McKIM&CREED



FINAL TECHNICAL MEMORANDUM

TO: Orange Water and Sewer Authority

FROM: Michael Penny, PE; Nick Dierkes, PE; Shelby Wiggins, EI;

DATE: November 1, 2023

RE: Morgan Creek Aerials Condition Assessment

1.0 Executive Summary

McKim & Creed (M&C) performed a condition assessment of fifteen (15) gravity sewer aerial crossings along the Morgan Creek Interceptor owned by Orange Water and Sewer Authority (OWASA). The purpose of the Assessment was to describe the condition of the identified aerial crossings and provide recommendations for renewal to be integrated into OWASA's existing maintenance work and Capital Improvement Project (CIP) efforts.

Where possible, ultrasonic thickness testing was performed on the pipelines. Manhole inspections in general accordance with NASSCO MACP Level 2 were performed on the upstream and downstream manholes. Structural assessments were performed on piers. Additionally, each site was reviewed for erosion concerns, and other location related concerns, and M&C reviewed OWASA provided closed circuit television (CCTV). See Section 3.0 for site specific results of the assessment.

Each pipeline was rated for risk based on criteria related to Likelihood and Consequence of Failure (LOF x COF) (See Section 4.0 for additional details). These risk assessments were used along with specific site findings and OWASA input to prioritize recommendations. The defects noted at each site were utilized to develop the recommended action item. Table 1 summarizes the recommendations and Table 2 prioritizes the recommendations on the risk matrix.

The recommendations are prioritized into three categories: "Critical Action Items", "Operations/Maintenance Action Items", and "Other Action Items".

- "Critical Action Items" are priority due to the risk of failure as determined by the engineer and evident in the overall risk factor. If there is a critical action item

identified, other action items that are less critical may be grouped under critical to limit additional mobilizations to the same site.

  - Nine (9) sites have recommendations deemed critical. It is recommended that these improvements are prioritized to avoid failure in the near future.
  - Table 2, along with Appendix A, can assist OWASA in determining the high priority repairs and consider completing repairs on multiple sites in the same vicinity to decrease mobilization cost and improve effectiveness of funds. See Appendix A and Section 5.0 for additional site grouping suggestions.
  - Total budgetary Opinion of Probably Construction Cost (OPCC): ~$3.1M

- "Operations/Maintenance Action Items" are recommended action items that are deemed low cost or require minimal equipment/tools to complete. These items are intended to the reduce the risk associated with LOF and typically include repairing pipe straps or pier defects, which M&C assumes can be completed by OWASA's internal staff.
  - Note that Operations/Maintenance Action Items are not necessary once the associated Critical Action Item has been completed, and if the Critical Action Item is performed, there is no need to perform the Operations/Maintenance Action Item. The intent of these repairs is to reduce budgetary burden on short term improvements while still reducing the LOF.
  - Total budgetary OPCC: ~$77,000
- "Other Action Items" are higher cost recommendations which include replacement or rehabilitation of the segment, and based on the risk evaluation, these items are deemed lower risk.
  - For some sites, items are noted in this column for OWASA to consider if the "Critical Action Item" effort is delayed (for example: stream stabilization). Stabilizing stream banks is a challenge at some of these sites due to the equipment needs to complete stabilization, and it may be preferrable to complete stabilization in conjunction with other repairs. However, similar to the "Operations/Maintenance Action Items", the "Other Action Items" will reduce the risk score if budget limitations restrict the ability to complete a critical repair.
  - If critical action items can be completed prior to further degradation of the site, then the Other Action Items would not be required, further reducing budgetary burdens.

    - In some instances, there are no Critical Action Items. In these instances, if the Other Action Item is completed, there is no need to complete the Operations/Maintenance Action Items.
    - Total budgetary OPCC: ~$2.1M
- Total Budgetary OPCC (all total repairs): ~$5.3M
    - For budgetary purposes, each cell listed in Table 1 assumes a separate mobilization cost. Therefore, completing projects in close proximity and reducing mobilization to the same site will result in cost reductions.
    - Section 5.0 provides additional details for cost of group sites to be completed as part of a single project.

Additionally, the "NCAC 6-Month Reinspection Considerations" column notes site specific concerns that should be considered as part of the 6-month inspections. The entire crossing should be reviewed during each inspection; however, these items are important to review due to the noted concerns. See Section 2.0 for additional discussion regarding the "high-priority sewers" classification.

The recommendations in this report are based on information collected and provided during this scope of services. Since these recommendations are based upon the condition of the infrastructure at time of the assessment, and the condition of the infrastructure may degrade at varying rates, it is important that OWASA comply with the North Carolina Administrative Code and inspect these "high-priority sewers" every six months to determine any adjustments necessary to the priority system provided in this report. M&C cannot predict when or if a failure will occur and has provided these recommendations to reduce the likelihood of failure.

Important items of note:

This assessment identified many critical action items that should be addressed promptly to avoid asset failure, especially during wet weather events where debris may further damage the assets. Defects include but are not limited to MHs partially or nearly exposed in the creek bank (Site 17 and 6), significantly deteriorated pipe wall (Site 4) and an exposed wood pier base (Site 18).

Table 1 - Summary of Recommendations

Site #	OWASA Pipe ID	OWASA USMH	OWASA DSMH	Critical Action Items[1,4]	Operations Action Items[2,4]	Other Action Items[3,4]	NCAC 6-Month Reinspection Considerations[5]
2	828	6806	6808	*No critical action items identified*	*No immediate action items*	• Find vent to make sure water is not flowing into encasement pipe as soon as possible.	• CCTV to evaluate potential deterioration • MH 6808 condition
3	954	28194	7224	• Replace MH to MH. Due to proximity, consider repairing in conjunction with Site 17.	*No immediate action items*	*No other action items identified*	• Stream bank erosion • Pier condition
4	974	7020	7021	• Replace from MH to MH and consider relocating the US MH further from the bank.	*No immediate action items*	*No other action items identified*	See note 3
5	1791	13075	7606	*No critical action items identified*	• Repair pipe to pier straps • Repair noted pier defects	• Replace from MH to MH due to bank erosion and pier condition • Pending results of 6-month inspections and schedule for a complete replacement, consider rehabilitating both MHs • Due to proximity, consider completing repairs in conjunction with Site 12	• Stream bank erosion • Pier condition • MH condition
6	1850	7706	7697	• Replace MH to MH, and relocate MH 7697 further from stream bank	*No immediate action items*	• If replacement is delayed, stabilize stream bank to protect manhole • Due to proximity, consider completing repairs in conjunction with Sites 13, 15, and 18	• Erosion: Inspect at least once per month and once after each 1-year storm event. • Interior of DS MH • Exterior of US MH
7	1981	7689	7670	• Rehabilitate US and DS MHs	• Repair pier strap assemblies as soon as possible • Repair noted pier defects	• Replace from MH to MH due to pier conditions	• Pier condition
8	2678	8355	9683	*No critical action items identified*	• Repair gap between pipe straps and pipeline • Install a repair clamp 126 feet from upstream MH.	• Install CIPP liner • Repair noted pier defects	• Offset joint • Pipe to pier connections
10	10325	13086	9666	*No critical action items identified*	No immediate action items	• Install CIPP from MH to MH • Rehabilitate MHs	See note 3
11	1950	7631	10371	• Replace MH to MH and relocate MHs further from bank	• Install repair clamp at point 52 feet from US MH • Replace missing pier straps as soon as possible. • Repair noted pier defects with repair mortar or epoxy	• If replacement is delayed, restore creek banks to limit erosion near MHs. • See detailed comments in Section 3 and 5 for additional information	• Stream bank erosion • Pier condition
12	14480	13078	13076	• Install CIPP liner • Rehabilitate both MHs • Due to proximity, consider completing repairs with Site 5	Install a repair clamp at 41, 51, and 61 feet from the upstream MH	*No other action items identified*	See note 3

Table 1 Continued

Site #	OWASA Pipe ID	OWASA USMH ID	OWASA DSMH ID	Critical Action Items[1,4]	Operations Action Items[2,4]	Other Action Items[3,4]	NCAC 6-Month Reinspection Considerations[5]
13	1836	7656	7658	• Replace cone, ring and cover on both MHs • Rehabilitate interior of DS MH • CIPP-line the pipe • Due to proximity, consider completing repairs in conjunction with Sites 6, 15, and 18	*No immediate action items*	*No other action items identified*	• Stream bank erosion
15	1860	7745	7770	*No critical action items identified*	*No immediate action items*	• Rehabilitate MHs • Repair piers • Restore stream banks • Due to proximity, consider completing repairs in conjunction with Sites 6, 13, and 18	• Stream bank erosion • Pier Condition
16	10322	9668	9669	*No critical action items identified*	*No immediate action items*	• Replace missing vent stack on MH 9668	See note 3
17	958	28192	28193	• Replace from MH to MH • Relocate Downstream MH further from stream bank • Due to proximity to Site 3, replace crossing at Site 3 and consider new layout as part of relocating SSMH 28193.	*No immediate action items*	*No other action items identified*	• Stream bank erosion
18	1833	7624	7618	• Replace MH to MH • Due to proximity, consider replacing in conjunction with Sites 6, 13, and 15	Remove debris	*No other action items identified*	• Stream bank erosion • Pier foundation • Debris • CCTV

[1] Critical action items need to be considered as soon as practicable.

[2] Operations Action Items are low cost items intended to reduce the likelihood of failure.

[3] Other action item recommendations are deemed less urgent than the "Critical Action Items" based on the results of the LOF x COF matrix (See Section 4.0 for LOF x COF matrix details)

[4] OWASA's modeling consultant should verify reduced diameter of CIPP liner is acceptable. If not, the segments where CIPP liner is recommended should be replaced to a larger diameter sewer.

[5] The North Carolina Administrative Code (NCAC), Subchapter 02T – Waste Not Discharged to Surface Waters, indicates all aerial sewers are considered "high-priority sewer", and requires that all "high-priority sewers" be inspected once every six (6) months and the inspection should be documented. Therefore, OWASA should reinspect each of these sites every six months, even after they have been replaced or repaired, unless after repair or construction the site no longer meets the criteria for a "high-priority sewer". The reinspection should include all accessible areas of the system for a visual inspection from MH to MH including but not limited to stream bank, pier and pipe condition. Based on the findings of this evaluation, M&C noted site specific concerns that warrant additional attention during each inspection.

Table 2 below provides a summary of the site prioritization based upon the LOF x COF scores discussed in Section 4.0. Higher Risk Values indicate more urgent repairs. See the remainder of the report for additional details.

Table 2 - Summary of Recommended Prioritization

Site #	OWASA Pipe ID	Pipe Diameter	OWASA US MH ID	OWASA DS MH ID	Risk Value	Critical Action Items?
17	958	18 in	28192	28193	20.0	Yes
12[1]	14480	30 in	13078	13076	10.0 (17.5 adjusted value)	Yes
13[1]	1836	24 in	7656	7658	10.0 (17.5 adjusted value)	Yes
4	974	18 in	7020	7021	17.0	Yes
6	1850	8 in	7706	7697	16.3	Yes
18	1833	10 in	7624	7618	16.3	Yes
3	954	12 in	28194	7224	15.0	Yes
11	1950	24 in	7631	10371	15.0	Yes
7	1981	24 in	7689	7670	12.5	Yes
15	1860	24 in	7745	7770	12.5	No
2	828	18 in	6806	6808	11.7	No
10	10325	30 in	13086	9666	11.7	No
8	2678	12 in	8355	9683	11.3	No
5[2]	1791	24 in	13075	7606	13.8 (11.3 adjusted value)	No
16	10322	30 in	9668	9669	10.0	No

[1]Sites 12 and 13 have lower risk scores since the pier and erosion LOFs are low. However, if only age and CCTV scores are considered, the Risk Values increase to 17.5 in which case these sites are 2nd on the priority list. These recommendations are critical and OWASA should consider the adjusted LOF scores as indicated in the above table and prioritized in Section 5.0 of this report.

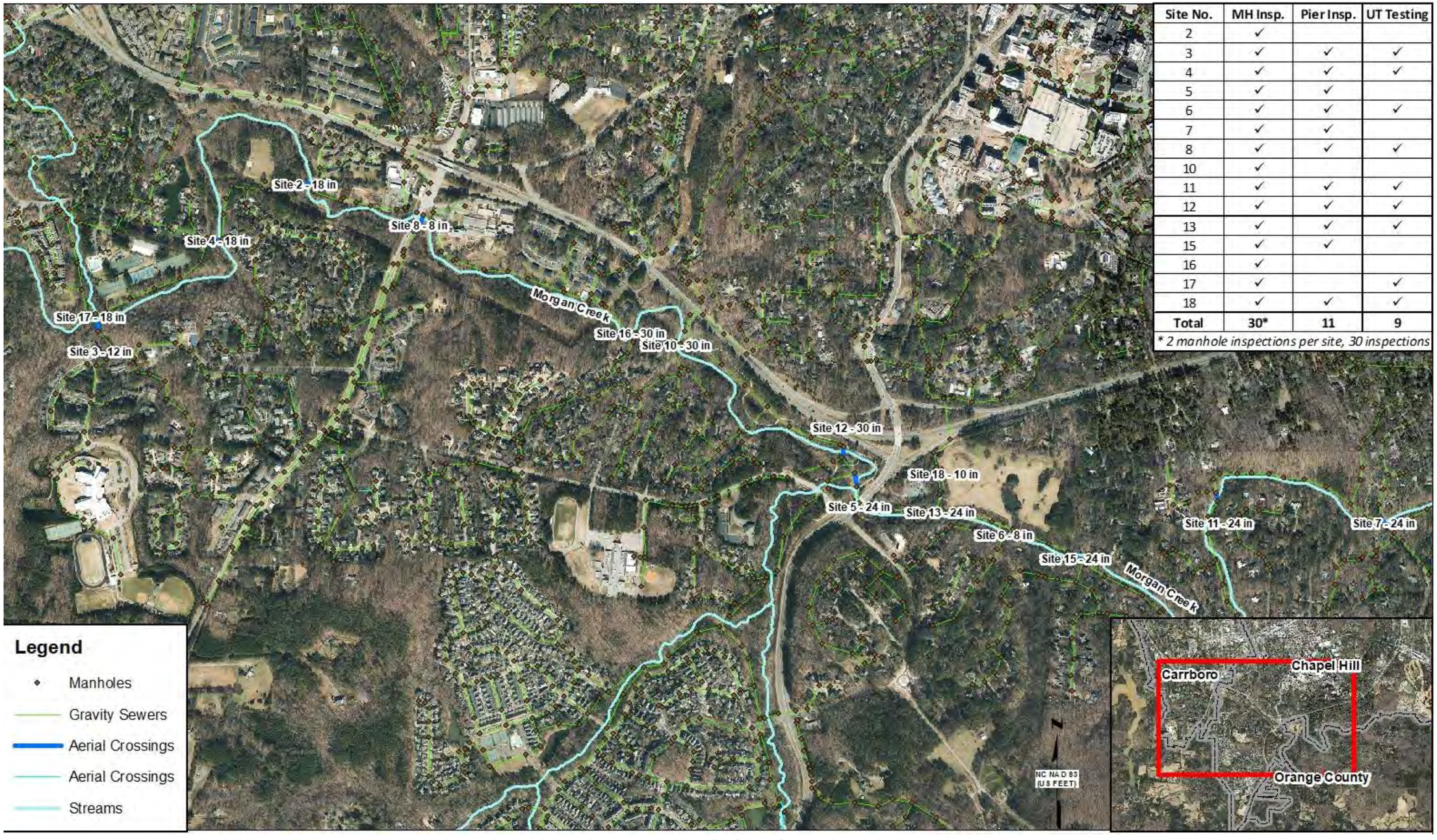
[2]Site 5 has a high risk score due to age, erosion and pier condition. However, the pipe has been CIPP-lined, the MHs do not appear to be in immediate danger of the noted erosion concerns, and M&C's structural engineer does not deem these piers critical. Therefore, these repairs appear less critical and OWASA should consider the adjusted LOF scores as indicated in the above table and prioritized in Section 5.0 of this report.

2.0 Introduction

Installed in the 1970s, the Morgan Creek Interceptor is approximately five (5) miles of gravity sewer infrastructure, ranging from 8 to 60 inches in diameter, serving the Morgan Creek sewer basin. OWASA has identified an unusual pattern of deterioration along the Interceptor. Multiple aerial crossings along the Interceptor have exhibited thinning of the pipeline wall at the invert of the pipe resulting in multiple emergency repairs in recent years. Due to this deterioration, OWASA identified other aerial pipeline segments to be assessed for condition.

2.1. Sites to be Evaluated

Fifteen (15) aerial crossings were identified by OWASA to be evaluated in the condition assessment. Figure 1 exhibits the project vicinity and site locations, as well as which assessments were performed at which sites.



Site No.	MH Insp.	Pier Insp.	UT Testing
2	✓		
3	✓	✓	✓
4	✓	✓	✓
5	✓	✓	
6	✓	✓	✓
7	✓	✓	
8	✓	✓	✓
10	✓		
11	✓	✓	✓
12	✓	✓	✓
13	✓	✓	✓
15	✓	✓	
16	✓		
17	✓		✓
18	✓	✓	✓
Total	**30***	**11**	**9**

** 2 manhole inspections per site, 30 inspections*

Figure 1. Morgan Creek Aerial Assessments project map

A summary of the pipeline characteristics at each site is shown in the table below. Following discussion with OWASA personnel it was determined that Site 1, Site 9, and Site 14 were not appropriate for assessment and should be removed; therefore, these sites considered during this assessment project and have not been shown in the table below.

Table 3 – Morgan Creek aerial crossings to be evaluated

Site #	OWASA Pipe ID	US MH	DS MH	Nominal Size	Material	Year Built	Rehab Date
2	828	6806	6808	18 in	Ductile Iron w/ Steel Casing	2005	
3	954	7224	28194	12 in	Ductile Iron & Cast Iron *	1987	
4	974	7021	7020	18 in	Ductile Iron	2003	
5	1791	13075	7606	24 in	CIPP lined Cast Iron	1971	2012
6	1850	7706	7697	8 in	Ductile Iron	1984	
7	1981	7670	7689	24 in	CIPP lined Cast Iron	1971	2012
8	2678	8355	9683	12 in[1]	Ductile Iron	1999	
10	10325	9666	13086	30 in	Ductile Iron w/ Steel Casing	2002	
11	1950	7631	10371	24 in	Ductile Iron	1971	
12	14480	13078	13076	30 in	Ductile Iron	2008	
13	1836	7656	7658	24 in	Ductile Iron	1971	
15	1860	7745	7770	24 in	CIPP lined Cast Iron	1971	2012
16	10322	9669	9668	30 in	Ductile Iron w/ Steel Casing	2002	
17	958	28192	28193	18 in[2]	Ductile Iron	2003	
18	1833	7618	7624	10 in	Cast Iron[3]	1971	

[1]GIS indicates this pipe diameter is 8-inches. Field measurements collected via no-man entry from the MH indicate it may be 12-inches.

[2]GIS indicates this pipe diameter is 12-inches. Field measurements collected via no-man entry from the MH indicate it may be 18-inches.

[3]Assumption that some material is cast iron was made following ultrasonic thickness (UT) testing. See Section 3.1 for additional information on this determination using UT testing.

2.2. Condition Assessment and Analysis Process

Field assessments and desktop analysis were performed to determine the current aerial pipe condition. The following process was used for the complete aerial assessment:

- Collect data from OWASA for review and perform a desktop condition assessment
- Complete field condition assessment
- Generate a preliminary assessment of risk and likelihood of failure analysis
- Provide recommendations for renewal of the aerial lines and associated manholes

The following data was collected from OWASA to perform the desktop condition assessment process: Geographic Information System (GIS) data, record drawings, and existing condition assessment CCTV videos. Physical attributes such as pipe size, material, installation date, and rehabilitation history were obtained from GIS and measured in the field. Records obtained from OWASA did not provide pipe class information on each aerial crossing; thus, assumptions regarding original wall thickness were made utilizing the results of the ultrasonic thickness testing.

Each site underwent field assessments including a visual assessment of bank erosion, manhole inspections, and ultrasonic thickness testing and structural pipe pier/support inspections where applicable. Pictures of each site were also taken and are shown in Section 3.0.

The field condition assessment was combined with the desktop condition assessment to formulate a final report documenting the current condition of each site, and recommendations for future action. The results and recommendations presented in this TM are intended to be formatted for easy integration into OWASA's existing Asset Management Plan and Capital Improvement Project list.

2.3. Condition Assessment Limitations

Services not listed above were excluded from this scope, which include but are not limited to: topographic survey, review of flow data, environmental assessment and environmental assessments, and review of connecting sewers. Prior to completing repairs, it is recommended all site conditions be confirmed including but not limited to: elevations of MHs and surface topography, diameter and material of existing sewers, connectivity of other sewers not reviewed, applicable environmental assessments.

The results of this assessment are based upon the condition of the sites at the time of the field evaluation and limited to the scope of services completed. Example limitations include but are not limited to pipe thickness between test points, and storm events that

occurred after site inspection and changed the condition of the site. Additionally, the condition of the sites may degrade at varying rates or in locations not noted in this report.

Due to the varying factors that impact site condition and deterioration, it is not possible to accurately predict when or if a failure will occur and the recommendations and considerations in this report should be routinely verified with site inspections. Per Chapter 15A of the North Carolina Administrative Code, Section 02T .0402 and .0403, these sites are classified as "high-priority sewers" and are required to have documented inspections completed every 6 months. OWASA is required to complete these 6-month inspections and should adjust the priority of projects based on noted degradation and risks as site conditions change.

3.0 Field Assessments

Assessments conducted at each site are summarized in Table 4. Due to Sites 5, 7, and 15 being CIPP lined Cast Iron, ultrasonic thickness testing would not be conclusive of the condition of the pipe, thus no ultrasonic thickness readings were taken at these sites. Additionally, Sites 2, 10, and 16 are encased by a steel encasement pipe; therefore, ultrasonic thickness testing would not provide information on the carrier pipe but only on the encasement pipe for these locations.

Table 4 – Assessments performed at each aerial location

Site #	OWASA Pipe ID	UT Testing	Manhole Inspection	Pier Inspection
2	828		Y	
3	954	Y	Y	Y
4	974	Y	Y	Y
5	1791		Y	Y
6	1850	Y	Y	Y
7	1981		Y	Y
8	2678	Y	Y	Y
10	10325		Y	
11	1950	Y	Y	Y
12	14480	Y	Y	Y
13	1836	Y	Y	Y
15	1860		Y	Y
16	10322		Y	
17	958	Y	Y	
18	1833	Y	Y	Y

3.1. Methods

All field assessments were performed by M&C. Ultrasonic thickness testing and manhole inspections were conducted by M&C's Water Asset Management group. Pier inspections were conducted by one of M&C's Water Group senior structural engineers, licensed in the state of North Carolina and experienced in the design and construction of the type of pipe support structures to be reviewed.

3.1.1. Ultrasonic Thickness Testing

M&C performed ultrasonic thickness testing at selected aerial crossings utilizing an Olympus 38DL PLUS Ultrasonic Thickness Gauge. Readings were collected at eight (8) equidistant circumferential points around the pipe, as shown in Figure 2. Three (3) readings were taken at each of the eight (8) points, and the average of these three (3) readings were recorded as the pipe thickness at that point.

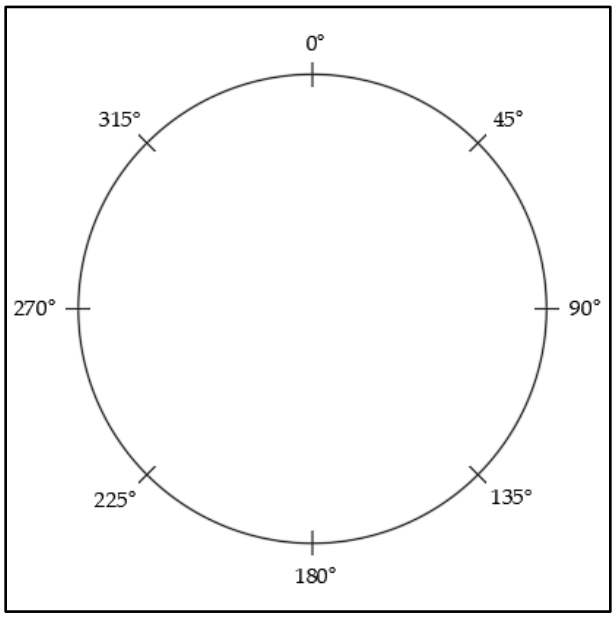


Figure 2: Points of UT measurement

The circumferential readings were taken every five (5) lateral feet along the pipeline. Lateral measurements began on the upstream end of the pipe, at the first point of exposed pipe, then every five (5) feet from there. If the exposed aerial pipeline crossing was less than five (5) feet long, a minimum of two (2) locations along the pipe were tested. Prior to testing at each aerial site, the equipment was calibrated using a 5-step steel block calibration standard of five (5) known thicknesses: 0.100", 0.200", 0.300", 0.400" and 0.500".

Per the equipment manufacturer, accurate readings can only be obtained by calibrating the equipment against the material in which you intend to test. The steel calibration block allows for accurate readings of ductile iron pipes. During review of the ultrasonic results, provided later in this report, the thickness readings indicated two locations (Site 3 and Site 18) are not solely ductile iron crossings as identified by GIS and record drawings. Therefore, select ultrasonic thickness readings obtained on these pipes were deemed inaccurate and were not included in this report. However, other variables outside of M&C's control may

have caused these inconsistences (inconsistencies with the pipe, meter or site other site specific issues). If it is desired, ultrasonic thickness testing on cast iron pipes can be conducted if the equipment is calibrated to a cast iron standard. The manufacturer of the equipment used during this particular condition assessment does not provide a cast iron standard. However, based on the identified concerns and existing conditions, and resulting recommendations, collecting thickness readings calibrated to cast iron standards is not necessary.

A liquid couplant was necessary during testing to provide acoustic coupling between the transducer and the pipe surface. Due to the peen, or "dimpling", of the ductile iron pipe surfaces at some of the sites, grinding down of the pipe coating was necessary to create a smooth area to apply the couplant and place the transducer. With approval from OWASA, where grinding occurred, coating was reapplied using a paint roller in the days following. The coating used was a bituminous sealcoat provided by U.S. Pipe, as required per OWASA's standard specifications for ductile iron sewer pipe.

Atypical composite coatings were discovered at two locations (Sites 4 and Site 17). Complete ultrasonic thickness results were obtained from Site 4; however, readings at Site 17 could only be taken at points along the crossing where the coating was chipped, revealing bare metal. A sample of the coating was taken from Site 17 and measured with an engineering scale, and is approximately 3/32" thick.

Pipe class of each aerial crossing was assumed based on the results of the ultrasonic thickness readings. The thickest reading at each site was compared to the wall thickness of various pipe classes. The pipe class with a wall thickness greater than or equal to the thickest reading was assumed to be the pipe class for that crossing. Assumptions made for each site are documented in the following subsections. The summary tables below have a color scale based on a gradient so the thickest reading appears green and the thinnest reading appears red to visually show the degradation of the pipe.

In two (2) prior emergency repairs of Morgan Creek aerials, OWASA found deterioration of the inverts of the pipe, rather than crown (which is more common). This led to the use of UT testing to find wall thickness of the pipelines at the inverts, which is not possible in traditional CCTV inspections since the visual assessment is only performed on the portion of pipe exposed above water level. Based on the results of this analysis, the deterioration of the inverts of the pipelines is not a rule to be applied across all the aerial pipelines. Traditional CCTV at low flow periods may still be a viable periodic assessment method for the

aerial pipes and is necessary for pipelines that are encased which prevents the use of UT thickness testing equipment.

The results of the UT testing can be found in ***Appendix B***.

3.1.2. Manhole Inspections

M&C performed manhole inspections in general accordance with National Association of Sewer Service Companies (NASSCO) Manhole Assessment Certification Program (MACP) Level 2 at the immediate upstream and downstream manhole for each aerial crossing.

Table 5 – Morgan Creek aerial crossing manholes

Site #	OWASA Pipe ID	Upstream MH ID	Downstream MH ID
2	828	6806	6808
3	954	7224	28194
4	974	7021	7020
5	1791	13075	7606
6	1850	7706	7697
7	1981	7670	7689
8	2678	8355	9683
10	10325	9666	13086
11	1950	7631	10371
12	14480	13078	13076
13	1836	7656	7658
15	1860	7745	7770
16	10322	9669	9668
17	958	28192	28193
18	1833	7618	7624

Due to the corrosive nature of gases present within sanitary sewer systems, most manholes have slight to heavy corrosion in the covers, frames, and rings where ventilation is not feasible.

Incoming and outgoing gravity sewer pipes connections were also inspected to note any visible interface defects utilizing a pole-mounted camera.

The results of the manhole inspections can be found in ***Appendix C***.

Measurements of pipe diameters during manhole inspections at Sites 8 and 17 indicated different pipe diameters than GIS/record drawings. These

measurements collected as part of field observations are documented in this report. However, it is recommended pipe diameters be confirmed during design and prior to construction of the individual repairs.

3.1.3. Pier Support Inspections

Visual assessments were performed on the existing pipe supports for the selected aerial crossings. The existing pipe supports consisted of cast-in-place concrete assemblies located at creek banks and midstream. In general, each aerial crossing site had different numbers of existing piers observed, individual pier dimensions, pipe to pier connection anchor assemblies, pier above surface water heights, and pier below surface water depths.

The following should be noted regarding the review of pier supports:

1. Evaluations were based primarily visual reviews of the pier assemblies. Visual reviews were conducted to assess condition of the above water exposed concrete surfaces and to determine the following:
    - Whether exposed concrete surfaces contained surface voids, cracks, spalls, delaminations, honeycombs or other imperfections.
    - Whether the existing piers were plumb and level.
    - Whether the existing piers were subjected to potential scouring.
    - Configuration of existing pipe to pier anchor assemblies.
    - General pier length and width dimensions.
    - Pier height above water surface and depth to existing footing.
2. Reviews included random non-destructive testing which included "ping" sound testing of existing concrete to locate sub-surface voids and abnormalities.
3. Reviews conducted did not include the following:
    - Precise dimensional data of existing construction conditions.
    - Recorded measurements of dry film thickness of any existing coating systems in place.
    - Probing of cracks and voids to assess their extents.
    - Measurement of any exposed reinforcing bars.
    - Material testing of existing soils.
    - Material testing of existing concrete or steel assemblies.

