Hydrologic and hydraulic analysis of Roots Ditch and two adjacent tributaries in the City of North Olmsted Cuyahoga County, Ohio

prepared for:

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All SWMM files should accompany this report.

INTRODUCTION

The City contracted with Hydrosphere Engineering to perform a hydrologic/hydraulic analysis of Roots Ditch and the two adjacent tributaries, develop a list of possible flood reduction options, and analyze the effectiveness of the flood reduction options. This report has been prepared to describe the work which was accomplished to perform the hydrologic/hydraulic analysis of Roots Ditch and the two adjacent tributaries for both current conditions, and for proposed conditions to determine the effectiveness of the possible flood mitigation options.

ORGANIZATION OF THIS REPORT

This report is organized by section. The beginning of each section is identified by a section heading with all capital letters. Each section of the report discusses a single topic. References are cited by author and year in the text of the report. A complete list of reference citations is located at the end of the report.

LIMITS OF ANALYSIS

The limits of the study reach of Roots Ditch investigated as part of this analysis are from the confluence with the West Branch of the Rocky River at the downstream end to just upstream (west) of Stearns Road at the upstream end. The limits of the first unnamed tributary are from the confluence with Roots Ditch at the downstream end to Interstate 480 at the upstream end. The limits of the second unnamed tributary are from the confluence with Roots Ditch at the downstream end to just east of Stearns Road at the upstream end. The study limits of Roots Ditch and the two unnamed tributaries are shown on Figure 1.

Through the limits of the study area, Roots Ditch flows generally from west to east, through the City, until reaching the confluence of the West Branch of the Rocky River. Both unnamed tributaries flow generally from west to east also, before reaching the confluence of Roots Ditch.

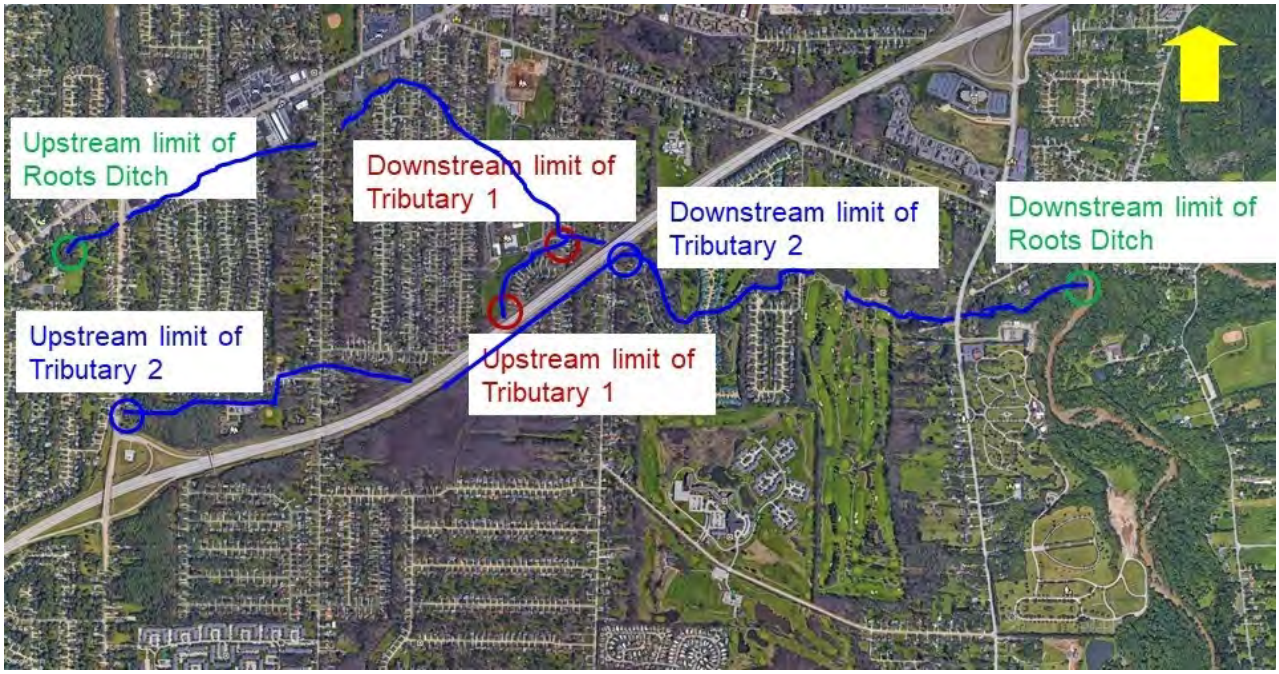


Figure 1. Study limits of Roots Ditch and the two unnamed tributaries. No scale. Map obtained from Google Maps.

DATA UTILIZED FOR THE DETERMINATION OF WATER SURFACE ELEVATIONS

The following sources of data were utilized to perform the hydrologic and hydraulic simulations used for the determination of water surface elevations for Roots Ditch and the two unnamed tributaries through the study area.

1. State of Ohio LIDAR topographic data. These data were used to generate stream cross sections through the study area for Roots Ditch and the two unnamed tributaries.

2. Cuyahoga County 2 foot topographic data. These data were used to help estimate stream elevations and were compared to LIDAR data for verification purposes.

3. Soil Survey of Cuyahoga County (December 1980). The survey was used to determine predominant soil types throughout the study area watershed.

4. NOAA Atlas 14 (2004) for applicable synthetic design storm 24 hour rainfall totals. 24 hour rainfall depths were obtained for rainfall events having an average recurrence interval of 100, 50, 25, 10, and 5 years.

5. The U.S.G.S. StreamStats website. This site was used to delineate the contributing drainage areas for Roots Ditch and the unnamed tributaries throughout the study area.

6. The current Cuyahoga County FEMA Flood Insurance Study (FIS) (December 3, 2010) and FEMA Flood Insurance Rate Map (FIRM) (December 3, 2010).

7. Various construction drawings of existing drainage structures throughout the study area. These drawings were provided by the City.

8. Data regarding the location of homes within the study area that have reported recent basement flooding.

METHOD OF ANALYSIS

To analyze flow through Roots Ditch and the two unnamed tributaries, the Storm Water Management Model (SWMM), Version 5.1.012 (March 2017) was used. This model is a dynamic flow routing model that computes the time history of flows and hydraulic heads throughout the drainage system. This model was selected because it is intended for applications in systems where the assumption of steady flow, for the purposes of computing backwater profiles, cannot be made. The program solves the full dynamic equations for gradually varied flow (St. Venant equations) and is capable of simulating surcharge conditions, as well as reverse flow conditions. The model is capable of simulating a combination of open channel flow, as well as closed conduit flow.

HYDROLOGIC ANALYSIS

For the analyses performed, a total of 13 subbasins were created within the SWMM model. Drainage areas were determined using the StreamStats website, construction drawings, and county topographic data. The total contributing drainage area for Roots Ditch with a downstream outlet being its confluence with the West Branch of the Rocky River was determined to be approximately 4.78 mi^2. Drainage areas varied from approximately 50 acres for a small subbasin located near the North Olmsted High School to approximately 1005 acres draining from the south into Tributary 2 near Interstate 480.

Figure 2 contains the entire drainage area of Roots Ditch with the downstream limit of the watershed being the confluence with the West Branch of the Rocky River. Figure 2 depicts the 13 subbasins contributing runoff to the three study reaches with their sizes. Table 1 contains a listing of the 13 subbasins contributing runoff to the three study reaches with their sizes.

The Green-Ampt method was chosen to simulate infiltration. A significant part of the drainage area is comprised of silt loam, silty clay loam, sandy loam, and Condit-Urban land complex. Table 2 contains a summary of Green-Ampt parameters used for the simulations for the soils located within the total drainage basin.

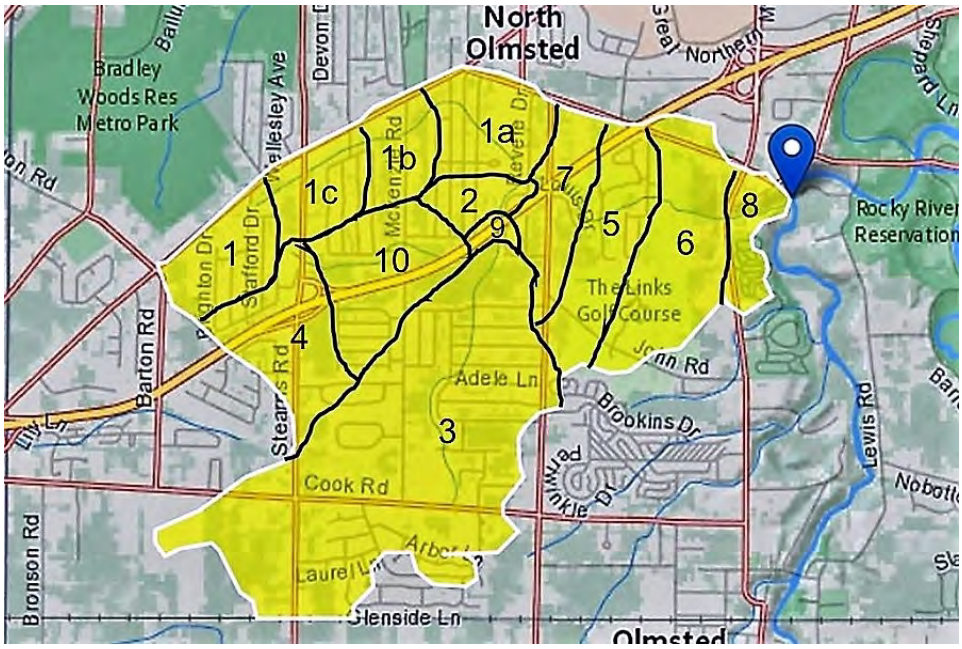


Figure 2. Contributing drainage area for the Roots Ditch watershed with delineated subbasins. North is up. No scale (Figure obtained from USGS StreamStats).

Table 1. 13 subbasins of the Roots Ditch watershed utilized as part of this study.

Subbasin #	Applicable stream reach	Area (acres)
1	Roots Ditch	92
2	Tributary 1	109
3	Tributary 2	1005
4	Tributary 2	200
5	Roots Ditch	200
6	Roots Ditch	200
7	Roots Ditch	150
8	Roots Ditch	150
9	Roots Ditch	50
10	Tributary 2	565
1a	Roots Ditch	150
1b	Roots Ditch	92
1c	Roots Ditch	93

Table 2. *Summary of Green-Ampt parameters for the various soil types used for the SWMM simulations.

Soil Type	Soil Capillary Suction Head (inches)	Saturated Hydraulic Conductivity (inches/hour)	Initial Soil Moisture Deficit (unitless)
silt loam	12	0.1	0.18
silty clay loam	32	0.01	0.06
sandy loam	3.3	1.0	0.28

*The values found in Table 2 were developed in a report prepared by De Groot and Menoes (December 2008).

For subbasins that contained more than one soil type, a combination of the values found in Table 2 was used for the infiltration parameters.

HYDRAULIC ANALYSIS

Cross section information for the hydraulic analysis was estimated using LIDAR and county topographic data. Channel roughness information was estimated by Hydrosphere Engineering from aerial photography of the study area. Manning's roughness coefficient for the channel was estimated to be 0.050. For the overbank, Manning's roughness coefficient was estimated to be between 0.09 and 0.10. These roughness factors include consideration for natural debris, such as woody debris. These items tend to significantly increase the bottom and overbank resistance during flooding events.

For the simulations performed, 44 cross sections and 16 drainage structures were utilized to estimate water surface elevation along Roots Ditch. For Tributary 1, 4 cross sections were utilized to estimate water surface elevations. For Tributary 2, 14 cross sections and 5 drainage structures were utilized to estimate water surface elevations. All cross section and drainage structure data were entered into the SWMM program (Version 5.1.010, March 2017).

DOWNSTREAM BOUNDARY CONDITION

To establish a downstream boundary condition for the subcritical stream analyses, the current FEMA FIS (December 3, 2010) was reviewed. A detailed analysis of the West Branch of the Rocky River exists at its confluence with Roots Ditch. Consequently, a known water surface elevation could be used as a downstream boundary condition.

SIMULATIONS PERFORMED FOR EXISTING CONDITIONS

Simulations were performed for rainfall events having an average recurrence interval of 5, 10, 25, 50, and 100 years.

Calibration efforts

The first simulation performed was for existing conditions for a rainfall event having an average recurrence interval of 100 years. This event was selected so that simulated SWMM water surface elevations could be compared to the existing FEMA FIRM (December 3, 2010) for Roots Ditch and the unnamed tributaries. Subbasin parameters and natural channel parameters were slightly adjusted so that the SWMM simulated values matched well with the water surface elevations shown on the current FEMA FIRM (December 3, 2010). The parameter adjustments represented the calibration efforts for this project.

