor
Per County Water & Sewer Ordiance Maximum d/D = 0.67
Future Peak Wastewater Flows within Alternate 1 Interceptor

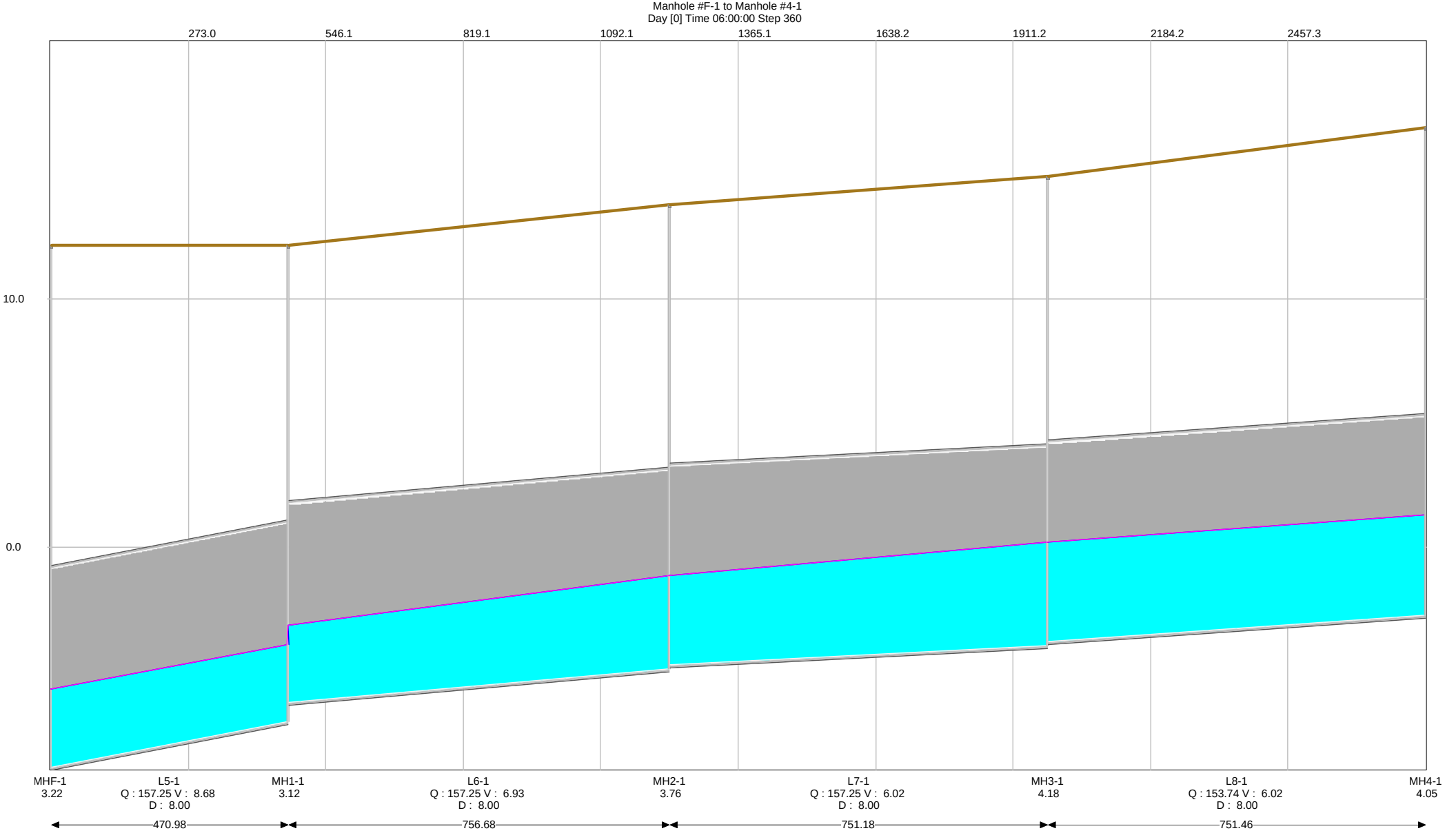
Model Identifier	Upstream Manhole	Downstream Manhole	Pipe Size Size (in)	n Factor	Slope %	Incremental Peak Sewer Inflow (cfs)	Incremental Peak Sewer Inlow Source	Cummulative Peak Sewer Inflow (cfs)	Full Pipe Flow (cfs)	Maximum Pipe Flow (cfs)[2]	Design Depth (ft)	Maximum Depth	Maximum d/D	Meets County Ordinance[3]
L44-1	40	39-1	84	0.015	0.19%	130.90	Upstream of MH 40[1]	135.27	242.51	137.68	4.69	3.66	0.52	YES
						1.27	Drainage Area 5							
						1.96	Drainage Area 6							
						1.14	Drainage Area 7							
L43-1	39-1	38-1	84	0.015	0.24%	0.00		135.27	273.69	135.59	4.69	3.70	0.53	YES
L42-1	38-1	37-1	90	0.015	0.13%	0.00		135.27	237.47	135.42	5.03	3.85	0.51	YES
L41-1	37-1	36-1	90	0.015	0.14%	0.00		135.27	247.34	135.45	5.03	3.68	0.49	YES
L40-1	36-1	35-1	90	0.015	0.22%	0.00		135.27	309.09	135.50	5.03	3.48	0.46	YES
L39-1	35-1	34-1	90	0.015	0.15%	0.00		135.27	261.60	135.52	5.03	3.73	0.50	YES
L38-1	34-1	33-1	90	0.015	0.15%	0.00		135.27	259.92	135.54	5.03	3.68	0.49	YES
L37-1	33-1	32-1	90	0.015	0.24%	0.00		135.27	329.06	135.49	5.03	3.47	0.46	YES
L36-1	32-1	31-1	90	0.015	0.19%	0.00		135.27	293.45	135.46	5.03	3.57	0.48	YES
L35-1	31-1	30-1	90	0.015	0.19%	0.00		135.27	287.92	135.42	5.03	3.61	0.48	YES
L34-1	30-1	29-1	90	0.015	0.15%	0.00		135.27	258.21	135.34	5.03	3.71	0.50	YES
L33-1	29-1	28-1	90	0.015	0.18%	0.00		135.27	282.12	135.28	5.03	3.62	0.48	YES
L32-1	28-1	27-1	90	0.015	0.13%	0.00		135.27	238.52	135.28	5.03	3.87	0.52	YES
L31-1	27-1	26-1	90	0.015	0.16%	4.28	Drainage Area 4	142.24	262.88	142.25	5.03	3.93	0.52	YES
						2.69	Drainage Area 8							
L30-1	26-1	25-1	90	0.015	0.12%	0.00		142.24	226.13	142.25	5.03	4.16	0.56	YES
L29-1	25-1	24-1	90	0.015	0.11%	0.00		142.24	216.87	142.25	5.03	4.16	0.55	YES
L28-1	24-1	23-1	90	0.015	0.11%	0.00		142.24	224.82	142.25	5.03	4.01	0.54	YES
L27-1	23-1	22-1	90	0.015	0.17%	0.00		142.24	273.31	142.25	5.03	3.81	0.51	YES
L26-1	22-1	21-1	96	0.015	0.08%	0.00		142.24	226.27	142.25	5.36	4.12	0.52	YES
L25-1	21-1	20-1	96	0.015	0.11%	0.00		142.24	264.26	142.25	5.36	3.97	0.50	YES
L24-1	20-1	19-1	96	0.015	0.12%	0.00		142.24	276.45	142.25	5.36	3.92	0.49	YES
L23-1	19-1	18-1	96	0.015	0.14%	3.32	Drainage Area 9	145.56	301.87	145.57	5.36	3.87	0.48	YES
L22-1	18-1	17-1	96	0.015	0.10%	3.07	Drainage Area 3	148.63	254.81	148.64	5.36	4.18	0.52	YES
L21-1	17-1	16-1	96	0.015	0.11%	0.00		148.63	267.46	148.64	5.36	4.20	0.52	YES
L20-1	16-1	15-1	96	0.015	0.11%	0.00		148.63	258.56	148.64	5.36	4.21	0.53	YES
L19-1	15-1	14-1	96	0.015	0.11%	1.25	CSM PS	149.88	264.81	149.89	5.36	4.13	0.52	YES
L18-1	14-1	13-1	96	0.015	0.11%	0.00		149.88	260.33	149.89	5.36	4.03	0.50	YES
L17-1	13-1	12-1	96	0.015	0.14%	0.00		149.88	295.39	149.89	5.36	3.75	0.47	YES
L16-1	12-1	11-1	96	0.015	0.31%	3.46	Drainage Area 2	153.34	443.21	153.35	5.36	3.93	0.49	YES
L15-1	11-1	10-1	96	0.015	0.14%	0.00		153.34	292.69	153.35	5.36	4.03	0.50	YES
L14-1	10-1	9-1	96	0.015	0.11%	0.00		153.34	265.76	153.35	5.36	4.11	0.51	YES
L13-1	9-1	8-1	96	0.015	0.12%	0.00		153.34	270.04	153.35	5.36	4.06	0.51	YES
L12-1	8-1	7-1	96	0.015	0.16%	0.40	Drainage Area 1	153.74	313.98	153.75	5.36	3.90	0.49	YES
L11-1	7-1	6-1	96	0.015	0.15%	0.00		153.74	310.69	153.75	5.36	3.93	0.49	YES
L10-1	6-1	5-1	96	0.015	0.10%	0.00		153.74	247.87	153.75	5.36	4.13	0.52	YES
L9-1	5-1	4-1	96	0.015	0.19%	0.00		153.74	347.57	153.75	5.36	3.85	0.48	YES
L8-1	4-1	3-1	96	0.015	0.14%	0.00		153.74	299.67	153.75	5.36	4.05	0.51	YES
L7-1	3-1	2-1	96	0.015	0.10%	3.51	Drainage Area 10	157.25	253.08	157.26	5.36	4.18	0.52	YES
L6-1	2-1	1-1	96	0.015	0.18%	0.00		157.25	337.57	157.26	5.36	3.76	0.47	YES
L5-1	1-1	F-1	96	0.015	0.38%	0.00		157.25	490.03	157.26	5.36	3.12	0.39	YES
L4-1	F-1	E-1	96	0.015	0.34%	0.00		157.25	462.55	157.26	5.36	3.22	0.40	YES
L3-1	E-1	D-1	96	0.015	0.32%	0.00		157.25	443.97	157.26	5.36	3.29	0.41	YES
L2-1	D-1	C-1	96	0.015	0.24%	0.00		157.25	388.67	157.26	5.36	3.34	0.42	YES
L1-1	C-1	A	96	0.015	1.74%	0.00		157.25	1043.18	157.26	5.36	2.10	0.26	YES

(1) Peak sewer flow of 130.9 cfs per previous study will enter Manhole #40, see Appendix B.
(2) Maximum Pipe Flow differs from Cummulative Peak Sewer Inflow due to rounding of numbers withing the model.
(3) Per County Water and Sewer Ordinance 8.2D(2)(a); maximum pipe flow of 2/3 full.

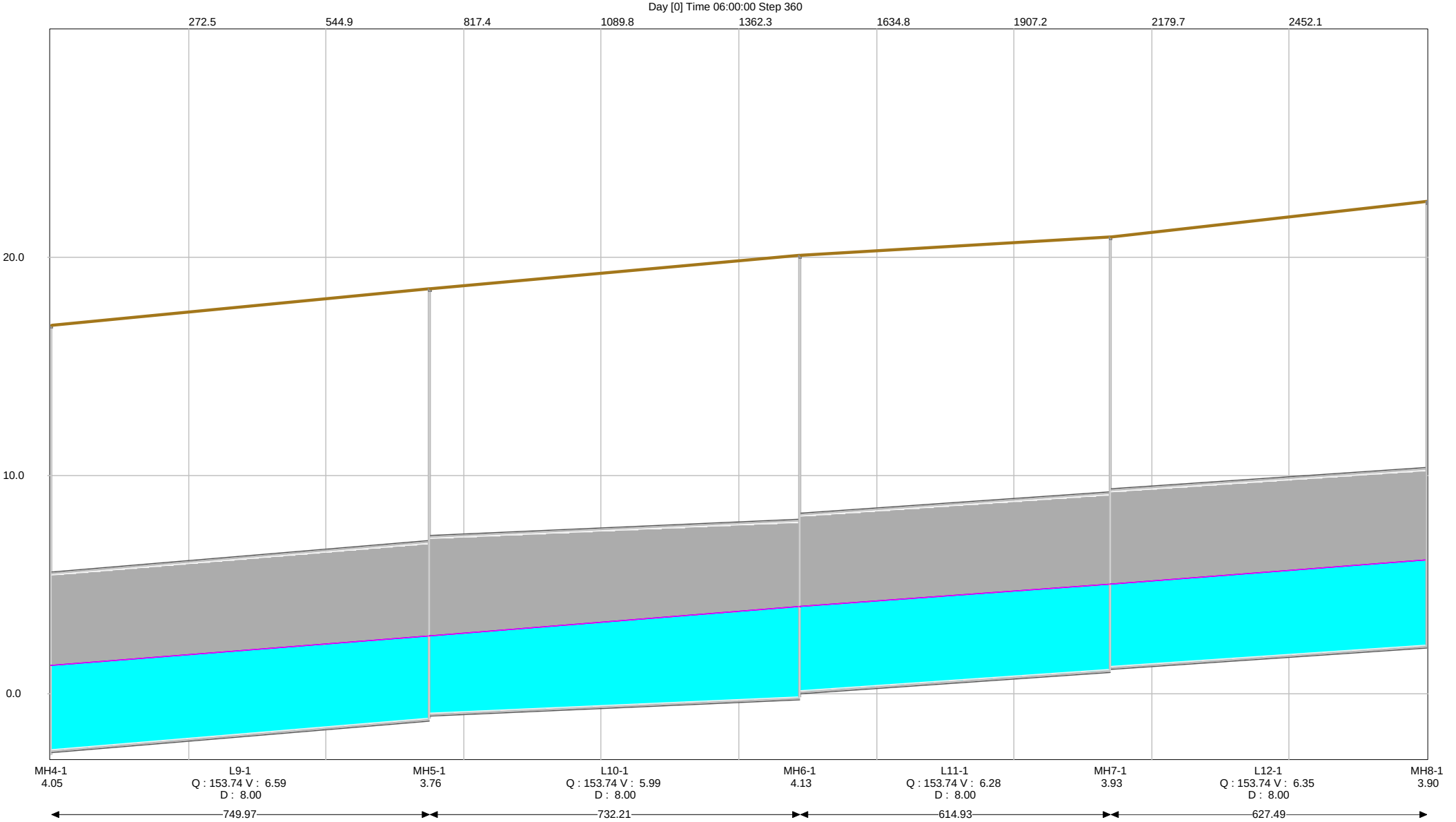

Manhole #11 to Manhole #1
Day [0] Time 06:00:00 Step 360
672.4
1344.9
2017.3
2689.7
3362.1
4034.6
4707.0
5379.4
6051.8
LEGEND SHEET
20.0
10.0
0.0
Ground Elevation
Hydraulic Grade Line
Water Elevation
Sewer Pipe
MH# = Manhole Number
L# = Model Line Number
Q = Flow (cfs)
V = Velocity (fps)
D = Pipe Diameter (ft)
MH1 3.37
L1 Q : 145.97 V : 7.14 D : 5.50
MH2 4.56
L2 Q : 145.97 V : 6.19 D : 5.50
MH3 5.59
L3 Q : 142.07 V : 5.77 D : 5.50
MH4 6.05
L4 Q : 142.07 V : 5.74 D : 5.50
MH5 6.06
L5 Q : 142.07 V : 5.83 D : 5.50
MH6 6.71
L6 Q : 142.07 V : 5.93 D : 5.50
MH7 6.86
L7 Q : 142.07 V : 5.95 D : 5.50
MH8 7.20
L8 Q : 141.67 V : 5.95 D : 5.50
MH9 7.77
L9 D : 5.50
MH10 8.20
L10 Q : 141.67 V : 5.94 D : 5.50
MH11 8.60
756.68
751.18
751.46
749.97
732.21
614.93
627.49
642.66
477.74
619.95

Manhole #A-1 to Manhole #F-1
Day [0] Time 06:00:00 Step 360

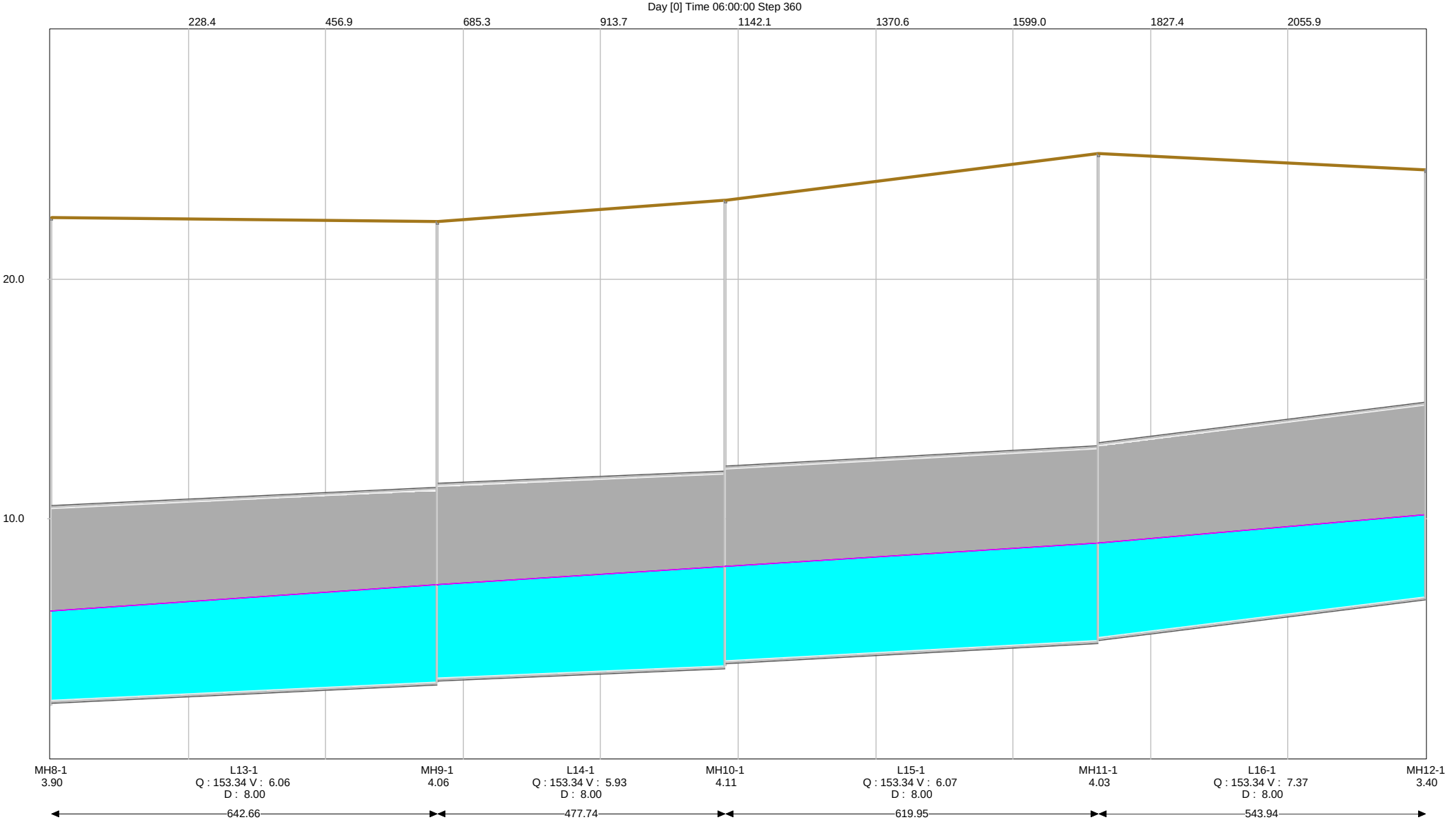



Manhole #F-1 to Manhole #4-1
Day [0] Time 06:00:00 Step 360
273.0
546.1
819.1
1092.1
1365.1
1638.2
1911.2
2184.2
2457.3
10.0
0.0
MHF-1
3.22
L5-1
Q : 157.25 V : 8.68
D : 8.00
MH1-1
3.12
L6-1
Q : 157.25 V : 6.93
D : 8.00
MH2-1
3.76
L7-1
Q : 157.25 V : 6.02
D : 8.00
MH3-1
4.18
L8-1
Q : 153.74 V : 6.02
D : 8.00
MH4-1
4.05
470.98
756.68
751.18
751.46

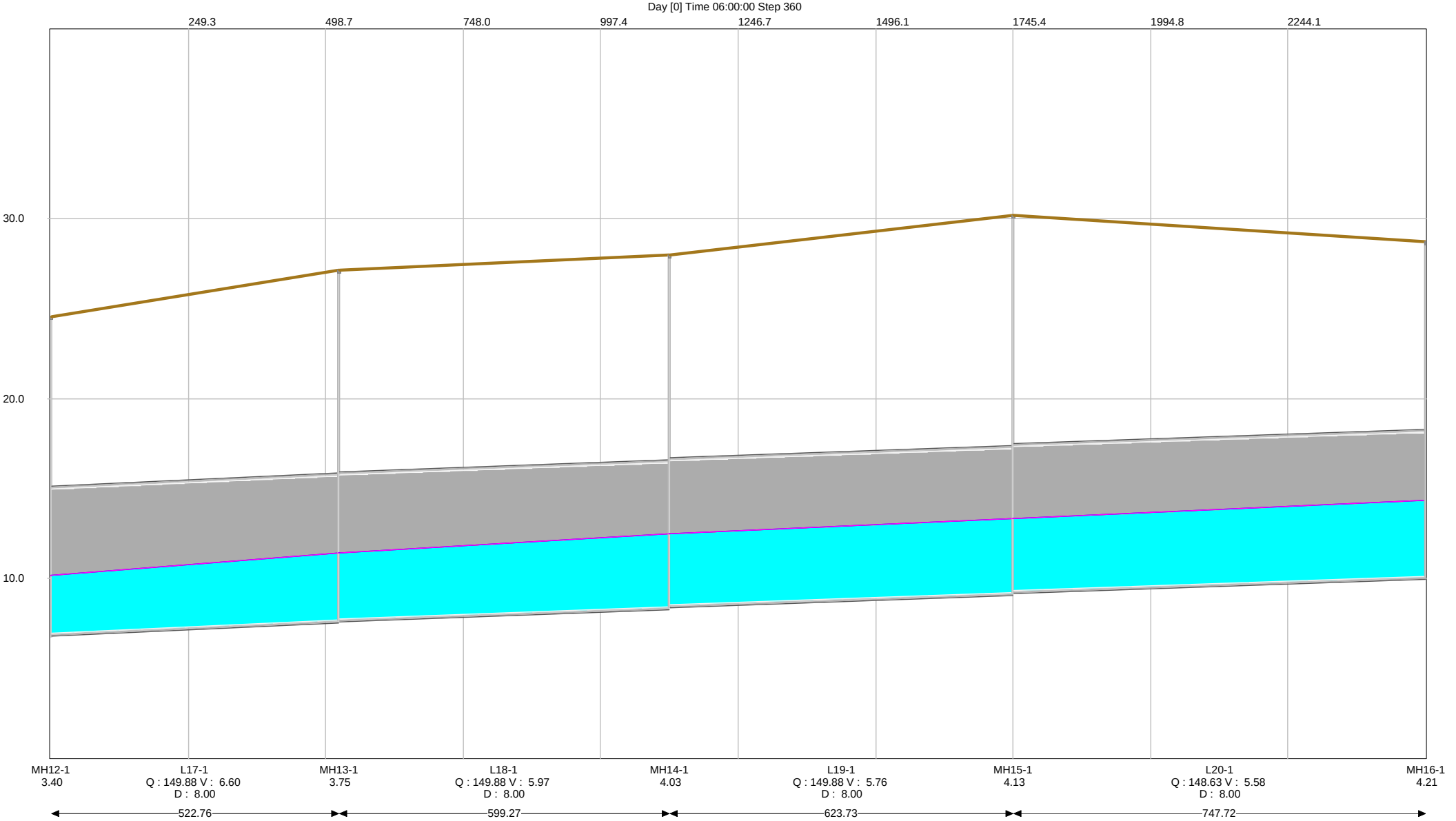
Manhole #4-1 to Manhole #8-1
Day [0] Time 06:00:00 Step 360



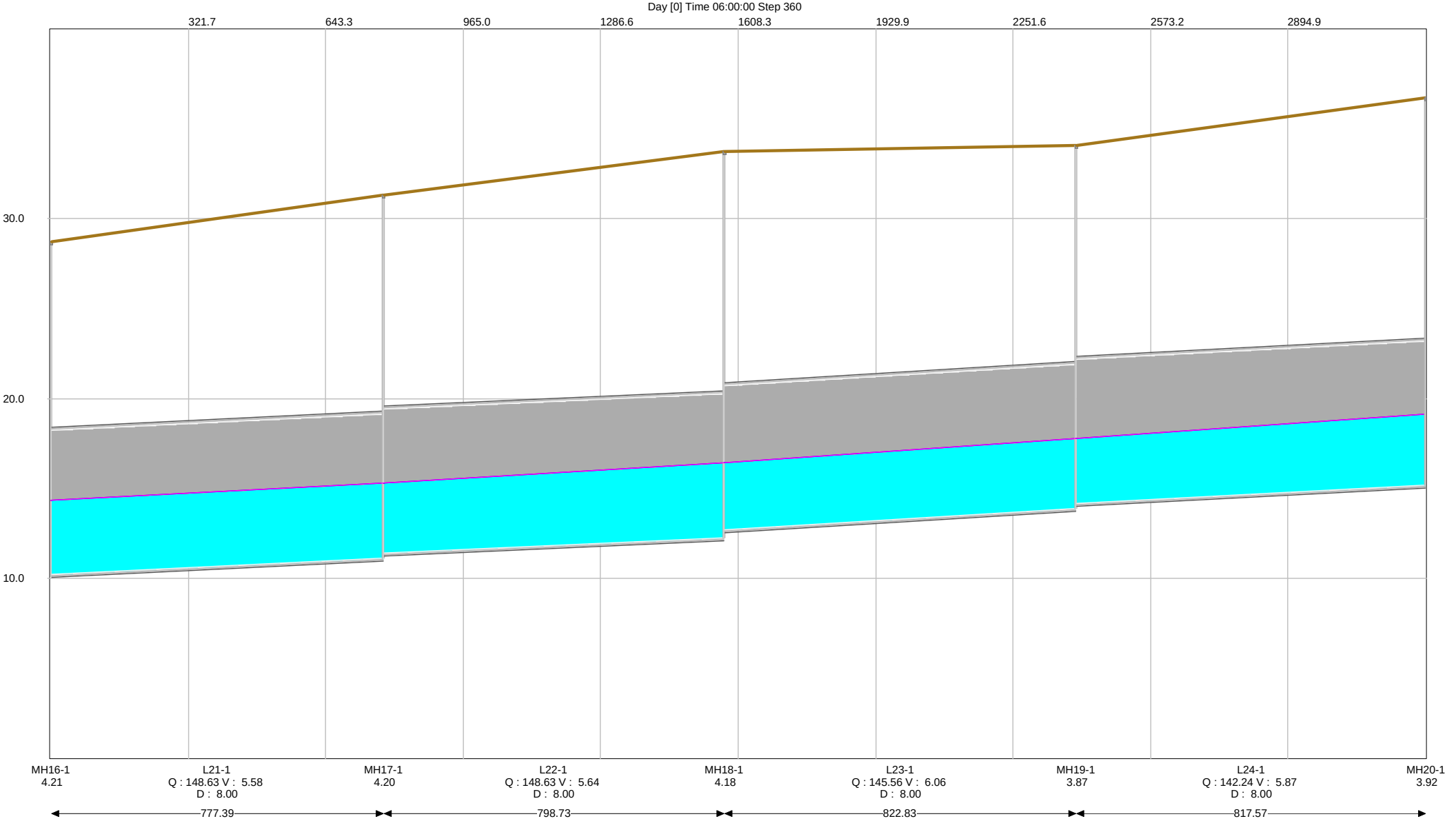
Manhole #8-1 to Manhole #12-1
Day [0] Time 06:00:00 Step 360