Results of the pier inspections can be found in ***Appendix D***.

3.1.4. *Closed Circuit Television (CCTV) Review*

OWASA provided CCTV videos of each crossing for review. A visual inspection of the videos was performed to identify any significant defects that would indicate near term asset failure. While detailed inspection reports are not included in this scope, NASSCO certified staff (Nick Dierkes, NASSCO Certification #: P0039562-102022) was utilized to characterize the pipe condition and provide rehabilitation recommendations. This review noted defects critical to the integrity and maintenance of the pipe and used these items to supplement the recommended repairs. The overall pipe condition was also assigned to one of the following categories and used as an input for the criticality evaluations described in Section 4. The condition of the pipe is noted in the Section 3.0 site specific discussion.

- Excellent – Pipe is in new or like-new condition
- Good – Minor superficial defects are present, no anticipated impact to system performance
- Fair – Moderate defects are present that affect system performance, pipe may need to be cleaned or repaired to restore full service
- Poor – Significant structural defects are present and service is impacted. Rehabilitation should be prioritized to avoid future failure.
- Failure – Pipe is not functioning (i.e., collapse) and must be repaired immediately.

3.2. *Assessment Results*

The summary of inspection results for each of the aerial sites are summarized below. Related inspection forms are shown in the appendices.

3.2.1. *Site 2, Pipe ID 828 – 18-inch DI w/ Steel Casing – near Abbey Rd*

Site 2, which is located near Abbey Rd, has an 18-inch ductile iron pipeline with a steel encasement. Due to the encasement, UT testing was not performed at this site. According to record drawings, this aerial crossing is supported by two piers; however, these are buried so no pier assessment was performed for this site. Therefore, a visual inspection and a manhole inspection were performed for this site.

A picture of this aerial pipeline is shown in the figure below, and the record drawing follows. The pipeline has two guards installed on it. It also has a 2-inch galvanized steel vent that, based upon the record drawings, penetrates through the blocking at the ends of the casing pipe. According to record drawings, this vent

should be located on each site of the casing pipe; however, only one was found in the field.



Figure 3 – Site 2 Aerial, near Abbey Road

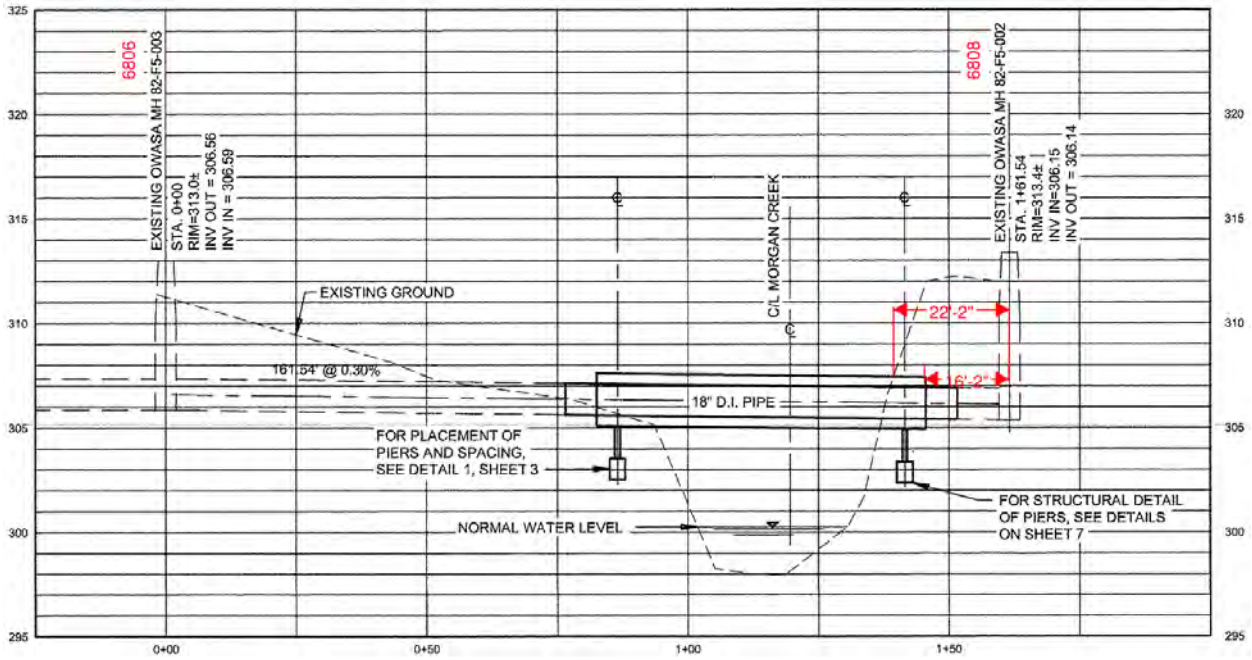


Figure 4 – Profile of Site 2 aerial from record drawings OSA-M07, dated March 2005 for "Sewer Crossing Repair (off Abbey Lane)"



Figure 5 – Site 2, two-inch galvanized vent

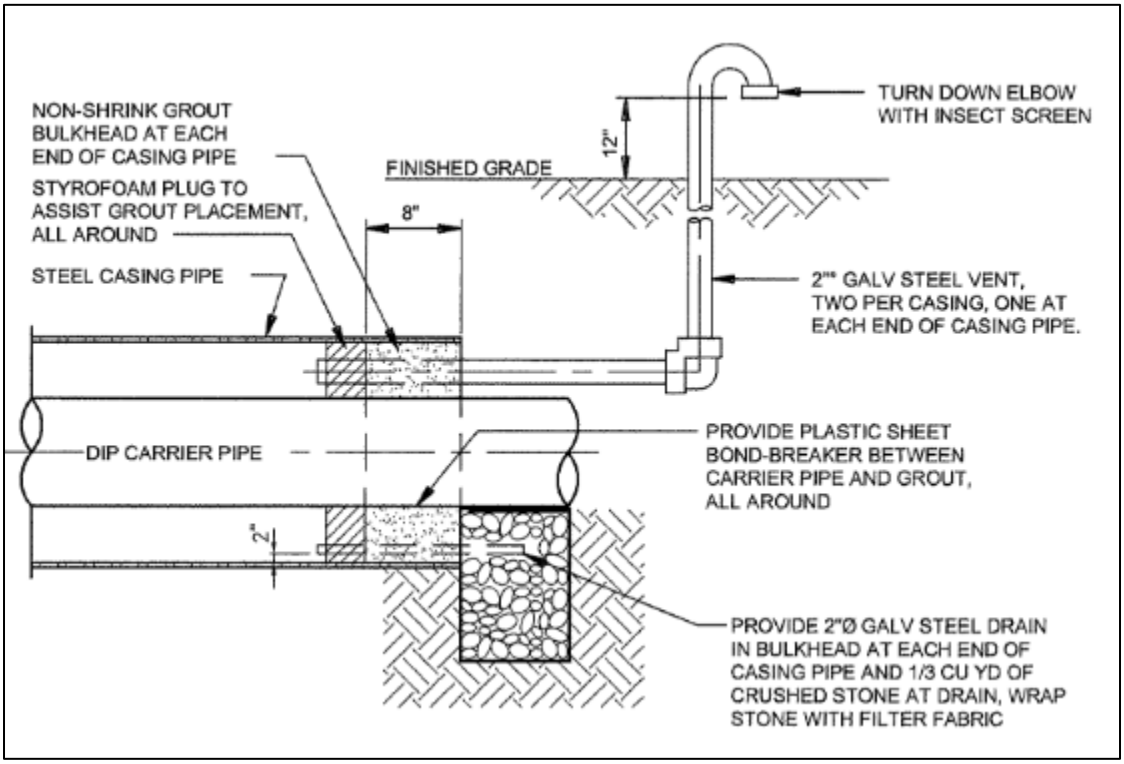


Figure 6 – Detail of two-inch galvanized vent from Site 2 record drawings

The visual inspection did not result in evidence of existing and significant erosion problems around this aerial pipeline. The banks of the stream bank were well vegetated. The shortest distance between the aerial pipeline and the closest

manhole (SSMH 6808) was 16′-2″. Record drawings indicate the distance from SSMH 6808 to the exposed aerial is 22′-2″. As stated in Section 2 above, the difference in these two measurements may not be an accurate depiction of historical erosion (see Section 2 for additional information).

The upstream and downstream manholes of Site 2 were found to be in sound condition with no visible defects of the cone, bench or channel and good wall condition. A summary of the manhole inspection results can be found in the table below.

Table 6 - Site 2 Manhole Inspection Results Summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
2	6806	Upstream	Corroded, slight	No defects	No defects	Debris, no defects	No Defects	Good
	6808	Downstream	Corroded, heavy	No defects	No defects	No Defects	No Defects	Good

The CCTV provided by OWASA indicated a single and minor offset joint which resulted in a "Fair" condition category.

It is recommended that OWASA find the other casing vent to confirm water is not flowing into the casing. Additionally, OWASA should continue with 6-month inspections and include CCTV as part of these recurring inspections to identify deterioration since UT testing is not feasible for this site.

3.2.2. Site 3, Pipe ID 954 – 12-inch CI/DI – near Tar Hill Dr

Site 3, near Tar Hill Dr, was assumed to be a 12-inch ductile iron pipeline. A visual inspection, manhole inspection, pier inspection, and UT testing were performed for this site. After UT testing it was determined that part of the pipeline is cast iron.



Figure 7 – Site 3 aerial pipeline, near Tar Hill Drive

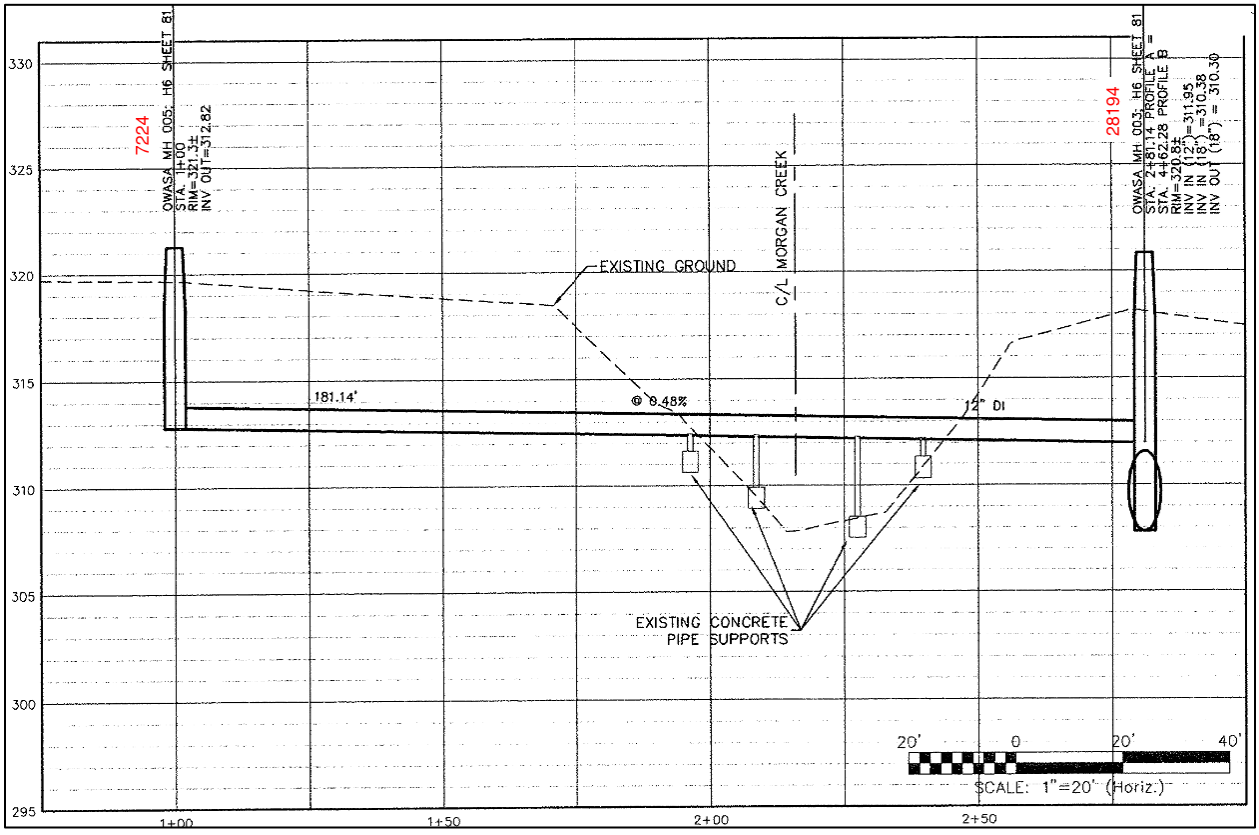


Figure 8 – Profile of Site 3 aerial from record drawings SMC-S46, dated October 2003 for "Morgan Creek Interceptor Sewer – Phase II"

The visual inspection showed that there is evidence of extensive erosion of the stream banks and widening of the stream. Concrete has been poured along the banks of the stream around the pipeline, most likely in order to prevent failure of

the pipeline due to erosion. There was also significant debris observed in the stream, caught against the piers. The pipeline appears to have been recently repaired at the joint with a mechanical restraint, as shown in the figure below.



Figure 9 - Pipeline restraint on the aerial pipeline at Site 3

After analysis of the UT test results for one segment of this line came back unrealistically thick. After further examination and discussion with OWASA personnel it appears that the segment of pipe from the upstream manhole (7224) to approximately 117-feet from the upstream manhole is cast iron and the remaining portion leading to the downstream manhole (28194) is ductile iron.

Average UT results for the ductile iron portion of the Site 3 pipeline can be found in the table below. In the table provided, it can be noted some circumferential locations could not be tested due to obstructions in the field (i.e., debris, vegetation, etc.). Based on the UT readings, it is assumed the ductile iron pipe segment is Class 55 with an original wall thickness of 0.50 inches. Under these assumptions, there is significant deterioration in the ductile iron portion of this aerial site 127 to 132-feet from the upstream manhole (7224). Deterioration is not concentrated at a particular circumferential spot; it is evident around the entire circumference. The most significant deterioration of the ductile iron pipe segment is 0.126 inches located near the top of the pipe, 132-feet from the upstream manhole (7224). It is not clear why this pattern of deterioration has emerged.

Table 7 - Site 3 UT Results Summary

	Footage from Upstream Manhole										
Degree	87	92	97	102	107	112	117	122	127	132	137
0	No results due to differing pipe material; assumed to be cast iron.							0.439	0.391	0.404	0.442
45								0.436	0.398	0.381	0.431
90								0.437	0.405	0.384	0.426
135								0.427	0.392	0.392	0.433
180								N/A	0.375	0.383	0.423
225								N/A	0.388	0.379	0.454
270								0.426	0.413	0.374	0.460
315								0.432	0.410	0.398	0.447

The upstream manhole of Site 3 (MH 7224) was found to have slight corrosion visible of the bench. The cone, channel and wall were in sound condition. The chimney of the upstream manhole has an outside cementitious coating that has deteriorated, as shown in Figure 10.



Figure 10 - Deteriorating Cementitious Coating on MH's Exterior

The downstream manhole (MH 28194) was found to be sound condition. A summary of the manhole inspection results can be found in the table below.

Table 8 - Site 3 Manhole Inspection Results Summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
3	7224	Upstream	Corroded, slight	Ring: Corroded, slight Chimney: cracked	No defects	Debris	No Defects	Good
	28194	Downstream	Corroded, slight	Ring: corroded, heavy Chimney: no defects	No defects	Corroded, Slight	No Defects	Good

The Site 3 aerial crossing consisted of (4) pier support assemblies linearly aligned across Morgan Creek in the north/south direction with pier "P1" at the north bank, pier "P4" at the south bank and the "P2" and "P3" piers in stream. Regarding the pier conditions observed in general note the following:

- Concrete piers had either a smooth or rough formed finish.
- Piers were rectangular shaped assemblies approximately 1'-1" wide x 2'-0" long at the top of pier with the short east and west sides tapered to the base.
- Top of pier was approximately 3'-3" above the water.
- Piers exhibited concrete surface defects primarily in the form of minor surface voids.
- Piers were not plumb.
- Pipe was anchored to the top of each concrete pier with (2) steel reinforcing bars. Each bar was embedded in the pier and bent around the crown of the pipe where it spliced to the side with the opposite side bar and welded together.
- Reinforcing bars and welds appeared to be in good condition.

Regarding the individual piers note the following:

- Pier P1:
    - Exposed aggregate and chipped grout at the top of the pier.
    - Surface flaking of concrete on the south side of the pier.
    - Pier vertically out of plumb approximately 1" to the south.
- Pier P2:
    - Exposed aggregate, chipped grout, section loss and cracks at the top of the pier.
    - Exposed vertical reinforcing bar observed at the top of the pier.
    - Surface flaking of concrete on all sides of the pier.

    - Pier vertically out of plumb approximately 1.25" to the north.
    - Scour and concrete surface wear at the base were observed on all sides of the pier.
    - Surface concrete at the base was soft and punky at the south side of the pier.
    - Debris and trash were observed around the pier.
- Pier P3:
    - Exposed aggregate, chipped grout, section loss and cracks at the top of the pier.
    - Exposed vertical reinforcing bar observed at the top of the pier.
    - Surface flaking of concrete on all sides of the pier.
    - Pier vertically out of plumb approximately 1.5" to the south.
    - Scour and concrete surface wear at the base were observed on all sides of the pier.
    - Minor amount of debris was observed at the west side of the pier.
- Pier P4:
    - Section loss and honeycombing at the top of the pier.
    - Pier vertically out of plumb approximately 2.75" to the south.
    - Vegetation and poison ivy growing around the pipe and the top of the pier.

M&C's review of the CCTV did not indicate additional defects, and resulted in a "Good" condition category.

Due to evidence of erosion, identification of a joint repair, identified deterioration of piers and proximity to Site 17, it is recommended this crossing be replaced from MH to MH in conjunction with Site 17. Record drawings indicate a water line between this site and Site 17 which may need to be relocated as part of the project.

3.2.3. Site 4, Pipe ID 974 – 18-inch DI – Near Weatherhill Pt

Site 4, located between two residential developments (Weatherhill Pt and River Creek Pl), is an 18-inch ductile iron pipeline. A visual inspection, manhole inspection, pier inspection, and UT testing were performed for this site.



Figure 11 – Site 4 aerial pipeline, near Weatherhill Pt

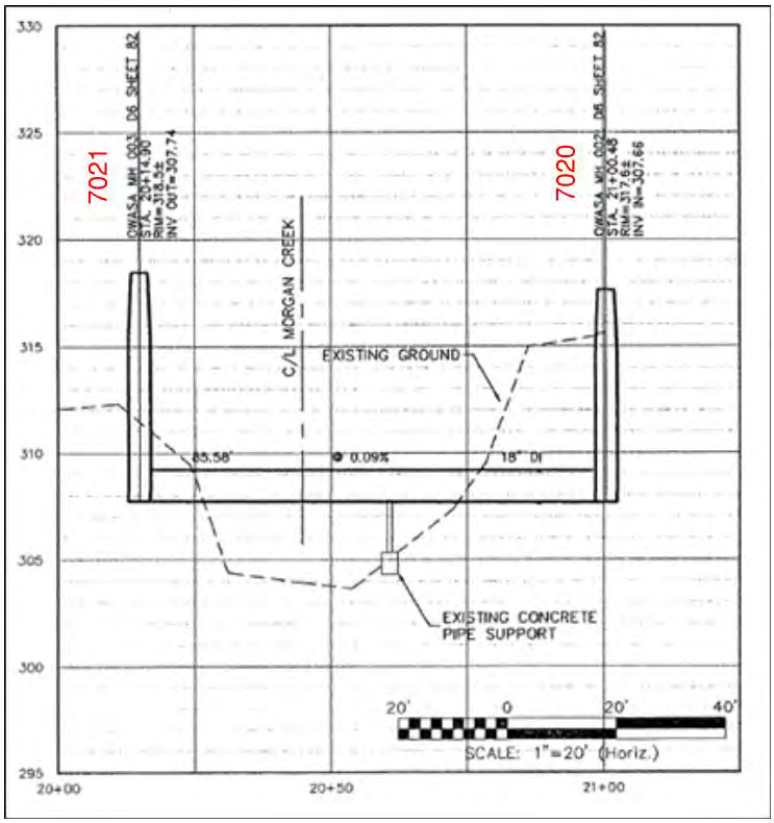


Figure 12 – Profile of Site 4 aerial

As shown in the profile above, there is not a significant amount of distance between the upstream manhole and the point at which the pipeline becomes aerial. Therefore, significant erosion of the stream in this location could become detrimental to the upstream manhole. Both evidence of erosion and significant debris was found on the pipeline during visual inspections on the site, as shown in Figure 13. This debris is large and above the pipeline, showing that the pipeline was most likely submerged in the recent past to lift this debris into its current location.



Figure 13 – Debris on the Site 4 aerial pipeline, near the downstream manhole

Average UT results can be found in the table below. In the table provided, it can be noted some circumferential locations could not be tested due to obstructions from in the field (i.e., debris, stream, vegetation, etc.). The wall thickness at Site 4 is most consistent with Class 55 with an original wall thickness of 0.50 inches. Significant deterioration is evident at the top of the pipe along the entirety of the aerial crossing with a maximum deterioration of 0.395 inches with a remaining wall thickness of 0.105 inches. There is also a point of concern at the invert of the pipe, 8-feet from the upstream manhole (7021) with a deterioration of 0.358 inches and remaining wall thickness of 0.142 inches.

Table 9 – Site 4 UT Results Summary

	Footage from Upstream Manhole								
Degree	8	13	18	23	28	33	38	43	48
0	0.138	0.105	0.141	0.141	N/A	0.116	0.138	0.301	0.324
45	0.392	0.218	0.352	0.372	0.402	0.151	0.430	0.323	0.383
90	0.461	0.279	0.354	0.350	0.378	N/A	N/A	0.309	0.368
135	0.388	0.358	0.351	0.350	0.389	N/A	0.426	0.293	0.362
180	0.142	0.386	0.328	0.373	0.390	N/A	N/A	N/A	0.378
225	0.407	0.352	0.328	0.350	0.385	N/A	0.473	0.273	0.355
270	0.378	0.376	0.364	0.396	0.412	0.402	0.407	0.200	0.341
315	0.410	N/A	0.400	0.360	0.147	0.157	0.159	0.365	0.410

The downstream manhole of Site 4 (MH 7020) was found to have deteriorated wall condition and slight corrosion visible of the bench. The cone and channel were in sound condition with no visible defects. The upstream manhole (MH 7021) was found to be in sound condition with no visible defects. A summary of the manhole inspection results can be found in the table below.

Table 10 – Site 4 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
4	7021	Upstream	Cover: Corroded, heavy Frame: Corroded, slight	Ring: Corroded, slight Chimney: corroded, slight	No Defects	No Defects	No Defects	Good
	7020	Downstream	Cover: Corroded, heavy Frame: Corroded, heavy	Ring: Corroded, slight Chimney: Corroded, slight	No Defects	Corroded, Slight	No Defects	Poor

The Site 4 aerial crossing consisted of (1) pier support assembly supporting the pipe spanning Morgan Creek in the east/west direction with pier "P1" in stream but closer to the east bank. Regarding the pier conditions observed note the following:

- Concrete pier had a rough formed finish.
- Pier was a rectangular shaped assembly approximately 1'-0" wide x 2'-8" long.
- Top of pier was approximately 4'-1" above the water.

- The pier was not plumb and leaning approximately 3″ to the south and 0.75″ to the east.
- Scour and concrete surface wear at the base above the waterline were observed on all sides of the pier.
- Pipe was anchored to the top of the concrete pier with a 2″ wide steel strap over the crown of the pipe and anchored to the pier each side of the pipe with a ¾″ diameter steel anchor bolt. The strap and anchor bolts appeared to be in good condition.
- Debris was observed at the east and south sides of the pier.

The CCTV review did not indicate additional defects of note, and resulted in a "Good" condition category.

Due to the UT testing results indicating significant deterioration, identified debris along the pipeline, poor pier condition, observed MH defects, and proximity of the upstream MH to the bank, it is recommended that this site be replaced from MH to MH. During replacement, OWASA should consider relocating the upstream MH further from the stream bank.

3.2.4. Site 5, Pipe ID 1791– 24-inch CIPP-CI – near S Columbia St

Site 5, located near S. Columbia St, is a 24-inch cast iron pipeline lined with CIPP. Since the pipeline has already been lined, a UT inspection was not useful. Therefore, a visual inspection, manhole inspection, and pier inspection were performed for this site.



Figure 14 – Site 5 aerial pipeline, near S Columbia St

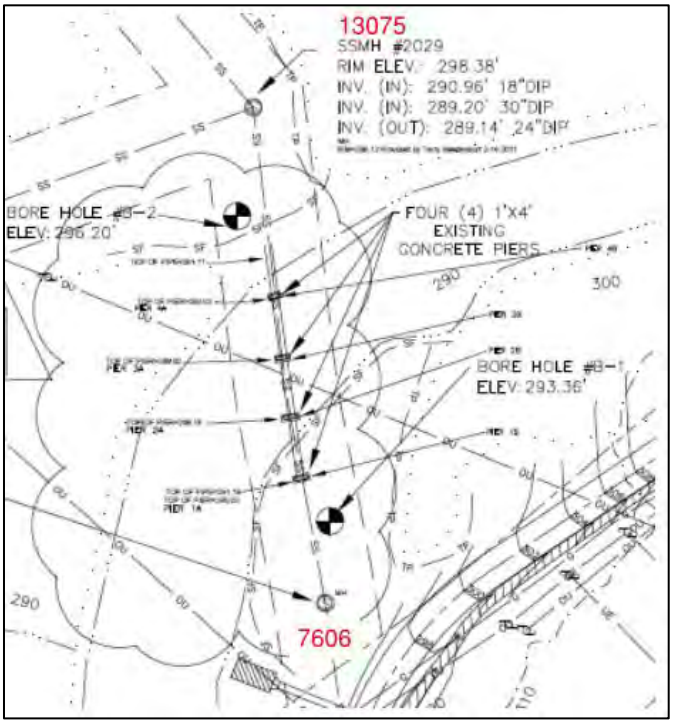


Figure 15 – Plan of Site 5 aerial

Visual inspection found that some erosion is evident at the upstream manhole (MH 13075) and under the pipeline, as well as a repair clamp from a previous

repair, as shown in Figure 16. The pipeline is mechanically restrained at a few of its joints. As seen in
Figure *14*, there is evident deflection in the pipe. However, there is at least 30 feet between the manhole rim and the first exposed part of the aerial pipeline, so the manholes are not in impending danger of failure.



Figure 16 – Erosion under upstream site of aerial pipeline at Site 5, and repair clamp



Figure 17 – Mechanically restrained joint on Site 5 aerial pipeline

The downstream manhole (MH 7606) of Site 5 was found to have slight corrosion of the cone, bench, and channel with fair wall condition. The upstream manhole (MH 13075) was found to have slight corrosion of the bench; however, the cone, channel, and wall were in sound condition with no visible defects. A summary of the manhole inspection results can be found in the table below.

Table 11 – Site 5 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
5	13075	Upstream	Cover: no defects Frame: Corroded, heavy	Ring: Corroded, heavy Chimney: Corroded, slight	No Defects	Corroded, Slight	No Defects	Good
	7606	Downstream	Cover: Corroded, heavy Frame: Corroded, heavy	Ring: Corroded, slight Chimney: Cracked, Corroded, slight	Corroded, Slight	Corroded, Slight	Corroded, Slight	Fair

The Site 5 aerial crossing consisted of (3) pier support assemblies linearly aligned across Morgan Creek in the north/south direction with pier "P1", "P2" and "P3" in stream. Pier "P1" was closest to the north bank and pier "P3" closest to the south bank. Regarding the pier conditions observed in general note the following:

- Concrete piers had a rough formed finish.

- Piers were rectangular shaped assemblies approximately 1′-1″ wide x 4′-1″ long and chamfered along the vertical edges at the corners.
- Top of piers were approximately 2′-7″ above the water.
- Piers exhibited concrete surface defects primarily in the form of minor surface voids on all sides of the pier and section loss at the tops of piers.
- Piers appeared to be plumb.
- Scour and concrete surface wear at the base above the waterline were observed on all sides of the piers.
- Pipes were anchored to each concrete pier with (2) separate metal strap and anchor bolt assemblies.
    - The first with a 2″ wide steel strap over the crown of the pipe and anchored to the top of pier each side of the pipe with a ¾″ diameter steel anchor bolt. Except as noted the strap and anchor bolts appeared to be in good condition.
    - The second with an approximate 3″ wide galvanized steel strap over the crown of the pipe and anchored to a long side of the pier each side of the pipe with a (2) ¾″ diameter galvanized steel anchor bolts. The straps and anchor bolts appeared to be in good condition.

Regarding the individual piers note the following:

- Pier P1:
    - Minor section loss was observed at the top of the pier at the southeast corner and side adjacent to the pipe.
- Pier P2:
    - Minor section loss was observed at the top of the pier at the west end of the pier.
    - Gaps between the bottom of the straps and the top surface of the concrete pier were observed.
    - Debris and trash were observed at the south and west sides of the pier.
- Pier P3:
    - Minor section loss was observed at the top of the pier at the east and west ends of the pier.
    - Gap between the bottom of the strap and the top surface of the concrete pier were observed at the east end of the pier.

- The bottom of the strap is not connected to the anchor bolt extension at the top surface of the concrete pier at the west end of the pier.
- Minor amount of debris was observed at the north and west side of the pier.



Figure 18 – Site 5 strap, no longer connected to the pier

M&C's CCTV review did not observe additional defects, and resulted in a "Good" condition category.

