

Storm Drain Rehabilitation Project Corrective Action Plan (CAP) – Final Submittal Technical Memorandum (City Project PW 1501-2015)

Prepared For:



City of Casselberry, FL



Prepared By:



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Stormwater Management and Civil Engineering

June 2016

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Section 1

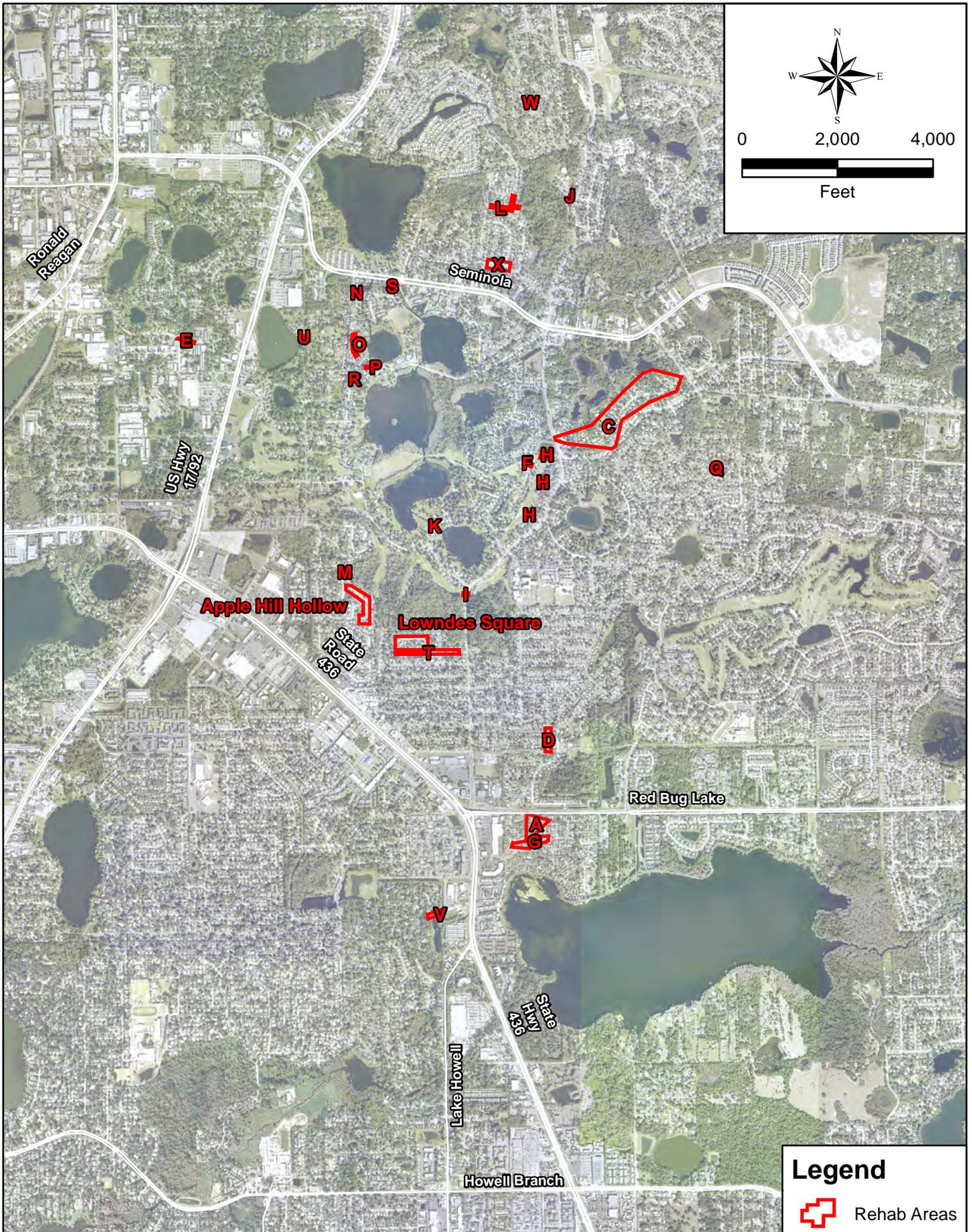
Introduction & Project Overview

1.1 Introduction and Project Overview

The City of Casselberry (City) has identified multiple locations where stormwater infrastructure is showing signs of failure and in possible need of rehabilitation. Singhofen & Associates, Inc. (SAI) was contracted by the City to investigate the locations as provided by the City and develop proposed solutions to address identified deficiencies. The City has identified 25 storm drain systems that are in need of repair. A map showing the general location of the areas is included on **Figure 1.1**. The storm drain areas to be addressed are identified as follows:

- A. Kantor Boulevard to Stanhope Drive;
- C. Quintuplet System;
- D. Gregory Drive;
- E. Concord Drive;
- F. Paul McClure Court;
- G. Stanhope Drive;
- H. Park Avenue;
- I. South Winter Park Drive;
- J. Water Reclamation Facility Ditch Crossing;
- K. Queen's Mirror Circle, South Lake Triplet Drive Bridge;
- L. Woodstream Lane;
- M. Easement From Carriage Hill Drive;
- N. 277/285 Secret Way;
- O. 224/228 Secret Way;
- P. Secret Way and North Triplet Lake Drive;
- Q. Guinevere Drive at Excalibur Drive;
- R. Oakwood Drive at North Triplet Lake Drive;
- S. Ivey Road at Seminola Boulevard;
- T. Marigold Road;
- U. Sunset Drive crossing at Sunset Park;
- V. Cassel Creek Boulevard;
- W. 848/852 Turtle Mound Drive
- X. Bridle Path
 - Apple Hill Hollow
 - Lowndes Square

It should be noted that Area B (Lake Anne Lane) was originally included as a part of this scope but was subsequently eliminated at the direction of the City. In addition, designs for the Apple Hill Hollow and Lowndes Square locations were initially designed under a separate contract but have been integrated into this project. The limits of the Apple Hill Hollow project have also been expanded to include the entire segment of road up to Carriage Hill Drive. Area X along Bridle Path was not originally included as a part of this project but is now included in the plans and this report.



**City of Casselberry
Storm Drain Rehabilitation**

Project Locations Map

**FIGURE:
1.1**

Section 2

Inspection and Assessment Process

2.1 CCTV Inspection:

Closed circuit television (CCTV) inspections and condition assessments of the existing storm drain systems were conducted at 14 of the identified locations. This consisted of 67 individual pipe segments with a total length of 7,824 linear feet. Culvert diameters ranged between 15" and 48". The CCTV inspections were conducted by Altair Environmental Group (Altair). Prior to videoing each location Altair flushed each culvert segment to remove sediment and debris as much as possible. The culverts were then plugged and dewatered as necessary. A discussion and summary of the CCTV inspection findings and recommendations are included in **Section 3**. DVD's of the CCTV videos are included in **Appendix A** and copies of the Altair reports are included in **Appendix B**. It should be noted that the majority of this work was performed during the peak of the rainy season which ultimately impacted the effort required as well as the sequence of work and project schedule.

2.2 Locating and Surveys:

At most locations where only minor deficiencies were anticipated, aerial maps were used to identify the approximate drainage structure and culvert locations. Construction level survey information was obtained for locations where the identified deficiency was anticipated to require more involved rehabilitation solutions (e.g., erosion control recommendations, underdrain construction, pipe replacement, etc.). Survey services were conducted by Southeastern Surveying & Mapping Corporation (SSMC) for 11 locations and included construction level survey. Survey information consisted of topographic information, boundary lines, and sanitary sewer and drainage structures information including location, invert, size, and material. The survey data is shown on the construction plans.

2.3 Geotechnical Investigations:

Geotechnical services were performed by Geotechnical and Environmental Consultants, Inc. (GEC). Eight (8) locations were identified as requiring subsurface evaluations and geotechnical recommendations as part of the rehabilitation efforts. Work at these locations includes geotechnical borings, muck probes, pavement cores, slope stability analysis, underdrain evaluations, and field/lab tests. The Geotechnical Report prepared by GEC is included in **Appendix C**.

Section 3

Inspection Results and Recommendations

3.1 Summary

SAI has reviewed all of the available CCTV and geotechnical investigation data, proposed rehabilitation solutions, prepared construction plans, and developed estimated costs for each area. Detailed discussions for each area are included in the subsequent sections including identified issues, recommended rehabilitation technique and detailed breakdown of the construction costs. Preliminary construction plans are included in **Appendix D**. In total, 35 culverts out of the 67 that were examined require some form of rehabilitation (e.g., CIPP, chemical grout, replacement, etc.). In general, chemical grout rehabilitation is recommended at locations that include minor deficiencies or require a “spot” fix as identified from the CCTV. Cured-in-place (CIPP) rehabilitation techniques are used at locations where the culvert issues are more severe or extensive. Partial CIPP has been recommended when there are only a few or relatively dispersed structural issues along the culvert. Full CIPP along the entire culvert length has been recommended when there are multiple structural issues along the culvert. Open cut culvert replacement is recommended in locations where significant structural failures (collapse / deformation / major joint offset) have occurred and do not allow for CIPP lining. Recommendations to address other erosion issues include construction of riprap, flowable fill, inlet modifications, and/or re-grading. Designs to address pavement concerns include the construction of underdrains in areas identified by the geotechnical investigation and survey as having high groundwater level issues. A summary of the identified issues, proposed solutions, and estimated costs is presented in **Table 3.1**. A more detailed summary is included in **Appendix E, Table E.1**.

Table 3.1 Summary of Issues, Recommended Solutions, and Estimated Costs

Area ID	Type of Inspection	General Observations	Recommendations	Cost Estimate	Length of Pipes Inspected w/ CCTV (ft)
A	CCTV	Mineral stains, roots, infiltration, and cement/debris	Rehabilitate culverts (chemical grout and CIPP)	\$174,400	984
C	CCTV	Joint separations and offsets, roots, broken pipe, and cracks	Rehabilitate culverts (chemical grout and CIPP) and pipe replacement	\$169,900	3190.7
D	CCTV	Broken pipe	Rehabilitate culverts (CIPP)	\$9,400	546.5
E	CCTV	Cracks and roots	Rehabilitate culverts (chemical grout)	\$4,100	308.7
F	CCTV	Broken pipe and roots	Pipe replacement	\$9,800	25.1
G	CCTV	Debris, mineral stains, cracks, and infiltration	Rehabilitate culverts (chemical grout and CIPP) and pipe replacement	\$74,300	817.1
H	CCTV	Cement/debris, cracks, and holes in pipe	Pipe replacement	\$50,900	498.7
I	CCTV	Joint failure	Rehabilitate culverts (chemical grout and CIPP)	\$159,600	224.1

Section 3.0

Inspection Results and Recommendations

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Area ID	Type of Inspection	General Observations	Recommendations	Cost Estimate	Length of Pipes Inspected w/ CCTV (ft)
J	Erosion	Bank erosion adjacent to wall	Construct riprap	\$14,600	0
K	Erosion	Erosion at retaining wall and along channel, displaced riprap/bags	Construct riprap, flowable fill and re-grading	\$82,900	0
L	Underdrain Evaluation	Groundwater table issues	Construct underdrain system	\$53,500	0
M	CCTV	Mineral stains and roots	Rehabilitate culverts (chemical grout)	\$5,600	411
N	CCTV	Infiltration and joint offset	Rehabilitate culverts (chemical grout)	\$5,200	133.8
O	Underdrain Evaluation & CCTV	Groundwater table issues, joint deflection, and exposed rebar	Construct underdrain system and pipe replacement	\$56,400	24.7
P	Inlets	Roadside hazard	Replace inlet	\$14,900	0
Q	Roadway	Nuisance flooding	Re-grade intersection	\$86,800	0
R	Inlets	Roadside & pedestrian hazard	Replace inlet and grate	\$18,600	0
S	CCTV	Water and Sand Infiltration	Rehabilitate culverts (chemical grout)	\$10,700	170.2
T	Underdrain Evaluation	Groundwater table issues	Construct underdrain system	\$103,400	0
U	CCTV	Joint offset and erosion behind wall	Rehabilitate culverts (chemical grout) and flowable fill	\$6,600	118.2
V	CCTV	Mineral stains	Rehabilitate culverts (chemical grout)	\$10,100	371.6
W	Inlets	Joint separation, cracks, and holes	Pipe replacement and inlet re-alignment	\$15,200	0
X	Culverts	Deficiencies with pipes	Rehabilitate culverts (CIPP)	\$44,400	0
Apple Hill Hollow	Underdrain Evaluation	Groundwater table issues	Construct underdrain system	\$89,300	0
Lowde s Square	Underdrain Evaluation	Groundwater table issues	Construct underdrain system	\$82,800	0
TOTAL =				\$1,353,400	7824.4

3.2 Area A - Kantor Boulevard to Stanhope Drive:

Area A is located along Kantor Boulevard and also includes the culvert behind the residences parallel to Holtz Drive between Kantor Boulevard and Stanhope Drive (**Figure 3.1**). This area consists of 5 culvert segments that were inspected by Altair. Deficiencies were identified in 4 of the culverts. There are two locations with mineral stains in the culvert located between structures #317 and 317N. The presence of mineral stains are indicative of leakage at the joint. The culvert between structures #317 and #103 included multiple instances of root intrusion. Root intrusion was also found in the culvert between structures #315 and #115. Furthermore, this culvert included a severe amount of concrete throughout the majority of the pipe. It is likely a person will need to enter the 48" pipe and manually break out the concrete in order to remove it before the recommended CIPP can be implemented. Examples of the issues observed are presented in **Figures 3.2** through **3.5**. Improvements for this area include CIPP and chemical grout.

There is also a location along the culvert between structures #317 and #329 where there is an unidentified rod protruding through the storm pipe. While this is not noted as a structural issue, the CCTV camera was not able to traverse beyond the rod. Recommended improvements for this culvert include placing CIPP throughout the culvert from both the upstream and downstream inlets. Chemical grout will also be placed at the location of the rod conflict. The camera was thus run from both ends of the pipes in order to evaluate the entire culvert length.

The estimated construction cost for this area is \$174,400. A detailed breakdown of the cost estimate is included in **Table 3.2**.

Figure 3.1 - Area A: Location Map



Figure 3.2 - Area A: Mineral Stain (Culvert #317 - #317N)



Figure 3.3 - Area A: Root Intrusion (Culvert #317 - #329)



Figure 3.4 - Area A: Cement in Pipe (Culvert #115 - #315)



Figure 3.5 - Area A: Rod Protruding through Pipe (Culvert #317 - #329)



Section 3.0

Inspection Results and Recommendations

Storm Drain Rehabilitation Project - Corrective Action Plan (CAP): PW 1501-2015

Table 3.2: Area "A"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area A					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 7,000.00	\$ 7,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 3,500.00	\$ 3,500.00
104		1	LS	\$ 3,500.00	\$ 3,500.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,000.00	\$ 2,000.00
430-94-3	DESILTING PIPE, 37 - 48"	417	LF	\$ 13.26	\$ 5,529.42
431-1-1	PIPE LINER, OPTIONAL MATERIAL, 0-24"	383	LF	\$ 87.93	\$ 33,677.19
431-1-3	PIPE LINER, OPTIONAL MATERIAL, 37-48"	417	LF	\$ 211.11	\$ 88,032.87
432-3-1	CHEM GROUT REPAIR, PIPE, NON-TEST, 15"	1	EA	\$ 300.00	\$ 300.00
432-3-8	CHEM GROUT REPAIR, PIPE, NON-TEST, 48"	2	EA	\$ 900.00	\$ 1,800.00
Construction Subtotal =					\$ 145,339.48
20% Contingency =					\$ 29,100.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$ 174,400.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA A					
(rounded to the nearest \$100) =					\$174,400.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.3 Area C - Quintuplet System:

Area C is located along Quintuplet Drive and is broken down into 5 sub-areas (C1 through C5) (Figure 3.6). This area consists of 26 culvert segments that were inspected with CCTV by Altair. Deficiencies were identified in 13 of the culverts. The majority of the issues were related to root intrusion. Two culverts were found to be perforated concrete pipes which had multiple locations where roots were growing through the slots in the pipes (between #1323 and #1319 and between #1147 and #1161). There were several other locations where cracks in the pipe or joint separations were identified.

Due to heavy deterioration and breaks in the pipe, CCTV inspection could not be completed for the full length of the culvert between structures #1319 to #1319N. As a result of the pipe breaks, there is also heavy debris located within the pipe approximately 350' downstream. The camera was unable to pass this location, nor was there a sufficient location at the other end of the culvert in order to set up the camera and run it from the other end. The recommended rehabilitation at this location is to remove and replace the culvert with the same size (24") RCP. Heavy sedimentation was also noted in the culvert between #1109 and #1107. Examples of the issues observed are presented in Figures 3.7 through 3.9. Recommended improvements at this location included removing the sediment and debris from the pipe.

The total estimated construction cost for this area is \$169,900. A detailed breakdown of the cost estimate is included in Table 3.3.

Figure 3.6 - Area C: Location Map

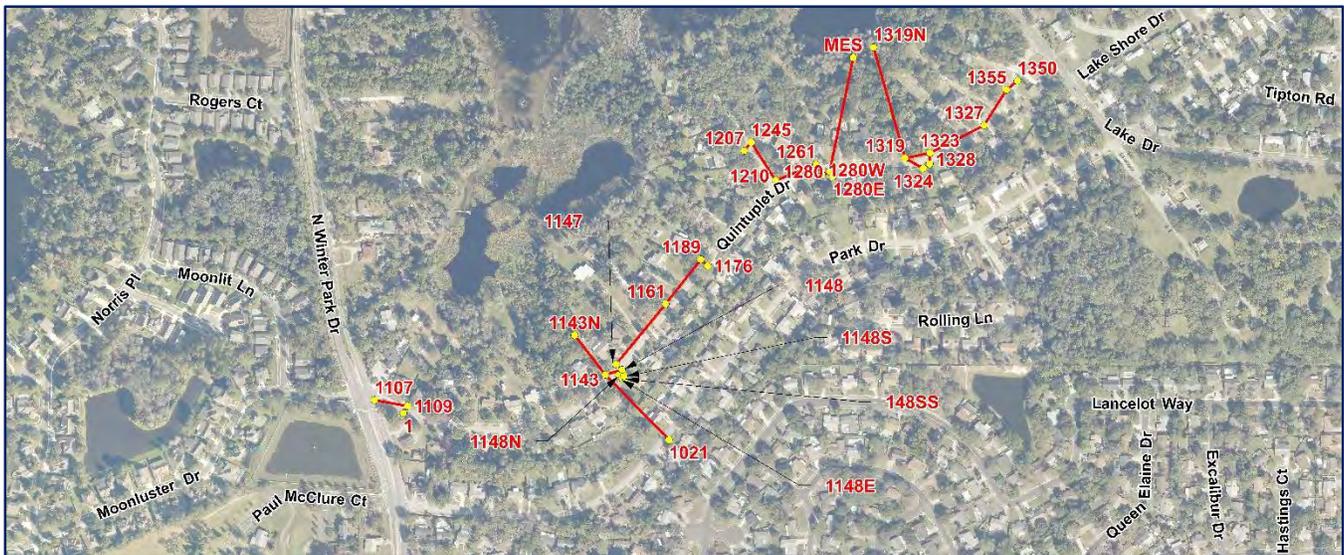


Figure 3.7 - Area C: Roots in Slotted Pipe (Culvert #1323 - #1319)

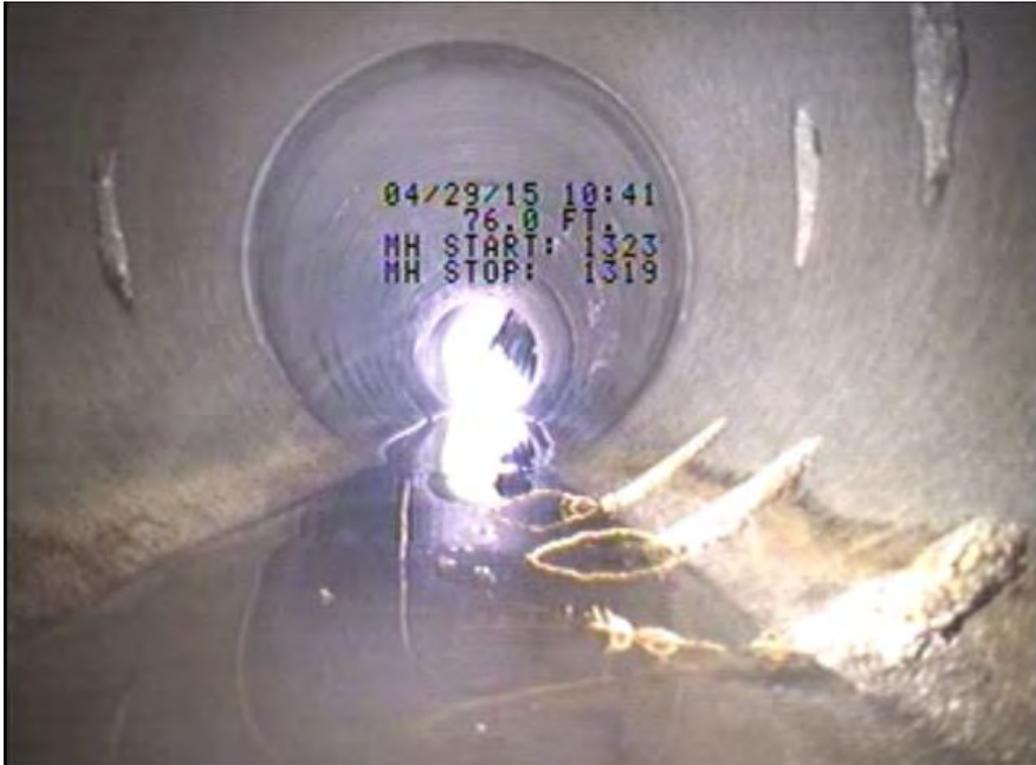
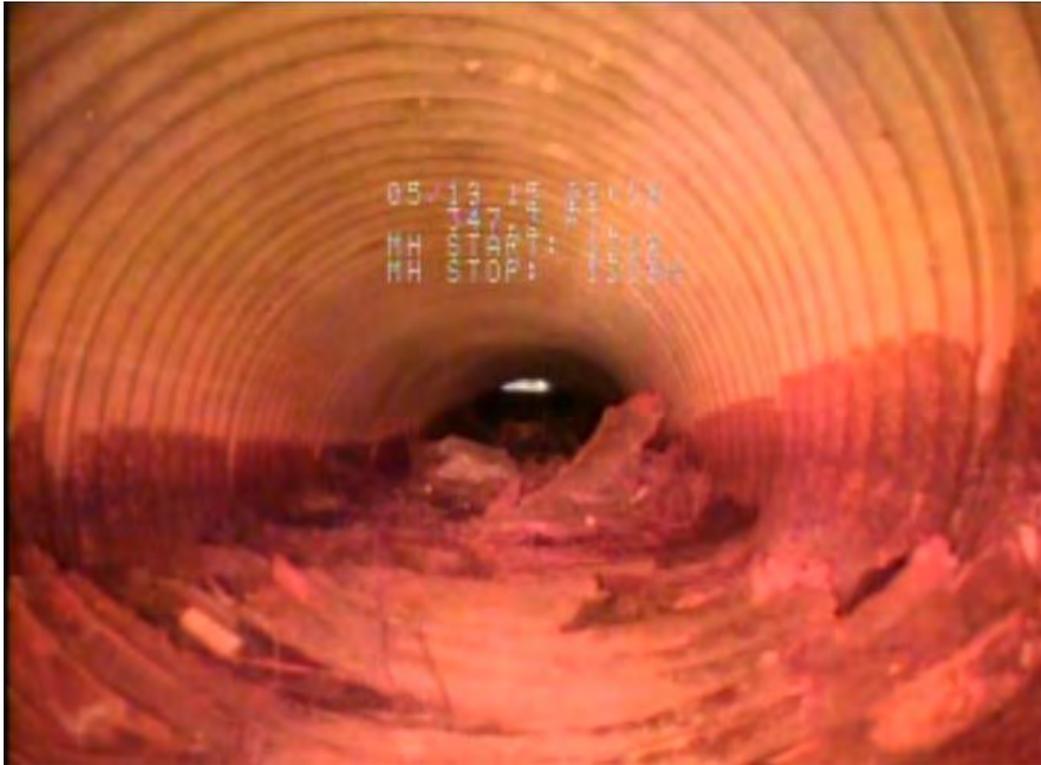