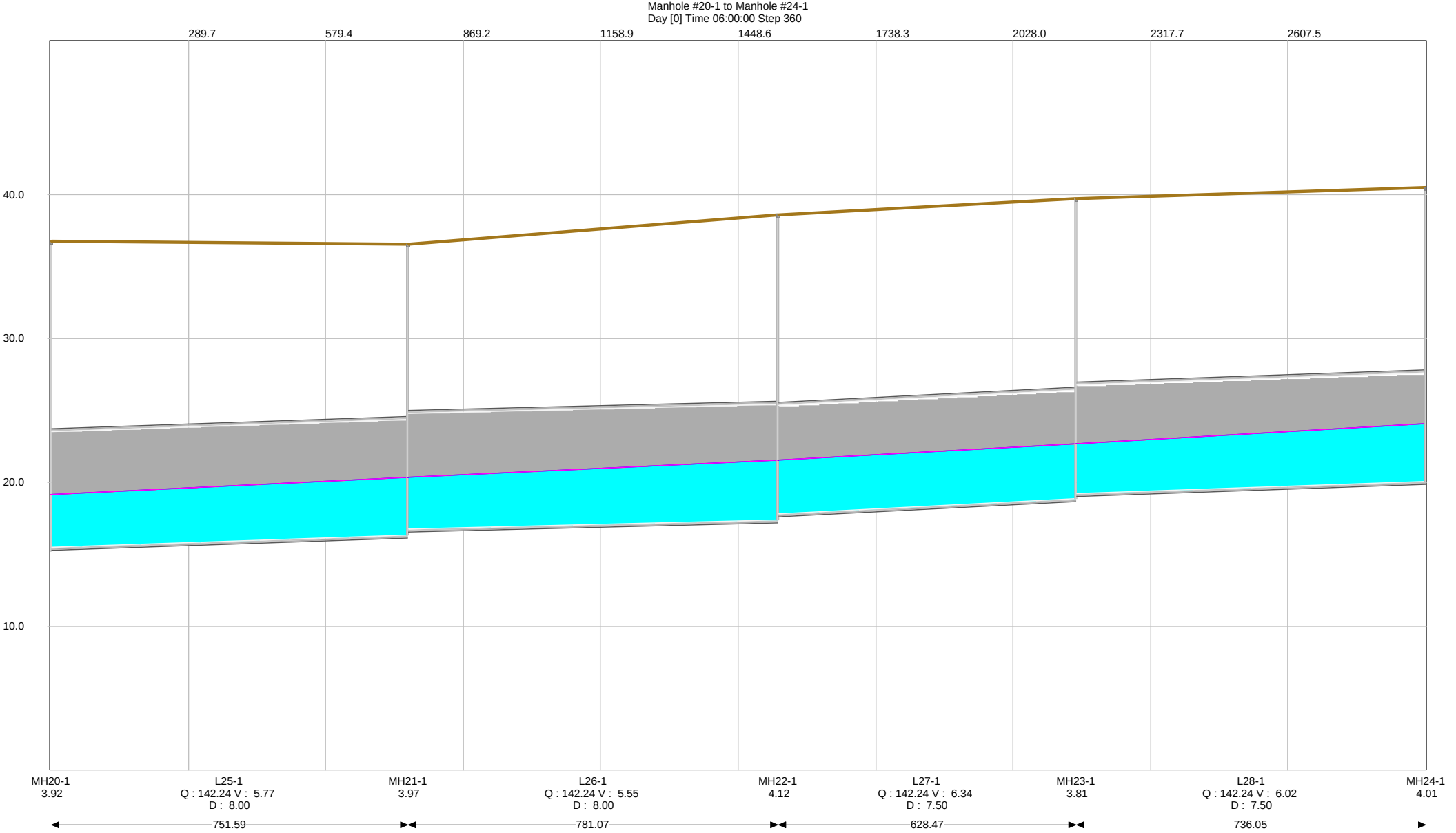


Manhole #12-1 to Manhole #16-1
Day [0] Time 06:00:00 Step 360

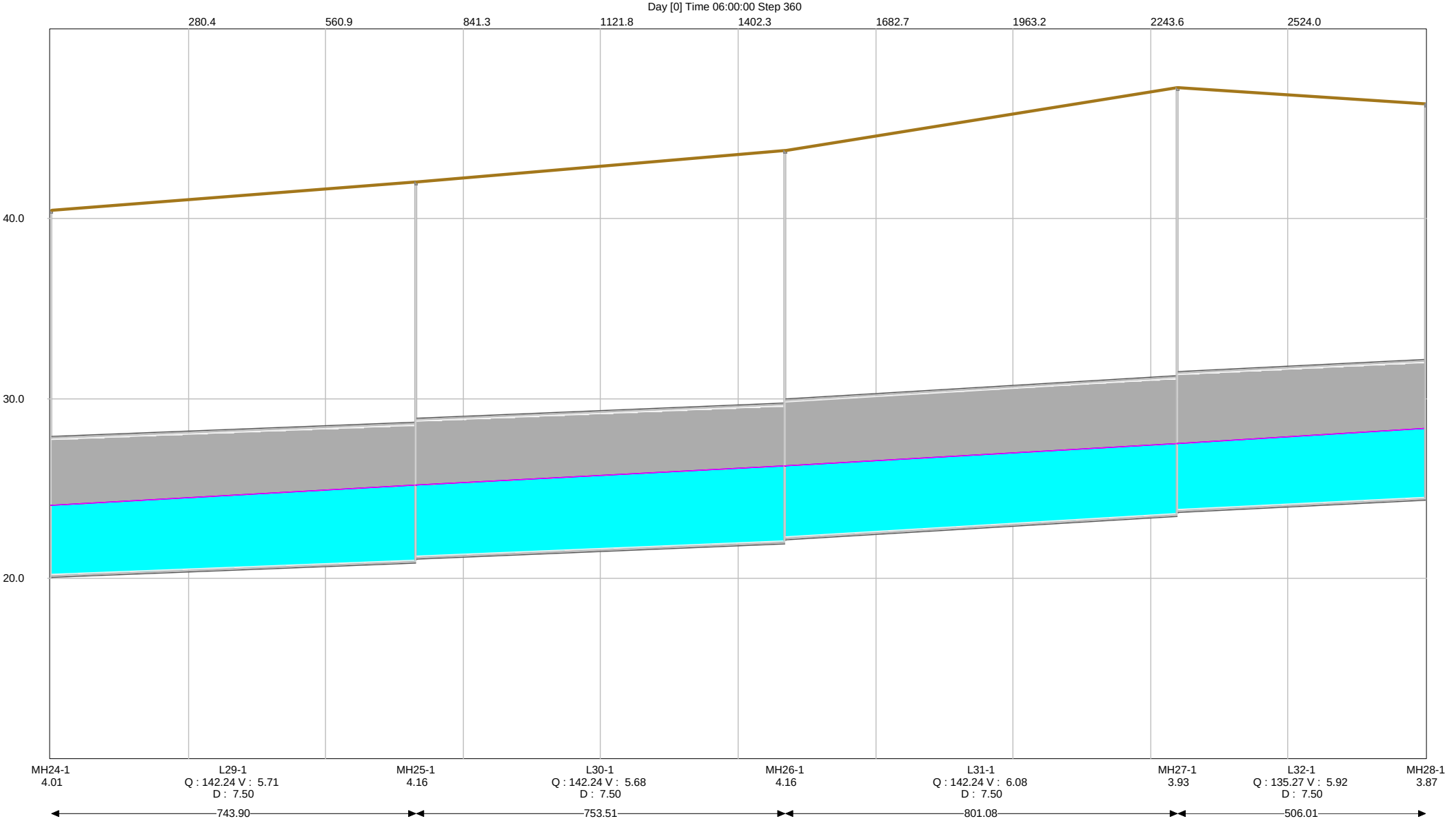


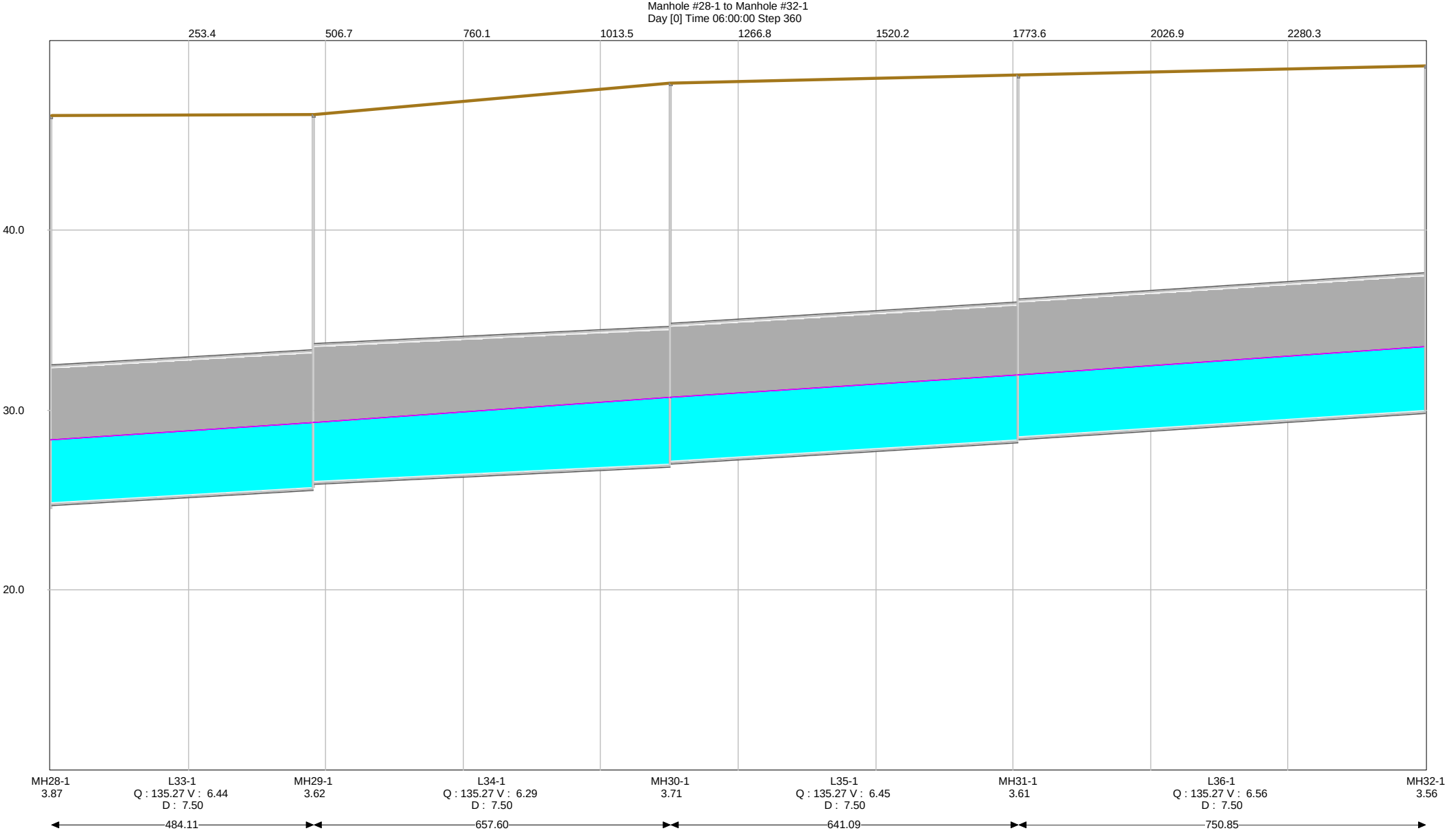
Manhole #16-1 to Manhole #20-1
Day [0] Time 06:00:00 Step 360



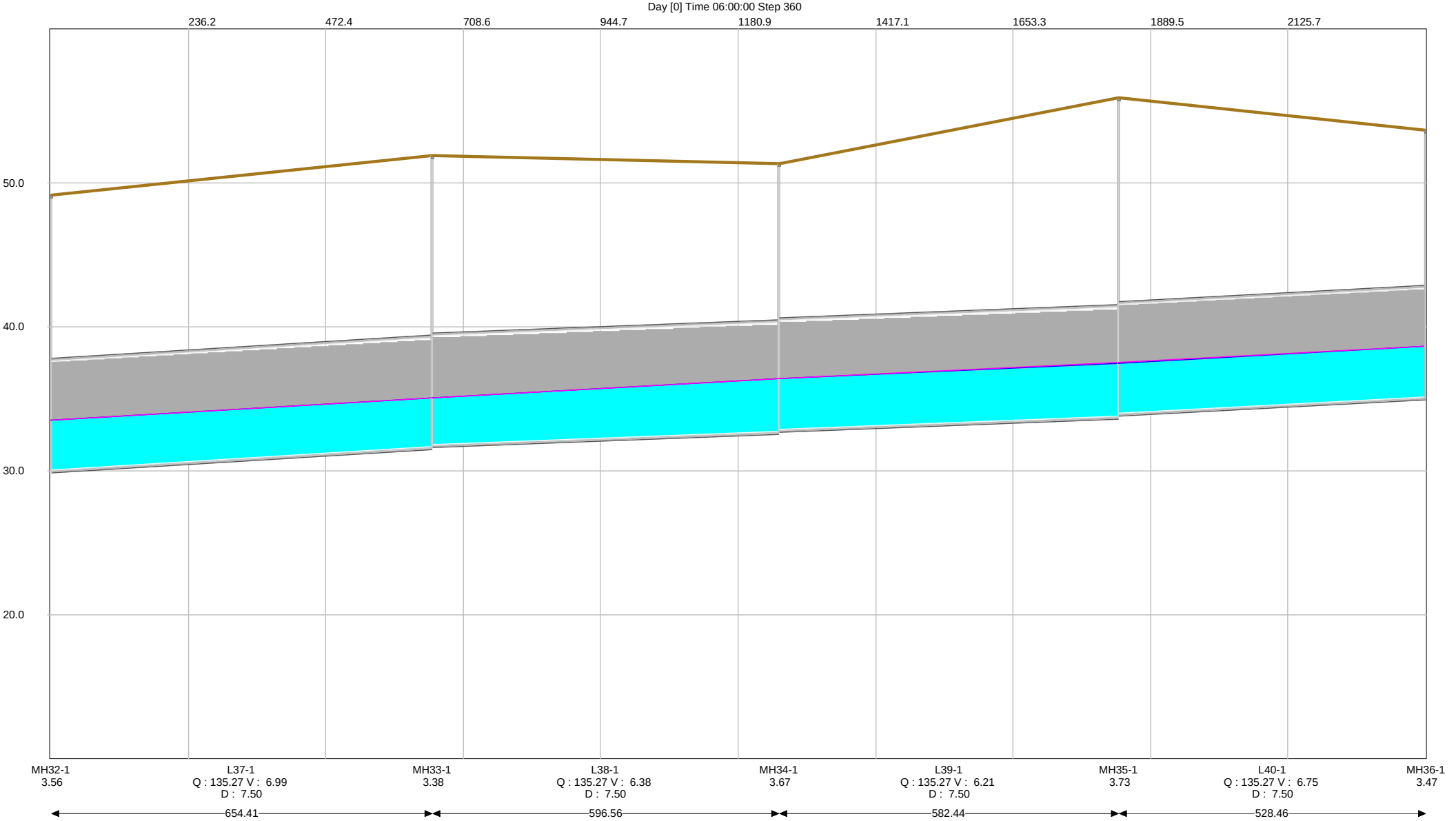

Manhole #20-1 to Manhole #24-1
Day [0] Time 06:00:00 Step 360
289.7
579.4
869.2
1158.9
1448.6
1738.3
2028.0
2317.7
2607.5
40.0
30.0
20.0
10.0
MH20-1
3.92
L25-1
Q : 142.24 V : 5.77
D : 8.00
751.59
MH21-1
3.97
L26-1
Q : 142.24 V : 5.55
D : 8.00
781.07
MH22-1
4.12
L27-1
Q : 142.24 V : 6.34
D : 7.50
628.47
MH23-1
3.81
L28-1
Q : 142.24 V : 6.02
D : 7.50
736.05
MH24-1
4.01

Manhole #24-1 to Manhole #28-1
Day [0] Time 06:00:00 Step 360

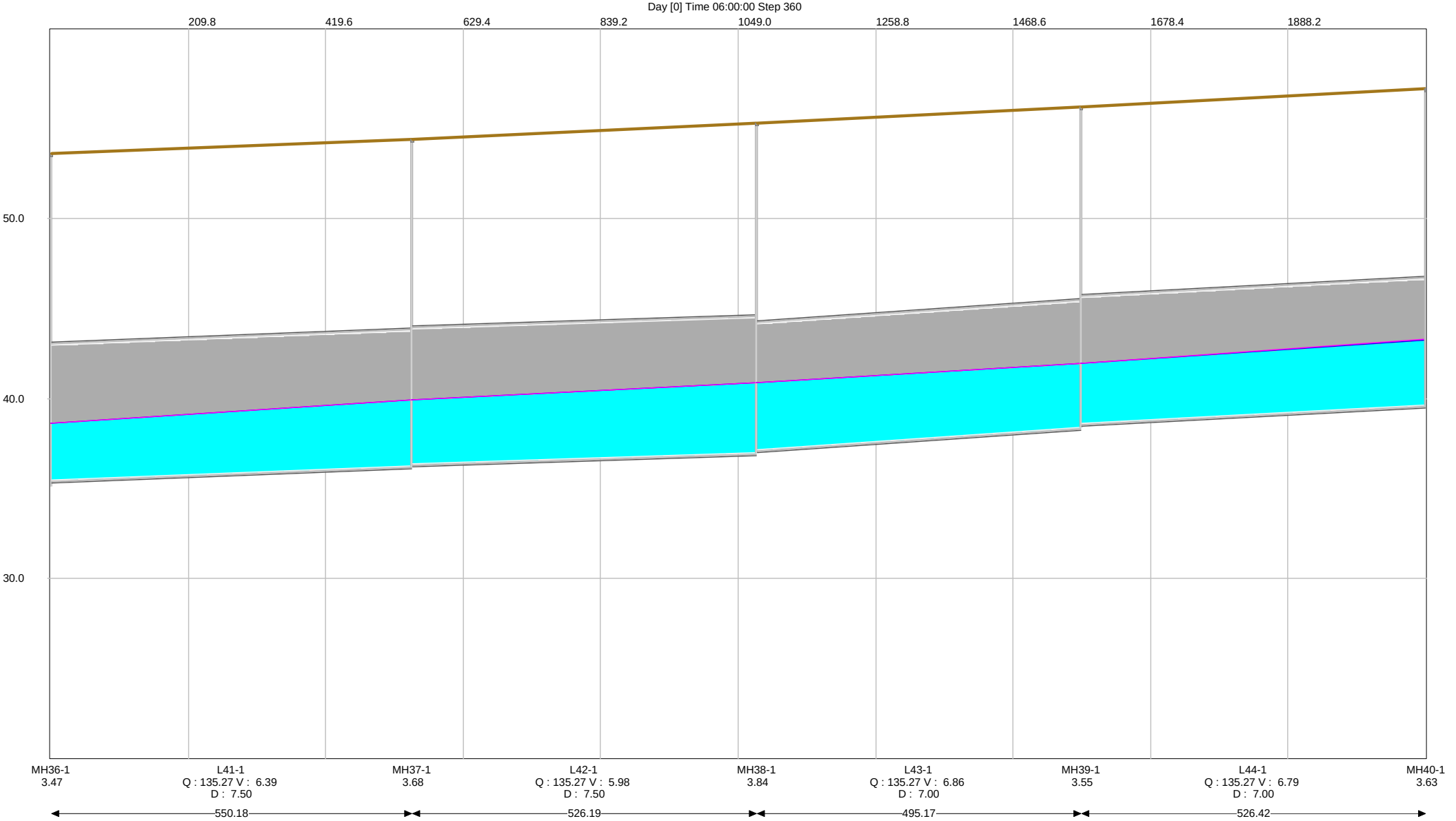



Manhole #28-1 to Manhole #32-1
Day [0] Time 06:00:00 Step 360
253.4
506.7
760.1
1013.5
1266.8
1520.2
1773.6
2026.9
2280.3
40.0
30.0
20.0
MH28-1
3.87
L33-1
Q : 135.27 V : 6.44
D : 7.50
MH29-1
3.62
L34-1
Q : 135.27 V : 6.29
D : 7.50
MH30-1
3.71
L35-1
Q : 135.27 V : 6.45
D : 7.50
MH31-1
3.61
L36-1
Q : 135.27 V : 6.56
D : 7.50
MH32-1
3.56
484.11
657.60
641.09
750.85

Manhole #32-1 to Manhole #36-1
Day [0] Time 06:00:00 Step 360



Manhole #36-1 to Manhole #40-1
Day [0] Time 06:00:00 Step 360



Max Depth and Max d/D

Name	Max d/D (depth/diameter)	Max Depth (ft, m)
L44-1	0.523	3.66
L43-1	0.528	3.70
L42-1	0.513	3.85
L41-1	0.491	3.68
L40-1	0.464	3.48
L39-1	0.498	3.73
L38-1	0.490	3.68
L37-1	0.462	3.47
L36-1	0.476	3.57
L35-1	0.481	3.61
L34-1	0.495	3.71
L33-1	0.482	3.62
L32-1	0.516	3.87
L31-1	0.524	3.93
L30-1	0.555	4.16
L29-1	0.554	4.16
L28-1	0.535	4.01
L27-1	0.507	3.81
L26-1	0.515	4.12
L25-1	0.497	3.97
L24-1	0.490	3.92
L23-1	0.484	3.87
L22-1	0.523	4.18
L21-1	0.524	4.20
L20-1	0.526	4.21
L19-1	0.516	4.13
L18-1	0.504	4.03
L17-1	0.469	3.75
L16-1	0.491	3.93
L15-1	0.504	4.03
L14-1	0.514	4.11
L13-1	0.508	4.06
L12-1	0.487	3.90
L11-1	0.491	3.93
L10-1	0.516	4.13
L9-1	0.482	3.85
L8-1	0.507	4.05
L7-1	0.522	4.18
L6-1	0.470	3.76
L5-1	0.390	3.12
L4-1	0.402	3.22
L3-1	0.411	3.29
L2-1	0.418	3.34
L1-1	0.262	2.10

Appendix J

- Alternate II Sewer Capacity Analysis

ALTERNATE SEWER ALIGNMENT 2

Legend

- Alternate Manholes Aligment
- Alternate Sewer Alignment
- Existing Manholes
- Existing Gravity Sewer
- Study Area
- Drainage Areas

DAVIS BOWEN & FRIEDEL, INC.

N
W E
S

1,500 750 0 1,500 Feet

DBF #1813A002A
PGM #VCI 06-1-082

Area 1
Area 2
Area 3
Area 4
Area 5
Area 6
Area 7
Area 8
Area 9
Area 10

MH-A
MH-1
MH2-2
MH5-2
MH-5
MH10-2
MH-10
MH15-2
MH-15
MH20-2
MH-20
MH25-2
MH-25
MH30-2
MH-30
MH35-2
MH-35
MH39-2
MH-40

LAUREL DR
OAKWOOD CIR
HENSON RD
HARGROVE PL
WAIKO PL
BILLINGSLEY RD
MOUNT ZERMYR FARM PL
RAY DR
FOXBURROW PL
BIRCHWOOD PL
FRIENDLY OAK PL
DIXON'S PL
BAKER ST
FORD DR
GREENWAY DR
BASIL CLARK PL
BARNETT SMITH PL
KANE DR
GREENHOW MARSHALL PL
MARBURY FREELAND PL
LIVINGSTON RD
JIMMY GREENS PL
MAGGIE PL
ASHLAND RD
CHRISTOPHER PL
JEANNETTE PL
HIKER BIKER TRL
POWHATTEN RD
GATHERING PL
PHILLIPS RD
BRIERWOOD RD
BUMPY OAK RD
HAWTHORNE RD
MAYFLOWER CT
VALLEY VIEW CT
HAWTHORNE CT

Mattawoman Interceptor
Improved Existing Sewer Line Summary[1]
Manholes #A through #40

Upstream Manhole	Downstream Manhole	Model Identifier	Pipe Size (in)	Length (ft)	Upstream Invert	Downstream Invert	Slope %[1]
40	39	L44	60	526.42	39.66	38.65	0.19%
39	38	L43	60	495.17	38.40	37.19	0.24%
38	37	L42	60	526.19	37.04	36.37	0.13%
37	36	L41	60	550.18	36.27	35.51	0.14%
36	35	L40	60	528.46	35.16	34.02	0.22%
35	34	L39	60	582.44	33.77	32.87	0.15%
34	33	L38	60	596.56	32.72	31.81	0.15%
33	32	L37	60	654.41	31.68	30.08	0.24%
32	31	L36	60	750.85	29.98	28.52	0.19%
31	30	L35	60	641.09	28.37	27.17	0.19%
30	29	L34	60	657.60	27.02	26.03	0.15%
29	28	L33	60	484.11	25.73	24.86	0.18%
28	27	L32	66	506.01	24.51	23.86	0.13%
27	26	L31	66	801.08	23.61	22.36	0.16%
26	25	L30	66	753.51	22.11	21.24	0.12%
25	24	L29	66	743.90	21.04	20.25	0.11%
24	23	L28	66	736.05	20.05	19.21	0.11%
23	22	L27	66	628.47	18.86	17.80	0.17%
22	21	L26	66	781.07	17.40	16.76	0.08%
21	20	L25	66	751.59	16.35	15.51	0.11%
20	19	L24	66	817.57	15.21	14.21	0.12%
19	18	L23	66	822.83	13.91	12.71	0.14%
18	17	L22	66	798.73	12.27	11.44	0.10%
17	16	L21	66	777.39	11.14	10.25	0.11%
16	15	L20	66	747.72	10.15	9.35	0.11%
15	14	L19	66	623.73	9.25	8.55	0.11%
14	13	L18	66	599.27	8.45	7.80	0.11%
13	12	L17	66	522.76	7.70	6.97	0.14%
12	11	L16	66	543.94	6.77	5.06	0.31%
11	10	L15	66	619.95	4.96	4.11	0.14%
10	9	L14	66	477.74	3.90	3.36	0.11%
9	8	L13	66	642.66	3.21	2.46	0.12%
8	7	L12	66	627.49	2.26	1.27	0.16%
7	6	L11	66	614.93	1.12	0.17	0.15%
6	5	L10	66	732.21	-0.13	-0.85	0.10%
5	4	L9	66	749.97	-1.10	-2.55	0.19%
4	3	L8	66	751.46	-2.75	-3.83	0.14%
3	2	L7	66	751.18	-3.98	-4.75	0.10%
2	1	L6	66	756.68	-4.90	-6.28	0.18%
1	F	L5	66	470.98	-7.05	-8.86	0.38%
F	E	L4	66	508.17	-8.96	-10.70	0.34%
E	D	L3	66	599.14	-10.80	-12.69	0.32%
D	C	L2	66	537.70	-12.79	-14.09	0.24%
C	A	L1	66	38.47	-14.09	-14.76	1.74%

(1) Existing negative slopes from Manhole 16 to Manhole 15 and Manhole 14 to Manhole 13 corrected.