It is recommended to repair all pipe to pier straps and patch the noted concrete pier defects. Additionally, it is recommended that OWASA replace this site from MH to MH due to the offset joints, noted erosion, and pier defects. OWASA should review MH condition during the 6-month inspections. If MH's continue to degrade, the MH's may need to be rehabilitated prior to the replacement project.

3.2.5. Site 6, Pipe ID 1850 – 8-inch DI – near Mallard Ct

Site 6, located near Mallard Ct, is an 8-inch ductile iron pipeline with horizontal supports running along the pipe. A visual inspection, manhole inspection, and UT testing were completed for this site. A pier inspection was planned, but not performed since there are no piers to inspect.



Figure 19 – Site 6 aerial pipeline, near Mallard Ct

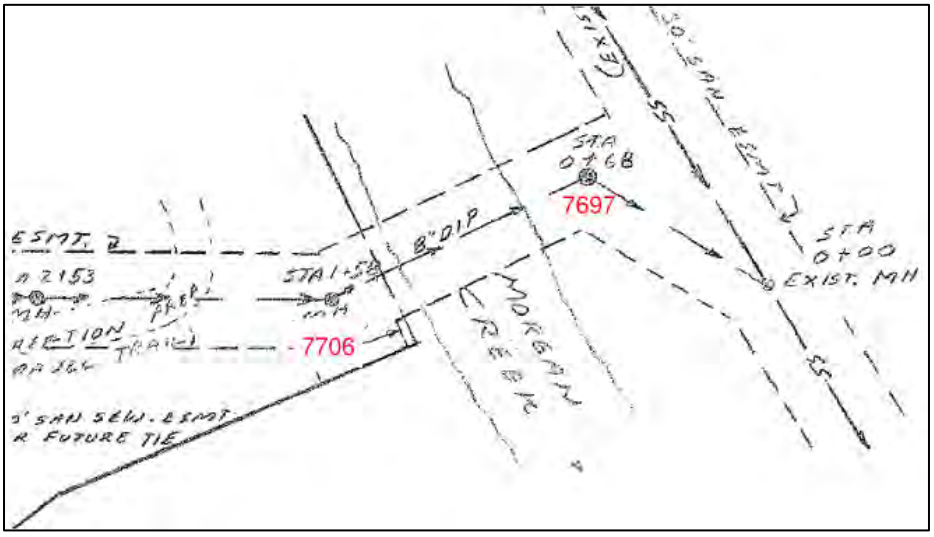


Figure 20 – Plan view of Site 6 aerial

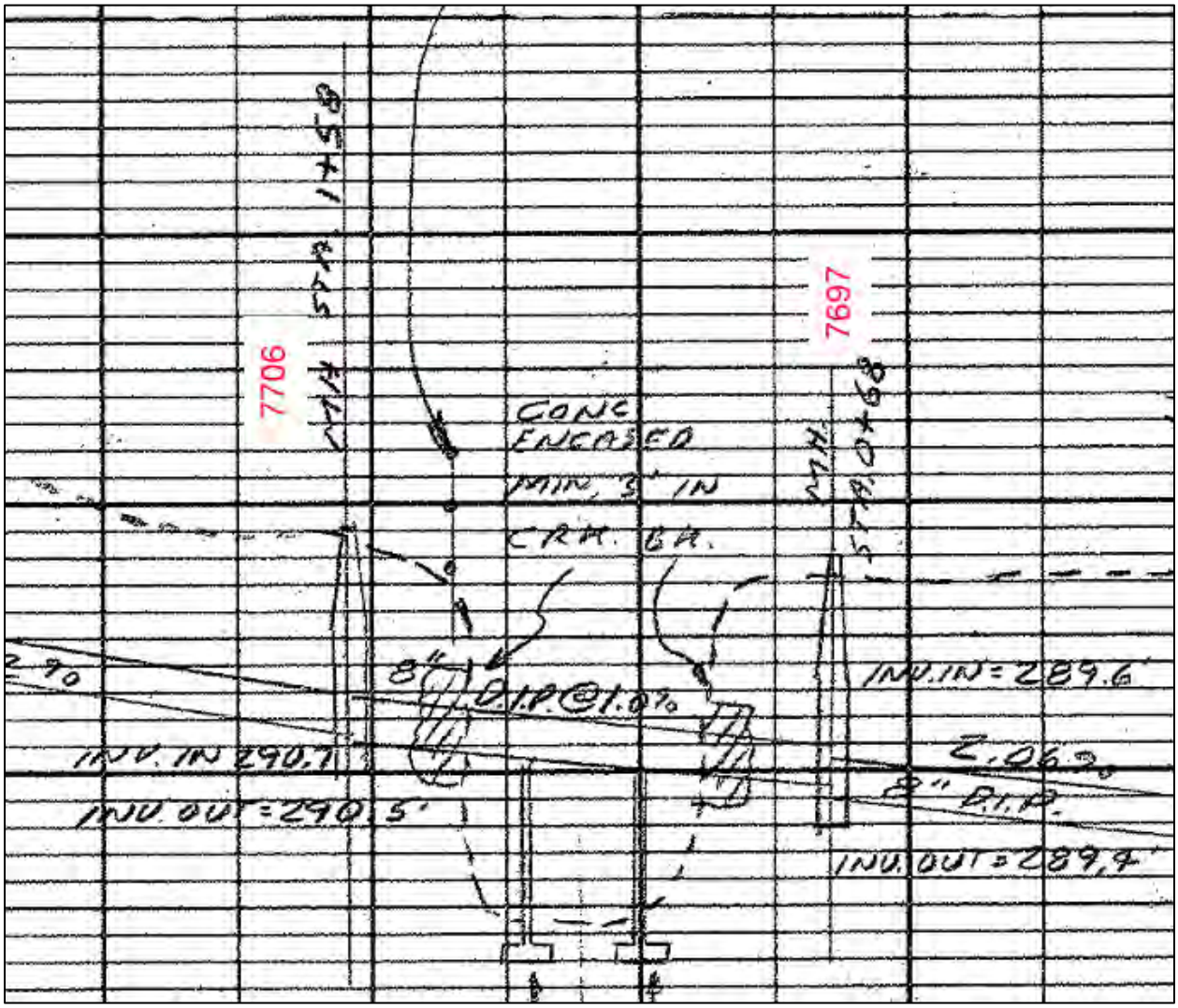


Figure 21 – Profile of Site 6 aerial

The upstream side of the pipeline is encased in poured, molded concrete. Erosion is evident around the concrete padding located at the downstream manhole (MH 7697), shown in the figure below.



Figure 22 – Bank erosion at upstream manhole (MH 7697)

Average UT results can be found in the table below. The wall thickness at Site 6 appears to be Class 53 with an original wall thickness of 0.36 inches. Moderate deterioration is evident along the entire length and circumference of the aerial crossing. The maximum deterioration is 0.125 inches with a remaining wall thickness of 0.235 inches at 19-feet from the upstream manhole (7706) located at the invert of the pipe.

Table 12 – Site 6 UT results summary

	Footage from Upstream Manhole							
Degree	14	19	24	29	34	39	44	49
0	0.256	0.253	0.349	0.268	0.263	0.280	0.290	0.258
45	0.262	0.244	0.331	0.276	0.258	0.270	0.301	0.270
90	0.267	0.250	0.332	0.279	0.268	0.277	0.303	0.258
135	0.264	0.257	0.275	0.278	0.256	0.281	0.259	0.268
180	0.260	0.235	0.294	0.255	0.260	0.273	0.267	0.262
225	0.263	0.259	0.283	0.262	0.252	0.252	0.252	0.253
270	0.264	0.256	0.344	0.258	0.277	0.284	0.288	0.250
315	0.260	0.254	0.331	0.262	0.271	0.282	0.278	0.256

A summary of the manhole inspection results can be found in the table below.

Table 13 – Site 6 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
6	7706	Upstream	Cover: no defects Frame: Corroded, slight	Ring: Corroded, slight Chimney: no defects	No Defects	No Defects	No Defects	Good
	7697	Downstream	Cover: no defects Frame: Corroded, slight	Ring: Corroded, slight Chimney: no defects	No Defects	Debris	No Defects	Good

The Site 6 aerial crossing consisted of (2) wide flange steel beams supporting the pipe and spanning across Morgan Creek in the north/south direction. No bank supported piers or intermediate midstream piers were observed. The wide flanges were embedded in a formed concrete assembly at the south bank. An unformed mass concrete pour was observed at the north bank. Record drawings indicate concrete was poured in the banks. It is not clear whether the observed concrete on the bank is from the original installation or was poured due to erosion at the site.

M&C's CCTV review did not observe additional defects, and resulted in a "Good" condition category.

Due to the proximity of the downstream MH to the creek, erosion near the downstream MH and around the concrete mass, and deterioration of the pipe, it is recommended to replace this segment from MH to MH and relocating the downstream MH further from the bank. Until this segment can be replaced, it is recommended OWASA increase inspection frequency to at least monthly, and after each major rain event of 1-year storm or more.

3.2.6. Site 7, Pipe ID 1981– 24-inch CIPP-CI – near Ashe Pl

Site 7, located near Ashe Pl, is a 24-inch CIPP lined cast iron pipeline. A visual inspection, manhole inspection, and pier inspection were performed for this site. No ultrasonic thickness testing was conducted at this site due to being previously lined.



Figure 23 – Site 7 aerial pipeline, near Ashe Pl

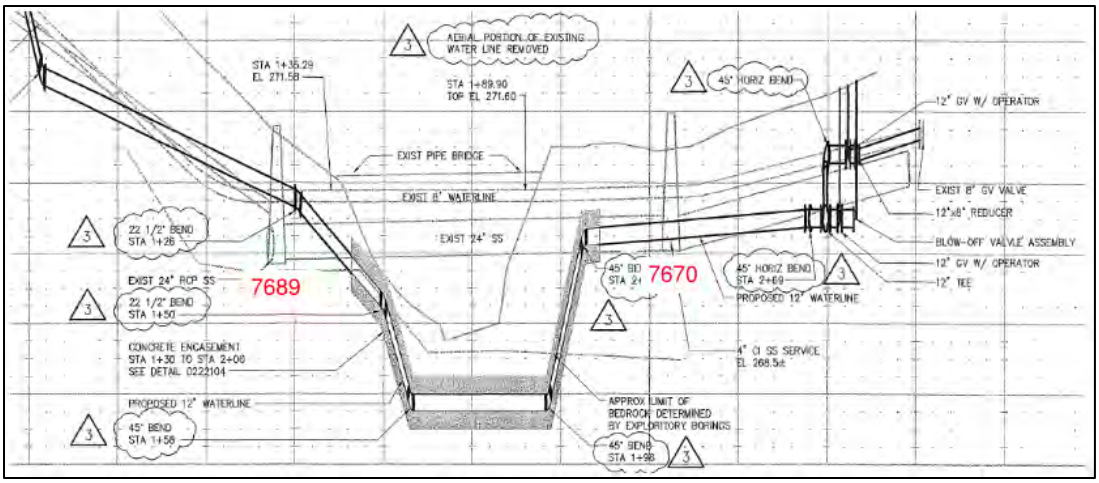


Figure 24 – Profile of Site 7 aerial

Minor deflection of the aerial pipe was visible during inspection, visible in Figure 23. A repair clamp was also noted on the pipe, indicating a previous pipe failure; the clamp is shown in the figure below.



Figure 25 – Repair clamp at Site 7

The upstream manhole (MH 7670) of Site 7 was found to have slight corrosion of the cone with poor wall condition. The bench and channel of the upstream manhole had no visible defects. The downstream manhole (MH 7689) was in sound condition with no visible defects. A summary of the manhole inspection results can be found in the table below.

Table 14 – Site 7 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
7	7670	Upstream	Cover: Corroded, heavy Frame: Corroded, slight	Ring: Corroded, slight Chimney: Corroded, slight	Corroded, Slight	Cracked, Corroded, Slight	No Defects	Poor
	7689	Downstream	Cover: Corroded, heavy Frame: Corroded, heavy	Ring: Corroded, slight Chimney: Corroded, slight	No Defects	No Defects	No Defects	Good

The Site 7 aerial crossing consisted of (4) pier support assemblies linearly aligned across Morgan Creek in the north/south direction with pier "P1" at the north bank,

pier "P4" at the south bank and the "P2" and "P3" piers in stream. Regarding the pier conditions observed in general note the following:

- Concrete piers had either a smooth or rough formed finish.
- Piers were rectangular shaped assemblies and approximately 1'-0" wide x 4'-2" long at the top of pier. The "P1", "P2" and "P4" piers had straight vertical faces and approximate 2" chamfered corners. However, the "P3" pier had south, east and west vertical faces that tapered to approximately 3'-6" wide x 7'-0" at the base.
- Top of pier was approximately 4'-6" above the water.
- Piers exhibited minor concrete surface defects primarily in the form of minor surface voids and linear cracks.
- Piers appeared to be plumb.
- Two separate types of pipe to pier connections were observed. Each appeared to be in adequate condition and note the following:
    - The "P1", "P2" and "P4" piers were anchored to the top of the concrete pier with a 2" wide steel strap over the crown of the pipe and anchored to the top of pier each side of the pipe with (2) ½" diameter steel anchor bolts. Strap assemblies included a steel fillet plate angled and welded between the vertical and horizontal legs of the straps.
    - The "P3" pier was anchored to the top of the concrete pier with a 5" wide steel strap over the crown of the pipe and anchored to the top of pier each side of the pipe with 1" diameter steel anchor bolts.

Regarding the individual piers note the following:

- Pier P1:
    - Minor surface voids and section loss observed at the exposed north and top of pier surfaces.
    - Debris was observed at the south side of the pier.
- Pier P2:
    - Minor surface voids were observed at the west face of the pier.
    - Linear diagonal crack was observed on the south face at the west end of the pier.
    - Linear cracks at the top surface of the west end of the pier.

    - Exposed pairs of anchor bolts embedded in the top of the pier indicated the assemblies may have once included (2) straps at the pier.
    - Debris was observed at the north side of the pier.
- Pier P3:
    - Linear crack at the south face of the pier approximately 1" to 2" below the top surface of the pier.
    - Linear crack at the north face of the pier east of the pipe propagating from and back to the pipe bearing edge.
- Pier P4:
    - Vegetation and poison ivy at the west end of the pier prevented review of the pipe to pier anchor assembly.
    - The horizontal leg of the strap assembly appeared to have sheared off and the strap was not connected to the existing anchor bolts.

Review of the OWASA provided CCTV noted deposits in the channel and debris buildup, and resulted in a "Good" condition category.

It is recommended to repair the pipe to pier strap assemblies and repair noted pier defects. Additionally, the upstream and downstream MHs should be rehabilitated. This segment will need to be replaced due to pier condition, however replacement is not deemed critical based on the information available. Additionally, it is possible that piers could be replaced without replacing the pipe, however this would require further evaluation to confirm the proposed pier replacement provides an advantageous overall cost savings to OWASA. During the 6-month inspections, the piers should be inspected for degradation and the schedule for replacing this section may change pending further pier degradation.

3.2.7. Site 8, Pipe ID 2678 – 12-inch DI – near Smith Level Rd, by Public Works Dr

Site 8, located near the Smith Level Rd bridge, by Public Works Dr, is an 8-inch ductile iron pipeline. A visual inspection, manhole inspection, pier inspection, and UT testing were performed for this site.



Figure 26 – Site 8 aerial pipeline, near Smith Level Rd

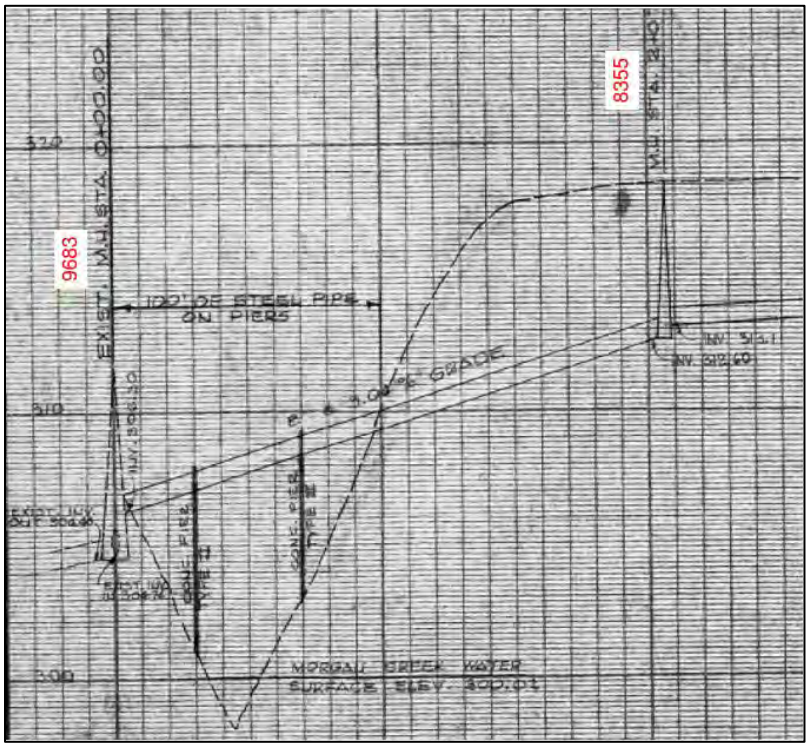


Figure 27 – Profile of Site 8 aerial

Visual inspection showed an obvious deflection in the pipeline, as well as evidence of erosion of the stream bank under the pipeline. Some concrete has been poured over the pipeline on each stream bank. Major debris was lodged against the piers during the period of visual inspection, as shown in the figure belowFigure 28.



Figure 28 – Debris lodged against the piers at Site 8

Average UT results can be found in the table below. The wall thickness at Site 8 appears to be Class 54 with an original wall thickness of 0.39 inches. Moderate deterioration is evident along the entire length and circumference of the aerial crossing. The maximum deterioration is 0.169 inches with a remaining wall thickness of 0.221 inches approximately 126-feet from the upstream manhole (8355) at 45 degrees circumferentially.

Table 15 – Site 8 UT results summary

	Footage from Upstream Manhole								
Degree	106	111	116	121	126	131	136	141	146
0	0.297	0.285	0.344	0.305	0.301	0.271	0.332	0.294	0.262
45	0.300	0.283	0.332	0.266	0.221	0.268	0.282	0.277	0.261
90	0.282	0.244	0.312	0.282	0.242	0.281	0.341	0.290	0.256
135	0.290	0.277	0.349	0.323	0.301	0.311	0.362	0.339	0.280
180	0.339	0.276	0.336	0.309	0.286	0.324	0.377	0.307	0.283
225	0.343	0.328	0.313	0.343	0.309	0.288	0.370	0.317	0.316
270	0.271	0.278	0.287	0.292	0.279	0.264	0.335	0.293	0.277
315	0.295	0.279	0.341	0.290	0.272	0.258	0.329	0.280	0.275

The upstream manhole (MH 8355) of Site 8 shown evidence of slight corrosion of the bench with fair wall condition. The cone and channel had no visible defects. The downstream manhole (MH 9683) was in sound condition with no visible defects. A summary of the manhole inspection results can be found in the table below.

Table 16 – Site 8 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
8	8355	Upstream	Cover: Corroded, slight Frame: Corroded, heavy	*No grade rings or other chimney material present	No Defects	Corroded, Slight	No Defects	Fair
	9683	Downstream	Cover: Corroded, slight Frame: Corroded, heavy	Ring: Corroded, slight *No chimney material present	No Defects	No Defects	No Defects	Good

The Site 8 aerial crossing consisted of (2) pier support assemblies linearly aligned across Morgan Creek in the east/west direction with both piers in stream and pier "P1" closest to the east bank and pier "P2" closest to the west bank. Regarding the pier conditions observed in general note the following:

- Concrete piers had a smooth formed finish.
- Piers were rectangular shaped assemblies approximately 0'-10 ½" wide x 2'-6" long at the top of pier with the short east and west sides tapered to the base and chamfered along the vertical edges at the corners.
- Top of piers were approximately 5'-4" above the water.
- Piers exhibited concrete surface defects primarily in the form of minor surface voids on all sides of the pier and linear cracks at specific locations.
- Piers appeared to be plumb.
- Scour and concrete surface wear at the base above the waterline were observed on all sides of the piers.
- Pipe was anchored to the top of the concrete piers with a 3" wide stainless steel strap over the crown of the pipe and anchored to the pier each side of the pipe with a ¾" diameter stainless steel anchor bolt. The strap and anchor bolts appeared to be in good condition.

Regarding the individual piers note the following:

- Pier P1:
    - Gap between the bottom of the strap and the top surface of the concrete pier was observed at the south end of the pier.
- Pier P2:
    - Linear crack at the west face of the pier below the pipe propagating diagonally down and away from the pipe bearing edge to and across the south face. Calcification staining was observed from the crack at the south face of the pier.
    - Linear crack at the south face of the pier below and following the profile of the pipe bearing edge, approximately 1" from the edge and propagating along the top surface of the pier.
    - Gaps between the bottom of the strap and the top surface of the concrete pier on each side of the pipe were observed.

CCTV of this site was not provided for review.

Due to the deterioration of the pipe wall, offset joint, and noted pier defects, this site should be lined with CIPP, and the piers should be rehabilitated. Due to the noted deterioration, if installation of CIPP liner is delayed, OWASA should install a repair clamp at 126 feet from the upstream MH. During the 6-month inspections, OWASA should review the pier condition and offset joint for further degradation. If offset joint further degrades, this section may require replacing in lieu of installing CIPP.

3.2.8. Site 10, Pipe ID 10325 – 30-inch DI w/ Steel Casing – near Morgan Creek trailhead

Site 10, located near the Morgan Creek Trail trailhead parking lot, is a 30-inch ductile iron pipeline with a steel casing and no piers. A visual inspection and manhole inspection were performed for this site. Due to the steel encasement, UT testing was not performed for this site.



Figure 29 – Site 10 aerial pipeline, near Morgan Creek Trail trailhead parking lot

M&C was provided with record drawings from 1979 for this crossing. Those record drawings indicate an 18-inch sewer indicating this crossing was replaced after it was initially installed. Since topographic survey was not completed as part of these services a profile cannot be drafted and therefore is excluded from this report.

The visual inspection did not show particularly concerning evidence of erosion and the bank is heavily armored with rip-rap in this location.

A summary of the manhole inspection results can be found in the table below.

Table 17 – Site 10 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
10	9666	Upstream	Cover: No defects Frame: Corroded, heavy	*No ring or chimney material present	No Defects	No Defects	No Defects	Good
	13086	Downstream	No defects	Ring: Corroded, heavy Chimney: Corroded, slight	No Defects	No Defects	No Defects	Good

A review of the CCTV found minor joint issues with the seal showing and resulted in a "Fair" condition category.

Based upon the age of the sewer and deterioration of similarly aged sewers on this project, and CCTV review identified seals showing, it is recommended this site be CIPP-lined, and the MH's rehabilitated.

3.2.9. Site 11, Pipe ID 1950 – 24-inch DI – near Gray Bluff Trail

Site 11, located near Gray Bluff Trail, has a 24-inch ductile iron pipeline with four concrete piers. Visual inspection, UT testing, manhole inspection, and pier inspection was performed for this site.



Figure 30 – Site 11

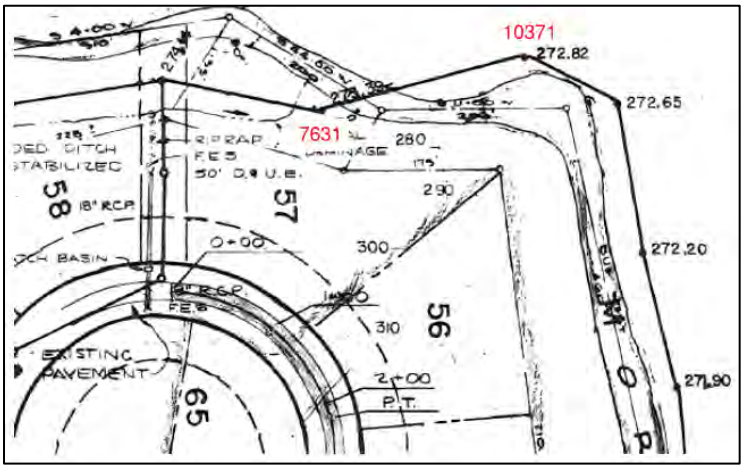


Figure 31 – Site 11 plan view

A repair clamp was noted on the aerial pipe during visual inspection, shown in the figure belowFigure 32.



Figure 32 – Repair clamp on the aerial pipe at Site 11

It was also noted during visual inspection that erosion is evident near the upstream manhole, as shown in the figure below.



Figure 33 – Site 11 erosion on the upstream bank

Average UT results can be found in the table below. In the table provided, it can be noted some circumferential locations could not be tested due to obstructions from in the field (i.e., debris, stream, vegetation, etc.). The wall thickness at Site 11 appears to be Class 55 with an original wall thickness of 0.53 inches. Moderate deterioration is evident along the entire length and circumference of the aerial crossing apart from one point of significant deterioration at the invert of the pipe, 52-feet from the upstream manhole (7631). Deterioration at the point of concern is 0.360 inches with a remaining wall thickness of 0.170 inches. Outside of the beforementioned point of concern, maximum deterioration is 0.228 inches with a remaining wall thickness of 0.302 inches.

Table 18 – Site 11 UT results summary

	Footage from Upstream Manhole												
Degree	2	7	12	17	22	27	32	37	42	47	52	57	62
0	0.432	0.425	0.460	0.392	0.345	0.395	0.439	0.418	0.366	0.393	0.387	0.376	0.356
45	0.392	0.382	0.506	0.427	0.379	0.377	0.469	0.429	0.374	0.380	0.392	0.359	0.364
90	0.406	0.394	0.478	0.457	0.388	0.410	0.470	0.466	0.430	0.401	0.346	0.382	0.385
135	0.457	0.411	0.519	0.452	0.411	0.364	0.484	0.404	0.380	0.377	0.339	0.434	N/A
180	0.452	0.444	0.522	0.358	0.408	0.335	0.457	0.442	0.416	N/A	0.170	0.302	N/A
225	0.458	0.407	0.493	0.382	0.406	0.396	0.433	0.400	0.369	0.421	0.331	0.368	N/A
270	0.449	0.425	0.518	0.428	0.383	0.374	0.463	0.447	0.386	0.412	0.359	0.341	0.338
315	0.488	0.463	0.493	0.402	0.428	0.372	0.468	0.413	0.357	0.394	0.384	0.363	0.363

The upstream manhole (MH 7631) was found to have slight corrosion of the cone and channel, heavy corrosion of the bench and poor wall condition. The downstream manhole (MH 10371) was found to have slight corrosion of the bench and fair wall condition. The cone and channel of the downstream manhole was in sound condition. A summary of the manhole inspection results can be found in the table below.

Table 19 – Site 11 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
11	7631	Upstream	Cover: Corroded, heavy Frame: Corroded, heavy	Ring: Corroded, heavy Chimney: Corroded, heavy	Corroded, Slight	Corroded, Heavy	Corroded, Slight	Poor
	10371	Downstream	Cover: Corroded, heavy Frame: Corroded, heavy	Ring: Corroded, heavy Chimney: Corroded, slight	Corroded, Slight	Corroded, Slight, cracked, roots	No Defects	Fair

The Site 11 aerial crossing consisted of (4) pier support assemblies linearly aligned across Morgan Creek in the north/south direction with all piers in stream, pier "P1" closest the south bank and pier "P4" closest to the north bank. Regarding the pier conditions observed in general note the following:

- Concrete piers had a rough formed finish.
- Piers were rectangular shaped assemblies and approximately 1'-0" wide x 4'-0" long at the top of pier, had straight vertical faces and approximate 2" chamfered corners.
- Top of pier was approximately 2'-7" above the water.
- Piers exhibited minor concrete surface defects primarily in the form of minor surface voids on all sides of pier.
- Piers appeared to be plumb.
- Scour and concrete surface wear at the base were observed on all sides of the piers.
- Pipe was anchored to the top of the concrete piers with a 2" wide steel strap over the crown of the pipe and anchored to the pier each side of the pipe with (2) ½" diameter steel anchor bolts. Strap assemblies included a steel fillet plate angled and welded between the vertical and horizontal legs of the straps. Each appeared to be in adequate condition.

Regarding the individual piers note the following:

- Pier P1:
    - In addition to minor surface voids a spalled section observed at the southeast corner exposing anchor bolts and reducing the bolts effective embed depth.
    - The exposed anchor bolts were bent.
- Pier P2:
    - Exposed pairs of anchor bolts embedded in the top of the pier indicated the assemblies may have once included (2) straps at the pier.
- Pier P3:
    - Exposed pairs of anchor bolts embedded in the top of the pier indicated the assemblies may have once included (2) straps at the pier.

- Pier P4:
    - Exposed section of vertical reinforcing bar was observed at the south face of the pier at the west end of the pier just above the waterline.
    - Debris was observed at the north and east side of the pier.

Review of OWASA provided CCTV identified significant deposits/encrustation but no apparent deterioration since 2013 inspection and resulted in a "Fair" condition category.

Due to identified pipe wall deterioration, an existing repair clamp indicating a prior repair, and observation of exposed reinforcing bar at one pier, corrosion at both MH's, ideally, the MHs will be relocated further from the stream and the segment replaced from MH to MH. However, focus should be establishing integrity of the existing crossing which can be accomplished via installation of CIPP liner, restoring the stream banks and repair the pier defects. Relocating the MHs can be delayed until erosion becomes a clearer issue. Until a replacement can be completed, it is recommended to install a repair clamp at 52 feet from the upstream MH, and repairing pipe to pier clamps.

3.2.10. Site 12, Pipe ID 14480 – 30-inch DI - between NC-54 and Culbreth Road

Site 12, located between NC-54 and Culbreth Road, has a 30-inch ductile iron pipeline with two concrete piers. Visual inspection, UT inspection, manhole inspection, and pier inspection were performed at this site.