Figure 3.8 - Area C: Broken Gasket and Pipe Separation (Culvert #1350 - #1355)



Figure 3.9 - Area C: Broken Pipe with Debris (Culvert #1319 - #1319N)



Section 3.0

Inspection Results and Recommendations

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Table 3.3: Area "C"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area C1					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 4,000.00	\$ 4,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 5,000.00	\$ 5,000.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 2,500.00	\$ 2,500.00
431-1-1	PIPE LINER, OPTIONAL MATERIAL, 0-24"	301	LF	\$ 87.93	\$ 26,466.93
431-1-2	PIPE LINER, OPTIONAL MATERIAL, 25-36"	203	LF	\$ 135.38	\$ 27,482.14
432-3-4	CHEM GROUT REPAIR, PIPE, NON-TEST, 24"	2	EA	\$ 489.00	\$ 978.00
Construction Subtotal =					\$ 66,427.07
20% Contingency =					\$ 13,300.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$ 79,700.00
Area C2					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 2,000.00	\$ 2,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 5,000.00	\$ 5,000.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 2,500.00	\$ 2,500.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,000.00	\$ 2,000.00
431-1-1	PIPE LINER, OPTIONAL MATERIAL, 0-24"	112	LF	\$ 87.93	\$ 9,848.16
430-175-224	PIPE CULV, OPT MATL, OTHER, 19"x30" S/CD	19	LF	\$ 74.69	\$ 1,419.11
430-982-629	MITERED END SECT, OPT - OTHER, 19"x30" CD	1	EA	\$ 1,180.08	\$ 1,180.08
432-3-1	CHEM GROUT REPAIR, PIPE, NON-TEST, 15"	6	EA	\$ 300.00	\$ 1,800.00
432-3-4	CHEM GROUT REPAIR, PIPE, NON-TEST, 24"	8	EA	\$ 489.00	\$ 3,912.00
570-1-2	PERFORMANCE TURF, SOD	278	SY	\$ 2.20	\$ 611.60
Construction Subtotal =					\$ 30,270.95
20% Contingency =					\$ 6,100.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$36,400.00
Area C3					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 2,000.00	\$ 2,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 5,000.00	\$ 5,000.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 2,500.00	\$ 2,500.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,500.00	\$ 2,500.00
430-175-124	PIPE CULV, OPT MATL, ROUND, 24"S/CD	156	LF	\$ 73.69	\$ 11,495.64
430-982-129	MITERED END SECT, OPTIONAL RD, 24" CD	1	EA	\$ 1,377.16	\$ 1,377.16
431-1-1	PIPE LINER, OPTIONAL MATERIAL, 0-24"	8	LF	\$ 87.93	\$ 703.44
432-3-4	CHEM GROUT REPAIR, PIPE, NON-TEST, 24"	7	EA	\$ 489.00	\$ 3,423.00
570-1-2	PERFORMANCE TURF, SOD	1,111	SY	\$ 2.20	\$ 2,444.20
Construction Subtotal =					\$ 31,443.44
20% Contingency =					\$ 6,300.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$37,700.00

Section 3.0

Inspection Results and Recommendations

Storm Drain Rehabilitation Project - Corrective Action Plan (CAP): PW 1501-2015

Table 3.3: Area "C"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area C4					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 2,500.00	\$ 2,500.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 1,500.00	\$ 1,500.00
431-1-1	PIPE LINER, OPTIONAL MATERIAL, 0-24"	62	LF	\$ 87.93	\$ 5,451.66
432-3-4	CHEM GROUT REPAIR, PIPE, NON-TEST, 24"	1	EA	\$ 489.00	\$ 489.00
Construction Subtotal =					\$ 10,940.66
20% Contingency =					\$ 2,200.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$13,100.00
Area C5					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 500.00	\$ 500.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 500.00	\$ 500.00
430-94-1	DESILTING PIPE, 0 - 24"	100	LF	\$ 4.68	\$ 468.00
Construction Subtotal =					\$ 2,468.00
20% Contingency =					\$ 500.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$3,000.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA C					
(rounded to the nearest \$100) =					\$169,900.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.4 Area D – Gregory Drive:

Area D is located along Gregory Drive and is shown on **Figure 3.10** below. This area consists of 6 culverts that were inspected with CCTV by Altair. Only one culvert was found to require rehabilitation. There is a chip/hole in the culvert located between structures #704 and #703 that will require CIPP. The chip is large enough that another pipe is visible through the hole that has been created. Another culvert was found to have a conflict where a sanitary pipe runs through the top of the storm pipe, however there were no signs of leaks or breaks at this location. Examples of the issues observed are presented in **Figures 3.11** and **3.12**.

The total estimated construction cost for this area is \$9,400 for the CIPP. A detailed breakdown of the cost estimate is included in **Table 3.4**.

Figure 3.10 - Area D: Location Map



Figure 3.11 - Area D: Hole in Pipe (Culvert #704 - #703)

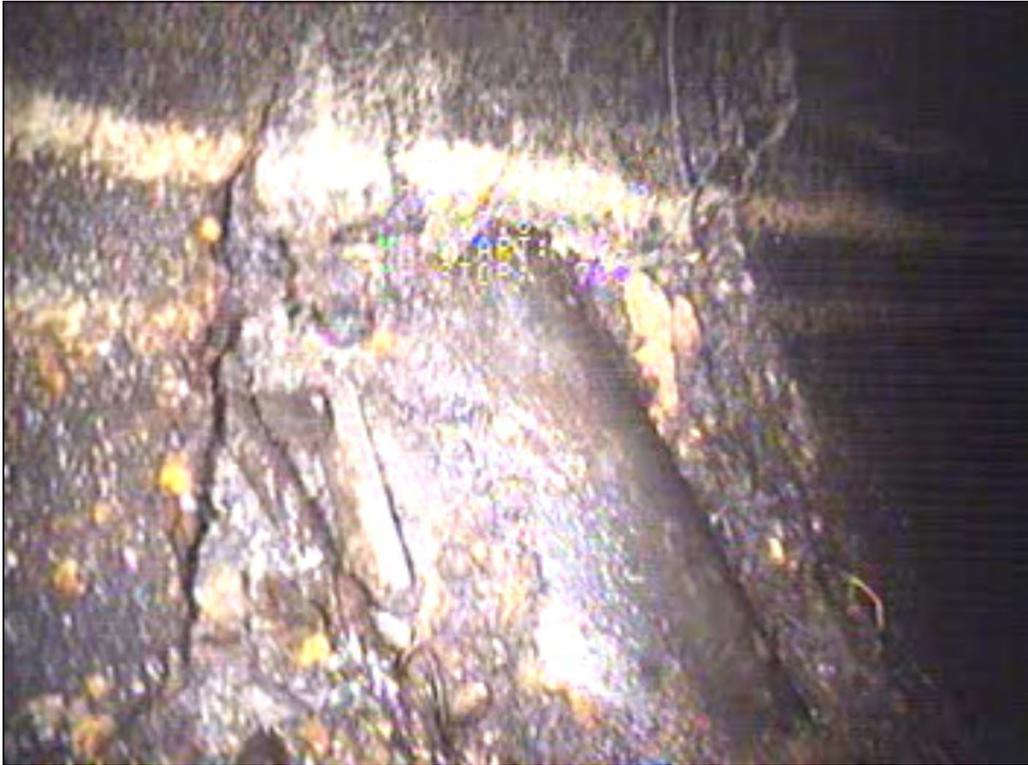


Figure 3.12 - Area D: Sanitary Pipe Conflict (Culvert #803A - #803)



Table 3.4: Area "D"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area D					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 1,000.00	\$ 1,000.00
104		1	LS	\$ 1,000.00	\$ 1,000.00
431-1-1	PIPE LINER, OPTIONAL MATERIAL, 0-24"	55	LF	\$ 87.93	\$ 4,836.15
Construction Subtotal =					\$ 7,836.15
20% Contingency =					\$ 1,600.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$ 9,400.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA D					
(rounded to the nearest \$100) =					\$9,400.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.5 Area E – Concord Drive:

Area E is located along Concord Drive at the intersection with Cypress Way (**Figure 3.13**). CCTV inspection was performed on two culverts in this area. Deficiencies were identified in both culverts, one of which is extensive enough that it is recommended to be replaced. A crack was found in the 18" RCP that crosses Cypress Way (structures #196 to #200) which will need to be grouted. The culvert from structures #196 to #130 included numerous roots throughout culvert as well as breaks in the CMP. The first 90' of the pipe is perforated CMP, however, the remaining 169' are standard, non-perforated CMP. Furthermore, the joint where the pipe becomes non-perforated has a large break/tear in the CMP that has exposed the filter fabric. There are additional locations where the culvert is broken and/or rusted out throughout the culvert. Examples of the issues observed are presented in **Figures 3.14** and **3.15**. At the request of the City, suggested improvements from #196 to #300 have been eliminated from this design. It is understood that improvements to this segment of pipe are to be incorporated into plans for Concord Drive to be prepared by others. The estimated construction cost for the remaining improvements for this area is \$4,100. A detailed breakdown of the cost estimate is included in **Table 3.5**.

Figure 3.13 - Area E: Location Map



Figure 3.14 - Area E: Break in CMP (Culvert #196 - #130)



Figure 3.15 - Area E: Crack in Culvert (Culvert #196 - #130)



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Table 3.5: Area "E"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area E					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 1,000.00	\$ 1,000.00
104		1	LS	\$ 1,000.00	\$ 1,000.00
432-3-2	CHEM GROUT REPAIR, PIPE, NON-TEST, 18"	1	EA	\$ 391.68	\$ 391.68
Construction Subtotal =					\$ 3,391.68
20% Contingency =					\$ 700.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$4,100.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA E (rounded to the nearest \$100) =					\$4,100.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.6 Area F – Paul McClure Court:

Area F is located along Paul McClure Court (Figure 3.16). CCTV inspection was performed on two culverts in this area with an identified deficiency noted in one of them. The culvert between structures #163A and #163B was broken at several locations and showed signs of rust and root intrusion (see Figure 3.17). The recommended improvement for this culvert is to replace the existing 18” CMP with a new 18” RCP. The estimated construction cost for this area is \$9,800. A detailed breakdown of the cost estimate is included in Table 3.6.

Figure 3.16 - Area F: Location Map



Figure 3.17 - Area F: Break in CMP (Culvert #163A - #163B)



Table 3.6: Area "F"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area F					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 1,500.00	\$ 1,500.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 1,500.00	\$ 1,500.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 1,000.00	\$ 1,000.00
430-175-118	PIPE CULV, OPT MATL, ROUND, 18"S/CD	36	LF	\$ 76.47	\$ 2,752.92
570-1-2	PERFORMANCE TURF, SOD	200	SY	\$ 2.20	\$ 440.00
Construction Subtotal =					\$ 8,192.92
20% Contingency =					\$ 1,600.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$9,800.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA F					=
(rounded to the nearest \$100)					\$9,800.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.7 Area G – Stanhope Drive:

Area G is located along Stanhope Drive (**Figure 3.18**). This area consists of 6 culverts that were inspected by Altair. Deficiencies were identified in 5 of the culverts. The majority of the issues were related to mineral stains which are indicative of leakage. Mineral stains were observed in 3 of the culverts inspected. In addition, infiltration was observed inside the structure walls at inlet #635. Heavy sedimentation was also noted in several culverts, including the culverts between #152 and #115 and between #624 and #635. This is another symptom that suggest infiltration is occurring within the culvert. Examples of the issues observed are presented in **Figures 3.19** and **3.20**. Recommended improvements for this area include CIPP and chemical grout. The culvert from structure #624 to #635 is also recommended to be removed and chemical grout will be placed inside structure #635 where leakage is occurring within the inlet. Sediment and debris must be removed prior to implementing the CIPP or chemical grout rehabilitation.

The total estimated construction cost for this area is \$74,300. A detailed breakdown of the cost estimate is included in **Table 3.7**.

Figure 3.18 - Area G: Location Map



Figure 3.19 - Area G: Crack in CMP (Culvert #624 - #635)



Figure 3.20 - Area G: Crack in CMP (Culvert #648 - #149)



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Table 3.7: Area "G"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area G1					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 3,000.00	\$ 3,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 5,000.00	\$ 5,000.00
104	CLEARING & GRUBBING	1	LS	\$ 2,500.00	\$ 2,500.00
110-1-1	PIPE CULV, OPT MATL, ROUND, 18"S/CD	1	LS	\$ 3,000.00	\$ 3,000.00
430-175-118	CHEM GROUT REPAIR, PIPE, NON-TEST, 48"	322	LF	\$ 76.47	\$ 24,623.34
432-3-8	CHEM GROUT REPAIR, MANHOLE / INLET	3	EA	\$ 900.00	\$ 2,700.00
433-1	CONCRETE SIDEWALK AND DRIVEWAYS, 4"	1	EA	\$ 916.87	\$ 916.87
522-1	CONCRETE SIDEWALK AND DRIVEWAYS, 6"	143	SY	\$ 32.57	\$ 4,657.51
522-2	PERFORMANCE TURF, SOD	194	SY	\$ 42.93	\$ 8,328.42
570-1-2		358	SY	\$ 2.20	\$ 787.60
Construction Subtotal =					\$ 55,513.74
20% Contingency =					\$ 11,100.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$ 66,600.00
Area G2					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 1,000.00	\$ 1,000.00
104	DESILTING PIPE, 0 - 24"	1	LS	\$ 1,000.00	\$ 1,000.00
430-94-1	PIPE LINER, OPTIONAL MATERIAL, 0-24"	100	LF	\$ 4.68	\$ 468.00
431-1-1		33	LF	\$ 87.93	\$ 2,901.69
Construction Subtotal =					\$ 6,369.69
20% Contingency =					\$ 1,300.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$7,700.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA G					
(rounded to the nearest \$100) =					\$74,300.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.8 Area H – Park Avenue:

Area H is located along Park Avenue (**Figure 3.21**) and is broken down into 3 sub-areas (H1, H2, and H3). CCTV inspection was performed on 8 culverts in this area with only 2 of the culverts requiring rehabilitation. The culvert between structure #148D and #148E at Area H1 near the intersection of Paul McClure Court and Park Avenue is severely rusted and includes a large hole in the pipe with visible soil and filter fabric (**Figure 3.22**). Furthermore, there is a material change in the pipe from CMP to HDPE approximately 15' from the outfall location (**Figure 3.23**). The proposed design for this culvert is to replace it with the equivalent sized (24") RCP.

The culvert in Area H3 between #126B and #126A is deformed to where the 18" CMP is bulging in and creates the potential for the pipe to break. The recommended improvement for this area is to replace this existing CMP with an equivalent size (18") RCP. Heavy debris and concrete was also noted in the bottom of structure #126B (**Figure 3.24**).

The total estimated construction cost for Area H is \$50,900. A detailed breakdown of the cost estimate is included in **Table 3.8**.

Figure 3.21 - Area H: Location Map



Figure 3.22 - Area H: CMP Deterioration (Culvert #148D - #148E)



Figure 3.23 - Area H: Material Change from CMP to HDPE (Culvert #148D - #148E)



Figure 3.24 - Area H: Inlet 126B



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**Table 3.8: Area "H"
Engineer's Conceptual Opinion of Probable Cost**

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area H1					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 2,000.00	\$ 2,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 5,000.00	\$ 5,000.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 3,000.00	\$ 3,000.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,500.00	\$ 2,500.00
160-4	TYPE B STABILIZATION	133	SY	\$ 3.43	\$ 456.19
285-708	OPTIONAL BASE, BASE GROUP 08	133	SY	\$ 15.79	\$ 2,100.07
334-1-13	SUPERPAVE ASPHALTIC CONC, TRAFFIC C	11	TN	\$ 89.20	\$ 981.20
430-175-124	PIPE CULV, OPT MATL, ROUND, 24"S/CD	96	LF	\$ 73.69	\$ 7,074.24
430-982-129	MITERED END SECT, OPTIONAL RD, 24" CD	1	EA	\$ 1,377.16	\$ 1,377.16
522-2	CONCRETE SIDEWALK AND DRIVEWAYS, 6"	27	SY	\$ 42.93	\$ 1,159.11
550-10-918	FENCING, SPECIAL TYP, 0.0-5.0', RESET EXISTING	50	LF	\$ 9.00	\$ 450.00
570-1-2	PERFORMANCE TURF, SOD	333	SY	\$ 2.20	\$ 732.60
Construction Subtotal =					\$ 26,830.57
20% Contingency =					\$ 5,400.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$ 32,200.00
Area H2					
NO IMPROVEMENTS REQUIRED					
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$0.00
Area H3					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 5,000.00	\$ 5,000.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 2,000.00	\$ 2,000.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,000.00	\$ 2,000.00
160-4	TYPE B STABILIZATION	133	SY	\$ 3.43	\$ 456.19
285-708	OPTIONAL BASE, BASE GROUP 08	133	SY	\$ 15.79	\$ 2,100.07
334-1-13	SUPERPAVE ASPHALTIC CONC, TRAFFIC C	11	TN	\$ 89.20	\$ 981.20
430-175-118	PIPE CULV, OPT MATL, ROUND, 18"S/CD	27	LF	\$ 76.47	\$ 2,064.69
Construction Subtotal =					\$ 15,602.15
20% Contingency =					\$ 3,100.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$18,700.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA H					=
(rounded to the nearest \$100)					\$50,900.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.9 Area I – S. Winter Park Drive:

Area I is located along South Winter Park Drive, south of Queens Mirror Circle as shown on **Figure 3.25**. This area consists of 3 parallel culverts that were inspected by Altair. During the inspection, a “new” junction box was identified approximately 57’ along the culverts. The junction box has been buried under the roadway pavement and there is no visible manhole from the roadway where the junction box is located. Access to the culverts are available at either end; thus this manhole being buried is not considered an issue at this time. Leakage/upflow has been noted within the culverts and the recommended improvements for this area include placing CIPP along all 3 culverts, as well as grouting along the junction box.

The total estimated construction cost for this area is \$159,600. A detailed breakdown of the cost estimate is included in **Table 3.9**.

Figure 3.25 - Area I: Location Map



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TABLE 3.9 AREA "I"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area I					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 7,000.00	\$ 7,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 5,000.00	\$ 5,000.00
104		1	LS	\$ 5,000.00	\$ 5,000.00
431-1-4	PIPE LINER, OPTIONAL MATERIAL, 49-60"	384	LF	\$ 295.00	\$ 113,280.00
433-1	CHEM GROUT REPAIR, MANHOLE / INLET	3	EA	\$ 916.87	\$ 2,750.61
Construction Subtotal =					\$ 133,030.61
20% Contingency =					\$ 26,600.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$ 159,600.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA I					
(rounded to the nearest \$100) =					\$159,600.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.10 Area J – Water Reclamation Facility Ditch Crossing:

Area J is located along Cross Street near the intersection with N Winter Park Ave at the entrance to the water reclamation facility (**Figure 3.26**). This area was identified as having erosion issues that need to be addressed. Ditch and bank erosion was noted adjacent to the roadway at the cross pipe. Survey of this area was performed by SSMC while a geotechnical evaluation of the site was performed by GEC.

Soil borings and muck probes were conducted at this location. A slope stability analyses indicated that the ditch side slopes are considered stable. In order to address the existing and future erosion issues at the site, the placement of rubble riprap at both sides of the culvert extending into the channel is recommended. Construction activities at this site will be relatively constrained due to existing fences and multiple utility pipe crossings through the channel, particularly at the north side of the roadway. The design improvements take these utilities and fence locations into account, however the contractor will be responsible to conduct a utility locate to ensure all utilities are located and not in conflict with construction.

The total estimated construction cost for Area J is \$14,600. A detailed breakdown of the cost estimate is included in **Table 3.10**.