Charles County
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PGM #VCI 06-1-082
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Mattawoman Interceptor

Improved Existing Sewer Capacity Analysis[1]
Per County Water & Sewer Ordiance
Manholes #A through #40

			Pipe Size			Full Pipe	Wetted	Hydraulic	Full Pipe	Full Pipe Flow				County Design Capacity d/D = .67[2] Velocity v/V=.94[3]		Pipe Flow q/Q=.67[3]		
Upstream Manhole	Downstream Manhole	Model Identifier	Size (in)	n Factor	Slope %[1]	Flow Area (ft2)	Perimeter (ft)	Radius	Velocity (fps)	(cfs)	(gpm)	(gpd)	(MGD)	(fps)	(cfs)	(gpm)	(gpd)	(MGD)
40	39	L44	60	0.015	0.19%	19.63	15.71	1.25	5.04	98.87	44,375	63,900,312	63.90	4.73	66.24	29,731	42,813,209	42.81
39	38	L43	60	0.015	0.24%	19.63	15.71	1.25	5.68	111.58	50,080	72,114,734	72.11	5.34	74.76	33,553	48,316,872	48.32
38	37	L42	60	0.015	0.13%	19.63	15.71	1.25	4.10	80.54	36,150	52,056,455	52.06	3.86	53.96	24,221	34,877,825	34.88
37	36	L41	60	0.015	0.14%	19.63	15.71	1.25	4.27	83.89	37,653	54,220,421	54.22	4.02	56.21	25,228	36,327,682	36.33
36	35	L40	60	0.015	0.22%	19.63	15.71	1.25	5.34	104.84	47,054	67,757,106	67.76	5.02	70.24	31,526	45,397,261	45.40
35	34	L39	60	0.015	0.15%	19.63	15.71	1.25	4.52	88.73	39,824	57,346,134	57.35	4.25	59.45	26,682	38,421,910	38.42
34	33	L38	60	0.015	0.15%	19.63	15.71	1.25	4.49	88.16	39,568	56,977,333	56.98	4.22	59.07	26,510	38,174,813	38.17
33	32	L37	60	0.015	0.24%	19.63	15.71	1.25	5.68	111.61	50,093	72,134,581	72.13	5.34	74.78	33,563	48,330,169	48.33
32	31	L36	60	0.015	0.19%	19.63	15.71	1.25	5.07	99.53	44,673	64,329,225	64.33	4.76	66.69	29,931	43,100,581	43.10
31	30	L35	60	0.015	0.19%	19.63	15.71	1.25	4.97	97.66	43,831	63,116,020	63.12	4.68	65.43	29,366	42,287,734	42.29
30	29	L34	60	0.015	0.15%	19.63	15.71	1.25	4.46	87.58	39,308	56,603,747	56.60	4.19	58.68	26,336	37,924,510	37.92
29	28	L33	60	0.015	0.18%	19.63	15.71	1.25	4.87	95.69	42,947	61,843,788	61.84	4.58	64.11	28,775	41,435,338	41.44
28	27	L32	66	0.015	0.13%	23.76	17.28	1.38	4.39	104.31	46,817	67,416,485	67.42	4.13	69.89	31,367	45,169,045	45.17
27	26	L31	66	0.015	0.16%	23.76	17.28	1.38	4.84	114.96	51,599	74,302,947	74.30	4.55	77.03	34,572	49,782,975	49.78
26	25	L30	66	0.015	0.12%	23.76	17.28	1.38	4.16	98.89	44,386	63,915,192	63.92	3.91	66.26	29,738	42,823,178	42.82
25	24	L29	66	0.015	0.11%	23.76	17.28	1.38	3.99	94.84	42,568	61,297,850	61.30	3.75	63.54	28,521	41,069,560	41.07
24	23	L28	66	0.015	0.11%	23.76	17.28	1.38	4.14	98.32	44,128	63,544,061	63.54	3.89	65.87	29,566	42,574,521	42.57
23	22	L27	66	0.015	0.17%	23.76	17.28	1.38	5.03	119.52	53,646	77,250,204	77.25	4.73	80.08	35,943	51,757,637	51.76
22	21	L26	66	0.015	0.08%	23.76	17.28	1.38	3.51	83.31	37,391	53,843,587	53.84	3.30	55.82	25,052	36,075,204	36.08
21	20	L25	66	0.015	0.11%	23.76	17.28	1.38	4.10	97.30	43,669	62,883,706	62.88	3.85	65.19	29,258	42,132,083	42.13
20	19	L24	66	0.015	0.12%	23.76	17.28	1.38	4.28	101.78	45,684	65,784,943	65.78	4.03	68.20	30,608	44,075,912	44.08
19	18	L23	66	0.015	0.14%	23.76	17.28	1.38	4.58	108.90	48,875	70,380,605	70.38	4.31	72.96	32,747	47,155,005	47.16
18	17	L22	66	0.015	0.10%	23.76	17.28	1.38	3.95	93.82	42,108	60,635,649	60.64	3.71	62.86	28,212	40,625,885	40.63
17	16	L21	66	0.015	0.11%	23.76	17.28	1.38	4.14	98.47	44,198	63,645,032	63.65	3.90	65.98	29,613	42,642,171	42.64
16	15	L20	66	0.015	0.11%	23.76	17.28	1.38	4.01	95.20	42,727	61,526,821	61.53	3.77	63.78	28,627	41,222,970	41.22
15	14	L19	66	0.015	0.11%	23.76	17.28	1.38	4.10	97.50	43,760	63,014,382	63.01	3.86	65.32	29,319	42,219,636	42.22
14	13	L18	66	0.015	0.11%	23.76	17.28	1.38	4.03	95.85	43,020	61,949,013	61.95	3.79	64.22	28,823	41,505,838	41.51
13	12	L17	66	0.015	0.14%	23.76	17.28	1.38	4.58	108.76	48,813	70,290,921	70.29	4.30	72.87	32,705	47,094,917	47.09
12	11	L16	66	0.015	0.31%	23.76	17.28	1.38	6.87	163.18	73,240	105,465,772	105.47	6.46	109.33	49,071	70,662,067	70.66
11	10	L15	66	0.015	0.14%	23.76	17.28	1.38	4.54	107.76	48,368	69,649,838	69.65	4.26	72.20	32,407	46,665,391	46.67
10	9	L14	66	0.015	0.11%	23.76	17.28	1.38	4.12	97.85	43,916	63,239,737	63.24	3.87	65.56	29,424	42,370,624	42.37
9	8	L13	66	0.015	0.12%	23.76	17.28	1.38	4.18	99.42	44,624	64,258,262	64.26	3.93	66.61	29,898	43,053,036	43.05
8	7	L12	66	0.015	0.16%	23.76	17.28	1.38	4.87	115.60	51,885	74,714,204	74.71	4.57	77.45	34,763	50,058,516	50.06
7	6	L11	66	0.015	0.15%	23.76	17.28	1.38	4.81	114.39	51,342	73,932,934	73.93	4.53	76.64	34,399	49,535,066	49.54
6	5	L10	66	0.015	0.10%	23.76	17.28	1.38	3.84	91.26	40,961	58,984,432	58.98	3.61	61.15	27,444	39,519,569	39.52
5	4	L9	66	0.015	0.19%	23.76	17.28	1.38	5.39	127.97	57,437	82,708,670	82.71	5.06	85.74	38,483	55,414,809	55.41
4	3	L8	66	0.015	0.14%	23.76	17.28	1.38	4.64	110.33	49,521	71,309,587	71.31	4.37	73.92	33,179	47,777,423	47.78
3	2	L7	66	0.015	0.10%	23.76	17.28	1.38	3.92	93.18	41,822	60,222,993	60.22	3.69	62.43	28,020	40,349,405	40.35
2	1	L6	66	0.015	0.18%	23.76	17.28	1.38	5.23	124.29	55,784	80,329,006	80.33	4.92	83.27	37,375	53,820,434	53.82
1	F	L5	66	0.015	0.38%	23.76	17.28	1.38	7.59	180.42	80,978	116,607,648	116.61	7.14	120.88	54,255	78,127,124	78.13
F	E	L4	66	0.015	0.34%	23.76	17.28	1.38	7.17	170.30	76,436	110,067,497	110.07	6.74	114.10	51,212	73,745,223	73.75
E	D	L3	66	0.015	0.32%	23.76	17.28	1.38	6.88	163.46	73,366	105,646,648	105.65	6.47	109.52	49,155	70,783,254	70.78
D	C	L2	66	0.015	0.24%	23.76	17.28	1.38	6.02	143.10	64,229	92,489,118	92.49	5.66	95.88	43,033	61,967,709	61.97
C	A	L1	66	0.015	1.74%	23.76	17.28	1.38	16.17	384.08	172,386	248,236,299	248.24	15.20	257.33	115,499	166,318,320	166.32

(1) Existing negative slopes corrected.
(2) Per County Water and Sewer Ordinance 8.2D(2)(a); maximum pipe flow of 2/3 full.
(3) Ratios per Charles County Water and Sewer Ordinance Appendix BB.

Charles County
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Mattawoman Interceptor Phase III Capacity Study
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Mattawoman Interceptor
Alternate II Paralell Sewer Line Summary
Manholes #A through #40

Upstream Manhole	Downstream Manhole	Model Identifier	Pipe Size (in)	Length (ft)[1]	Upstream Invert[1]	Downstream Invert[1]	Slope %[1]
40	39-2	L44-2	72	601.42	39.66	38.65	0.17%
39-2	38-2	L43-2	72	495.17	38.40	37.19	0.24%
38-2	37-2	L42-2	72	526.19	37.04	36.37	0.13%
37-2	36-2	L41-2	72	550.18	36.27	35.51	0.14%
36-2	35-2	L40-2	72	528.46	35.16	34.02	0.22%
35-2	34-2	L39-2	72	582.44	33.77	32.87	0.15%
34-2	33-2	L38-2	72	596.56	32.72	31.81	0.15%
33-2	32-2	L37-2	72	654.41	31.68	30.08	0.24%
32-2	31-2	L36-2	72	750.85	29.98	28.52	0.19%
31-2	30-2	L35-2	72	641.09	28.37	27.17	0.19%
30-2	29-2	L34-2	72	657.60	27.02	26.03	0.15%
29-2	28-2	L33-2	72	484.11	25.73	24.86	0.18%
28-2	27-2	L32-2	72	506.01	24.51	23.86	0.13%
27-2	26-2	L31-2	72	801.08	23.61	22.36	0.16%
26-2	25-2	L30-2	78	753.51	22.11	21.24	0.12%
25-2	24-2	L29-2	78	743.90	21.04	20.25	0.11%
24-2	23-2	L28-2	78	736.05	20.05	19.21	0.11%
23-2	22-2	L27-2	78	628.47	18.86	17.80	0.17%
22-2	21-2	L26-2	84	781.07	17.40	16.76	0.08%
21-2	20-2	L25-2	84	751.59	16.35	15.51	0.11%
20-2	19-2	L24-2	84	817.57	15.21	14.21	0.12%
19-2	18-2	L23-2	84	822.83	13.91	12.71	0.15%
18-2	17-2	L22-2	84	798.73	12.27	11.44	0.10%
17-2	16-2	L21-2	84	777.39	11.14	10.25	0.11%
16-2	15-2	L20-2	84	747.72	10.15	9.35	0.11%
15-2	14-2	L19-2	84	623.73	9.25	8.55	0.11%
14-2	13-2	L18-2	84	599.27	8.45	7.80	0.11%
13-2	12-2	L17-2	84	522.76	7.70	6.97	0.14%
12-2	11-2	L16-2	84	543.94	6.77	5.06	0.31%
11-2	10-2	L15-2	84	619.95	4.96	4.11	0.14%
10-2	9-2	L14-2	84	477.74	3.90	3.36	0.11%
9-2	8-2	L13-2	84	642.66	3.21	2.46	0.12%
8-2	7-2	L12-2	84	627.49	2.26	1.27	0.16%
7-2	6-2	L11-2	84	614.93	1.12	0.17	0.15%
6-2	5-2	L10-2	84	732.21	-0.13	-0.85	0.10%
5-2	4-2	L9-2	84	749.97	-1.10	-2.55	0.19%
4-2	3-2	L8-2	84	751.46	-2.75	-3.83	0.14%
3-2	2-2	L7-2	84	751.18	-3.98	-4.75	0.10%
2-2	1-2	L6-2	84	756.68	-4.90	-6.28	0.18%
1-2	F-2	L5-2	84	470.98	-7.05	-8.86	0.38%
F-2	E-2	L4-2	84	508.17	-8.96	-10.70	0.34%
E-2	D-2	L3-2	84	599.14	-10.80	-12.69	0.32%
D-2	C-2	L2-2	84	537.70	-12.79	-14.09	0.24%
C-2	A	L1-2	84	113.47	-14.09	-14.76	0.59%

(1) New parallel Interceptor based on exiting Interceptor and is only approximate; actual lengths, slopes, and inverts to be verified during design.

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Mattawoman Interceptor
Alternate II Sewer Capacity Analysis
Per County Water & Sewer Ordiance
Parallel Existing Interceptor with New Parallel Interceptor

			Pipe Size			Full Pipe	Wetted	Hydraulic	Full Pipe	Full Pipe Flow				**County Design Capacity d/D = .67[1]** Velocity		Pipe Flow			Existing Sewer Capacity
Upstream Manhole	Downstream Manhole	Model Identifier	Size (in)	n Factor	Slope %	Flow Area (ft2)	Perimeter (ft)	Radius	Velocity (fps)	(cfs)	(gpm)	(gpd)	(MGD)	v/V=.94[2] (fps)	(cfs)	q/Q=.67[2] (gpm)	(gpd)	(MGD)	Deficit (cfs)
40	39-2	L44-2	72	0.015	0.17%	28.27	18.85	1.50	5.32	150.41	67,510	97,214,317	97.21	5.00	100.78	45,232	65,133,592	65.13	69.03
39-2	38-2	L43-2	72	0.015	0.24%	28.27	18.85	1.50	6.42	181.44	81,435	117,266,509	117.27	6.03	121.56	54,562	78,568,561	78.57	60.51
38-2	37-2	L42-2	72	0.015	0.13%	28.27	18.85	1.50	4.63	130.97	58,784	84,649,536	84.65	4.35	87.75	39,386	56,715,189	56.72	81.31
37-2	36-2	L41-2	72	0.015	0.14%	28.27	18.85	1.50	4.82	136.42	61,228	88,168,382	88.17	4.54	91.40	41,023	59,072,816	59.07	79.06
36-2	35-2	L40-2	72	0.015	0.22%	28.27	18.85	1.50	6.03	170.47	76,514	110,180,526	110.18	5.67	114.22	51,265	73,820,952	73.82	65.03
35-2	34-2	L39-2	72	0.015	0.15%	28.27	18.85	1.50	5.10	144.28	64,758	93,251,136	93.25	4.80	96.67	43,388	62,478,261	62.48	75.82
34-2	33-2	L38-2	72	0.015	0.15%	28.27	18.85	1.50	5.07	143.35	64,341	92,651,426	92.65	4.77	96.05	43,109	62,076,455	62.08	76.20
33-2	32-2	L37-2	72	0.015	0.24%	28.27	18.85	1.50	6.42	181.49	81,457	117,298,782	117.30	6.03	121.60	54,577	78,590,184	78.59	60.49
32-2	31-2	L36-2	72	0.015	0.19%	28.27	18.85	1.50	5.72	161.85	72,643	104,606,413	104.61	5.38	108.44	48,671	70,086,297	70.09	68.58
31-2	30-2	L35-2	72	0.015	0.19%	28.27	18.85	1.50	5.62	158.80	71,273	102,633,608	102.63	5.28	106.39	47,753	68,764,517	68.76	69.84
30-2	29-2	L34-2	72	0.015	0.15%	28.27	18.85	1.50	5.04	142.41	63,919	92,043,934	92.04	4.73	95.42	42,826	61,669,435	61.67	76.59
29-2	28-2	L33-2	72	0.015	0.18%	28.27	18.85	1.50	5.50	155.60	69,837	100,564,819	100.56	5.17	104.25	46,791	67,378,428	67.38	71.16
28-2	27-2	L32-2	72	0.015	0.13%	28.27	18.85	1.50	4.65	131.55	59,044	85,022,839	85.02	4.37	88.14	39,559	56,965,302	56.97	65.38
27-2	26-2	L31-2	72	0.015	0.16%	28.27	18.85	1.50	5.13	144.99	65,075	93,707,756	93.71	4.82	97.14	43,600	62,784,196	62.78	65.21
26-2	25-2	L30-2	78	0.015	0.12%	33.18	20.42	1.63	4.65	154.39	69,296	99,786,673	99.79	4.37	103.44	46,429	66,857,071	66.86	75.98
25-2	24-2	L29-2	78	0.015	0.11%	33.18	20.42	1.63	4.46	148.07	66,459	95,700,386	95.70	4.19	99.21	44,527	64,119,259	64.12	78.70
24-2	23-2	L28-2	78	0.015	0.11%	33.18	20.42	1.63	4.63	153.50	68,894	99,207,250	99.21	4.35	102.84	46,159	66,468,857	66.47	76.37
23-2	22-2	L27-2	78	0.015	0.17%	33.18	20.42	1.63	5.62	186.61	83,754	120,605,769	120.61	5.29	125.03	56,115	80,805,865	80.81	62.16
22-2	21-2	L26-2	84	0.015	0.08%	38.48	21.99	1.75	4.12	158.48	71,132	102,430,255	102.43	3.87	106.18	47,659	68,628,271	68.63	86.42
21-2	20-2	L25-2	84	0.015	0.11%	38.48	21.99	1.75	4.81	185.09	83,075	119,627,877	119.63	4.52	124.01	55,660	80,150,677	80.15	77.05
20-2	19-2	L24-2	84	0.015	0.12%	38.48	21.99	1.75	5.03	193.63	86,908	125,147,095	125.15	4.73	129.73	58,228	83,848,554	83.85	74.04
19-2	18-2	L23-2	84	0.015	0.15%	38.48	21.99	1.75	5.49	211.43	94,898	136,652,887	136.65	5.16	141.66	63,582	91,557,434	91.56	72.60
18-2	17-2	L22-2	84	0.015	0.10%	38.48	21.99	1.75	4.64	178.48	80,105	115,351,247	115.35	4.36	119.58	53,670	77,285,336	77.29	85.77
17-2	16-2	L21-2	84	0.015	0.11%	38.48	21.99	1.75	4.87	187.33	84,081	121,076,198	121.08	4.58	125.51	56,334	81,121,053	81.12	82.65
16-2	15-2	L20-2	84	0.015	0.11%	38.48	21.99	1.75	4.71	181.10	81,282	117,046,584	117.05	4.42	121.34	54,459	78,421,211	78.42	84.85
15-2	14-2	L19-2	84	0.015	0.11%	38.48	21.99	1.75	4.82	185.48	83,248	119,876,471	119.88	4.53	124.27	55,776	80,317,236	80.32	47.78
14-2	13-2	L18-2	84	0.015	0.11%	38.48	21.99	1.75	4.74	182.34	81,840	117,849,748	117.85	4.45	122.17	54,833	78,959,331	78.96	85.66
13-2	12-2	L17-2	84	0.015	0.14%	38.48	21.99	1.75	5.38	206.89	92,860	133,719,118	133.72	5.05	138.62	62,217	89,591,809	89.59	77.01
12-2	11-2	L16-2	84	0.015	0.31%	38.48	21.99	1.75	8.07	310.43	139,330	200,634,588	200.63	7.58	207.99	93,351	134,425,174	134.43	44.01
11-2	10-2	L15-2	84	0.015	0.14%	38.48	21.99	1.75	5.33	205.01	92,014	132,499,542	132.50	5.01	137.36	61,649	88,774,693	88.77	81.14
10-2	9-2	L14-2	84	0.015	0.11%	38.48	21.99	1.75	4.84	186.14	83,545	120,305,179	120.31	4.55	124.71	55,975	80,604,470	80.60	87.78
9-2	8-2	L13-2	84	0.015	0.12%	38.48	21.99	1.75	4.91	189.14	84,891	122,242,787	122.24	4.62	126.72	56,877	81,902,668	81.90	86.73
8-2	7-2	L12-2	84	0.015	0.16%	38.48	21.99	1.75	5.71	219.91	98,704	142,133,824	142.13	5.37	147.34	66,132	95,229,662	95.23	76.29
7-2	6-2	L11-2	84	0.015	0.15%	38.48	21.99	1.75	5.65	217.61	97,672	140,647,562	140.65	5.32	145.80	65,440	94,233,867	94.23	77.10
6-2	5-2	L10-2	84	0.015	0.10%	38.48	21.99	1.75	4.51	173.62	77,924	112,210,027	112.21	4.24	116.32	52,209	75,180,718	75.18	92.59
5-2	4-2	L9-2	84	0.015	0.19%	38.48	21.99	1.75	6.33	243.45	109,265	157,342,231	157.34	5.95	163.11	73,208	105,419,295	105.42	68.00
4-2	3-2	L8-2	84	0.015	0.14%	38.48	21.99	1.75	5.45	209.89	94,206	135,656,994	135.66	5.13	140.63	63,118	90,890,186	90.89	79.82
3-2	2-2	L7-2	84	0.015	0.10%	38.48	21.99	1.75	4.61	177.26	79,560	114,566,225	114.57	4.33	118.76	53,305	76,759,370	76.76	94.82
2-2	1-2	L6-2	84	0.015	0.18%	38.48	21.99	1.75	6.14	236.44	106,122	152,815,238	152.82	5.78	158.42	71,102	102,386,210	102.39	73.98
1-2	F-2	L5-2	84	0.015	0.38%	38.48	21.99	1.75	8.92	343.22	154,049	221,830,522	221.83	8.38	229.96	103,213	148,626,450	148.63	36.37
F-2	E-2	L4-2	84	0.015	0.34%	38.48	21.99	1.75	8.42	323.97	145,409	209,388,758	209.39	7.91	217.06	97,424	140,290,468	140.29	43.15
E-2	D-2	L3-2	84	0.015	0.32%	38.48	21.99	1.75	8.08	310.96	139,569	200,978,681	200.98	7.60	208.34	93,511	134,655,716	134.66	47.73
D-2	C-2	L2-2	84	0.015	0.24%	38.48	21.99	1.75	7.07	272.23	122,186	175,948,231	175.95	6.65	182.40	81,865	117,885,315	117.89	61.37
C-2	A	L1-2	84	0.015	0.59%	38.48	21.99	1.75	11.05	425.44	190,949	274,966,712	274.97	10.39	285.04	127,936	184,227,697	184.23	-100.08

(1) Per County Water and Sewer Ordinance 8.2D(2)(a); maximum pipe flow of 2/3 full.
(2) Ratios per Charles County Water and Sewer Ordinance Appendix BB.

Charles County
Department of Planning & Growth Management
Mattawoman Interceptor Phase III Capacity Study
PGM #VCI 06-1-082
DBF #1813A002A
Final Report

Mattawoman Interceptor
Alternate II Sewer Capacity Peak Flow Analysis
Per County Water & Sewer Ordiance
Parallel Existing Interceptor with New Parallel Interceptor

Upstream Manhole	Downstream Manhole	Model Identifier	Incremental Peak Sewer Inflow (cfs)	Incremental Peak Sewer Inflow Source	Cummulative Peak Sewer Flow (cfs)	Sewer Capacity (cfs)	Adequate to Convey Peak Flow YES/NO	Additional Capaciy Provided (cfs)
40	39	L44	130.90	Upstream of MH 40[1]				
			1.27	Drainage Area 5				
			1.96	Drainage Area 6				
			1.14	Drainage Area 7	48.64 [2]	66.24	YES	17.61
39	38	L43	0.00		48.64	74.76	YES	26.12
38	37	L42	0.00		48.64	53.96	YES	5.33
37	36	L41	0.00		48.64	56.21	YES	7.57
36	35	L40	0.00		48.64	70.24	YES	21.61
35	34	L39	0.00		48.64	59.45	YES	10.81
34	33	L38	0.00		48.64	59.07	YES	10.43
33	32	L37	0.00		48.64	74.78	YES	26.14
32	31	L36	0.00		48.64	66.69	YES	18.05
31	30	L35	0.00		48.64	65.43	YES	16.79
30	29	L34	0.00		48.64	58.68	YES	10.04
29	28	L33	0.00		48.64	64.11	YES	15.48
28	27	L32	0.00		48.64	69.89	YES	21.25
27	26	L31	4.28	Drainage Area 4	52.92	77.03	YES	24.11
26	25	L30	0.00		52.92	66.26	YES	13.34
25	24	L29	0.00		52.92	63.54	YES	10.63
24	23	L28	0.00		52.92	65.87	YES	12.96
23	22	L27	0.00		52.92	80.08	YES	27.17
22	21	L26	0.00		52.92	55.82	YES	2.90
21	20	L25	0.00		52.92	65.19	YES	12.27
20	19	L24	0.00		52.92	68.20	YES	15.28
19	18	L23	0.00		52.92	72.96	YES	20.04
18	17	L22	3.07	Drainage Area 3	55.99	62.86	YES	6.87
17	16	L21	0.00		55.99	65.98	YES	9.99
16	15	L20	0.00		55.99	63.78	YES	7.80
15	14	L19	1.25	CSM PS	57.24	65.32	YES	8.09
14	13	L18	0.00		57.24	64.22	YES	6.98
13	12	L17	0.00		57.24	72.87	YES	15.63
12	11	L16	3.46	Drainage Area 2	60.70	109.33	YES	48.64
11	10	L15	0.00		60.70	72.20	YES	11.51
10	9	L14	0.00		60.70	65.56	YES	4.86
9	8	L13	0.00		60.70	66.61	YES	5.92
8	7	L12	0.40	Drainage Area 1	61.10	77.45	YES	16.36
7	6	L11	0.00		61.10	76.64	YES	15.55
6	5	L10	0.00		61.10	61.15	YES	0.05
5	4	L9	0.00		61.10	85.74	YES	24.64
4	3	L8	0.00		61.10	73.92	YES	12.83
3	2	L7	0.00		61.10	62.43	YES	1.33
2	1	L6	0.00		61.10	83.27	YES	22.18
1	F	L5	0.00		61.10	120.88	YES	59.79
F	E	L4	0.00		61.10	114.10	YES	53.01
E	D	L3	0.00		61.10	109.52	YES	48.42
D	C	L2	0.00		61.10	95.88	YES	34.78
C	A	L1	0.00		61.10	257.33	YES	196.24

Upstream Manhole	Downstream Manhole	Model Identifier	Incremental Peak Sewer Inflow (cfs)	Incremental Peak Sewer Inflow Source	Cummulative Peak Sewer Flow (cfs)	Sewer Capaciy (cfs)	Adequate to Convey Peak Flow YES/NO	Additional Capaciy Provided (cfs)
40	39-2	L44-2	130.90	Upstream of MH 40[1]				
			1.27	Drainage Area 5				
			1.96	Drainage Area 6				
			1.14	Drainage Area 7	86.64 [2]	100.78	YES	14.14
39-2	38-2	L43-2	0.00		86.64	121.56	YES	34.93
38-2	37-2	L42-2	0.00		86.64	87.75	YES	1.12
37-2	36-2	L41-2	0.00		86.64	91.40	YES	4.76
36-2	35-2	L40-2	0.00		86.64	114.22	YES	27.58
35-2	34-2	L39-2	0.00		86.64	96.67	YES	10.03
34-2	33-2	L38-2	0.00		86.64	96.05	YES	9.41
33-2	32-2	L37-2	0.00		86.64	121.60	YES	34.96
32-2	31-2	L36-2	0.00		86.64	108.44	YES	21.80
31-2	30-2	L35-2	0.00		86.64	106.39	YES	19.76
30-2	29-2	L34-2	0.00		86.64	95.42	YES	8.78
29-2	28-2	L33-2	0.00		86.64	104.25	YES	17.62
28-2	27-2	L32-2	0.00		86.64	88.14	YES	1.50
27-2	26-2	L31-2	2.69	Drainage Area 8	89.33	97.14	YES	7.82
26-2	25-2	L30-2	0.00		89.33	103.44	YES	14.12
25-2	24-2	L29-2	0.00		89.33	99.21	YES	9.88
24-2	23-2	L28-2	0.00		89.33	102.84	YES	13.52
23-2	22-2	L27-2	0.00		89.33	125.03	YES	35.70
22-2	21-2	L26-2	0.00		89.33	106.18	YES	16.86
21-2	20-2	L25-2	0.00		89.33	124.01	YES	34.69
20-2	19-2	L24-2	0.00		89.33	129.73	YES	40.41
19-2	18-2	L23-2	3.32	Drainage Area 9	92.65	141.66	YES	49.02
18-2	17-2	L22-2	0.00		92.65	119.58	YES	26.93
17-2	16-2	L21-2	0.00		92.65	125.51	YES	32.87
16-2	15-2	L20-2	0.00		92.65	121.34	YES	28.69
15-2	14-2	L19-2	0.00		92.65	124.27	YES	31.62
14-2	13-2	L18-2	0.00		92.65	122.17	YES	29.52
13-2	12-2	L17-2	0.00		92.65	138.62	YES	45.97
12-2	11-2	L16-2	0.00		92.65	207.99	YES	115.34
11-2	10-2	L15-2	0.00		92.65	137.36	YES	44.71
10-2	9-2	L14-2	0.00		92.65	124.71	YES	32.07
9-2	8-2	L13-2	0.00		92.65	126.72	YES	34.08
8-2	7-2	L12-2	0.00		92.65	147.34	YES	54.70
7-2	6-2	L11-2	0.00		92.65	145.80	YES	53.16
6-2	5-2	L10-2	0.00		92.65	116.32	YES	23.68
5-2	4-2	L9-2	0.00		92.65	163.11	YES	70.46
4-2	3-2	L8-2	0.00		92.65	140.63	YES	47.98
3-2	2-2	L7-2	3.51	Drainage Area 10	96.16	118.76	YES	22.61
2-2	1-2	L6-2	0.00		96.16	158.42	YES	62.26
1-2	F-2	L5-2	0.00		96.16	229.96	YES	133.80
F-2	E-2	L4-2	0.00		96.16	217.06	YES	120.91
E-2	D-2	L3-2	0.00		96.16	208.34	YES	112.19
D-2	C-2	L2-2	0.00		96.16	182.40	YES	86.24
C-2	A	L1-2	0.00		96.16	285.04	YES	188.89

(1) Peak sewer flow of 130.9 cfs per previous study will enter Manhole #40, see Appendix B.
(2) Replacement of Manhole #40 with new vault and flow diversion structure in order to split flow exiting Manhole #40. Flow diversion structured shall be designed such that the intial 19 cfs will be diverted to the new parallel Interceptor in order to eliminate bottleneck capacity between Manholes #6 and #5.