Figure 34 – Site 12

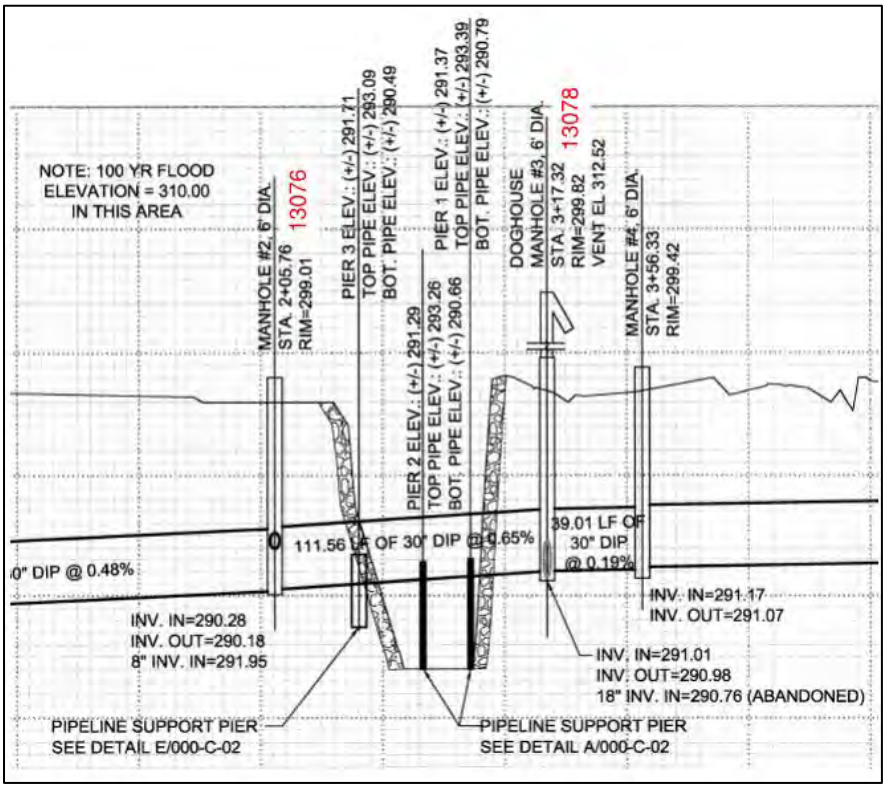


Figure 35 – Site 12 pipe profile

Average UT results can be found in the table below. In the table provided, it can be noted some circumferential locations could not be tested due to obstructions from in the field (i.e., debris, stream, vegetation, etc.). The wall thickness at Site 12 appears to be Class 52 with an original wall thickness of 0.47 inches. Moderate

deterioration is evident in the segments of pipe 31-feet to 41-feet and 51-feet to 61-feet from the upstream manhole (13078). Maximum deterioration of 0.213 inches occurs near the invert of the pipe at 61-feet from the upstream manhole (13078) with a remaining wall thickness of 0.257 inches.

Table 20 – Site 12 UT results summary

	Footage from Upstream Manhole							
Degree	26	31	36	41	46	51	56	61
0	0.448	0.400	0.389	0.348	0.430	0.366	0.382	0.396
45	0.457	0.399	0.352	0.290	0.422	0.358	0.367	0.368
90	0.441	0.370	0.358	0.335	0.362	0.343	0.333	0.320
135	0.453	0.389	0.374	0.338	0.420	0.405	0.393	0.418
180	N/A	0.410	0.380	0.341	0.428	0.393	0.416	0.395
225	N/A	0.396	0.372	0.343	0.425	0.384	0.392	0.352
270	0.446	0.382	0.371	0.348	0.382	0.289	0.310	0.257
315	0.455	0.361	0.334	0.290	0.400	0.404	0.369	0.342

The downstream manhole (MH 13076) was found to have slight corrosion of the bench and channel while the cone and wall conditions are sound with no visible defects. The upstream manhole (MH 13078) was found to be of sound condition with no visible defects. A summary of the manhole inspection results can be found in the table below.

Table 21 – Site 12 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
12	13078	Upstream	Cover: Corroded, slight Frame: Corroded, heavy	Ring: Corroded, slight Chimney: no defect	No Defects	No defects	Corroded, heavy	Good
	13076	Downstream	Cover: Corroded, slight Frame: Corroded, heavy	Ring: Corroded, heavy Chimney: no defect	No Defects	Corroded, slight, cracked	Corroded, slight	Good

The Site 12 aerial crossing consisted of (2) pier support assemblies linearly aligned across Morgan Creek in the north/south direction with all piers in stream, pier "P1" closest the south bank and pier "P2" closest to the north bank. Regarding the pier conditions observed in general note the following:

- Concrete piers had a smooth formed finish.
- Piers were rectangular shaped assemblies and approximately 2'-1" wide x 6'-11" long at the top of pier, had straight vertical faces and approximate 11" chamfered corners at the west end of the pier.
- Top of pier depth above the water was not obtained.
- Piers surfaces exhibited very few minor concrete surface defects.
- Piers appeared to be plumb.
- Pipe was anchored to the top of the concrete piers with a 4" wide stainless steel strap over the crown of the pipe and anchored to the pier each side of the pipe with ¾" diameter steel anchor bolts. Strap assemblies included a neoprene pad between the plate and pipe surfaces. Each appeared to be in good condition.

Review of CCTV identified corrosion at the top of the pipe between 1/3 to ½ the length of the segment and resulted in a "Poor" condition category.

Due to identified pipe wall deterioration, it is recommended lining this section with CIPP. While installing the CIPP, it is recommended to rehabilitate both manholes. Until the CIPP can be installed, it is recommend to install repair clamps at 41, 51, and 61 feet from the upstream MH. Due to corrosion identified at each MH, it is recommended to replace the ring and cover and rehabilitate each MH.

3.2.11. Site 13, Pipe ID 1836 – 24-inch DI – near Old Bridge Lane and Merritt's Pasture

Site 13, located near Old Bridge Lane and Merritt's Pasture, has a 24-inch ductile iron pipe with one concrete pier. Visual assessment, UT inspection, manhole inspection, and pier inspection was performed at this location.



Figure 36 – Site 13

Average UT results can be found in the table below. In the table provided, it can be noted some circumferential locations could not be tested due to obstructions from in the field (i.e., debris, stream, vegetation, etc.). The wall thickness at Site 13 appears to be Class 55 with an original wall thickness of 0.53 inches. Moderate deterioration is evident between 20-feet and 30-feet from the upstream manhole (7656). The maximum deterioration is 0.155 inches and remaining wall thickness of 0.375 inches approximately 30-feet from the upstream manhole (7656) at 45 degrees circumferentially.

Table 22 – Site 13 UT results summary

	Footage from Upstream Manhole				
Degree	15	20	25	30	35
0	0.428	0.402	0.404	0.391	0.426
45	0.439	0.395	0.399	0.375	N/A
90	0.457	0.406	0.435	0.432	N/A
135	0.520	0.399	0.413	N/A	N/A
180	0.442	0.435	0.467	N/A	N/A
225	0.483	0.379	0.428	0.450	N/A
270	0.511	0.407	0.472	0.412	0.494
315	0.429	0.392	0.472	0.381	0.403

The interior of the upstream and downstream manholes of Sites 13 were found to be in sound condition however, the exterior of the cone and chimney were

corroded on both. A summary of the manhole inspection results can be found in the table below.

Table 23 – Site 13 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
13	7656	Upstream	Cover: Corroded, slight Frame: Corroded, heavy	Ring: Corroded, heavy Chimney: Corroded, slight	No defects	No Defects	No Defects	Good
	7658	Downstream	Cover: Corroded, slight Frame: Corroded, heavy	Ring: Corroded, heavy Chimney: Corroded, slight	No defects	No Defects	No Defects	Fair

The Site 13 aerial crossing consisted of (1) pier support assembly supporting the pipe spanning Merritt's Pasture tributary creek to Morgan Creek in the east/west direction with pier "P1" in stream but closer to the west bank. Regarding the pier conditions observed note the following:

- Concrete pier had a rough formed finish.
- Pier was a rectangular shaped assembly approximately 1'-0" wide x 4'-0" long.
- Top of pier was approximately 3'-10" above the creek mud line.
- The pier appeared to be plumb.
- Pipe was anchored to the top of the concrete pier with a 2" wide steel strap over the crown of the pipe and anchored to the pier each side of the pipe with a ¾" diameter steel anchor bolt. The strap and anchor bolts appeared to be in good condition.
- Debris was observed all around the pier.

A review of the OWASA provided CCTV did not indicate additional defects, and resulted in a "Good" condition category.

Due to deteriorated wall thickness, it is recommended to line this section with CIPP. Due to corroded MH exteriors, it is recommended to replace the cone, ring and cover of both MHs, and rehabilitate each MH during CIPP installation. Due to proximity to Sites 6, 15 and 18, it may be advantageous to repair at the same time.

3.2.12. Site 15, Pipe ID 1860– 24-inch CIPP-CI – near Azalea Drive

Site 15, located near Azalea Drive, has a 24-inch CI pipeline. Due to the pipe being CI, ultrasonic thickness testing was not conducted at this site. Additionally, GIS indicates this pipe has CIPP liner (although that is not evident in the OWASA-provided CCTV). This site has six concrete piers. Visual inspection, manhole inspection, and pier inspection were performed at this site.



Figure 37 – Site 15

During visual inspection, a repair clamp was noted 91-feet from the upstream manhole, shown in Figure 38 figure below.



Figure 38 – Repair clamp at Site 15

Slight erosion was also noted in the upstream bank, shown in the figure below.



Figure 39 – Site 15 erosion in the upstream bank

A summary of the manhole inspection results can be found in the table below.

Table 24 – Site 15 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
15	7745	Upstream	Cover: Corroded, heavy Frame: Corroded, heavy	Ring: Corroded, heavy	No Defects	Corroded, slight	Corroded, slight	Good
	7770	Downstream	Cover: Corroded, heavy Frame: Corroded, heavy	Ring: Corroded, heavy Chimney: Corroded, slight	Corroded, Slight	No Defects	No Defects	Poor

The Site 15 aerial crossing consisted of (6) pier support assemblies linearly aligned across Morgan Creek in the east/west direction with pier "P1" at the west bank, pier "P6" at the east bank and the "P2", P3", "P4" and "P5" piers in stream. Regarding the pier conditions observed in general note the following:

- Concrete piers had either a smooth or rough formed finish.
- Piers were rectangular shaped assemblies and approximately 1'-0" wide x 4'-2" long at the top of pier. The piers had straight vertical faces and approximate 2" chamfered corners.
- Top of pier was approximately 2'-6" above the water.
- Piers exhibited minor concrete surface defects primarily in the form of minor surface voids on all faces, small cracks or very minor section loss at the top of pier.
- Piers were out of plumb approximately ¼" to ½" in either the east or west directions.
- The pipe was connected to the concrete piers with a 2" wide steel strap over the crown of the pipe and anchored to the top of pier each side of the pipe with ½" diameter steel anchor bolts.
- Debris was observed around the "P2" and "P5" piers.

A review of OWASA provided CCTV did not indicate additional defects and resulted in a "Good" condition category.

It is recommended to repair the noted pier defects and continue to monitor stream bank conditions. Restore stream banks, and rehabilitate MHs in conjunction with sites 6, 13, and 18 due to apparent restricted access.

3.2.13. Site 16, Pipe ID 10322 – 30-inch DI w/ Steel Casing – by Kingswood Apartments

Site 16, located by Kingswood Apartments, has a 30-inch ductile iron pipeline with a steel encasement. Due to the steel encasement, no ultrasonic thickness testing was conducted at this site. There are no piers; therefore, no pier inspections were conducted.



Figure 40 – Site 16

It was noted during visual inspection that the downstream manhole (MH 9668) may be missing a vent stack. A hole, approximately 8-inches deep is located atop of the manhole, shown in the figure belowFigure 41.



Figure 41 – Possible missing vent stack located in downstream manhole (MH 9668)

The upstream and downstream manholes of Site 16 were found to be in sound condition with no visible defects of the cone, bench or channel and good wall condition. A summary of the manhole inspection results can be found in the table below.

Table 25 – Site 16 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
16	9669	Upstream	Cover: Corroded, slight Frame: Corroded, heavy	*No adjustment rings or chimney present	No Defects	No Defects	No Defects	Good
	9668	Downstream	Cover: Corroded, slight Frame: Corroded, heavy	*No adjustment rings or chimney present	No Defects	No Defects	No Defects	Good

No pier inspections were conducted at this site.

A review of OWASA provided CCTV confirmed this segment has CIPP-liner, did not note additional defects and resulted in a "Good" condition category.

It is recommended OWASA reinstall the vent stack on SSMH 9668.

3.2.14. Site 17, Pipe ID 958 – 12-inch DI – near Chapel Hill Tennis Courts, crossing Tom's Creek

Site 17, located near the Chapel Hill Tennis Courts, has a 12-inch ductile iron pipeline crossing Tom's Creek. Visual inspection, UT testing, and manhole inspection was performed for this aerial crossing.



Figure 42 – Site 17

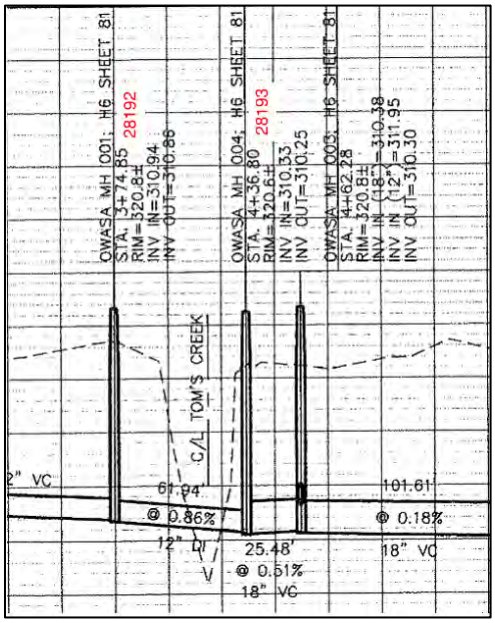


Figure 43 – Site 17 pipe profile (Comparing record drawings to field survey, it appears the aerial crossing was upsized to 18-inches since the record drawings were drafted.)

Significant bank erosion is evident at the downstream manhole (MH 28193). Erosion has left the manhole partially exposed as shown in the figure below.



Figure 44 – Bank erosion at downstream manhole (MH 28193)

Ultrasonic thickness testing was limited at Site 17 due to equipment complications. Some readings were obtained from the top of the pipe at locations in which the pipe coating was absent, and the transducer could meet bare metal. Average UT results can be found in the table below. Given the limited results, an original nominal wall thickness could not be reasonably assumed, and readings were

compared to Class 52 (best case scenario) and Class 56 (worst case scenario). Class 52 ductile iron pipe has a nominal wall thickness of 0.37 inches and Class 56 ductile iron pipe has a nominal wall thickness of 0.49 inches.

Deterioration is evident along the top of the pipe. The minimum remaining wall thickness was 0.138 inches with deterioration ranging from 0.232 inches (Class 52) to 0.352 inches (Class 56).

Table 26 – Site 17 UT results summary

	Footage from Upstream Manhole				
Degree	31	36	41	46	51
0	0.148	0.143	0.145	N/A	N/A
45	N/A	0.150	N/A	N/A	N/A
90	N/A	N/A	N/A	N/A	N/A
135	N/A	N/A	N/A	N/A	N/A
180	N/A	N/A	N/A	N/A	N/A
225	N/A	N/A	N/A	N/A	N/A
270	N/A	N/A	N/A	N/A	N/A
315	N/A	N/A	N/A	0.138	0.251

Fair wall condition was evident in the upstream manhole (MH 28192) while the cone, bench, and channel were found to be in sound condition. Slight corrosion of the bench was evident in the downstream manhole (MH 28193), the cone, channel, and wall were found to be in sound condition. A summary of the manhole inspection results can be found in the table below.

Table 27 – Site 17 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
17	28192	Upstream	Cover: Corroded, slight Frame: Corroded, slight	Ring: Corroded, slight Chimney: Corroded, slight	No Defects	No Defects	No Defects	Fair
	28193	Downstream	Cover: Corroded, slight Frame: Corroded, slight	Ring: Corroded, slight Chimney: No defect	No Defects	Corroded, Slight	No Defects	Good

A review of OWASA provided CCTV indicated corrosion at the joints and resulted in a "Fair" condition category.

Due to stream bank erosion causing the MH 28193 to be partially exposed and there appears to be no additional support for the pipe to manhole connection, observed MH corrosion, this site needs to be replaced from MH to MH with MH 28193 needing to be relocated further from the bank. Due to proximity to Site 3, consider replacing Site 3 in conjunction with this site.

3.2.15. Site 18, Pipe ID 1833 – 10-inch CI – near Merritt's Pasture, north of Site 13

Site 18, located near Merritt's Pasture, has a 10-inch pipeline with an assumed pipe material of cast iron. This site has one concrete pier. GIS data provided by OWASA identifies the pipe material of Site 18 as vitrified clay.



Figure 45 – Site 18

During visual inspection of the site, large amounts of debris were found. This debris is shown in the figure above and below. Also noted during visual inspections, both upstream and downstream banks have evident erosion, shown in one of the figures below.



Figure 46 – Debris to be cleared at Site 18



Figure 47 – Upstream bank erosion



Figure 48 – Downstream bank erosion

Ultrasonic thickness testing was conducted at Site 18; however, the readings exceeded that of standard wall thicknesses for all manufactured ductile iron pipe classes. Given these results, it was assumed that the pipe material was cast iron. The ultrasonic equipment was not calibrated to accurately read cast iron pipe; therefore, all readings taken at Site 18 were considered inconclusive and will not be discussed in this report. If it is desired, ultrasonic thickness testing on cast iron pipes can be conducted if the equipment is calibrated to a cast iron standard. The manufacturer of the equipment used during this particular condition assessment does not provide a cast iron standard.

The upstream and downstream manholes of Site 18 were found to be in sound condition with no visible defects of the cone, bench or channel and good wall condition. A summary of the manhole inspection results can be found in the table below.

Table 28 – Site 18 Manhole Inspection results summary

Site #	MH ID	US/DS	Frame, Cover	Adjustment Rings, Chimney	Cone	Bench	Channel	Wall
18	7618	Upstream	Cover: no defects Frame: Corroded, heavy	Ring: Corroded, slight Chimney: Corroded, slight	Slight deterioration	No Defects	No Defects	Good
	7624	Downstream	Cover: no defects Frame: Corroded, Slight	Ring: Corroded, slight Chimney: no defects	No Defects	No Defects	No Defects	Good

The Site 18 aerial crossing consisted of (1) pier support assembly supporting the pipe spanning Merritt's Pasture tributary creek to Morgan Creek in the north/south direction with pier "P1" appearing to be located midstream. Regarding the pier conditions observed note the following:

- Concrete pier had a smooth formed finish.
- Pier was a rectangular shaped assembly approximately 1'-0" wide x 2'-3" long.
- Top of pier was not obtained due to the debris in place.
- Piers exhibited minor concrete surface defects primarily in the form of minor surface voids on all faces.
- The pier appeared to be plumb.
- Pipe was anchored to the top of the concrete pier with a 2" wide stainless steel strap over the crown of the pipe and anchored to the pier each side of the pipe with a ¾" diameter stainless steel anchor bolt. The strap and anchor bolts appeared to be in good condition.
- Review of the base of the pier where exposed indicated the pier resting on a built-up wood base.
- Debris was observed all around the pier.



Figure 49 - Pier with Wood Base Exposed

A review of OWASA provided CCTV did not identify additional defects and resulted in a "Good" condition category.

Due to the age of the pipe, and identified bank erosion, and an exposed wood foundation for the pier, this section needs to be replaced MH to MH. Until the replacement can occur, the tree limbs and debris should be removed from the pipe. Due to proximity to Site 13, consideration should be given to replacing it in conjunction with Site 13.

4.0 Risk Modeling

For this Assessment, risk was defined as the product of the Consequence of Failure (COF) and the Likelihood of Failure (LOF). It was decided that the COF would be assigned a number value from one (1) to five (5), indicating its level from a low consequence of failure (1) to a high consequence of failure (5). It was also decided that the LOF would be assigned a number value from one (1) to five (5), indicating its level from a low likelihood of failure (1) to a high likelihood of failure (5). These two numbers would then be multiplied together to develop a system to quantify relative risk, as shown in the figure below, and demonstrated by the equation:

Risk Value = COF x LOF

Likelihood of Failure						
	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		Consequence of Failure				

Figure 50. LOF x COF Matrix

The definitions of COF and LOF are described in more detail below.

4.1. Defining Consequence of Failure (COF)

Considering each asset assessed is an aerial crossing, each asset therefore has high consequences of failure. Additional factors impact the consequence of failure include but are not limited to:

- Diameter (resulting in increased bypass pumping cost and larger volume of spilled sewer)
- Existence of piers (which may extend the construction period and cost of construction)
- Existence of casing (which may extend construction period and cost of construction).
- Challenging site access (additional time required to access the site results in additional volume of spilled sewer)
- Proximity to public (resulting in potentially larger public concern)

- Extent of recommended repair / configuration of asset (consequence will increase if structures need to be relocated, or streams need to be restored as part of the repair)
- Type of water body impacted by failure (see below regarding North Carolina Department of Environmental Quality stream classifications).

Water Quality Classifications

The portion of Morgan Creek west of Smith Level Road is classified as Water Supply V (WS-V), Nutrient Sensitive Waters (NSW). Per NC DEQ, WS-V waters are protected as water supplies which are generally upstream and draining to Class WS-IV waters and are also protected for Class C uses as well. Since all the manholes associated with the Morgan Creek aerials create a risk of leak into Morgan Creek and further collapse of the bank or the connecting aerial pipe, the manholes were also all assigned the same high COF score of 5.

The portion of Morgan Creek east of Smith Level Road is classified as Water Supply-IV (WS-IV), NSW. Per NC DEQ, WS-IV waters are used to supply water for drinking, culinary, or food processing purposes. WS-V waters are also protected for Class C uses which entails aquatic life propagation, survival and maintenance of biological integrity, wildlife, secondary contact recreation, and agriculture. The NSW classification is intended for waters needing additional nutrient management due to being subject to excessive growths of microscopic or macroscopic vegetation.

Consequence of Failure Determination

Therefore, considering the multiple factors impacting COF and variability of each site, scaling the consequence of failure between 1 and 5 may result in artificially increasing or decreasing the perceived risk and it was decided to use a COF of 5 for each asset.

4.2. Defining Likelihood of Failure (LOF)

The LOF criteria selected for the aerial pipelines were pipe condition, pipe wall thickness loss, pier condition, and relative streambank erosion level. The values of these criteria are shown in the table below. Since the primary concern of failure at these sites is the integrity of the aerial crossing, manhole LOF was not considered in the priority matrix. However, manhole condition and manhole recommendations have been provided in Sections 3.0 and 5.0, and are included in the cost of repairs summarized in Table 1.

Due to the quantity of sites evaluated, the weight for the criteria was determined to be equally distributed. However, as discussed in Section 4.2, Sites 5, 12, and 13 were considered for revised Risk Value due to site specific concerns.

Table 29 – LOF Criterial and Weighting Factors for Aerial Pipes

		LOF Score				
Criteria	**Weight**	**1**	**2**	**3**	**4**	**5**
Pipe Condition (from CCTV review)	20%	Excellent (new pipe)	Good (minor defects)	Fair (moderate defects)	Poor (significant defects)	Failure (operation impact and immediate repair is required)
Pipe Age	20%	0 to 10 years		11 to 20 years		21 and older
		If pipe was lined with CIPP, then 1 LoF unit was subtracted.				
UT Pipe Condition	20%	No pattern of deterioration	No pattern of deterioration; at least one hot spot where pipe wall <0.2" thick	Moderate deterioration (at least 20% of measurements at less than half of wall thickness)	Moderate deterioration (at least 20% of measurements at less than half of wall thickness); at least one hot spot where pipe wall <0.2" thick	Significant pattern of deterioration (at least 50% of measurements at less than half of wall thickness)
Pier Condition	20%	Defects noted were weighted and added per pier, all piers at each site were averaged, and that average value was rated from 1-5 based upon its range from min. possible value to max. possible value.				
Streambank Erosion Level	20%	No evidence of erosion		Some erosion that has been mitigated with rip rap or concrete		Signs of severe erosion with no mitigating factors or with mitigating factors failing.

4.3. Risk Results

Using the criteria noted above, the average LOF was calculated for the aerial pipelines. That LOF was then multiplied by the COF value (5) to get the Risk Value for each aerial pipeline asset, as shown in the table below. Where UT and pier inspections were not completed, those values were not considered for the average LOF.

Table 30 – Summary of Risk Scores for Aerial Pipelines

Site #	OWASA Pipe ID	UT LOF	Pier LOF	Erosion LOF	Age LOF	CCTV LOF	Average LOF	COF	Risk Value LOF x COF
2	828	NA	NA	1	3	3	2.3	5.0	11.7
3	954	1	4	3	5	2	3.0	5.0	15.0
4	974	4	3	5	3	2	3.4	5.0	17.0
5[1]	1791	NA	3	3	3	2	2.8	5.0	13.8 (11.3 adjusted value)
6	1850	1	NA	5	5	2	3.3	5.0	16.3
7	1981	NA	2	3	3	2	2.5	5.0	12.5
8	2678	1	3	2	3	n/a	2.3	5.0	11.3
10	10325	NA	NA	1	3	3	2.3	5.0	11.7
11	1950	2	2	3	5	3	3.0	5.0	15.0
12[2]	14480	1	1	1	3	4	2.0	5.0	10.0 (17.5 adjusted value)
13[2]	1836	1	1	1	5	2	2.0	5.0	10.0 (17.5 adjusted value)
15	1860	NA	2	3	3	2	2.5	5.0	12.5
16	10322	NA	NA	1	3	2	2.0	5.0	10.0
17	958	5	NA	5	3	3	4.0	5.0	20.0
18	1833	NA	1	5	5	2	3.3	5.0	16.3

[1]Site 5 has a high risk score due to age, erosion and pier condition. However, the pipe has been CIPP-lined, the MHs do not appear to be in immediate danger of the noted erosion concerns, and M&C's structural engineer does not deem these piers critical. Therefore, these repairs appear less critical and OWASA should consider the adjusted LOF scores as indicated in the above table and prioritized in Section 5.0 of this report.

[2]Sites 12 and 13 have lower risk scores since the pier and erosion LOFs are low. However, if only age and CCTV scores are considered, the Risk Values increase to 17.5 in which

case these sites are 2nd on the priority list. These recommendations are critical and OWASA should consider the adjusted LOF scores as indicated in the above table and prioritized in Section 5.0 of this report.

5.0 Recommended CIPs, Prioritizations, and Budgetary OPCC

The following table summarizes the recommendations at each site and provides a budgetary OPCC for each type of repair. Additionally, the above Risk Values were then used to create a prioritization list with highest Risk Value as the first assumed critical repair to the lowest Risk Value as the assumed least critical repair. As noted in other places of this report, this matrix cannot predict when or if a failure will occur and is to be only a tool based upon this scope of services.

Additionally, M&C considered consolidating sites into a single "project" to potentially improve efficiency and reduce budgetary requirements for multiple mobilizations.

As a general recommendation, signs should be installed on upstream and downstream ends of all aerial crossings to identify each site as an OWASA-owned sanitary sewer crossing, provide contact information for emergencies, and state using the pipe to cross the stream is prohibited. Barriers should not be installed on existing sewers due to additional structural fatigue that may result from installation or debris in heavy rain events, resulting in buildup of material. Barriers should be considered as part of newly installed crossings where structural integrity of the pipe can be considered as part of the design process.

The following tables summarize the recommendations included in Section 3.0 and detail the Risk Value and associated prioritization resulting from the LOF x COF evaluation discussed in Section 4.0.

M&C's budgetary OPCC excluded cost for removal of debris assuming this task will either be completed in conjunction with other improvements or can be completed by operations staff at overall negligible cost.