PROPOSED FLOOD REDUCTION OPTIONS

The following options were identified as possible flood reduction options within the limits of the study area:

1. Enlarge the existing culverts along the main line Roots Ditch at Decker Road and Porter Road.

2. Construct a regional detention basin along the main line Roots Ditch just west of Stearns Road, and north of Stewart Drive. The approximate top area of the proposed basin is 2.4 acres and is approximately 3.5 feet deep.

3. Construct an additional bypass culvert along the main line Roots Ditch at Fitch Road, near Interstate 480.

4. Construct a regional detention basin along Tributary 2 just east of Stearns Road, and north of Interstate 480. The approximate top area of the proposed basin is 5.0 acres and is approximately 4 feet deep.

5. Construct a regional detention basin along the main line Roots Ditch just west of MacKenzie Road, and south of Lorain Road. The approximate top area of the proposed basin is 4.2 acres and is approximately 4 feet deep.

6. Construct a regional detention basin along Tributary 2 just south of Interstate 480, and west of Bellevue Drive. The approximate top area of the proposed basin is 5.0 acres and is approximately 4 feet deep.

7. Construct a regional detention basin along Tributary 2 just south of Interstate 480, near the golf course. The approximate top area of the proposed basin is 1.6 acres and is approximately 7 feet deep.

Simulations for all of these possible flood mitigation options were performed for rainfall events having an average recurrence interval of 100, 50, 25, 10, and 5 years.

RESULTS OF PROPOSED CONDITIONS SIMULATIONS

All simulation results of the proposed flood reduction options have been tabulated in an Excel spreadsheet (The spreadsheet is included with this report.). The results spreadsheet contains 7 tabs. The first tab contains a description of the existing conditions and proposed flood reduction options, as well as aerial views of all proposed regional detention basins with approximate location and size depicted. The spreadsheet's second tab contains the schematic work map area of the developed SWMM model. This figure depicts the location of all junctions and conduits developed in the SWMM model throughout the study area. Tabs 3 through 7 contain tabular results of all proposed reduction options for average recurrence intervals of 5 through 100 years. For each tab, existing conditions water surface elevations are also included so that a comparison can be made as to the effectiveness of each flood reduction option. Cells that have a yellow color represent a lowering of the water surface elevation of 0.3 feet or greater. A lowering of the water surface elevation of 0.3 feet or greater is considered significant.

DISCUSSION OF RESULTS AND RECOMMENDATIONS

Based upon the tabulated results shown in the Excel spreadsheet, the following comments and recommendations can be made:

1. Option 1 provides significant water surface elevation reduction for approximately 820 feet along Roots Ditch in the vicinity of Decker Road and Porter Road. Construction of this option should help to alleviate flooding in the Decker Road and Porter Road vicinity.

2. Option 2 provides significant water surface elevation reduction for approximately 5,200 feet along Roots Ditch from approximately Stearns Road to Decker Road and Porter Road. Construction of this option should help to alleviate flooding along Roots Ditch from the Stearns Road vicinity to the Decker Road and Porter Road vicinity.

3. Option 3 provides little reduction in water surface elevation in the Fitch Road vicinity. This option is not recommended.

4. Option 4 provides significant water surface elevation reduction for approximately 4,200 feet along Tributary 2 from approximately Stearns Road to Interstate 480. Construction of this option should help to alleviate flooding along Tributary 2 from the Stearns Road vicinity to the Interstate 480 vicinity.

5. Option 5 provides significant water surface elevation reduction for approximately 4,250 feet along Roots Ditch from just west of Mackenzie Road to the North

Olmsted High School. Construction of this option should help to alleviate flooding along Roots Ditch from the MacKenzie Road vicinity to the vicinity of the North Olmsted High School.

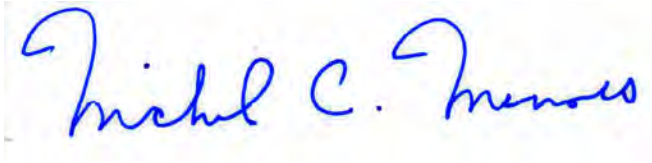
6. Option 6 provides significant water surface elevation reduction for approximately 4,250 feet along Roots Ditch from Burns Road to Greenward Way. This option additionally provides significant water surface elevation reduction for approximately 4,500 feet along Tributary 1 from Stearns Road to Fitch Road, and provides significant water surface elevation reduction along the full length of Tributary 2.

7. Option 7 provides little reduction in water surface elevation near the proposed basin. This option is not recommended.

8. Cross sections are not based upon field surveying, but rather were estimated based upon LIDAR and county topographic data. Possible depths of regional basins are also estimated and based on LIDAR and county topographic data. If the City decides to pursue any of the proposed mitigation options, it is recommended that field data be obtained, the SWMM model by updated, and simulations be rerun to verify initial model results. Additionally, if a regional basin option is considered, but the top area of the regional basin differs significantly from the size indicated in this report, it is recommended that the SWMM model by updated with the new basin size, and simulations be rerun to verify initial model results.

TECHNICAL CERTIFICATION

All work done in the preparation of this report was under my direct supervision.



February 8, 2018

Michael C. Menoes, Ph.D., P.E. — Date
State of Ohio
Registered Professional Engineer E-59955

REFERENCES

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APPENDIX

Summary of SWMM simulation output

Roots Ditch Flood Mitigation Project - hydraulic analyses summary

Hydrosphere Engineering

November 2018

All cross section data obtained from LIDAR and county information. These data were not field verified.

The following is a description of existing conditions and the proposed conditions scenarios.
The results of these scenarios are tabulated on the following tabs for various recurrence intervals.

Existing conditions: Cross section data primarily obtained from LIDAR data, culvert data obtained from existing City construction drawings.
The main line Roots Ditch culverts at Decker Road and Porter Road are the only 2 drainage structures to overtop the roadway during a 10 year rainfall event.

Option 1: Enlarge existing culverts along main line Roots Ditch at Decker Road and Porter Road.
Replace both existing elliptical culverts with 5 feet by 10 feet box culverts.

Option 2: Regional detention along main line Roots Ditch just west of Stearns Road, and north of Stewart Drive.
Top area of regional basin ~ 2.4 acres and 3.5 feet deep. Inv. ~ 773 feet
Connects to stream at Junction J1h

Option 3: Construct additional bypass culvert under Fitch Road (by I-480).
Construct additional 3 feet by 5 feet box culvert adjacent to existing culvert.

Option 4: Regional detention along south tributary just east of Stearns Road, and north of I-480.
Top area of regional basin ~ 5 acres and 4.0 feet deep. Inv. ~ 772 feet
Connects to stream at Junction J2r

Option 5: Regional detention along Roots Ditch just west of MacKenzie Road, and south of Lorain Road.
Top area of regional basin ~ 4.2 acres and 4.0 feet deep. Inv. ~ 771.2 feet
Connects to stream at Junction J1b

Option 6: Regional detention along tributary flowing from south just south of I-480, and west of Bellevue Drive.
Top area of regional basin ~ 5.0 acres and 4.0 feet deep. Inv. ~ 763.2 feet
Connects to stream at Junction J2e

Option 7: Regional detention along south tributary near golf course.

Top area of regional basin ~ 1.6 acres and 7.0 feet deep. Inv. ~ 760.0 feet

Connects to stream at Junction J410

SWMM simulation results for
a 5 year recurrence interval
rainfall event

Roots Ditch Flood Mitigation Project - hydraulic analyses summary
Hydrosphere Engineering Nov-18

Table 1. Results for a 5 year recurrence interval

- Represents a reduction in water surface elevation of 0.3 feet or greater.