Appendix K

- Alternate II Model Results

Charles County
Department of Planning & Growth Management
Mattawoman Interceptor Phase III Capacity Study
PGM #VCI 06-1-082
DBF #1813A002A
Final Report

Mattawoman Interceptor
XPSWMM Alternate II Model Results
Per County Water & Sewer Ordiance Maximum d/D = 0.67
Parallel Existing Interceptor with New Parallel Interceptor

Model Identifier	Upstream Manhole	Downstream Manhole	Pipe Size (in)	n Factor	Slope %	Incremental Peak Sewer Inflow (cfs)	Incremental Peak Sewer Inlow Source	Cummulative Peak Sewer Inflow (cfs)		Full Pipe Flow (cfs)	Maximum Pipe Flow (cfs)[2]	Design Depth (ft)	Maximum Depth	Maximum d/D	Meets County Ordinance[3]
L44	40	39	60	0.015	0.19%	130.90	Upstream of MH 40[1]	48.64		98.87	63.65	3.35	2.85	0.57	YES
						1.27	Drainage Area 5								
						1.96	Drainage Area 6								
						1.14	Drainage Area 7								
L43	39	38	60	0.015	0.24%	0.00		48.64		111.58	63.65	3.35	3.00	0.60	YES
L42	38	37	60	0.015	0.13%	0.00		48.64		80.54	63.65	3.35	3.15	0.63	YES
L41	37	36	60	0.015	0.14%	0.00		48.64		83.89	63.65	3.35	3.01	0.60	YES
L40	36	35	60	0.015	0.22%	0.00		48.64		104.84	63.65	3.35	2.81	0.56	YES
L39	35	34	60	0.015	0.15%	0.00		48.64		88.73	63.65	3.35	3.05	0.61	YES
L38	34	33	60	0.015	0.15%	0.00		48.64		88.16	63.65	3.35	3.00	0.60	YES
L37	33	32	60	0.015	0.24%	0.00		48.64		111.61	63.65	3.35	2.80	0.56	YES
L36	32	31	60	0.015	0.19%	0.00		48.64		99.53	63.65	3.35	2.90	0.58	YES
L35	31	30	60	0.015	0.19%	0.00		48.64		97.66	63.65	3.35	2.93	0.59	YES
L34	30	29	60	0.015	0.15%	0.00		48.64		87.58	63.65	3.35	3.02	0.61	YES
L33	29	28	60	0.015	0.18%	0.00		48.64		95.69	63.65	3.35	2.89	0.58	YES
L32	28	27	66	0.015	0.13%	0.00		48.64		104.31	63.65	3.69	2.98	0.54	YES
L31	27	26	66	0.015	0.16%	4.28	Drainage Area 4	52.92		114.96	67.93	3.69	3.03	0.55	YES
L30	26	25	66	0.015	0.12%	0.00		52.92		98.89	67.93	3.69	3.24	0.59	YES
L29	25	24	66	0.015	0.11%	0.00		52.92		94.84	67.93	3.69	3.25	0.59	YES
L28	24	23	66	0.015	0.11%	0.00		52.92		98.32	67.93	3.69	3.14	0.57	YES
L27	23	22	66	0.015	0.17%	0.00		52.92		119.52	67.93	3.69	2.96	0.54	YES
L26	22	21	66	0.015	0.08%	0.00		52.92		83.31	67.93	3.69	3.34	0.61	YES
L25	21	20	66	0.015	0.11%	0.00		52.92		97.30	67.93	3.69	3.21	0.58	YES
L24	20	19	66	0.015	0.12%	0.00		52.92		101.78	67.93	3.69	3.16	0.57	YES
L23	19	18	66	0.015	0.14%	0.00		52.92		111.14	67.93	3.69	3.08	0.56	YES
L22	18	17	66	0.015	0.10%	3.07	Drainage Area 3	55.99		93.82	71.00	3.69	3.39	0.62	YES
L21	17	16	66	0.015	0.11%	0.00		55.99		98.47	71.00	3.69	3.41	0.62	YES
L20	16	15	66	0.015	0.11%	0.00		55.99		95.20	71.00	3.69	3.42	0.62	YES
L19	15	14	66	0.015	0.11%	1.25	CSM PS	57.24		97.50	72.25	3.69	3.37	0.61	YES
L18	14	13	66	0.015	0.11%	0.00		57.24		95.85	72.25	3.69	3.29	0.60	YES
L17	13	12	66	0.015	0.14%	0.00		57.24		108.76	72.25	3.69	3.05	0.56	YES
L16	12	11	66	0.015	0.31%	3.46	Drainage Area 2	60.70		163.18	75.71	3.69	3.22	0.59	YES
L15	11	10	66	0.015	0.14%	0.00		60.70		107.76	75.71	3.69	3.32	0.60	YES
L14	10	9	66	0.015	0.11%	0.00		60.70		97.85	75.71	3.69	3.40	0.62	YES
L13	9	8	66	0.015	0.12%	0.00		60.70		99.42	75.71	3.69	3.35	0.61	YES
L12	8	7	66	0.015	0.16%	0.40	Drainage Area 1	61.10		115.60	76.11	3.69	3.21	0.58	YES
L11	7	6	66	0.015	0.15%	0.00		61.10		114.39	76.11	3.69	3.23	0.59	YES
L10	6	5	66	0.015	0.10%	0.00		61.10		91.26	76.11	3.69	3.42	0.62	YES
L9	5	4	66	0.015	0.19%	0.00		61.10		127.97	76.11	3.69	3.14	0.57	YES
L8	4	3	66	0.015	0.14%	0.00		61.10		110.33	76.11	3.69	3.34	0.61	YES
L7	3	2	66	0.015	0.10%	0.00		61.10		93.18	76.11	3.69	3.43	0.62	YES
L6	2	1	66	0.015	0.18%	0.00		61.10		124.29	76.11	3.69	3.06	0.56	YES
L5	1	F	66	0.015	0.38%	0.00		61.10		180.42	76.11	3.69	2.50	0.45	YES
L4	F	E	66	0.015	0.34%	0.00		61.10		170.30	76.11	3.69	2.58	0.47	YES
L3	E	D	66	0.015	0.32%	0.00		61.10		163.46	76.11	3.69	2.71	0.49	YES
L2	D	C	66	0.015	0.24%	0.00		61.10		143.10	76.11	3.69	2.81	0.51	YES
L1	C	A	66	0.015	1.74%	0.00		61.10		384.08	76.11	3.69	1.66	0.30	YES

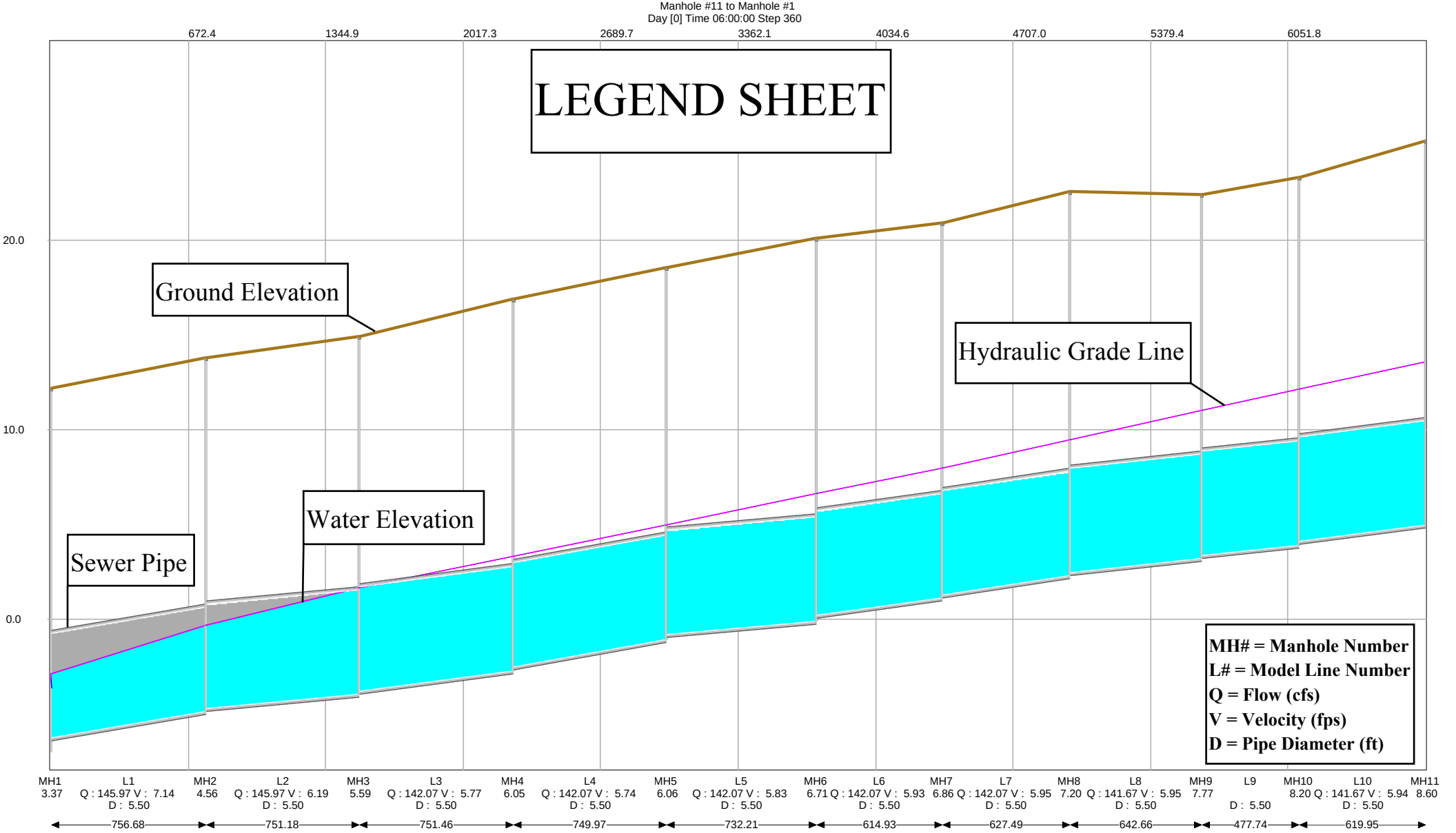
(1) Peak sewer flow of 130.9 cfs per previous study will enter Manhole #40, see Appendix A.
(2) Maximum Pipe Flow differs from Cummulative Peak Sewer Inflow due to model assuming equal split flow exiting MH40.
(3) Per County Water and Sewer Ordinance 8.2D(2)(a); maximum pipe flow of 2/3 full.

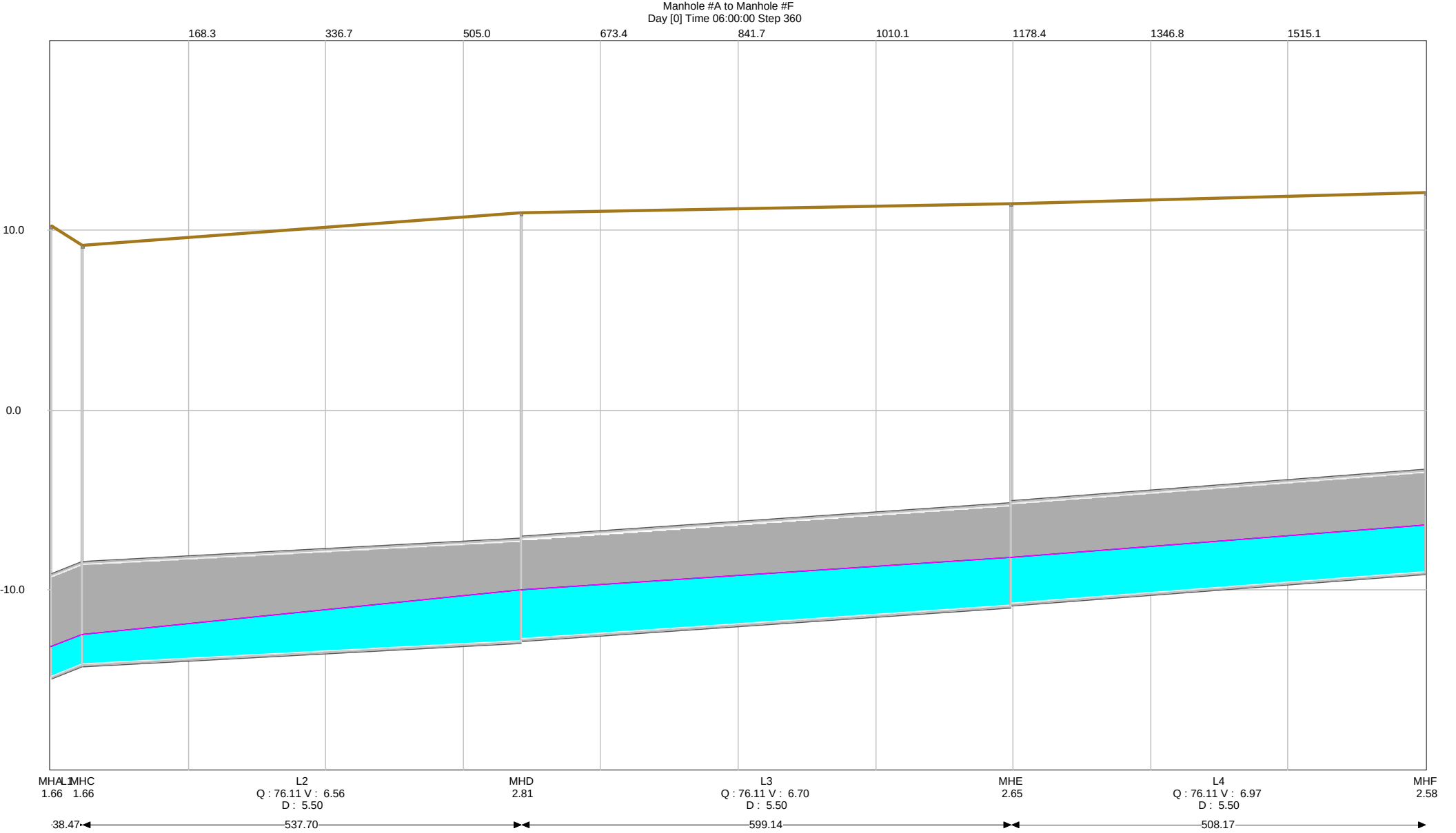
Charles County
Department of Planning & Growth Management
Mattawoman Interceptor Phase III Capacity Study
PGM #VCI 06-1-082
DBF #1813A002A
Final Report

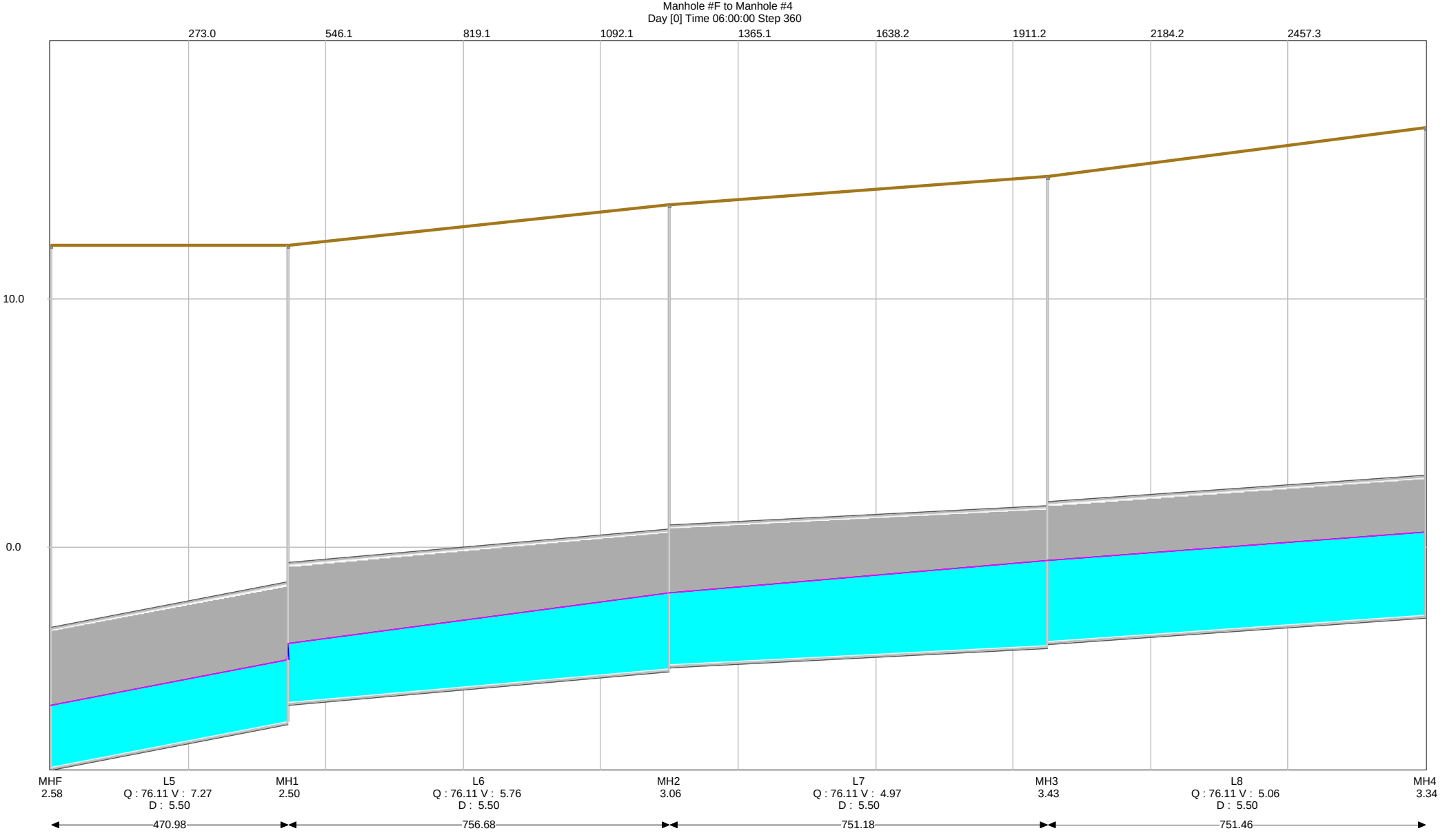
Mattawoman Interceptor
XPSWMM Alternate II Model Results
Per County Water & Sewer Ordiance Maximum d/D = 0.67
Parallel Existing Interceptor with New Parallel Interceptor

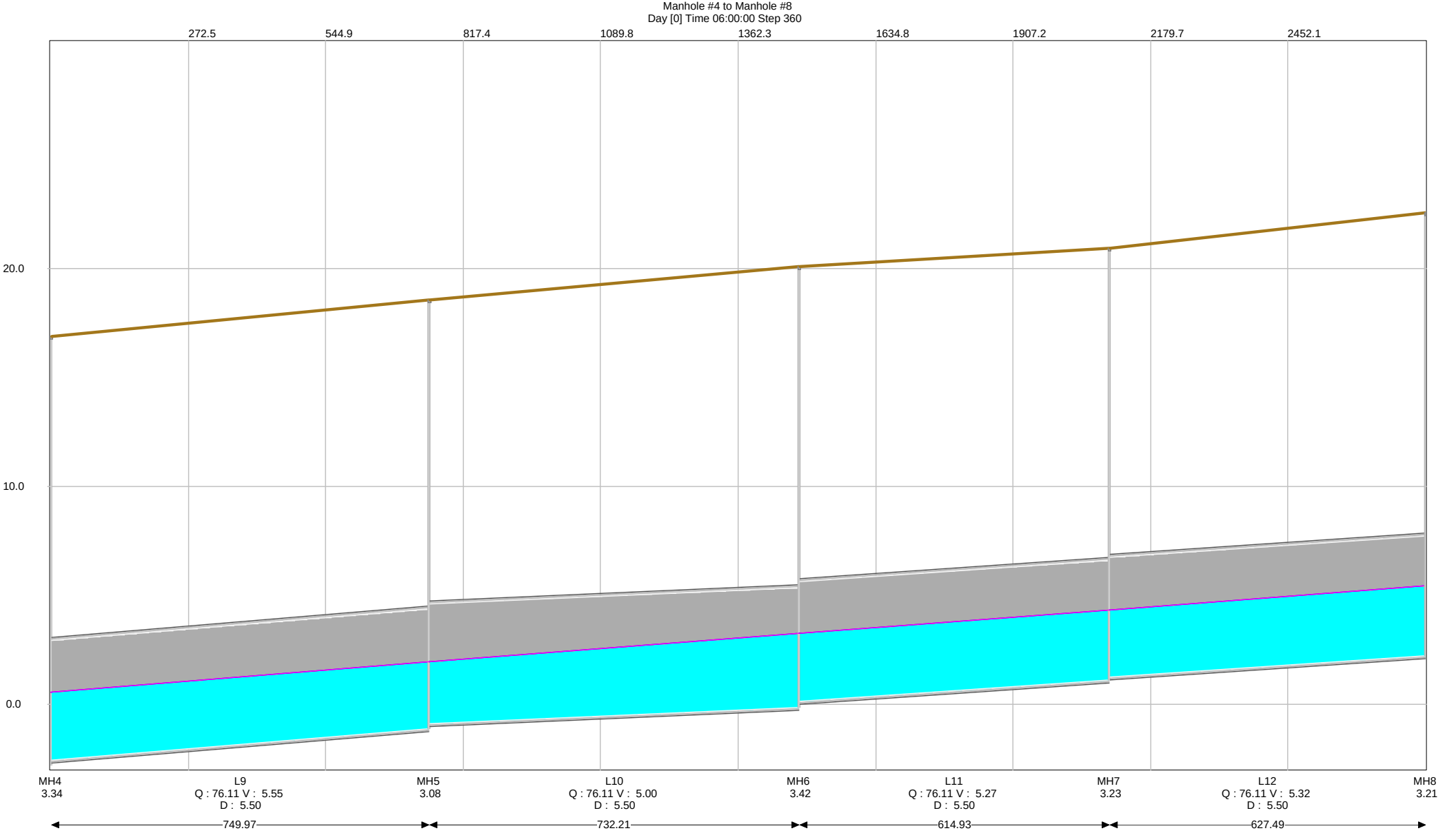
Model Identifier	Upstream Manhole	Downstream Manhole	Pipe Size Size (in)	n Factor	Slope %	Incremental Peak Sewer Inflow (cfs)	Incremental Peak Sewer Inlow Source	Cummulative Peak Sewer Inflow (cfs)		Full Pipe Flow (cfs)	Maximum Pipe Flow (cfs)[2]	Design Depth (ft)	Maximum Depth	Maximum d/D	Meets County Ordinance[3]
L44-2	40	39-2	72	0.015	0.17%	130.90	Upstream of MH 40[1]	86.64		150.41	71.62	4.02	2.85	0.48	YES
						1.27	Drainage Area 5								
						1.96	Drainage Area 6								
						1.14	Drainage Area 7								
L43-2	39-2	38-2	72	0.015	0.24%	0.00		86.64		181.44	71.62	4.02	2.89	0.48	YES
L42-2	38-2	37-2	72	0.015	0.13%	0.00		86.64		130.97	71.62	4.02	3.04	0.51	YES
L41-2	37-2	36-2	72	0.015	0.14%	0.00		86.64		136.42	71.62	4.02	2.91	0.49	YES
L40-2	36-2	35-2	72	0.015	0.22%	0.00		86.64		170.47	71.62	4.02	2.71	0.45	YES
L39-2	35-2	34-2	72	0.015	0.15%	0.00		86.64		144.28	71.62	4.02	2.93	0.49	YES
L38-2	34-2	33-2	72	0.015	0.15%	0.00		86.64		143.35	71.62	4.02	2.90	0.48	YES
L37-2	33-2	32-2	72	0.015	0.24%	0.00		86.64		181.49	71.62	4.02	2.69	0.45	YES
L36-2	32-2	31-2	72	0.015	0.19%	0.00		86.64		161.85	71.62	4.02	2.79	0.47	YES
L35-2	31-2	30-2	72	0.015	0.19%	0.00		86.64		158.80	71.62	4.02	2.82	0.47	YES
L34-2	30-2	29-2	72	0.015	0.15%	0.00		86.64		142.41	71.62	4.02	2.93	0.49	YES
L33-2	29-2	28-2	72	0.015	0.18%	0.00		86.64		155.60	71.62	4.02	2.82	0.47	YES
L32-2	28-2	27-2	72	0.015	0.13%	0.00		86.64		131.55	71.62	4.02	3.01	0.50	YES
L31-2	27-2	26-2	72	0.015	0.16%	2.69	Drainage Area 8	89.33		144.99	74.31	4.02	3.02	0.50	YES
L30-2	26-2	25-2	78	0.015	0.12%	0.00		89.33		154.39	74.31	4.36	3.11	0.48	YES
L29-2	25-2	24-2	78	0.015	0.11%	0.00		89.33		148.07	74.31	4.36	3.12	0.48	YES
L28-2	24-2	23-2	78	0.015	0.11%	0.00		89.33		153.50	74.31	4.36	3.03	0.47	YES
L27-2	23-2	22-2	78	0.015	0.17%	0.00		89.33		186.61	74.31	4.36	2.83	0.44	YES
L26-2	22-2	21-2	84	0.015	0.08%	0.00		89.33		158.48	74.31	4.69	3.10	0.44	YES
L25-2	21-2	20-2	84	0.015	0.11%	0.00		89.33		185.09	74.31	4.69	2.98	0.43	YES
L24-2	20-2	19-2	84	0.015	0.12%	0.00		89.33		193.63	74.31	4.69	2.94	0.42	YES
L23-2	19-2	18-2	84	0.015	0.15%	3.32	Drainage Area 9	92.65		211.43	77.63	4.69	2.91	0.42	YES
L22-2	18-2	17-2	84	0.015	0.10%	0.00		92.65		178.48	77.63	4.69	3.11	0.45	YES
L21-2	17-2	16-2	84	0.015	0.11%	0.00		92.65		187.33	77.63	4.69	3.11	0.44	YES
L20-2	16-2	15-2	84	0.015	0.11%	0.00		92.65		181.10	77.63	4.69	3.13	0.45	YES
L19-2	15-2	14-2	84	0.015	0.11%	0.00		92.65		185.48	77.63	4.69	3.08	0.44	YES
L18-2	14-2	13-2	84	0.015	0.11%	0.00		92.65		182.34	77.63	4.69	3.03	0.43	YES
L17-2	13-2	12-2	84	0.015	0.14%	0.00		92.65		206.89	77.63	4.69	2.82	0.40	YES
L16-2	12-2	11-2	84	0.015	0.31%	0.00		92.65		310.43	77.63	4.69	2.84	0.41	YES
L15-2	11-2	10-2	84	0.015	0.14%	0.00		92.65		205.01	77.63	4.69	2.94	0.42	YES
L14-2	10-2	9-2	84	0.015	0.11%	0.00		92.65		186.14	77.63	4.69	3.02	0.43	YES
L13-2	9-2	8-2	84	0.015	0.12%	0.00		92.65		189.14	77.63	4.69	2.99	0.43	YES
L12-2	8-2	7-2	84	0.015	0.16%	0.00		92.65		219.91	77.63	4.69	2.85	0.41	YES
L11-2	7-2	6-2	84	0.015	0.15%	0.00		92.65		217.61	77.63	4.69	2.86	0.41	YES
L10-2	6-2	5-2	84	0.015	0.10%	0.00		92.65		173.62	77.63	4.69	3.06	0.44	YES
L9-2	5-2	4-2	84	0.015	0.19%	0.00		92.65		243.45	77.63	4.69	2.76	0.40	YES
L8-2	4-2	3-2	84	0.015	0.14%	0.00		92.65		209.89	77.63	4.69	2.99	0.43	YES
L7-2	3-2	2-2	84	0.015	0.10%	3.51	Drainage Area 10	96.16		177.26	81.14	4.69	3.14	0.45	YES
L6-2	2-2	1-2	84	0.015	0.18%	0.00		96.16		236.44	81.14	4.69	2.83	0.40	YES
L5-2	1-2	F-2	84	0.015	0.38%	0.00		96.16		343.22	81.14	4.69	2.32	0.33	YES
L4-2	F-2	E-2	84	0.015	0.34%	0.00		96.16		323.97	81.14	4.69	2.39	0.34	YES
L3-2	E-2	D-2	84	0.015	0.32%	0.00		96.16		310.96	81.14	4.69	2.53	0.36	YES
L2-2	D-2	C-2	84	0.015	0.24%	0.00		96.16		272.23	81.14	4.69	2.63	0.38	YES
L1-2	C-2	A	84	0.015	0.59%	0.00		96.16		425.44	81.14	4.69	1.98	0.28	YES

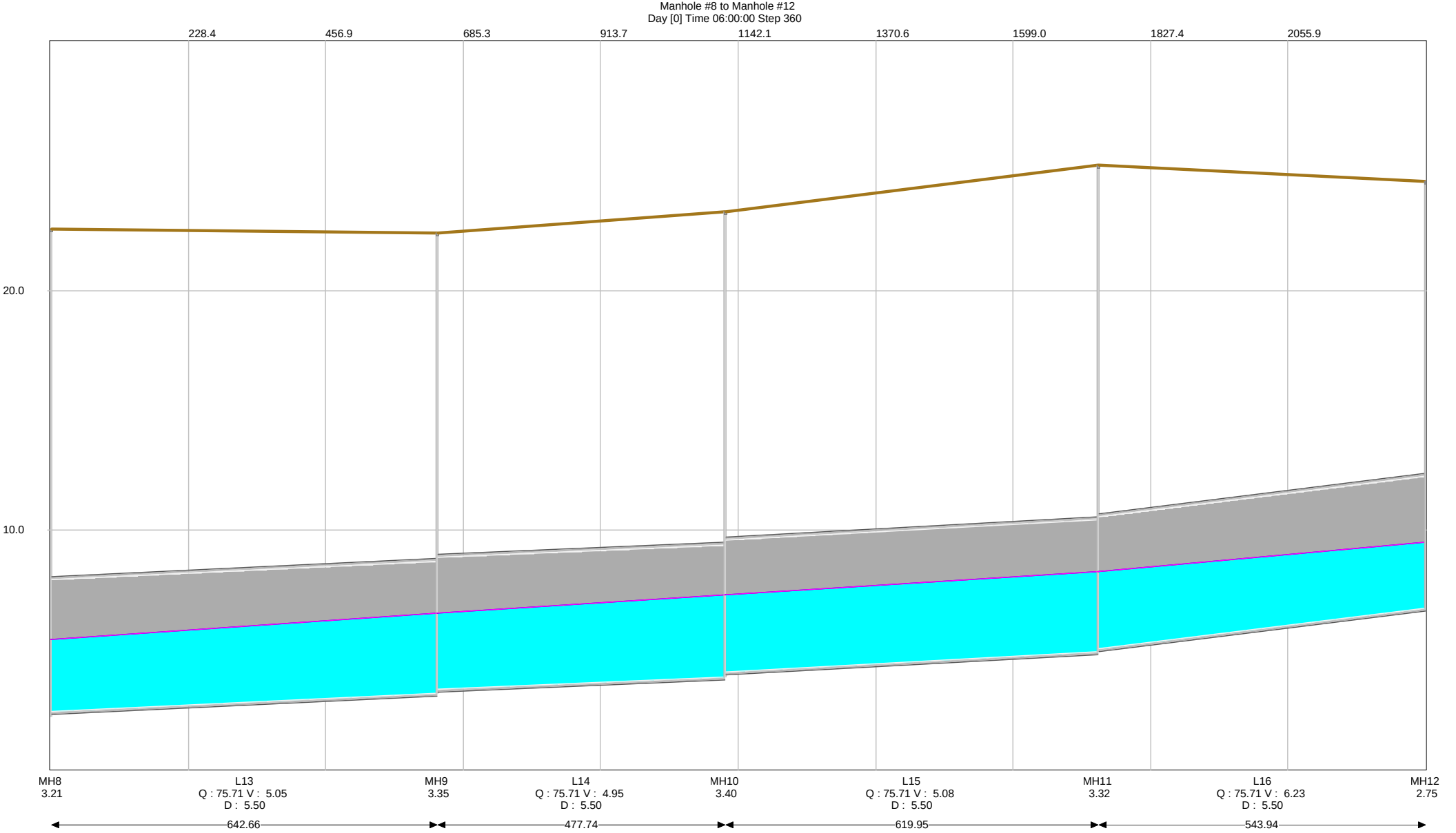
(1) Peak sewer flow of 130.9 cfs per previous study will enter Manhole #40, see Appendix B.
(2) Maximum Pipe Flow differs from Cummulative Peak Sewer Inflow due to model assuming equal split flow exiting Manhole #40.
(3) Per County Water and Sewer Ordinance 8.2D(2)(a); maximum pipe flow of 2/3 full.