Table 31 - Summary of Recommendations and Budgetary OPCC

Site #	OWASA Pipe ID	Pipe Diameter	OWASA US MH ID	OWASA DS MH ID	Recommendations	Budgetary OPCC of "Critical Action Items"	Budgetary OPCC of "Operations / Maintenance Action Items"	Budgetary OPCC of "Other Action Items"
2	828	18 in	6806	6808	It is recommended OWASA find the other casing vent to confirm water is not flowing into the casing. Additionally, OWASA should continue with 6-month inspections and include CCTV as part of these recurring inspections to identify deterioration since UT testing is not feasible for this site	$ -	$ -	$ -
3	954	12 in	28194	7224	Due to evidence of erosion, identification of a joint repair, identified deterioration of piers and proximity to Site 17, it is recommended this crossing be replaced from MH to MH in conjunction with Site 17. Record drawings indicate a water line between this site and Site 17 which may need to be relocated as part of the project	$ 669,000	$ -	$ -
4	974	18 in	7020	7021	Due to the UT testing results indicating significant deterioration, identified debris along the pipeline, poor pier condition, observed MH defects, and proximity of the upstream MH to the bank, it is recommended that this site be replaced from MH to MH. During replacement, OWASA should consider relocating the upstream MH further from the stream bank.	$ 525,000	$ -	$ -
5	1791	24 in	13075	7606	It is recommended to repair all pipe to pier straps and patch the noted concrete pier defects. After the more critical replacements are completed, OWASA should replace this site from MH to MH to remove offset joints, and prevent the noted erosion and pier defects from becoming a concern. OWASA should review MH condition during the 6-month inspections. If MHs continue to degrade, the MH's may need to be rehabilitated prior to the replacement project	$ -	$ 7,200	$ 651,000
6	1850	8 in	7706	7697	Due to the proximity of the downstream MH to the creek, erosion near the downstream MH and around the concrete mass, and deterioration of the pipe, it is recommended to replace this segment from MH to MH and relocate the downstream MH further from the bank. Until this segment can be replaced, it is recommended OWASA increase inspection frequency to at least monthly, and after each major rain event of 1-year storm or more. Due to proximity to Sites 13, 15, and 18, consideration should be given to conducting repairs at the same time.	$ 456,000	$ -	$ -
7	1981	24 in	7689	7670	It is recommended to repair the pipe to pier strap assemblies and repair noted pier defects. Additionally, the upstream and downstream MHs should be rehabilitated. This segment will need to be replaced due to pier condition, however replacement is not deemed critical based on the information available. During the 6-month inspections, the piers should be inspected for degradation and schedule for replacing this section may change pending further pier degradation.	$ 30,000	$ 7,200	$ 638,000
8	2678	12 in	8355	9683	Due to the noted deterioration, OWASA should install a repair clamp at 126 feet from the upstream MH. Due to the deterioration of the pipe wall, offset joint, and noted pier defects, this site should be lined with CIPP, and the piers should be rehabilitated. During the 6-month inspections, OWASA should review the pier condition and offset joint for further degradation. If offset joint further degrades, this section may require replacing in lieu of installing CIPP.	$ -	$ 8,200	$ 28,000
10	10325	30 in	13086	9666	Based upon the age of the sewer and deterioration of similarly aged sewers on this project, and CCTV review identified seals showing, it is recommended this site be CIPP-lined and the MHs rehabilitated.	$ -	$ -	$ 53,200

Table 31 Continued

Site #	OWASA Pipe ID	Pipe Diameter	OWASA US MH ID	OWASA DS MH ID	Recommendations	Budgetary OPCC of "Critical Action Items"	Budgetary OPCC of "Operations / Maintenance Action Items"	Budgetary OPCC of "Other Action Items"
11	1950	24 in	7631	10371	Due to identified pipe wall deterioration, an existing repair clamp indicating a prior repair, and observation of exposed reinforcing bar at one pier, corrosion at both MH's, ideally, the MHs will be relocated further from the stream and the segment replaced from MH to MH. However, focus should be establishing integrity of the existing crossing which can be accomplished via installation of CIPP liner, restoring the stream banks and repair the pier defects. Relocating the MHs can be delayed until erosion becomes a clearer issue. Until a replacement can be completed, it is recommended to install a repair clamp at 52 feet from the upstream MH, and repairing pipe to pier clamps.	$ 565,000	$ 33,150	$ 33,800
12	14480	30 in	13078	13076	Due to identified pipe wall deterioration, it is recommended to line this section with CIPP. While installing the CIPP, it is recommended to rehabilitate both manholes. Until the CIPP can be installed, it is recommended to install repair clamps at 41, 51, and 61 feet from the upstream MH. Due to corrosion identified at each MH, it is recommended to replace the ring and cover and rehabilitate each MH.	$ 57,000	$ 21,710	$ -
13	1836	24 in	7656	7658	Due to deteriorated wall thickness, it is recommended to line this section with CIPP. Due to corroded MH exteriors, it is recommended to replace the cone, ring and cover of both MHs, and rehabilitate each MH during CIPP installation. Due to proximity to Sites 6, 15 and 18, it may be advantageous to repair at the same time.	$ 40,100	$ -	$ -
15	1860	24 in	7745	7770	It is recommended to repair the noted pier defects and continue to monitor stream bank conditions. Rehabilitate MHs in conjunction with sites 6, 13, and 18 due to apparent restricted access.	$ -	$ -	$ 668,000
16	10322	30 in	9668	9669	It is recommended OWASA reinstall the vent stack on SSMH 9668.	$ -	$ -	$ 4,600
17	958	18 in	28192	28193	Due to stream bank erosion causing the MH 28193 to be partially exposed and there appears to be no additional support for the pipe to manhole connection, observed MH corrosion, this site needs to be replaced from MH to MH with MH 28193 needing to be relocated further from the bank. Due to proximity to Site 3, consider replacing Site 3 in conjunction with this site.	$ 456,000	$ -	$ -
18	1833	10 in	7624	7618	Due to the age of the pipe, and identified bank erosion, and an exposed wood foundation for the pier, this section needs to be replaced MH to MH. Until the replacement can occur, the tree limbs and debris should be removed from the pipe. Due to proximity to Sites 6, 13 and 15, consideration should be given to repairing at the same time.	$ 350,000	$ -	$ -
					Total Budgetary OPCC by action item	$ 3,148,100	$ 77,460	$ 2,076,600
					Total Budgetary OPCC	$5,302,160		

Table 32 - Recommended Prioritization and Critical Action Items OPCC

Site #	OWASA Pipe ID	Risk Value	Critical Recommended Action Items?	Risk Priority #[1]	Critical Action Items OPCC
17	958	20.0	Yes	1	$ 456,000
12[2]	14480	10.0 (17.5 adjusted value)	Yes	2	$ 57,000
13[2]	1836	10.0 (17.5 adjusted value)	Yes	3	$ 40,100
4	974	17.0	Yes	4	$ 525,000
6	1850	16.3	Yes	5	$ 456,000
18	1833	16.3	Yes	6	$ 350,000
3	954	15.0	Yes	7	$ 669,000
11	1950	15.0	Yes	8	$ 565,000
7	1981	12.5	Yes	9	$ 30,000
15	1860	12.5	No	10	N/A
2	828	11.7	No	11	N/A
10	10325	11.7	No	12	N/A
8	2678	11.3	No	13	N/A
5[2]	1791	13.8 (11.3 adjusted value)	No	14	N/A
16	10322	10.0	No	15	N/A
					$3,148,100

[1]As mentioned in Section 2, this priority system is based upon the scope of services completed and condition of the site at the time of the assessment. The conditions of each site will change and degrade at varying rates. OWASA should complete 6-month inspections and adjust the priority of repairs based on conditions over time.

[2]See Section 4.0 for rationale of adjusting the risk factors for Sites 12, 13, and 5.

Due to proximity and criticality of repairs, M&C has recommended the following groups of sites be considered for repair at the same time which may reduce mobilization cost and increase contractor efficiency.

Table 33 - Recommended Site Grouping A

Site #	OWASA Pipe ID	Risk Value	Critical Recommended Action Items?	Risk Priority #	Critical Action Item OPCC
17	958	20.0	Yes	1	$ 456,000
3	954	15.0	Yes	7	$ 669,000
				Total Grouping Budgetary OPCC	$ 1,125,000

Table 34 - Recommended Site Grouping B

Site #	OWASA Pipe ID	Risk Value	Critical Recommended Action Items?	Risk Priority #	Critical Action Item OPCC	Other Action Item OPCC
13	1836	10.0 (17.5 adjusted value)	Yes	3	$ 40,100	N/A
6	1850	16.3	Yes	5	$ 456,000	N/A
18	1833	16.3	Yes	6	$ 350,000	N/A
15	1860	12.5	No	10	N/A	$668,000
				Total Grouping Budgetary OPCC	$ 1,514,000	

Table 35 - Recommended Site Grouping C

Site #	OWASA Pipe ID	Risk Value	Critical Recommended Action Items?	Risk Priority #	Critical Action Items OPCC	Other Action Item OPCC
12	14480	10.0 (17.5 adjusted value)	Yes	2	$ 57,000	N/A
5	1791	13.8 (11.3 adjusted value)	No	14	N/A	$ 651,000
				Total Grouping Budgetary OPCC	$ 708,000	

6.0 Appendices

Appendix A – Site Priority and Budgetary OPCC Map

Appendix B – UT Results

Appendix C – Manhole Inspection Results

Appendix D – Pier Inspection Results

Appendix E – Detailed Budgetary OPCC

Appendix A

Site Priority and Budgetary OPCC Map

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Key:
CAI: Critical Action Item Budgetary OPCC
OMAI: Operations/Maintenance Action Item Budgetary OPCC
Other Action Item Budgetary OPCC

NC NAD 83 (US FEET)

Risk Priority #11
CAI: N/A
OMAI: N/A
OAI: N/A

Site 2 - 18 in

Risk Priority #13
CAI: N/A
OMAI: $8,200
OAI: $28,000

Site 8 - 12 in

Risk Priority #4
CAI: $525,000
OMAI: N/A
OAI: N/A

Site 4 - 18 in

Risk Priority #1
CAI: $456,000
OMAI: N/A
OAI: N/A

Site 17 - 18 in

Recommended Site Grouping A
Grouping Budgetary OPCC: $1.125M

Site 3 - 12 in

Risk Priority #7
CAI: $669,000
OMAI: N/A
OAI: N/A

Risk Priority #12
CAI: N/A
OMAI: N/A
OAI: $53,000

Site 16 - 30 in

Site 10 - 30 in

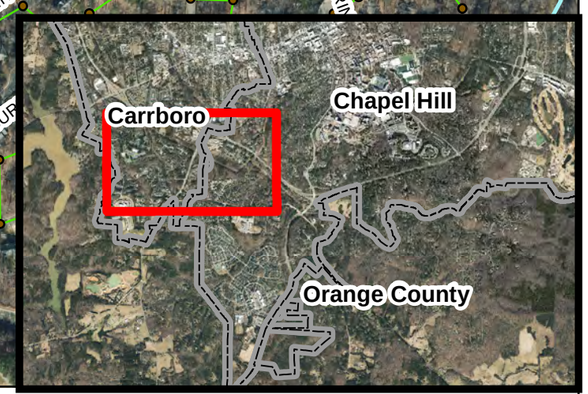
Risk Priority #15
CAI: N/A
OMAI: N/A
OAI: $4,600

Morgan Creek

BEECHWOOD DR
CEDARWOOD LN
LORILANE DR
WESTBROOK DR
TANGLEWOOD LN
BERRYHILL DR
WEATHERHILL PT
RIVERBIRCH PT
RIVER WALK LN
MARLOWE CT
ABBEY RD
COLERIDGE CT
FRI CHAUCER CT
DAFFODIL LN
S GREENSBORO-NC 54 EXIT
NC 54-SMITH LEVEL EXIT
S GREENSBORO ST
RAND RD
ROBERTS ST
PARK RD
PUBLIC WORKS DR
RIVER CREEK PL
MANOR RIDGE DR
MISTY PINES PL
GATERIDGE PL
WILLOW OAK LN
NC 54
ORCHARD LN
JUNIPER CT
OAK SPRING CT
SMITH LEVEL RD
UNIVERSITY COMMONS
BPW CLUB RD
TEAL PL
ROSSBURN WAY
CULLODEN RD
CROFTON SPRINGS PL
MONTCLAIR WAY
WESTBURY DR
MARIN DR
DORSET PT
MARIN PL
ROCK HAVEN RD
PALOMAR PT
WEYER
GARDNER

Legend

- Manholes
- Gravity Sewers
- Aerial Crossings
- Aerial Crossings
- Streams



Morgan Creek Outfall Aerial Crossings West - Priority and Budgetary OPCC Map

Orange Water and Sewer Authority

Orange County, NC

1 inch = 452 feet

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9/28/2023

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Key:
CAI: Critical Action Item Budgetary OPCC
OMAI: Operations/Maintenance Action Item Budgetary OPCC
Other Action Item Budgetary OPCC

NC NAD 83 (US FEET)

Recommended Site Grouping C
Grouping Budgetary OPCC: $708,000

Recommended Site Grouping B
Grouping Budgetary OPCC: $1.5M

Risk Priority #2
CAI: $57,000
OMAI: $21,710
OAI: N/A

Risk Priority #14
CAI: N/A
OMAI: $7,200
OAI: $651,000

Risk Priority #6
CAI: $350,000
OMAI: N/A
OAI: N/A

Risk Priority #10
CAI: N/A
OMAI: N/A
OAI: $668,000

Risk Priority #3
CAI: $40,100
OMAI: N/A
OAI: N/A

Risk Priority #5
CAI: $456,000
OMAI: N/A
OAI: N/A

Risk Priority #8
CAI: $565,000
OMAI: $33,150
OAI: $33,800

Risk Priority #9
CAI: $30,000
OMAI: $7,200
OAI: $638,000

Site 12 - 30 in
Site 5 - 24 in
Site 18 - 10 in
Site 13 - 24 in
Site 6 - 8 in
Site 15 - 24 in
Site 11 - 24 in
Site 7 - 24 in

NC 54
PINE BLUFF TRL
DAWES ST
COOLIDGE ST
OLD PITTSBO
HOLLAND DR
MONROE ST
PUREFOY RD
HOWELL ST
WHITEHEAD RD
WHITEHEAD CIR
GOOSENECK RD
OTEYS RD
COKER DR
KINGS MILL RD
COKER LN
SPRING DELL LN
BARTRAM D
RWOOD DR
S COLUMBIA ST
FORDHAM BLVD
MEADOW LN
WINTER DR
MORGAN CREEK RD
MORGAN CREEK LN
HAWTHORNE LN
BOTANICAL WAY
SOURWOOD CIR
ASHE PL
ARBORETUM DR
ANNING LN
CULBRETH RD
MT CARMEL CHURCH RD
OLD BRIDGE LN
MALLARD CT
AZALEA PL
AZALEA DR
BEECHRIDGE CT
COPPER BEECH CT
BENNETT RD
HAYWORTH DR
VAN DOREN PL
MIRAMAR PL
LOMBARD CT
MORGAN BLUFF LN
MORGAN BEND CT
Morgan Creek

Legend

- Manholes
- Gravity Sewers
- Aerial Crossings
- Aerial Crossings
- Streams



Morgan Creek Outfall Aerial Crossings East - Priority and Budgetary OPCC Map
Orange Water and Sewer Authority
Orange County, NC

1 inch = 452 feet

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9/28/2023

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Appendix B

UT Inspection Results

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ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/15/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 3**	**Procedure No:**
Pipe ID: 954	**Diameter: 12**	

Ultrasonic Flow Detector / Gage		**Transducer(s)**		**Calibration Standards(s)**	
Manufacter:	**Olympus**	**Manufacter:**	**Olypus**	**Material:**	**Steel**
Model No:	**38DL PLUS**	**Model No.:**	**D790-SM**	**S/N:**	**2214E**
Serial No:	**203676909**	**Serial No.:**	**1435517**	**Step #:**	**5-Step**
Cable Type:	**Dual Molded LEMO 00 to Microdot Cable**	**Frequency:**	**5MHz**	**Thickness:**	**0.100", 0.200", 0.300", 0.400", 0.500"**
Cable Length:	**5Ft**	**Size:**	**0.434" Tip Diameter**	**Calibration Date:**	**4/15/23**

Starting Manhole: 7224

Site Location:	**Start Location:**
	

Supporting Photos

...

Comments:

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/15/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 3**	**Procedure No:**
Pipe ID: 954	**Diameter: 12**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.639	0.641	0.638		**0.639**
45 Degree:	0.605	0.611	0.609		**0.608**
90 Degree:	0.664	0.664	0.673		**0.667**
135 Degree:	**Rusted, cannot get readings**				
180 Degree:	**Rusted, cannot get readings**				
200 Degree:	**Obstructed, cannot get readings**				
270 Degree:	**Obstructed, cannot get readings**				
315 Degree:	**Obstructed, cannot get readings**				

Notes:
5ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.548	0.549	0.547		**0.548**
45 Degree:	0.555	0.548	0.549		**0.551**
90 Degree:	0.556	0.549	0.540		**0.548**
135 Degree:	0.548	0.550	0.551		**0.550**
180 Degree:	0.540	0.549	0.541		**0.543**
200 Degree:	0.508	0.504	0.498		**0.503**
270 Degree:	0.553	0.552	0.551		**0.552**
315 Degree:	0.548	0.547	0.551		**0.549**

Notes:
10 from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.535	0.532	0.529		**0.532**
45 Degree:	0.525	0.524	0.528		**0.526**
90 Degree:	0.525	0.524	0.528		**0.526**
135 Degree:	0.526	0.530	0.531		**0.529**
180 Degree:	0.528	0.547	0.541		**0.539**
200 Degree:	0.548	0.547	0.548		**0.548**
270 Degree:	0.548	0.545	0.543		**0.545**
315 Degree:	0.534	0.531	0.534		**0.533**

Notes:
15 from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/15/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 3**	**Procedure No:**
Pipe ID: 954	**Diameter: 12**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.514	0.519	0.496		**0.510**
45 Degree:	0.492	0.490	0.489		**0.490**
90 Degree:	0.482	0.492	0.495		**0.490**
135 Degree:	0.559	0.560	0.561		**0.560**
180 Degree:	0.548	0.546	0.559		**0.551**
200 Degree:	0.543	0.546	0.544		**0.544**
270 Degree:	0.494	0.490	0.489		**0.491**
315 Degree:	0.497	0.490	0.496		**0.494**

Notes:
20 from upstream manhole

Near joint

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.533	0.531	0.533		**0.532**
45 Degree:	0.537	0.535	0.536		**0.536**
90 Degree:	0.534	0.532	0.534		**0.533**
135 Degree:	0.548	0.549	0.550		**0.549**
180 Degree:	0.546	0.547	0.546		**0.546**
200 Degree:	0.531	0.534	0.532		**0.532**
270 Degree:	0.519	0.522	0.520		**0.520**
315 Degree:	0.538	0.530	0.531		**0.533**

Notes:
25 ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.592	0.595	0.596		**0.594**
45 Degree:	0.608	0.606	0.600		**0.605**
90 Degree:	0.632	0.629	0.624		**0.628**
135 Degree:	**Obstructed, cannot get readings**				
180 Degree:	0.664	0.672	0.665		**0.667**
200 Degree:	0.672	0.677	0.658		**0.669**
270 Degree:	0.586	0.584	0.578		**0.583**
315 Degree:	0.583	0.585	0.586		**0.585**

Notes:
30ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	Project No.: 01519-0062	Date: 04/15/2023
Client Name: Orange Water and Sewer Authority	Site Number: 3	Procedure No:
Pipe ID: 954	Diameter: 12	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.644	0.655	0.643		0.647
45 Degree:	0.650	0.642	0.644		0.645
90 Degree:	0.537	0.636	0.630		0.601
135 Degree:	0.655	0.656	0.660		0.657
180 Degree:	0.696	0.695	0.698		0.696
200 Degree:	0.635	0.636	0.634		0.635
270 Degree:	0.638	0.640	0.735		0.671
315 Degree:	0.638	0.639	0.637		0.638

Notes:
35ft from upstream manhole

Near joint

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.438	0.441	0.439		0.439
45 Degree:	0.437	0.438	0.432		0.436
90 Degree:	0.442	0.438	0.431		0.437
135 Degree:	0.433	0.425	0.423		0.427
180 Degree:	Obstructed, cannot get readings				
200 Degree:	Obstructed, cannot get readings				
270 Degree:	0.429	0.423	0.425		0.426
315 Degree:	0.433	0.435	0.427		0.432

Notes:
40ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.391	0.394	0.387		0.391
45 Degree:	0.398	0.397	0.399		0.398
90 Degree:	0.409	0.404	0.402		0.405
135 Degree:	0.392	0.387	0.397		0.392
180 Degree:	0.373	0.377	0.375		0.375
200 Degree:	0.387	0.386	0.391		0.388
270 Degree:	0.421	0.410	0.408		0.413
315 Degree:	0.414	0.407	0.409		0.410

Notes:
45ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/15/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 3**	**Procedure No:**
Pipe ID: 954	**Diameter: 12**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.400	0.404	0.407		**0.404**
45 Degree:	0.381	0.382	0.380		**0.381**
90 Degree:	0.385	0.384	0.384		**0.384**
135 Degree:	0.390	0.396	0.389		**0.392**
180 Degree:	0.378	0.397	0.375		**0.383**
200 Degree:	0.376	0.373	0.387		**0.379**
270 Degree:	0.374	0.371	0.377		**0.374**
315 Degree:	0.399	0.398	0.396		**0.398**

Notes:
50 from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.446	0.442	0.439		**0.442**
45 Degree:	0.434	0.429	0.430		**0.431**
90 Degree:	0.421	0.431	0.426		**0.426**
135 Degree:	0.445	0.428	0.425		**0.433**
180 Degree:	0.429	0.418	0.423		**0.423**
200 Degree:	0.441	0.458	0.463		**0.454**
270 Degree:	0.467	0.455	0.459		**0.460**
315 Degree:	0.444	0.443	0.455		**0.447**

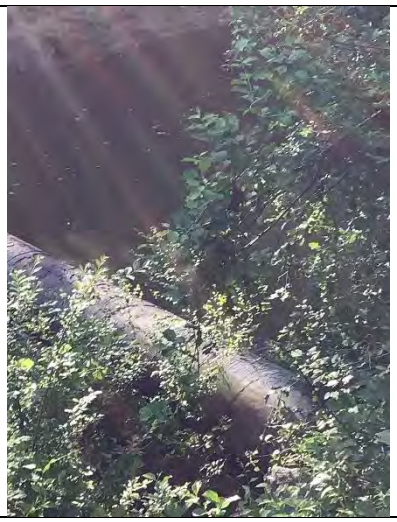
Notes:
55ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/18/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 4**	**Procedure No:**
Pipe ID: 974	**Diameter: 18**	

Ultrasonic Flow Detector / Gage		**Transducer(s)**		**Calibration Standards(s)**	
Manufacter:	**Olympus**	**Manufacter:**	**Olypus**	**Material:**	**Steel**
Model No:	**38DL PLUS**	**Model No.:**	**D790-SM**	**S/N:**	**2214E**
Serial No:	**203676909**	**Serial No.:**	**1435517**	**Step #:**	**5-Step**
Cable Type:	**Dual Molded LEMO 00 to Microdot Cable**	**Frequency:**	**5MHz**	**Thickness:**	**0.100", 0.200", 0.300", 0.400", 0.500"**
Cable Length:	**5Ft**	**Size:**	**0.434" Tip Diameter**	**Calibration Date:**	**4/15/23**

Starting Manhole: 7021

Site Location:	**Start Location:**
	

Supporting Photos

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Comments:

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/18/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 4**	**Procedure No:**
Pipe ID: 974	**Diameter: 18**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.154	0.136	0.125		**0.138**
45 Degree:	0.409	0.367	0.399		**0.392**
90 Degree:	0.445	0.473	0.465		**0.461**
135 Degree:	0.404	0.383	0.377		**0.388**
180 Degree:	0.156	0.127	0.144		**0.142**
200 Degree:	0.425	0.405	0.391		**0.407**
270 Degree:	0.382	0.377	0.376		**0.378**
315 Degree:	0.410	0.412	0.408		**0.410**

Notes:
5ft from upstream manhole
0 Degree - Bare Metal
45 Degree thru 315 Degree - Coating on pipe

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	106.000	0.106	0.102		**35.403**
45 Degree:	0.219	0.222	0.214		**0.218**
90 Degree:	0.275	0.253	0.309		**0.279**
135 Degree:	0.362	0.355	0.358		**0.358**
180 Degree:	0.387	0.388	0.384		**0.386**
200 Degree:	0.349	0.360	0.346		**0.352**
270 Degree:	0.376	0.390	0.361		**0.376**
315 Degree:	**No Readings Poor Service**				

Notes:
10ft from upstream manhole
0 Degree - Bare Metal
45 Degree thru 270 Degree - Coating on pipe

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/18/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 4**	**Procedure No:**
Pipe ID: 974	**Diameter: 18**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.135	0.155	0.134		**0.141**
45 Degree:	0.350	0.352	0.354		**0.352**
90 Degree:	0.350	0.355	0.356		**0.354**
135 Degree:	0.349	0.350	0.355		**0.351**
180 Degree:	0.315	0.332	0.338		**0.328**
200 Degree:	0.332	0.338	0.315		**0.328**
270 Degree:	0.353	0.364	0.374		**0.364**
315 Degree:	0.399	0.396	0.406		**0.400**

Notes:
15ft from upstream manhole
0 Degree - Bare Metal
45 Degree thru 315 Degree - Coating on pipe

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.113	0.154	0.155		**0.141**
45 Degree:	0.368	0.363	0.384		**0.372**
90 Degree:	0.350	0.349	0.352		**0.350**
135 Degree:	0.340	0.347	0.363		**0.350**
180 Degree:	0.371	0.368	0.380		**0.373**
200 Degree:	0.337	0.340	0.373		**0.350**
270 Degree:	0.385	0.403	0.400		**0.396**
315 Degree:	0.354	0.357	0.369		**0.360**

Notes:
20ft from upstream manhole
0 Degree - Bare Metal
45 Degree thru 315 Degree - Coating on pipe

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/18/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 4**	**Procedure No:**
Pipe ID: 974	**Diameter: 18**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	**No Readings Poor Service**				
45 Degree:	0.410	0.398	0.399		**0.402**
90 Degree:	0.380	0.379	0.374		**0.378**
135 Degree:	0.393	0.398	0.376		**0.389**
180 Degree:	0.369	0.391	0.411		**0.390**
200 Degree:	0.401	0.397	0.358		**0.385**
270 Degree:	0.419	0.412	0.406		**0.412**
315 Degree:	0.145	0.146	0.151		**0.147**

Notes:
25ft from upstream manhole
45 Degree thru 270 Degree - Coating on pipe
315 Degree - Bare Metal

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.113	0.114	0.120		**0.116**
45 Degree:	0.153	0.152	0.149		**0.151**
90 Degree:	**No Readings Poor Service**				
135 Degree:	**No Readings Poor Service**				
180 Degree:	**No Readings Poor Service**				
200 Degree:	**No Readings Poor Service**				
270 Degree:	0.414	0.412	0.381		**0.402**
315 Degree:	0.147	0.161	0.163		**0.157**

Notes:
30ft from upstream manhole
0 Degree ,45 Degree and 315 Degree - Bare Metal
270 Degree - Coating on pipe

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/18/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 4**	**Procedure No:**
Pipe ID: 974	**Diameter: 18**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.130	0.128	0.155		**0.138**
45 Degree:	0.462	0.414	0.413		**0.430**
90 Degree:	**No Readings Poor Service**				
135 Degree:	0.431	0.427	0.421		**0.426**
180 Degree:	**No Readings Poor Service**				
200 Degree:	0.476	0.473	0.470		**0.473**
270 Degree:	0.404	0.406	0.410		**0.407**
315 Degree:	0.158	0.155	0.164		**0.159**

Notes:
35ft from upstream manhole
0 Degree - Bare Metal
45 Degree, 135 Degree, 200 Degree and 270 Degree – Coating on pipe

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.301	0.299	0.303		**0.301**
45 Degree:	0.319	0.328	0.322		**0.323**
90 Degree:	0.311	0.305	0.312		**0.309**
135 Degree:	0.291	0.292	0.295		**0.293**
180 Degree:	**No Readings Poor Service**				
200 Degree:	0.273	0.275	0.270		**0.273**
270 Degree:	0.198	0.200	0.202		**0.200**
315 Degree:	0.357	0.368	0.371		**0.365**

Notes:
40ft from upstream manhole
0 Degree thru 135 Degree, 200 Degree, and 315 Degree – Coating on pipe
270 Degree - Bare Metal

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/18/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 4**	**Procedure No:**
Pipe ID: 974	**Diameter: 18**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.318	0.332	0.322		**0.324**
45 Degree:	0.382	0.383	0.384		**0.383**
90 Degree:	0.360	0.366	0.378		**0.368**
135 Degree:	0.365	0.364	0.358		**0.362**
180 Degree:	0.379	0.375	0.381		**0.378**
200 Degree:	0.350	0.351	0.364		**0.355**
270 Degree:	0.340	0.344	0.339		**0.341**
315 Degree:	**Obstructed, cannot get readings**				

Notes:
45ft from upstream manhole
0 Degree thru 270 Degree - coating on pipe

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/13/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 6**	**Procedure No:**
Pipe ID: 1850	**Diameter: 8**	

Ultrasonic Flow Detector / Gage		**Transducer(s)**		**Calibration Standards(s)**	
Manufacter:	**Olympus**	**Manufacter:**	**Olypus**	**Material:**	**Steel**
Model No:	**38DL PLUS**	**Model No.:**	**D790-SM**	**S/N:**	**2214E**
Serial No:	**203676909**	**Serial No.:**	**1435517**	**Step #:**	**5-Step**
Cable Type:	**Dual Molded LEMO 00 to Microdot Cable**	**Frequency:**	**5MHz**	**Thickness:**	**0.100", 0.200", 0.300", 0.400", 0.500"**
Cable Length:	**5Ft**	**Size:**	**0.434" Tip Diameter**	**Calibration Date:**	**4/15/23**

Starting Manhole: 7706

Site Location:	**Start Location:**
	

Supporting Photos

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Comments:

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/13/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 6**	**Procedure No:**
Pipe ID: 1850	**Diameter: 8**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.255	0.256	0.257		**0.256**
45 Degree:	0.267	0.260	0.260		**0.262**
90 Degree:	0.264	0.266	0.271		**0.267**
135 Degree:	0.266	0.277	0.248		**0.264**
180 Degree:	0.257	0.260	0.262		**0.260**
200 Degree:	0.272	0.259	0.258		**0.263**
270 Degree:	0.281	0.257	0.254		**0.264**
315 Degree:	0.256	0.270	0.253		**0.260**

Notes:
5ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.251	0.254	0.253		**0.253**
45 Degree:	0.240	0.251	0.242		**0.244**
90 Degree:	0.251	0.242	0.256		**0.250**
135 Degree:	0.252	0.251	0.269		**0.257**
180 Degree:	0.234	0.235	0.236		**0.235**
200 Degree:	0.261	0.259	0.258		**0.259**
270 Degree:	0.256	0.259	0.254		**0.256**
315 Degree:	0.257	0.251	0.255		**0.254**

Notes:
10ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.355	0.345	0.347		**0.349**
45 Degree:	0.333	0.330	0.331		**0.331**
90 Degree:	0.332	0.331	0.334		**0.332**
135 Degree:	0.269	0.261	0.296		**0.275**
180 Degree:	0.296	0.290	0.295		**0.294**
200 Degree:	0.288	0.289	0.273		**0.283**
270 Degree:	0.342	0.341	0.350		**0.344**
315 Degree:	0.336	0.328	0.330		**0.331**

Notes:
15ft from upstream manhole

Readings near bell

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/13/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 6**	**Procedure No:**
Pipe ID: 1850	**Diameter: 8**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.268	0.271	0.265		**0.268**
45 Degree:	0.281	0.272	0.274		**0.276**
90 Degree:	0.278	0.283	0.276		**0.279**
135 Degree:	0.277	0.279	0.278		**0.278**
180 Degree:	0.258	0.253	0.254		**0.255**
200 Degree:	0.266	0.267	0.252		**0.262**
270 Degree:	0.258	0.256	0.259		**0.258**
315 Degree:	0.265	0.258	0.264		**0.262**