	Junction	Channel distance from previous section (feet)	Cumulative channel distance (feet)	Existing Conditions water surface elevation (feet)	Proposed Conditions Option 1 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 2 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 3 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 4 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)
Main line	Outfall	0	0	672.50	672.50	0.00	672.50	0.00	672.50	0.00	672.50	0.00
	J200	500	500	672.78	672.78	0.00	672.78	0.00	672.78	0.00	672.78	0.00
	J210	600	1100	684.80	684.80	0.00	684.80	0.00	684.80	0.00	684.80	0.00
	J220	150	1250	692.07	692.07	0.00	692.07	0.00	692.07	0.00	692.07	0.00
	J230	125	1375	698.45	698.45	0.00	698.40	-0.05	698.45	0.00	698.45	0.00
	J240	400	1775	705.65	705.65	0.00	705.59	-0.06	705.65	0.00	705.65	0.00
	J250	344	2119	714.15	714.15	0.00	714.05	-0.10	714.15	0.00	714.15	0.00
	J260	200	2319	721.01	721.01	0.00	720.94	-0.07	721.01	0.00	721.01	0.00
	J270	1500	3819	739.68	739.68	0.00	739.63	-0.05	739.68	0.00	739.68	0.00
	J280	550	4369	747.89	747.89	0.00	747.81	-0.08	747.89	0.00	747.85	-0.04
	J290	400	4769	752.92	752.92	0.00	752.89	-0.03	752.92	0.00	752.91	-0.01
	J300	220	4989	755.65	755.65	0.00	755.58	-0.07	755.65	0.00	755.62	-0.03
	J310	46	5035	755.73	755.73	0.00	755.66	-0.07	755.73	0.00	755.70	-0.03
	J320	220	5255	757.21	757.21	0.00	757.13	-0.08	757.21	0.00	757.16	-0.05
	J330	340	5595	758.15	758.15	0.00	758.06	-0.09	758.15	0.00	758.10	-0.05
	J340	270	5865	759.39	759.39	0.00	759.30	-0.09	759.39	0.00	759.34	-0.05
	J350	240	6105	761.33	761.33	0.00	761.25	-0.08	761.33	0.00	761.29	-0.04
	J360	250	6355	762.41	762.41	0.00	762.33	-0.08	762.41	0.00	762.36	-0.05
	J370	29	6384	763.24	763.24	0.00	763.14	-0.10	763.24	0.00	763.18	-0.06
	J380	180	6564	763.81	763.81	0.00	763.71	-0.10	763.81	0.00	763.75	-0.06
	J390	380	6944	765.37	765.37	0.00	765.24	-0.13	765.37	0.00	765.29	-0.08
	J400	420	7364	766.43	766.43	0.00	766.29	-0.14	766.43	0.00	766.34	-0.09
	J410	110	7474	766.64	766.64	0.00	766.50	-0.14	766.63	-0.01	766.54	-0.10
	J420	320	7794	766.94	766.94	0.00	766.80	-0.14	766.94	0.00	766.85	-0.09
	J430	315	8109	766.97	766.97	0.00	766.82	-0.15	766.97	0.00	766.88	-0.09
	J440	487	8596	767.01	767.01	0.00	766.85	-0.16	767.00	-0.01	766.93	-0.08
	J190	65	8661	767.02	767.02	0.00	766.86	-0.16	767.02	0.00	766.94	-0.08
	J180	120	8781	767.03	767.03	0.00	766.87	-0.16	767.02	-0.01	766.95	-0.08
	J170	81	8862	767.03	767.03	0.00	766.87	-0.16	767.03	0.00	766.95	-0.08
	J160	48	8910	767.04	767.04	0.00	766.88	-0.16	767.03	-0.01	766.96	-0.08
	J150	130	9040	767.04	767.04	0.00	766.88	-0.16	767.04	0.00	766.97	-0.07
	J140	73	9113	767.05	767.05	0.00	766.88	-0.17	767.04	-0.01	766.97	-0.08
	J130	8	9121	767.05	767.05	0.00	766.88	-0.17	767.04	-0.01	766.97	-0.08
	J120	128	9249	767.05	767.05	0.00	766.88	-0.17	767.05	0.00	766.98	-0.07
	J110	303	9552	767.07	767.06	-0.01	766.90	-0.17	767.06	-0.01	767.00	-0.07
	J100	84	9636	767.07	767.07	0.00	766.90	-0.17	767.07	0.00	767.00	-0.07
	J90	114	9750	767.08	767.07	-0.01	766.90	-0.18	767.07	-0.01	767.01	-0.07
	J80	13	9763	767.08	767.07	-0.01	766.91	-0.17	767.07	-0.01	767.01	-0.07
	J70	21	9784	767.09	767.08	-0.01	766.91	-0.18	767.08	-0.01	767.02	-0.07
	J60	8	9792	767.09	767.08	-0.01	766.91	-0.18	767.08	-0.01	767.02	-0.07
	J50	312	10104	767.11	767.10	-0.01	766.93	-0.18	767.10	-0.01	767.04	-0.07
	J40	95	10199	767.11	767.10	-0.01	766.93	-0.18	767.10	-0.01	767.04	-0.07
	J30	110	10309	767.11	767.10	-0.01	766.93	-0.18	767.10	-0.01	767.04	-0.07
	J20	48	10357	767.21	767.20	-0.01	767.00	-0.21	767.20	-0.01	767.16	-0.05
	J10	52	10409	767.21	767.20	-0.01	767.00	-0.21	767.20	-0.01	767.16	-0.05
	J9	250	10659	767.24	767.23	-0.01	767.03	-0.21	767.24	0.00	767.24	0.00
	J8	80	10739	767.59	767.56	-0.03	767.21	-0.38	767.59	0.00	767.59	0.00
	J7	150	10889	768.33	*768.44*	*0.11*	767.97	-0.36	768.33	0.00	768.33	0.00
	J6	150	11039	768.83	*768.94*	*0.11*	768.40	-0.43	768.83	0.00	768.83	0.00
	J5	160	11199	769.87	769.17	-0.70	768.96	-0.91	769.87	0.00	769.87	0.00
	J4	233	11432	770.00	769.46	-0.54	769.15	-0.85	770.00	0.00	770.00	0.00
	J3	80	11512	770.58	769.69	-0.89	769.52	-1.06	770.58	0.00	770.58	0.00
	J2	350	11862	770.84	770.31	-0.53	769.93	-0.91	770.84	0.00	770.84	0.00
	J1	490	12352	771.83	771.80	-0.03	771.25	-0.58	771.83	0.00	771.83	0.00
	J1a	410	12762	772.14	772.11	-0.03	771.39	-0.75	772.14	0.00	772.14	0.00
	J1b	400	13162	774.33	774.33	0.00	773.67	-0.66	774.33	0.00	774.33	0.00
	J1c	680	13842	775.28	775.28	0.00	774.36	-0.92	775.28	0.00	775.28	0.00
	J1d	380	14222	775.52	775.52	0.00	774.42	-1.10	775.52	0.00	775.52	0.00
	J1e	330	14552	775.66	775.66	0.00	774.56	-1.10	775.66	0.00	775.66	0.00
	J1f	610	15162	775.97	775.97	0.00	774.86	-1.11	775.97	0.00	775.97	0.00
	J1g	320	15482	775.99	775.99	0.00	774.87	-1.12	775.99	0.00	775.99	0.00
	J1h	450	15932	776.10	776.10	0.00	775.03	-1.07	776.10	0.00	776.10	0.00
Tributary 1	J180	0	0	767.03	767.03	0.00	766.87	-0.16	767.02	-0.01	766.95	-0.08
	JTrib4	177	177	767.03	767.03	0.00	766.87	-0.16	767.02	-0.01	766.95	-0.08
	JTrib3	248	425	767.03	767.03	0.00	766.87	-0.16	767.02	-0.01	766.95	-0.08
	JTrib2	288	713	767.03	767.03	0.00	766.87	-0.16	767.03	0.00	766.95	-0.08
	JTrib1	500	1213	767.03	767.03	0.00	766.87	-0.16	767.03	0.00	766.95	-0.08
Tributary 2	J420	0	0	766.94	766.94	0.00	766.80	-0.14	766.94	0.00	766.85	-0.09
	J2a	150	150	766.98	766.98	0.00	766.84	-0.14	766.97	-0.01	766.88	-0.10
	J2b	190	340	767.16	767.16	0.00	767.03	-0.13	767.16	0.00	767.04	-0.12
	J2c	450	790	767.70	767.70	0.00	767.64	-0.06	767.70	0.00	767.58	-0.12
	J2d	500	1290	768.63	768.63	0.00	768.61	-0.02	768.63	0.00	768.55	-0.08
	J2e	750	2040	770.04	770.04	0.00	770.04	0.00	770.04	0.00	769.99	-0.05
	J2f	450	2490	770.15	770.15	0.00	770.15	0.00	770.15	0.00	770.00	-0.15
	J2g	600	3090	770.45	770.45	0.00	770.45	0.00	770.45	0.00	770.00	-0.45
	J2h	383	3473	770.58	770.58	0.00	770.58	0.00	770.58	0.00	770.00	-0.58
	J2i	300	3773	770.82	770.82	0.00	770.82	0.00	770.82	0.00	770.01	-0.81
	J2j	390	4163	771.36	771.36	0.00	771.36	0.00	771.36	0.00	770.03	-1.33
	J2k	380	4543	771.96	771.96	0.00	771.96	0.00	771.96	0.00	770.04	-1.92
	J2l	480	5023	773.25	773.25	0.00	773.25	0.00	773.25	0.00	771.27	-1.98
	J2m	106	5129	773.40	773.40	0.00	773.40	0.00	773.40	0.00	771.32	-2.08
	J2n	310	5439	774.54	774.54	0.00	774.54	0.00	774.54	0.00	772.62	-1.92
	J2o	700	6139	775.70	775.70	0.00	775.70	0.00	775.70	0.00	773.44	-2.26
	J2p	38	6177	775.89	775.89	0.00	775.89	0.00	775.89	0.00	773.48	-2.41
	J2q	440	6617	776.27	776.27	0.00	776.27	0.00	776.27	0.00	773.83	-2.44
	J2r	280	6897	776.59	776.59	0.00	776.59	0.00	776.59	0.00	774.09	-2.50
	J2s	420	7317	777.05	777.05	0.00	777.05	0.00	777.05	0.00	776.27	-0.78

Proposed Conditions Scenario 5 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 6 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 7 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)
672.5	0.00	672.5	0.00	672.5	0.00
672.74	-0.04	672.68	-0.10	672.76	-0.02
684.67	-0.13	684.51	-0.29	684.73	-0.07
691.97	-0.10	691.85	-0.22	692.02	-0.05
698.35	-0.10	698.22	-0.23	698.40	-0.05
705.52	-0.13	705.37	-0.28	705.58	-0.07
713.93	-0.22	713.71	-0.44	714.04	-0.11
720.86	-0.15	720.50	-0.51	720.93	-0.08
739.53	-0.15	739.37	-0.31	739.63	-0.05
747.74	-0.15	747.56	-0.33	747.81	-0.08
752.87	-0.05	752.81	-0.11	752.89	-0.03
755.51	-0.14	755.35	-0.30	755.58	-0.07
755.58	-0.15	755.41	-0.32	755.66	-0.07
757.05	-0.16	756.89	-0.32	757.13	-0.08
757.97	-0.18	757.79	-0.36	758.06	-0.09
759.21	-0.18	759.02	-0.37	759.30	-0.09
761.18	-0.15	761.02	-0.31	761.26	-0.07
762.26	-0.15	762.09	-0.32	762.33	-0.08
763.05	-0.19	762.86	-0.38	763.15	-0.09
763.61	-0.20	763.39	-0.42	763.72	-0.09
765.11	-0.26	764.84	-0.53	765.25	-0.12
766.15	-0.28	765.88	-0.55	766.31	-0.12
766.35	-0.29	766.10	-0.54	766.51	-0.13
766.66	-0.28	766.37	-0.57	766.82	-0.12
766.68	-0.29	766.42	-0.55	766.85	-0.12
766.7	-0.31	766.49	-0.52	766.88	-0.13
766.71	-0.31	766.57	-0.45	766.90	-0.12
766.71	-0.32	766.58	-0.45	766.90	-0.13
766.71	-0.32	766.58	-0.45	766.90	-0.13
766.71	-0.33	766.58	-0.46	766.91	-0.13
766.72	-0.32	766.58	-0.46	766.92	-0.12
766.72	-0.33	766.58	-0.47	766.92	-0.13
766.72	-0.33	766.58	-0.47	766.92	-0.13
766.72	-0.33	766.59	-0.46	766.92	-0.13
766.73	-0.34	766.61	-0.46	766.94	-0.13
766.73	-0.34	766.62	-0.45	766.94	-0.13
766.74	-0.34	766.62	-0.46	766.95	-0.13
766.74	-0.34	766.62	-0.46	766.95	-0.13
766.74	-0.35	766.63	-0.46	766.96	-0.13
766.74	-0.35	766.64	-0.45	766.96	-0.13
766.76	-0.35	766.64	-0.47	766.98	-0.13
766.76	-0.35	766.64	-0.47	766.98	-0.13
766.76	-0.35	766.65	-0.46	766.98	-0.13
766.81	-0.40	766.71	-0.50	767.08	-0.13
766.81	-0.40	766.77	-0.44	767.08	-0.13
766.83	-0.41	766.82	-0.42	767.11	-0.13
766.97	-0.62	767.19	-0.40	767.43	-0.16
767.58	-0.75	768.30	-0.03	768.32	-0.01
767.90	-0.93	768.81	-0.02	768.83	0.00
768.20	-1.67	769.87	0.00	769.87	0.00
768.39	-1.61	770.00	0.00	770.00	0.00
768.64	-1.94	770.58	0.00	770.58	0.00
769.12	-1.72	770.84	0.00	770.84	0.00
770.55	-1.28	771.83	0.00	771.83	0.00
770.64	-1.50	772.14	0.00	772.14	0.00
773.41	-0.92	774.33	0.00	774.33	0.00
775.29	0.01	775.28	0.00	775.28	0.00
775.54	0.02	775.52	0.00	775.52	0.00
775.68	0.02	775.66	0.00	775.66	0.00
776.00	0.03	775.97	0.00	775.97	0.00
776.02	0.03	775.99	0.00	775.99	0.00
776.12	0.02	776.10	0.00	776.10	0.00
766.71	-0.32	766.58	-0.45	766.90	-0.13
766.71	-0.32	766.58	-0.45	766.90	-0.13
766.71	-0.32	766.58	-0.45	766.91	-0.12
766.71	-0.32	766.58	-0.45	766.91	-0.12
766.72	-0.31	766.59	-0.44	766.91	-0.12
766.66	-0.28	766.37	-0.57	766.82	-0.12
766.70	-0.28	766.44	-0.54	766.85	-0.13
766.89	-0.27	766.53	-0.63	767.03	-0.13
767.57	-0.13	767.08	-0.62	767.61	-0.09
768.59	-0.04	768.05	-0.58	768.59	-0.04
770.04	0.00	769.32	-0.72	770.04	0.00
770.15	0.00	769.50	-0.65	770.15	0.00
770.45	0.00	769.72	-0.73	770.45	0.00
770.58	0.00	769.78	-0.80	770.58	0.00
770.82	0.00	769.87	-0.95	770.82	0.00
771.36	0.00	770.82	-0.54	771.36	0.00
771.96	0.00	771.63	-0.33	771.96	0.00
773.25	0.00	773.25	0.00	773.25	0.00
773.40	0.00	773.40	0.00	773.40	0.00
774.54	0.00	774.54	0.00	774.54	0.00
775.70	0.00	775.70	0.00	775.70	0.00
775.89	0.00	775.89	0.00	775.89	0.00
776.27	0.00	776.27	0.00	776.27	0.00
776.59	0.00	776.59	0.00	776.59	0.00
777.05	0.00	777.05	0.00	777.05	0.00

SWMM simulation results for
a 10 year recurrence interval
rainfall event

Roots Ditch Flood Mitigation Project - hydraulic analyses summary

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Table 2. Results for a 10 year recurrence interval - Represents a reduction in water surface elevation of 0.3 feet or greater.