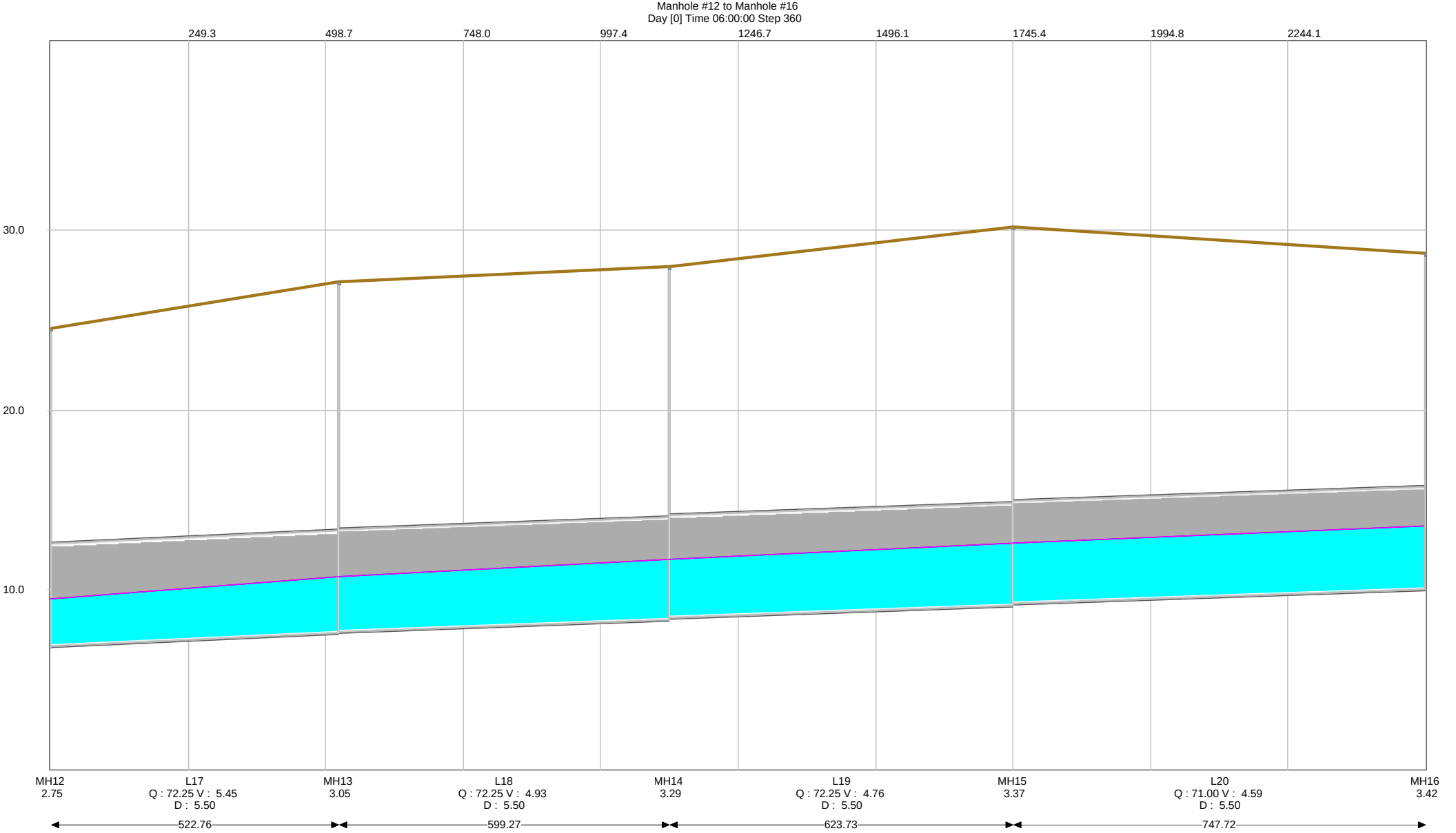

Manhole #11 to Manhole #1
Day [0] Time 06:00:00 Step 360
672.4
1344.9
2017.3
2689.7
3362.1
4034.6
4707.0
5379.4
6051.8
LEGEND SHEET
20.0
10.0
0.0
Ground Elevation
Hydraulic Grade Line
Water Elevation
Sewer Pipe
MH# = Manhole Number
L# = Model Line Number
Q = Flow (cfs)
V = Velocity (fps)
D = Pipe Diameter (ft)
MH1 3.37
L1 Q : 145.97 V : 7.14 D : 5.50
MH2 4.56
L2 Q : 145.97 V : 6.19 D : 5.50
MH3 5.59
L3 Q : 142.07 V : 5.77 D : 5.50
MH4 6.05
L4 Q : 142.07 V : 5.74 D : 5.50
MH5 6.06
L5 Q : 142.07 V : 5.83 D : 5.50
MH6 6.71
L6 Q : 142.07 V : 5.93 D : 5.50
MH7 6.86
L7 Q : 142.07 V : 5.95 D : 5.50
MH8 7.20
L8 Q : 141.67 V : 5.95 D : 5.50
MH9 7.77
L9 D : 5.50
MH10 8.20
L10 Q : 141.67 V : 5.94 D : 5.50
MH11 8.60
756.68
751.18
751.46
749.97
732.21
614.93
627.49
642.66
477.74
619.95


Manhole #A to Manhole #F
Day [0] Time 06:00:00 Step 360
168.3
336.7
505.0
673.4
841.7
1010.1
1178.4
1346.8
1515.1
10.0
0.0
-10.0
MHA
1.66
L1
MHC
1.66
L2
Q : 76.11 V : 6.56
D : 5.50
MHD
2.81
L3
Q : 76.11 V : 6.70
D : 5.50
MHE
2.65
L4
Q : 76.11 V : 6.97
D : 5.50
MHF
2.58
38.47
537.70
599.14
508.17

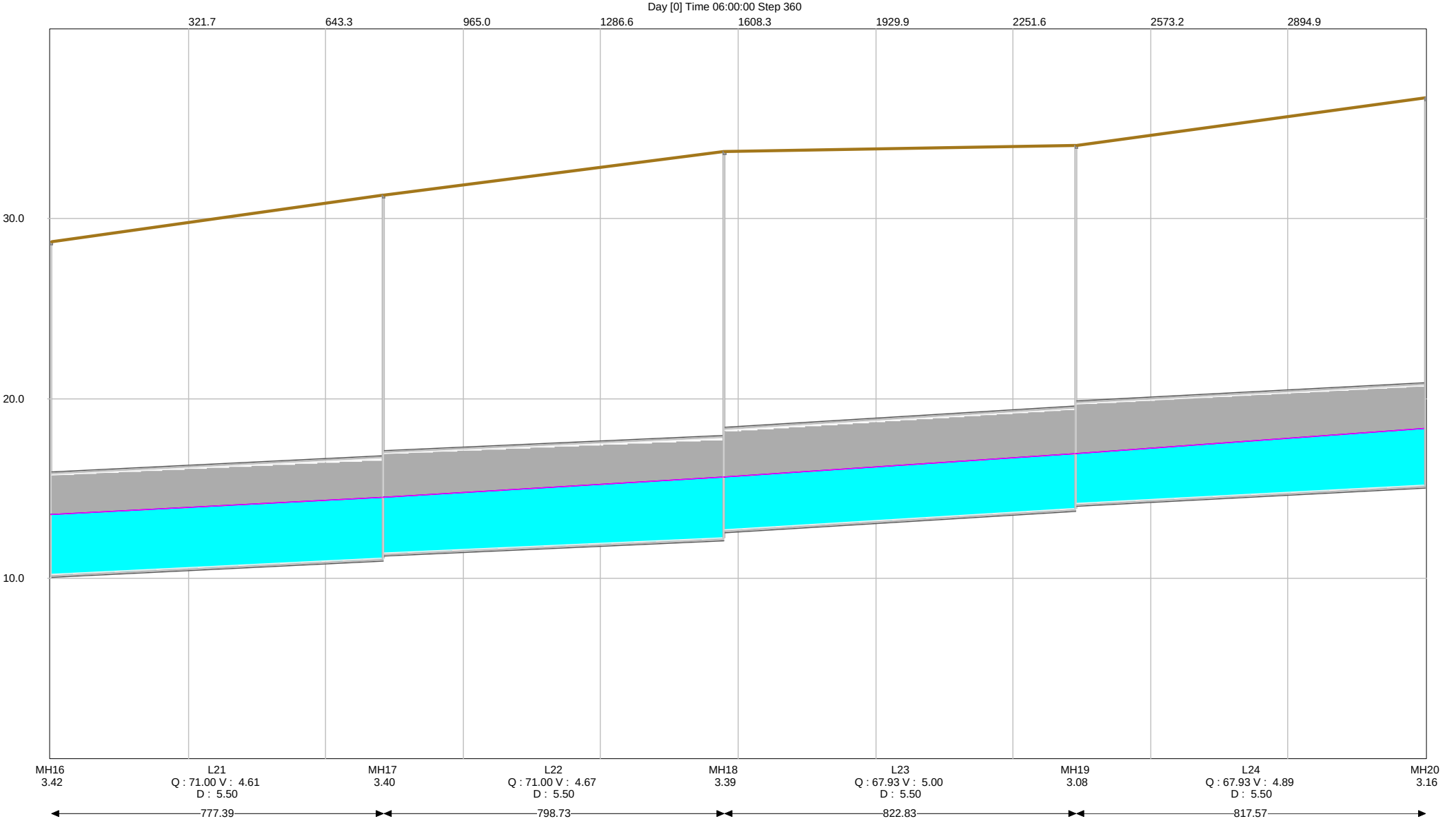

Manhole #F to Manhole #4
Day [0] Time 06:00:00 Step 360
273.0
546.1
819.1
1092.1
1365.1
1638.2
1911.2
2184.2
2457.3
10.0
0.0
MHF
2.58
L5
Q : 76.11 V : 7.27
D : 5.50
MH1
2.50
L6
Q : 76.11 V : 5.76
D : 5.50
MH2
3.06
L7
Q : 76.11 V : 4.97
D : 5.50
MH3
3.43
L8
Q : 76.11 V : 5.06
D : 5.50
MH4
3.34
470.98
756.68
751.18
751.46

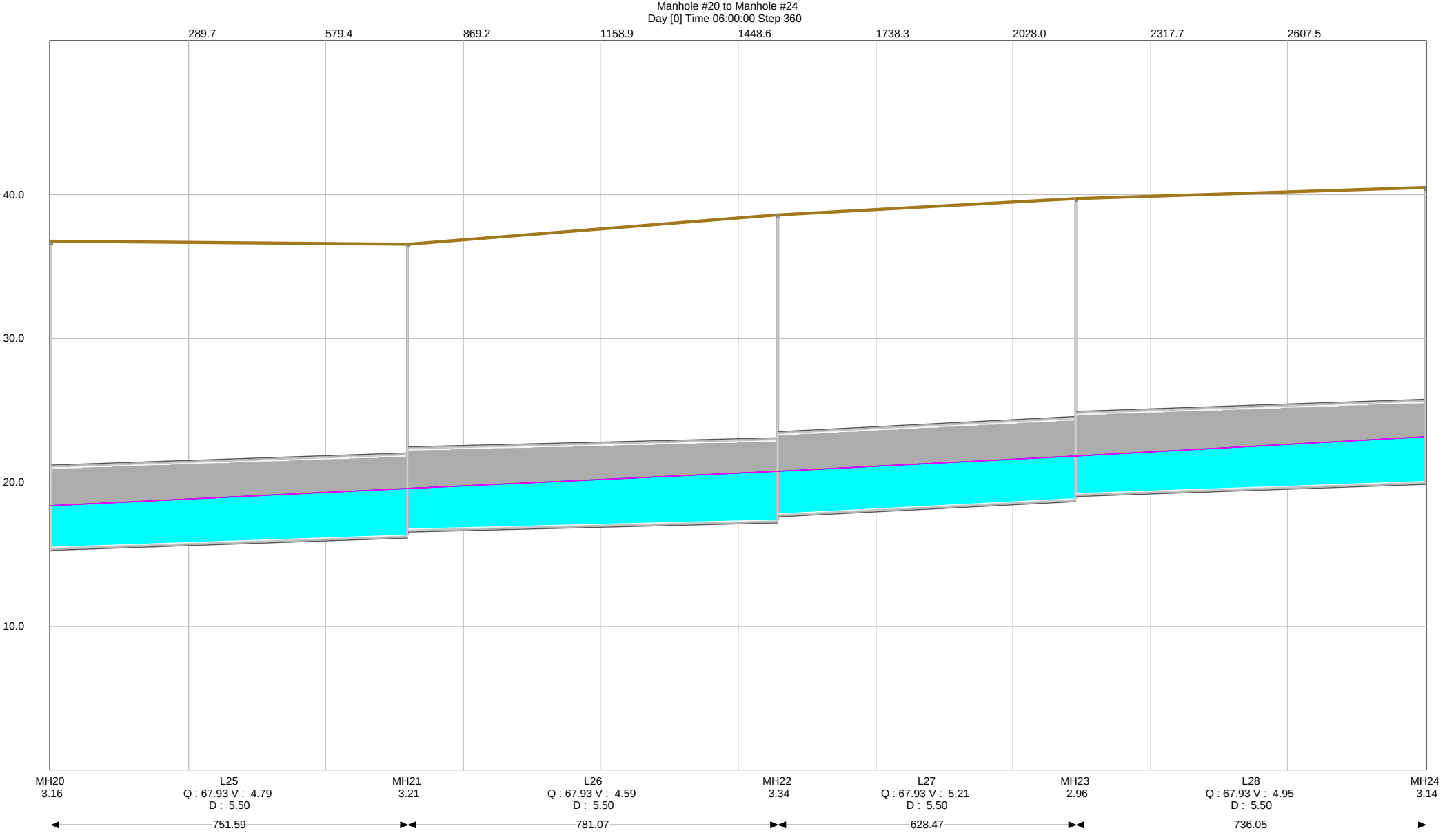

Manhole #4 to Manhole #8
Day [0] Time 06:00:00 Step 360
272.5
544.9
817.4
1089.8
1362.3
1634.8
1907.2
2179.7
2452.1
20.0
10.0
0.0
MH4
3.34
L9
Q : 76.11 V : 5.55
D : 5.50
MH5
3.08
L10
Q : 76.11 V : 5.00
D : 5.50
MH6
3.42
L11
Q : 76.11 V : 5.27
D : 5.50
MH7
3.23
L12
Q : 76.11 V : 5.32
D : 5.50
MH8
3.21
749.97
732.21
614.93
627.49


Manhole #8 to Manhole #12
Day [0] Time 06:00:00 Step 360
228.4
456.9
685.3
913.7
1142.1
1370.6
1599.0
1827.4
2055.9
20.0
10.0
MH8
3.21
L13
Q : 75.71 V : 5.05
D : 5.50
642.66
MH9
3.35
L14
Q : 75.71 V : 4.95
D : 5.50
477.74
MH10
3.40
L15
Q : 75.71 V : 5.08
D : 5.50
619.95
MH11
3.32
L16
Q : 75.71 V : 6.23
D : 5.50
543.94
MH12
2.75

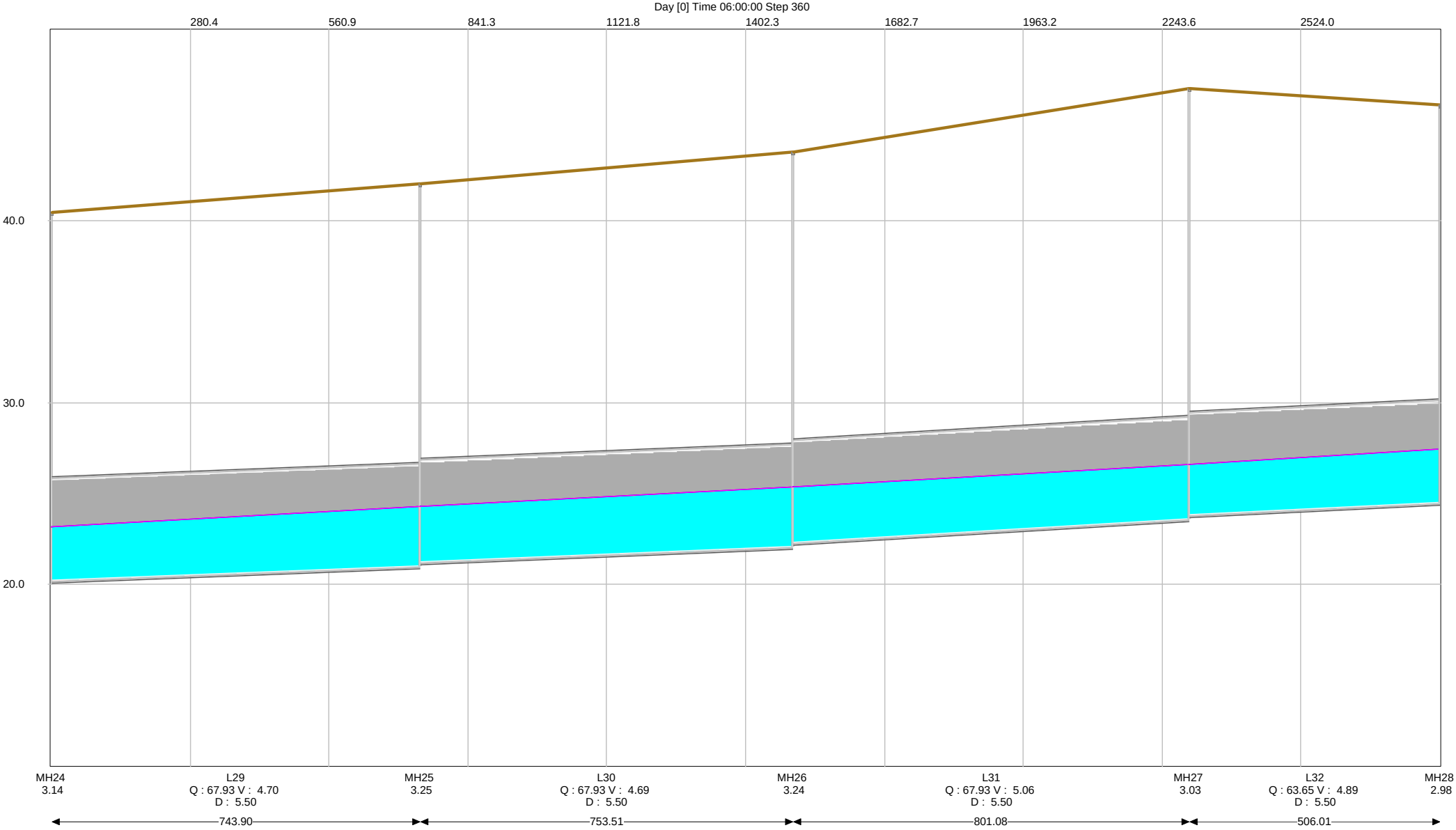

Manhole #12 to Manhole #16
Day [0] Time 06:00:00 Step 360
249.3
498.7
748.0
997.4
1246.7
1496.1
1745.4
1994.8
2244.1
30.0
20.0
10.0
MH12
2.75
L17
Q : 72.25 V : 5.45
D : 5.50
MH13
3.05
L18
Q : 72.25 V : 4.93
D : 5.50
MH14
3.29
L19
Q : 72.25 V : 4.76
D : 5.50
MH15
3.37
L20
Q : 71.00 V : 4.59
D : 5.50
MH16
3.42
522.76
599.27
623.73
747.72

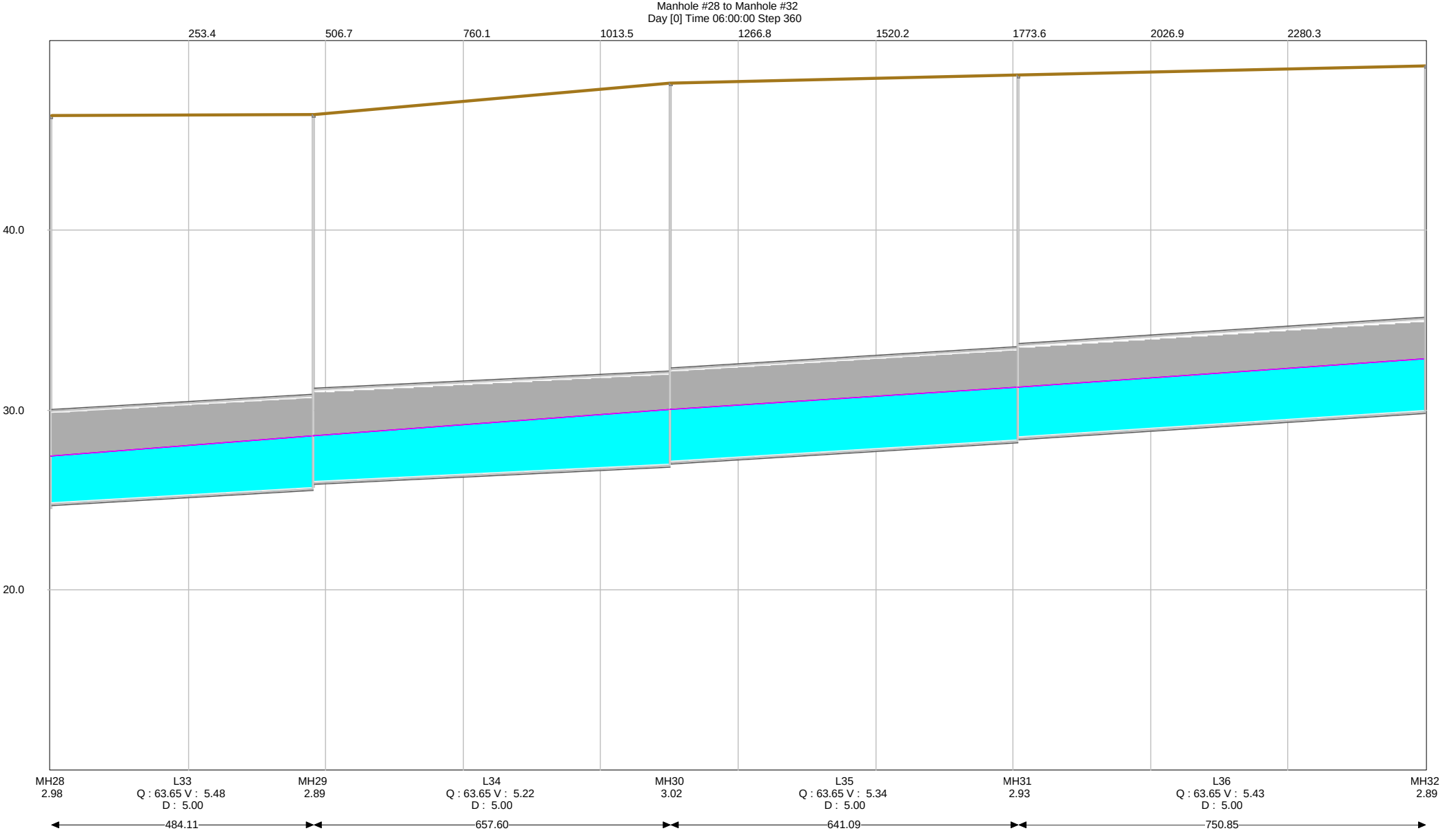
Manhole #16 to Manhole #20
Day [0] Time 06:00:00 Step 360

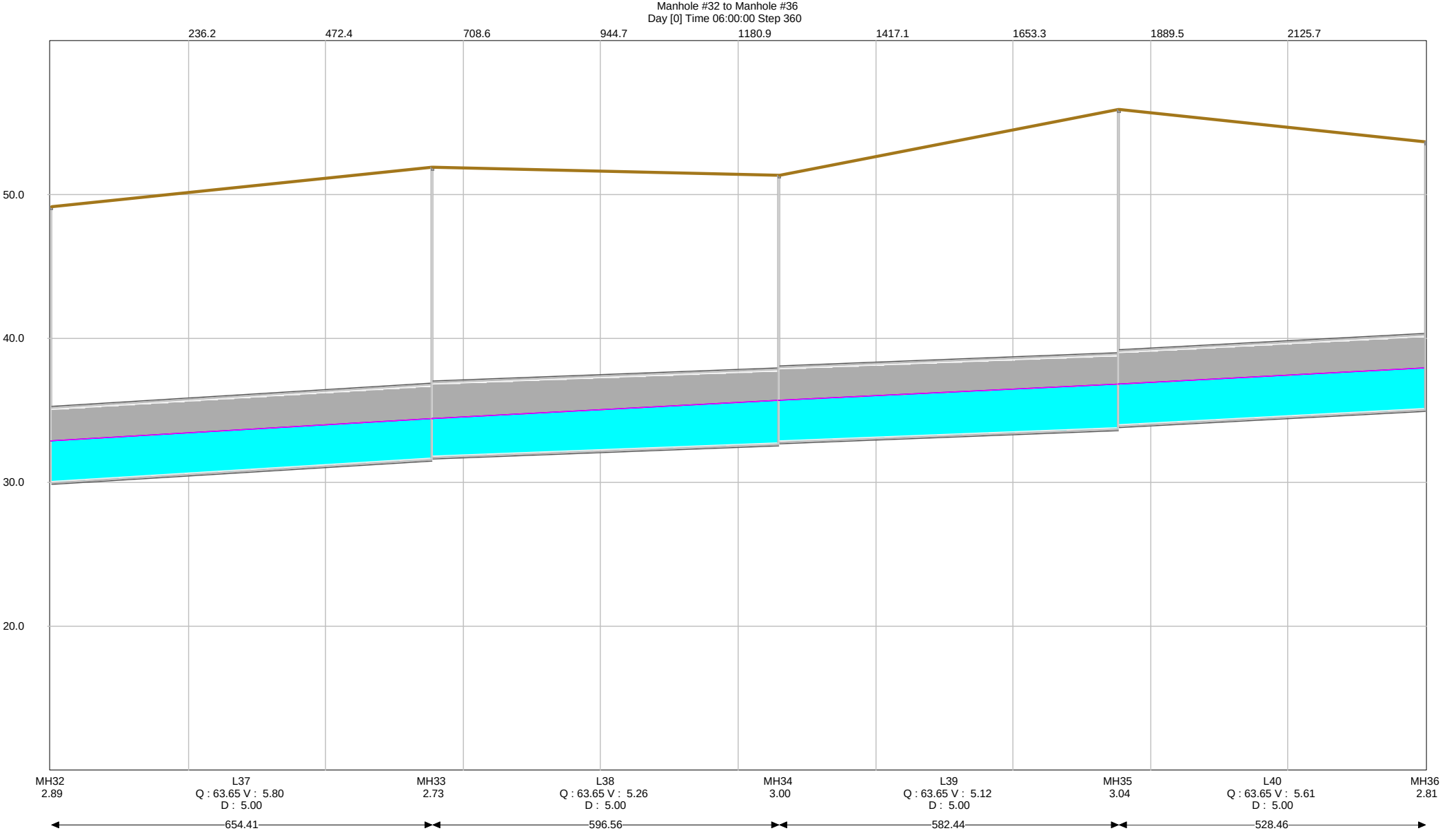


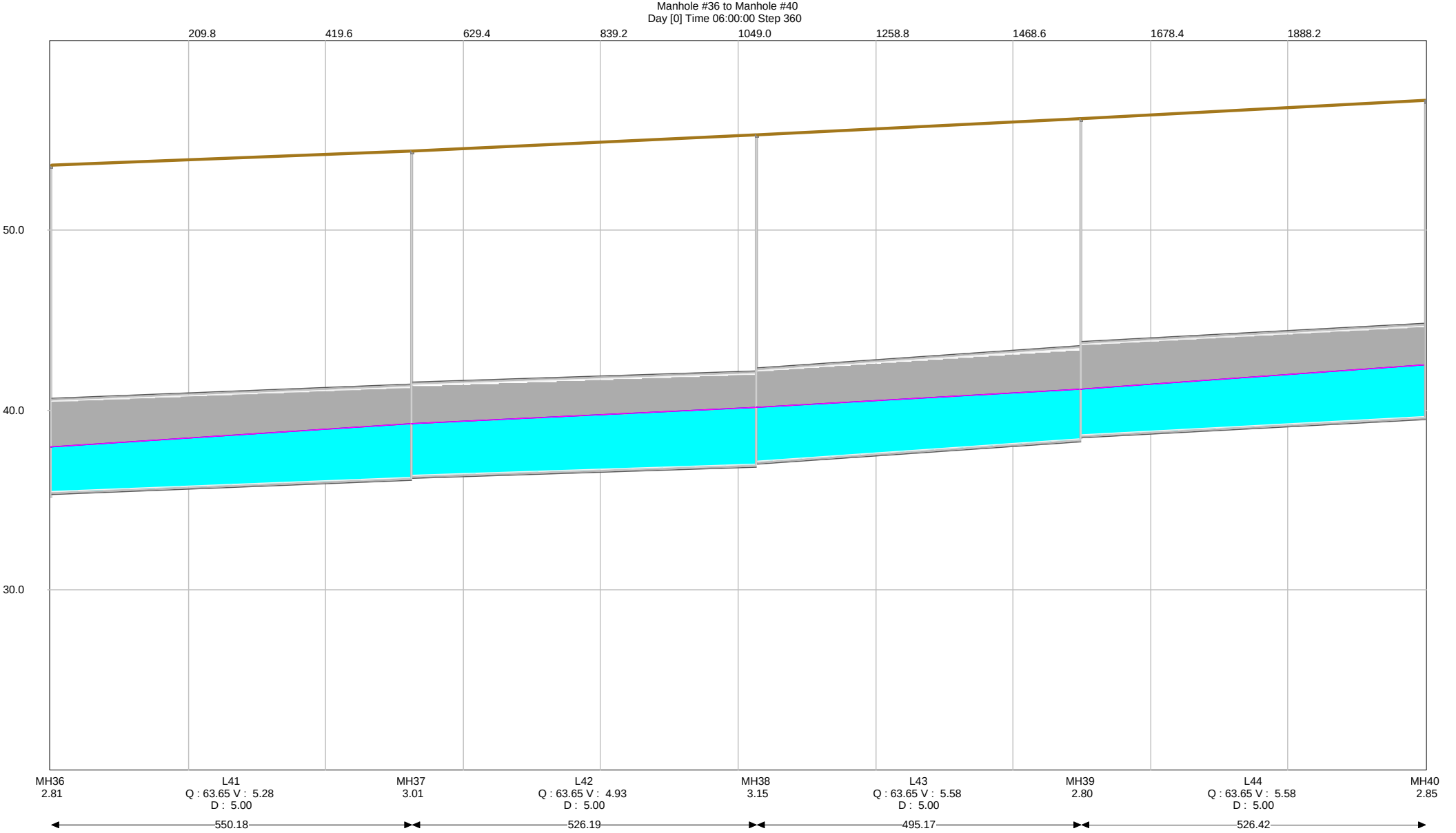

Manhole #20 to Manhole #24
Day [0] Time 06:00:00 Step 360
289.7
579.4
869.2
1158.9
1448.6
1738.3
2028.0
2317.7
2607.5
40.0
30.0
20.0
10.0
MH20
3.16
L25
Q : 67.93 V : 4.79
D : 5.50
MH21
3.21
L26
Q : 67.93 V : 4.59
D : 5.50
MH22
3.34
L27
Q : 67.93 V : 5.21
D : 5.50
MH23
2.96
L28
Q : 67.93 V : 4.95
D : 5.50
MH24
3.14
751.59
781.07
628.47
736.05