Figure 3.26 - Area J: Location Map



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Table 3.10: Area "J"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST.		UNIT	CONTRACT	
		QTY.	UNIT	PRICE	PRICE	
Area J						
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00	
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 1,000.00	\$ 1,000.00	
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 2,500.00	\$ 2,500.00	
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,500.00	\$ 2,500.00	
530-3-4	RIPRAP, RUBBLE, F&I, DITCH LINING	46	TN	\$ 112.17	\$ 5,159.82	
Construction Subtotal =					\$ 12,159.82	
20% Contingency =					\$ 2,400.00	
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$14,600.00	
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA J					=	
(rounded to the nearest \$100)					\$14,600.00	

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.11 Area K – Queens Mirror Circle, South Lake Triplet Drive Bridge:

Area K is located along S Triplet Lake Drive at the Queens Mirror Bridge (**Figure 3.27**). This area was noted as having numerous erosion issues including ditch slope erosion as well as riprap and bag issues under the bridge. There is an existing sheet pile wall along the southwest slope that is in good condition. However, there are several locations of erosion behind the retaining wall. **Figures 3.28** through **3.30** present photographs of the issues at this location.

A geotechnical investigation of the site was performed by GEC to include soil borings, muck probes, measurement of groundwater levels, and a ditch slope stability analysis. Soils encountered at this area were medium dense fine sand with silt and silty fine sand to a depth of 8 feet below the existing grade. This was underlain by a layer of clayey fine sand and a layer of fine sand to the boring termination depth of 15 feet. The water level at the time of the investigation was roughly 6 feet deep for a water elevation of 50.2 NAVD88. The estimated seasonal high water level for Area K is 52.0 feet NAVD88. In addition, there was no muck encountered during the muck probes for this area.

Although there are currently riprap bags underneath the bridge, these bags have become displaced and are falling apart. The design for this area includes construction of rubble riprap under the bridge to replace the failing bags. The design also extends the riprap limits in either direction along the channel. In addition, ditch slopes around 1H:1.5V were observed which produces a ditch slope stability factor of safety of 1.2. This is less than the recommended factor of safety of 1.3 for earthen slopes. Therefore, improvements for this location also include re-grading the ditch to provide a minimum slope of 1H:2.5V.

As noted above, erosion was observed behind the retaining wall along the southeast ditch bank. In addition, there is an existing plastic stormwater pipe that ends approximately 6' short of the channel/wall. Even though some riprap has been placed at the discharge location and a slot has been placed in the concrete cap of the retaining wall, moderate erosion has still occurred behind the wall at this spot. The recommendation at the location is to extend the plastic pipe to the ditch to allow stormwater to discharge into the channel rather than behind the wall. Flowable fill is also proposed behind the retaining wall closer to the roadway where overland flow has eroded the existing ground. All work at Area K is to be within the existing City owned parcels in order to minimize disruption to residents.

The total estimated construction cost for Area K is \$82,900. A detailed breakdown of the cost estimate is included in **Table 3.11**.

Figure 3.27 - Area K: Location Map



Figure 3.28 - Area K: Erosion Behind Wall (southwest corner)



Figure 3.29 - Area K: Ditch Side Slope Erosion (facing southeast)



Figure 3.30 - Area K: Underneath Bridge



Table 3.11: Area "K"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area K					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 4,000.00	\$ 4,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 2,500.00	\$ 2,500.00
104	CLEARING & GRUBBING	1	LS	\$ 5,000.00	\$ 5,000.00
110-1-1	EXCAVATION, EMBANKMENT, & GRADING	1	LS	\$ 12,500.00	\$ 12,500.00
120-14	FLOWABLE FILL	2	CY	\$ 154.72	\$ 309.44
121-70	RIPRAP- RUBBLE, BANK AND SHORE	437	TN	\$ 88.36	\$ 38,613.32
530-3-3	PERFORMANCE TURF, SOD	345	SY	\$ 2.20	\$ 759.00
1050-11-224	UTILITY PIPE, F&I,PVC,WATER/SEWER,8-19.9	6	LF	\$ 75.71	\$ 454.26
Construction Subtotal =					\$ 69,136.02
20% Contingency =					\$ 13,800.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$82,900.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA K (rounded to the nearest \$100) =					\$82,900.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.12 Area L – Woodstream Lane:

Area L is located along Woodstream Lane between Bridle Path and Sundown Trail (**Figure 3.31**). This area was initially identified as possibly requiring the construction of underdrains. Plans prepared by CDM Smith in February 2014 called for the existing 24" CMP along Woodstream Lane to be rehabilitated with CIPP. After this pipe was rehabilitated, depression issues in the pavement and water table concerns were noted by the City.

The area was inspected and evaluated by GEC to include soil borings, measurement of groundwater levels, pavement assessment, and underdrain recommendations. Soils encountered in the area were typically fine sands with variable silt content. At the time of the investigation, the roads within the area appeared to be recently repaved and currently in good condition. Pavement cores were performed at two locations along Woodstream Lane. Results show an asphalt thickness of approximately 1-1/2" with a limerock base from 6-3/4" to 8" thick. The water level at the time of the investigation varied from 2.7 to 10.3 feet below existing grade for a water elevation between 50.2 to 47.3 feet NAVD88. The estimated seasonal high groundwater levels (SHGL) for Area L are between 49.0 and 52.5 feet NAVD88. Underdrains are typically recommended at locations where the SHGL is within one –foot of the bottom of roadway base elevation. The roadway becomes susceptible to cracking, erosion, and damage if the one-foot clearance from the base and SHGL is not provided.

While the majority of pavement appeared in good condition due to the recent repaving, a comparison of the SHGL and topography of the roads show that there are approximately 600 feet of roadway where there is less than the recommended 1' clearance between the base and SHGL. This aligns with the reports of pavement issues since the previous culvert rehabilitation. The recommended design includes roughly 1,000 feet of 6" Type 1 underdrains to be constructed along both sides of portions of Woodstream Lane and Sundown Trail.

The total estimated construction cost for Area L is \$53,500. A detailed breakdown of the cost estimate is included in **Table 3.12**.

Figure 3.31 - Area L: Location Map



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Table 3.12: Area "L"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area L					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 3,000.00	\$ 3,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 5,000.00	\$ 5,000.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 2,500.00	\$ 2,500.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,000.00	\$ 2,000.00
110-15-2	TREE PRESERVATION & REPLACEMENT		LS	\$ 2,500.00	\$ -
440-1-10	UNDERDRAIN, TYPE I	1,061	LF	\$ 23.66	\$ 25,103.26
522-1	CONCRETE SIDEWALK AND DRIVEWAYS, 4"	4	SY	\$ 32.57	\$ 130.28
522-2	CONCRETE SIDEWALK AND DRIVEWAYS, 6"	136	SY	\$ 42.93	\$ 5,838.48
570-1-2	PERFORMANCE TURF, SOD	472	SY	\$ 2.20	\$ 1,038.40
Construction Subtotal =					\$ 44,610.42
20% Contingency =					\$ 8,900.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$53,500.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA L					
(rounded to the nearest \$100) =					\$53,500.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.13 Area M – Easement from Carriage Hill Drive:

Area M is located along Carriage Hill Drive and is within the City-owned drainage easement between the residential houses at 201 and 139 Carriage Hill Drive (**Figure 3.32**). CCTV inspection was performed on the 30" culvert within this easement that discharges to the wetland to the east.

Deficiencies identified in this culvert included mineral stains and root intrusion (**Figure 3.33**), both of which are recommended to receive chemical grout to address the concerns. It is also noted that the culvert had a material change from RCP to ADS approximately 25' from the outfall to the wetland (**Figure 3.34**). There was, however, no leakage or other issues observed at this joint.

The estimated construction cost for this area is \$5,600. A detailed breakdown of the cost estimate is included in **Table 3.13**.

Figure 3.32 - Area M: Location Map

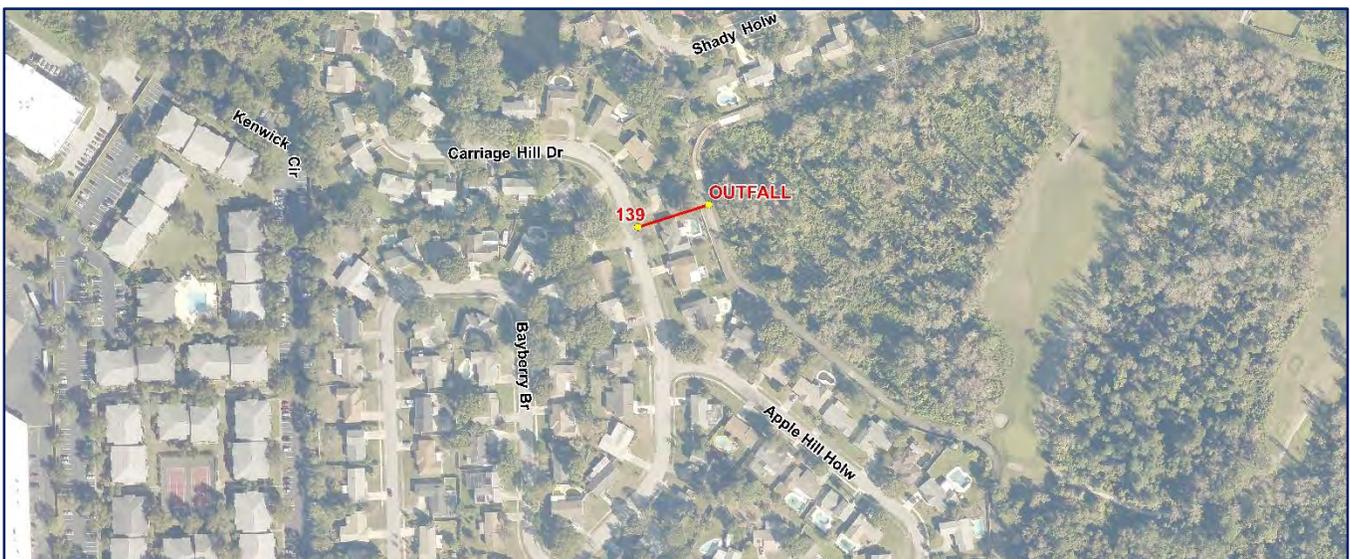
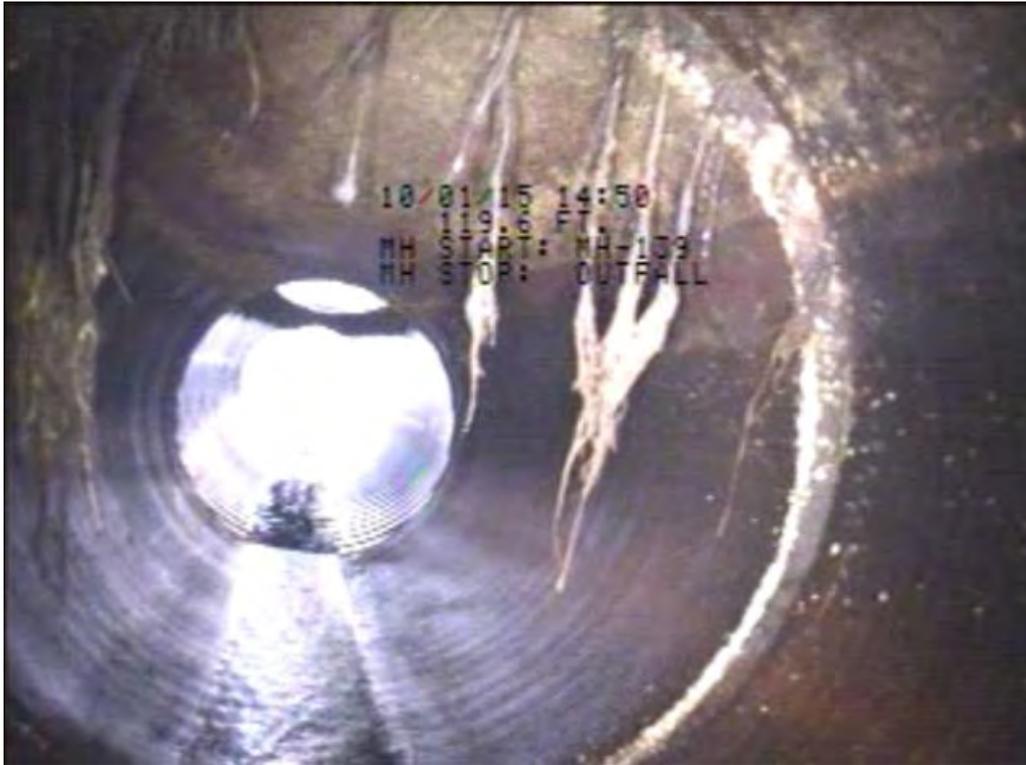


Figure 3.33 - Area M: Root Intrusion (Culvert #139 - #Outfall)



10/01/15 14:50
119.0 FT.
MH START: MH-139
MH STOP: OUTFALL

Figure 3.34 - Area M: Material Change- RCP to ADS (Culvert #139 - #Outfall)



10/01/15 14:52
130.0 FT.
MH START: MH-139
MH STOP: OUTFALL

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Storm Drain Rehabilitation Project - Corrective Action Plan (CAP): PW 1501-2015

Table 3.13: Area "M"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area M					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 1,000.00	\$ 1,000.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 1,500.00	\$ 1,500.00
432-3-5	CHEM GROUT REPAIR, PIPE, NON-TEST, 30"	2	EA	\$ 600.00	\$ 1,200.00
Construction Subtotal =					\$ 4,700.00
20% Contingency =					\$ 900.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$5,600.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA M					
(rounded to the nearest \$100) =					\$5,600.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

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3.14 Area N – 277/285 Secret Way:

Area N is located along Secret Way and consists of the culvert between the residences of 277 and 285 Secret Way (**Figure 3.35**). CCTV inspection was performed on the 18" culvert that drains east towards the rear of the lots and discharges into the existing channel.

The first 130' of this culvert is RCP at which point there is a material change to HDPE. There is visible leakage at this joint. The joint is also offset such that the camera was unable to pass this location to video the remaining culvert. Thus, CCTV inspection could not be completed for the full length of the culvert to the outfall location. Chemical grout at the joint is recommended to address the leakage issues.

The estimated construction cost for this area is \$5,200. A detailed breakdown of the cost estimate is included in **Table 3.14**.

Figure 3.35 - Area N: Location Map



Table 3.14: Area "N"

Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area N					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 1,000.00	\$ 1,000.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 1,500.00	\$ 1,500.00
432-3-2	CHEM GROUT REPAIR, PIPE, NON-TEST, 18"	2	EA	\$ 391.68	\$ 783.36
Construction Subtotal =					\$ 4,283.36
20% Contingency =					\$ 900.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$5,200.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA N					
(rounded to the nearest \$100) =					\$5,200.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.15 Area O – 224/228 Secret Way:

Area O is located along Secret Way near the 224 Secret Way (**Figure 3.36**). This area also includes the culvert that drains east to Secret Lake. Secret Way in this area was recently re-paved, however, there were several issues with the pavement. A damaged pipe was identified by the City which was subsequently repaired in-house. Assessment work included CCTV inspection on two culverts in this area as well as evaluation for a potential underdrain system.

Results of the CCTV inspection found a material change from RCP to ADS approximately 118' along the culvert from #225 to #225A (**Figure 3.37**). At this joint the culvert angled to the right which prevented the camera from being able to follow the path of the ADS. CCTV inspection could not be completed for the full length of the culvert to the outfall location. As a result of the historical issues in this area, the recommended design includes replacing approximately 88' of the 15" ADS with the same size RCP. Inlet #224 also showed exposed rebar inside the structure. The design here also includes repairs to the concrete inside the structure.

A geotechnical investigation was performed by GEC to include soil borings, measurement of groundwater levels, pavement assessment, and underdrain recommendations. Soils encountered in the area were typically fine sands with variable silt content and a layer of mucky fine sands from 2 to 3 feet below existing ground. Pavement cores were performed at two locations along Secret Way. Results show an asphalt thickness between 1-7/8" to 2-5/8" with a soil cement base approximately 6" thick. The water level at the time of the investigation was around 4 feet below existing grade for a water elevation of approximately 51.2 feet NAVD88. The estimated seasonal high groundwater levels (SHGL) for Area O is around 53.2 feet NAVD88. Underdrains are typically recommended at locations where the SHGL is within one foot of the bottom of the roadway base elevation. The roadway becomes susceptible to cracking, erosion, and damage if the one-foot clearance from the base and SHGL is not provided.

While the roads within the area appeared to be recently repaved and currently in good condition, a comparison of the SHGL and topography of the roads show that there are approximately 350 feet of roadway where there is less than the recommended 1' clearance. The recommended design to address the pavement issues include 637 feet of 6" Type 1 underdrains to be constructed along both sides Secret Way.

The total estimated construction cost for Area O is \$56,400. A detailed breakdown of the cost estimate is included in **Table 3.15**.

Figure 3.36 - Area O: Location Map



Figure 3.37 - Area O: Material Change – RCP to ADS (Culvert #225 - #225A)



Table 3.15: Area "O"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area O					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 3,000.00	\$ 3,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 5,000.00	\$ 5,000.00
104		1	LS	\$ 2,500.00	\$ 2,500.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,500.00	\$ 2,500.00
110-15-2	TREE PRESERVATION & REPLACEMENT	1	LS	\$ 2,500.00	\$ 2,500.00
400-4-2	CONC CLASS IV, ENDWALLS	1	CY	\$ 1,617.30	\$ 1,617.30
430-175-115	PIPE CULV, OPT MATL, ROUND, 15"/S/CD	88	LF	\$ 105.92	\$ 9,320.96
440-1-10	UNDERDRAIN, TYPE I	637	LF	\$ 23.66	\$ 15,071.42
522-2	CONCRETE SIDEWALK AND DRIVEWAYS, 6"	108	SY	\$ 42.93	\$ 4,636.44
570-1-2	PERFORMANCE TURF, SOD	381	SY	\$ 2.20	\$ 838.20
Construction Subtotal =					\$ 46,984.32
20% Contingency =					\$ 9,400.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$56,400.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA O					
(rounded to the nearest \$100) =					\$56,400.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.16 Area P – Secret Way & N Triplet Lake Drive:

Area P is located along Secret Way near the intersection with N Triplet Lake Drive (**Figure 3.38**). The existing roadway includes valley curb along both sides of the road to convey runoff. The curb inlet on the west side of Secret Way at the intersection with N Triplet Lake Drive includes raised curb that is frequently run over by vehicles and is a roadside hazard (**Figure 3.39**). The proposed design includes replacing the existing curb inlet with a ditch bottom inlet (DBI). The existing raised curb will be removed and the valley curb extended to the new DBI. Approximately 20' of the adjacent sidewalk will be shifted over to prevent a steep drop off from the sidewalk to the new inlet.

The total estimated construction cost for Area P is \$14,900. A detailed breakdown of the cost estimate is included in **Table 3.16**.

Figure 3.38 - Area P: Location Map

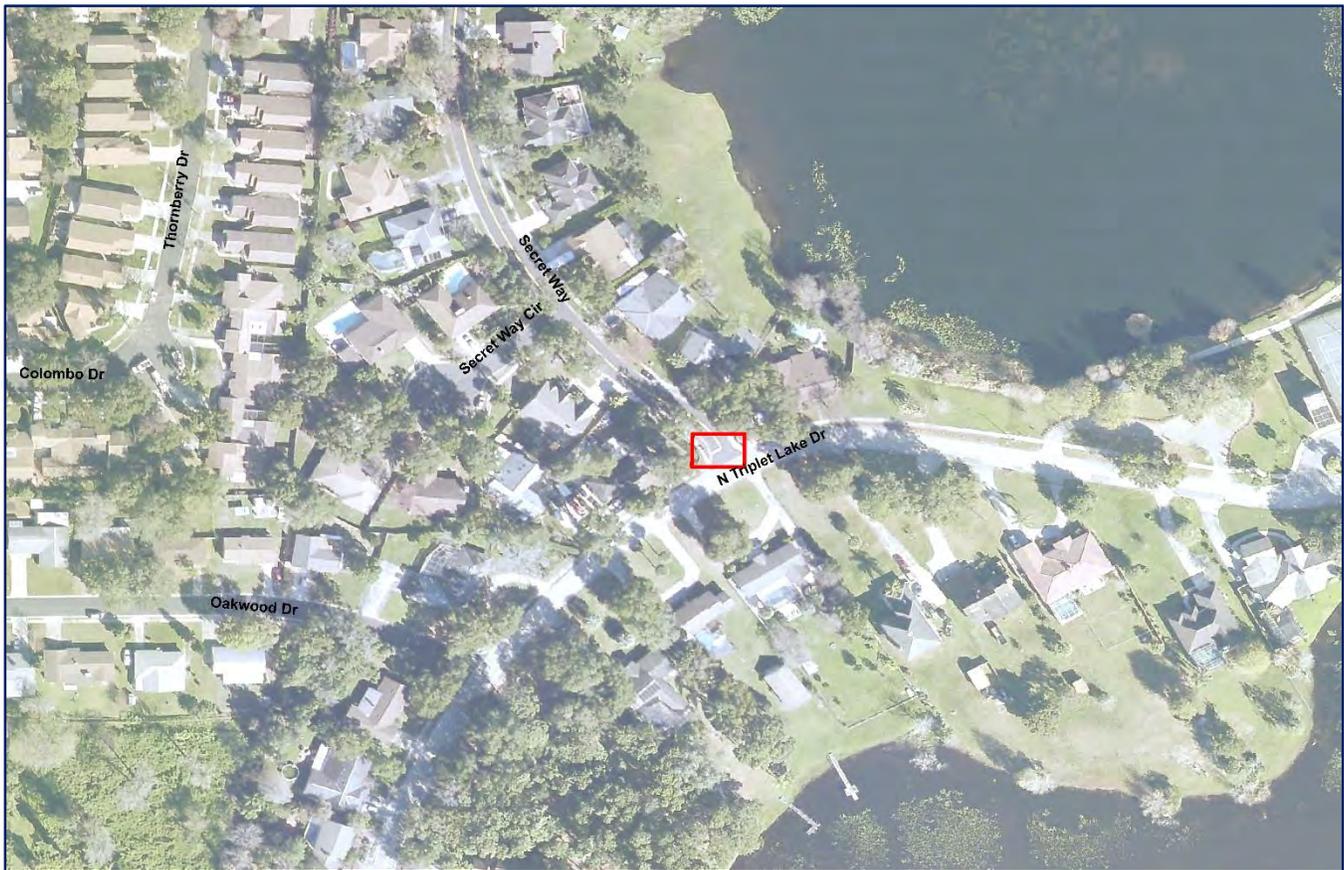


Figure 3.39 - Area P: Raised Curb and Inlet



Table 3.16: Area "P"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area P					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 3,000.00	\$ 3,000.00
104		1	LS	\$ 2,500.00	\$ 2,500.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,000.00	\$ 2,000.00
425-1-541	INLETS, DT BOT, TYPE D, <10'	1	EA	\$ 2,979.69	\$ 2,979.69
520-3	VALLEY GUTTER- CONCRETE	25	LF	\$ 24.51	\$ 612.75
522-1	CONCRETE SIDEWALK AND DRIVEWAYS, 4"	9	SY	\$ 32.57	\$ 293.13
570-1-2	PERFORMANCE TURF, SOD	22	SY	\$ 2.20	\$ 48.40
Construction Subtotal =					\$ 12,433.97
20% Contingency =					\$ 2,500.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$14,900.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA P (rounded to the nearest \$100) =					\$14,900.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.17 Area Q – Guinevere Drive at Excalibur Drive:

Area Q is located at the intersection of Guinevere Drive and Excalibur Drive (**Figure 3.40**). Frequent nuisance flooding at the intersection has been noted by the City. Runoff at this location currently drains toward the intersection and then north along Excalibur Drive. However, there is a relative low point at the south edge of Guinevere Drive at this intersection where water stages and creates nuisance ponding within the roadway. The closest inlets are along Excalibur Drive, approximately 300' from the intersection. Design improvements for this area include re-grading and repaving the intersection to allow runoff along the south side of the road to drain to Excalibur Drive and continue north to the curb inlets.