	Node	Channel distance from previous section (feet)	Cumulative channel distance (feet)	Existing Conditions water surface elevation (feet)	Proposed Conditions Option 1 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 2 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 3 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 4 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)
Main line	Outfall	0	0	672.50	672.50	0.00	672.50	0.00	672.50	0.00	672.50	0.00
	J200	500	500	672.93	672.93	0.00	672.93	0.00	672.93	0.00	672.93	0.00
	J210	600	1100	685.21	685.21	0.00	685.21	0.00	685.21	0.00	685.21	0.00
	J220	150	1250	692.37	692.37	0.00	692.37	0.00	692.37	0.00	692.37	0.00
	J230	125	1375	698.76	698.76	0.00	698.71	-0.05	698.76	0.00	698.76	0.00
	J240	400	1775	706.01	706.01	0.00	705.95	-0.06	706.01	0.00	706.01	0.00
	J250	344	2119	714.82	714.82	0.00	714.71	-0.11	714.82	0.00	714.82	0.00
	J260	200	2319	721.45	721.45	0.00	721.38	-0.07	721.45	0.00	721.45	0.00
	J270	1500	3819	740.04	740.04	0.00	739.97	-0.07	740.04	0.00	740.04	0.00
	J280	550	4369	748.28	748.28	0.00	748.22	-0.06	748.28	0.00	748.26	-0.02
	J290	400	4769	753.05	753.05	0.00	753.03	-0.02	753.05	0.00	753.05	0.00
	J300	220	4989	756.05	756.05	0.00	755.98	-0.07	756.05	0.00	756.03	-0.02
	J310	46	5035	756.15	756.15	0.00	756.08	-0.07	756.15	0.00	756.13	-0.02
	J320	220	5255	757.61	757.61	0.00	757.54	-0.07	757.61	0.00	757.59	-0.02
	J330	340	5595	758.58	758.58	0.00	758.50	-0.08	758.58	0.00	758.56	-0.02
	J340	270	5865	759.82	759.82	0.00	759.74	-0.08	759.82	0.00	759.79	-0.03
	J350	240	6105	761.66	761.66	0.00	761.60	-0.06	761.66	0.00	761.63	-0.03
	J360	250	6355	762.84	762.84	0.00	762.74	-0.10	762.84	0.00	762.79	-0.05
	J370	29	6384	763.70	763.70	0.00	763.61	-0.09	763.70	0.00	763.66	-0.04
	J380	180	6564	764.32	764.32	0.00	764.23	-0.09	764.33	0.01	764.29	-0.03
	J390	380	6944	766.01	766.01	0.00	765.89	-0.12	766.01	0.00	765.96	-0.05
	J400	420	7364	767.05	767.05	0.00	766.93	-0.12	767.05	0.00	766.99	-0.06
	J410	110	7474	767.24	767.24	0.00	767.13	-0.11	767.24	0.00	767.19	-0.05
	J420	320	7794	767.55	767.54	-0.01	767.43	-0.12	767.55	0.00	767.50	-0.05
	J430	315	8109	767.59	767.59	0.00	767.47	-0.12	767.58	-0.01	767.55	-0.04
	J440	487	8596	767.63	767.62	-0.01	767.50	-0.13	767.62	-0.01	767.59	-0.04
	J190	65	8661	767.65	767.65	0.00	767.51	-0.14	767.65	0.00	767.62	-0.03
	J180	120	8781	767.66	767.65	-0.01	767.52	-0.14	767.65	-0.01	767.62	-0.04
	J170	81	8862	767.66	767.66	0.00	767.52	-0.14	767.65	-0.01	767.63	-0.03
	J160	48	8910	767.68	767.68	0.00	767.53	-0.15	767.67	-0.01	767.64	-0.04
	J150	130	9040	767.68	767.68	0.00	767.53	-0.15	767.67	-0.01	767.65	-0.03
	J140	73	9113	767.68	767.68	0.00	767.53	-0.15	767.67	-0.01	767.65	-0.03
	J130	8	9121	767.68	767.68	0.00	767.54	-0.14	767.68	0.00	767.65	-0.03
	J120	128	9249	767.69	767.69	0.00	767.54	-0.15	767.68	-0.01	767.66	-0.03
	J110	303	9552	767.71	767.71	0.00	767.55	-0.16	767.70	-0.01	767.68	-0.03
	J100	84	9636	767.71	767.71	0.00	767.56	-0.15	767.70	-0.01	767.68	-0.03
	J90	114	9750	767.71	767.71	0.00	767.56	-0.15	767.71	0.00	767.69	-0.02
	J80	13	9763	767.72	767.71	-0.01	767.56	-0.16	767.71	-0.01	767.69	-0.03
	J70	21	9784	767.72	767.71	-0.01	767.57	-0.15	767.72	0.00	767.70	-0.02
	J60	8	9792	767.73	767.71	-0.02	767.57	-0.16	767.72	-0.01	767.70	-0.03
	J50	312	10104	767.74	767.72	-0.02	767.58	-0.16	767.73	-0.01	767.71	-0.03
	J40	95	10199	767.74	767.73	-0.01	767.58	-0.16	767.73	-0.01	767.72	-0.02
	J30	110	10309	767.74	767.73	-0.01	767.58	-0.16	767.73	-0.01	767.72	-0.02
	J20	48	10357	767.86	767.84	-0.02	767.67	-0.19	767.85	-0.01	767.85	-0.01
	J10	52	10409	767.87	767.84	-0.03	767.67	-0.20	767.86	-0.01	767.86	-0.01
	J9	250	10659	767.89	767.87	-0.02	767.69	-0.20	767.89	0.00	767.89	0.00
	J8	80	10739	768.48	768.51	0.03	768.02	-0.46	768.48	0.00	768.48	0.00
	J7	150	10889	768.95	769.17	0.22	768.50	-0.45	768.95	0.00	768.95	0.00
	J6	150	11039	769.37	769.58	0.21	768.90	-0.47	769.37	0.00	769.37	0.00
	J5	160	11199	770.79	769.85	-0.94	769.84	-0.95	770.79	0.00	770.79	0.00
	J4	233	11432	770.88	770.09	-0.79	769.96	-0.92	770.88	0.00	770.88	0.00
	J3	80	11512	771.52	770.35	-1.17	770.49	-1.03	771.52	0.00	771.52	0.00
	J2	350	11862	771.69	770.86	-0.83	770.74	-0.95	771.69	0.00	771.69	0.00
	J1	490	12352	772.44	772.26	-0.18	771.78	-0.66	772.44	0.00	772.44	0.00
	J1a	410	12762	772.79	772.64	-0.15	771.94	-0.85	772.79	0.00	772.79	0.00
	J1b	400	13162	774.58	774.59	0.01	773.91	-0.67	774.58	0.00	774.58	0.00
	J1c	680	13842	775.60	775.60	0.00	774.75	-0.85	775.60	0.00	775.60	0.00
	J1d	380	14222	775.85	775.85	0.00	774.87	-0.98	775.85	0.00	775.85	0.00
	J1e	330	14552	775.98	775.98	0.00	775.01	-0.97	775.98	0.00	775.98	0.00
	J1f	610	15162	776.28	776.28	0.00	775.32	-0.96	776.28	0.00	776.28	0.00
	J1g	320	15482	776.30	776.30	0.00	775.33	-0.97	776.30	0.00	776.30	0.00
	J1h	450	15932	776.38	776.38	0.00	775.49	-0.89	776.38	0.00	776.38	0.00
Tributary 1	J180	0	0	767.66	767.65	-0.01	767.52	-0.14	767.65	-0.01	767.62	-0.04
	JTrib4	177	177	767.66	767.65	-0.01	767.52	-0.14	767.65	-0.01	767.62	-0.04
	JTrib3	248	425	767.66	767.65	-0.01	767.52	-0.14	767.65	-0.01	767.63	-0.03
	JTrib2	288	713	767.66	767.65	-0.01	767.52	-0.14	767.66	0.00	767.63	-0.03
	JTrib1	500	1213	767.66	767.65	-0.01	767.52	-0.14	767.66	0.00	767.63	-0.03
Tributary 2	J420	0	0	767.55	767.54	-0.01	767.43	-0.12	767.55	0.00	767.50	-0.05
	J2a	150	150	767.58	767.58	0.00	767.47	-0.11	767.58	0.00	767.53	-0.05
	J2b	190	340	767.87	767.87	0.00	767.76	-0.11	767.87	0.00	767.79	-0.08
	J2c	450	790	768.30	768.30	0.00	768.24	-0.06	768.30	0.00	768.24	-0.06
	J2d	500	1290	769.11	769.11	0.00	769.09	-0.02	769.11	0.00	769.11	0.00
	J2e	750	2040	770.47	770.47	0.00	770.47	0.00	770.47	0.00	770.51	0.04
	J2f	450	2490	770.57	770.57	0.00	770.57	0.00	770.57	0.00	770.52	-0.05
	J2g	600	3090	770.85	770.85	0.00	770.85	0.00	770.85	0.00	770.52	-0.33
	J2h	383	3473	771.01	771.01	0.00	771.01	0.00	771.01	0.00	770.53	-0.48
	J2i	300	3773	771.27	771.27	0.00	771.27	0.00	771.27	0.00	770.54	-0.73
	J2j	390	4163	771.80	771.80	0.00	771.80	0.00	771.80	0.00	770.56	-1.24
	J2k	380	4543	772.69	772.69	0.00	772.69	0.00	772.69	0.00	770.59	-2.10
	J2l	480	5023	773.71	773.71	0.00	773.71	0.00	773.71	0.00	771.52	-2.19
	J2m	106	5129	773.88	773.88	0.00	773.88	0.00	773.88	0.00	771.59	-2.29
	J2n	310	5439	774.91	774.91	0.00	774.91	0.00	774.91	0.00	772.95	-1.96
	J2o	700	6139	776.03	776.03	0.00	776.03	0.00	776.03	0.00	773.86	-2.17
	J2p	38	6177	776.27	776.27	0.00	776.27	0.00	776.27	0.00	773.92	-2.35
	J2q	440	6617	776.62	776.62	0.00	776.62	0.00	776.62	0.00	774.29	-2.33
	J2r	280	6897	776.93	776.93	0.00	776.93	0.00	776.93	0.00	774.57	-2.36
	J2s	420	7317	777.42	777.42	0.00	777.42	0.00	777.42	0.00	776.77	-0.65

Proposed Conditions Scenario 5 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 6 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 7 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)
672.50	0.00	672.5	0.00	672.5	0.00
672.88	-0.05	672.81	-0.12	672.90	-0.03
685.07	-0.14	684.95	-0.26	685.14	-0.07
692.27	-0.10	692.17	-0.20	692.33	-0.04
698.65	-0.11	698.56	-0.20	698.71	-0.05
705.88	-0.13	705.74	-0.27	705.96	-0.05
714.58	-0.24	714.45	-0.37	714.72	-0.10
721.29	-0.16	721.16	-0.29	721.38	-0.07
739.89	-0.15	739.76	-0.28	739.98	-0.06
748.15	-0.13	748.03	-0.25	748.22	-0.06
753.00	-0.05	752.96	-0.09	753.05	0.00
755.90	-0.15	755.78	-0.27	755.99	-0.06
755.99	-0.16	755.87	-0.28	756.08	-0.07
757.46	-0.15	757.34	-0.27	757.55	-0.06
758.41	-0.17	758.29	-0.29	758.51	-0.07
759.66	-0.16	759.55	-0.27	759.75	-0.07
761.53	-0.13	761.45	-0.21	761.61	-0.05
762.65	-0.19	762.58	-0.26	762.77	-0.07
763.51	-0.19	763.40	-0.30	763.62	-0.08
764.12	-0.20	763.96	-0.36	764.24	-0.08
765.74	-0.27	765.57	-0.44	765.91	-0.10
766.80	-0.25	766.64	-0.41	766.95	-0.10
767.00	-0.24	766.82	-0.42	767.15	-0.09
767.30	-0.25	767.14	-0.41	767.46	-0.09
767.33	-0.26	767.17	-0.42	767.50	-0.09
767.35	-0.28	767.22	-0.41	767.54	-0.09
767.37	-0.28	767.23	-0.42	767.56	-0.09
767.37	-0.29	767.24	-0.42	767.56	-0.10
767.37	-0.29	767.24	-0.42	767.57	-0.09
767.38	-0.30	767.25	-0.43	767.58	-0.10
767.38	-0.30	767.25	-0.43	767.58	-0.10
767.38	-0.30	767.25	-0.43	767.59	-0.09
767.38	-0.30	767.25	-0.43	767.59	-0.09
767.39	-0.30	767.27	-0.42	767.59	-0.10
767.40	-0.31	767.29	-0.42	767.61	-0.10
767.40	-0.31	767.29	-0.42	767.61	-0.10
767.40	-0.31	767.29	-0.42	767.62	-0.09
767.40	-0.32	767.30	-0.42	767.62	-0.10
767.41	-0.31	767.30	-0.42	767.63	-0.09
767.41	-0.32	767.32	-0.41	767.63	-0.10
767.42	-0.32	767.32	-0.42	767.64	-0.10
767.42	-0.32	767.32	-0.42	767.64	-0.10
767.42	-0.32	767.32	-0.42	767.64	-0.10
767.49	-0.37	767.43	-0.43	767.76	-0.10
767.49	-0.38	767.44	-0.43	767.76	-0.11
767.51	-0.38	767.46	-0.43	767.79	-0.10
767.74	-0.74	768.54	0.06	768.34	-0.14
768.09	-0.86	768.81	-0.14	768.90	-0.05
768.40	-0.97	769.29	-0.08	769.34	-0.03
768.84	-1.95	770.77	-0.02	770.78	-0.01
769.01	-1.87	770.86	-0.02	770.88	0.00
769.31	-2.21	771.52	0.00	771.52	0.00
769.72	-1.97	771.69	0.00	771.69	0.00
771.04	-1.40	772.44	0.00	772.44	0.00
771.07	-1.72	772.79	0.00	772.79	0.00
773.83	-0.75	774.58	0.00	774.58	0.00
775.63	0.03	775.60	0.00	775.60	0.00
775.91	0.06	775.85	0.00	775.85	0.00
776.03	0.05	775.98	0.00	775.98	0.00
776.31	0.03	776.28	0.00	776.28	0.00
776.33	0.03	776.30	0.00	776.30	0.00
776.41	0.03	776.38	0.00	776.38	0.00
767.37	-0.29	767.24	-0.42	767.56	-0.10
767.37	-0.29	767.24	-0.42	767.56	-0.10
767.37	-0.29	767.24	-0.42	767.57	-0.09
767.37	-0.29	767.25	-0.41	767.57	-0.09
767.37	-0.29	767.25	-0.41	767.57	-0.09
767.30	-0.25	767.14	-0.41	767.46	-0.09
767.34	-0.24	767.16	-0.42	767.49	-0.09
767.63	-0.24	767.32	-0.55	767.76	-0.11
768.16	-0.14	767.76	-0.54	768.22	-0.08
769.07	-0.04	768.54	-0.57	769.08	-0.03
770.47	0.00	769.87	-0.60	770.47	0.00
770.57	0.00	769.97	-0.60	770.57	0.00
770.85	0.00	770.44	-0.41	770.85	0.00
771.01	0.00	770.39	-0.62	771.01	0.00
771.27	0.00	770.67	-0.60	771.27	0.00
771.80	0.00	771.35	-0.45	771.80	0.00
772.69	0.00	772.20	-0.49	772.69	0.00
773.71	0.00	773.63	-0.08	773.71	0.00
773.88	0.00	773.81	-0.07	773.88	0.00
774.91	0.00	774.90	-0.01	774.91	0.00
776.03	0.00	776.03	0.00	776.03	0.00
776.27	0.00	776.27	0.00	776.27	0.00
776.62	0.00	776.62	0.00	776.62	0.00
776.93	0.00	776.93	0.00	776.93	0.00
777.42	0.00	777.42	0.00	777.42	0.00