Manhole #24 to Manhole #28
Day [0] Time 06:00:00 Step 360

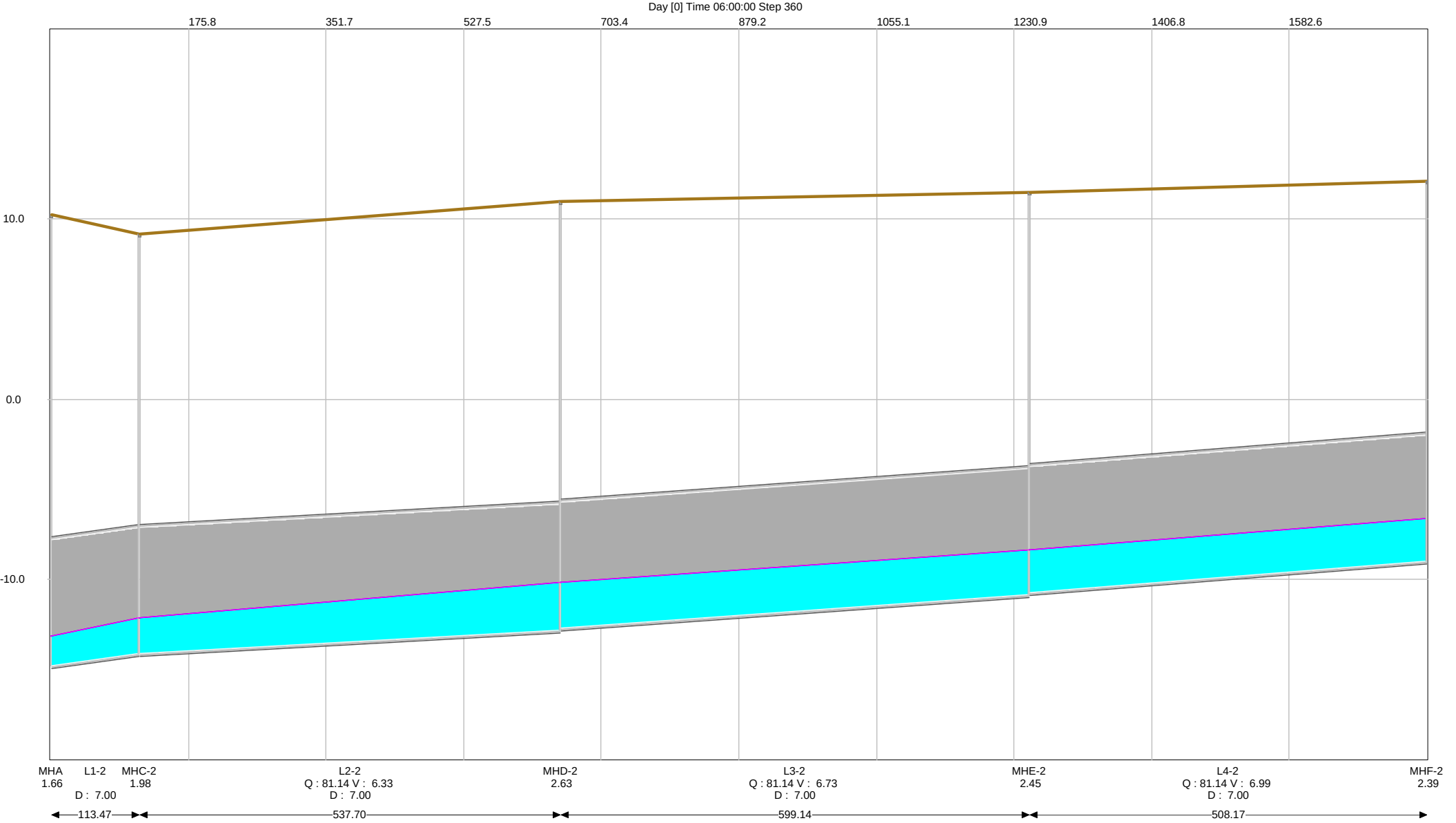


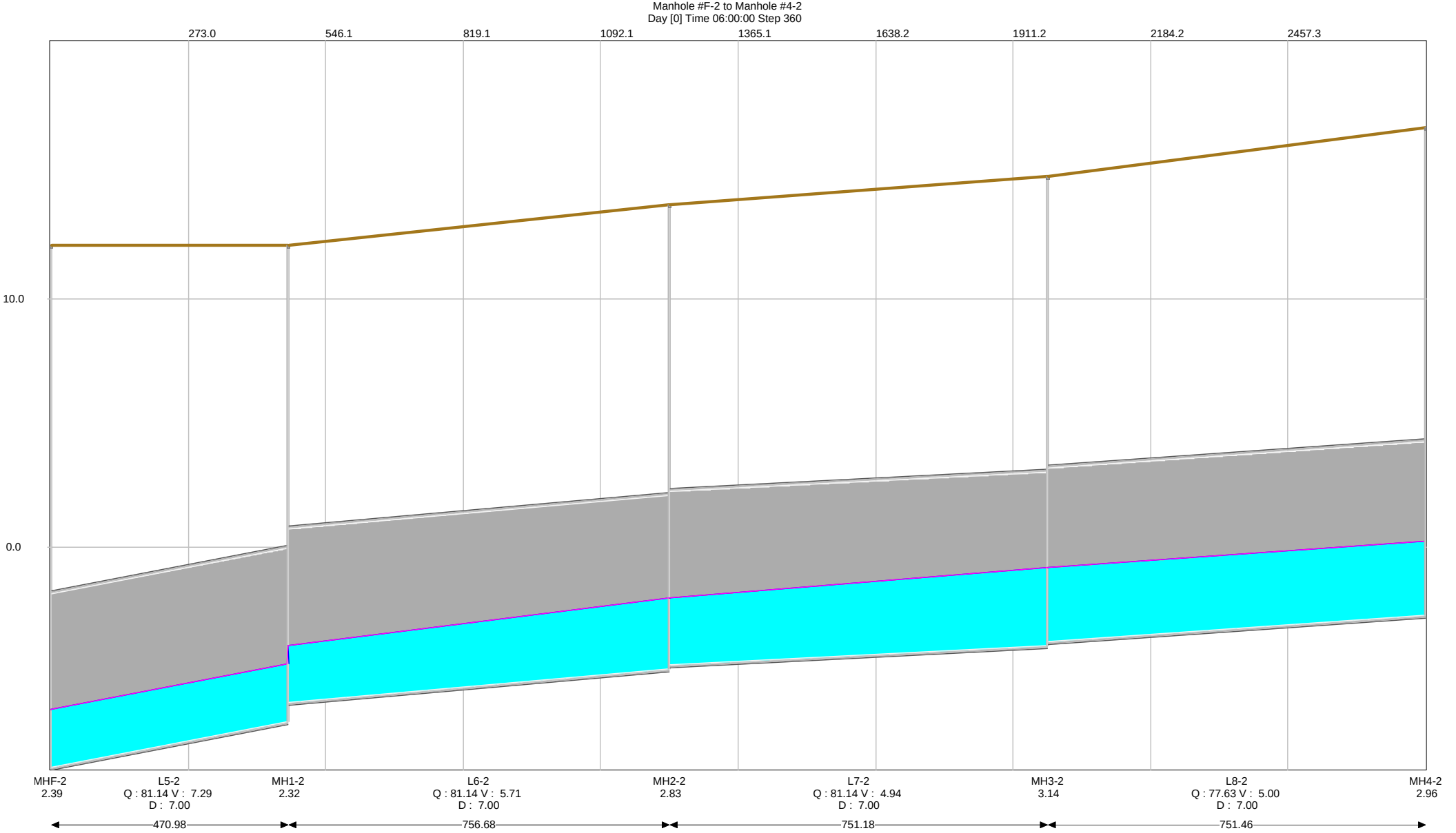

Manhole #28 to Manhole #32
Day [0] Time 06:00:00 Step 360
253.4
506.7
760.1
1013.5
1266.8
1520.2
1773.6
2026.9
2280.3
40.0
30.0
20.0
MH28
2.98
L33
Q : 63.65 V : 5.48
D : 5.00
MH29
2.89
L34
Q : 63.65 V : 5.22
D : 5.00
MH30
3.02
L35
Q : 63.65 V : 5.34
D : 5.00
MH31
2.93
L36
Q : 63.65 V : 5.43
D : 5.00
MH32
2.89
484.11
657.60
641.09
750.85


Manhole #32 to Manhole #36
Day [0] Time 06:00:00 Step 360
236.2
472.4
708.6
944.7
1180.9
1417.1
1653.3
1889.5
2125.7
50.0
40.0
30.0
20.0
MH32
2.89
L37
Q : 63.65 V : 5.80
D : 5.00
MH33
2.73
L38
Q : 63.65 V : 5.26
D : 5.00
MH34
3.00
L39
Q : 63.65 V : 5.12
D : 5.00
MH35
3.04
L40
Q : 63.65 V : 5.61
D : 5.00
MH36
2.81
654.41
596.56
582.44
528.46

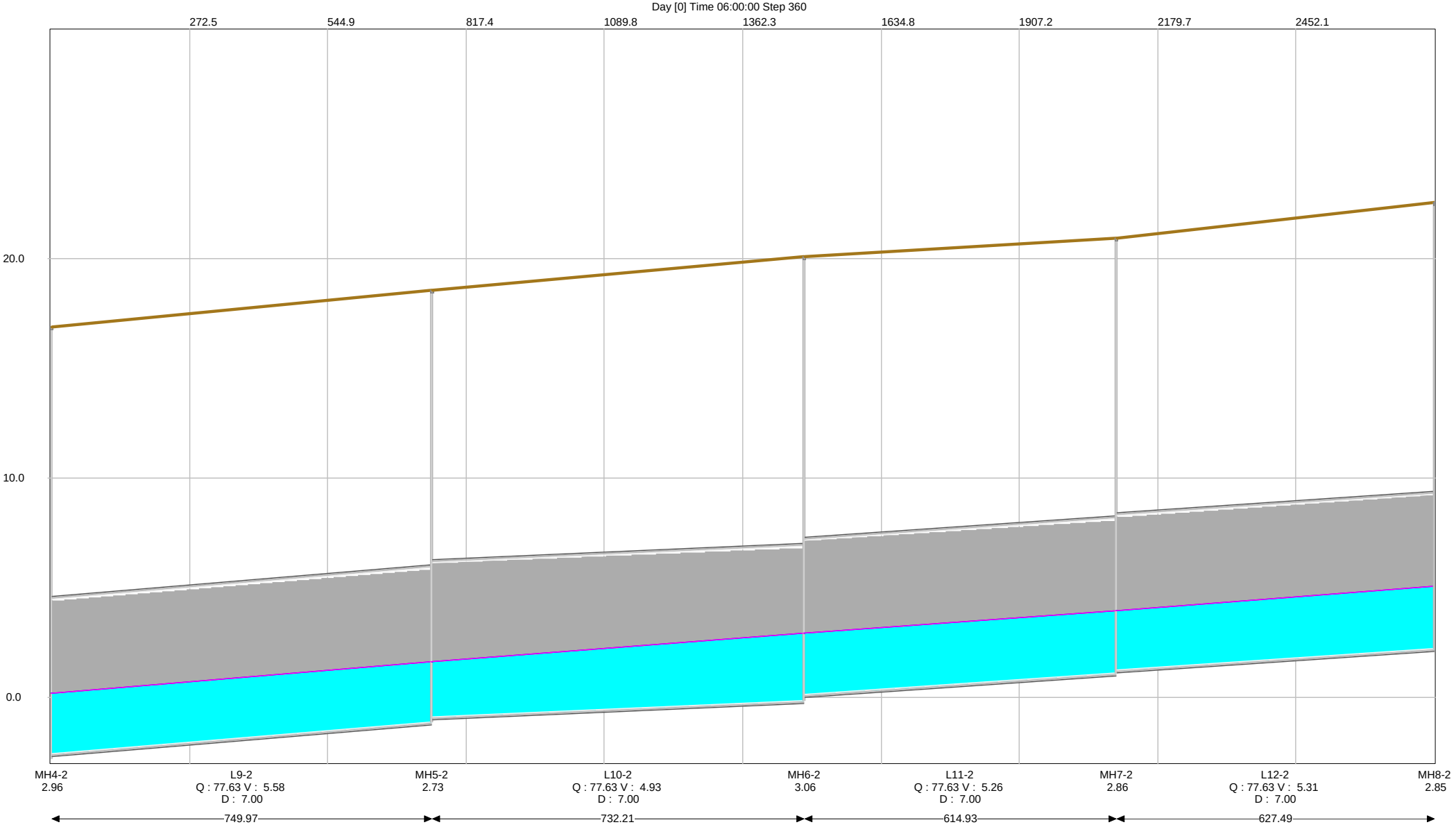

Manhole #36 to Manhole #40
Day [0] Time 06:00:00 Step 360
209.8
419.6
629.4
839.2
1049.0
1258.8
1468.6
1678.4
1888.2
50.0
40.0
30.0
MH36
2.81
L41
Q : 63.65 V : 5.28
D : 5.00
MH37
3.01
L42
Q : 63.65 V : 4.93
D : 5.00
MH38
3.15
L43
Q : 63.65 V : 5.58
D : 5.00
MH39
2.80
L44
Q : 63.65 V : 5.58
D : 5.00
MH40
2.85
550.18
526.19
495.17
526.42

Manhole #A to Manhole #F-2
Day [0] Time 06:00:00 Step 360

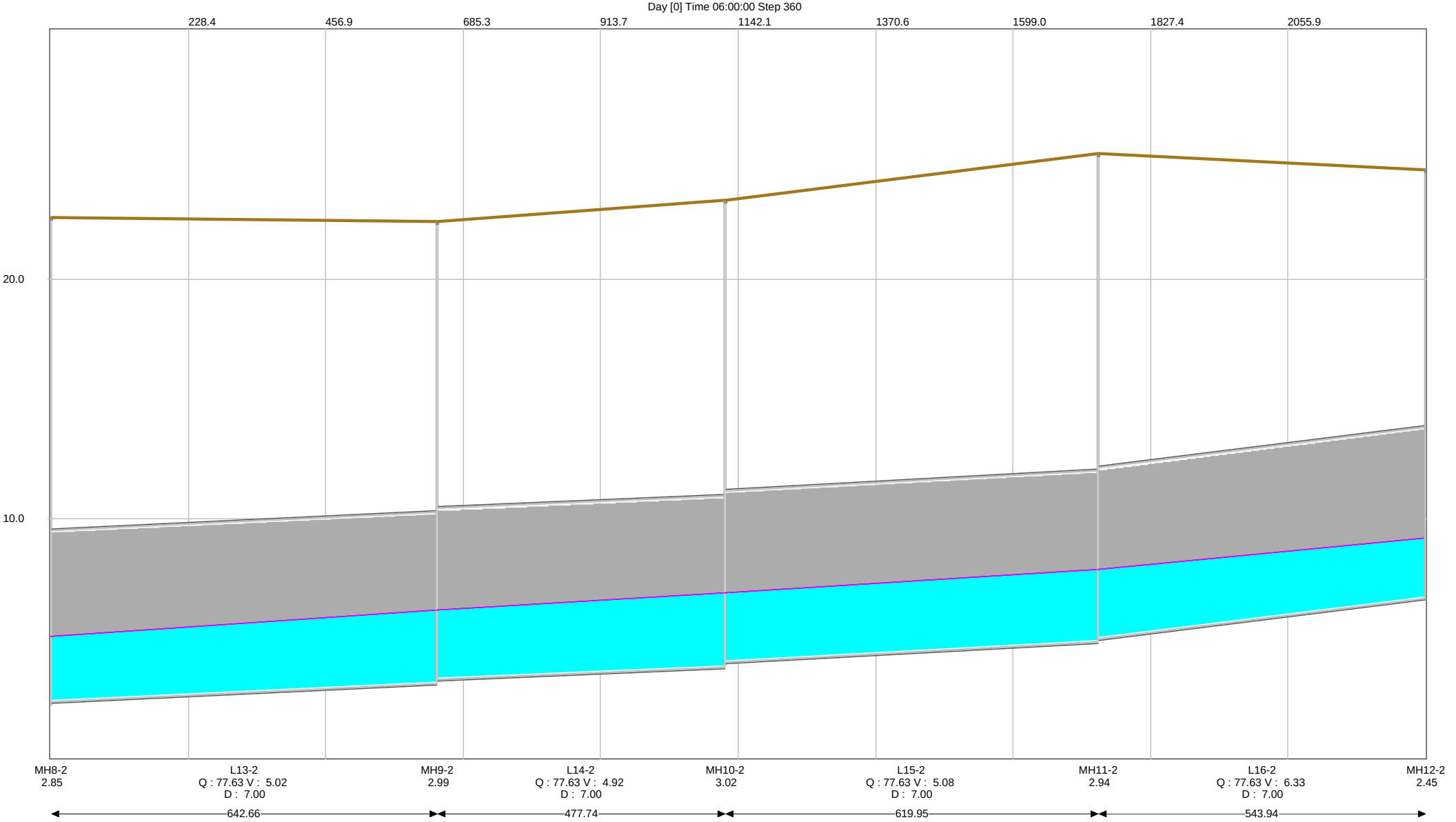



Manhole #F-2 to Manhole #4-2
Day [0] Time 06:00:00 Step 360
273.0
546.1
819.1
1092.1
1365.1
1638.2
1911.2
2184.2
2457.3
10.0
0.0
MHF-2
2.39
L5-2
Q : 81.14 V : 7.29
D : 7.00
MH1-2
2.32
L6-2
Q : 81.14 V : 5.71
D : 7.00
MH2-2
2.83
L7-2
Q : 81.14 V : 4.94
D : 7.00
MH3-2
3.14
L8-2
Q : 77.63 V : 5.00
D : 7.00
MH4-2
2.96
470.98
756.68
751.18
751.46

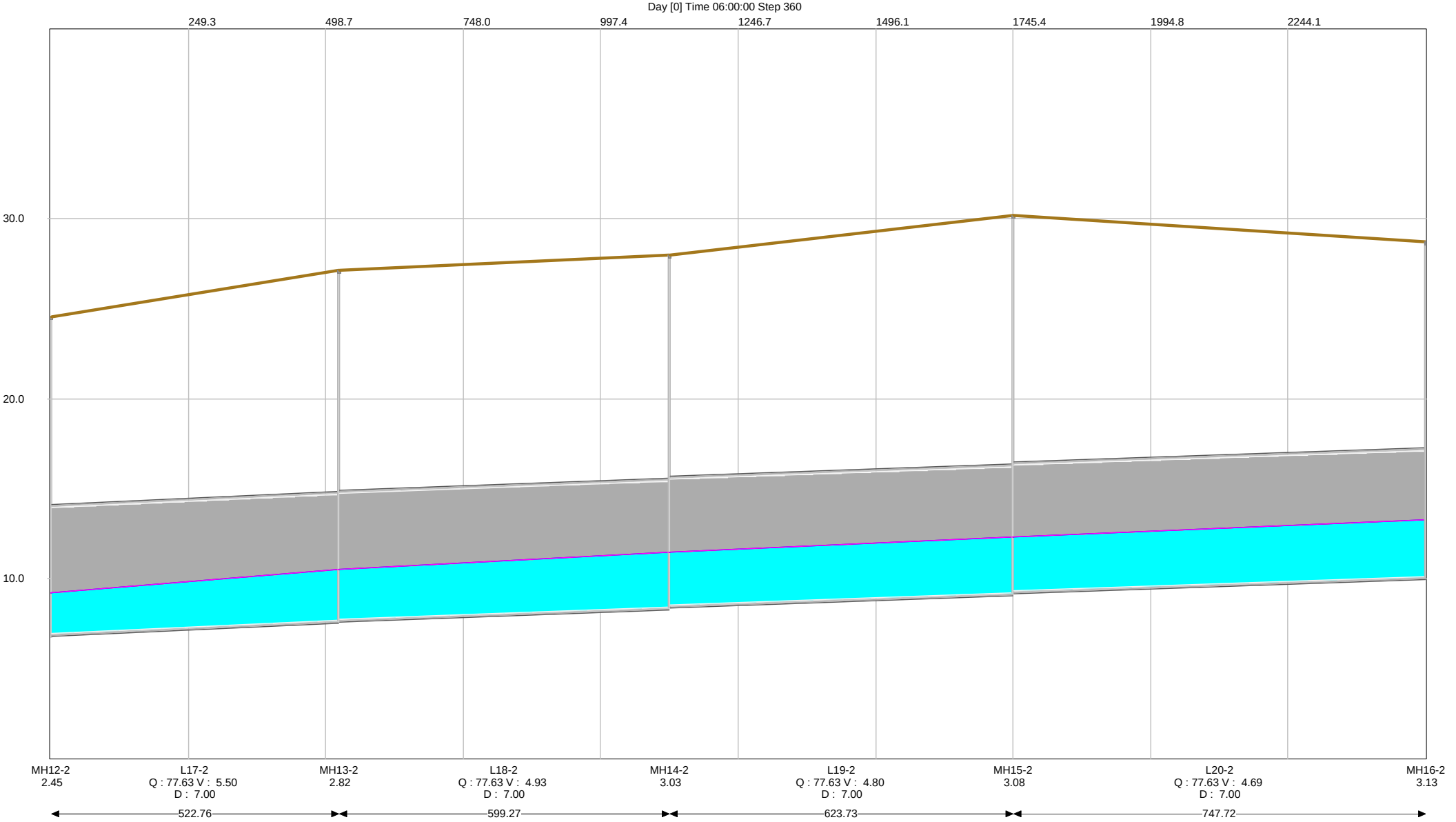
Manhole #4-2 to Manhole #8-2
Day [0] Time 06:00:00 Step 360



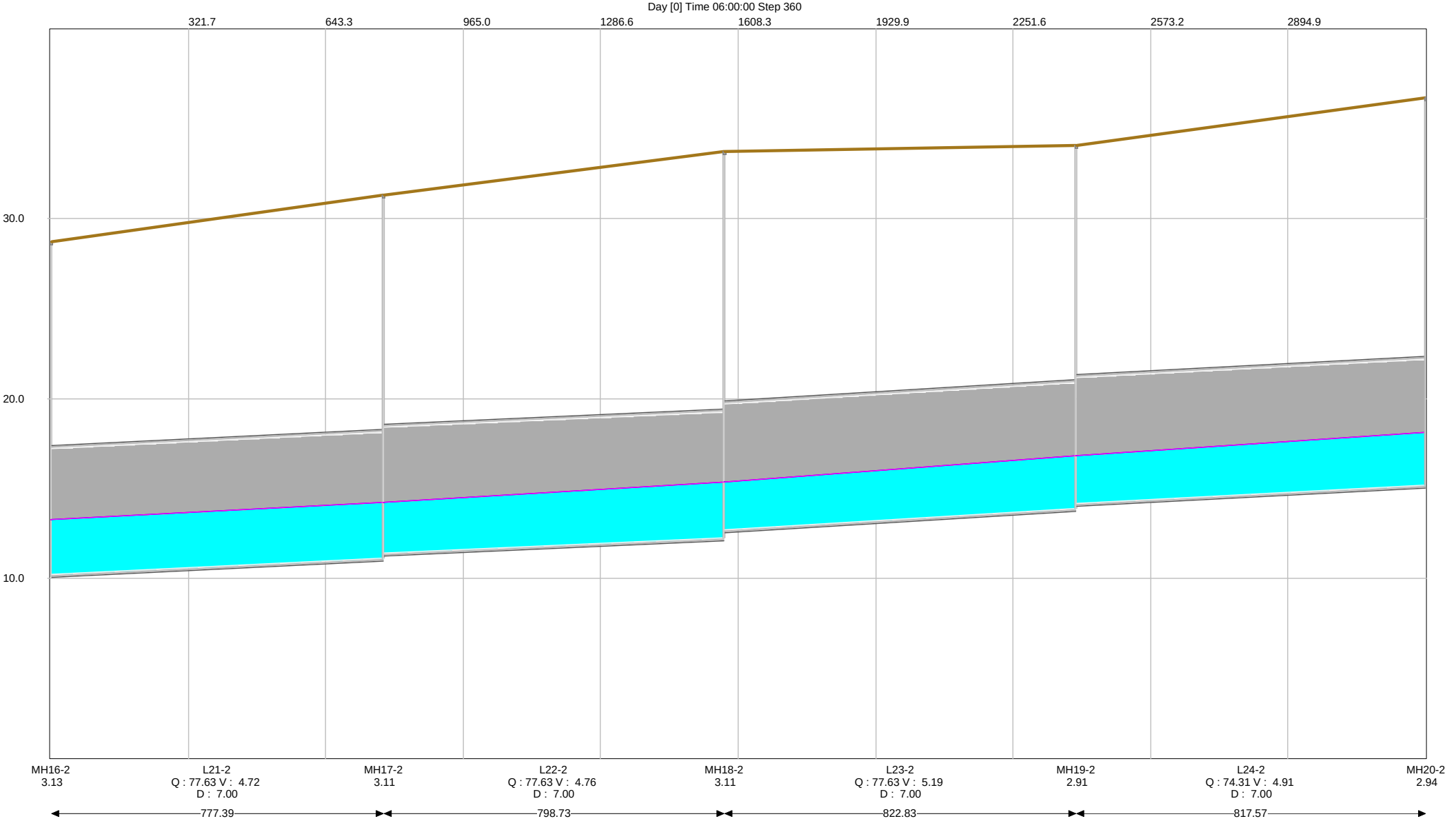
Manhole #8-2 to Manhole #12-2
Day [0] Time 06:00:00 Step 360



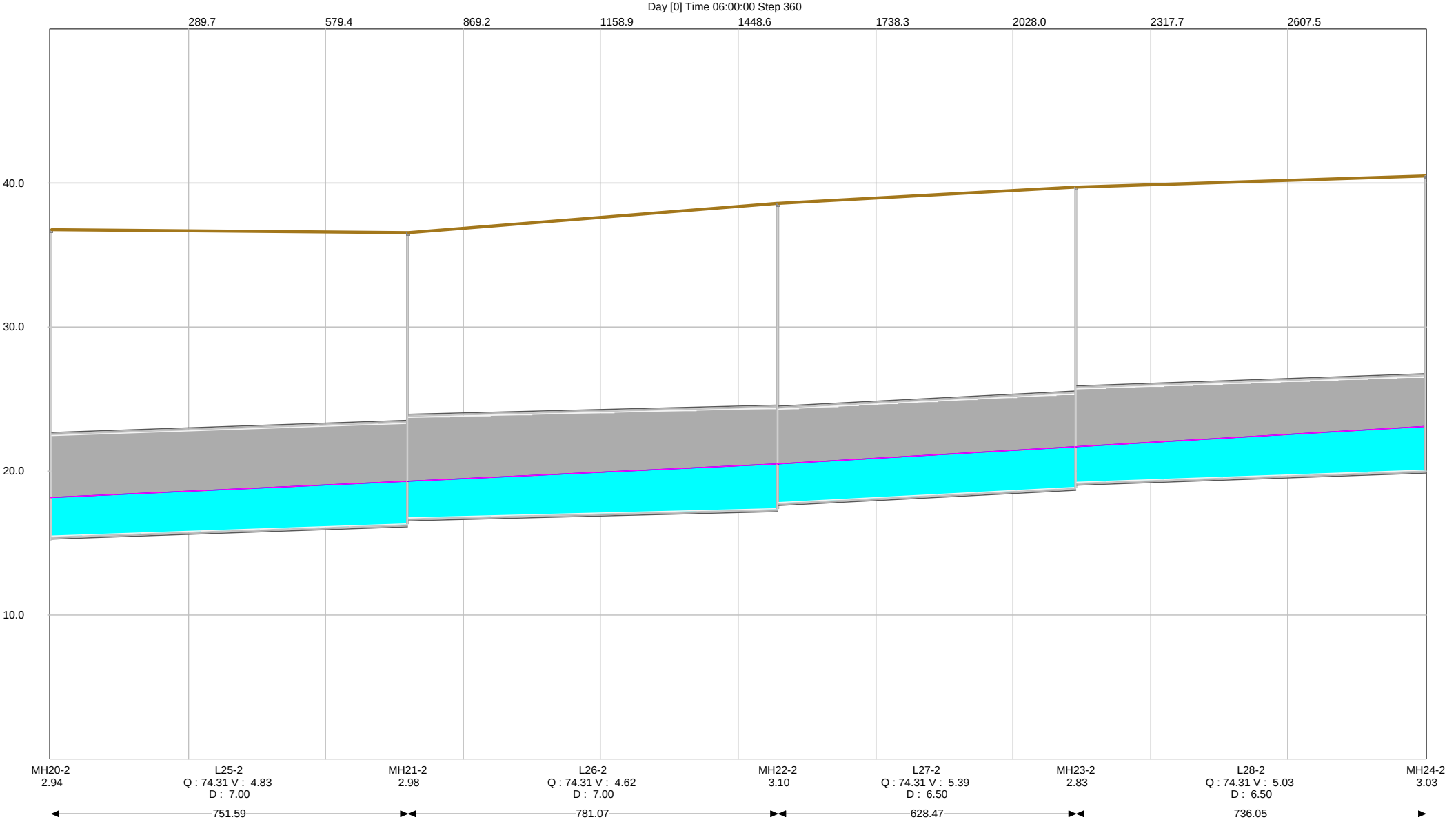
Manhole #12-2 to Manhole #16-2
Day [0] Time 06:00:00 Step 360