The total estimated construction cost for Area Q is \$86,800. A detailed breakdown of the cost estimate is included in **Table 3.17**.

Figure 3.40 - Area Q: Location Map



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Table 3.17: Area "Q"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area Q					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 4,000.00	\$ 4,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 10,000.00	\$ 10,000.00
104		1	LS	\$ 2,500.00	\$ 2,500.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,500.00	\$ 2,500.00
160-4	TYPE B STABILIZATION	1,109	SY	\$ 3.43	\$ 3,803.87
285-708	OPTIONAL BASE, BASE GROUP 08	1,109	SY	\$ 15.79	\$ 17,511.11
334-1-13	SUPERPAVE ASPHALTIC CONC, TRAFFIC C	91	TN	\$ 89.20	\$ 8,117.20
425-5-1	MANHOLE, ADJUST, UTILITIES	1	EA	\$ 844.45	\$ 844.45
520-3	VALLEY GUTTER- CONCRETE	677	LF	\$ 24.51	\$ 16,593.27
522-1	CONCRETE SIDEWALK AND DRIVEWAYS, 4"	26	SY	\$ 32.57	\$ 846.82
522-2	CONCRETE SIDEWALK AND DRIVEWAYS, 6"	61	SY	\$ 42.93	\$ 2,618.73
570-1-2	PERFORMANCE TURF, SOD	214	SY	\$ 2.20	\$ 470.80
700-1	SIGNAGE & MARKINGS	1	LS	\$ 2,500.00	\$ 2,500.00
Construction Subtotal =					\$ 72,306.25
20% Contingency =					\$ 14,500.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$ 86,800.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA Q					=
(rounded to the nearest \$100)					\$86,800.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.18 Area R – Oakwood Drive at N Triplet Lake Drive:

Area R is located at the intersection of Oakwood Drive and N Triplet Lake Drive (**Figure 3.41**). Maintenance and hazard issues have been reported in this area which are related to two inlets on either side of Oakwood Drive at this intersection. The ditch bottom inlet located at the southern corner of the intersection is frequently run over by turning vehicles which causes the grate to pop off creating a hazard. In addition, the curb inlet at the northern corner is also frequently damaged by vehicles. This inlet also extends into the adjacent sidewalk and is approximately 6" higher than the sidewalk which creates a tripping hazard for pedestrians (**Figure 3.42**).

Improvements at this location include replacing the existing curb inlet at the north corner with a new ditch bottom inlet. The adjacent sidewalk will also be re-graded to be flush with the new inlet. The grate at the existing ditch bottom inlet at the other side of the intersection will be replaced with a heavy duty grate that will be chained to the structure to prevent it from popping off. The total estimated construction cost for Area R is \$18,600. A detailed breakdown of the cost estimate is included in **Table 3.18**.

Another option that was evaluated included removing the existing ditch bottom inlet structure and re-grading the intersection to drain to the adjacent curb inlet. However, there are multiple utilities in this area including a 3" PVC pipe that runs through the existing structure. **Figure 3.43** includes a photograph of the inlet and the PVC conflict. The degree of difficulty for the contractor to remove this structure without impacting existing utilities and other pipes would be high; thus this option is not recommended.

Figure 3.41 - Area R: Location Map

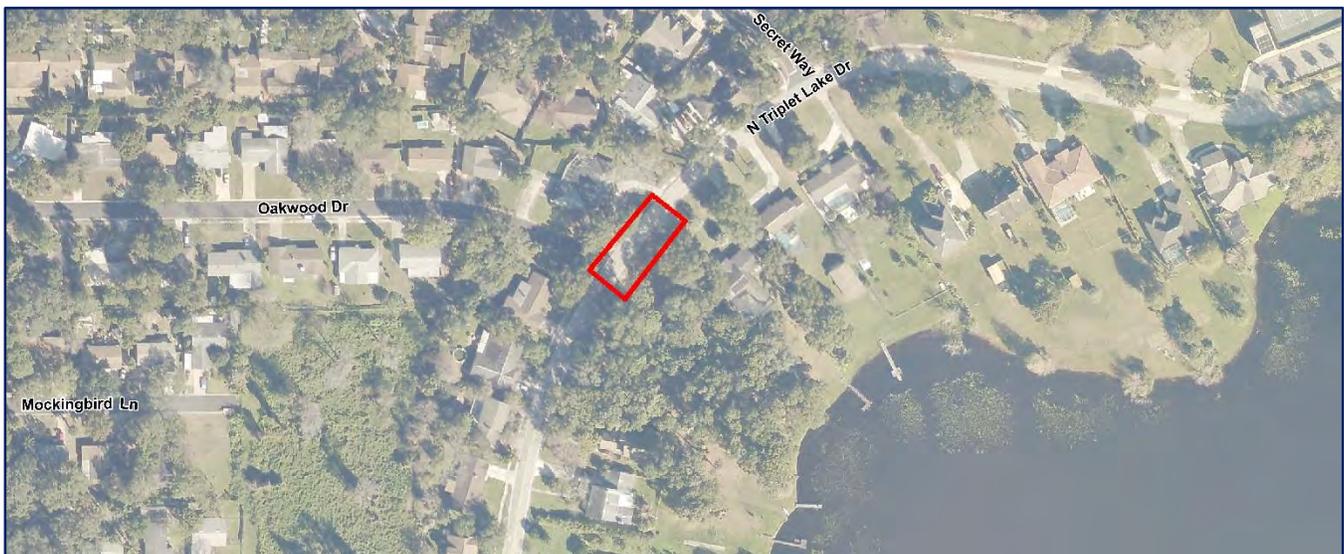


Figure 3.42 - Area R: Raised Inlet at Sidewalk (facing north)



Figure 3.43 - Area R: Inlet and Pipe Conflict (facing south)



Table 3.18: Area "R"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area R					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 2,500.00	\$ 2,500.00
104		1	LS	\$ 2,500.00	\$ 2,500.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,000.00	\$ 2,000.00
400-2-1	CONC CLASS II, CULVERTS	1	CY	\$ 1,323.95	\$ 1,323.95
425-1-541	INLETS, DT BOT, TYPE D, <10'	1	EA	\$ 2,979.69	\$ 2,979.69
425-1-545	INLETS, DT BOT, TYPE D, PARTIAL	1	EA	\$ 2,953.49	\$ 2,953.49
522-1	CONCRETE SIDEWALK AND DRIVEWAYS, 4"	8	SY	\$ 32.57	\$ 260.56
Construction Subtotal =					\$ 15,517.69
20% Contingency =					\$ 3,100.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$18,600.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA R (rounded to the nearest \$100) =					\$18,600.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.19 Area S – Ivey Road at Seminola Boulevard:

Area S is located along Ivey Road near the intersection with Seminola Boulevard and is shown on **Figure 3.44**. CCTV inspection was performed on the culvert crossing under Ivey Road to the channel to the east. There are several instances of infiltration at the pipe joints in this area. Sand and water were noticeable at two joint locations towards the eastern end of the pipe near outfall #295. It was also found that although there is a manhole cover located in the sidewalk along the east side of Ivey Road, there is no structure bottom within the pipe. The culvert bends approximately 30° at this location and the manhole cover has been constructed to connect to the top of the pipe. This was supposedly done in order to provide a means of access at this joint. While not necessarily an issue, the CCTV inspection also found water infiltration along the bottom of the pipe at the joint in this location. An example of water and sand infiltrating the pipe at the joint is presented in **Figure 3.45**.

The recommended rehabilitation technique for this culvert includes the placement of chemical grout. The total estimated construction cost for this area is \$10,700. A detailed breakdown of the cost estimate is included in **Table 3.19**.

Figure 3.44 - Area S: Location Map



Figure 3.45 - Area S: Water and Sand Infiltration at Joint

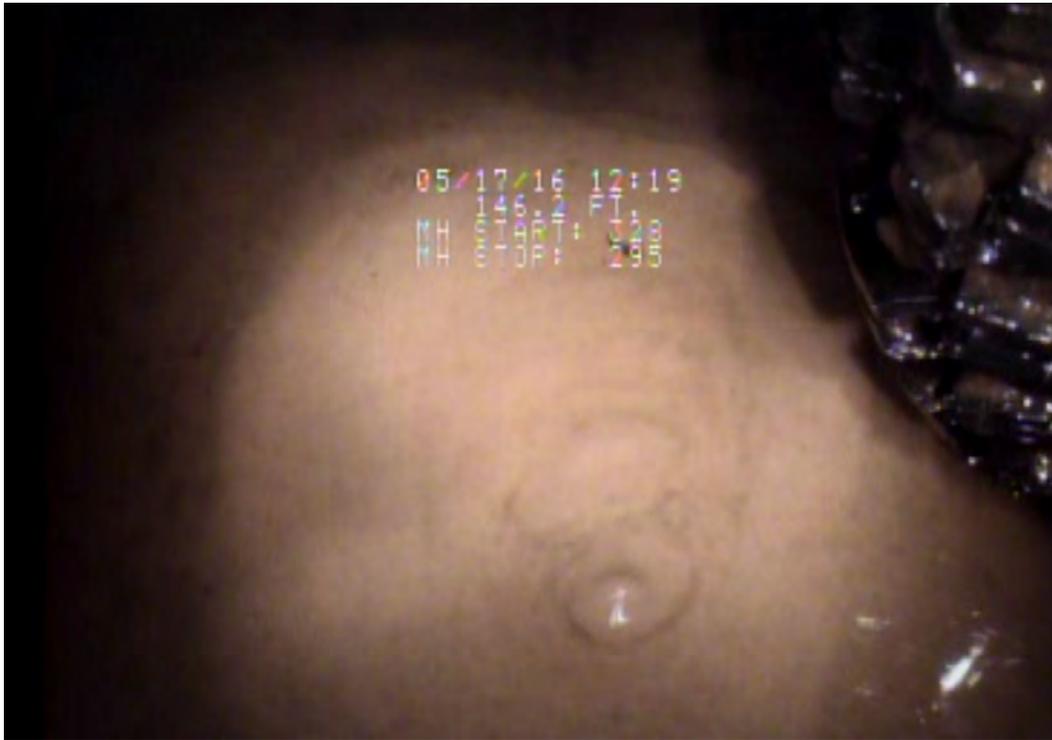


Table 3.19: Area "S"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area S					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 1,000.00	\$ 1,000.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 1,500.00	\$ 1,500.00
432-3-8	CHEM GROUT REPAIR, PIPE, NON-TEST, 48"	6	EA	\$ 900.00	\$ 5,400.00
Construction Subtotal =					\$ 8,900.00
20% Contingency =					\$ 1,800.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$10,700.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA S (rounded to the nearest \$100) =					\$10,700.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.20 Area T – Marigold Road:

Area T is located Marigold Road between Winter Park Drive and Tulip Trail (**Figure 3.46**). This area was initially identified as possibly requiring the construction of underdrains.

A geotechnical investigation was performed by GEC to include soil borings, measurement of groundwater levels, pavement assessment, and underdrain recommendations. Soils encountered in the area were typically fine sands with variable silt content and a layer of clayey fine sand from 2 to 2.5 feet below existing ground. Pavement cores were performed at three locations along Marigold Road. Results show asphalt thicknesses between 1-7/8" to 3-1/4" with a soil cement base ranging between 9" and 14" thick. The water level at the time of the investigation varied from 1.8 to 3.7 feet below existing grade for a water elevation between 72.2 and 59.4 feet NAVD88. The estimated seasonal high groundwater levels (SHGL) for Area T are between 60.8 and 72.5 feet NAVD88. Underdrains are typically recommended at locations where the SHGL is within one foot of the bottom of roadway base elevation. The roadway becomes susceptible to cracking, erosion, and damage if the one-foot clearance from the base and SHGL is not provided.

While the majority of pavement appeared in good condition due to recent repaving, a comparison of the SHGL and topography of the roads show that there are approximately 1,200 feet of roadway where there is less than the recommended 1' clearance between the base and SHGL. The recommended design to address the pavement issues include 2,228 total feet of 6" Type 1 underdrains to be constructed along both sides of Marigold Road.

The total estimated construction cost for Area T is \$103,400. A detailed breakdown of the cost estimate is included in **Table 3.20**.

Figure 3.46 - Area T: Location Map



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Table 3.20: Area "T"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area T					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 5,000.00	\$ 5,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 7,500.00	\$ 7,500.00
104		1	LS	\$ 2,500.00	\$ 2,500.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,000.00	\$ 2,000.00
110-15-2	TREE PRESERVATION & REPLACEMENT	1	LS	\$ 2,500.00	\$ 2,500.00
440-1-10	UNDERDRAIN, TYPE I	2,228	LF	\$ 23.66	\$ 52,714.48
520-3	VALLEY GUTTER- CONCRETE	67	LF	\$ 24.51	\$ 1,642.17
522-2	CONCRETE SIDEWALK AND DRIVEWAYS, 6"	237	SY	\$ 42.93	\$ 10,174.41
570-1-2	PERFORMANCE TURF, SOD	990	SY	\$ 2.20	\$ 2,178.00
Construction Subtotal =					\$ 86,209.06
20% Contingency =					\$ 17,200.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$ 103,400.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA T					
(rounded to the nearest \$100) =					\$103,400.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.21 Area U – Sunset Drive Crossing at Sunset Park:

Area U is located along N. Sunset Drive between Aldeen Drive and Oak Park Place (**Figure 3.47**). Sunset Drive in this area was recently re-paved, however, there are reported erosion issues adjacent to the road at the culvert outfall location around the existing wing wall (**Figure 3.48**). CCTV inspection was also performed by Altair on two culverts in this area. Results of the CCTV inspection found a minor offset joint in the culvert between structures #MH-1 to #1A (**Figure 3.49**). Chemical grout is recommended at this location to address the joint issue.

A geotechnical investigation was performed by GEC to include soil borings, muck probes, and groundwater level measurements. Soils encountered at this area were generally medium dense fine sand with silt and silty fine sand. There was also a layer of mucky fine sand from 2 to 4 feet below the existing ground. The water level at the time of the investigation was varied from 3.5 to 6.4 feet below grade. They also observed erosion behind the wing wall adjacent to the roadway and guardrail. The pavement was repaved relatively recently and there were no noticeable signs of pavement distress or other issues.

The proposed design to address the erosion issue is to regrade the slope in this area and place flowable fill to protect against future erosion. The total estimated construction cost for Area U is \$6,600. A detailed breakdown of the cost estimate is included in **Table 3.21**.

Figure 3.47 - Area U: Location Map

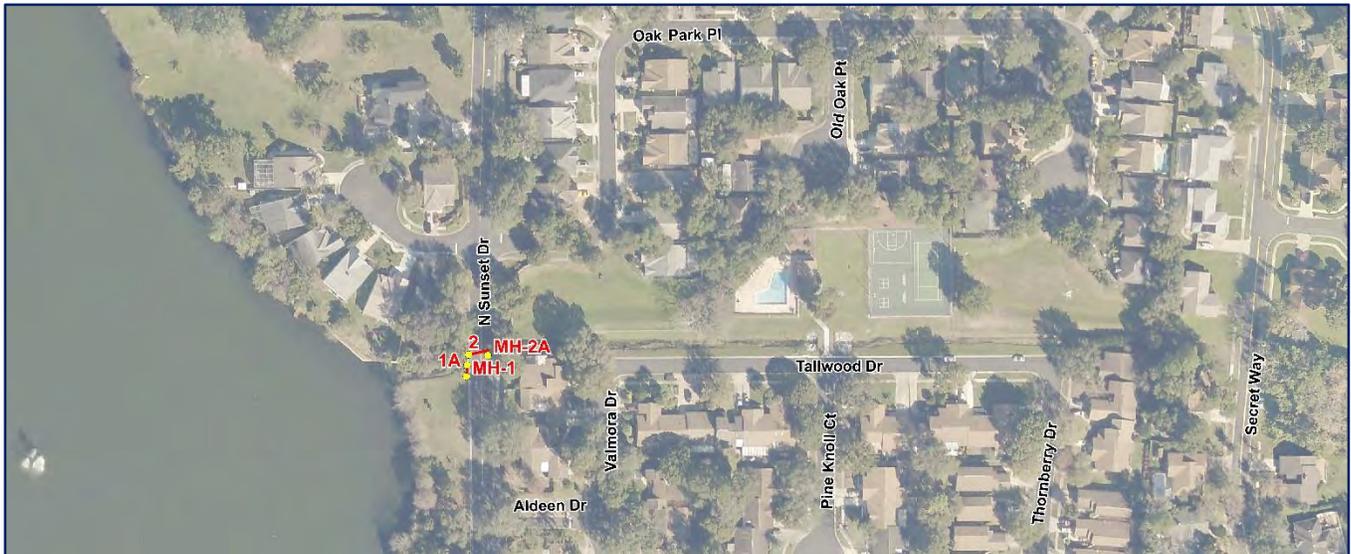


Figure 3.48 - Area U: Erosion Behind Wall (facing north)



Figure 3.49 - Area U: Separation at Joint (Culvert #MH1 – #1A)



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Table 3.21: Area "U"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area U					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 2,000.00	\$ 2,000.00
104		1	LS	\$ 2,000.00	\$ 2,000.00
121-70	FLOWABLE FILL	1	CY	\$ 154.72	\$ 154.72
432-3-1	CHEM GROUT REPAIR, PIPE, NON-TEST, 15"	1	EA	\$ 300.00	\$ 300.00
570-1-2	PERFORMANCE TURF, SOD	4	SY	\$ 2.20	\$ 8.80
Construction Subtotal =					\$ 5,463.52
20% Contingency =					\$ 1,100.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$6,600.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA U (rounded to the nearest \$100) =					\$6,600.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.22 Area V – Cassel Creek Boulevard:

Area V is located along Cassel Creek Boulevard near Derbyshire Circle (**Figure 3.50**). This area consists of 2 culverts that were inspected by Altair.

Multiple deficiencies were identified in the culvert between structures #1166 to #1166A. All of the observed issues were due to mineral stains at joints (**Figure 3.51**), which is indicative of leakage into the culvert. In each case, the recommended improvement includes chemical grout being placed at the joint.

The total estimated construction cost for this area is \$10,100. A detailed breakdown of the cost estimate is included in **Table 3.22**.

Figure 3.50 - Area V: Location Map



Figure 3.51 - Area V: Mineral Stain at Joint (Culvert #1166 - #1166A)



Table 3.22: Area "V"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area V					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 1,000.00	\$ 1,000.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 1,500.00	\$ 1,500.00
432-3-6	CHEM GROUT REPAIR, PIPE, NON-TEST, 36"	7	EA	\$ 700.00	\$ 4,900.00
Construction Subtotal =					\$ 8,400.00
20% Contingency =					\$ 1,700.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$10,100.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA V (rounded to the nearest \$100) =					\$10,100.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.23 Area W – 848/852 Turtle Mound Drive:

Area W is located within the existing drainage easement from Micanopy Court to Turtle Mound Drive through several residential lots (**Figure 3.52**). This area was originally inspected by CDM Smith in 2014. Their findings included multiple instances of joint separation, cracks, and holes in the pipes between Micanopy Court and Turtle Mound Drive. The recommendations from CDM Smith consisted of approximately 142' of 24" CIPP. Design plans and inspection results from CDM Smith for Area W are included in **Appendix F**. Only a portion of the proposed recommendations were actually constructed at that time, however.

A geotechnical investigation was performed by GEC as part of this study to include soil borings and groundwater levels. Soils encountered at this area were generally medium dense fine sand and fine sand with silt. The water level at the time of the investigation was around 7.7 feet below existing grade for a water elevation of 50.5 feet NAVD88. The estimated season high groundwater level (SHGL) for Area W is 53.5 feet NAVD88.

The design improvements for this project include removing the existing metal pipe behind the residential properties and replacing it with RCP. The structures behind the residences will also be realigned to remove the 90° angles between pipes.

The total estimated construction cost for this area is \$15,200. A detailed breakdown of the cost estimate is included in **Table 3.23**.