SWMM simulation results for
a 25 year recurrence interval
rainfall event

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Table 3. Results for a 25 year recurrence interval

- Represents a reduction in water surface elevation of 0.3 feet or greater.

	Node	Channel distance from previous section (feet)	Cumulative channel distance (feet)	Existing Conditions water surface elevation (feet)	Proposed Conditions Option 1 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 2 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 3 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 4 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)
Main line	Outfall	0	0	672.50	672.50	0.00	672.50	0.00	672.50	0.00	672.50	0.00
	J200	500	500	673.14	673.14	0.00	673.14	0.00	673.14	0.00	673.14	0.00
	J210	600	1100	685.64	685.64	0.00	685.64	0.00	685.64	0.00	685.64	0.00
	J220	150	1250	692.70	692.70	0.00	692.70	0.00	692.70	0.00	692.70	0.00
	J230	125	1375	699.09	699.09	0.00	699.09	0.00	699.09	0.00	699.09	0.00
	J240	400	1775	706.40	706.40	0.00	706.40	0.00	706.40	0.00	706.40	0.00
	J250	344	2119	715.57	715.57	0.00	715.57	0.00	715.57	0.00	715.57	0.00
	J260	200	2319	721.88	721.88	0.00	721.83	-0.05	721.88	0.00	721.88	0.00
	J270	1500	3819	740.49	740.49	0.00	740.43	-0.06	740.50	0.01	740.49	0.00
	J280	550	4369	748.66	748.66	0.00	748.62	-0.04	748.66	0.00	748.66	0.00
	J290	400	4769	753.19	753.19	0.00	753.17	-0.02	753.19	0.00	753.19	0.00
	J300	220	4989	756.46	756.46	0.00	756.41	-0.05	756.46	0.00	756.46	0.00
	J310	46	5035	756.57	756.57	0.00	756.52	-0.05	756.57	0.00	756.57	0.00
	J320	220	5255	758.00	758.00	0.00	757.95	-0.05	758.00	0.00	758.00	0.00
	J330	340	5595	759.00	759.00	0.00	758.94	-0.06	759.00	0.00	759.00	0.00
	J340	270	5865	760.21	760.21	0.00	760.16	-0.05	760.21	0.00	760.21	0.00
	J350	240	6105	761.96	761.96	0.00	761.91	-0.05	761.96	0.00	761.96	0.00
	J360	250	6355	763.20	763.20	0.00	763.14	-0.06	763.20	0.00	763.20	0.00
	J370	29	6384	764.12	764.12	0.00	764.06	-0.06	764.13	0.01	764.12	0.00
	J380	180	6564	764.81	764.81	0.00	764.74	-0.07	764.82	0.01	764.81	0.00
	J390	380	6944	766.56	766.56	0.00	766.51	-0.05	766.56	0.00	766.56	0.00
	J400	420	7364	767.57	767.57	0.00	767.50	-0.07	767.57	0.00	767.57	0.00
	J410	110	7474	767.76	767.76	0.00	767.69	-0.07	767.76	0.00	767.76	0.00
	J420	320	7794	768.07	768.07	0.00	768.00	-0.07	768.07	0.00	768.07	0.00
	J430	315	8109	768.13	768.14	0.01	768.05	-0.08	768.12	-0.01	768.13	0.00
	J440	487	8596	768.18	768.18	0.00	768.09	-0.09	768.16	-0.02	768.18	0.00
	J190	65	8661	768.21	768.21	0.00	768.11	-0.10	768.20	-0.01	768.21	0.00
	J180	120	8781	768.21	768.21	0.00	768.12	-0.09	768.20	-0.01	768.21	0.00
	J170	81	8862	768.22	768.22	0.00	768.12	-0.10	768.21	-0.01	768.22	0.00
	J160	48	8910	768.24	768.24	0.00	768.14	-0.10	768.23	-0.01	768.24	0.00
	J150	130	9040	768.24	768.24	0.00	768.14	-0.10	768.23	-0.01	768.24	0.00
	J140	73	9113	768.24	768.24	0.00	768.14	-0.10	768.23	-0.01	768.24	0.00
	J130	8	9121	768.24	768.24	0.00	768.14	-0.10	768.23	-0.01	768.24	0.00
	J120	128	9249	768.25	768.25	0.00	768.15	-0.10	768.24	-0.01	768.25	0.00
	J110	303	9552	768.27	768.27	0.00	768.17	-0.10	768.26	-0.01	768.27	0.00
	J100	84	9636	768.27	768.27	0.00	768.17	-0.10	768.26	-0.01	768.27	0.00
	J90	114	9750	768.27	768.28	0.01	768.17	-0.10	768.26	-0.01	768.27	0.00
	J80	13	9763	768.28	768.28	0.00	768.17	-0.11	768.27	-0.01	768.29	0.01
	J70	21	9784	768.28	768.29	0.01	768.18	-0.10	768.27	-0.01	768.30	0.02
	J60	8	9792	768.29	768.29	0.00	768.18	-0.11	768.28	-0.01	768.31	0.02
	J50	312	10104	768.30	768.30	0.00	768.19	-0.11	768.29	-0.01	768.32	0.02
	J40	95	10199	768.30	768.30	0.00	768.19	-0.11	768.29	-0.01	768.32	0.02
	J30	110	10309	768.30	768.30	0.00	768.19	-0.11	768.29	-0.01	768.32	0.02
	J20	48	10357	768.44	768.44	0.00	768.31	-0.13	768.44	0.00	768.46	0.02
	J10	52	10409	768.45	768.45	0.00	768.31	-0.14	768.44	-0.01	768.46	0.01
	J9	250	10659	768.47	768.48	0.01	768.34	-0.13	768.47	0.00	768.47	0.00
	J8	80	10739	769.65	769.66	0.01	768.95	-0.70	769.65	0.00	769.65	0.00
	J7	150	10889	770.04	770.04	0.00	769.26	-0.78	770.04	0.00	770.04	0.00
	J6	150	11039	770.34	770.33	-0.01	769.57	-0.77	770.34	0.00	770.34	0.00
	J5	160	11199	771.24	770.70	-0.54	770.83	-0.41	771.24	0.00	771.24	0.00
	J4	233	11432	771.35	770.86	-0.49	770.91	-0.44	771.35	0.00	771.35	0.00
	J3	80	11512	771.78	771.21	-0.57	771.51	-0.27	771.78	0.00	771.78	0.00
	J2	350	11862	772.02	771.56	-0.46	771.67	-0.35	772.02	0.00	772.02	0.00
	J1	490	12352	772.93	772.74	-0.19	772.38	-0.55	772.93	0.00	772.93	0.00
	J1a	410	12762	773.35	773.19	-0.16	772.59	-0.76	773.35	0.00	773.35	0.00
	J1b	400	13162	774.88	774.87	-0.01	774.21	-0.67	774.88	0.00	774.88	0.00
	J1c	680	13842	775.91	775.91	0.00	775.20	-0.71	775.91	0.00	775.91	0.00
	J1d	380	14222	776.17	776.17	0.00	775.37	-0.80	776.17	0.00	776.17	0.00
	J1e	330	14552	776.30	776.30	0.00	775.52	-0.78	776.30	0.00	776.30	0.00
	J1f	610	15162	776.59	776.59	0.00	775.83	-0.76	776.59	0.00	776.59	0.00
	J1g	320	15482	776.62	776.62	0.00	775.85	-0.77	776.62	0.00	776.62	0.00
	J1h	450	15932	776.67	776.67	0.00	775.98	-0.69	776.67	0.00	776.67	0.00
Tributary 1	J180	0	0	768.21	768.21	0.00	768.12	-0.09	768.20	-0.01	768.21	0.00
	JTrib4	177	177	768.21	768.22	0.01	768.12	-0.09	768.20	-0.01	768.21	0.00
	JTrib3	248	425	768.21	768.22	0.01	768.12	-0.09	768.20	-0.01	768.21	0.00
	JTrib2	288	713	768.22	768.22	0.00	768.12	-0.10	768.21	-0.01	768.22	0.00
	JTrib1	500	1213	768.22	768.22	0.00	768.12	-0.10	768.21	-0.01	768.22	0.00
Tributary 2	J420	0	0	768.07	768.07	0.00	768.00	-0.07	768.07	0.00	768.07	0.00
	J2a	150	150	768.10	768.10	0.00	768.03	-0.07	768.11	0.01	768.11	0.01
	J2b	190	340	768.53	768.53	0.00	768.46	-0.07	768.53	0.00	768.55	0.02
	J2c	450	790	768.89	768.89	0.00	768.84	-0.05	768.89	0.00	768.91	0.02
	J2d	500	1290	769.59	769.59	0.00	769.56	-0.03	769.59	0.00	769.61	0.02
	J2e	750	2040	770.88	770.88	0.00	770.88	0.00	770.88	0.00	770.88	0.00
	J2f	450	2490	770.96	770.96	0.00	770.96	0.00	770.96	0.00	770.97	0.01
	J2g	600	3090	771.20	771.20	0.00	771.20	0.00	771.20	0.00	771.02	-0.18
	J2h	383	3473	771.41	771.41	0.00	771.41	0.00	771.41	0.00	771.03	-0.38
	J2i	300	3773	771.67	771.67	0.00	771.67	0.00	771.67	0.00	771.04	-0.63
	J2j	390	4163	772.20	772.20	0.00	772.20	0.00	772.20	0.00	771.09	-1.11
	J2k	380	4543	773.43	773.43	0.00	773.43	0.00	773.43	0.00	771.15	-2.28
	J2l	480	5023	774.23	774.23	0.00	774.23	0.00	774.23	0.00	771.95	-2.28
	J2m	106	5129	774.42	774.42	0.00	774.42	0.00	774.42	0.00	772.03	-2.39
	J2n	310	5439	775.27	775.27	0.00	775.27	0.00	775.27	0.00	773.34	-1.93
	J2o	700	6139	776.34	776.34	0.00	776.34	0.00	776.34	0.00	774.37	-1.97
	J2p	38	6177	776.64	776.64	0.00	776.64	0.00	776.64	0.00	774.45	-2.19
	J2q	440	6617	776.92	776.92	0.00	776.92	0.00	776.92	0.00	774.85	-2.07
	J2r	280	6897	777.23	777.23	0.00	777.23	0.00	777.23	0.00	775.15	-2.08
	J2s	420	7317	777.75	777.75	0.00	777.75	0.00	777.75	0.00	777.11	-0.64