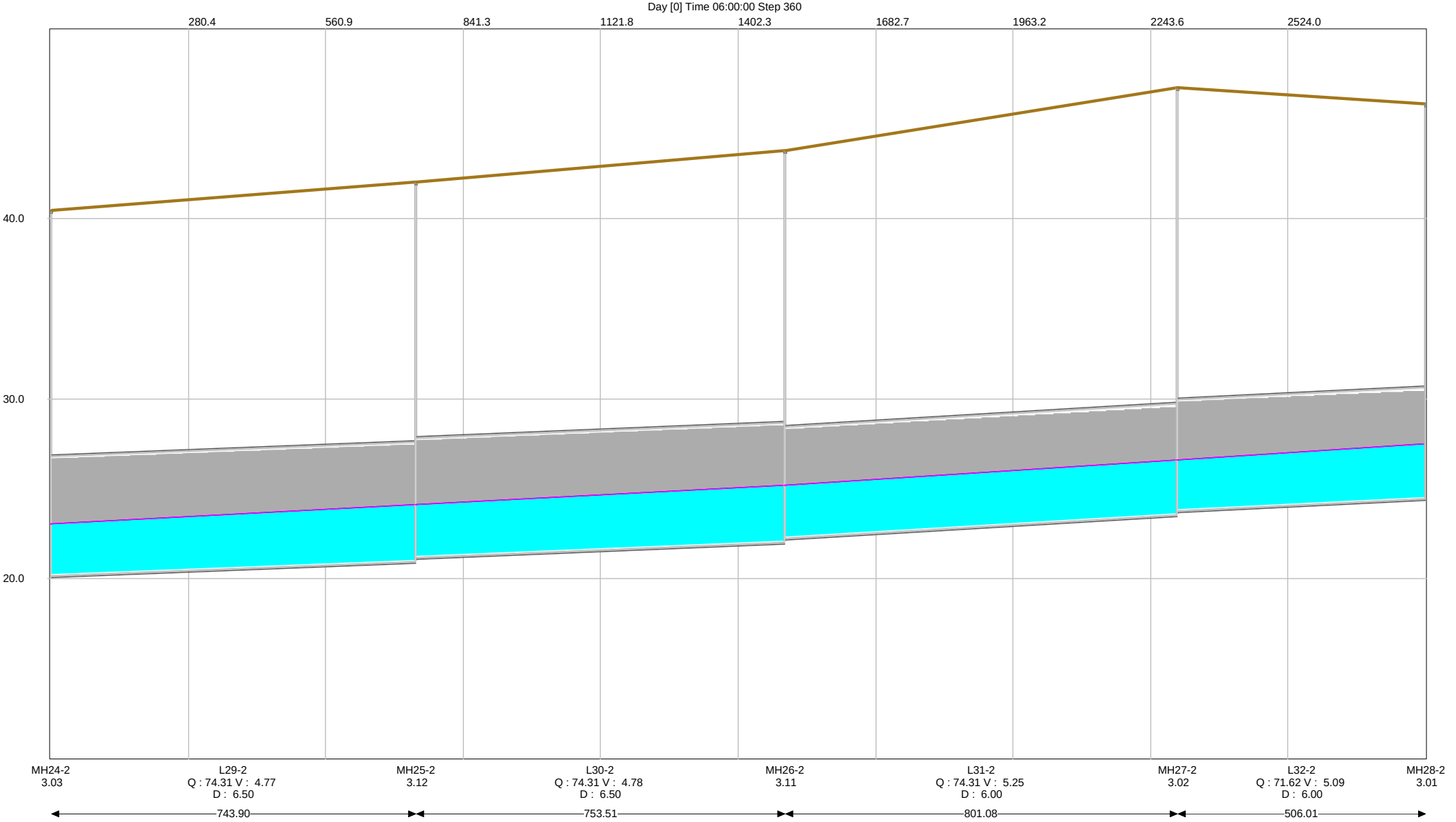
Manhole #16-2 to Manhole #20-2
Day [0] Time 06:00:00 Step 360

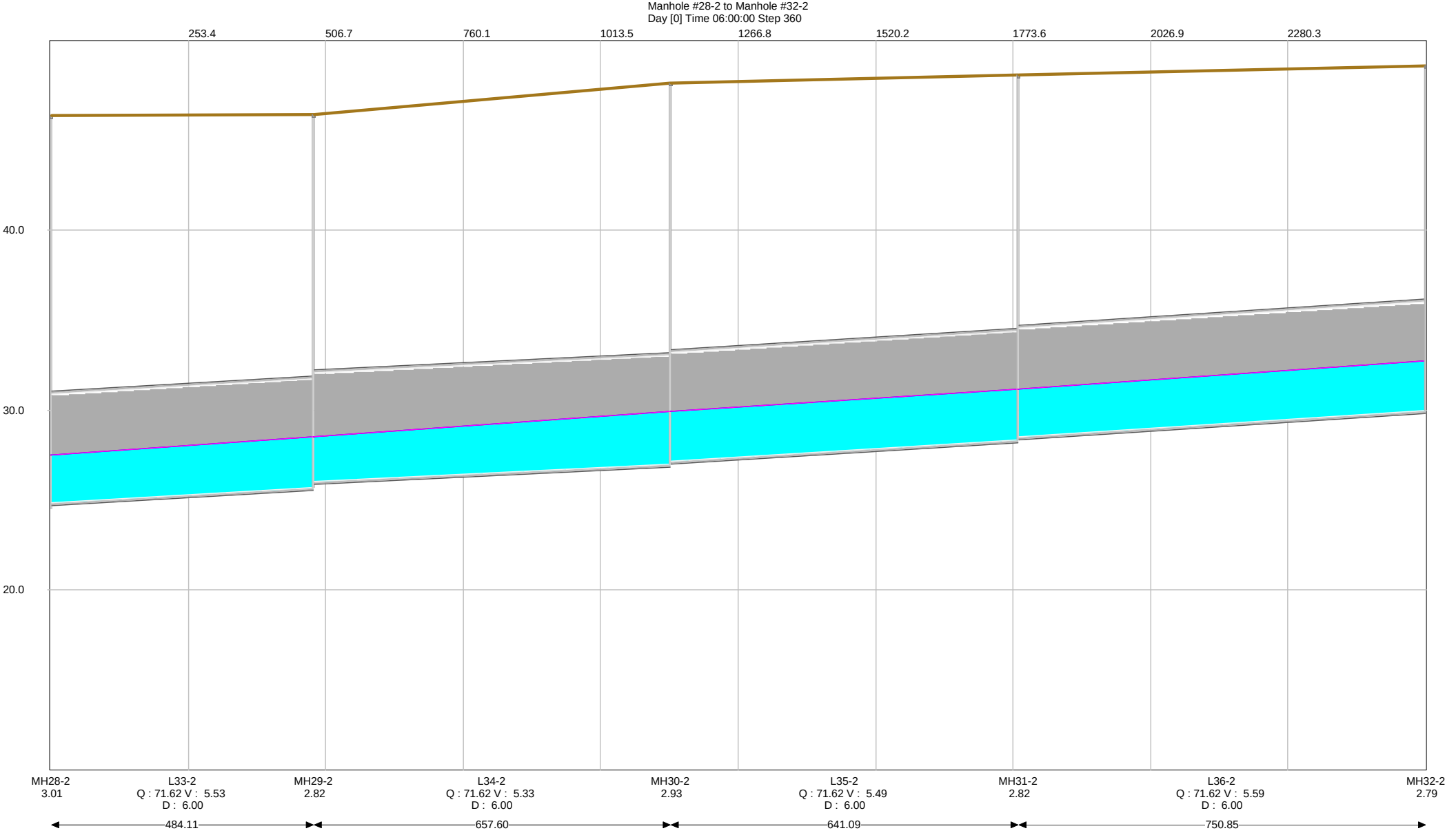


Manhole #20-2 to Manhole #24-2
Day [0] Time 06:00:00 Step 360

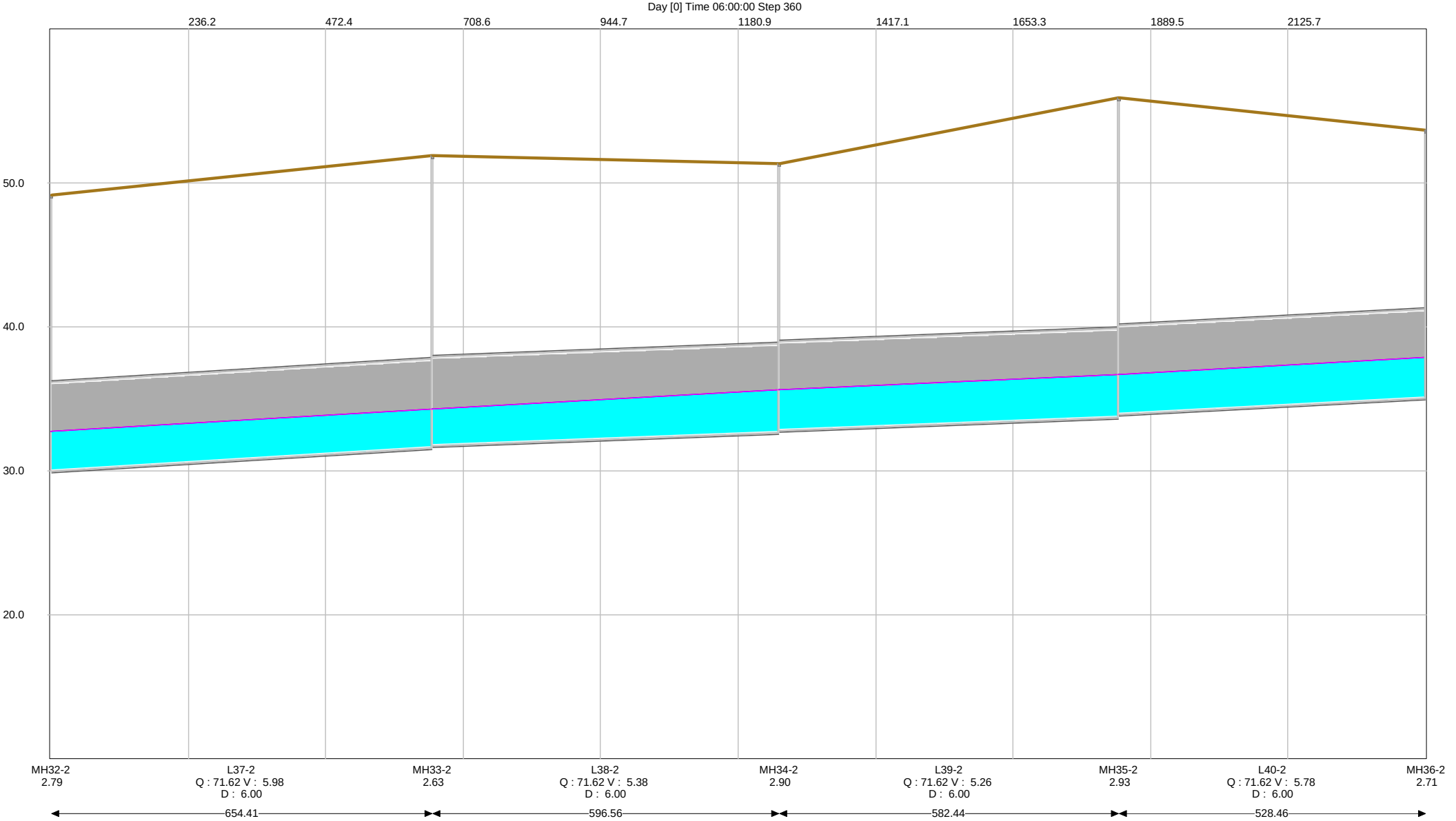


Manhole #24-2 to Manhole #28-2
Day [0] Time 06:00:00 Step 360

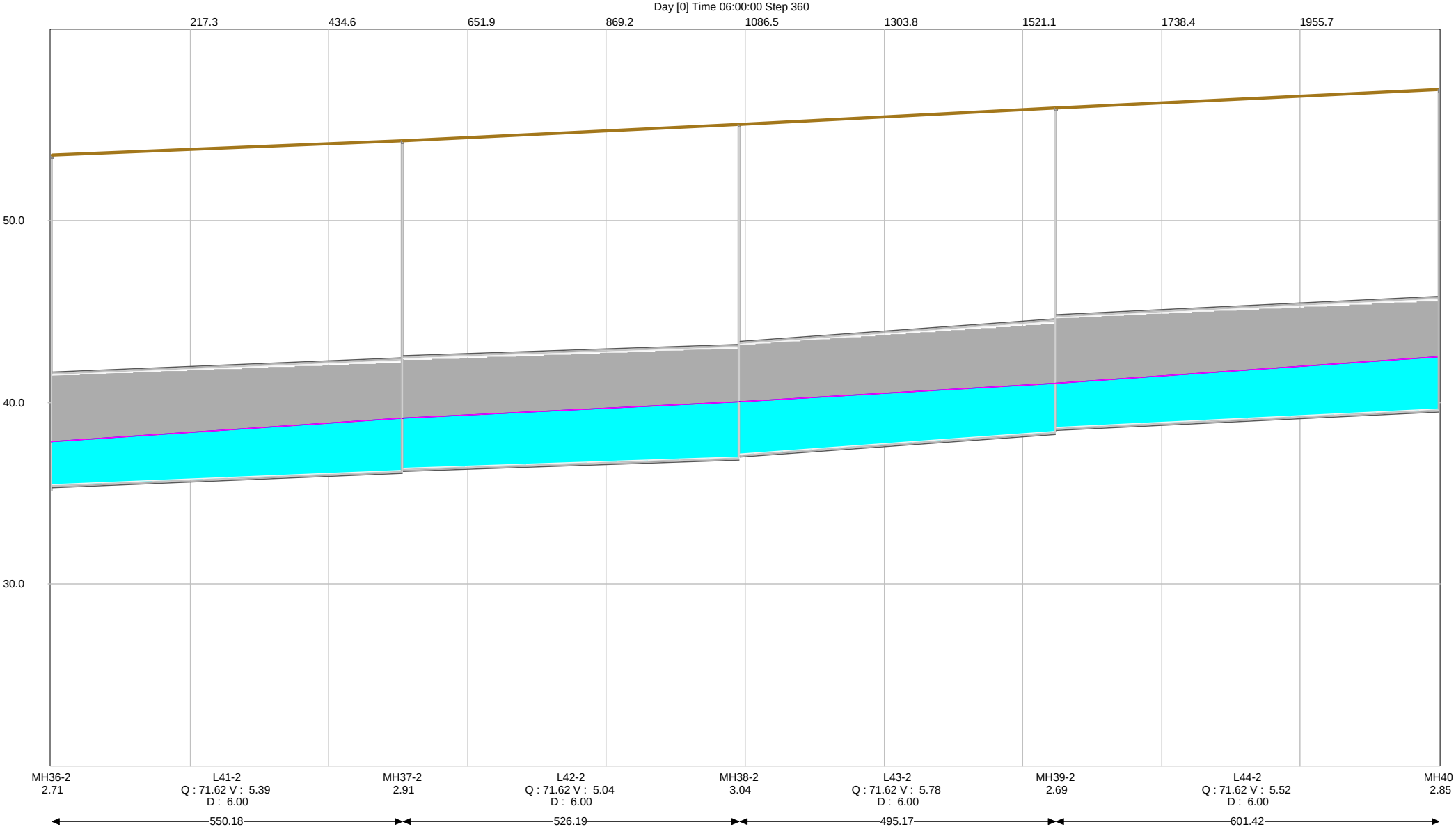



Manhole #28-2 to Manhole #32-2
Day [0] Time 06:00:00 Step 360
253.4
506.7
760.1
1013.5
1266.8
1520.2
1773.6
2026.9
2280.3
40.0
30.0
20.0
MH28-2
3.01
L33-2
Q : 71.62 V : 5.53
D : 6.00
MH29-2
2.82
L34-2
Q : 71.62 V : 5.33
D : 6.00
MH30-2
2.93
L35-2
Q : 71.62 V : 5.49
D : 6.00
MH31-2
2.82
L36-2
Q : 71.62 V : 5.59
D : 6.00
MH32-2
2.79
484.11
657.60
641.09
750.85

Manhole #32-2 to Manhole #36-2
Day [0] Time 06:00:00 Step 360



Manhole #36-2 to Manhole #40
Day [0] Time 06:00:00 Step 360



Max Depth and Max d/D

Name	Max d/D (depth/diameter)	Max Depth (ft, m)
L44	0.570	2.85
L44-2	0.475	2.85
L43	0.601	3.00
L42	0.631	3.15
L41	0.601	3.01
L40	0.562	2.81
L39	0.609	3.05
L38	0.600	3.00
L37	0.559	2.80
L36	0.579	2.90
L35	0.586	2.93
L34	0.605	3.02
L33	0.578	2.89
L32	0.542	2.98
L31	0.552	3.03
L30	0.590	3.24
L29	0.592	3.25
L28	0.571	3.14
L27	0.539	2.96
L26	0.607	3.34
L25	0.583	3.21
L24	0.574	3.16
L23	0.559	3.08
L22	0.616	3.39
L21	0.619	3.41
L20	0.622	3.42
L19	0.613	3.37
L18	0.599	3.29
L17	0.555	3.05
L16	0.585	3.22
L15	0.603	3.32
L14	0.618	3.40
L13	0.610	3.35
L12	0.583	3.21
L11	0.587	3.23
L10	0.623	3.42
L9	0.570	3.14
L8	0.606	3.34
L7	0.624	3.43
L6	0.556	3.06
L5	0.454	2.50
L4	0.469	2.58
L3	0.493	2.71
L2	0.512	2.81
L1	0.302	1.66
L43-2	0.481	2.89
L42-2	0.506	3.04
L41-2	0.485	2.91
L40-2	0.452	2.71
L39-2	0.489	2.93
L38-2	0.484	2.90

Max Depth and Max d/D

Name	Max d/D (depth/diameter)	Max Depth (ft, m)
L37-2	0.449	2.69
L36-2	0.465	2.79
L35-2	0.470	2.82
L34-2	0.488	2.93
L33-2	0.470	2.82
L32-2	0.502	3.01
L31-2	0.503	3.02
L30-2	0.478	3.11
L29-2	0.481	3.12
L28-2	0.466	3.03
L27-2	0.436	2.83
L26-2	0.443	3.10
L25-2	0.426	2.98
L24-2	0.420	2.94
L23-2	0.416	2.91
L22-2	0.445	3.11
L21-2	0.444	3.11
L20-2	0.447	3.13
L19-2	0.440	3.08
L18-2	0.433	3.03
L17-2	0.403	2.82
L16-2	0.406	2.84
L15-2	0.420	2.94
L14-2	0.432	3.02
L13-2	0.427	2.99
L12-2	0.407	2.85
L11-2	0.409	2.86
L10-2	0.437	3.06
L9-2	0.395	2.76
L8-2	0.427	2.99
L7-2	0.449	3.14
L6-2	0.404	2.83
L5-2	0.331	2.32
L4-2	0.342	2.39
L3-2	0.362	2.53
L2-2	0.376	2.63
L1-2	0.283	1.98

Appendix L

- List of Developed and Undeveloped Parcels

Charles County
Department of Planning & Growth Management
Mattawoman Interceptor Phase III Capacity Study
PGM #VCI 06-1-082
DBF #1813A002A
100% Submission

Mattawoman Interceptor
Future Wastewater Flows
List of Existing Properties

Sewershed	Map	Parcel	Lot
1	21	21	
1	21	21	
1	21	21	
1	21	21	
1	21	21	
1	21	21	
1	21	21	
1	21	21	
1	21	21	
2	31	213	1
2	32	105	10
2	31	214	3
2	31	207	7
2	31	63	
2	31	156	
2	31	220	3
2	31	177	2
2	31	53	1
2	31	108	6
2	31	108	4
2	32	76	
2	31	213	2
2	32	61	7
2	31	220	17
2	31	214	11
2	31	166	
2	31	108	5
2	31	220	4
2	31	134	
2	31	220	15
2	31	239	10
2	31	239	11
2	31	34	
2	31	98	3
2	31	210	4
2	31	214	10
2	31	210	3
2	31	210	2
2	31	109	1
2	31	108	3
2	32	64	12
2	32	67	13
2	32	67	14
2	31	29	8
2	31	174	9
2	31	220	13
2	31	178	6
2	31	50	7
2	31	28	8
2	32	50	11
2	32	75	6
2	32	232	1
2	31	21	
2	31	60	
2	32	65	8
2	32	73	
2	31	51	2
2	32	154	
2	31	79	
2	31	207	4
2	31	220	5
2	31	239	9
2	31	130	12
2	31	239	0006A
2	31	220	1
2	31	131	10

Mattawoman Interceptor
Future Wastewater Flows
List of Existing Properties

Sewershed	Map	Parcel	Lot
2	31	39	
2	31	38	
2	31	17	3
2	31	264	0003R
2	21	85	
2	31	207	8
2	31	214	4
2	31	207	9
2	31	207	3
2	31	207	5
2	31	229	
2	31	96	
2	31	235	1
2	21	97	
2	31	242	14
2	31	239	0006C
2	31	71	
2	31	214	7
2	31	213	3
2	31	109	7
2	31	173	1
2	31	172	1
2	31	226	10
2	31	230	6
2	31	239	2
2	31	239	12
2	31	214	6
2	31	207	10
2	31	28	
2	31	80	9
2	31	208	6
2	32	109	17
2	31	70	
2	31	10	6
2	31	247	13
2	31	27	7
2	31	109	18
2	31	90	
2	31	37	
2	31	169	
2	31	231	14
2	31	208	5
2	31	83	5
2	31	52	10
2	31	191	2
2	31	211	
2	31	109	14
2	31	109	15
2	31	33	
2	31	170	
2	31	16	1
2	31	264	0005R
2	31	133	
2	21	156	
2	31	23	11
2	31	24	2
2	31	28	
2	31	87	11
2	31	109	12
2	31	109	8
2	31	108	9
2	31	108	8
2	31	210	1
2	31	214	8
2	31	125	3
2	31	84	3

Charles County
Department of Planning & Growth Management
Mattawoman Interceptor Phase III Capacity Study
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Mattawoman Interceptor
Future Wastewater Flows
List of Existing Properties

Sewershed	Map	Parcel	Lot
2	31	118	11
2	31	239	5
2	31	100	3
2	31	73	5
2	31	19	7
2	31	18	6
2	31	239	3
2	31	239	4
2	31	235	2
2	31	109	10
2	31	109	9
2	31	264	0001R
2	31	237	8
2	31	7	10
2	31	1	16
2	31	163	5
2	31	208	2
2	31	208	4
2	31	109	2
2	31	109	3
2	31	109	4
2	21	99	
2	21	82	
2	21	27	PAR-B
2	31	108	7
2	31	47	5
2	31	108	2
2	31	247	6
2	31	247	1
2	20	247	5
2	31	59	
2	31	61	
2	31	108	10
2	31	214	12
2	31	207	6
2	31	216	1
2	31	108	1
2	31	235	4
2	31	235	5
2	31	220	14
2	31	175	5
2	31	220	16
2	31	111	
2	31	235	3
2	21	143	
2	21	47	
2	31	207	2
2	31	176	4
2	31	233	2
2	32	70	16
2	31	116	2
2	31	220	11
2	31	220	12
2	31	220	6
2	31	215	
2	31	6	11
2	31	122	
2	31	7	10
2	31	45	7
2	31	239	5
2	31	109	17
2	31	109	16
2	31	220	10
2	31	220	7
2	32	140	
2	31	88	

Mattawoman Interceptor
Future Wastewater Flows
List of Existing Properties

Sewershed	Map	Parcel	Lot
2	31	99	2
2	31	207	1
2	31	208	7
2	31	208	3
2	31	186	11
2	31	204	11
2	31	212	5
2	31	92	
2	31	2	15
2	21	84	
2	31	247	3
2	31	109	6
2	21	83	1
2	31	214	5
2	31	220	7
2	31	251	
2	21	206	
2	31	171	13
2	31	5	12
2	31	160	4
2	31	200	
2	31	109	11
2	31	91	
2	31	40	
2	31	190	2
2	31	101	6
2	31	126	4
2	32	145	
2	31	180	14
2	31	11	6
2	31	12	5
2	32	79	0018A
2	31	246	16
2	31	249	14
2	31	81	14
2	31	109	13
2	31	109	5
2	31	214	2
2	31	82	4
2	31	200	
2	31	243	2
2	31	244	3
2	31	195	
2	31	162	
2	31	241	
2	31	161	
2	31	233	1
2	31	94	4
2	32	210	16
2	31	57	7
2	31	233	3
2	31	42	3
2	31	247	7
2	31	239	1
2	31	89	1
2	21	79	
2	21	98	
2	31	239	7
2	31	239	8
2	31	15	1
2	31	239	7
2	31	129	1
2	31	255	2
2	31	127	7
2	31	247	9
2	31	247	10

Charles County
Department of Planning & Growth Management
Mattawoman Interceptor Phase III Capacity Study
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Mattawoman Interceptor
Future Wastewater Flows
List of Existing Properties

Sewershed	Map	Parcel	Lot
2	31	247	4
2	31	113	3
2	31	41	
2	31	233	6
2	31	233	4
2	31	233	5
2	31	120	14
2	31	76	2
2	31	264	0004R
2	31	264	0002R
2	31	239	LOT A
2	32	79	0018B
2	31	262	
2	31	215	PAR-A
2	21	207	
2	31	247	14
2	31	95	15
3	32	207	
3	32	24	
3	32	66	
3	32	85	1
3	32	86	
3	22	112	
3	22	182	
3	32	21	
3	32	21	
3	32	136	
3	32	213	
3	22	44	
3	22	59	
3	22	230	5
3	22	42	
3	22	49	
3	32	0	
3	32	100	
3	22	114	14
3	22	114	8
3	22	114	7
3	22	114	6
3	22	114	3
3	32	20	
3	22	37	
3	22	135	
3	21	111	
3	21	69	5
3	22	25	
3	22	164	
3	22	185	
3	22	84	
3	22	35	
3	32	236	
3	22	262	
3	21	29	8
3	21	68	5
3	22	125	
3	22	127	
3	22	45	
3	22	46	
3	22	193	
3	22	193	
3	22	97	
3	22	236	
3	32	16	
3	22	142	
3	22	251	
3	21	0033A	

Mattawoman Interceptor
Future Wastewater Flows
List of Existing Properties

Sewershed	Map	Parcel	Lot
2	31	117	8
2	31	239	0006B
3	32	43	
3	22	197	1
3	22	111	
3	22	55	
3	22	219	
3	22	51	
3	22	203	
3	32	18	
3	22	183	
3	32	71	
3	32	72	
3	32	44	
3	32	233	
3	32	46	
3	32	188	
3	22	139	
3	22	139	
3	22	74	2
3	22	74	2
3	22	99	
3	22	100	
3	22	175	
3	32	63	
3	21	34	
3	32	57	
3	32	13	2
3	22	114	5
3	22	114	4
3	22	114	2
3	21	62	1
3	22	114	10
3	22	114	9
3	22	122	
3	22	176	
3	22	246	2
3	22	298	
3	32	172	
3	22	114	13
3	32	23	
3	22	106	
3	22	204	
3	22	250	
3	22	114	1
3	22	115	
3	22	93	
3	22	73	4
3	22	114	12
3	22	114	11
3	22	282	
3	22	167	
3	22	99	
3	22	168	
3	32	58	
3	22	53	
3	22	75	1
3	22	69	PAR D
3	22	294	
3	22	245	1
3	22	170	20
3	22	166	
3	22	69	PAR C
3	22	282	
3	22	69	PAR B
3	22	31	1

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Mattawoman Interceptor
Future Wastewater Flows
List of Existing Properties

Sewershed	Map	Parcel	Lot
3	22	42	
3	32	174	2
3	22	68	
3	22	221	115
3	22	69	PAR A
3	22	31	4
3	31	95	15
4	13	104	14
4	22	3	
4	22	170	19
4	14	187	10
4	14	124	19
4	14	124	18
4	14	272	
4	14	186	11
4	14	156	
4	14	12	
4	14	186	31
4	14	122	
4	14	186	10
4	22	94	9
4	22	94	18
4	14	331	4
4	14	181	8
4	14	124	6
4	14	124	16
4	14	187	7
4	14	58	
4	14	124	40
4	14	331	2
4	14	124	31
4	14	186	4
4	14	186	5
4	14	181	1
4	14	186	33
4	14	186	34
4	14	186	32
4	14	186	35
4	14	124	21
4	14	124	20
4	14	197	11
4	14	186	9
4	14	186	3
4	14	124	7
4	14	78	
4	14	124	25
4	22	94	10
4	22	94	8
4	14	186	16
4	14	186	15
4	14	186	14
4	14	186	13
4	14	124	44
4	14	58	
4	14	331	1
4	14	186	37
4	14	110	
4	14	197	11
4	14	187	10
4	14	124	41
4	14	124	42
4	14	331	3
4	14	331	22
4	22	96	
4	22	156	
4	14	331	6