Figure 3.52 - Area W: Location Map



Section 3.0

Inspection Results and Recommendations

Storm Drain Rehabilitation Project - Corrective Action Plan (CAP): PW 1501-2015

Table 3.23: Area "W"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area W					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 1,000.00	\$ 1,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 1,000.00	\$ 1,000.00
104		1	LS	\$ 2,500.00	\$ 2,500.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,500.00	\$ 2,500.00
425-2-61	MANHOLES, P-8, <10'	1	EA	\$ 3,276.96	\$ 3,276.96
430-175-124	PIPE CULV, OPT MATL, ROUND, 24"S/CD	32	LF	\$ 73.69	\$ 2,358.08
570-1-2	PERFORMANCE TURF, SOD	36	SY	\$ 2.20	\$ 79.20
Construction Subtotal =					\$ 12,714.24
20% Contingency =					\$ 2,500.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$15,200.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA W (rounded to the nearest \$100) =					\$15,200.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.24 Area X – Bridle Path:

Area X is located along Bridle Path between Ranch Trail and Surrey Run (**Figure 3.53**). This area was originally inspected by CDM Smith in 2014. Their recommendations at the time did not include improvements to the pipes within this project area. The City has identified probable issues with these pipes and has requested CIPP for the two culverts.

The design improvements include placing approximately 313 feet of CIPP. The total estimated construction cost for this area is \$44,400. A detailed breakdown of the cost estimate is included in **Table 3.24**.

Figure 3.53 – Area X: Location Map



Section 3.0

Inspection Results and Recommendations

Storm Drain Rehabilitation Project - Corrective Action Plan (CAP): PW 1501-2015

Table 3.24: Area "X"
Engineer's Conceptual Opinion of Probable Cost

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Area W					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 2,000.00	\$ 2,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 5,000.00	\$ 5,000.00
104	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 2,500.00	\$ 2,500.00
431-1-1	PIPE LINER, OPTIONAL MATERIAL, 0-24"	313	LF	\$ 87.93	\$ 27,522.09
Construction Subtotal =					\$ 37,022.09
20% Contingency =					\$ 7,400.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$44,400.00
TOTAL ESTIMATED CONSTRUCTION COST FOR AREA X					
(rounded to the nearest \$100) =					\$44,400.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.25 Apple Hill Hollow:

This area is located along Apple Hill Hollow as shown on **Figure 3.54**. This location was previously evaluated by SAI as part of a separate project. The work included the design of an underdrain system to address high groundwater and pavement issues. The limits of the project area were expanded in April 2016 to also include the segment of Apple Hill Hollow all the way to the intersection with Carriage Hill Drive.

The area was inspected and evaluated by GEC to include soil borings, groundwater level measurements, and underdrain recommendations. Soils encountered in the area were typically fine sand with silt. There was also a layer of silty fine sand from 4 to 6 feet deep. The water level at the time of the investigation varied from 0.7 to 2.7 feet below the existing grade. Underdrains are typically recommended at locations where the season high groundwater level (SHGL) is within one foot of the bottom of roadway base elevation. The roadway becomes susceptible to cracking, erosion, and damage if the one-foot clearance from the base and SHGL is not provided. The estimated SHGL for this area is estimated to be between 0.0 to 2.0 feet below existing ground, which is less than the recommended clearance between SHGL and bottom of the base.

The recommended design includes almost 1600 total feet of 6" Type 1 underdrains to be constructed along both sides of Apple Hill Hollow. The total estimated construction cost for this area is \$89,300. A detailed breakdown of the cost estimate is included in **Table 3.25**.

Figure 3.54 – Apple Hill Hollow: Location Map



Section 3.0

Inspection Results and Recommendations

Storm Drain Rehabilitation Project - Corrective Action Plan (CAP): PW 1501-2015

**Table 3.25: Apple Hill Hollow
Engineer's Conceptual Opinion of Probable Cost**

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Apple Hill Hollow					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 4,000.00	\$ 4,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 10,000.00	\$ 10,000.00
104		1	LS	\$ 5,000.00	\$ 5,000.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 4,000.00	\$ 4,000.00
110-15-2	TREE PRESERVATION & REPLACEMENT	1	LS	\$ 1,000.00	\$ 1,000.00
440-1-10	UNDERDRAIN, TYPE I	1,576	LF	\$ 23.66	\$ 37,288.16
522-1	CONCRETE SIDEWALK AND DRIVEWAYS, 4"	28	SY	\$ 32.57	\$ 911.96
522-2	CONCRETE SIDEWALK AND DRIVEWAYS, 6"	249	SY	\$ 42.93	\$ 10,689.57
570-1-2	PERFORMANCE TURF, SOD	700	SY	\$ 2.20	\$ 1,540.00
Construction Subtotal =					\$ 74,429.69
20% Contingency =					\$ 14,900.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$89,300.00
TOTAL ESTIMATED CONSTRUCTION COST FOR APPLE HILL HOLLOW					
(rounded to the nearest \$100) =					\$89,300.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

3.26 Lowndes Square:

This area is located along Lowndes Square as shown on **Figure 3.55**. This location was previously evaluated by SAI as part of a separate project. The work included the design of an underdrain system to address high groundwater and pavement issues.

The area was inspected and evaluated by GEC to include soil borings, groundwater levels, and underdrain recommendations. Soils encountered in the area were typically fine sand with silt and silty fine sand. There was also a layer of clayey fine sand from 3 to 4.5 feet deep at one of the borings. The water level at the time of the investigation varied from 2.1 to 3.1 feet below the existing grade. Underdrains are typically recommended at locations where the season high groundwater level (SHGL) is within one foot of the bottom of roadway base elevation. The roadway becomes susceptible to cracking, erosion, and damage if the one-foot clearance from the base and SHGL is not provided. The estimated SHGL for this area is estimated to be between 1.5 to 2.5 feet below existing ground. Pavement cores would not be conducted at this area, but roadway thickness observed in other typical roads throughout the City have been approximately 10" thick. This does not allow for the recommended 1' minimum clearance between SHGL and bottom of the base.

The recommended design includes roughly 1,600 total feet of 6" Type 1 underdrains to be constructed along both sides of Lowndes Square.

The total estimated construction cost for this area is \$82,800. A detailed breakdown of the cost estimate is included in **Table 3.26**.

Figure 3.55 – Lowndes Square: Location Map



**Table 3.26: Lowndes Square
Engineer's Conceptual Opinion of Probable Cost**

NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Lowndes Square					
101-1	MOBILIZATION (5% OF BASE BID)	1	LS	\$ 4,000.00	\$ 4,000.00
102-1	MAINTENANCE OF TRAFFIC PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	\$ 5,000.00	\$ 5,000.00
104		1	LS	\$ 2,500.00	\$ 2,500.00
110-1-1	CLEARING & GRUBBING	1	LS	\$ 2,000.00	\$ 2,000.00
110-15-2	TREE PRESERVATION & REPLACEMENT	1	LS	\$ 2,500.00	\$ 2,500.00
440-1-10	UNDERDRAIN, TYPE I	1,626	LF	\$ 23.66	\$ 38,471.16
522-2	CONCRETE SIDEWALK AND DRIVEWAYS, 6"	297	SY	\$ 42.93	\$ 12,750.21
570-1-2	PERFORMANCE TURF, SOD	824	SY	\$ 2.20	\$ 1,812.80
Construction Subtotal =					\$ 69,034.17
20% Contingency =					\$ 13,800.00
Total Estimated Construction Cost (rounded to the nearest \$100) =					\$82,800.00
TOTAL ESTIMATED CONSTRUCTION COST FOR LOWNDES SQUARE (rounded to the nearest \$100) =					\$82,800.00

1. Costs do not include construction administration.
2. Unit costs are from Florida Department of Transportation - Item Average Unit Cost
3. Lump Sum costs are engineer's estimate.

Appendix A
CCTV Inspections:
Altair Environmental Group

Appendix B
CCTV Inspection Reports:
Altair Environmental Group

Singhoffen & Associates, Inc.

Orlando, Florida

Storm Drain Rehabilitation Project
Casselberry, Florida

Internal Television Inspection and Report of Findings
of Storm Water Pipelines



Trenchless Pipeline Services Since 1980

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April 2015

Job No. 15040

Singhoffen & Associates, Inc
Orlando, Florida

Storm Drain Rehabilitation Project
Casselberry, Florida

**Internal Television Inspection and Report of
Findings of Storm Water Pipelines**

Prepared for Singhoffen & Associates, Inc.

By:

Altair Environmental Group, LLC

710 South Milwee Street

Longwood, Florida 32750

Office (407) 339-7134

Fax (407) 339-6618

Email: admin@altairenvironmental.com

Website: www.altairenvironmental.com

April, 2015

Location Map



Client Singhoffen & Associates, Inc.
Job No. 15040

Project Name Internal Television Inspection and Report of Findings

Drawings not to scale





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 Longwood, FL 32750
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Observations by Inspections

SITE DATA

Mainline ID: 1166B TO 1166		City: CASSELBERRY		Address: CASSEL CREEK BLVD.			
Upstream node: 1166B	Depth: 3.3	Downstream node: 1166	Depth: 8.8	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 18	Pipe width: 18

INSPECTION DATA

Map No:	Scheduled Date: 4/28/2015 8:53:37 AM	Start date/time: 4/28/2015 8:57:52 AM	End date/time: 4/28/2015 9:47:10 AM
Surveyed footage: 116.0	Status: Stopped	Operator: M. POMALES	Work order No.: 15040
Reason: Regular	Weather: Light Rain	Condition: Satisfactory	Direction of Inspection: Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1166
0.0				Water Level		0%
116.0				Catch Basin		1166B
116.0				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1166A TO 1166		City: CASSELBERRY		Address: ESMT/SOUTH/CASSEL CREEK BLVD.			
Upstream node: 1166A	Depth: 8.5	Downstream node: 1166	Depth: 8.8	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 36	Pipe width: 36

INSPECTION DATA

Map No:	Scheduled Date: 4/28/2015 10:16:44 AM	Start date/time: 4/28/2015 10:17:32 AM	End date/time: 4/28/2015 10:39:43 AM
Surveyed footage: 207.9	Status: Stopped	Operator: M. POMALES	Work order No.: 15040
Reason: Regular	Weather: Light Rain	Condition: Satisfactory	Direction of Inspection: Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1166
8.8				Water Level		2%
105.0		2	10	Mineral Stain		
129.0		2	5	Mineral Stain		
154.9		3	9	Mineral Stain		AT JOINT
163.0		12	12	Mineral Stain		
171.2		3	6	Mineral Stain		AT JOINT
195.4		7		Mineral Stain		AT JOINT
203.2		2	9	Mineral Stain		AT JOINT

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OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments
207.9				Manhole		1166A
207.9				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 141 TO 329		City: CASSELBERRY		Address: KANTOR BLVD.			
Upstream node: 141	Depth: 	Downstream node: 329	Depth: 3	Pipe type: Concrete Reinf	Pipe shape: Circular	Pipe height: 18	Pipe width: 18

INSPECTION DATA

Map No:	Scheduled Date: 4/28/2015 12:15:32 PM	Start date/time: 4/28/2015 12:16:22 PM	End date/time: 4/28/2015 12:30:51 PM
Surveyed footage: 33.9	Status: Stopped	Operator: M. POMALES	Work order No.: 15040
Reason: Regular	Weather: Light Rain	Condition: Satisfactory	Direction of Inspection: Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		329
0.0				Water Level		1%
33.9				Catch Basin		141
33.9				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
317N TO 317		CASSELBERRY		317 KANTOR BLVD./ESMT NORTH			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
317N		317	9	Concrete Rein	Circular	48	48

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
	4/28/2015 2:01:02 PM	4/28/2015 2:01:49 PM	4/28/2015 2:13:57 PM
Surveyed footage:	Status:	Operator:	Work order No.:
117.5	Stopped	M. POMALES	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		317
0.0				Water Level		5%
11.1		12	12	Mineral Stain		AT JOINT
68.7		6	9	Mineral Stain		AT JOINT- 1/2INCH DEPOSITS
117.5				Catch Basin		317 NORTH
117.5				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
317 TO 103		CASSELBERRY		317 KANTOR BLVD.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
317	9	103		Concrete Rein	Circular	48	48

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
	4/28/2015 2:28:39 PM	4/28/2015 2:29:16 PM	4/28/2015 2:33:58 PM
Surveyed footage:	Status:	Operator:	Work order No.:
33.5	Stopped	M. POMALES	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		317
0.0				Water Level		1%
33.5				Catch Basin		103
33.5				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1350 TO 1355		City: CASSELBERRY		Address: 1350 QUINTUPLET DR.			
Upstream node: 1350	Depth: 	Downstream node: 1355	Depth: 3.5	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 18	Pipe width: 18

INSPECTION DATA

Map No:	Scheduled Date: 4/29/2015 8:03:24 AM	Start date/time: 4/29/2015 8:05:23 AM	End date/time: 4/29/2015 8:22:54 AM
Surveyed footage: 30.9	Status: Stopped	Operator: M. POMALES	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1350
0.0				Water Level		0%
17.3		4	8	Joint - Gasket		BROKEN AND SEPARATED 1.5INCH.
17.3				Joint - Separated		VOID VISIBLE
29.2		11	3	General Observation		CEMENT REPAIR PROTRUDING 1INCH
30.9				Catch Basin		1355
30.9				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1355 TO 1327		City: CASSELBERRY		Address: 1355 QUINTUPLET DR.			
Upstream node: 1355	Depth: 3.5	Downstream node: 1327	Depth: 3.5	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 24	Pipe width: 24

INSPECTION DATA

Map No:	Scheduled Date: 4/29/2015 8:33:06 AM	Start date/time: 4/29/2015 8:33:39 AM	End date/time: 4/29/2015 9:30:51 AM
Surveyed footage: 204.9	Status: Stopped	Operator: M. POMALES	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		1355
0.0				Water Level		0%
41.0		1	4	Crack	Circular	WITH MINERAL STAINS
64.1				Water Level		10%
72.1				Water Level		0%
100.1				General Observation		CITY RECLEANED PIPE
204.9				Manhole		1327
204.9				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1327 TO 1323		City: CASSELBERRY		Address: 1323 QUINTUPLET DR.			
Upstream node: 1327	Depth: 3.5	Downstream node: 1323	Depth: 4.6	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 24	Pipe width: 24

INSPECTION DATA

Map No:	Scheduled Date: 4/29/2015 10:09:08 AM	Start date/time: 4/29/2015 10:10:07 AM	End date/time: 4/29/2015 10:24:43 AM
Surveyed footage: 225.9	Status: Stopped	Operator: M. POMALES	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1323
0.0				Water Level		2%
225.9				Manhole		1327
225.9				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1328 TO 1323		City: CASSELBERRY		Address: QUINTUPLET DR.			
Upstream node: 1328	Depth: 2.8	Downstream node: 1323	Depth: 4.6	Pipe type: Concrete Reinf	Pipe shape: Circular	Pipe height: 18	Pipe width: 18

INSPECTION DATA

Map No:	Scheduled Date: 4/29/2015 10:34:06 AM	Start date/time: 4/29/2015 10:34:34 AM	End date/time: 4/29/2015 10:39:32 AM
Surveyed footage: 30.9	Status: Stopped	Operator: M. POMALES	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1323
0.0				Water Level		0%
25.1		5		Root-in-Joint		
25.1		6	12	Crack	Circular	
30.9				Catch Basin		1328
30.9				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1323 TO 1319		City: CASSELBERRY		Address: 1323 QUINTUPLET DR.			
Upstream node: 1323	Depth: 4.6	Downstream node: 1319	Depth: 5.6	Pipe type: Concrete Reinf	Pipe shape: Circular	Pipe height: 24	Pipe width: 24

INSPECTION DATA

Map No:	Scheduled Date: 4/29/2015 10:52:52 AM	Start date/time: 4/29/2015 11:34:57 AM	End date/time: 4/29/2015 11:49:50 AM
Surveyed footage: 97.7	Status: Stopped	Operator: M. POMALES	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments PERFORATED CONCRETE PIPE			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		1323
0.0				Water Level		0%
70.1	3			Root	Light	
76.3	5			Root	Light	
77.4	5			Root	Light	
78.3	5			Root	Light	
79.4	5			Root	Light	
86.3	4			Root	Light	
91.2	7			Root	Light	

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OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments
97.7				Manhole		1319
97.7				General Observation		PIPE IS PERFORATED WITH HOLES
97.7				STOP		

Singhoffen & Associates, Inc.
Orlando, Florida
Job No. 15040

Line Segment Information			Distance	Observations	Clock Position	Rehabilitation Technique	Cost
From <u>#1166</u>	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 36" 207.9'	0'	Catch Basin - #1166			
To <u>#1166A</u>			105.0'	Mineral Stains at Joint	2 - 10	Chemical Grout	
			129.0'	Mineral Stains at Joint	2 - 5	Chemical Grout	
			154.9'	Mineral Stains at Joint	3 - 9	Chemical Grout	
			163.0'	Mineral Stains at Joint	12 - 12	Chemical Grout	
			171.2'	Mineral Stains at Joint	3 - 6	Chemical Grout	
			195.4'	Mineral Stains at Joint	7	Chemical Grout	
			203.2'	Mineral Stains at Joint	2 - 9	Chemical Grout	
			207.9'	Manhole - #1166A			
Total							\$6,650.00
From <u>#317</u>	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 48" 117.5'	0'	Catch Basin - #317			
To <u>#317 North</u>			11.1'	Mineral Stains at Joint	12 - 12	Chemical Grout	
			68.7'	Mineral Deposits at Joint	6 - 9	Chemical Grout	
			117.5'	Catch Basin - #317 North			
Total							\$2,500.00
From <u>#1350</u>	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 18" 30.9'	0'	Catch Basin - #1350			
To <u>#1355</u>			17.3'	Joint Bell Broken - Gasket Exposed	11 - 3	4' CIPP	
			17.3'	Joint Separated - Void Visible			
			29.2'	Cement Repair Protruding 1"			
			30.9'	Catch Basin - #1355			
Total							\$3,995.00
From <u>#1355</u>	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 24" 204.9'	0'	Catch Basin - #1355			
To <u>#1327</u>			41.0'	Circular Crack with Mineral Stains	1 - 4	Chemical Grout	
			204.9'	Manhole - #1327			
Total							\$1,500.00
From <u>#1323</u>	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 18" 30.9'	0'	Catch Basin - #1323			
To <u>#1328</u>			25.1'	Roots at Joint	5 6 - 12	4' CIPP	
			25.1'	Crack at Joint			
			30.9'	Catch Basin - #1328			
Total							\$3,995.00
From <u>#1323</u>	PIPE TYPE PIPE SIZE PIPE LENGTH	Perforated RCP 24" 97.7'	0'	Catch Basin - #1323			
To <u>#1319</u>			70.1'	Roots in Pipe	3	Chemical Grout	
			76.3'	Roots in Pipe	5	Chemical Grout	
			77.4'	Roots in Pipe	5	Chemical Grout	
			78.3'	Roots in Pipe	5	Chemical Grout	
			79.4'	Roots in Pipe	5	Chemical Grout	
			86.3'	Roots in Pipe	4	Chemical Grout	
			91.2'	Roots in Pipe	7	Chemical Grout	
			97.7'	Manhole - #1319			
Total							
Grand Total							\$18,640.00

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Orlando, Florida

Storm Drain Rehabilitation Project
Casselberry, Florida

Internal Television Inspection and Report of Findings
of Storm Water Pipelines

DVD #2



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May 2015

Job No. 15040

Singhoffen & Associates, Inc
Orlando, Florida

Storm Drain Rehabilitation Project
Casselberry, Florida

**Internal Television Inspection and Report of
Findings of Storm Water Pipelines**

Prepared for Singhoffen & Associates, Inc.