Notes:
20ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.261	0.264	0.265		**0.263**
45 Degree:	0.264	0.253	0.258		**0.258**
90 Degree:	0.265	0.266	0.272		**0.268**
135 Degree:	0.252	0.257	0.258		**0.256**
180 Degree:	0.255	0.266	0.258		**0.260**
200 Degree:	0.249	0.254	0.253		**0.252**
270 Degree:	0.278	0.278	0.275		**0.277**
315 Degree:	0.271	0.273	0.269		**0.271**

Notes:
25ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.284	0.279	0.276		**0.280**
45 Degree:	0.272	0.272	0.267		**0.270**
90 Degree:	0.278	0.276	0.276		**0.277**
135 Degree:	0.287	0.276	0.279		**0.281**
180 Degree:	0.276	0.275	0.268		**0.273**
200 Degree:	0.251	0.249	0.256		**0.252**
270 Degree:	0.287	0.285	0.279		**0.284**
315 Degree:	0.277	0.284	0.286		**0.282**

Notes:
30ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/13/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 6**	**Procedure No:**
Pipe ID: 1850	**Diameter: 8**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.291	0.288	0.291		**0.290**
45 Degree:	0.302	0.297	0.305		**0.301**
90 Degree:	0.300	0.302	0.307		**0.303**
135 Degree:	0.259	0.264	0.253		**0.259**
180 Degree:	0.273	0.266	0.262		**0.267**
200 Degree:	0.251	0.244	0.260		**0.252**
270 Degree:	0.285	0.292	0.288		**0.288**
315 Degree:	0.285	0.273	0.276		**0.278**

Notes:
35ft from upstream manhole

Readings near bell

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.258	0.260	0.255		**0.258**
45 Degree:	0.271	0.278	0.262		**0.270**
90 Degree:	0.258	0.255	0.260		**0.258**
135 Degree:	0.278	0.267	0.259		**0.268**
180 Degree:	0.266	0.260	0.260		**0.262**
200 Degree:	0.246	0.257	0.256		**0.253**
270 Degree:	0.243	0.260	0.246		**0.250**
315 Degree:	0.252	0.263	0.254		**0.256**

Notes:
40ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/17/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 8**	**Procedure No:**
Pipe ID: 10292	**Diameter: 8**	

Ultrasonic Flow Detector / Gage		**Transducer(s)**		**Calibration Standards(s)**	
Manufacter:	**Olympus**	**Manufacter:**	**Olypus**	**Material:**	**Steel**
Model No:	**38DL PLUS**	**Model No.:**	**D790-SM**	**S/N:**	**2214E**
Serial No:	**203676909**	**Serial No.:**	**1435517**	**Step #:**	**5-Step**
Cable Type:	**Dual Molded LEMO 00 to Microdot Cable**	**Frequency:**	**5MHz**	**Thickness:**	**0.100", 0.200", 0.300", 0.400", 0.500"**
Cable Length:	**5Ft**	**Size:**	**0.434" Tip Diameter**	**Calibration Date:**	**4/15/23**

Starting Manhole: 9683

Site Location:	**Start Location:**
	

Supporting Photos

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Comments:
Locations 1,2,3,7 and 8 were grinder to bare metal

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/17/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 8**	**Procedure No:**
Pipe ID: 10292	**Diameter: 8**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.295	0.299	0.297		**0.297**
45 Degree:	0.299	0.304	0.296		**0.300**
90 Degree:	0.298	0.270	0.279		**0.282**
135 Degree:	0.284	0.290	0.295		**0.290**
180 Degree:	0.350	0.337	0.331		**0.339**
200 Degree:	0.349	0.343	0.337		**0.343**
270 Degree:	0.266	0.276	0.270		**0.271**
315 Degree:	0.295	0.293	0.298		**0.295**

Notes:
5ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.282	0.288	0.284		**0.285**
45 Degree:	0.284	0.285	0.281		**0.283**
90 Degree:	0.248	0.240	0.243		**0.244**
135 Degree:	0.277	0.278	0.275		**0.277**
180 Degree:	0.277	0.278	0.272		**0.276**
200 Degree:	0.332	0.328	0.325		**0.328**
270 Degree:	0.279	0.276	0.280		**0.278**
315 Degree:	0.271	0.279	0.286		**0.279**

Notes:
10ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.344	0.345	0.342		**0.344**
45 Degree:	0.328	0.331	0.336		**0.332**
90 Degree:	0.316	0.309	0.311		**0.312**
135 Degree:	0.336	0.345	0.365		**0.349**
180 Degree:	0.328	0.348	0.332		**0.336**
200 Degree:	0.314	0.315	0.311		**0.313**
270 Degree:	0.274	0.288	0.299		**0.287**
315 Degree:	0.341	0.344	0.338		**0.341**

Notes:
15ft from upstream manhole

Near bell

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/17/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 8**	**Procedure No:**
Pipe ID: 10292	**Diameter: 8**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.301	0.309	0.304		**0.305**
45 Degree:	0.270	0.262	0.267		**0.266**
90 Degree:	0.290	0.280	0.277		**0.282**
135 Degree:	0.325	0.323	0.322		**0.323**
180 Degree:	0.309	0.305	0.312		**0.309**
200 Degree:	0.318	0.332	0.378		**0.343**
270 Degree:	0.290	0.291	0.294		**0.292**
315 Degree:	0.291	0.284	0.295		**0.290**

Notes:
20ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.300	0.308	0.295		**0.301**
45 Degree:	0.219	0.224	0.220		**0.221**
90 Degree:	0.237	0.241	0.248		**0.242**
135 Degree:	0.300	0.299	0.305		**0.301**
180 Degree:	0.287	0.288	0.284		**0.286**
200 Degree:	0.319	0.306	0.301		**0.309**
270 Degree:	0.270	0.279	0.288		**0.279**
315 Degree:	0.271	0.272	0.273		**0.272**

Notes:
25ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.271	0.273	0.269		**0.271**
45 Degree:	0.270	0.266	0.267		**0.268**
90 Degree:	0.279	0.282	0.281		**0.281**
135 Degree:	0.325	0.309	0.300		**0.311**
180 Degree:	0.328	0.321	0.323		**0.324**
200 Degree:	0.291	0.289	0.285		**0.288**
270 Degree:	0.267	0.266	0.258		**0.264**
315 Degree:	0.254	0.253	0.267		**0.258**

Notes:
30ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/17/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 8**	**Procedure No:**
Pipe ID: 10292	**Diameter: 8**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.331	0.330	0.336		**0.332**
45 Degree:	0.284	0.271	0.291		**0.282**
90 Degree:	0.342	0.346	0.334		**0.341**
135 Degree:	0.365	0.364	0.358		**0.362**
180 Degree:	0.381	0.377	0.373		**0.377**
200 Degree:	0.379	0.349	0.382		**0.370**
270 Degree:	0.335	0.335	0.334		**0.335**
315 Degree:	0.325	0.328	0.334		**0.329**

Notes:
35ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.294	0.292	0.296		**0.294**
45 Degree:	0.279	0.277	0.274		**0.277**
90 Degree:	0.293	0.296	0.282		**0.290**
135 Degree:	0.343	0.342	0.333		**0.339**
180 Degree:	0.309	0.305	0.308		**0.307**
200 Degree:	0.322	0.316	0.314		**0.317**
270 Degree:	0.296	0.293	0.290		**0.293**
315 Degree:	0.284	0.275	280.000		**93.520**

Notes:
40ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.256	0.254	0.277		**0.262**
45 Degree:	0.254	0.263	0.266		**0.261**
90 Degree:	0.256	0.258	0.255		**0.256**
135 Degree:	0.267	0.278	0.296		**0.280**
180 Degree:	0.282	0.290	0.277		**0.283**
200 Degree:	0.308	0.314	0.326		**0.316**
270 Degree:	0.263	0.297	0.271		**0.277**
315 Degree:	0.290	0.272	0.263		**0.275**

Notes:
45ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/19/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 11**	**Procedure No:**
Pipe ID: 1950	**Diameter: 24**	

Ultrasonic Flow Detector / Gage		**Transducer(s)**		**Calibration Standards(s)**	
Manufacter:	**Olympus**	**Manufacter:**	**Olypus**	**Material:**	**Steel**
Model No:	**38DL PLUS**	**Model No.:**	**D790-SM**	**S/N:**	**2214E**
Serial No:	**203676909**	**Serial No.:**	**1435517**	**Step #:**	**5-Step**
Cable Type:	**Dual Molded LEMO 00 to Microdot Cable**	**Frequency:**	**5MHz**	**Thickness:**	**0.100", 0.200", 0.300", 0.400", 0.500"**
Cable Length:	**5Ft**	**Size:**	**0.434" Tip Diameter**	**Calibration Date:**	**4/15/23**

Starting Manhole: 7631

Site Location:	**Start Location:**
	

Supporting Photos

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Comments:

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/19/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 11**	**Procedure No:**
Pipe ID: 1950	**Diameter: 24**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.434	0.427	0.434		**0.432**
45 Degree:	0.392	0.390	0.393		**0.392**
90 Degree:	0.404	0.406	0.407		**0.406**
135 Degree:	0.459	0.458	0.454		**0.457**
180 Degree:	0.454	0.450	0.453		**0.452**
200 Degree:	0.465	0.467	0.442		**0.458**
270 Degree:	0.442	0.454	0.452		**0.449**
315 Degree:	0.488	0.499	0.476		**0.488**

Notes:
5ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.429	0.425	0.420		**0.425**
45 Degree:	0.382	0.387	0.377		**0.382**
90 Degree:	0.391	0.393	0.397		**0.394**
135 Degree:	0.409	0.410	0.413		**0.411**
180 Degree:	0.441	0.449	0.443		**0.444**
200 Degree:	0.407	0.409	0.405		**0.407**
270 Degree:	0.427	0.428	0.420		**0.425**
315 Degree:	0.454	0.463	0.473		**0.463**

Notes:
10ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.460	0.461	0.458		**0.460**
45 Degree:	0.511	0.505	0.503		**0.506**
90 Degree:	0.471	0.488	0.474		**0.478**
135 Degree:	0.529	0.514	0.513		**0.519**
180 Degree:	0.525	0.523	0.518		**0.522**
200 Degree:	0.482	0.490	0.506		**0.493**
270 Degree:	0.524	0.521	0.508		**0.518**
315 Degree:	0.492	0.491	0.495		**0.493**

Notes:
15ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/19/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 11**	**Procedure No:**
Pipe ID: 1950	**Diameter: 24**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.389	0.385	0.401		**0.392**
45 Degree:	0.429	0.428	0.423		**0.427**
90 Degree:	0.447	0.452	0.472		**0.457**
135 Degree:	0.454	0.442	0.459		**0.452**
180 Degree:	0.354	0.369	0.352		**0.358**
200 Degree:	0.396	0.365	0.384		**0.382**
270 Degree:	0.418	0.421	0.445		**0.428**
315 Degree:	0.401	0.403	0.402		**0.402**

Notes:
20ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.347	0.341	0.348		**0.345**
45 Degree:	0.385	0.382	0.369		**0.379**
90 Degree:	0.388	0.392	0.384		**0.388**
135 Degree:	0.397	0.400	0.436		**0.411**
180 Degree:	0.405	0.410	0.408		**0.408**
200 Degree:	0.411	0.404	0.402		**0.406**
270 Degree:	0.378	0.384	0.386		**0.383**
315 Degree:	0.428	0.435	0.421		**0.428**

Notes:
25ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.398	0.394	0.392		**0.395**
45 Degree:	0.377	0.372	0.383		**0.377**
90 Degree:	0.416	0.414	0.400		**0.410**
135 Degree:	0.356	0.358	0.377		**0.364**
180 Degree:	0.327	0.333	0.346		**0.335**
200 Degree:	0.392	0.395	0.402		**0.396**
270 Degree:	0.373	0.376	0.373		**0.374**
315 Degree:	0.373	0.376	0.367		**0.372**

Notes:
30ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/19/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 11**	**Procedure No:**
Pipe ID: 1950	**Diameter: 24**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.427	0.436	0.454		**0.439**
45 Degree:	0.465	0.476	0.466		**0.469**
90 Degree:	0.467	0.474	0.468		**0.470**
135 Degree:	0.484	0.471	0.498		**0.484**
180 Degree:	0.467	0.453	0.450		**0.457**
200 Degree:	0.428	0.450	0.422		**0.433**
270 Degree:	0.450	0.465	0.475		**0.463**
315 Degree:	0.461	0.474	0.470		**0.468**

Notes:
35ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.420	0.416	0.418		**0.418**
45 Degree:	0.429	0.428	0.430		**0.429**
90 Degree:	0.468	0.465	0.464		**0.466**
135 Degree:	0.406	0.407	0.399		**0.404**
180 Degree:	0.450	0.438	0.439		**0.442**
200 Degree:	0.401	0.400	0.398		**0.400**
270 Degree:	0.453	0.445	0.444		**0.447**
315 Degree:	0.409	0.412	0.417		**0.413**

Notes:
40ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.367	0.363	0.368		**0.366**
45 Degree:	0.371	0.373	0.378		**0.374**
90 Degree:	0.418	0.425	0.447		**0.430**
135 Degree:	0.387	0.389	0.365		**0.380**
180 Degree:	0.407	0.415	0.426		**0.416**
200 Degree:	0.355	0.361	0.390		**0.369**
270 Degree:	0.376	0.379	0.402		**0.386**
315 Degree:	0.357	0.357	0.356		**0.357**

Notes:
45ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/19/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 11**	**Procedure No:**
Pipe ID: 1950	**Diameter: 24**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.393	0.408	0.379		**0.393**
45 Degree:	0.364	0.373	0.402		**0.380**
90 Degree:	0.400	0.399	0.404		**0.401**
135 Degree:	0.374	0.368	0.388		**0.377**
180 Degree:	**Obstructed, cannot get readings**				
200 Degree:	0.432	0.426	0.404		**0.421**
270 Degree:	0.409	0.412	0.415		**0.412**
315 Degree:	0.403	0.397	0.381		**0.394**

Notes:
50ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.382	0.392	0.388		**0.387**
45 Degree:	0.391	0.395	0.389		**0.392**
90 Degree:	0.343	0.345	0.351		**0.346**
135 Degree:	0.343	0.341	0.333		**0.339**
180 Degree:	0.199	0.167	0.144		**0.170**
200 Degree:	0.333	0.339	0.322		**0.331**
270 Degree:	0.347	0.367	0.363		**0.359**
315 Degree:	0.388	0.391	0.373		**0.384**

Notes:
55ft from upstream manhole

Extra readings at 180 Degree (0.185, 0.205, 0.190)

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.373	0.371	0.384		**0.376**
45 Degree:	0.360	0.365	0.353		**0.359**
90 Degree:	0.383	0.387	0.375		**0.382**
135 Degree:	0.435	0.439	0.429		**0.434**
180 Degree:	0.298	0.303	0.304		**0.302**
200 Degree:	0.359	0.360	0.385		**0.368**
270 Degree:	0.348	0.353	0.322		**0.341**
315 Degree:	0.371	0.362	0.355		**0.363**

Notes:
60ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/19/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 11**	**Procedure No:**
Pipe ID: 1950	**Diameter: 24**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.350	0.354	0.364		**0.356**
45 Degree:	0.362	0.367	0.364		**0.364**
90 Degree:	0.394	0.391	0.371		**0.385**
135 Degree:	**Obstructed, cannot get readings**				
180 Degree:	**Obstructed, cannot get readings**				
200 Degree:	**Obstructed, cannot get readings**				
270 Degree:	0.330	0.340	0.343		**0.338**
315 Degree:	0.370	0.363	0.355		**0.363**

Notes:
65ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/17/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 12**	**Procedure No:**
Pipe ID: 14480	**Diameter: 30**	

Ultrasonic Flow Detector / Gage		**Transducer(s)**		**Calibration Standards(s)**	
Manufacter:	**Olympus**	**Manufacter:**	**Olypus**	**Material:**	**Steel**
Model No:	**38DL PLUS**	**Model No.:**	**D790-SM**	**S/N:**	**2214E**
Serial No:	**203676909**	**Serial No.:**	**1435517**	**Step #:**	**5-Step**
Cable Type:	**Dual Molded LEMO 00 to Microdot Cable**	**Frequency:**	**5MHz**	**Thickness:**	**0.100", 0.200", 0.300", 0.400", 0.500"**
Cable Length:	**5Ft**	**Size:**	**0.434" Tip Diameter**	**Calibration Date:**	**4/15/23**

Starting Manhole: 13078

Site Location:	**Start Location:**
	

Supporting Photos




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Comments:
Locations 1 thru 8 were grinder to bare metal

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/17/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 12**	**Procedure No:**
Pipe ID: 14480	**Diameter: 30**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.455	0.436	0.452		**0.448**
45 Degree:	0.467	0.435	0.468		**0.457**
90 Degree:	0.441	0.433	0.448		**0.441**
135 Degree:	0.450	0.461	0.449		**0.453**
180 Degree:	**Obstructed, cannot get readings**				
200 Degree:	**Obstructed, cannot get readings**				
270 Degree:	0.448	0.442	0.449		**0.446**
315 Degree:	0.469	0.450	0.446		**0.455**

Notes:
5ft from upstream manhole

Near bell

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.393	0.422	0.386		**0.400**
45 Degree:	0.404	0.391	0.401		**0.399**
90 Degree:	0.371	0.372	0.366		**0.370**
135 Degree:	0.389	0.383	0.396		**0.389**
180 Degree:	0.401	0.405	0.425		**0.410**
200 Degree:	0.401	0.396	0.391		**0.396**
270 Degree:	0.387	0.376	0.384		**0.382**
315 Degree:	0.364	0.359	0.360		**0.361**

Notes:
10ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.375	0.402	0.390		**0.389**
45 Degree:	0.353	0.351	0.353		**0.352**
90 Degree:	0.361	0.355	0.358		**0.358**
135 Degree:	0.373	0.372	0.378		**0.374**
180 Degree:	0.375	0.383	0.382		**0.380**
200 Degree:	0.369	0.371	0.376		**0.372**
270 Degree:	0.373	0.372	0.368		**0.371**
315 Degree:	0.339	0.337	0.327		**0.334**

Notes:
15ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	Project No.: 01519-0062	Date: 04/17/2023
Client Name: Orange Water and Sewer Authority	Site Number: 12	Procedure No:
Pipe ID: 14480	Diameter: 30	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.334	0.369	0.340		0.348
45 Degree:	0.291	0.295	0.283		0.290
90 Degree:	0.335	0.334	0.337		0.335
135 Degree:	0.341	0.331	0.341		0.338
180 Degree:	0.349	0.337	0.336		0.341
200 Degree:	0.345	0.344	0.340		0.343
270 Degree:	0.345	0.349	0.350		0.348
315 Degree:	0.304	0.272	0.294		0.290

Notes:
20ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.439	0.428	0.423		0.430
45 Degree:	0.425	0.404	0.436		0.422
90 Degree:	0.357	0.353	0.375		0.362
135 Degree:	0.419	0.417	0.423		0.420
180 Degree:	0.423	0.427	0.435		0.428
200 Degree:	0.423	0.426	0.425		0.425
270 Degree:	0.405	0.376	0.364		0.382
315 Degree:	0.399	0.402	0.400		0.400

Notes:
25ft from upstream manhole

Near bell

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.352	0.347	0.398		0.366
45 Degree:	0.365	0.359	0.349		0.358
90 Degree:	0.342	0.352	0.335		0.343
135 Degree:	0.406	0.401	0.409		0.405
180 Degree:	0.393	0.392	0.395		0.393
200 Degree:	0.387	0.385	0.379		0.384
270 Degree:	0.292	0.291	0.285		0.289
315 Degree:	0.399	0.398	0.415		0.404

Notes:
30ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/17/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 12**	**Procedure No:**
Pipe ID: 14480	**Diameter: 30**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.383	0.385	0.379		**0.382**
45 Degree:	0.386	0.364	0.350		**0.367**
90 Degree:	0.331	0.329	0.340		**0.333**
135 Degree:	0.389	0.390	0.400		**0.393**
180 Degree:	0.426	0.421	0.400		**0.416**
200 Degree:	0.389	0.396	0.390		**0.392**
270 Degree:	0.306	0.308	0.316		**0.310**
315 Degree:	0.368	0.367	0.372		**0.369**

Notes:
35ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.385	0.400	0.404		**0.396**
45 Degree:	0.367	0.379	0.359		**0.368**
90 Degree:	0.323	0.325	0.311		**0.320**
135 Degree:	0.435	0.414	0.404		**0.418**
180 Degree:	0.404	0.382	0.399		**0.395**
200 Degree:	0.351	0.351	0.353		**0.352**
270 Degree:	0.248	0.244	0.280		**0.257**
315 Degree:	0.347	0.356	0.322		**0.342**

Notes:
40ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/13/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 13**	**Procedure No:**
Pipe ID: 1836	**Diameter: 24**	

Ultrasonic Flow Detector / Gage		**Transducer(s)**		**Calibration Standards(s)**	
Manufacter:	**Olympus**	**Manufacter:**	**Olypus**	**Material:**	**Steel**
Model No:	**38DL PLUS**	**Model No.:**	**D790-SM**	**S/N:**	**2214E**
Serial No:	**203676909**	**Serial No.:**	**1435517**	**Step #:**	**5-Step**
Cable Type:	**Dual Molded LEMO 00 to Microdot Cable**	**Frequency:**	**5MHz**	**Thickness:**	**0.100", 0.200", 0.300", 0.400", 0.500"**
Cable Length:	**5Ft**	**Size:**	**0.434" Tip Diameter**	**Calibration Date:**	**4/15/23**

Starting Manhole: 7656

Site Location:	**Start Location:**
	

Supporting Photos



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Comments:

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/13/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 13**	**Procedure No:**
Pipe ID: 1836	**Diameter: 24**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.434	0.436	0.414		**0.428**
45 Degree:	0.438	0.445	0.433		**0.439**
90 Degree:	0.450	0.463	0.458		**0.457**
135 Degree:	0.517	0.526	0.517		**0.520**
180 Degree:	0.436	0.431	0.459		**0.442**
200 Degree:	0.476	0.484	0.488		**0.483**
270 Degree:	0.507	0.522	0.505		**0.511**
315 Degree:	0.427	0.428	0.431		**0.429**

Notes:
5ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.402	0.403	0.401		**0.402**
45 Degree:	0.400	0.396	0.389		**0.395**
90 Degree:	0.407	0.405	0.407		**0.406**
135 Degree:	0.400	0.398	0.399		**0.399**
180 Degree:	0.424	0.456	0.426		**0.435**
200 Degree:	0.374	0.370	0.392		**0.379**
270 Degree:	0.406	0.404	0.410		**0.407**
315 Degree:	0.395	0.396	0.384		**0.392**

Notes:
10ft from upstream manhole

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.405	0.403	0.405		**0.404**
45 Degree:	0.400	0.394	0.404		**0.399**
90 Degree:	0.432	0.437	0.435		**0.435**
135 Degree:	0.409	0.420	0.411		**0.413**
180 Degree:	0.468	0.474	0.459		**0.467**
200 Degree:	0.432	0.432	0.421		**0.428**
270 Degree:	0.487	0.451	0.479		**0.472**
315 Degree:	0.487	0.451	0.479		**0.472**

Notes:
15ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/13/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 13**	**Procedure No:**
Pipe ID: 1836	**Diameter: 24**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.393	0.388	0.392		**0.391**
45 Degree:	0.370	0.373	0.381		**0.375**
90 Degree:	0.434	0.439	0.422		**0.432**
135 Degree:	**Under Dirt, cannot get readings**				
180 Degree:	**Under Dirt, cannot get readings**				
200 Degree:	0.450	0.447	0.453		**0.450**
270 Degree:	0.429	0.403	0.403		**0.412**
315 Degree:	0.380	0.376	0.386		**0.381**

Notes:
20ft from upstream man

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.437	0.420	0.421		**0.426**
45 Degree:	**Under Dirt, cannot get readings**				
90 Degree:	**Under Dirt, cannot get readings**				
135 Degree:	**Under Dirt, cannot get readings**				
180 Degree:	**Under Dirt, cannot get readings**				
200 Degree:	**Under Dirt, cannot get readings**				
270 Degree:	0.488	0.496	0.499		**0.494**
315 Degree:	0.399	0.396	0.415		**0.403**

Notes:
25ft from upstream manhole

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 06/22/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 17**	**Procedure No:**
Pipe ID: 958	**Diameter: 12**	

Ultrasonic Flow Detector / Gage		**Transducer(s)**		**Calibration Standards(s)**	
Manufacturer:	**Olympus**	**Manufacturer:**	**Olympus**	**Material:**	**Steel**
Model No:	**38DL PLUS**	**Model No.:**	**D790-SM**	**S/N:**	**2214E**
Serial No:	**203676909**	**Serial No.:**	**1435517**	**Step #:**	**5-Step**
Cable Type:	**Dual Molded LEMO 00 to Microdot Cable**	**Frequency:**	**5MHz**	**Thickness:**	**0.100", 0.200", 0.300", 0.400", 0.500"**
Cable Length:	**5Ft**	**Size:**	**0.434" Tip Diameter**	**Calibration Date:**	**6/22/23**

Starting Manhole: 28192

Site Location:	**Start Location:**
	

Supporting Photos

...

Comments:

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 06/22/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 17**	**Procedure No:**
Pipe ID: 958	**Diameter: 12**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.144	0.148	0.151		**0.148**
45 Degree:					
90 Degree:					
135 Degree:					
180 Degree:					
225 Degree:					
270 Degree:					
315 Degree:					

Notes:
31 ft from upstream manhole
Pipeline coating prevented additional UT readings

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.144	0.145	0.139		**0.143**
45 Degree:	0.164	0.141	0.146		**0.150**
90 Degree:					
135 Degree:					
180 Degree:					
225 Degree:					
270 Degree:					
315 Degree:					

Notes:
36 ft from upstream manhole
Pipeline coating prevented additional UT readings

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.145	0.151	0.140		**0.145**
45 Degree:					
90 Degree:					
135 Degree:					
180 Degree:					
225 Degree:					
270 Degree:					
315 Degree:					

Notes:
41ft from upstream manhole
Pipeline coating prevented additional UT readings

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 06/22/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 17**	**Procedure No:**
Pipe ID: 958	**Diameter: 12**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:					
45 Degree:					
90 Degree:					
135 Degree:					
180 Degree:					
225 Degree:					
270 Degree:					
315 Degree:	0.139	0.140	0.135		**0.138**

Notes:
46ft from upstream manhole
Pipeline coating prevented additional UT readings

	Reading 1	Reading 2	Reading 3		Average
0 Degree:					
45 Degree:					
90 Degree:					
135 Degree:					
180 Degree:					
225 Degree:					
270 Degree:					
315 Degree:	0.253	0.261	0.240		**0.251**

Notes:
51 ft from upstream manhole
Pipeline coating prevented additional UT readings

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/12/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 18**	**Procedure No:**
Pipe ID: 1833	**Diameter: 10**	

Ultrasonic Flow Detector / Gage		**Transducer(s)**		**Calibration Standards(s)**	
Manufacter:	**Olympus**	**Manufacter:**	**Olypus**	**Material:**	**Steel**
Model No:	**38DL PLUS**	**Model No.:**	**D790-SM**	**S/N:**	**2214E**
Serial No:	**203676909**	**Serial No.:**	**1435517**	**Step #:**	**5-Step**
Cable Type:	**Dual Molded LEMO 00 to Microdot Cable**	**Frequency:**	**5MHz**	**Thickness:**	**0.100", 0.200", 0.300", 0.400", 0.500"**
Cable Length:	**5Ft**	**Size:**	**0.434" Tip Diameter**	**Calibration Date:**	**4/15/23**

Starting Manhole: 7618

Site Location:	**Start Location:**
	

Supporting Photos

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Comments:

ULTRASONIC THICKNESS REPORT

Project Name: Morgan Creek Aerial Assessment	**Project No.: 01519-0062**	**Date: 04/12/2023**
Client Name: Orange Water and Sewer Authority	**Site Number: 18**	**Procedure No:**
Pipe ID: 1833	**Diameter: 10**	

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.575	0.574	0.569		**0.573**
45 Degree:	0.569	0.586	0.562		**0.572**
90 Degree:	0.556	0.551	0.553		**0.553**
135 Degree:	0.550	0.552	0.554		**0.552**
180 Degree:	0.567	0.562	0.554		**0.561**
200 Degree:	0.572	0.578	0.560		**0.570**
270 Degree:	0.559	0.587	0.558		**0.568**
315 Degree:	0.597	0.595	0.581		**0.591**

Notes:

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.614	0.620	0.623		**0.619**
45 Degree:	0.645	0.641	0.646		**0.644**
90 Degree:	0.634	0.633	0.640		**0.636**
135 Degree:	0.630	0.635	0.600		**0.622**
180 Degree:	**Obstructed, cannot get readings**				
200 Degree:	0.543	0.560	0.576		**0.560**
270 Degree:	0.636	0.618	0.627		**0.627**
315 Degree:	0.638	0.642	0.649		**0.643**

Notes:

	Reading 1	Reading 2	Reading 3		Average
0 Degree:	0.531	0.527	0.532		**0.530**
45 Degree:	0.523	0.527	0.523		**0.524**
90 Degree:	0.542	0.556	0.523		**0.540**
135 Degree:	0.534	0.559	0.514		**0.536**
180 Degree:	0.535	0.532	0.537		**0.535**
200 Degree:	0.507	0.506	0.514		**0.509**
270 Degree:	0.528	0.528	0.531		**0.529**
315 Degree:	0.525	0.530	0.527		**0.527**

Notes:

Technician: MCousins@mckimcreed.com
Date: 04/20/2023 06:52

Appendix C

Manhole Inspection Results

McKIM&CREED

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 6806 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:41 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Easements / Right-of-way **Weather:** Dry

Comment: N/A

Surface Cover Material: Grass / Dirt

Location Coordinates

X: 1976772.430073 **Y:** 782782.619994

Rim to Invert (ft): 8 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: No Defects **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Slight **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 18.25 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: No Defect **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Plastic **Steps Condition:** No Defects

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 10% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: Debris **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 6806 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:41 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	6808	8	DIP	GM	RES	18	C	6	ND	
2	INLET	6798	8	DIP	GM	RES	14	C	12	ND	
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

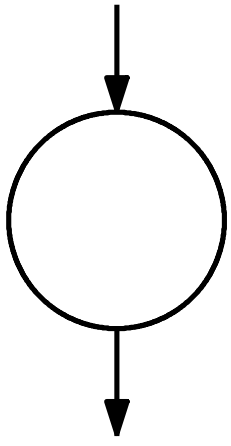
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



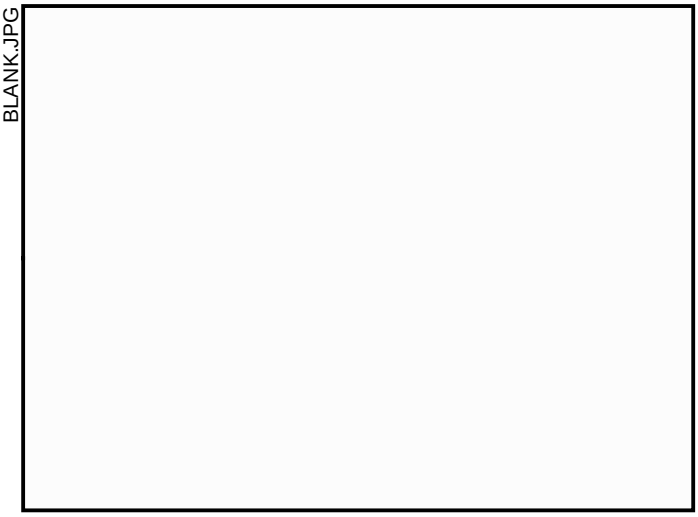
Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 6806 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:41 AM

Landscape

BLANK.JPG



Down View

PHOTO 4.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 6806 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:41 AM



0 50 100

Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

Map Disclaimer: This product is for informational purposes only and is based on some unverified information provided by others. This product has not been prepared for nor is it suitable for legal, engineering, or surveying purposes. It represents only the approximate relative location of property boundaries. McKim & Creed, Inc. assumes no liability or damages due to inaccuracies, errors or omissions.