Mattawoman Interceptor
Future Wastewater Flows
List of Existing Properties

Sewershed	Map	Parcel	Lot
3	22	39	
3	22	39	
3	32	149	
4	14	181	9
4	13	139	19
4	14	276	
4	14	187	1
4	14	276	
4	14	186	23
4	14	181	6
4	14	331	7
4	14	331	12
4	14	331	19
4	14	181	5
4	14	197	14
4	14	124	22
4	14	124	28
4	14	124	27
4	14	298	16
4	14	186	12
4	14	186	25
4	14	111	
4	14	124	24
4	14	187	2
4	14	186	28
4	14	187	6
4	14	279	15
4	14	124	2
4	14	124	3
4	14	197	16
4	14	170	15
4	14	170	16
4	14	170	17
4	14	170	18
4	14	124	23
4	14	124	1
4	14	124	30
4	14	186	6
4	14	186	7
4	14	124	33
4	14	124	34
4	14	181	4
4	14	124	45
4	14	125	
4	14	266	2
4	14	186	17
4	14	187	7
4	14	187	5
4	14	187	9
4	14	186	21
4	14	170	4
4	14	266	4
4	14	186	24
4	14	186	27
4	22	94	6
4	14	270	3
4	14	270	1
4	14	170	14
4	22	94	7
4	14	181	7
4	13	139	16
4	14	270	4
4	14	170	11
4	14	170	13
4	14	124	26
4	13	139	15

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Sewershed	Map	Parcel	Lot
4	14	186	22
4	14	186	36
4	14	12	
4	14	12	
4	14	186	1
4	23	285	1
4	14	187	8
4	13	139	17
4	14	124	12
4	13	139	18
4	14	124	4
4	14	124	5
4	14	331	21
4	14	181	3
4	14	181	2
4	14	186	26
4	14	124	8
4	14	124	9
4	14	124	32
4	14	170	1
4	14	124	15
4	14	124	14
4	14	186	8
4	14	7	
4	14	187	3
4	14	187	4
4	14	187	2
4	14	86	
4	14	186	29
4	14	331	10
4	14	266	3
4	14	175	
4	14	119	
4	14	88	
4	13	221	1
4	14	170	9
4	14	170	12
4	14	331	15
4	14	124	48
4	14	124	47
4	14	170	6
4	14	270	2
4	14	92	
4	14	124	13
4	14	124	11
4	14	266	1
4	14	187	3
4	14	187	5
4	14	187	4
4	14	124	17
4	14	124	39
4	14	331	13
4	14	331	20
4	13	139	14
4	14	331	8
4	14	331	11
4	14	86	39
4	14	186	19
4	14	187	9
4	14	186	18
4	14	186	20
4	14	197	1
4	14	197	13
4	14	170	5
4	14	197	12
4	14	197	15

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Sewershed	Map	Parcel	Lot
4	14	331	9
4	14	124	29
4	14	124	43
4	14	187	1
4	14	124	10
4	14	197	12
4	14	197	13
4	14	187	8
4	14	124	35
4	14	124	37
4	14	124	38
4	22	18	
4	14	170	10
4	14	266	5
4	14	101	
4	14	130	
4	14	129	
4	13	106	31
4	22	132	
4	22	215	1
4	22	215	2
4	22	21	2
4	22	133	
4	22	98	
4	22	21	5
4	22	78	13
4	22	29	17
4	22	56	17
4	22	31	5
4	13	106	33
4	13	182	6
4	13	182	5
4	13	157	3
4	22	170	39
4	13	171	4
4	13	203	12
4	13	203	21
4	13	106	15
4	13	106	16
4	13	157	10
4	13	188	17
4	22	170	23
4	22	170	45
4	22	170	15
4	22	170	16
4	22	76	
4	22	85	
4	22	32	3
4	22	170	42
4	22	170	43
4	22	170	29
4	22	11	1
4	22	234	1
4	13	106	21
4	13	188	19
4	13	188	18
4	22	170	30
4	13	167	2
4	13	188	14
4	13	139	22
4	22	234	2
4	13	183	2
4	13	211	26
4	13	78	
4	22	19	
4	22	17	

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Sewershed	Map	Parcel	Lot
4	14	197	3
4	14	124	46
4	14	124	36
4	14	187	6
4	14	197	2
4	22	234	26
4	13	211	18
4	13	139	26
4	22	94	14
4	22	234	15
4	22	234	17
4	13	211	4
4	13	165	
4	13	207	010C2
4	22	234	16
4	22	234	11
4	22	28	
4	22	278	
4	13	106	17
4	13	106	27
4	13	139	24
4	22	234	21
4	13	108	
4	13	144	
4	22	215	3
4	22	215	5
4	22	128	3
4	22	33	
4	13	198	31
4	22	21	17
4	22	170	11
4	13	211	25
4	22	170	25
4	22	170	44
4	13	188	3
4	13	169	8
4	13	182	1
4	13	182	2
4	22	170	21
4	22	61	2
4	22	170	24
4	13	128	
4	13	139	25
4	13	211	15
4	13	211	16
4	22	30	16
4	22	266	
4	22	258	
4	13	211	14
4	22	259	
4	22	197	1
4	22	170	18
4	22	21	4
4	13	203	19
4	13	203	18
4	13	203	15
4	13	196	1
4	13	83	30
4	22	234	27
4	22	234	19
4	22	234	18
4	13	188	15
4	22	170	22
4	22	170	6
4	13	211	30
4	13	79	

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Sewershed	Map	Parcel	Lot
4	22	11	5
4	13	188	5
4	13	211	19
4	13	104	18
4	13	104	17
4	22	247	3
4	22	247	2
4	22	247	
4	22	47	
4	22	259	
4	22	27	15
4	13	188	12
4	22	195	
4	13	211	27
4	22	101	
4	22	26	12
4	13	139	2
4	22	170	36
4	22	170	37
4	22	170	32
4	22	170	40
4	13	106	24
4	13	157	14
4	13	167	3
4	22	58	
4	13	168	3
4	22	170	41
4	13	106	14
4	22	191	1
4	22	124	
4	22	21	500
4	22	234	1
4	13	157	1
4	13	157	2
4	13	203	17
4	13	83	30
4	22	4	
4	22	215	4
4	13	211	28
4	22	234	23
4	22	126	
4	13	104	13
4	13	106	29
4	22	31	3
4	22	157	
4	22	170	1
4	13	211	1
4	13	211	2
4	13	188	13
4	13	188	16
4	13	188	11
4	13	188	8
4	13	188	9
4	22	20	
4	22	174	
4	13	106	26
4	13	106	25
4	22	234	33
4	13	139	23
4	13	211	13
4	13	211	11
4	13	162	
4	13	145	
4	13	211	3
4	13	211	6
4	13	167	1

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Sewershed	Map	Parcel	Lot
4	13	83	2
4	13	211	24
4	13	139	7
4	13	178	
4	22	234	29
4	22	24	6
4	22	215	6
4	22	256	4
4	22	170	33
4	13	139	5
4	22	40	
4	13	183	6
4	13	183	7
4	13	183	4
4	22	21	1
4	13	188	7
4	22	285	1
4	13	203	20
4	13	58	
4	22	3	
4	22	296	1
4	13	188	1
4	13	182	4
4	13	182	3
4	13	188	2
4	13	188	4
4	22	170	14
4	13	211	22
4	22	58	
4	13	106	28
4	22	170	34
4	22	170	3
4	22	170	4
4	22	170	12
4	22	170	13
4	22	170	10
4	13	157	12
4	13	157	11
4	13	157	13
4	13	167	5
4	13	168	1
4	13	171	1
4	22	118	1
4	22	206	4
4	22	170	2
4	13	169	7
4	13	211	17
4	13	211	29
4	22	119	
4	22	2	
4	13	139	11
4	13	139	12
4	22	22	8
4	22	11	6
4	22	11	4
4	22	11	2
4	22	21	3
4	22	144	
4	22	146	
4	22	188	3
4	22	108	2
4	13	203	16
4	13	83	4
4	22	257	6
4	13	83	5
4	22	94	13

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Sewershed	Map	Parcel	Lot
4	22	103	7
4	22	227	2
4	13	261	PAR C
4	22	234	22
4	13	139	6
4	13	139	27
4	13	169	5
4	22	234	14
4	22	208	
4	22	234	5
4	22	234	4
4	22	234	3
4	22	252	8
4	13	106	34
4	13	183	1
4	13	183	1
4	13	207	0010A
4	22	5	
4	22	134	
4	22	14	
4	22	94	5
4	22	253	9
4	13	139	28
4	13	139	29
4	22	234	24
4	13	202	PAR B
4	13	203	14
4	13	168	4
4	13	106	30
4	13	211	5
4	13	139	13
4	13	191	9
4	13	171	6
4	13	169	4
4	13	213	
4	13	241	2
4	22	123	
4	13	211	20
4	13	139	8
4	13	139	9
4	13	139	10
4	13	167	4
4	13	183	3
4	22	170	9
4	13	83	26
4	13	139	3
4	22	113	
4	22	181	
4	22	57	
4	22	11	3
4	13	157	9
4	13	139	31
4	13	139	21
4	22	170	5
4	22	81	
4	22	102	
4	22	102	
4	22	214	
4	22	170	31
4	22	170	38
4	22	1	
4	13	203	22
4	13	203	11
4	22	170	7
4	22	170	8
4	13	207	010C1

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Sewershed	Map	Parcel	Lot
4	22	3	
4	22	3	
4	22	3	
4	22	234	34
4	13	211	10
4	13	211	12
4	22	170	17
4	22	161	2
4	22	0001A	
4	13	188	6
4	13	157	4
4	13	157	5
4	13	168	2
4	13	106	22
4	13	106	23
4	22	152	4
4	13	171	5
4	13	190	16
4	13	190	17
4	13	169	2
4	13	169	6
4	13	169	3
4	13	225	3
4	13	225	2
4	13	241	3
4	22	170	28
4	22	170	27
4	22	170	26
4	13	106	32
4	13	212	1
4	13	104	15
4	13	104	16
4	13	83	29
4	13	83	28
4	13	203	23
4	13	171	2
4	13	183	5
4	13	197	10
4	22	241	
4	13	207	0010B
4	13	211	32
4	13	153	
4	13	211	1
4	13	211	31
4	13	139	20
4	22	234	28
4	22	234	13
4	13	139	1
4	13	139	30
4	22	170	20
4	13	211	23
4	13	211	21
4	22	170	35
4	22	249	7
4	22	16	
4	22	104	
4	13	211	8
4	13	211	9
4	22	179	
4	13	166	
4	13	83	3
4	22	94	15
4	22	247	1
4	22	247	5
4	13	83	27
4	13	203	24

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Sewershed	Map	Parcel	Lot
4	22	234	32
4	13	203	25
4	13	171	3
4	22	234	12
4	22	234	9
4	13	241	1
4	22	234	25
4	13	139	4
4	13	203	13
4	22	94	17
4	22	94	5
4	22	234	31
4	22	234	6
4	22	234	8
4	22	234	7
4	13	240	6
4	14	331	16
4	14	331	17
4	22	79	14
4	13	240	4
4	14	331	18
4	14	170	0002A
4	14	170	3
4	14	331	5
4	14	331	14
4	14	331	24
4	14	331	23
4	22	120	69
4	22	213	
4	13	240	5
4	22	31	2
4	13	106	20
4	22	297	3
4	13	220	2
4	14	187	WELL
4	22	31	1
4	23	276	OPSPA
4	22	265	
4	22	31	4
4	22	212	
4	13	147	
4	22	234	30
4	23	19	3
4	22	214	
4	22	234	10
4	13	147	
4	14	186	30
5	13	218	9
5	13	218	11
5	13	212	10
5	13	212	6
5	13	134	2
5	13	134	17
5	13	137	11
5	13	104	2
5	13	222	2
5	13	134	6
5	13	106	15
5	13	106	16
5	13	160	11
5	13	218	12
5	13	105	3
5	13	134	14
5	13	134	13
5	13	134	10
5	13	222	1

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Sewershed	Map	Parcel	Lot
4	13	157	6
4	13	190	15
4	13	157	8
4	13	157	7
4	13	169	1
4	13	168	5
4	13	211	7
4	22	94	16
5	13	106	1
5	13	106	2
5	13	212	7
5	13	137	15
5	13	218	7
5	13	105	7
5	13	104	6
5	13	222	3
5	13	218	1
5	13	134	7
5	13	134	8
5	13	160	21
5	13	14	
5	13	160	8
5	13	160	9
5	13	134	9
5	13	212	1
5	13	160	18
5	13	160	20
5	13	218	6
5	13	105	4
5	13	104	4
5	13	104	5
5	13	137	7
5	13	137	13
5	13	137	12
5	13	218	5
5	13	146	
5	13	218	13
5	13	218	3
5	13	106	9
5	13	106	7
5	13	106	6
5	13	134	3
5	13	134	4
5	13	160	
5	13	104	3
5	13	106	14
5	13	11	
5	13	100	4
5	13	100	5
5	13	218	4
5	13	104	1
5	13	105	2
5	13	134	15
5	13	222	5
5	13	53	
5	13	160	7
5	13	212	13
5	13	134	5
5	13	104	12
5	13	137	1
5	13	137	2
5	13	205	13
5	13	104	11
5	13	100	6
5	13	100	3
5	13	100	7

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Sewershed	Map	Parcel	Lot
5	13	105	5
5	13	104	18
5	13	134	12
5	13	134	11
5	13	104	7
5	13	105	6
5	13	222	
5	13	106	17
5	13	137	10
5	13	106	8
5	13	106	11
5	13	88	4
5	13	218	10
5	13	134	18
5	13	160	6
5	13	160	8
5	13	160	7
5	13	160	5
5	13	160	17
5	13	88	5
5	13	88	16
5	13	218	2
5	13	212	9
5	13	137	6
5	13	137	5
5	13	137	14
5	13	88	16
5	13	88	11
5	13	88	20
5	13	212	5
5	13	137	8
5	13	137	3
5	13	137	16
5	13	212	8
5	13	212	4
5	13	106	10
5	13	106	19
5	13	106	18
5	13	100	8
5	13	100	1
5	13	160	10
5	13	106	4
5	13	225	3
5	13	225	2
5	13	148	
5	13	137	9
5	13	160	16
5	13	134	1
5	13	66	
5	13	104	10
5	13	106	5
5	13	106	3
5	13	160	2
5	13	137	4
5	13	137	17
5	13	141	
5	13	160	10
5	13	160	9
5	13	137	19
5	13	160	11
5	13	160	6
5	13	137	20
5	13	137	18
5	13	160	3
5	13	160	1
5	13	160	12

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Sewershed	Map	Parcel	Lot
5	13	134	16
5	13	88	8
5	13	212	2
5	13	212	3
5	13	212	12
5	13	212	11
5	13	104	8
5	13	104	9
5	13	106	12
5	13	106	13
6	5	260	
6	5	162	
6	5	291	
6	6	65	
6	13	47	3
6	5	328	
6	5	288	
6	5	161	
6	5	251	
6	13	92	
6	5	262	
6	5	175	
6	13	123	5
6	6	48	
6	6	48	
6	6	49	
6	6	71	
6	5	424	
6	13	48	4
6	13	107	
6	13	73	
6	6	28	
6	6	64	
7	12	471	2
7	13	243	
7	12	291	
7	12	291	
7	13	102	4
7	13	46	2
7	12	291	
7	13	51	
7	13	70	
7	12	291	
7	12	291	
7	13	102	
7	12	16	
7	12	435	
7	13	54	
7	13	62	
7	12	291	
7	12	291	
7	12	291	
7	12	291	
8	12	407	
8	12	366	
8	12	369	
8	12	110	
8	12	192	
8	12	206	
8	13	55	
8	12	407	
8	12	185	
8	12	193	
8	12	151	
8	12	362	
8	12	254	

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Sewershed	Map	Parcel	Lot
5	13	160	2
5	13	160	3
5	13	160	4
5	13	160	19
5	13	88	16
5	13	222	4
5	13	106	20
5	13	160	1
5	13	218	8
8	12	249	
8	12	484	
8	12	209	
8	12	448	
8	12	342	
8	12	486	
8	12	314	3
8	12	156	
8	12	187	
8	12	154	
8	12	188	
8	12	111	
8	12	47	
8	12	246	
8	12	189	
8	12	190	
8	12	183	
8	12	151	
8	12	298	
8	12	298	
8	12	479	PAR7A
8	12	505	PAR10
8	12	404	
8	12	244	
8	12	106	
9	21	166	
9	21	176	
9	21	16	
9	21	168	
9	21	167	
9	21	74	
9	21	196	15
9	21	159	
9	21	175	
9	21	196	14
9	12	429	
9	12	287	
9	21	146	
9	21	23	
9	12	346	
9	21	20	
9	21	17	
9	21	120	
9	21	19	
9	21	119	
9	21	21	
9	21	203	1
9	21	204	2
9	12	431	
9	12	398	
9	12	158	
9	12	345	
9	21	196	16
9	21	122	
9	21	20	
9	12	315	
9	21	196	13

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Sewershed	Map	Parcel	Lot
8	12	155	PAR 1
8	12	212	
8	12	487	
8	12	494	
8	12	106	
8	12	106	
8	12	263	
8	12	503	PAR 7
8	12	152	
8	12	194	
10	21	131	
10	21	177	
10	12	490	
10	12	338	3
10	12	146	
10	12	316	
10	12	117	
10	12	116	
10	12	387	9
10	12	419	10
10	12	385	1
10	12	440	
10	21	147	
10	12	147	
10	12	336	1
10	12	353	3
10	21	198	2
10	21	181	
10	21	153	
10	21	182	
10	12	337	2
10	12	40	
10	12	408	1
10	12	441	
10	12	167	3
10	12	311	1
10	12	451	1
10	12	451	2
10	12	248	11
10	12	168	1
10	12	308	7
10	12	281	
10	12	491	
10	12	421	
10	12	307	
10	12	386	2
10	12	196	5
10	12	196	4
10	12	196	3
10	12	196	2
10	12	202	
10	12	390	
10	12	417	11
10	12	44	
10	12	42	
10	12	331	
10	12	43	
10	12	43	
10	12	334	
10	12	162	
10	12	162	
10	12	201	
10	12	451	3
10	12	144	
10	12	143	
10	12	145	

Mattawoman Interceptor
Future Wastewater Flows
List of Existing Properties

Sewershed	Map	Parcel	Lot
9	21	196	9
10	21	202	
10	12	210	
10	12	332	
10	12	396	
10	12	464	
10	12	414	
10	21	125	
10	21	180	
10	12	243	
10	21	70	101
10	12	517	
10	21	118	
10	12	45	
10	12	30	
10	21	139	
10	12	141	
10	12	333	
10	21	197	
10	12	345	
10	21	151	5
10	12	425	
10	12	445	
10	12	203	
10	12	393	
10	12	100	
10	12	160	
10	12	392	
10	12	290	
10	12	208	
10	12	452	
10	21	151	4
10	21	151	3
10	21	151	2
10	12	339	5
10	12	196	
10	12	376	
10	12	410	
10	12	115	
10	12	308	5
10	12	384	6
10	12	266	5
10	12	442	
10	12	308	6
10	12	236	2
10	12	41	
10	12	315	
10	12	161	
10	12	215	
10	12	187	
10	12	271	
10	21	126	
10	21	142	
10	12	207	
10	12	290	
10	21	129	
10	21	155	
10	21	128	
10	21	142	
10	21	127	
10	21	45	
10	12	227	
10	12	142	
10	12	34	
10	12	461	1
10	12	463	

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Future Wastewater Flows
List of Existing Properties

Sewershed	Map	Parcel	Lot
10	12	327	6
10	12	165	9
10	12	166	10
10	12	347	1
10	12	341	4
10	12	164	8
10	12	153	
10	12	153	
10	12	496	
10	12	205	
10	21	160	

Mattawoman Interceptor
Future Wastewater Flows
List of Existing Properties

Sewershed	Map	Parcel	Lot
10	12	378	
10	12	197	
10	12	28	1
10	12	454	
10	12	195	
10	12	28	2
10	12	308	6
10	12	243	

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Mattawoman Interceptor
Future Wastewater Flows
List of Undeveloped Properties

Sewershed	Map	Parcel	Lot	Acres	Zoning
1	21	14		234.56	RC
2	31	247	7	6.11	RC
2	31	247	8	10.22	RC
2	21	169		30	RC
2	21	170		12.08	RC
2	21	99		3	RC
2	31	97		10.5	RC
2	31	144		21.97	RC
2	21	82		48.44	RC
2	21	98		39.27	RC
2	31	267		17.28	RC
2	31	268		12.92	RC
2	31	103		139.94	RC
2	31	26		102	RC
2	31	196		50	RC
2	31	265		102.73	RC
2	31	228		2.8	RC
2	31	261		2.8	RC
2	31	156		5	RC
2	31	231		2.72	RC
2	31	123		3.59	RC
2	31	57		15.43	RC
2	31	75		22.34	RC
2	31	64		10.09	RC
2	31	21		4.1	CN
2	31	93		5.3	RC
2	31	221		20	RC
2	31	106		14.25	RC
2	31	85		12	RC
2	31	185	7	2.58	RC
2	31	121		7.83	RC
2	21	35		313.25	RC
2	21	28		764	RC
2	21	76		314.2	RC
2	31	8		17.1	RC
2	31	7		14.62	RC
2	31	7		4	CN
3	32	132		30.68	RC
3	21	24		56.2	RC
3	21	187		73.4	RC
3	21	61		69.73	RC
3	22	199		25	RC
3	22	36		46.5	RC
3	22	37		206.64	RC
3	22	41		161.54	RC
3	22	192		45.08	RC
3	22	50		138.46	RC
3	32	208		72	RR
3	32	24		7.31	RR
3	32	244		13.25	RR
3	32	100 & 48		7.38	CN

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Future Wastewater Flows
List of Undeveloped Properties

Sewershed	Map	Parcel	Lot	Acres	Zoning
4	13	57		99.66	RC
4	22	231		36.1	RC
4	22	34		145.31	RC
4	22	60		19.23	RC
4	22	275		201.55	RC
4	22	212		5.13	RC
4	13	241		10.01	RC
4	22	1		25.8	RC
4	22	1C		14.41	RC
4	13	202		23.91	RC
4	13	213		57.75	RC
4	13	147		94.41	RC
4	13	140		12.39	RC
4	22	14		38	RC
4	22	208		26.97	RC
4	13	178		109.87	RC
4	14	93		43.6	RC
4	14	8		63.6	RC
4	14	134		31.14	RC
4	22	94	1	1.76	RC
4	22	94	2	1.8	RC
4	22	94	3	1.81	RC
4	22	94	4	1.82	RC
4	14	12		32.53	RC
4	14	236		7	RC
4	14	127		49.12	RC
4	14	136		10.22	RC
4	14	135		10.38	RC
4	14	34		5.48	RC
4	14	126		2.06	RC
4	22	58		0.8	CN
5	13	52A		243.85	RC
5	13	13		143.56	RC
5	13	163		25	RC
6	5	250		4.94	CN
6	5	295		11.81	CN
6	5	441		4.22	CN
6	5	442		4.96	CN
6	5	346		5.5	CN
6	5	424		20.75	CN
6	13	156		110.92	RM
6	13	49		73.25	RM
6	6	26		28.71	RM
6	6	66		31.83	RM
7	12	437		13	RM
7	12	435		3	RM
7	12	439		8	RM
7	12	436		6	RM
7	12	453		5	RM
7	12	96		6.28	RM
7	13	45		14	RM
7	13	49		40.25	RC
7	13	254		92.91	RC
7	13	243		6.45	RC
7	13	62		15	RC
7	13	16		157.07	RC
7	13	51		269.21	RC
7	13	214		15.48	RC

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Mattawoman Interceptor
Future Wastewater Flows
List of Undeveloped Properties

Sewershed	Map	Parcel	Lot	Acres	Zoning
8	12	182		17.9	RC
8	12	111		7.44	RC
8	12	119		32.1	RC
8	12	157		77.5	IG
8	12	504		17.42	IG
8	12	253		3	IG
8	12	479		7	IG
8	12	363		35.84	IG
8	21	164		14.24	IG
8	12	364		10.25	IG
8	13	55		55.63	IG
8	13	189		22.77	RC
8	13	173		23.6	RC
9	12	158		228.25	IG
9	21	23		80.59	IG
9	21	213		34.86	IG
9	21	171		20	RC
9	21	18		32.41	RC
9	21	15		20.53	RC
9	21	17		75.4	RC
9	21	172		75.4	RC
9	21	173		75.42	RC
10	12	467		100	RC
10	12	169		400	RC
10	12	400		72.84	RC
10	12	516		15	RC
10	21	136		41.08	RC
10	21	183		10	RC
10	21	112		3	RC
10	21	106		244.64	RC
10	12	150		50	IG
10	12	204		100	IG
10	12	316		13.95	CN
10	12	161		10.3	CN
10	12	461		1.57	CN
10	12	308		1	CN

Appendix M

- Detailed Cost Estimates

Charles County
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Mattawoman Interceptor
Alternate I
Replace Existing Interceptor with New Parallel Interceptor
Preliminary Estimate of Probable Costs

	Item	Quantity	Unit	Unit Price	Total
1.	Mobilization	1	LS	$2,500.00	$2,500.00
2.	Construction Survey and Field Engineering	1	LS	$50,000.00	$50,000.00
3.	Manhole for large diameter sewer pipe (84"-96" in diameter), average depth of 20' w/interio	44	EA	$22,230.00	$978,120.00
4.	Manhole Watertight Frame and Cover	44	EA	$453.00	$19,932.00
5.	84-inch RCP Class IV Sanitary Sewer Pipe w/interior coating for hydrogen sulfide protectio	1,022	LF	$461.50	$471,653.00
6.	90-inch RCP Class IV Sanitary Sewer Pipe w/interior coating for hydrogen sulfide protectio	10,141	LF	$513.50	$5,207,403.50
7.	96-inch RCP Class IV Sanitary Sewer Pipe w/interior coating for hydrogen sulfide protectio	16,666	LF	$578.50	$9,641,281.00
8.	Clear and Grub	38	AC	$7,550.00	$289,406.27
9.	Silt Fence	56,258	LF	$4.51	$253,723.58
10.	Stabilized Construction Entrance	4	EA	$1,120.00	$4,480.00
11.	Seed, Mulch, Lime, and Fertilizer	61,842	SY	$0.71	$43,907.98
12.	Wetland Mitigation	867,540	SF	$4.00	$3,470,160.00
13.	Bitumous Concretet Base Course (10-inches in detph)	135	SY	$35.30	$4,765.50
14.	Bitumous Concretet Surface Course (2-inches in detph)	135	SY	$8.12	$1,096.20
15.	Bankrun Gravel (12-inches in depth)	135	SY	$13.56	$1,830.60
16.	Traffic Control	1	LS	$50,000.00	$50,000.00
17.	By-Pass Pumping (during connection of new and existing Interceptor)	2	MO	$175,000.00	$350,000.00
18.	10' Sewer Easement Acquistion	278,290	SF	$2.50	$695,725.00
19.	40' Construciton Easeement Acquistion	1,113,160	SF	$0.75	$834,870.00
20.	Subtotal				$22,370,854.62
21.	Contingency @ 20%				$4,474,170.92
22.	Enginering Design, Construction Adminisration, and Inspection @ 20%				$4,474,170.92
	Total				**$31,319,196.47**

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Mattawoman Interceptor
Alternate II
Parallel Existing Interceptor with New Parallel Interceptor
Preliminary Estimate of Probable Costs

	Item	Quantity	Unit	Unit Price	Total
1.	Mobilization	1	LS	$2,500.00	$2,500.00
2.	Construction Survey and Field Engineering	1	LS	$50,000.00	$50,000.00
3.	Manhole for multiple large diameter sewer pipe (MH40 and MHA), average depth of 22' w/	2	EA	$29,900.00	$59,800.00
4.	Manholes for large diameter sewer pipe (72"-84" in diameter), average depth of 20' w/interi	42	EA	$22,100.00	$928,200.00
5.	Manhole Watertight Frame and Cover	44	EA	$453.00	$19,932.00
6.	72-inch RCP Class IV Sanitary Sewer Pipe w/interior coating for hydrogen sulfide protectio	8,376	LF	$313.95	$2,629,645.20
7.	78-inch RCP Class IV Sanitary Sewer Pipe w/interior coating for hydrogen sulfide protectio	2,862	LF	$383.50	$1,097,577.00
8.	84-inch RCP Class IV Sanitary Sewer Pipe w/interior coating for hydrogen sulfide protectio	16,740	LF	$461.50	$7,725,510.00
9.	66-inch RCP Class IV Sanitary Sewer Pipe w/interior coating for hydrogen sulfide protectio	2,099	LF	$287.04	$602,496.96
10.	Heavy Cleaning and Chemical Grouting of Exisitng Interceptor where Applicable	21,240	LF	$15.00	$318,600.00
11.	Clear and Grub	38	AC	$7,550.00	$286,900.00
12.	Silt Fence	56,258	LF	$4.51	$253,723.58
13.	Stabilized Construction Entrance	4	EA	$1,120.00	$4,480.00
14.	Seed, Mulch, Lime, and Fertilizer	61,842	SY	$0.71	$43,907.98
15.	Wetland Mitigation	867,540	SF	$4.00	$3,470,160.00
16.	Bitumous Concretet Base Course (10-inches in detph)	135	SY	$35.30	$4,765.50
17.	Bitumous Concretet Surface Course (2-inches in detph)	135	SY	$8.12	$1,096.20
18.	Bankrun Gravel (12-inches in depth)	135	SY	$13.56	$1,830.60
19.	Traffic Control	1	LS	$50,000.00	$50,000.00
20.	By-Pass Pumping (during connection of new and existing Interceptor, repalcement of existi	6	MO	$175,000.00	$1,050,000.00
21.	30' Sewer Easement Acquistion	839,340	SF	$2.50	$2,098,350.00
22.	40' Construciton Easeement Acquistion	11,191,210	SF	$0.75	$8,393,407.50
23.	Subtotal				$29,092,882.52
24.	Contingency @ 20%				$5,818,576.50
25.	Enginering Design, Construction Adminisration, and Inspection @ 20%				$5,818,576.50
	Total				**$40,730,035.52**