By:

Altair Environmental Group, LLC

710 South Milwee Street

Longwood, Florida 32750

Office (407) 339-7134

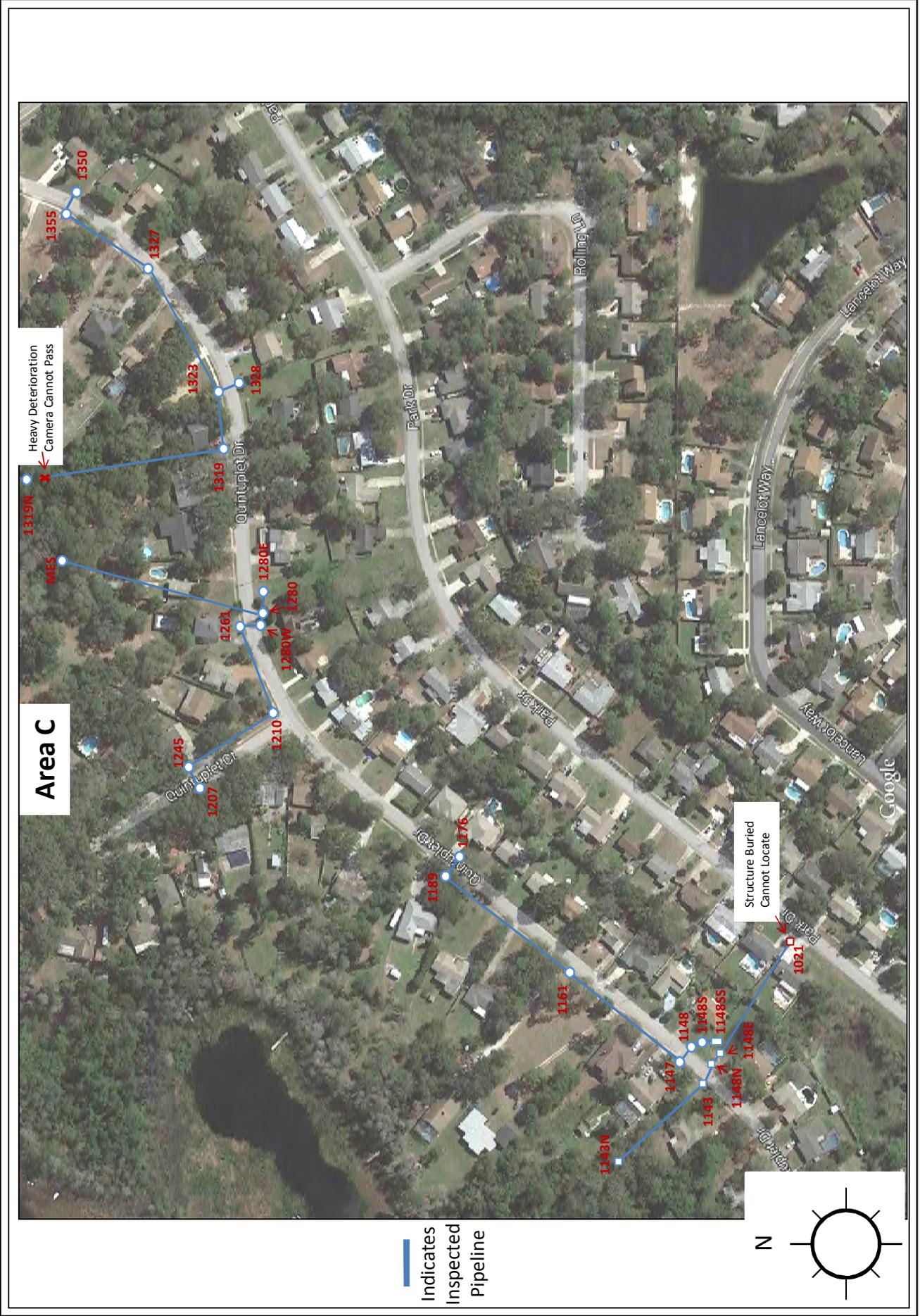
Fax (407) 339-6618

Email: admin@altairenvironmental.com

Website: www.altairenvironmental.com

May, 2015

Location Map





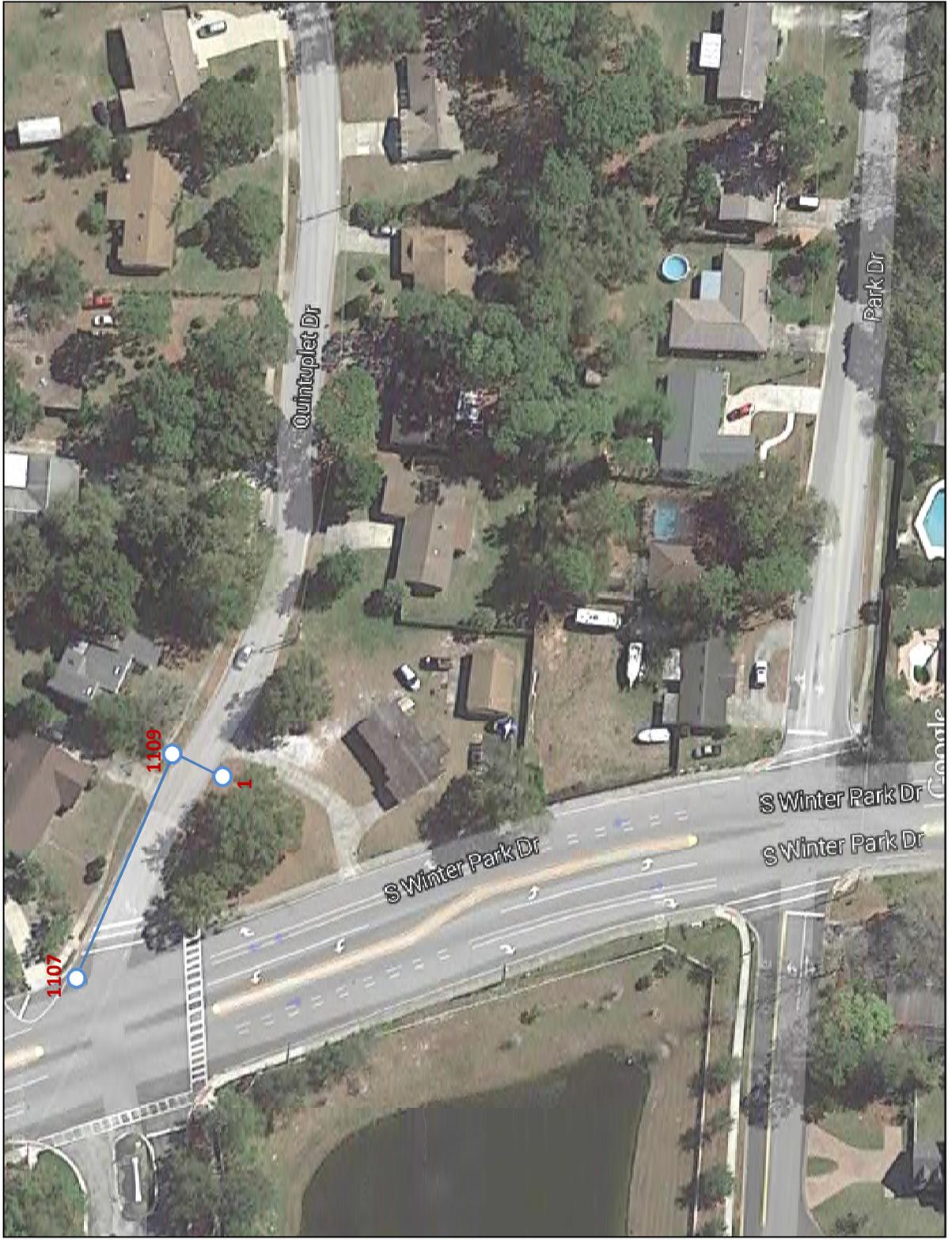
Client Singhoffen & Associates, Inc.

Job No. 15040

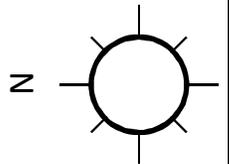
Project Name Internal Television Inspection and Report of Findings

Drawings not to scale

Area C



— Indicates Inspected Pipeline



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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1324 TO 1319		CASSELBERRY		1319 QUINTUPLET DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1324	3	1319	5.6	Concrete Rein	Circular	24	24

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/PART 1	5/19/2015 8:37:37 AM	5/19/2015 8:38:46 AM	5/19/2015 8:57:35 AM
Surveyed footage:	Status:	Operator:	Work order No.:
100.2	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Manhole		1319
75.2		5	7	Broken Pipe		MISSING PIECE. CHIP AT BELL
100.2				Inlet		1324
100.2				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1319 T0 1319N		City: CASSELBERRY		Address: 1319 QUINTUPLET DR.			
Upstream node: 1319	Depth: 5.6	Downstream node: 1319N	Depth:	Pipe type: Corrugated	Pipe shape: Circular	Pipe height: 24	Pipe width: 24

INSPECTION DATA

Map No: AREA C/PART1	Scheduled Date: 5/19/2015 9:08:30 AM	Start date/time: 5/19/2015 9:10:02 AM	End date/time: 5/19/2015 9:25:42 AM
Surveyed footage: 347.3	Status: Stopped	Operator: M Pomales	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Manhole		1319
0.0				Water Level		0%
62.2	10			Root	at Joint	MEDIUM
230.5				Pipe Type		CMP TO HDPE
274.0				Pipe Type		HDPE TO CMP
347.3	4	8		Broken Pipe	oil Visible - Medium	PIPE SEPARATED WITH HEAVY DETERIORATION. END TV INSPECTION AT 350.6', CAMERA UNABLE TO PASS HEAVY DEBRIS. NO ACCESS FOR REVERSE SET UP.
347.3				STOP		

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OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments
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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1207 TO1245		CASSELBERRY		1245 QUINTUPLET CT.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1207	3.2	1245	3.3	Concrete Rein	Circular	15	15

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/PART 2	5/19/2015 10:15:07 AM	5/19/2015 10:15:32 AM	5/19/2015 10:25:08 AM
Surveyed footage:	Status:	Operator:	Work order No.:
31.1	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1245
0.0				Water Level		10%
31.1				Catch Basin		1207
31.1				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1245 TO 1210		City: CASSELBERRY		Address: 1245 QUINTUPLET CT.			
Upstream node: 1245	Depth: 3.3	Downstream node: 1210	Depth: 4.2	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 15	Pipe width: 15

INSPECTION DATA

Map No: AREA C/ PART 2	Scheduled Date: 5/19/2015 10:32:15 AM	Start date/time: 5/19/2015 10:32:58 AM	End date/time: 5/19/2015 10:45:44 AM
Surveyed footage: 166.0	Status: Stopped	Operator: M Pomales	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		1245
0.0				Water Level		0%
17.2				Water Level		5%
32.7				Water Level		0%
55.2				Water Level		5%
118.0				Water Level		+ +0%
166.0				Manhole		1210
166.0				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1210 TO 1261		CASSELBERRY		1261 QUINTUPLET DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1210	4.2	1261	3.6	Concrete Reinf	Circular	15	15

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/ PART2	5/19/2015 11:05:18 AM	5/19/2015 11:06:07 AM	5/19/2015 11:28:20 AM
Surveyed footage:	Status:	Operator:	Work order No.:
170.6	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1261
0.0				Water Level		0%
10.2	5			Root	at Joint	
34.0	5			Root	at Joint	EXTENDS DOWNSTREAM 20FT.
41.9	5			Root	at Joint	EXTENDS 8FT DOWNSTREAM
70.1	5			Hole	in Pipe	LIFT HOLE WITH VISIBLE SOIL
102.7	7			Hole	in Pipe	LIFT HOLE
126.8	5			Hole	in Pipe	LIFT HOLE
143.1	5			Hole	in Pipe	LIFT HOLE WITH CEMENT EXTENDS 1 INCH IN THE PIPE



OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments
143.1		12		Hole	in Pipe	LIFT HOLE WITH CEMENT EXTENDS 1 INCH IN THE PIPE
151.1		1		Hole	in Pipe	LIFT HOLE WITH CEMENT EXTENDS 1 INCH IN THE PIPE
170.6				Manhole		1210
170.6				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1261 TO 1280W		City: CASSELBERRY		Address: 1261 QUINTUPLET DR.			
Upstream node: 1261	Depth: 3.6	Downstream node: 1280W	Depth: 3.8	Pipe type: Concrete Reinf	Pipe shape: Circular	Pipe height: 18	Pipe width: 18

INSPECTION DATA

Map No: AREA C/PART 2	Scheduled Date: 5/19/2015 11:37:28 AM	Start date/time: 5/19/2015 11:38:18 AM	End date/time: 5/19/2015 12:16:01 PM
Surveyed footage: 32.1	Status: Stopped	Operator: M Pomales	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		1261
0.0				Water Level		0%
14.6		12	12	Broken Pipe	oil Visible - Medium	
14.6		5	6	Root	at Crack	MEDIUM
14.6				General Observation		HAD TO CHANGE TRANSPORTER TO GET PAST ROOTS
32.1				Catch Basin		1280W
32.1				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1280W TO 1280		CASSELBERRY		1280 QUINTUPLET DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1280W	3.8	1280	4	Concrete Rein	Circular	18	18

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/ PART 2	5/19/2015 12:20:29 PM	5/19/2015 12:21:02 PM	5/19/2015 12:29:25 PM
Surveyed footage:	Status:	Operator:	Work order No.:
16.6	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		1280W
0.0				Water Level		0%
16.6				General Observation		8 INCH PVC PIPE INTERSECTS BOTTOM OF MH.
16.6				Manhole		1280
16.6				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1280E TO 1280		CASSELBERRY		1280 QUINTUPLET DR./DRIVEWAY			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1280E	2	1280	4	Concrete Rein	Oval	18	30

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/ PART2	5/19/2015 12:32:44 PM	5/19/2015 12:33:18 PM	5/19/2015 12:38:21 PM
Surveyed footage:	Status:	Operator:	Work order No.:
44.8	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Manhole		1280
0.0				Water Level		0%
44.8				Catch Basin		1280E
44.8				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1176 TO 1189		CASSELBERRY		1189 QUINTUPLET DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1176	3.9	1189	4.4	Concrete Rein	Circular	18	18

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/ PART 3	5/19/2015 2:16:38 PM	5/19/2015 2:17:30 PM	5/19/2015 2:26:43 PM
Surveyed footage:	Status:	Operator:	Work order No.:
30.8	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1189
0.0				Water Level		0%
30.8				Catch Basin		1176
30.8				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1189 TO 1161		City: CASSELBERRY		Address: 1189 QUINTUPLET DR.			
Upstream node: 1189	Depth: 4.4	Downstream node: 1161	Depth: 6	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 24	Pipe width: 24

INSPECTION DATA

Map No: AREA C/ PART 3	Scheduled Date: 5/19/2015 2:41:32 PM	Start date/time: 5/19/2015 2:45:00 PM	End date/time: 5/19/2015 3:00:43 PM
Surveyed footage: 271.3	Status: Stopped	Operator: M Pomales	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		1189
0.0				Water Level		0%
27.9				Water Level		5%
55.3				Water Level		10%
150.1				General Observation		2 INCHES OF DIRT FROM 60FT. TO 150FT.
166.5				General Observation		1 INCH OF DIRT FROM 150FT. TO 166FT.
222.4		3		Root	at Joint	LIGHT
248.7	5.7	8		Crack	Longitudinal	
271.3				Manhole		1161

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OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments
271.3				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1161 TO 1147		CASSELBERRY		1147 QUINTUPLET DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1161	6	1147	6.3	Concrete Rein	Circular	24	24

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/ PART 3	5/20/2015 8:11:25 AM	5/20/2015 8:12:29 AM	5/20/2015 8:27:55 AM
Surveyed footage:	Status:	Operator:	Work order No.:
256.3	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			
FRENCH DRAIN			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1147
0.0				Water Level		2%
27.0				General Observation		DRAINAGE PIPE WITH HOLES
91.9	7			Root	at Hole	LIGHT
99.7	5			Root	at Hole	LIGHT
256.3				Manhole		1161
256.3				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1147 TO 1148		City: CASSELBERRY		Address: 1147 QUINTUPLET DR.			
Upstream node: 1147	Depth: 6.3	Downstream node: 1148	Depth: 6.5	Pipe type: Concrete Reinf	Pipe shape: Circular	Pipe height: 24	Pipe width: 24

INSPECTION DATA

Map No: AREA C/ PART 3	Scheduled Date: 5/20/2015 8:36:15 AM	Start date/time: 5/20/2015 8:36:58 AM	End date/time: 5/20/2015 8:41:54 AM
Surveyed footage: 30.1	Status: Stopped	Operator: M Pomales	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Manhole		1147
0.1				Water Level		5%
21.7				Joint Offset	Medium	
30.1				Catch Basin		1148
30.1				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1148 TO 1148S		City: CASSELBERRY		Address: 1147 QUINTUPLET DR.			
Upstream node: 1148	Depth: 6.5	Downstream node: 1148S	Depth: 6.7	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 24	Pipe width: 24

INSPECTION DATA

Map No: AREA C/ PART 3	Scheduled Date: 5/20/2015 8:53:30 AM	Start date/time: 5/20/2015 8:59:27 AM	End date/time: 5/20/2015 9:04:37 AM
Surveyed footage: 26.7	Status: Stopped	Operator: M Pomales	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		1148
0.0				Water Level		5%
26.7				Manhole		1148S
26.7				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1143 TO 1143N		CASSELBERRY		1143 QUINTUPLET DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1143	5.5	1143N		Concrete Rein	Circular	36	36

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/ PART 4	5/20/2015 9:55:37 AM	5/20/2015 10:00:07 AM	5/20/2015 10:08:33 AM
Surveyed footage:	Status:	Operator:	Work order No.:
203.0	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		1143
0.0				Water Level		5%
203.0				Outfall		1143N
203.0				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1143 TO 1148N		CASSELBERRY		1143 QUINTUPLET DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1143	5.5	1148N	5.5	Concrete Rein	Circular	36	36

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/ PART 2	5/20/2015 10:24:28 AM	5/20/2015 10:26:25 AM	5/20/2015 10:34:44 AM
Surveyed footage:	Status:	Operator:	Work order No.:
52.9	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1143
0.0				Water Level		15%
52.9				Catch Basin		1148N
52.9				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1148N TO 1148E		CASSELBERRY		1148 QUINTUPLET DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1148N	5.5	1148E	5.5	Concrete Rein	Circular	30	30

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/ PART 4	5/20/2015 10:51:07 AM	5/20/2015 10:54:25 AM	5/20/2015 10:57:15 AM
Surveyed footage:	Status:	Operator:	Work order No.:
21.6	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1148N
0.0				Water Level		10%
21.6				Catch Basin		1148E
21.6				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1148E TO 1021		CASSELBERRY		1148 QUINTUPLET DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1148E	5.5	1021	5.5	Concrete Rein	Circular	30	30

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/ PART 4	5/20/2015 11:19:16 AM	5/20/2015 11:19:47 AM	5/20/2015 11:45:07 AM
Surveyed footage:	Status:	Operator:	Work order No.:
230.9	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1148E
0.0				Water Level		5%
230.9				Junction Box		1021 BURIED STRUCTURE
230.9				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 1148SS TO 1148S		City: CASSELBERRY		Address: 1148 QUINTUPLET DR.			
Upstream node: 1148SS	Depth: 	Downstream node: 1148S	Depth: 6.7	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 18	Pipe width: 18

INSPECTION DATA

Map No: AREA C/ PART 2	Scheduled Date: 5/20/2015 1:20:12 PM	Start date/time: 5/20/2015 1:20:33 PM	End date/time: 5/20/2015 1:23:45 PM
Surveyed footage: 18.0	Status: Stopped	Operator: M Pomales	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Outfall		1148SS
0.0				Water Level		0%
18.0				Manhole		1148S
18.0				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1 TO 1109		CASSELBERRY		1109 QUINTUPLET DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1	4	1109	4.2	Concrete Rein	Circular	18	18

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/ PART 4	5/20/2015 1:48:17 PM	5/20/2015 1:49:55 PM	5/20/2015 1:55:42 PM
Surveyed footage:	Status:	Operator:	Work order No.:
29.2	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		1109
0.0				Water Level		0%
29.2				Catch Basin		1
29.2				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1109 TO 1107		CASSELBERRY		1109 QUINTUPLET DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1109	4.2	1107		Concrete Rein	Circular	24	24

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA C/ PART4	5/20/2015 2:03:12 PM	5/20/2015 2:03:44 PM	5/20/2015 2:36:40 PM
Surveyed footage:	Status:	Operator:	Work order No.:
152.5	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		1109
0.0				Water Level		0%
62.2				Water Level		5%
95.3				General Observation		1 INCH OF DIRT & BRICKS
152.5				Manhole		1107
152.5				STOP		

Singhoffen & Associates, Inc.
Orlando, Florida
Job No. 15040

Line Segment Information			Distance	Observations	Clock Position	Rehabilitation Technique	Cost
From <u> #1319 </u>	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 24" 100.2'	0' 75.2' 100.2'	Manhole - #1319 Chip at Bell Inlet - #1324	5 - 7	4' CIPP Total	 \$4,495.00
From <u> #1319 </u>	PIPE TYPE PIPE SIZE PIPE LENGTH	CMP / HDPE 24" to 30" N/A	0' 62.2' 347.3'	Manhole - #1319 Medium Roots at Joint Pipe Broken - Heavy Deterioration CAMERA CANNOT CONTINUE	10	Root Removal Excavate / Repair (Altair Cannot Repair) Total	 \$900.00
From <u> #1261 </u>	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 15" 170.6'	0' 10.2' 14.0' 170.6'	Catch Basin - #1261 Light Roots at Joint 20' of Medium Roots Manhole - #1210	5 5	Root Removal Total	 \$2,550.00
From <u> #1261 </u>	PIPE TYPE PIPE SIZE PIPE LENGTH	RCO 18" 32.1'	0' 14.6' 14.6' 32.1'	Catch Basin - #1261 Pipe Broken at Joint - Soil Visible Medium Roots at Joint Catch Basin - #1280W	12 - 12 5 - 6	Root Removal & 4' CIPP Total	 \$5,000.00
From <u> #1189 </u>	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 24" 271.3'	0' 222.4' 248.7' 271.3'	Catch Basin - #1189 Light Roots at Joint 5.7' Longitudinal Crack Manhole - #1161	3	Chemical Grout 8' CIPP Total	 \$9,000.00
From <u> #1147 </u>	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 24" 30.1'	0' 21.7' 30.1'	Catch Basin - #1323 Joint Offset - Medium Catch Basin - #1148		4' CIPP Total	 \$4,495.00
Grand Total							\$26,440.00

Singhoffen & Associates, Inc.