Proposed Conditions Scenario 5 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 6 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 7 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)
672.50	0.00	672.5	0.00	672.5	0.00
673.07	-0.07	672.89	-0.25	673.09	-0.05
685.51	-0.13	685.41	-0.23	685.58	-0.06
692.60	-0.10	692.52	-0.18	692.66	-0.04
698.99	-0.10	698.90	-0.19	699.04	-0.05
706.28	-0.12	706.19	-0.21	706.35	-0.05
715.34	-0.23	715.24	-0.33	715.47	-0.10
721.76	-0.12	721.67	-0.21	721.83	-0.05
740.35	-0.14	740.22	-0.27	740.43	-0.06
748.55	-0.11	748.48	-0.18	748.62	-0.04
753.15	-0.04	753.09	-0.10	753.17	-0.02
756.33	-0.13	756.23	-0.23	756.40	-0.06
756.44	-0.13	756.33	-0.24	756.52	-0.05
757.87	-0.13	757.77	-0.23	757.95	-0.05
758.85	-0.15	758.76	-0.24	758.95	-0.05
760.09	-0.12	759.98	-0.23	760.16	-0.05
761.86	-0.10	761.76	-0.20	761.92	-0.04
763.09	-0.11	762.96	-0.24	763.14	-0.06
764.00	-0.12	763.88	-0.24	764.07	-0.05
764.66	-0.15	764.51	-0.30	764.75	-0.06
766.39	-0.17	766.31	-0.25	766.52	-0.04
767.40	-0.17	767.30	-0.27	767.51	-0.06
767.59	-0.17	767.49	-0.27	767.70	-0.06
767.89	-0.18	767.79	-0.28	768.00	-0.07
767.94	-0.19	767.84	-0.29	768.07	-0.06
767.97	-0.21	767.89	-0.29	768.11	-0.07
767.99	-0.22	767.93	-0.28	768.14	-0.07
767.99	-0.22	767.93	-0.28	768.15	-0.06
768.00	-0.22	767.93	-0.29	768.15	-0.07
768.01	-0.23	767.95	-0.29	768.17	-0.07
768.01	-0.23	767.95	-0.29	768.17	-0.07
768.01	-0.23	767.95	-0.29	768.18	-0.06
768.02	-0.22	767.96	-0.28	768.18	-0.06
768.02	-0.23	767.96	-0.29	768.18	-0.07
768.04	-0.23	767.98	-0.29	768.20	-0.07
768.04	-0.23	767.98	-0.29	768.20	-0.07
768.04	-0.23	767.99	-0.28	768.21	-0.06
768.04	-0.24	767.99	-0.29	768.21	-0.07
768.05	-0.23	767.99	-0.29	768.22	-0.06
768.05	-0.24	768.01	-0.28	768.22	-0.07
768.06	-0.24	768.02	-0.28	768.23	-0.07
768.06	-0.24	768.02	-0.28	768.23	-0.07
768.06	-0.24	768.02	-0.28	768.23	-0.07
768.16	-0.28	768.15	-0.29	768.38	-0.06
768.17	-0.28	768.16	-0.29	768.38	-0.07
768.19	-0.28	768.19	-0.28	768.41	-0.06
768.64	-1.01	769.46	-0.19	769.57	-0.08
768.87	-1.17	769.94	-0.10	770.01	-0.03
769.08	-1.26	770.28	-0.06	770.31	-0.03
769.75	-1.49	771.23	-0.01	771.24	0.00
769.85	-1.50	771.35	0.00	771.35	0.00
770.22	-1.56	771.78	0.00	771.78	0.00
770.46	-1.56	772.02	0.00	772.02	0.00
771.56	-1.37	772.93	0.00	772.93	0.00
771.70	-1.65	773.35	0.00	773.35	0.00
774.18	-0.70	774.88	0.00	774.88	0.00
775.94	0.03	775.91	0.00	775.91	0.00
776.22	0.05	776.17	0.00	776.17	0.00
776.33	0.03	776.30	0.00	776.30	0.00
776.61	0.02	776.59	0.00	776.59	0.00
776.65	0.03	776.62	0.00	776.62	0.00
776.67	0.00	776.67	0.00	776.67	0.00
767.99	-0.22	767.93	-0.28	768.15	-0.06
767.99	-0.22	767.93	-0.28	768.15	-0.06
768.00	-0.21	767.93	-0.28	768.15	-0.06
768.00	-0.22	767.94	-0.28	768.15	-0.07
768.00	-0.22	767.94	-0.28	768.15	-0.07
767.89	-0.18	767.79	-0.28	768.00	-0.07
767.93	-0.17	767.81	-0.29	768.04	-0.06
768.35	-0.18	768.16	-0.37	768.45	-0.08
768.76	-0.13	768.46	-0.43	768.83	-0.06
769.54	-0.05	769.17	-0.42	769.55	-0.04
770.88	0.00	770.42	-0.46	770.88	0.00
770.96	0.00	770.50	-0.46	770.96	0.00
771.20	0.00	770.78	-0.42	771.20	0.00
771.41	0.00	770.97	-0.44	771.41	0.00
771.67	0.00	771.25	-0.42	771.67	0.00
772.20	0.00	771.78	-0.42	772.20	0.00
773.43	0.00	773.07	-0.36	773.43	0.00
774.23	0.00	774.09	-0.14	774.23	0.00
774.42	0.00	774.30	-0.12	774.42	0.00
775.27	0.00	775.24	-0.03	775.27	0.00
776.34	0.00	776.34	0.00	776.34	0.00
776.64	0.00	776.64	0.00	776.64	0.00
776.92	0.00	776.92	0.00	776.92	0.00
777.23	0.00	777.23	0.00	777.23	0.00
777.75	0.00	777.75	0.00	777.75	0.00

SWMM simulation results for
a 50 year recurrence interval
rainfall event

Roots Ditch Flood Mitigation Project - hydraulic analyses summary
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Table 4. Results for a 50 year recurrence interval

- Represents a reduction in water surface elevation of 0.3 feet or greater.

	Node	Channel distance from previous section (feet)	Cumulative channel distance (feet)	Existing Conditions water surface elevation (feet)	Proposed Conditions Option 1 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 2 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 3 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 4 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)
Main line	Outfall	0	0	672.50	672.50	0.00	672.50	0.00	672.50	0.00	672.50	0.00
	J200	500	500	673.55	673.55	0.00	673.55	0.00	673.55	0.00	673.55	0.00
	J210	600	1100	686.06	686.06	0.00	686.06	0.00	686.06	0.00	686.06	0.00
	J220	150	1250	693.02	693.02	0.00	693.02	0.00	693.02	0.00	693.02	0.00
	J230	125	1375	699.41	699.41	0.00	699.41	0.00	699.41	0.00	699.41	0.00
	J240	400	1775	706.77	706.77	0.00	706.77	0.00	706.77	0.00	706.77	0.00
	J250	344	2119	716.32	716.32	0.00	716.32	0.00	716.32	0.00	716.32	0.00
	J260	200	2319	722.24	722.24	0.00	722.24	0.00	722.24	0.00	722.24	0.00
	J270	1500	3819	740.95	740.95	0.00	740.90	-0.05	740.95	0.00	740.95	0.00
	J280	550	4369	748.99	748.99	0.00	748.94	-0.05	748.99	0.00	748.99	0.00
	J290	400	4769	753.33	753.33	0.00	753.31	-0.02	753.33	0.00	753.33	0.00
	J300	220	4989	756.84	756.84	0.00	756.80	-0.04	756.84	0.00	756.84	0.00
	J310	46	5035	756.98	756.98	0.00	756.93	-0.05	756.98	0.00	756.98	0.00
	J320	220	5255	758.36	758.36	0.00	758.32	-0.04	758.36	0.00	758.36	0.00
	J330	340	5595	759.39	759.39	0.00	759.35	-0.04	759.39	0.00	759.39	0.00
	J340	270	5865	760.58	760.58	0.00	760.54	-0.04	760.58	0.00	760.58	0.00
	J350	240	6105	762.27	762.27	0.00	762.22	-0.05	762.27	0.00	762.27	0.00
	J360	250	6355	763.57	763.57	0.00	763.52	-0.05	763.57	0.00	763.57	0.00
	J370	29	6384	764.53	764.53	0.00	764.47	-0.06	764.53	0.00	764.53	0.00
	J380	180	6564	765.26	765.26	0.00	765.21	-0.05	765.27	0.01	765.26	0.00
	J390	380	6944	766.96	766.96	0.00	766.91	-0.05	766.97	0.01	766.96	0.00
	J400	420	7364	767.98	767.98	0.00	767.92	-0.06	767.99	0.01	767.98	0.00
	J410	110	7474	768.17	768.17	0.00	768.11	-0.06	768.17	0.00	768.17	0.00
	J420	320	7794	768.49	768.49	0.00	768.43	-0.06	768.49	0.00	768.49	0.00
	J430	315	8109	768.58	768.58	0.00	768.51	-0.07	768.57	-0.01	768.58	0.00
	J440	487	8596	768.63	768.63	0.00	768.55	-0.08	768.61	-0.02	768.63	0.00
	J190	65	8661	768.67	768.68	0.01	768.59	-0.08	768.66	-0.01	768.67	0.00
	J180	120	8781	768.68	768.68	0.00	768.59	-0.09	768.66	-0.02	768.68	0.00
	J170	81	8862	768.68	768.68	0.00	768.59	-0.09	768.66	-0.02	768.68	0.00
	J160	48	8910	768.70	768.71	0.01	768.62	-0.08	768.69	-0.01	768.70	0.00
	J150	130	9040	768.71	768.72	0.01	768.62	-0.09	768.69	-0.02	768.71	0.00
	J140	73	9113	768.71	768.72	0.01	768.62	-0.09	768.70	-0.01	768.71	0.00
	J130	8	9121	768.71	768.72	0.01	768.62	-0.09	768.70	-0.01	768.71	0.00
	J120	128	9249	768.72	768.73	0.01	768.63	-0.09	768.71	-0.01	768.72	0.00
	J110	303	9552	768.74	768.75	0.01	768.65	-0.09	768.73	-0.01	768.74	0.00
	J100	84	9636	768.74	768.75	0.01	768.65	-0.09	768.73	-0.01	768.74	0.00
	J90	114	9750	768.74	768.75	0.01	768.65	-0.09	768.73	-0.01	768.74	0.00
	J80	13	9763	768.75	768.76	0.01	768.65	-0.10	768.74	-0.01	768.75	0.00
	J70	21	9784	768.75	768.76	0.01	768.66	-0.09	768.74	-0.01	768.75	0.00
	J60	8	9792	768.76	768.76	0.00	768.66	-0.10	768.74	-0.02	768.76	0.00
	J50	312	10104	768.77	768.77	0.00	768.67	-0.10	768.75	-0.02	768.77	0.00
	J40	95	10199	768.77	768.77	0.00	768.67	-0.10	768.75	-0.02	768.77	0.00
	J30	110	10309	768.77	768.77	0.00	768.67	-0.10	768.76	-0.01	768.77	0.00
	J20	48	10357	768.94	768.95	0.01	768.82	-0.12	768.93	-0.01	768.94	0.00
	J10	52	10409	768.95	768.96	0.01	768.82	-0.13	768.94	-0.01	768.95	0.00
	J9	250	10659	768.97	768.98	0.01	768.84	-0.13	768.96	-0.01	768.97	0.00
	J8	80	10739	770.31	770.30	-0.01	770.02	-0.29	770.31	0.00	770.31	0.00
	J7	150	10889	770.54	770.52	-0.02	770.29	-0.25	770.54	0.00	770.54	0.00
	J6	150	11039	770.83	770.81	-0.02	770.53	-0.30	770.83	0.00	770.83	0.00
	J5	160	11199	771.45	771.14	-0.31	771.28	-0.17	771.45	0.00	771.45	0.00
	J4	233	11432	771.60	771.32	-0.28	771.39	-0.21	771.60	0.00	771.60	0.00
	J3	80	11512	771.94	771.66	-0.28	771.79	-0.15	771.94	0.00	771.94	0.00
	J2	350	11862	772.26	772.03	-0.23	772.03	-0.23	772.26	0.00	772.26	0.00
	J1	490	12352	773.34	773.26	-0.08	772.95	-0.39	773.34	0.00	773.34	0.00
	J1a	410	12762	773.94	773.78	-0.16	773.22	-0.72	773.94	0.00	773.94	0.00
	J1b	400	13162	775.18	775.18	0.00	774.59	-0.59	775.18	0.00	775.18	0.00
	J1c	680	13842	776.24	776.24	0.00	775.62	-0.62	776.24	0.00	776.24	0.00
	J1d	380	14222	776.53	776.53	0.00	775.82	-0.71	776.53	0.00	776.53	0.00
	J1e	330	14552	776.66	776.66	0.00	775.96	-0.70	776.66	0.00	776.66	0.00
	J1f	610	15162	776.93	776.93	0.00	776.26	-0.67	776.93	0.00	776.93	0.00
	J1g	320	15482	776.97	776.97	0.00	776.28	-0.69	776.97	0.00	776.97	0.00
	J1h	450	15932	777.00	777.00	0.00	776.36	-0.64	777.00	0.00	777.00	0.00
Tributary 1	J180	0	0	768.68	768.68	0.00	768.59	-0.09	768.66	-0.02	768.68	0.00
	JTrib4	177	177	768.68	768.68	0.00	768.59	-0.09	768.66	-0.02	768.68	0.00
	JTrib3	248	425	768.68	768.68	0.00	768.59	-0.09	768.66	-0.02	768.68	0.00
	JTrib2	288	713	768.68	768.68	0.00	768.59	-0.09	768.66	-0.02	768.68	0.00
	JTrib1	500	1213	768.68	768.68	0.00	768.60	-0.08	768.67	-0.01	768.68	0.00
Tributary 2	J420	0	0	768.49	768.49	0.00	768.43	-0.06	768.49	0.00	768.49	0.00
	J2a	150	150	768.53	768.53	0.00	768.47	-0.06	768.53	0.00	768.53	0.00
	J2b	190	340	769.14	769.14	0.00	769.08	-0.06	769.14	0.00	769.14	0.00
	J2c	450	790	769.42	769.42	0.00	769.38	-0.04	769.42	0.00	769.42	0.00
	J2d	500	1290	770.03	770.03	0.00	770.02	-0.01	770.03	0.00	770.03	0.00
	J2e	750	2040	771.29	771.29	0.00	771.29	0.00	771.29	0.00	771.29	0.00
	J2f	450	2490	771.34	771.34	0.00	771.34	0.00	771.34	0.00	771.34	0.00
	J2g	600	3090	771.53	771.53	0.00	771.53	0.00	771.53	0.00	771.51	-0.02
	J2h	383	3473	771.77	771.77	0.00	771.77	0.00	771.77	0.00	771.53	-0.24
	J2i	300	3773	772.02	772.02	0.00	772.02	0.00	772.02	0.00	771.55	-0.47
	J2j	390	4163	772.56	772.56	0.00	772.56	0.00	772.56	0.00	771.62	-0.94
	J2k	380	4543	774.20	774.20	0.00	774.20	0.00	774.20	0.00	771.74	-2.46
	J2l	480	5023	774.82	774.82	0.00	774.82	0.00	774.82	0.00	772.49	-2.33
	J2m	106	5129	775.08	775.08	0.00	775.08	0.00	775.08	0.00	772.58	-2.50
	J2n	310	5439	775.72	775.72	0.00	775.72	0.00	775.72	0.00	773.75	-1.97
	J2o	700	6139	776.59	776.59	0.00	776.59	0.00	776.59	0.00	774.86	-1.73
	J2p	38	6177	776.99	776.99	0.00	776.99	0.00	776.99	0.00	774.96	-2.03
	J2q	440	6617	777.20	777.20	0.00	777.20	0.00	777.20	0.00	775.37	-1.83
	J2r	280	6897	777.51	777.51	0.00	777.51	0.00	777.51	0.00	775.68	-1.83
	J2s	420	7317	778.06	778.06	0.00	778.06	0.00	778.06	0.00	777.41	-0.65