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 6808 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 04:38 PM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Secondary Road **Weather:** Dry

Comment: N/A

Surface Cover Material: Grass / Dirt

Location Coordinates

X: 1976935.790639 **Y:** 782776.504849

Rim to Invert (ft): 11.6 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: No Defects **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 16 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: No Defect **Chimney Inflow:** N/A

Chimney Material: Brick

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Plastic **Steps Condition:** No Defects

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 10% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 6808 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 04:38 PM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
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DIP - Ductile Iron
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HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	6835	11.6	DIP	GM	RES	18	C	6	ND	
2	INLET	6806	11.6	DIP	GM	RES	18	C	10	ND	
3	INLET	8346	10.7	DIP	GM	RES	8	C	2	ND	Gap in concrete
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

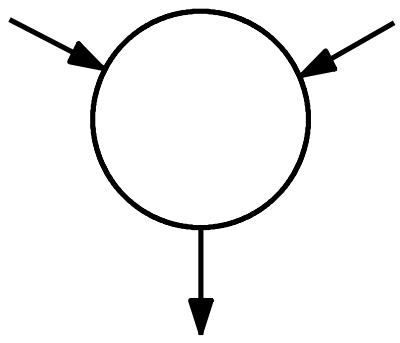
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 6808 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 04:38 PM

Landscape

PHOTO 5.JPG



Down View

PHOTO 4.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Pipe 3

PHOTO 3.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 6808 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 04:38 PM



0 50 100

Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

Map Disclaimer: This product is for informational purposes only and is based on some unverified information provided by others. This product has not been prepared for nor is it suitable for legal, engineering, or surveying purposes. It represents only the approximate relative location of property boundaries. McKim & Creed, Inc. assumes no liability or damages due to inaccuracies, errors or omissions.

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7020 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 12:48 PM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Easements / Right-of-way | Woods **Weather:** Dry

Comment: N/A

Surface Cover Material: Grass

Location Coordinates

X: 1975993.470017 **Y:** 782208.25008

Rim to Invert (ft): 9.9 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Heavy **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 15 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: Corroded, Slight **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Poor **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Plastic **Steps Condition:** No Defects

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 25% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: Corroded, Slight **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7020 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 12:48 PM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	6943	9.9	DIP	GM	RES	18	C	6	ND	
2	INLET	7015	8.8	VCP	GM	RES	8	C	9	ND	
3	INLET	7021	9.9	DIP	GM	RES	18	C	3	ND	
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

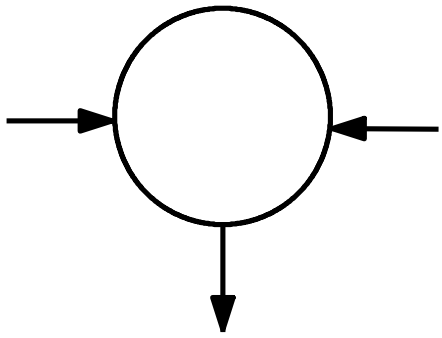
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment: Root from Precast wall joint

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☐ 4 ☑ 5 ☐

Recommended Rehab:

Comment: Remove Roots / Coat MH Interior

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7020 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 12:48 PM

Landscape

PHOTO 5.JPG



Down View

PHOTO 4.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Pipe 3

PHOTO 3.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7020 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 12:48 PM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7021 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 01:27 PM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Woods **Weather:** Dry

Comment: N/A

Surface Cover Material: Grass / Dirt

Location Coordinates

X: 1975909.529896 **Y:** 782190.349853

Rim to Invert (ft): 10.7 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Heavy **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Slight **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 45.5 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: Corroded, Slight **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: N/A **Steps Condition:** N/A

Check if structure is Lined? Yes **Check if Lining is Defective?** No

Flow Depth: 25% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7021 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 01:27 PM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7020	10.7	DIP	GM	RES	18	C	6	ND	
2	INLET	7018	10.7	DIP	GM	RES	18	C	1	ND	
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

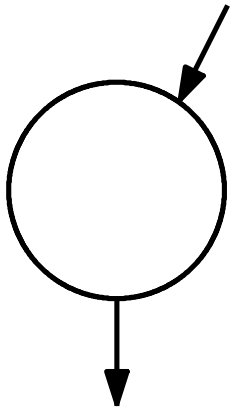
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7021 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 01:27 PM

Landscape

PHOTO 4.JPG



Down View

PHOTO 3.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

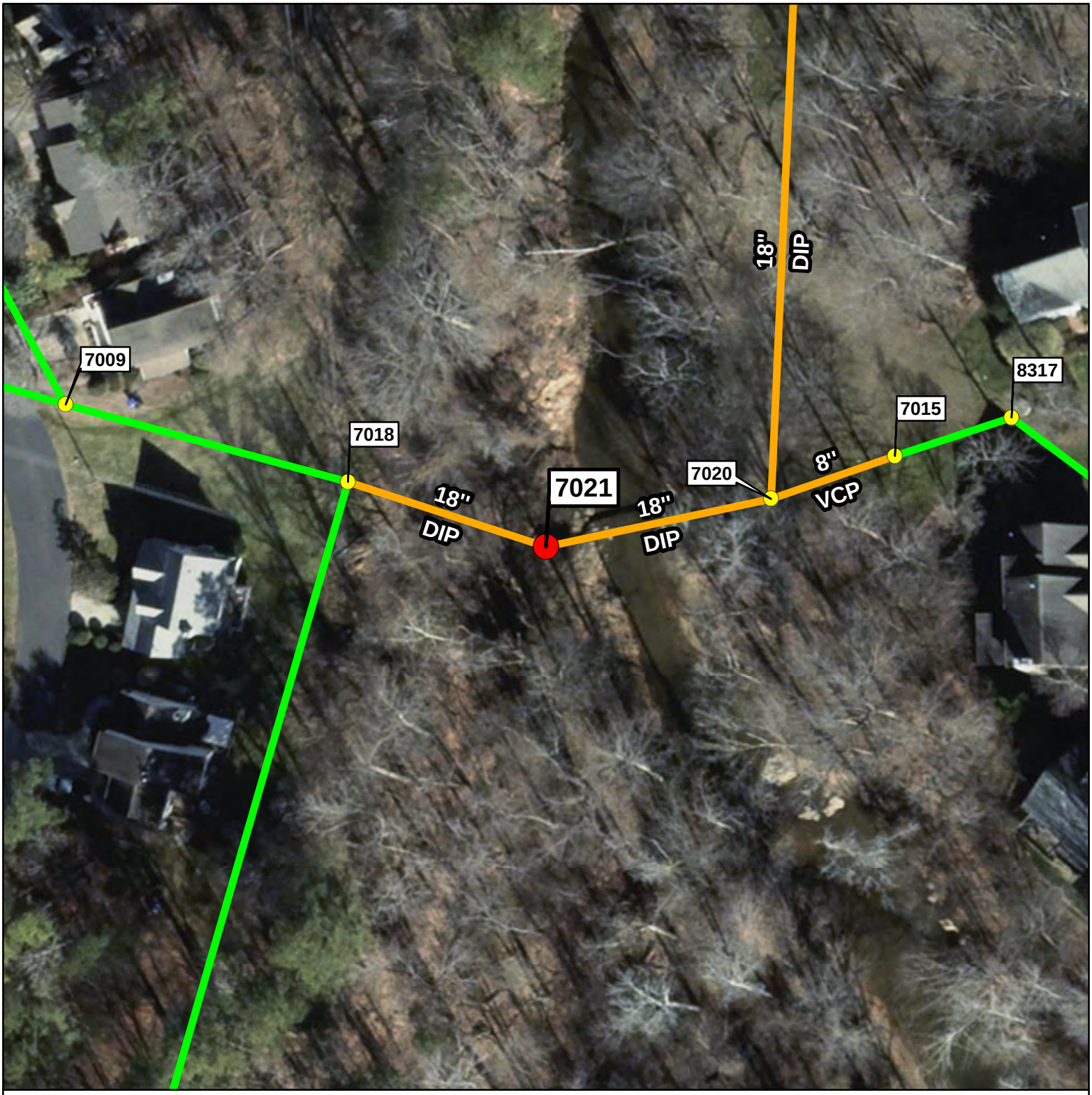
PHOTO 2.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7021 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 01:27 PM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7224 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 02:24 PM

General Information

Inspection Status: Inspected, Remote	**Structure Type:** Manhole
Location: Woods	**Weather:** Dry
Comment: N/A	
Surface Cover Material: Grass	
Location Coordinates	**Rim to Invert (ft):** 8.5 **Inflow Potential:** N/A
X: 1974711.739969 **Y:** 781247.939992	**Potential Surface Ponding (sq ft)**
Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet	

Frame & Cover

Cover Condition: Corroded, Slight	**Cover Inflow:** N/A
Cover Material: Iron with 1 or 2 Holes	
Frame Condition: Corroded, Slight	**Frame Inflow:** N/A
Frame Material: Cast Iron	**Frame Seal Condition:** N/A
Cover Diameter: 23.5 in.	**Rim to Grade:** 21.5 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight	**Ring Inflow:** N/A
Rings Material: Cast Iron	
Chimney Condition: Cracked	**Chimney Inflow:** N/A
Chimney Material: Cast-in-Place Concrete	
Chimney Seal Present? No	**Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects	**Cone Infiltration:** N/A
Cone Material: Precast Concrete	

Barrel & Steps

Barrel Condition: Good	**Barrel Infiltration:** N/A
Barrel Material: Precast Concrete	
Barrel Diameter: 48 in.	
Steps Material: Plastic	**Steps Condition:** No Defects | Small debris
Check if structure is Lined? No	**Check if Lining is Defective?** N/A
Flow Depth: 2% of discharge pipe X-section	

Bench & Channel

Debris Build-up? No	**Debris Depth:** 0 in.
Bench Condition: Debris	**Bench Infiltration:** N/A
Bench Material: Cast-in-Place Concrete	
Channel Condition: No Defects	**Channel Infiltration:** N/A
Channel Material: Cast-in-Place Concrete	

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7224 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 02:24 PM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	28194	8.5	DIP	GM	RES	12	C	6	ND	
2	INLET	7279	8.5	DIP	GM	RES	12	C	11	ND	
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

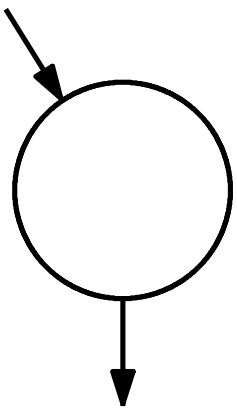
Surcharge: Y ☐ N ☑ Surcharge Depth: 0 ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7224 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 02:24 PM

Landscape

PHOTO 4.JPG



Down View

PHOTO 3.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

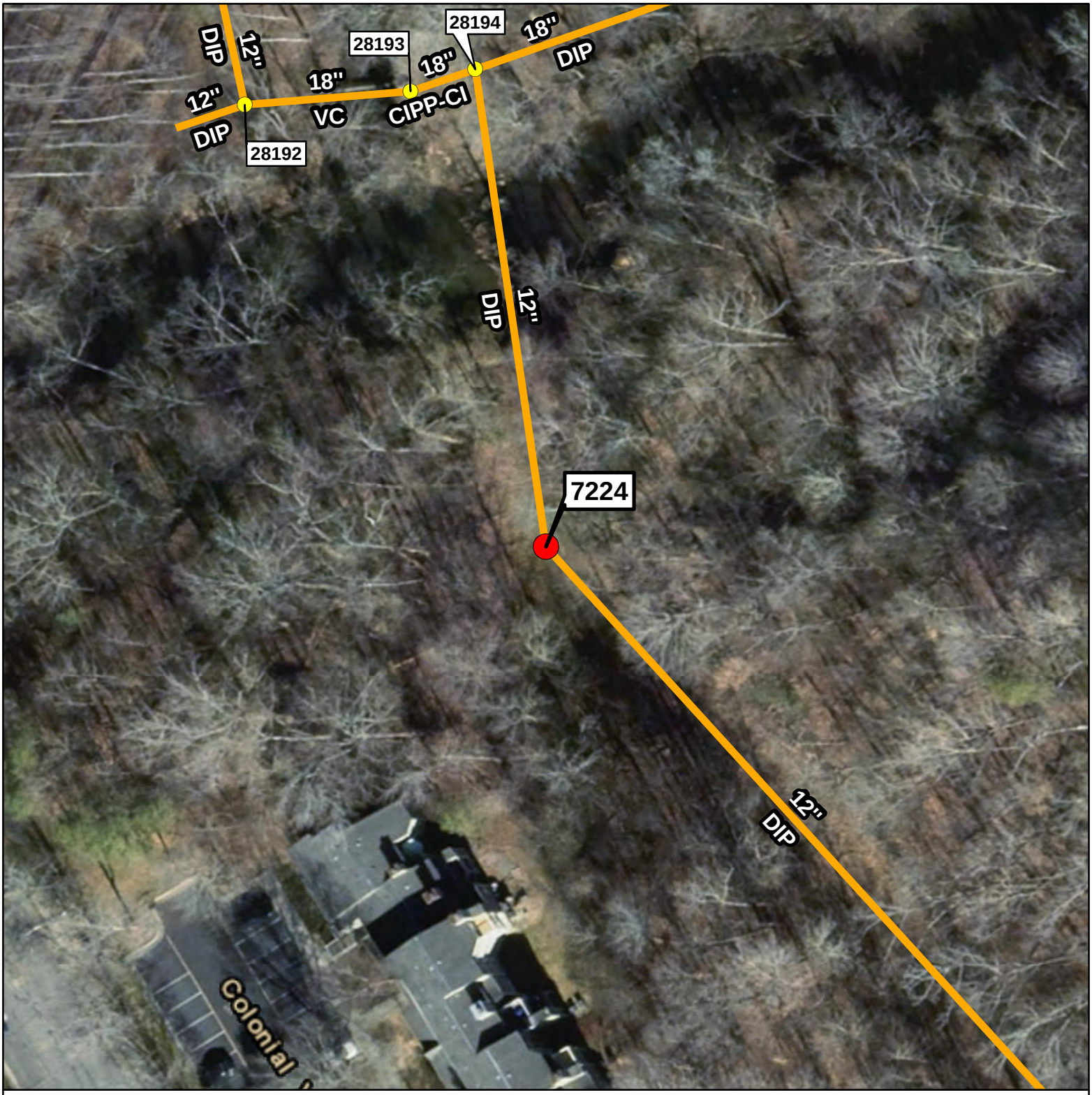
PHOTO 2.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7224 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 02:24 PM



0 50 100
Feet

N

Manhole

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7606 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:29 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Easements / Right-of-way **Weather:** Dry

Comment: N/A

Surface Cover Material: Grass / Dirt

Location Coordinates

X: 1982547.740045 **Y:** 779649.269961

Rim to Invert (ft): 7.9 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Heavy **Cover Inflow:** N/A

Cover Material: Iron without Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 15 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: Cracked | Corroded, Slight **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: Corroded, Slight **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Fair **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Cast Iron **Steps Condition:** Broken | Corroded, Heavy | MIssing

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 10% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** 0 in.

Bench Condition: Corroded, Slight **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: Corroded, Slight **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7606 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:29 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7632	7.9	CIPP-CI	GM	RES	24	C	6	ND	
2	INLET	13075	7.9	DIP	GM	RES	24	C	12	ND	
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

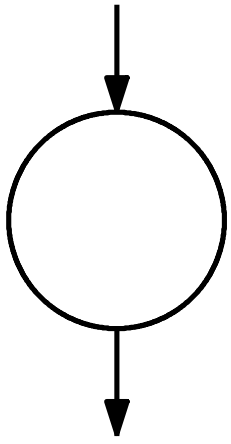
Surcharge: Y ☐ N ☑ Surcharge Depth: 0 ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



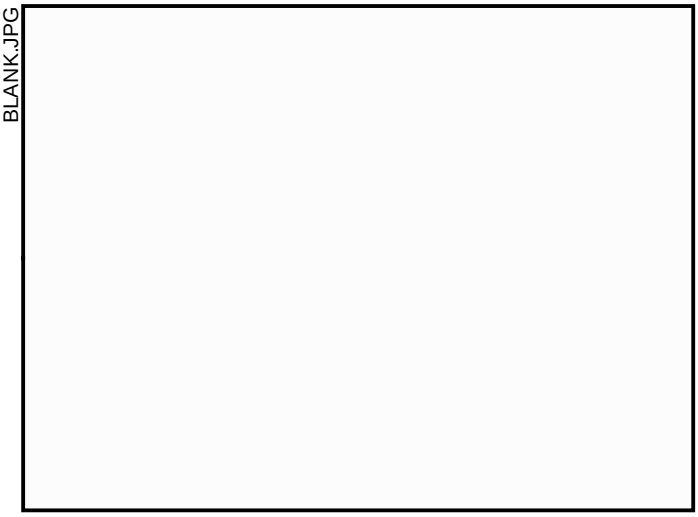
Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7606 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:29 AM

Landscape

BLANK.JPG



Down View

PHOTO 3.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7606 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:29 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7618 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:26 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Easements / Right-of-way **Weather:** Dry

Comment: N/A

Surface Cover Material: Grass / Dirt

Location Coordinates

X: 1983404.050012 **Y:** 779600.899979

Rim to Invert (ft): 4.7 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: No Defects **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 2 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: Corroded, Slight **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Steel **Steps Condition:** Corroded, Heavy

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 10% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7618 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:26 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7624	4.7	VC	GM	RES	10	C	6	ND	
2	INLET	7553	4.7	VC	GM	RES	10	C	12	ND	
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

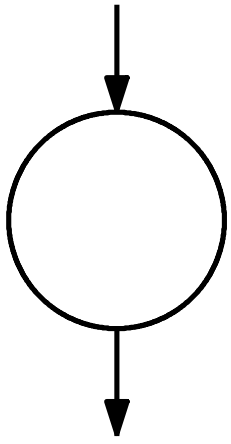
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7618 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:26 AM

Landscape

PHOTO 4.JPG



Down View

PHOTO 3.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7618 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:26 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

Map Disclaimer: This product is for informational purposes only and is based on some unverified information provided by others. This product has not been prepared for nor is it suitable for legal, engineering, or surveying purposes. It represents only the approximate relative location of property boundaries. McKim & Creed, Inc. assumes no liability or damages due to inaccuracies, errors or omissions.

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7624 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:08 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Easements / Right-of-way | Woods **Weather:** Dry

Comment: N/A

Surface Cover Material: Grass / Dirt

Location Coordinates

X: 1983394.590057 **Y:** 779557.909908

Rim to Invert (ft): 6.2 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: No Defects **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Slight **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 16 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: No Defect **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: 48 in.

Steps Material: Steel **Steps Condition:** Corroded, Heavy

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 10% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** 0 in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7624 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:08 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7656	6.2	DIP	GM	RES	12	C	6	ND	
2	INLET	7618	6.2	VC	GM	RES	10	C	12	ND	
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

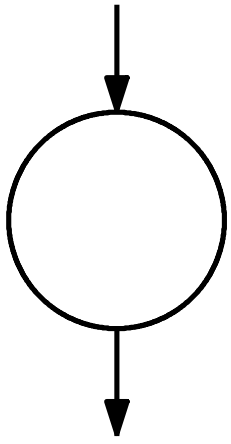
Surcharge: Y ☐ N ☑ Surcharge Depth: 0 ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7624 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:08 AM

Landscape

PHOTO 4.JPG



Down View

PHOTO 3.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

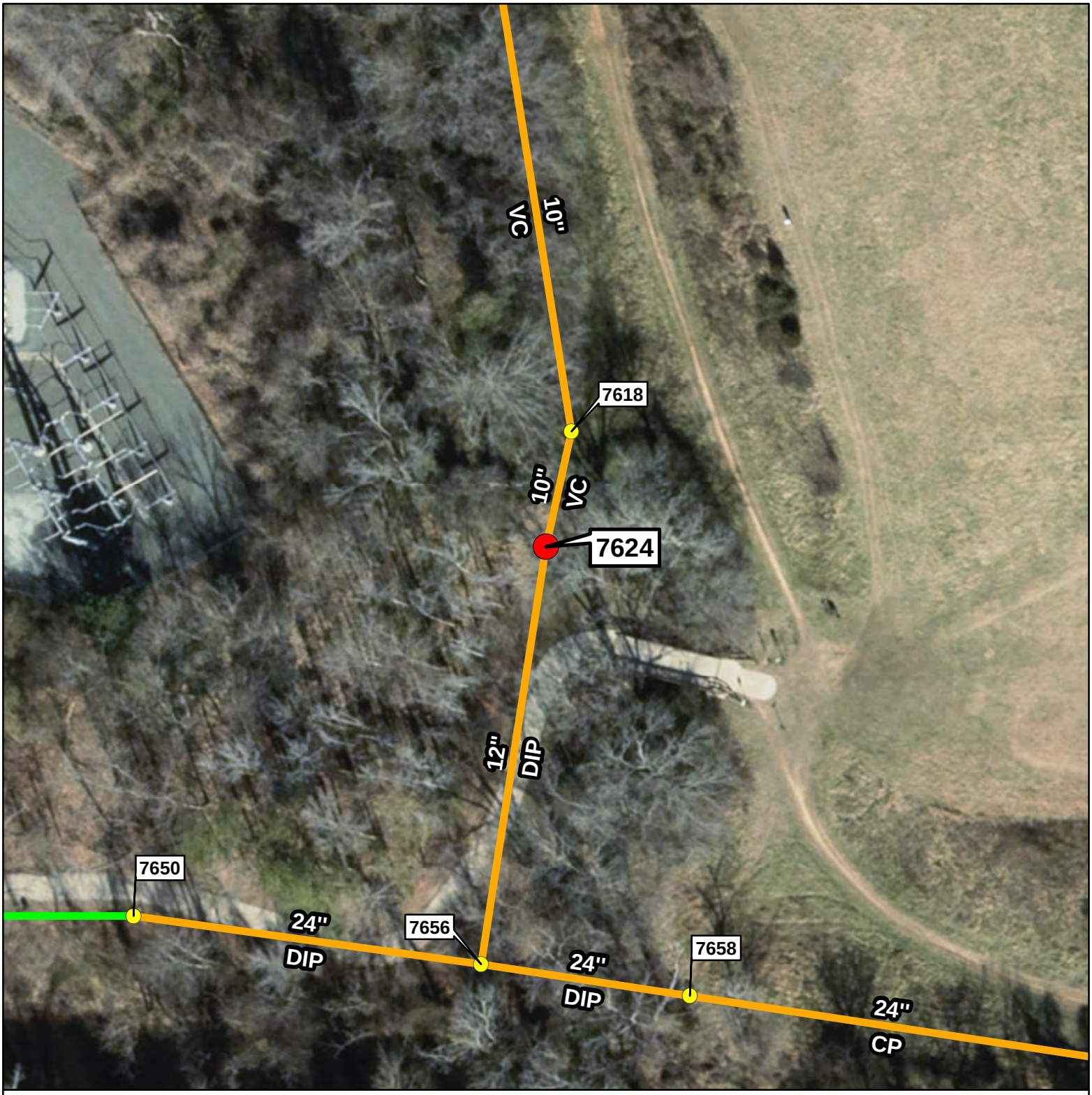
PHOTO 2.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7624 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:08 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7631 DATE: 4/19/2023
Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:37 AM

General Information

Inspection Status: Inspected, Remote
Structure Type: Manhole
Location: Woods
Weather: Dry
Comment: N/A
Surface Cover Material: Concrete
Location Coordinates
X: 1986263.780513 **Y:** 779493.467452
Rim to Invert (ft): 7.8 **Inflow Potential:** N/A
Potential Surface Ponding (sq ft)
Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Heavy
Cover Inflow: N/A
Cover Material: Iron with 1 or 2 Holes
Frame Condition: Corroded, Heavy
Frame Inflow: N/A
Frame Material: Cast Iron
Frame Seal Condition: N/A
Cover Diameter: 23.5 in.
Rim to Grade: 78 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Heavy
Ring Inflow: N/A
Rings Material: Cast Iron
Chimney Condition: Corroded, Heavy
Chimney Inflow: N/A
Chimney Material: Cast-in-Place Concrete
Chimney Seal Present? No
Check if Chimney Seal is Defective? N/A

Cone Section

Cone Condition: Corroded, Slight
Cone Infiltration: N/A
Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Poor
Barrel Infiltration: N/A
Barrel Material: Precast Concrete
Barrel Diameter: in.
Steps Material: Cast Iron
Steps Condition: Corroded, Heavy
Check if structure is Lined? No
Check if Lining is Defective? N/A
Flow Depth: 50% of discharge pipe X-section

Bench & Channel

Debris Build-up? No
Debris Depth: in.
Bench Condition: Corroded, Heavy
Bench Infiltration: N/A
Bench Material: Cast-in-Place Concrete
Channel Condition: Corroded, Slight
Channel Infiltration: N/A
Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7631 DATE: 4/19/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:37 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	10371	7.8	DIP	GM	RES	24	C	6	ND	
2	INLET	7666	7.8	DIP	GM	RES	24	C	1	ND	
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

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Comment:

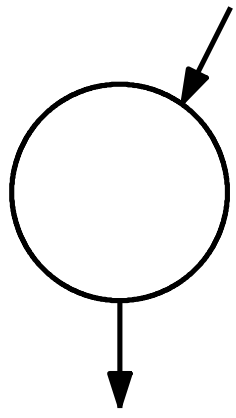
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



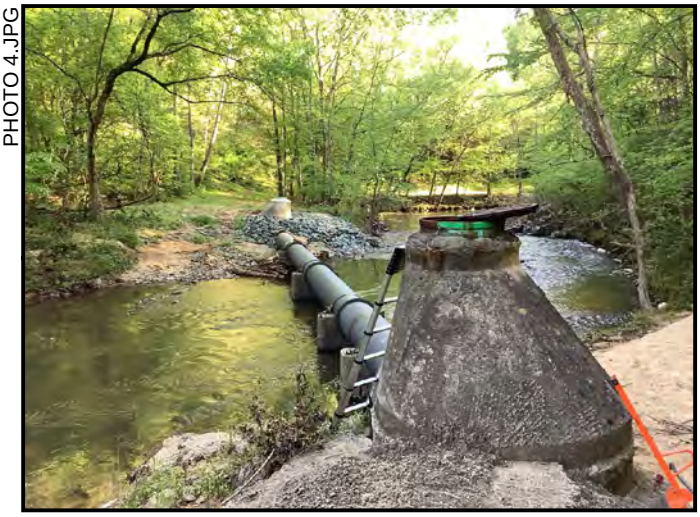
Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7631 DATE: 4/19/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:37 AM

Landscape

PHOTO 4.JPG



Down View

PHOTO 3.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7631 DATE: 4/19/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:37 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7656 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:52 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Woods **Weather:** Dry

Comment: N/A

Surface Cover Material: Concrete

Location Coordinates

X: 1983370.420158 **Y:** 779402.230101

Rim to Invert (ft): 7.8 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Slight **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 30 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Heavy **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: Corroded, Slight **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Cast Iron **Steps Condition:** Corroded, Heavy

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 50% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7656 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:52 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7658	7.8	DIP	GM	RES	24	C	6	ND	
2	INLET	7624	7.1	DIP	GM	RES	12	C	3	ND	
3	INLET	7650	7.8	DIP	GM	RES	24	C	12	ND	
4											
5											
6											
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10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

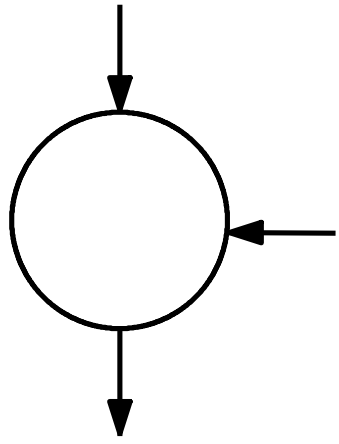
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7656 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:52 AM

Landscape

PHOTO 6.JPG



Down View

PHOTO 5.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Pipe 3

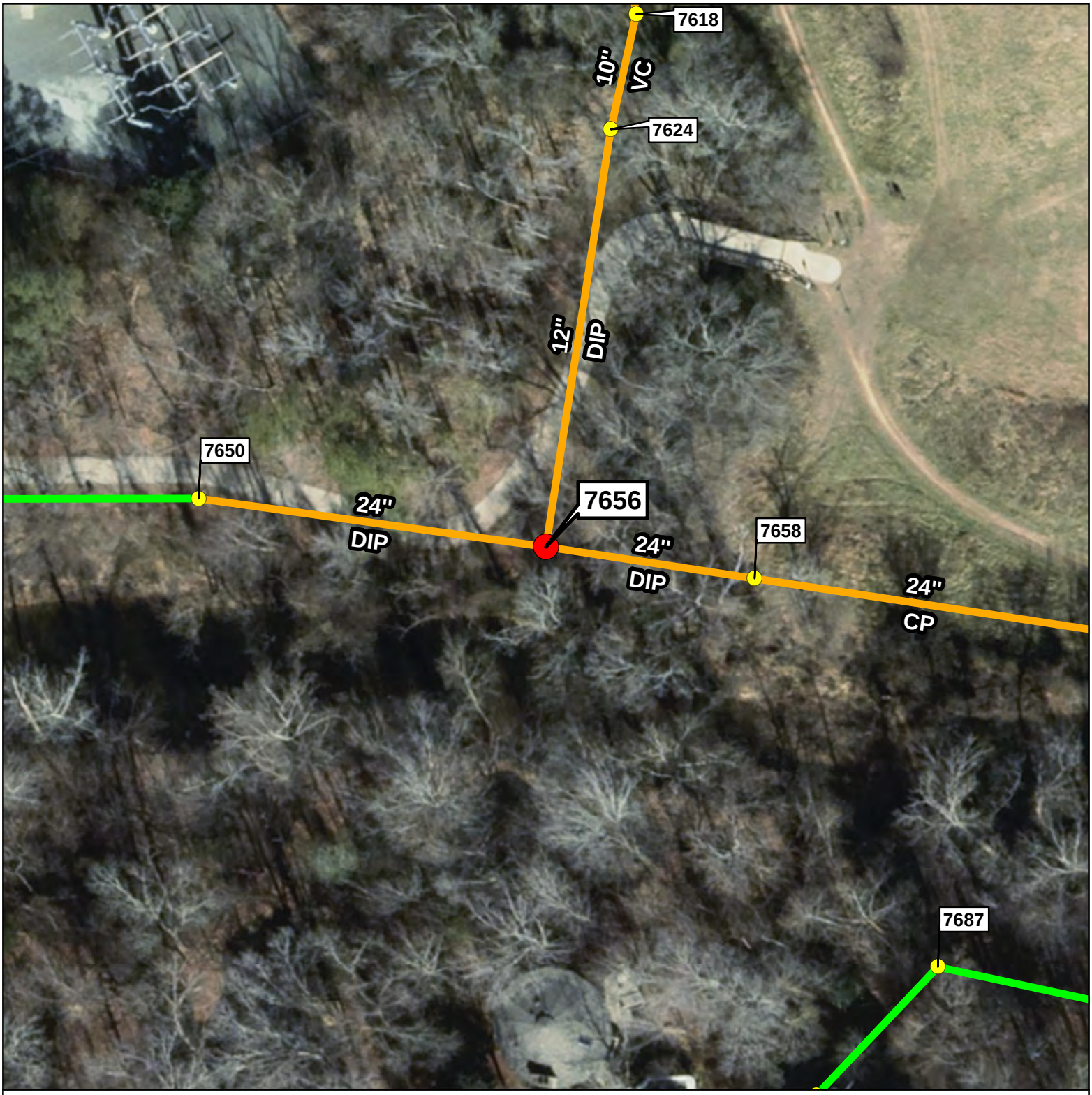
PHOTO 4.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7656 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:52 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7658 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:03 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Woods **Weather:** Dry

Comment: N/A

Surface Cover Material: Concrete

Location Coordinates

X: 1983448.319937 **Y:** 779390.400072

Rim to Invert (ft): 7.9 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Slight **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 29.25 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Heavy **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: Corroded, Slight **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Cast-in-Place Concrete

Barrel & Steps

Barrel Condition: Fair **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Cast Iron **Steps Condition:** Corroded, Heavy

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 10% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7658 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:03 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7663	7.9	CP	GM	RES	24	C	6	CR	
2	INLET	7656	7.9	CP | DIP	GM	RES	24	C	12	ND	
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.