Orlando, Florida

Storm Drain Rehabilitation Project
Casselberry, Florida

Plugging, Dewatering, Cleaning and Television
Inspection of Storm Water Pipelines

DVD #3 – DVD #4



Trenchless Pipeline Services Since 1980

Inspection • Evaluation • Maintenance • Rehabilitation

September 2015

Job No. 15130

**Singhoffen & Associates, Inc
Orlando, Florida**

**Storm Drain Rehabilitation Project
Casselberry, Florida**

**Plugging, Dewatering, Cleaning and
Television Inspection of Storm Water
Pipelines**

Prepared for Singhoffen & Associates, Inc.

by:

**Altair Environmental Group, LLC
710 South Milwee Street
Longwood, Florida 32750
Office (407) 339 – 7134
Fax (407) 339 – 6618**

**E-Mail: admin@altairenvironmental.com
Website: www.altairenvironmental.com**

September, 2015

Work Zone #3
(Location G)

*No Cleaning Performed
Billed standard inspection rate*

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Observations by Inspections

SITE DATA

Mainline ID: 152 TO 115		City: CASSELBERRY		Address: 152 STANHOPE DR.			
Upstream node: 152	Depth: 4.9	Downstream node: 115	Depth: 9	Pipe type: Corrugated	Pipe shape: Circular	Pipe height: 24	Pipe width: 24

INSPECTION DATA

Map No:	Scheduled Date: 5/22/2015 11:10:32 AM	Start date/time: 5/22/2015 11:22:10 AM	End date/time: 5/22/2015 11:07:02 AM
Surveyed footage: 298.1	Status: Stopped	Operator: M. POMALES	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		152
0.0				Water Level		5%
152.5				General Observation		2 INCHES OF DIRT
298.1				Catch Basin		115
298.1				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 115 TO 638		City: CASSELBERRY		Address: 638 STANHOPE DR.			
Upstream node: 115	Depth: 9	Downstream node: 638	Depth: 9.2	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 48	Pipe width: 48

INSPECTION DATA

Map No:	Scheduled Date: 5/22/2015 12:37:06 PM	Start date/time: 5/22/2015 12:37:41 PM	End date/time: 5/22/2015 12:43:59 PM
Surveyed footage: 37.4	Status: Stopped	Operator: M. POMALES	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		638
26.4		4	7	Mineral Stain		
37.4				Catch Basin		115
37.4				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
638 TO 638S		CASSELBERRY		638 STANHOPE DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
638	9.2	638S		Concrete Rein	Circular	48	48

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
	5/22/2015 12:56:50 PM	5/22/2015 12:57:10 PM	5/22/2015 1:05:03 PM
Surveyed footage:	Status:	Operator:	Work order No.:
90.7	Stopped	M. POMALES	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		638
0.0				Water Level		5%
0.0		3		Mineral Stain		
63.4		12	12	Mineral Stain		
90.7				Manhole		638S
90.7				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
624-635		CASSLEBERRY FLA		STANHOPE DR			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
624		635		Corrugated	Circular	18	18

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
	8/24/2015 2:36:00 PM	8/24/2015 2:36:19 PM	8/24/2015 2:52:39 PM
Surveyed footage:	Status:	Operator:	Work order No.:
322.5	Stopped	KIRK	15040
Reason:	Weather:	Condition:	Direction of Inspection
Assessment	Dry	Satisfactory	Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		624
0.0				Water Level		5%
166.5	0.9	1		Crack	ongitudinal - Wide	SOILS VISIBLE - METAL STICKS OUT AND IS SHARP
321.5		5	7	Debris		PLASTIC PLATE ACROSS END OF PIPE-3"-12"
322.5				Catch Basin		635-LEAKING AT WALLS-OUTGOING PIPE
322.5				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
149 TO 648		CASSELBERRY		149 SPOONHOUR DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
149	3.8			Concrete Rein	Circular	15	15

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
	5/22/2015 10:30:52 AM	5/22/2015 10:31:40 AM	5/22/2015 10:40:26 AM
Surveyed footage:	Status:	Operator:	Work order No.:
32.6	Stopped	M. POMALES	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		648
0.0				Water Level		0%
16.1		10	7	Mineral Stain		
30.3		7	4	Crack	Circular	
32.6				Catch Basin		149
32.6				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
648 TO 152		CASSELBERRY		648 SPOONHOUR DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
648		152	4.9	Corrugated	Circular	18	18

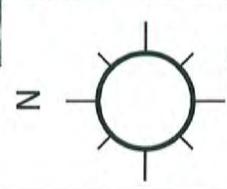
INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
	5/22/2015 10:44:22 AM	5/22/2015 10:44:45 AM	5/22/2015 10:51:51 AM
Surveyed footage:	Status:	Operator:	Work order No.:
104.2	Stopped	M. POMALES	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		648
0.0				Water Level		0%
28.5				Water Level		5%
68.2				Water Level		0%
104.2				Catch Basin		152
104.2				STOP		

Work Zone #5 (Location C)



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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
1280 TO MES		CASSELBERRY		1280 QUINTUPLET DR.			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
1280	4	MES		Concrete Rein	Oval	18	30

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
	7/27/2015 3:20:56 PM	7/27/2015 3:21:36 PM	7/27/2015 3:50:09 PM
Surveyed footage:	Status:	Operator:	Work order No.:
365.1	Stopped	M Pomales	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Manhole		1280
0.0				Water Level		0%
0.0				General Observation		SANITARY PIPE RUNNING THROUGH MH
39.8		8		Root	at Joint	
48.8		7		Root	at Joint	
120.8		5		Root	at Joint	
169.0		5	7	Joint Offset	Small	
193.8		5	7	Joint Offset	Small	
250.0		8		Root	at Joint	



OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments
266.5		6		Root	at Joint	
275.5		6		Sag	Light	
290.8		12	12	Joint - Separated	Small	WITH FINE ROOTS
299.5		8		Root	at Joint	FINE
315.4		9		Root	at Joint	
339.3		5		Root	at Joint	
346.6		5	7	Joint Offset	Small	
355.0		12	12	Joint - Separated	Large	WITH CONCRETE @ 9 AND ROOTS
365.1				End of Pipe		MES
365.1				STOP		

Work Zone #8
(Location F & H)

Client Singhoffen & Associates, Inc.

Project Name Internal Television Inspection and Report of Findings **Job No.** 15040

Area F



Drawings not to scale
— Indicates Inspected Pipeline

Client Singhoffen & Associates, Inc.

Project Name Internal Television Inspection and Report of Findings **Job No.** 15040

Area H

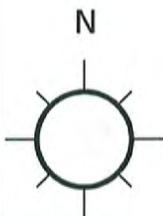


Drawings not to scale
— Indicates Inspected Pipeline

Client Singhoffen & Associates, Inc.

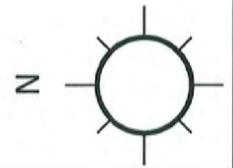
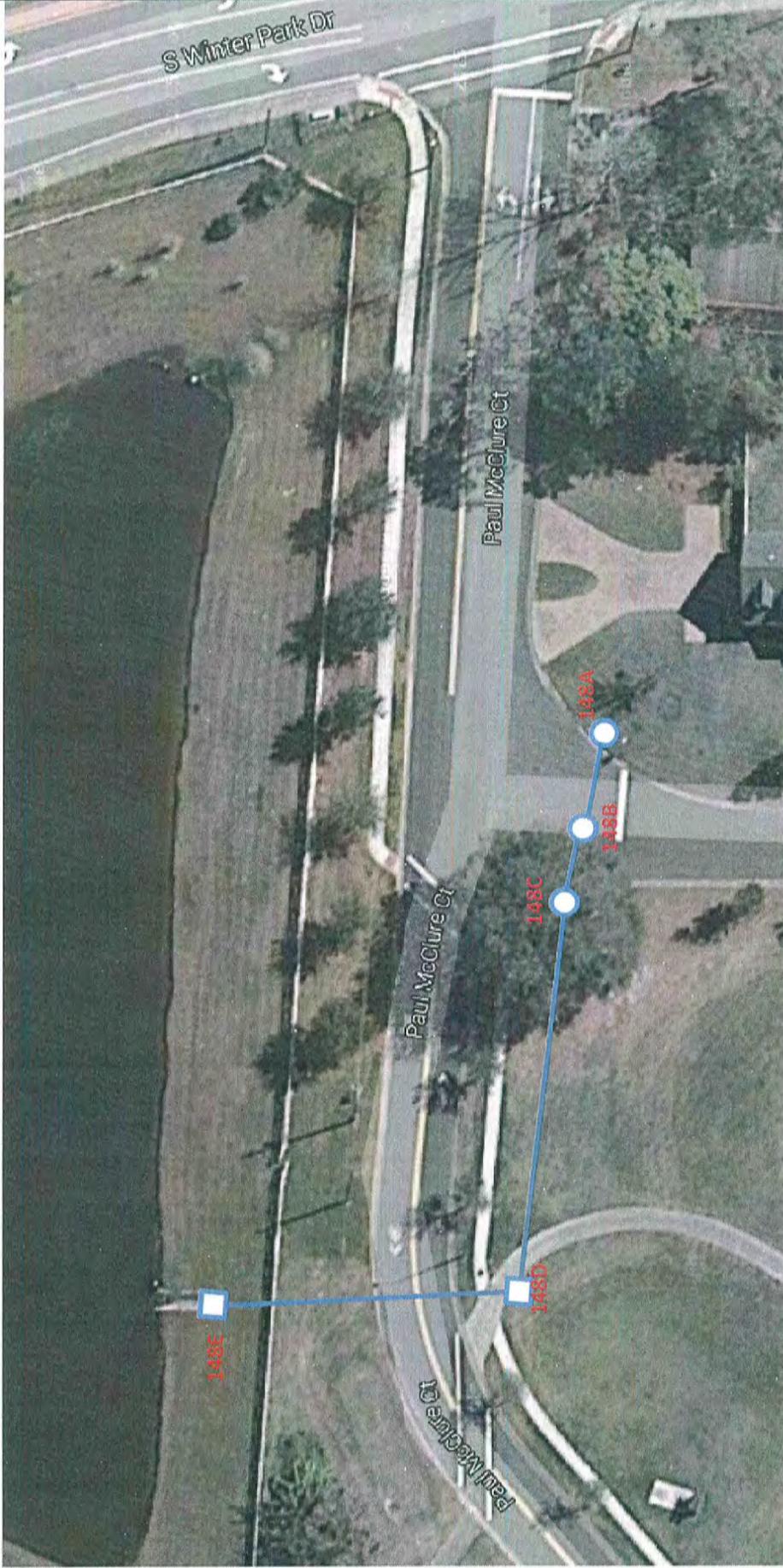
Project Name Internal Television Inspection and Report of Findings **Job No.** 15040

Area H



Drawings not to scale
— Indicates Inspected Pipeline

Area H



— Indicates Inspected Pipeline



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Owner CASSELBERRY
 Customer SINGHOFEN
 Project CASSELBERRY
 Upstream MH MH-163
 Downstream MH MH-163A
 Date 22-Jul-2015

Surveyor M. POMALES
 Street 163 PAUL McCLURE CT.
 City CASSELBERRY
 Time 9:44 AM

Size 15
 Material Corrugated Metal Pipe
 Sewer Use Stormwater
 Purpose Routine Assessment
 Length 25.1
 (TV'd) 25.1
 Pre-Clean Jetting
 Weather Dry

Comments DEPTH 3.7FT
 Direction Upstream

Ftg.	Code	Description	Position	Severity	Comment
0.0	CB	Catch Basin		0	163A
0.0	WL	Water Level		0	
25.1	CB	Catch Basin		0	163



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Owner CASSELBERRY **Customer** SINGHOFEN **Project** CASSELBERRY **Upstream MH** MH-163A **Downstream MH** MH-163B **Date** 22-Jul-2015

Surveyor M. POMALES **Street** 163 PAUL McCLURE CT. **City** CASSELBERRY **Time** 10:07 AM

Size 18 **Material** Corrugated Metal Pipe **Sewer Use** Stormwater **Purpose** Routine Assessment **Length** 35.8 **(TV'd)** 35.8 **Pre-Clean** Jetting **Weather** Dry

Comments DEPTH 3.7FT **Direction** Downstream

Ftg.	Code	Description	Position	Severity	Comment
0.0	CB	Catch Basin		0	163A
0.0	WL	Water Level		0	
17.7	R	Roots	5 to 7	3	
35.8	AP	Access Point - Other			HEAD WALL 163B



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Owner CASSELBERRY
 Customer SINGHOFEN
 Project CASSELBERRY
 Upstream MH MH-138
 Downstream MH MH-138A
 Date 22-Jul-2015

Surveyor M. POMALES
 Street 138 PARK AVE.
 City CASSELBERRY
 Time 11:20 AM

Size 18
 Material Corrugated Metal Pipe
 Sewer Use Stormwater
 Purpose Routine Assessment
 Length 24.1
 (TV'd) 24.1
 Pre-Clean Jetting
 Weather Dry

Comments DEPTH 4.5 FT
 Direction Upstream

Ftg.	Code	Description	Position	Severity	Comment
0.0	CB	Catch Basin		0	138-A
0.0	WL	Water Level		0	
24.1	CB	Catch Basin		0	138



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Owner CASSELBERRY
 Customer SINGHOFEN
 Project CASSELBERRY
 Upstream MH MH-138A
 Downstream MH MH-144
 Date 22-Jul-2015

Surveyor M. POMALES
 Street 138 PARK AVE.
 City CASSELBERRY
 Time 12:54 PM

Size 18
Material Corrugated Metal Pipe
Sewer Use Stormwater
Purpose Routine Assessment
Length 160
(TV'd) 160
Pre-Clean Jetting
Weather Dry

Comments DEPTH 4.5 FT
Direction Downstream

Ftg.	Code	Description	Position	Severity	Comment
0.0	CB	Catch Basin		0	138A
0.0	WL	Water Level		0	
160.0	MH	Manhole			144. FOOTAGE COUNTER ON TRUCK MALFUNCTIONED. USED FOOTAGE WHEEL ON SURFACE TO MEASURE PIPELINE DISTANCE. CHANGED LENGTH OF PIPE TO 160 LF



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Owner CITY OF CASSELBERRY	Customer CITY OF CASSELBERRY	Project CITY OF CASSELBERRY	Upstream MH S-126B	Downstream MH S-126A	Date 12-Aug-2015		
Surveyor T. GARVEY		Street 126 PARK AVE		City CASSELBERRY	Time 10:40 AM		
Size 18	Material Corrugated Metal Pipe	Sewer Use Stormwater	Purpose Routine Assessment	Length 27.2	(TV'd) 27.2	Pre-Clean Jetting	Weather Dry

Comments	Direction Upstream
-----------------	------------------------------

Ftg.	Code	Description	Position	Severity	Comment
0.0	CB	Catch Basin		0	S-126B
0.0	WL	Water Level		0	
0.0	GO	General Observation			HEAVY CONCRETE IN CATCH BASIN
12.1	GO	General Observation	8		BULGE
27.2	CB	Catch Basin		0	S-126A

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Observations by Inspections

SITE DATA

Mainline ID: 126B-126C		City: CASSLEBERRY FLA		Address: PARK AVE			
Upstream node: 126B	Depth: 	Downstream node: 126C	Depth: 	Pipe type: Corrugated	Pipe shape: Circular	Pipe height: 18	Pipe width: 18

INSPECTION DATA

Map No:	Scheduled Date: 8/24/2015 3:43:26 PM	Start date/time: 8/24/2015 3:44:05 PM	End date/time: 8/24/2015 3:48:42 PM
Surveyed footage: 11.9	Status: Stopped	Operator: KIRK	Work order No.: 15040
Reason: Assessment	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		126B
0.0				Water Level		5%
11.9				Outfall		126C
11.9				STOP		



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Owner CITY OF CASSELBERRY	Customer CITY OF CASSELBERRY	Project CITY OF CASSELBERRY	Upstream MH S-148A	Downstream MH S-148B	Date 11-Aug-2015
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Surveyor T. GARVEY	Street PAUL McCLURE CT	City CASSELBERRY	Time 2:18 PM
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Size 18	Material Corrugated Metal Pipe	Sewer Use Stormwater	Purpose Routine Assessment	Length 31.6	(TV'd) 31.6	Pre-Clean Jetting	Weather Dry
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Comments	Direction Upstream
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Ftg.	Code	Description	Position	Severity	Comment
0.0	MH	Manhole			S-148B
0.0	WL	Water Level		0	
31.6	CB	Catch Basin		0	S-148A



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Owner CITY OF CASSELBERRY	Customer CITY OF CASSELBERRY	Project CITY OF CASSELBERRY	Upstream MH S-148B	Downstream MH S-148C	Date 11-Aug-2015
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Surveyor T. GARVEY	Street PAUL McCLURE CT	City CASSELBERRY	Time 2:13 PM
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Size 18	Material Reinforced Concrete Pipe	Sewer Use Stormwater	Purpose Routine Assessment	Length 24.4	(TV'd) 24.4	Pre-Clean Jetting	Weather Dry
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Comments	Direction Upstream
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Ftg.	Code	Description	Position	Severity	Comment
0.0	CB	Catch Basin		0	S-148C
10.0	GO	General Observation			CMP
24.4	MH	Manhole			S-148B



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Owner CITY OF CASSELBERRY	Customer CITY OF CASSELBERRY	Project CITY OF CASSELBERRY	Upstream MH S-148C	Downstream MH S-148D	Date 11-Aug-2015		
Surveyor T. GARVEY	Street PAUL McCLURE CT			City CASSELBERRY	Time 1:51 PM		
Size 18	Material Corrugated Metal Pipe	Sewer Use Stormwater	Purpose Routine Assessment	Length 115.4	(TV'd) 115.4	Pre-Clean Jetting	Weather Dry

Comments **Direction**
Upstream

Ftg.	Code	Description	Position	Severity	Comment
0.0	CB	Catch Basin		0	S-148D
0.0	WL	Water Level		0	
115.4	CB	Catch Basin		0	S-148C



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Owner CITY OF CASSELBERRY	Customer CITY OF CASSELBERRY	Project CITY OF CASSELBERRY	Upstream MH S-148D	Downstream MH S-148E	Date 12-Aug-2015
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Surveyor T. GARVEY	Street PAUL McCLURE CT	City CASSELBERRY	Time 8:17 AM
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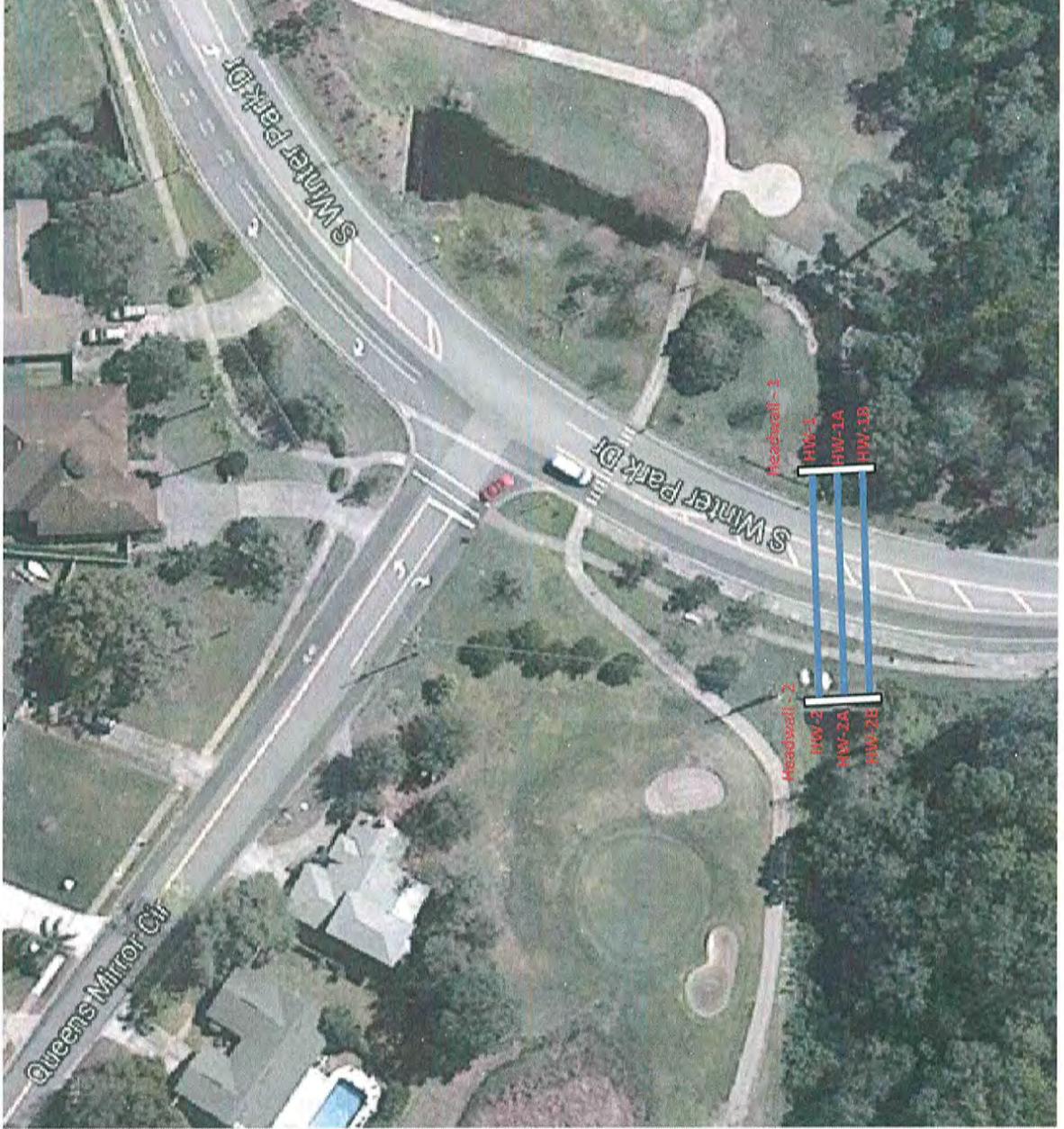
Size 24	Material Corrugated Metal Pipe	Sewer Use Stormwater	Purpose Routine Assessment	Length 96.2	(TV'd) 96.2	Pre-Clean Jetting	Weather Dry
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Comments	Direction Downstream
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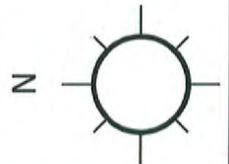
Ftg.	Code	Description	Position	Severity	Comment
0.0	CB	Catch Basin		0	S-148D
0.0	WL	Water Level		0	
33.5	H	Hole	9	4	
80.3	GO	General Observation			CHANGES TO HDPE
96.2	AP	Access Point - Other			OUTFALL, S-148E

Work Zone #9 (Location I)

Area I



— Indicates
Inspected
Pipeline



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Observations by Inspections

SITE DATA

Mainline ID:		City:	Address:				
HW 1 TTO HW 2		CASSELBERRY	CASSELBERRY/ WEST				
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
HW 1		HW 2		Concrete Rein	Egg	36	72

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
	7/27/2015 12:17:10 PM	7/27/2015 12:17:32 PM	7/27/2015 1:01:54 PM
Surveyed footage:	Status:	Operator:	Work order No.:
127.9	Stopped	ADRIAN JR	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Manhole		HW-2
0.0				Water Level		10%
57.7				Manhole		NEW STRUCTURE FOUND
127.9				Inlet		HW 1
127.9				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
HW 1A TO HW 2A		CASSELBERRY		WINTER PARK DR/WEST			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
HW 1A		HW 2A		Concrete Rein	Egg	36	72

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
	7/27/2015 1:11:24 PM	7/27/2015 1:13:58 PM	7/27/2015 1:20:52 PM
Surveyed footage:	Status:	Operator:	Work order No.:
126.9	Stopped	ADRIAN JR	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Manhole		HW-2A
0.0				Water Level		15%
56.2				General Observation		MANHOLE IN BETWEEN
126.9				Inlet		HW-1A
126.9				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:		Address:			
HW 1B TO HW 2B		CASSELBERRY		WINTER PARK DR/ WEST			
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
HW 1B		HW 2B		Concrete Rein	Egg	36	72