Proposed Conditions Scenario 5 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 6 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 7 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)
672.50	0.00	672.5	0.00	672.5	0.00
673.45	-0.10	673.36	-0.19	673.51	-0.04
685.95	-0.11	685.87	-0.19	686.02	-0.04
692.93	-0.09	692.86	-0.16	692.98	-0.04
699.32	-0.09	699.24	-0.17	699.37	-0.04
706.67	-0.10	706.57	-0.20	706.73	-0.04
716.11	-0.21	716.01	-0.31	716.24	-0.08
722.14	-0.10	722.06	-0.18	722.20	-0.04
740.82	-0.13	740.71	-0.24	740.90	-0.05
748.88	-0.11	748.83	-0.16	748.94	-0.05
753.29	-0.04	753.25	-0.08	753.31	-0.02
756.73	-0.11	756.62	-0.22	756.80	-0.04
756.86	-0.12	756.75	-0.23	756.93	-0.05
758.26	-0.10	758.16	-0.20	758.32	-0.04
759.28	-0.11	759.15	-0.24	759.35	-0.04
760.47	-0.11	760.35	-0.23	760.54	-0.04
762.17	-0.10	762.03	-0.24	762.23	-0.04
763.45	-0.12	763.34	-0.23	763.53	-0.04
764.40	-0.13	764.24	-0.29	764.48	-0.05
765.13	-0.13	764.99	-0.27	765.22	-0.04
766.82	-0.14	766.68	-0.28	766.92	-0.04
767.84	-0.14	767.68	-0.30	767.93	-0.05
768.03	-0.14	767.92	-0.25	768.12	-0.05
768.34	-0.15	768.24	-0.25	768.44	-0.05
768.41	-0.17	768.33	-0.25	768.53	-0.05
768.45	-0.18	768.40	-0.23	768.58	-0.05
768.48	-0.19	768.44	-0.23	768.62	-0.05
768.49	-0.19	768.45	-0.23	768.62	-0.06
768.49	-0.19	768.45	-0.23	768.63	-0.05
768.51	-0.19	768.47	-0.23	768.65	-0.05
768.51	-0.20	768.48	-0.23	768.66	-0.05
768.52	-0.19	768.48	-0.23	768.66	-0.05
768.52	-0.19	768.48	-0.23	768.66	-0.05
768.52	-0.20	768.50	-0.22	768.67	-0.05
768.54	-0.20	768.51	-0.23	768.69	-0.05
768.54	-0.20	768.51	-0.23	768.69	-0.05
768.55	-0.19	768.52	-0.22	768.69	-0.05
768.55	-0.20	768.52	-0.23	768.70	-0.05
768.55	-0.20	768.52	-0.23	768.70	-0.05
768.56	-0.20	768.53	-0.23	768.70	-0.06
768.57	-0.20	768.54	-0.23	768.71	-0.06
768.57	-0.20	768.54	-0.23	768.71	-0.06
768.57	-0.20	768.54	-0.23	768.72	-0.05
768.71	-0.23	768.72	-0.22	768.89	-0.05
768.71	-0.24	768.72	-0.23	768.89	-0.06
768.73	-0.24	768.76	-0.21	768.92	-0.05
769.45	-0.86	770.31	0.00	770.29	-0.02
769.64	-0.90	770.54	0.00	770.52	-0.02
769.82	-1.01	770.83	0.00	770.82	-0.01
770.79	-0.66	771.45	0.00	771.45	0.00
770.86	-0.74	771.60	0.00	771.60	0.00
771.41	-0.53	771.94	0.00	771.94	0.00
771.54	-0.72	772.26	0.00	772.26	0.00
772.13	-1.21	773.34	0.00	773.34	0.00
772.46	-1.48	773.94	0.00	773.94	0.00
774.44	-0.74	775.18	0.00	775.18	0.00
776.27	0.03	776.24	0.00	776.24	0.00
776.57	0.04	776.53	0.00	776.53	0.00
776.68	0.02	776.66	0.00	776.66	0.00
776.96	0.03	776.93	0.00	776.93	0.00
777.00	0.03	776.97	0.00	776.97	0.00
777.03	0.03	777.00	0.00	777.00	0.00
768.49	-0.19	768.45	-0.23	768.62	-0.06
768.49	-0.19	768.45	-0.23	768.62	-0.06
768.49	-0.19	768.45	-0.23	768.63	-0.05
768.49	-0.19	768.46	-0.22	768.63	-0.05
768.49	-0.19	768.46	-0.22	768.63	-0.05
768.34	-0.15	768.24	-0.25	768.44	-0.05
768.38	-0.15	768.30	-0.23	768.48	-0.05
768.99	-0.15	768.70	-0.44	769.07	-0.07
769.31	-0.11	769.02	-0.40	769.36	-0.06
769.99	-0.04	769.69	-0.34	770.00	-0.03
771.29	0.00	770.90	-0.39	771.29	0.00
771.34	0.00	770.97	-0.37	771.34	0.00
771.53	0.00	771.19	-0.34	771.53	0.00
771.77	0.00	771.41	-0.36	771.77	0.00
772.02	0.00	771.70	-0.32	772.02	0.00
772.56	0.00	772.30	-0.26	772.56	0.00
774.20	0.00	773.92	-0.28	774.20	0.00
774.82	0.00	774.67	-0.15	774.82	0.00
775.08	0.00	774.93	-0.15	775.08	0.00
775.72	0.00	775.68	-0.04	775.72	0.00
776.59	0.00	776.59	0.00	776.59	0.00
776.99	0.00	776.99	0.00	776.99	0.00
777.20	0.00	777.20	0.00	777.20	0.00
777.51	0.00	777.51	0.00	777.51	0.00
778.06	0.00	778.06	0.00	778.06	0.00

SWMM simulation results for
a 100 year recurrence interval
rainfall event

Roots Ditch Flood Mitigation Project - hydraulic analyses summary
Hydrosphere Engineering Nov-18

Table 5. Results for a 100 year recurrence interval

- Represents a reduction in water surface elevation of 0.3 feet or greater.

	Node	Channel distance from previous section (feet)	Cumulative channel distance (feet)	Existing Conditions water surface elevation (feet)	Proposed Conditions Option 1 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 2 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 3 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 4 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)
Main line	Outfall	0	0	672.50	672.50	0.00	672.50	0.00	672.50	0.00	672.50	0.00
	J200	500	500	673.98	673.98	0.00	673.98	0.00	673.98	0.00	673.98	0.00
	J210	600	1100	686.45	686.45	0.00	686.45	0.00	686.45	0.00	686.45	0.00
	J220	150	1250	693.34	693.34	0.00	693.34	0.00	693.34	0.00	693.34	0.00
	J230	125	1375	699.74	699.74	0.00	699.74	0.00	699.74	0.00	699.74	0.00
	J240	400	1775	707.16	707.16	0.00	707.16	0.00	707.16	0.00	707.16	0.00
	J250	344	2119	717.16	717.16	0.00	717.16	0.00	717.16	0.00	717.16	0.00
	J260	200	2319	722.60	722.61	0.01	722.61	0.01	722.60	0.00	722.60	0.00
	J270	1500	3819	741.41	741.41	0.00	741.37	-0.04	741.42	0.01	741.41	0.00
	J280	550	4369	749.28	749.28	0.00	749.25	-0.03	749.28	0.00	749.28	0.00
	J290	400	4769	753.47	753.47	0.00	753.46	-0.01	753.47	0.00	753.47	0.00
	J300	220	4989	757.24	757.24	0.00	757.20	-0.04	757.24	0.00	757.24	0.00
	J310	46	5035	757.45	757.45	0.00	757.40	-0.05	757.45	0.00	757.45	0.00
	J320	220	5255	758.74	758.74	0.00	758.70	-0.04	758.74	0.00	758.74	0.00
	J330	340	5595	759.79	759.79	0.00	759.76	-0.03	759.79	0.00	759.79	0.00
	J340	270	5865	760.96	760.96	0.00	760.94	-0.02	760.96	0.00	760.96	0.00
	J350	240	6105	762.61	762.61	0.00	762.60	-0.01	762.61	0.00	762.61	0.00
	J360	250	6355	764.62	764.62	0.00	764.59	-0.03	764.62	0.00	764.62	0.00
	J370	29	6384	764.96	764.96	0.00	764.92	-0.04	764.96	0.00	764.96	0.00
	J380	180	6564	765.70	765.70	0.00	765.65	-0.05	765.70	0.00	765.70	0.00
	J390	380	6944	767.39	767.39	0.00	767.34	-0.05	767.39	0.00	767.39	0.00
	J400	420	7364	768.37	768.37	0.00	768.32	-0.05	768.38	0.01	768.37	0.00
	J410	110	7474	768.56	768.56	0.00	768.51	-0.05	768.56	0.00	768.56	0.00
	J420	320	7794	768.87	768.87	0.00	768.83	-0.04	768.88	0.01	768.87	0.00
	J430	315	8109	768.99	768.99	0.00	768.93	-0.06	768.98	-0.01	768.99	0.00
	J440	487	8596	769.04	769.04	0.00	769.02	-0.02	769.02	-0.02	769.04	0.00
	J190	65	8661	769.10	769.10	0.00	769.02	-0.08	769.08	-0.02	769.10	0.00
	J180	120	8781	769.10	769.10	0.00	769.03	-0.07	769.09	-0.01	769.10	0.00
	J170	81	8862	769.11	769.11	0.00	769.03	-0.08	769.09	-0.02	769.11	0.00
	J160	48	8910	769.13	769.14	0.01	769.06	-0.07	769.12	-0.01	769.13	0.00
	J150	130	9040	769.14	769.14	0.00	769.06	-0.08	769.12	-0.02	769.14	0.00
	J140	73	9113	769.14	769.14	0.00	769.06	-0.08	769.12	-0.02	769.14	0.00
	J130	8	9121	769.14	769.15	0.01	769.06	-0.08	769.13	-0.01	769.14	0.00
	J120	128	9249	769.15	769.15	0.00	769.07	-0.08	769.13	-0.02	769.15	0.00
	J110	303	9552	769.17	769.17	0.00	769.09	-0.08	769.15	-0.02	769.17	0.00
	J100	84	9636	769.17	769.17	0.00	769.09	-0.08	769.15	-0.02	769.17	0.00
	J90	114	9750	769.17	769.18	0.01	769.09	-0.08	768.16	-1.01	769.17	0.00
	J80	13	9763	769.18	769.18	0.00	769.09	-0.09	769.16	-0.02	769.18	0.00
	J70	21	9784	769.18	769.18	0.00	769.10	-0.08	769.16	-0.02	769.18	0.00
	J60	8	9792	769.18	769.18	0.00	769.10	-0.08	769.17	-0.01	769.18	0.00
	J50	312	10104	769.19	769.19	0.00	769.11	-0.08	769.18	-0.01	769.19	0.00
	J40	95	10199	769.19	769.20	0.01	769.11	-0.08	769.18	-0.01	769.19	0.00
	J30	110	10309	769.19	769.20	0.01	769.11	-0.08	769.18	-0.01	769.19	0.00
	J20	48	10357	769.41	769.42	0.01	769.29	-0.12	769.40	-0.01	769.41	0.00
	J10	52	10409	769.42	769.42	0.00	769.30	-0.12	769.40	-0.02	769.42	0.00
	J9	250	10659	769.44	769.45	0.01	769.32	-0.12	769.43	-0.01	769.44	0.00
	J8	80	10739	770.61	770.60	-0.01	770.47	-0.14	770.60	-0.01	770.61	0.00
	J7	150	10889	770.79	770.79	0.00	770.67	-0.12	770.79	0.00	770.79	0.00
	J6	150	11039	771.06	771.05	-0.01	770.91	-0.15	771.06	0.00	771.06	0.00
	J5	160	11199	771.59	771.36	-0.23	771.49	-0.10	771.59	0.00	771.59	0.00
	J4	233	11432	771.78	771.58	-0.20	771.65	-0.13	771.78	0.00	771.78	0.00
	J3	80	11512	772.07	771.86	-0.21	771.97	-0.10	772.07	0.00	772.07	0.00
	J2	350	11862	772.47	772.31	-0.16	772.31	-0.16	772.47	0.00	772.47	0.00
	J1	490	12352	773.70	773.64	-0.06	773.43	-0.27	773.70	0.00	773.70	0.00
	J1a	410	12762	774.54	774.48	-0.06	773.81	-0.73	774.54	0.00	774.54	0.00
	J1b	400	13162	775.46	775.45	-0.01	774.98	-0.48	775.46	0.00	775.46	0.00
	J1c	680	13842	776.55	776.55	0.00	776.00	-0.55	776.55	0.00	776.55	0.00
	J1d	380	14222	776.94	776.94	0.00	776.24	-0.70	776.94	0.00	776.94	0.00
	J1e	330	14552	777.05	777.05	0.00	776.37	-0.68	777.05	0.00	777.05	0.00
	J1f	610	15162	777.29	777.29	0.00	776.67	-0.62	777.29	0.00	777.29	0.00
	J1g	320	15482	777.35	777.35	0.00	776.70	-0.65	777.35	0.00	777.35	0.00
	J1h	450	15932	777.36	777.36	0.00	776.74	-0.62	777.36	0.00	777.36	0.00
Tributary 1	J180	0	0	769.10	769.10	0.00	769.03	-0.07	769.09	-0.01	769.10	0.00
	JTrib4	177	177	769.10	769.11	0.01	769.03	-0.07	769.09	-0.01	769.10	0.00
	JTrib3	248	425	769.10	769.11	0.01	769.03	-0.07	769.09	-0.01	769.10	0.00
	JTrib2	288	713	769.11	769.11	0.00	769.03	-0.08	769.09	-0.02	769.11	0.00
	JTrib1	500	1213	769.11	769.11	0.00	769.03	-0.08	769.09	-0.02	769.11	0.00
Tributary 2	J420	0	0	768.87	768.87	0.00	768.83	-0.04	768.88	0.01	768.87	0.00
	J2a	150	150	768.92	768.92	0.00	768.87	-0.05	768.92	0.00	768.94	0.02
	J2b	190	340	769.76	769.76	0.00	769.72	-0.04	769.76	0.00	769.75	-0.01
	J2c	450	790	769.97	769.97	0.00	769.93	-0.04	769.97	0.00	769.96	-0.01
	J2d	500	1290	770.47	770.47	0.00	770.46	-0.01	770.47	0.00	770.47	0.00
	J2e	750	2040	771.69	771.69	0.00	771.69	0.00	771.69	0.00	771.68	-0.01
	J2f	450	2490	771.72	771.72	0.00	771.72	0.00	771.72	0.00	771.71	-0.01
	J2g	600	3090	771.85	771.85	0.00	771.85	0.00	771.85	0.00	771.98	0.13
	J2h	383	3473	772.10	772.10	0.00	772.10	0.00	772.10	0.00	772.02	-0.08
	J2i	300	3773	772.33	772.33	0.00	772.33	0.00	772.33	0.00	772.05	-0.28
	J2j	390	4163	772.88	772.88	0.00	772.88	0.00	772.88	0.00	772.14	-0.74
	J2k	380	4543	774.79	774.79	0.00	774.79	0.00	774.79	0.00	772.44	-2.35
	J2l	480	5023	775.30	775.30	0.00	775.30	0.00	775.30	0.00	773.04	-2.26
	J2m	106	5129	775.63	775.63	0.00	775.63	0.00	775.63	0.00	773.13	-2.50
	J2n	310	5439	776.15	776.15	0.00	776.15	0.00	776.15	0.00	774.06	-2.09
	J2o	700	6139	776.82	776.82	0.00	776.82	0.00	776.82	0.00	775.16	-1.66
	J2p	38	6177	777.34	777.34	0.00	777.34	0.00	777.34	0.00	775.29	-2.05
	J2q	440	6617	777.49	777.49	0.00	777.49	0.00	777.49	0.00	775.68	-1.81
	J2r	280	6897	777.78	777.78	0.00	777.78	0.00	777.78	0.00	776.00	-1.78
	J2s	420	7317	778.36	778.36	0.00	778.36	0.00	778.36	0.00	777.66	-0.70

Proposed Conditions Scenario 5 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 6 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)	Proposed Conditions Scenario 7 water surface elevation (feet)	Proposed Conditions Minus Existing Conditions (feet)
672.50	0.00	672.5	0.00	672.5	0.00
673.86	-0.12	673.77	-0.21	673.94	-0.04
686.35	-0.10	686.23	-0.22	686.41	-0.04
693.25	-0.09	693.14	-0.20	693.31	-0.03
699.65	-0.09	699.55	-0.19	699.71	-0.03
707.05	-0.11	706.96	-0.20	707.12	-0.04
716.92	-0.24	716.90	-0.26	717.08	-0.08
722.50	-0.10	722.39	-0.21	722.57	-0.03
741.28	-0.13	741.15	-0.26	741.37	-0.04
749.19	-0.09	749.08	-0.20	749.25	-0.03
753.43	-0.04	753.28	-0.19	753.46	-0.01
757.12	-0.12	757.01	-0.23	757.20	-0.04
757.28	-0.17	757.15	-0.30	757.40	-0.05
758.62	-0.12	758.50	-0.24	758.70	-0.04
759.67	-0.12	759.53	-0.26	759.75	-0.04
760.84	-0.12	760.74	-0.22	760.93	-0.03
762.50	-0.11	762.41	-0.20	762.59	-0.02
764.51	-0.11	764.42	-0.20	764.59	-0.03
764.84	-0.12	764.70	-0.26	764.93	-0.03
765.57	-0.13	765.45	-0.25	765.65	-0.05
767.25	-0.14	767.08	-0.31	767.33	-0.06
768.25	-0.12	768.09	-0.28	768.32	-0.05
768.43	-0.13	768.29	-0.27	768.50	-0.06
768.75	-0.12	768.59	-0.28	768.83	-0.04
768.85	-0.14	768.75	-0.24	768.95	-0.04
768.89	-0.15	768.81	-0.23	768.99	-0.05
768.94	-0.16	768.87	-0.23	769.05	-0.05
768.95	-0.15	768.87	-0.23	769.06	-0.04
768.95	-0.16	768.88	-0.23	769.06	-0.05
768.98	-0.15	768.90	-0.23	769.09	-0.04
768.98	-0.16	768.91	-0.23	769.09	-0.05
768.98	-0.16	768.91	-0.23	769.09	-0.05
768.98	-0.16	768.91	-0.23	769.10	-0.04
768.99	-0.16	768.93	-0.22	769.10	-0.05
769.01	-0.16	768.95	-0.22	769.12	-0.05
769.01	-0.16	768.95	-0.22	769.12	-0.05
769.01	-0.16	768.95	-0.22	769.13	-0.04
769.02	-0.16	768.96	-0.22	769.13	-0.05
769.02	-0.16	768.96	-0.22	769.13	-0.05
769.02	-0.16	768.96	-0.22	769.14	-0.04
769.03	-0.16	768.96	-0.23	769.15	-0.04
769.03	-0.16	768.96	-0.23	769.15	-0.04
769.03	-0.16	768.98	-0.21	769.15	-0.04
769.21	-0.20	769.21	-0.20	769.36	-0.05
769.21	-0.21	769.22	-0.20	769.37	-0.05
769.24	-0.20	769.24	-0.20	769.39	-0.05
770.11	-0.50	770.61	0.00	770.59	-0.02
770.25	-0.54	770.79	0.00	770.78	-0.01
770.42	-0.64	771.06	0.00	771.06	0.00
771.13	-0.46	771.59	0.00	771.59	0.00
771.20	-0.58	771.78	0.00	771.78	0.00
771.64	-0.43	772.07	0.00	772.07	0.00
771.81	-0.66	772.47	0.00	772.47	0.00
772.57	-1.13	773.70	0.00	773.70	0.00
772.90	-1.64	774.54	0.00	774.54	0.00
774.75	-0.71	775.46	0.00	775.46	0.00
776.58	0.03	776.55	0.00	776.55	0.00
776.95	0.01	776.94	0.00	776.94	0.00
777.07	0.02	777.05	0.00	777.05	0.00
777.32	0.03	777.29	0.00	777.29	0.00
777.38	0.03	777.35	0.00	777.35	0.00
777.39	0.03	777.36	0.00	777.36	0.00
768.95	-0.15	768.87	-0.23	769.06	-0.04
768.95	-0.15	768.87	-0.23	769.06	-0.04
768.95	-0.15	768.87	-0.23	769.06	-0.04
768.95	-0.16	768.88	-0.23	769.06	-0.05
768.95	-0.16	768.88	-0.23	769.06	-0.05
768.75	-0.12	768.59	-0.28	768.83	-0.04
768.80	-0.12	768.74	-0.18	768.87	-0.05
769.62	-0.14	769.35	-0.41	769.70	-0.06
769.86	-0.11	769.57	-0.40	769.92	-0.05
770.42	-0.05	770.15	-0.32	770.44	-0.03
771.69	0.00	771.34	-0.35	771.68	-0.01
771.72	0.00	771.31	-0.41	771.72	0.00
771.85	0.00	771.55	-0.30	771.85	0.00
772.10	0.00	771.82	-0.28	772.10	0.00
772.33	0.00	772.08	-0.25	772.33	0.00
772.88	0.00	772.69	-0.19	772.88	0.00
774.79	0.00	774.58	-0.21	774.79	0.00
775.30	0.00	775.16	-0.14	775.30	0.00
775.63	0.00	775.49	-0.14	775.63	0.00
776.15	0.00	776.07	-0.08	776.15	0.00
776.82	0.00	776.81	-0.01	776.82	0.00
777.34	0.00	777.34	0.00	777.34	0.00
777.49	0.00	777.49	0.00	777.49	0.00
777.78	0.00	777.78	0.00	777.78	0.00
778.36	0.00	778.36	0.00	778.36	0.00