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
	7/27/2015 1:27:16 PM	7/27/2015 1:27:32 PM	7/27/2015 1:31:47 PM
Surveyed footage:	Status:	Operator:	Work order No.:
129.1	Stopped	ADRIAN JR	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Manhole		HW-2B
0.0				Water Level		15%
60.4				General Observation		MANHOLE IN BETWEEN
129.1				Inlet		HW-1B
129.1				STOP		

**Work Zone #10
(Location E & O)**

Area E



Area O



— Indicates Inspected Pipeline

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Observations by Inspections

SITE DATA

Mainline ID:		City:	Address:				
196 TO 200		CASSELBERRY	CONCORD DR.				
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
200		196		Concrete Rein	Circular	18	18

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
AREA E/ZONE 10	7/20/2015 11:11:29 AM	7/20/2015 11:12:44 AM	7/20/2015 11:23:38 AM
Surveyed footage:	Status:	Operator:	Work order No.:
48.4	Stopped	M Pomales	15140
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Catch Basin		196
0.0				Water Level		0%
33.6		2		Crack	Longitudinal	
48.4				Catch Basin		200
48.4				STOP		



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Owner CASSELBERRY **Customer** SINGHOFEN **Project** CASSELBERRY **Upstream MH** MH-196 **Downstream MH** MH-130 **Date** 21-Jul-2015

Surveyor M. POMALES **Street** CONCORD DR. **City** CASSELBERRY **Time** 2:39 PM

Size 24 **Material** Corrugated Metal Pipe **Sewer Use** Stormwater **Purpose** Routine Assessment **Length** 260.3 **(TV'd)** 260.3 **Pre-Clean** Jetting **Weather** Dry

Comments _____ **Direction** Downstream

Ftg.	Code	Description	Position	Severity	Comment
0.0	MH	Manhole			196
0.0	WL	Water Level		0	
33.1	R	Roots	4	3	
35.1	R	Roots	8	3	
52.1	R	Roots	5 to 7	3	
100.4	R	Roots	7	3	
111.7	R	Roots	7	3	
132.3	R	Roots	5	3	
141.2	R	Roots	5	3	
160.8	R	Roots	5	3	
167.8	GO	General Observation	8 to 4		FILTER FABRIC
187.5	GO	General Observation	9 to 3		FILTER FABRIC AT JOINT
244.8	GO	General Observation	12 to 12		FILTER FABRIC AT JOINT
249.6	WL	Water Level		0	
260.3	CB	Catch Basin		0	130



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Owner CASSELBERRY
 Customer SINGHOFEN
 Project CASSELBERRY
 Upstream MH MH-224
 Downstream MH MH-225
 Date 21-Jul-2015

Surveyor M. POMALES
 Street SECRET WAY
 City CASSELBERRY
 Time 3:32 PM

Size 15
 Material Reinforced Concrete Pipe
 Sewer Use Stormwater
 Purpose Routine Assessment
 Length 24.7
 (TV'd) 24.7
 Pre-Clean Jetting
 Weather Dry

Comments _____
 Direction Upstream

Ftg.	Code	Description	Position	Severity	Comment
0.0	CB	Catch Basin		0	225
0.0	WL	Water Level		0	
5.0	WL	Water Level		0	
24.7	SD	Surface Damage		2	REINFORCEMENT VISIBLE
24.7	CB	Catch Basin		0	224



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Owner CASSELBERRY **Customer** SINGHOFEN **Project** CASSELBERRY **Upstream MH** MH-225 **Downstream MH** MH-225A **Date** 22-Jul-2015

Surveyor M. POMALES **Street** 225 SECRET WAY **City** CASSELBERRY **Time** 8:09 AM

Size 15 **Material** Reinforced Concrete Pipe **Sewer Use** Stormwater **Purpose** Routine Assessment **Length** 118.2 **(TV'd)** 118.2 **Pre-Clean** Jetting **Weather** Dry

Comments DEPTH 3.7FT **Direction** Downstream

Ftg.	Code	Description	Position	Severity	Comment
0.0	CB	Catch Basin		0	225
0.0	WL	Water Level		0	
73.7	WL	Water Level		0	
118.2	GO	General Observation			MATERIAL CHANGE FROM RCP TO ADS
118.2	GO	General Observation			JOINT ANGULAR TO THE RIGHT
118.2	SA	Survey Abandoned			TRACTOR WILL NOT GO PASS THIS POINT DUE TO THE ANGLE OF PIPE

**Work Zone #11
(Location U & N)**

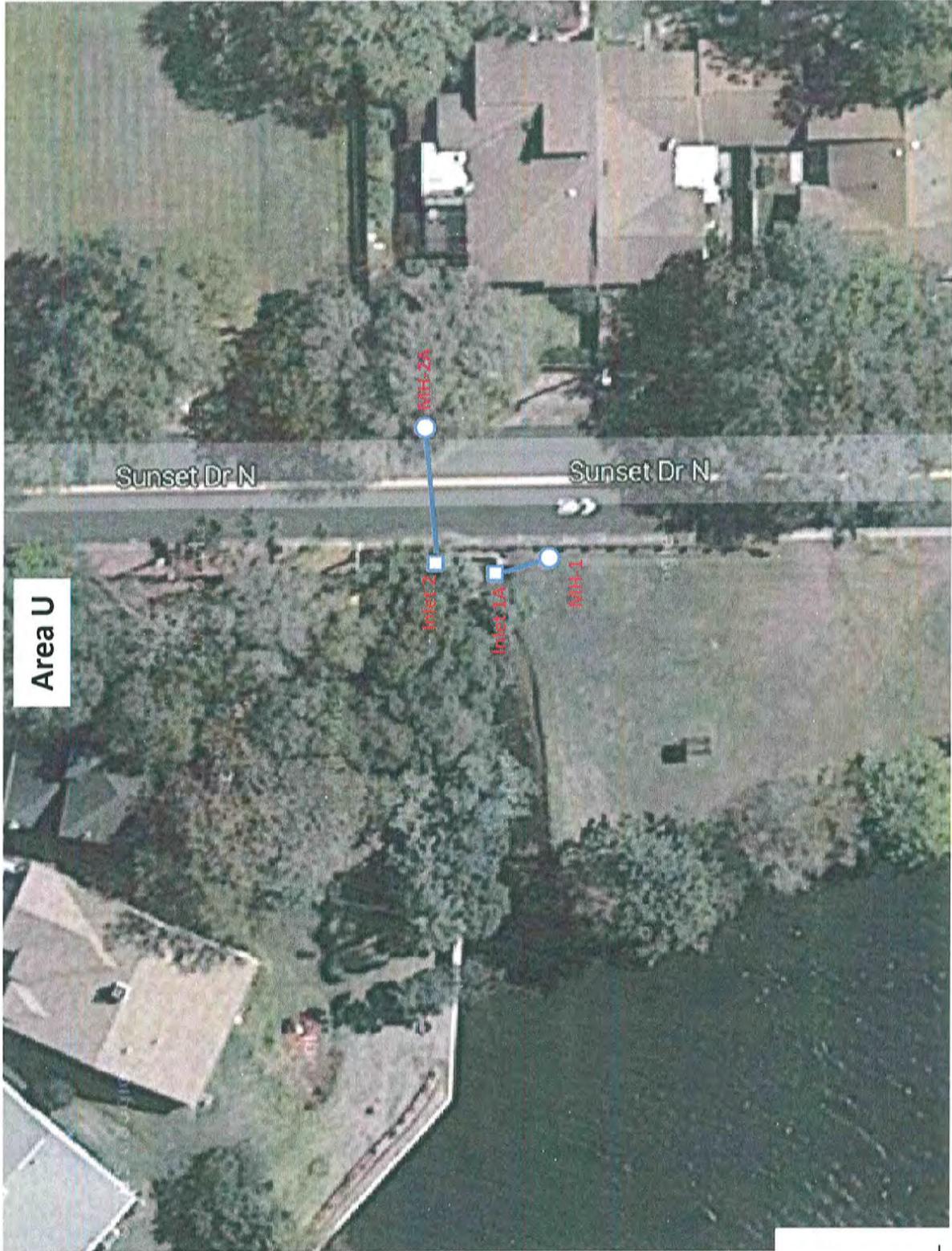


Client Singhoffen & Associates, Inc.

Job No. 15040

Project Name Internal Television Inspection and Report of Findings

Drawings not to scale



— Indicates Inspected Pipeline



— Indicates Inspected Pipeline



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Owner CASSELBERRY **Customer** SINGHOFEN **Project** CASSELBERRY **Upstream MH** MH-1 **Downstream MH** MH-1A **Date** 23-Jul-2015

Surveyor M. POMALES **Street** NORTH SUNSET DR. **City** CASSELBERRY **Time** 9:20 AM

Size 15 **Material** Reinforced Concrete Pipe **Sewer Use** Stormwater **Purpose** Routine Assessment **Length** 12 **(TV'd)** 12 **Pre-Clean** Jetting **Weather** Dry

Comments DEPTH 2'10" **Direction** Downstream

Ftg.	Code	Description	Position	Severity	Comment
0.0	CB	Catch Basin		0	MH-1
0.0	WL	Water Level		0	
10.1	JO	Joint Offset	5 to 7	2	
12.0	AP	Access Point - Other			END OF PIPE 1A



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Owner CASSELBERRY **Customer** SINGHOFEN **Project** CASSELBERRY **Upstream MH** MH-2 **Downstream MH** MH-2A **Date** 23-Jul-2015

Surveyor M. POMALES **Street** NORTH SUNSET DR. **City** CASSELBERRY **Time** 9:58 AM

Size 15 **Material** Reinforced Concrete Pipe **Sewer Use** Stormwater **Purpose** Routine Assessment **Length** 35.7 **(TV'd)** 35.7 **Pre-Clean** Jetting **Weather** Dry

Comments _____ **Direction** Downstream

Ftg.	Code	Description	Position	Severity	Comment
0.0	AP	Access Point - Other			INLET 2
0.0	WL	Water Level		0	
35.7	MH	Manhole			2A

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Observations by Inspections

SITE DATA

Mainline ID: 277F-277B		City: CASSLEBERRY FLA	Address: SECRET WAY				
Upstream node: 277F	Depth:	Downstream node: 277B	Depth:	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 18	Pipe width: 18

INSPECTION DATA

Map No:	Scheduled Date: 8/24/2015 10:19:48 AM	Start date/time: 8/24/2015 10:21:16 AM	End date/time: 8/24/2015 11:34:00 AM
Surveyed footage: 133.8	Status: Stopped	Operator: KIRK	Work order No.: 15040
Reason: Assessment	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Catch Basin		277F
0.0				Water Level		5%
14.4				Status - Satisfactory		
17.7				Status - Satisfactory		
130.8		9		Pipe Type		LEAKING AT CHANGE OF PIPE MATERIAL
132.8		12	12	Joint Offset		CAMERA WILL NOT PASS
133.8				Pipe Type		RCP-HDPE
133.8				STOP		

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments
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Singhoffen & Associates, Inc.
Orlando, Florida
Job No. 15040

Line Segment Information			Distance	Observations	Clock Position	Rehabilitation Technique	Cost
From #638	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 48" 37.4'	0'	Catch Basin - #638			
To #115	Location G		26.4'	Mineral Stains	4 - 7	Chemical Grout	
			37.4'	Catch Basin - #115		Total	
From #638	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 48" 90.7'	0'	Catch Basin - #638			
To #638S	Location G		0.0'	Mineral Stains	3	Chemical Grout	
			63.4'	Mineral Stains	12 - 12	Chemical Grout	
			90.7'	Manhole - #638S		Total	
From #624	PIPE TYPE PIPE SIZE PIPE LENGTH	CMP 18" 322.5'	0'	Catch Basin - #624			
To #635	Location G		166.5'	0.9' Longitudinal Crack - Soil Visible		Altair Unable to Repair	
			322.5'	Infiltration at #635 Structure Walls		Chemical Grout	
			322.5'	Catch Basin - #635		Total	
From #648	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 15" 32.6'	0'	Catch Basin - #648			
To #149	Location G		16.1'	Mineral Stains	7 - 10	Chemical Grout	
			30.3'	Circular Crack	7 - 4	3' CIPP	
			32.6'	Catch Basin - #149		Total	
From #1280	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 18"x30" 365.1'	0'	Manhole - #1280			
To MES	Location C		39.8'	Roots at Joint	8		
			48.8'	Roots at Joint	7		
			120.8'	Roots at Joint	5		
			169.0'	Roots at Joint	5 - 7		
			193.8'	Roots at Joint	5 - 7		
			250.0'	Roots at Joint	8		
			266.5'	Roots at Joint	6		
			290.8'	Joint Separated with Roots			
			299.5'	Roots at Joint	8		
			315.4'	Roots at Joint	9		
			339.3'	Roots at Joint	5		
			346.6'	Joint Offset	5 - 7		
			355.0'	Joint Separated (Large) with Roots and Concrete	12 - 12		
			365.1'	End of Pipe - MES		Total	
From #163A	PIPE TYPE PIPE SIZE PIPE LENGTH	CMP 18" 35.8'	0'	Catch Basin - #163A			
To #163B	Location F		17.7'	Root Infiltration	5 - 7	Altair Unable to Repair	
			35.8'	Headwall - 163B		Total	
From #148D	PIPE TYPE PIPE SIZE PIPE LENGTH	CMP 24" 96.2'	0'	Catch Basin - #148D			
To #148E	Location H		33.5'	Hole in Pipe - Deterioration - Soil Visible		Altair Unable to Repair	
			96.2'	Outfall - #148E		Total	
From #196	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 18" 48.4'	0'	Catch Basin - #196			
To #200	Location E		33.6'	Longitudinal Crack	2	Chemical Grout	
			48.4'	Catch Basin - #200		Total	

Singhoffen & Associates, Inc.
 Orlando, Florida
 Job No. 15040

Line Segment Information			Distance	Observations	Clock Position	Rehabilitation Technique	Cost
From <u> #196 </u>	PIPE TYPE PIPE SIZE PIPE LENGTH	CMP 24" 260.3'	0'	Manhole - #196			
To <u> #130 </u>	Location E		33.1'	Roots	4	Altair Unable to Repair	
			35.1'	Roots	8	Altair Unable to Repair	
			52.1'	Roots	5 - 7	Altair Unable to Repair	
			100.4'	Roots	7	Altair Unable to Repair	
			111.7'	Roots	7	Altair Unable to Repair	
			132.3'	Roots	5	Altair Unable to Repair	
			141.2'	Roots	5	Altair Unable to Repair	
			160.8'	Roots	5	Altair Unable to Repair	
			260.3'	Catch Basin - #130		Total	
Pipe material is perforated Corrugated Metal							
From <u> MH-1 </u>	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 15" 12.0'	0'	Catch Basin - MH-1			
To <u> 1A </u>	Location U		10.1'	Joint Offset	5 - 7	Chemical Grout	
			12.0'	End of Pipe - 1A		Total	
From <u> #277F </u>	PIPE TYPE PIPE SIZE PIPE LENGTH	RCP 18" -	0'	Catch Basin - #277F			
To <u> #277B </u>	Location N		130.8'	Material Change - RCP to HDPE	9	Chemical Grout	
			130.8'	Infiltration at Material Change			
			132.8'	Offset Joint - Camera unable to pass		Total	
						Grand Total	\$0.00

Singhoffen & Associates, Inc.

Orlando, Florida

Storm Drain Rehabilitation Project
Casselberry, Florida

Plugging, Dewatering, Cleaning and Television
Inspection of Storm Water Pipelines

DVD #5 – Work Zone #9



Trenchless Pipeline Services Since 1980

Inspection • Evaluation • Maintenance • Rehabilitation

September 2015

Job No. 15130

**Singhoffen & Associates, Inc
Orlando, Florida**

**Storm Drain Rehabilitation Project
Casselberry, Florida**

**Plugging, Dewatering, Cleaning and
Television Inspection of Storm Water
Pipelines**

DVD # 5 - Work Zone #9

**Prepared for Singhoffen & Associates, Inc.
by:**

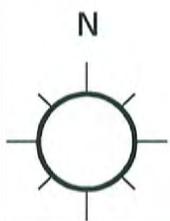
**Altair Environmental Group, LLC
710 South Milwee Street
Longwood, Florida 32750
Office (407) 339 – 7134
Fax (407) 339 – 6618**

**E-Mail: admin@altairenvironmental.com
Website: www.altairenvironmental.com**

September, 2015

Client Singhoffen & Associates, Inc.

Project Name Internal Television Inspection and Report of Findings Job No. 15130



Drawings not to scale

— Indicates Inspected Pipeline



Client Singhoffen & Associates, Inc.
Job No. 15040

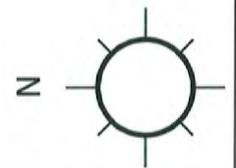
Project Name Internal Television Inspection and Report of Findings

Drawings not to scale

Area M



— Indicates Inspected Pipeline



Location D
(Work Zone 9)

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 Longwood, FL 32750
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Observations by Inspections

SITE DATA

Mainline ID: 703 TO 704		City: CASSELBERRY		Address: 703 GREGORY DR			
Upstream node: 703	Depth: 4.5	Downstream node: 704	Depth: 5	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 24	Pipe width: 24

INSPECTION DATA

Map No:	Scheduled Date: 7/23/2015 8:25:08 AM	Start date/time: 7/23/2015 8:29:14 AM	End date/time: 7/23/2015 8:39:01 AM
Surveyed footage: 55.2	Status: Stopped	Operator: ADRIAN JR	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Manhole		MH-704
0.0				Water Level		0%
38.1		6		General Observation		BOTTOM OF PIPE IS BROKEN, ANOTHER VISIBLE PIPE RUNNING ACROSS
55.2				Catch Basin		CB-703
55.2				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 704 to 704A		City: casselberry		Address: 704 gregory			
Upstream node: 704	Depth: 5	Downstream node: 704A	Depth: 5.5	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 30	Pipe width: 30

INSPECTION DATA

Map No:	Scheduled Date: 7/22/2015 1:31:30 PM	Start date/time: 7/22/2015 1:33:21 PM	End date/time: 8/5/2015 10:24:40 AM
Surveyed footage: 50.4	Status: Stopped	Operator: ADRIAN JR	Work order No.: 15040
Reason: Regular	Weather: Heavy Rain	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Manhole		704
50.4				Manhole		704A
50.4				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 704A TO 704B		City: CASSELERRY		Address: 704 GREGORY DR			
Upstream node: 704A	Depth: 5.5	Downstream node: 704B	Depth: 6	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 30	Pipe width: 30

INSPECTION DATA

Map No:	Scheduled Date: 7/23/2015 8:45:54 AM	Start date/time: 7/23/2015 8:46:15 AM	End date/time: 7/23/2015 8:52:28 AM
Surveyed footage: 182.7	Status: Stopped	Operator: ADRIAN JR	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Manhole		MH-704A
0.0				General Observation		RE-BAR VISIBLE AT TIE IN
182.7				Manhole		MH-704B/ MANHOLE IS LOCATED ON OTHER SIDE OF FENCE IN A BACKYARD
182.7				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 803 TO 803A		City: CASSELBERRY		Address: 803 BRIGHTON			
Upstream node: 803	Depth: 4	Downstream node: 803A	Depth: 5	Pipe type: Concrete Rein	Pipe shape: Circular	Pipe height: 18	Pipe width: 18

INSPECTION DATA

Map No:	Scheduled Date: 7/23/2015 9:43:27 AM	Start date/time: 7/23/2015 9:43:54 AM	End date/time: 7/23/2015 9:55:18 AM
Surveyed footage: 32.1	Status: Stopped	Operator: ADRIAN JR	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				Manhole		803A
30.1				General Observation		SEWER LINE RUNNING ACROSS
32.1				General Observation		THERE IS ONLY 3 TO 4 FT LEFT BEFORE BOX, THE SANITARY LINE WILL NOT LET CAMERA GO PASS BECAUSE IT IS SITTING TO LOW, ONE OF MY GUYS WENT IN FROM OTHER END AND VISUALY INSPECTED IT ENDING INSPECTION HERE.
32.1				Manhole		803
32.1				STOP		

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Observations by Inspections

SITE DATA

Mainline ID: 803A TO 803B		City: CASSELBERRY		Address: 803 BRIGHTON WY			
Upstream node: 803A	Depth: 5	Downstream node: 803B	Depth:	Pipe type: Concrete Reinf	Pipe shape: Circular	Pipe height: 24	Pipe width: 24

INSPECTION DATA

Map No:	Scheduled Date: 7/23/2015 10:01:12 AM	Start date/time: 7/23/2015 10:01:28 AM	End date/time: 7/23/2015 10:03:51 AM
Surveyed footage: 8.0	Status: Stopped	Operator: ADRIAN JR	Work order No.: 15040
Reason: Regular	Weather: Dry	Condition: Satisfactory	Direction of Inspection: Downstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START WITH FLOW		
0.0				Manhole		803A
8.0				Manhole		MH 803B / 704B (STRUCTURE LABELED TWICE BY TV OPERATOR, REFER TO UPDATED MAPS) THIS MANHOLE IS ON OTHER SIDE OF FENCE.
8.0				STOP		

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Observations by Inspections

SITE DATA

Mainline ID:		City:	Address:				
MH-803B TO OUTFALL		CASSELBERRY	803 GREGORY DR.				
Upstream node:	Depth:	Downstream node:	Depth:	Pipe type:	Pipe shape:	Pipe height:	Pipe width:
MH-803B	5	OUTFALL		Concrete Rein	Circular	36	36

INSPECTION DATA

Map No:	Scheduled Date:	Start date/time:	End date/time:
	9/30/2015 1:41:04 PM	9/30/2015 4:00:42 PM	9/30/2015 4:10:33 PM
Surveyed footage:	Status:	Operator:	Work order No.:
218.1	Stopped	M. POMALES	15040
Reason:	Weather:	Condition:	Direction of Inspection
Regular	Dry	Satisfactory	Upstream
Comments			

OBSERVATIONS

Footage	Length	From	To	Code	Modifiers	Comments:
0.0				START AGAINST FLOW		
0.0				MES		OUTFALL
0.0				Water Level		5%%
218.1				Manhole		MH-803B
218.1				STOP		