Does Structure Require Full Inspection? Y ☐ N ☑

Comment: Aggregate projecting on wall

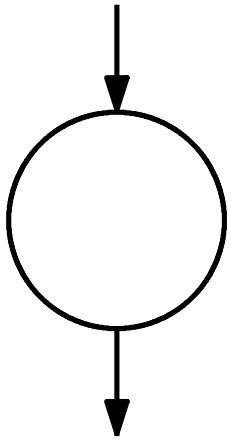
Structural Rating: 1 ☐ 2 ☐ 3 ☐ 4 ☑ 5 ☐

O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: Coat MH Interior

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7658 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:03 AM

Landscape

PHOTO 4.JPG



Down View

PHOTO 3.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7658 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:03 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7670 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:37 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Residential | Woods **Weather:** Light Rain

Comment: N/A

Surface Cover Material: Grass / Dirt

Location Coordinates

X: 1987958.367019 **Y:** 779322.799486

Rim to Invert (ft): 8.3 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Heavy **Cover Inflow:** N/A

Cover Material: Iron with 2+ Holes

Frame Condition: Corroded, Slight **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 31 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: Corroded, Slight **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: Corroded, Slight **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Poor **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: N/A **Steps Condition:** N/A

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 50% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: Corroded, Slight | Cracked **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7670 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:37 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7689	8.3	CIPP-CI	GM	RES	24	C	6	ND	
2	INLET	7638	6.9	DIP	GM	RES	8	C	1	ND	
3	INLET	1112AshPL	7.1	DIP	LAT	RES	4	B	2	ND	
4	INLET	7669	8.3	DIP	GM	RES	24	C	10	ND	
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.

Does Structure Require Full Inspection? Y ☐ N ☑

Comment: Spalling of concrete on bench

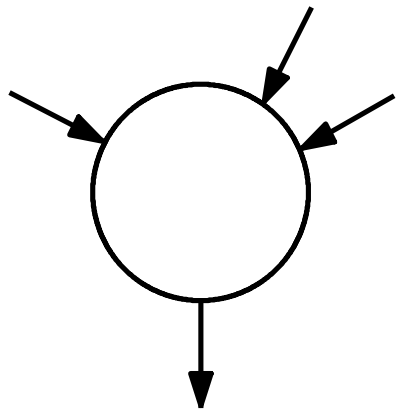
Structural Rating: 1 ☐ 2 ☐ 3 ☐ 4 ☑ 5 ☐

O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: Coat MH Interior

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7670 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:37 AM

Landscape

PHOTO 6.JPG



Down View

PHOTO 5.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Pipe 3

PHOTO 3.JPG



Pipe 4

PHOTO 4.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7670 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:37 AM



0 50 100
Feet

N

Manhole
Gravity Main (Unchanged)
Gravity Main (Updated Attributes)
Lateral

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7689 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:27 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Woods **Weather:** Light Rain

Comment: N/A

Surface Cover Material: Grass / Dirt

Location Coordinates

X: 1988025.909863 **Y:** 779235.17991

Rim to Invert (ft): 8.8 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Heavy **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 6 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: Corroded, Slight **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? Yes **Check if Chimney Seal is Defective?** No

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Cast-in-Place Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: N/A **Steps Condition:** N/A

Check if structure is Lined? Yes **Check if Lining is Defective?** N/A

Flow Depth: 50% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7689 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:27 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7679	8.8	DIP	GM	RES	24	C	3	ND	
2	INLET	7700	6.5	CT	GM	RES	8	C	6	ND	
3	INLET	7670	8.8	CIPP-CI	GM	RES	24	C	12	ND	
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

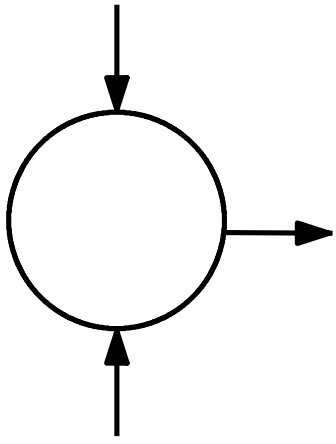
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7689 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:27 AM

Landscape

PHOTO 9.JPG



Down View

PHOTO 8.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 5.JPG



Pipe 3

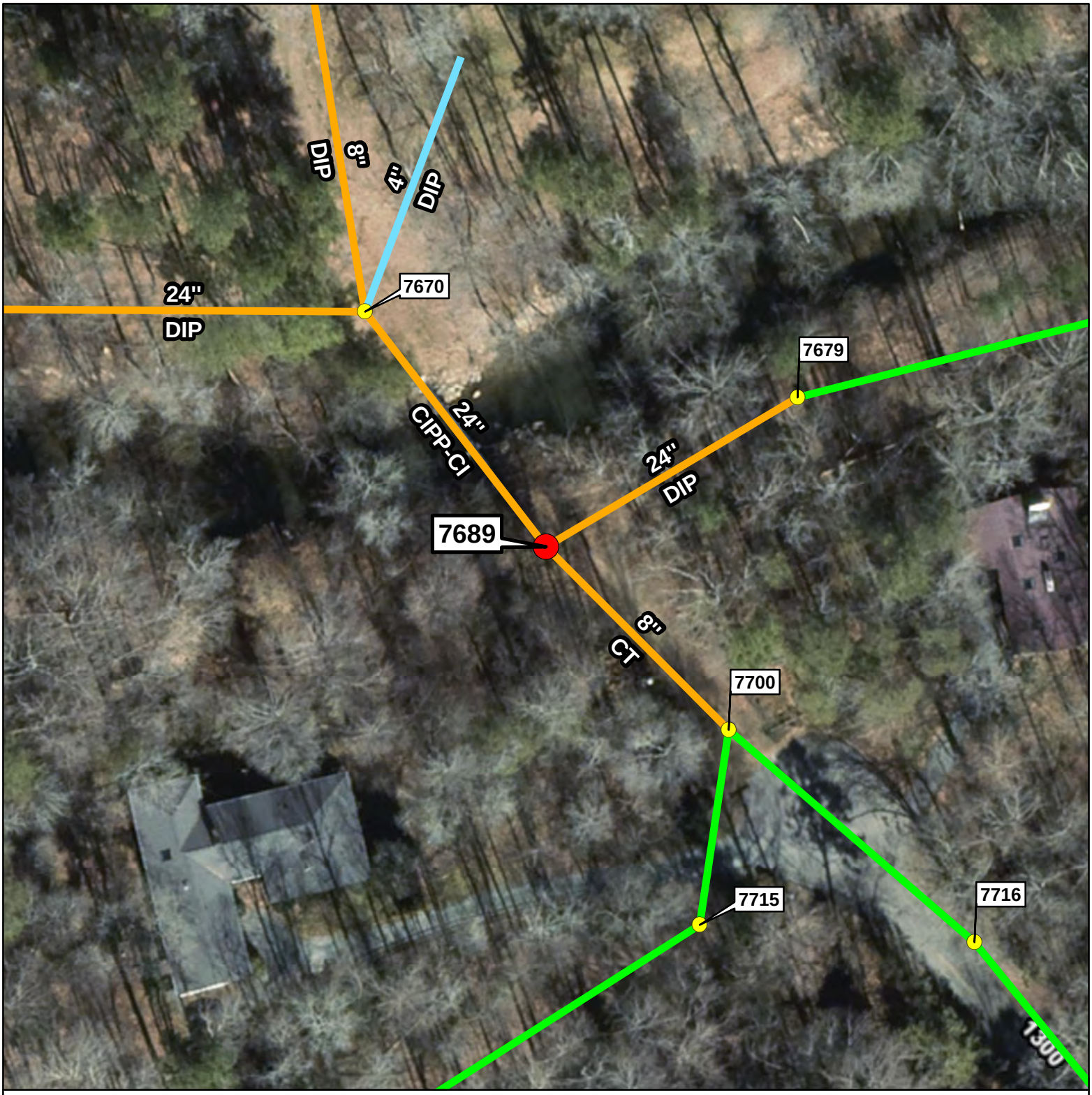
PHOTO 6.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7689 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:27 AM



0 50 100
Feet

N

Manhole
Gravity Main (Unchanged)
Gravity Main (Updated Attributes)
Lateral

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7697 DATE: 4/13/2023
Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 01:50 PM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole
Location: Woods **Weather:** Dry
Comment: N/A
Surface Cover Material: Concrete
Location Coordinates **Rim to Invert (ft):** 4.6 **Inflow Potential:** N/A
X: 1984088.109996 **Y:** 779187.519901 **Potential Surface Ponding (sq ft)**
Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: No Defects **Cover Inflow:** N/A
Cover Material: Iron with 1 or 2 Holes
Frame Condition: Corroded, Slight **Frame Inflow:** N/A
Frame Material: Cast Iron **Frame Seal Condition:** N/A
Cover Diameter: 23.5 in. **Rim to Grade:** 16 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A
Rings Material: Cast Iron
Chimney Condition: No Defect **Chimney Inflow:** N/A
Chimney Material: Cast-in-Place Concrete
Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A
Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A
Barrel Material: Precast Concrete
Barrel Diameter: in.
Steps Material: Plastic **Steps Condition:** No Defects
Check if structure is Lined? No **Check if Lining is Defective?** N/A
Flow Depth: 0% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.
Bench Condition: Debris **Bench Infiltration:** N/A
Bench Material: Cast-in-Place Concrete
Channel Condition: No Defects **Channel Infiltration:** N/A
Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7697 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 01:50 PM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7693	4.6	DIP	GM	RES	8	C	7	ND	
2	INLET	7706	4.6	DIP	GM	RES	8	C	12	ND	
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

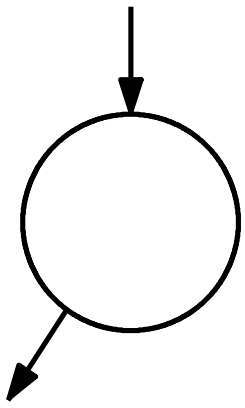
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7697 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 01:50 PM

Landscape

PHOTO 5.JPG



Down View

PHOTO 4.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7697 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 01:50 PM



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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7706 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 01:41 PM

General Information

Inspection Status: Inspected, Remote	**Structure Type:** Manhole
Location: Woods	**Weather:** Dry
Comment: N/A	
Surface Cover Material: Concrete	
Location Coordinates	**Rim to Invert (ft):** 4.6 **Inflow Potential:** N/A
X: 1984061.099879 **Y:** 779126.68997	**Potential Surface Ponding (sq ft)**
Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet	

Frame & Cover

Cover Condition: No Defects	**Cover Inflow:** N/A
Cover Material: Iron with 1 or 2 Holes	
Frame Condition: Corroded, Slight	**Frame Inflow:** N/A
Frame Material: Cast Iron	**Frame Seal Condition:** N/A
Cover Diameter: 23.5 in.	**Rim to Grade:** 43.5 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight	**Ring Inflow:** N/A
Rings Material: Cast Iron	
Chimney Condition: No Defect	**Chimney Inflow:** N/A
Chimney Material: Cast-in-Place Concrete	
Chimney Seal Present? No	**Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects	**Cone Infiltration:** N/A
Cone Material: Precast Concrete	

Barrel & Steps

Barrel Condition: Good	**Barrel Infiltration:** N/A
Barrel Material: Precast Concrete	
Barrel Diameter: in.	
Steps Material: Plastic	**Steps Condition:** No Defects
Check if structure is Lined? No	**Check if Lining is Defective?** N/A
Flow Depth: 0% of discharge pipe X-section	

Bench & Channel

Debris Build-up? No	**Debris Depth:** in.
Bench Condition: No Defects	**Bench Infiltration:** N/A
Bench Material: Cast-in-Place Concrete	
Channel Condition: No Defects	**Channel Infiltration:** N/A
Channel Material: Cast-in-Place Concrete	

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7706 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 01:41 PM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7697	4.6	DIP	GM	RES	8	C	6	ND	
2	INLET	7696	4.1	DIP	GM	RES	8	C	3	ND	
3	INLET	7738	4.6	DIP	GM	RES	8	C	12	ND	
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

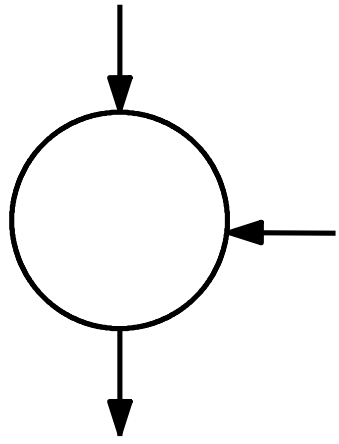
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7706 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 01:41 PM

Landscape

PHOTO 5.JPG



Down View

PHOTO 4.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Pipe 3

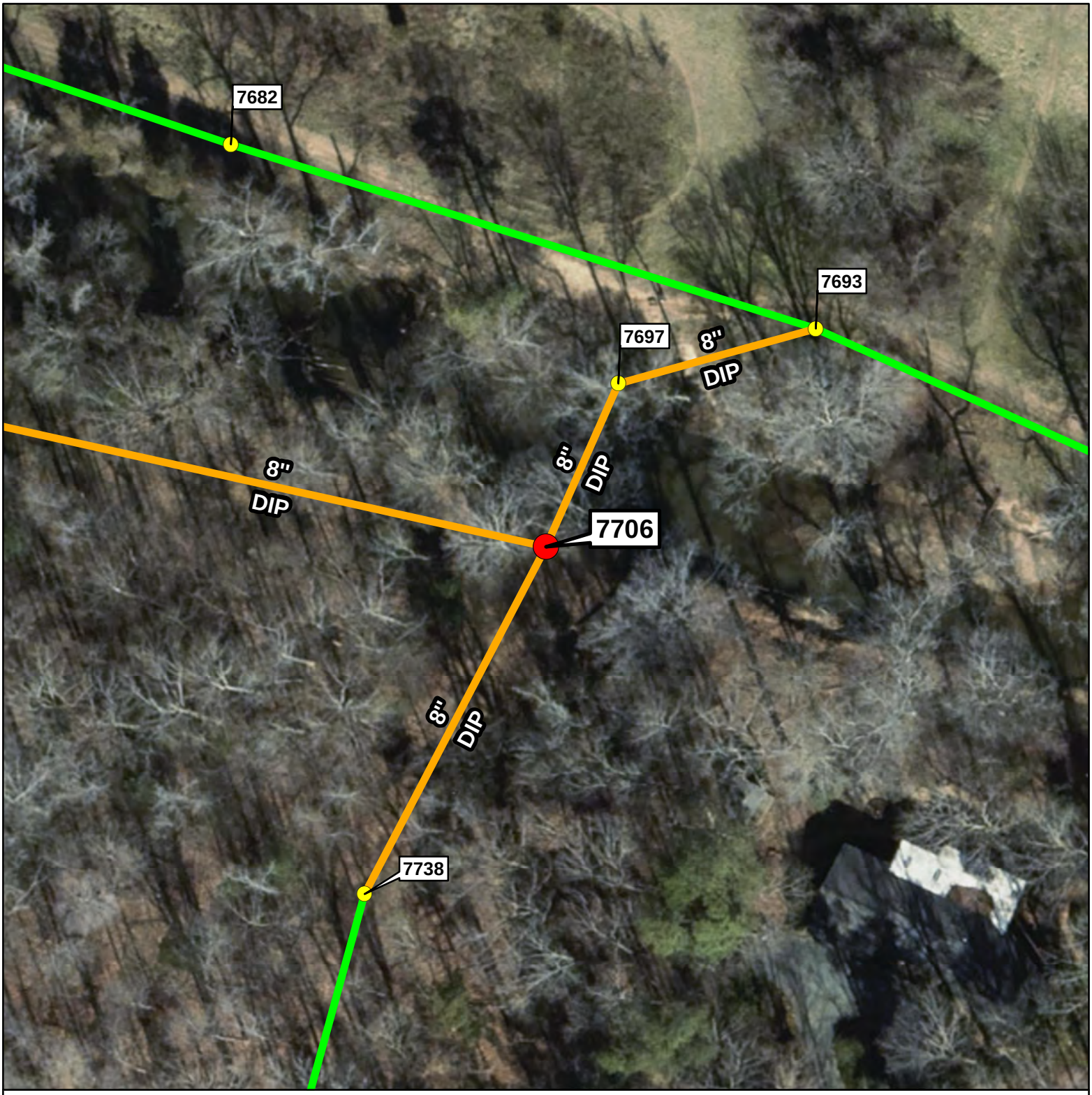
PHOTO 3.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7706 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 01:41 PM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7745 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 02:05 PM

General Information

Inspection Status: Inspected, Remote	**Structure Type:** Manhole
Location: Woods	**Weather:** Dry
Comment: N/A	
Surface Cover Material: Concrete	
Location Coordinates	**Rim to Invert (ft):** 8.1 **Inflow Potential:** N/A
X: 1984733.790135 **Y:** 778969.529851	**Potential Surface Ponding (sq ft)**
Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet	

Frame & Cover

Cover Condition: Corroded, Heavy	**Cover Inflow:** N/A
Cover Material: Iron with 1 or 2 Holes	
Frame Condition: Corroded, Heavy	**Frame Inflow:** N/A
Frame Material: Cast Iron	**Frame Seal Condition:** N/A
Cover Diameter: 23.5 in.	**Rim to Grade:** 55 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Heavy	**Ring Inflow:** N/A
Rings Material: Cast Iron	
Chimney Condition: N/A	**Chimney Inflow:** N/A
Chimney Material: N/A	
Chimney Seal Present? N/A	**Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects	**Cone Infiltration:** N/A
Cone Material: Precast Concrete	

Barrel & Steps

Barrel Condition: Good	**Barrel Infiltration:** N/A
Barrel Material: Precast Concrete	
Barrel Diameter: in.	
Steps Material: Cast Iron	**Steps Condition:** Corroded, Heavy
Check if structure is Lined? No	**Check if Lining is Defective?** N/A
Flow Depth: 50% of discharge pipe X-section	

Bench & Channel

Debris Build-up? No	**Debris Depth:** in.
Bench Condition: No Defects	**Bench Infiltration:** N/A
Bench Material: Cast-in-Place Concrete	
Channel Condition: No Defects	**Channel Infiltration:** N/A
Channel Material: Cast-in-Place Concrete	

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7745 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 02:05 PM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7770	8.1	CIPP-CI	GM	RES	24	C	6	ND	
2	INLET	7723	8.1	CONC	GM	RES	24	C	12	ND	
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

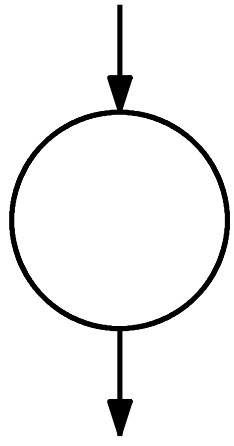
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7745 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 02:05 PM

Landscape

PHOTO 4.JPG



Down View

PHOTO 3.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

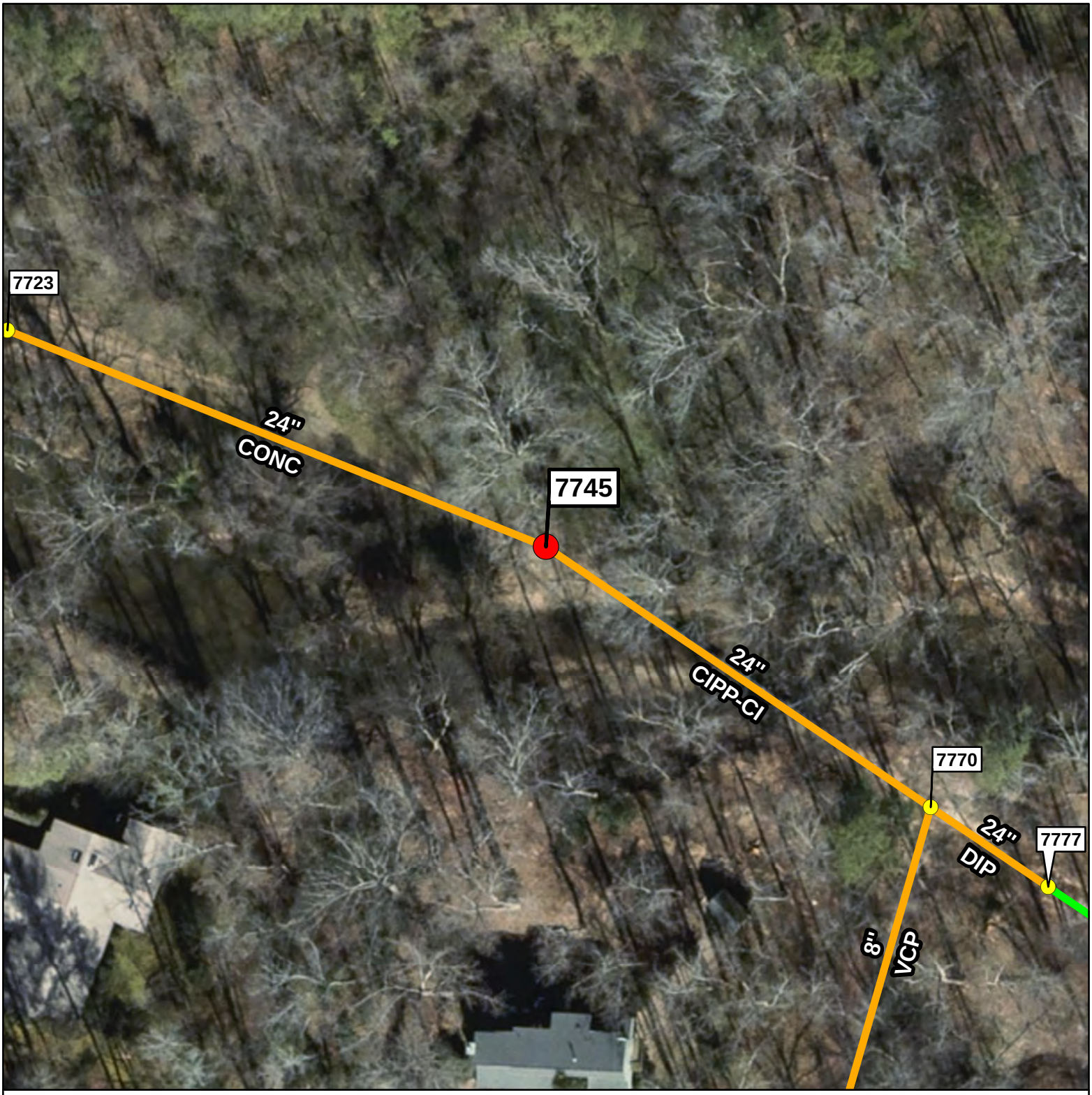
PHOTO 2.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7745 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 02:05 PM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7770 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 02:44 PM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Woods **Weather:** Dry

Comment: N/A

Surface Cover Material: Concrete

Location Coordinates

X: 1984877.360058 **Y:** 778872.409967

Rim to Invert (ft): 8.1 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Heavy **Cover Inflow:** N/A

Cover Material: Iron with 2+ Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 18.5 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Heavy **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: Corroded, Slight **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: Corroded, Slight **Cone Infiltration:** N/A

Cone Material: Cast-in-Place Concrete

Barrel & Steps

Barrel Condition: Poor **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Cast Iron **Steps Condition:** Corroded, Heavy

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 50% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7770 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 02:44 PM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7777	8.1	DIP	GM	RES	24	C	6	ND	
2	INLET	7816	6.9	VCP	GM	RES	8	C	4	ND	
3	INLET	7745	8.1	CIPP-CI	GM	RES	24	C	12	ND	
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.

Does Structure Require Full Inspection? Y ☐ N ☑

Comment: Aggregate projecting on wall

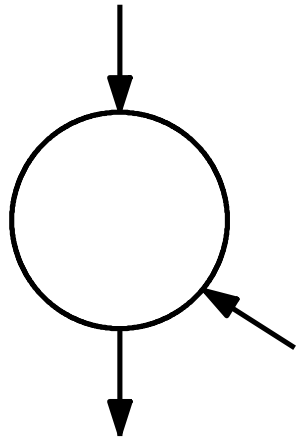
Structural Rating: 1 ☐ 2 ☐ 3 ☐ 4 ☑ 5 ☐

O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: Coat MH Interior

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7770 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 02:44 PM

Landscape

PHOTO 5.JPG



Down View

PHOTO 4.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Pipe 3

PHOTO 3.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 7770 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 02:44 PM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 8355 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:45 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Easements / Right-of-way | Railway **Weather:** Light Rain

Comment: N/A

Surface Cover Material: Concrete

Location Coordinates

X: 1977993.257028 **Y:** 782280.216799

Rim to Invert (ft): 12.8 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Slight **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 24.5 in.

Adjustment Rings & Chimney Seal

Ring Condition: N/A **Ring Inflow:** N/A

Rings Material: N/A

Chimney Condition: N/A **Chimney Inflow:** N/A

Chimney Material: N/A

Chimney Seal Present? N/A **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Fair **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Plastic **Steps Condition:** No Defects

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 10% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: Corroded, Slight **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 8355 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:45 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	9683	12.8	DIP	GM	RES	12	C	6	ND	
2	INLET	6997	9.2	DIP	GM	RES	12	C	10	ND	Drop connection
3	INLET	6997	12.8	DIP	GM	RES	12	C	2	ND	
4	INLET	SVC	8.2	DIP	GM	RES	4	C	5	ND	
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.

Does Structure Require Full Inspection? Y ☐ N ☑

Comment: Manhole cover missing bolts

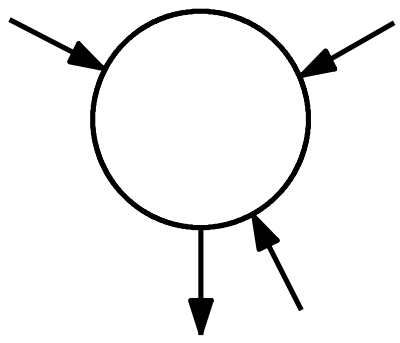
Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 8355 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:45 AM

Landscape

PHOTO 5.JPG



Down View

PHOTO 4.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Pipe 3

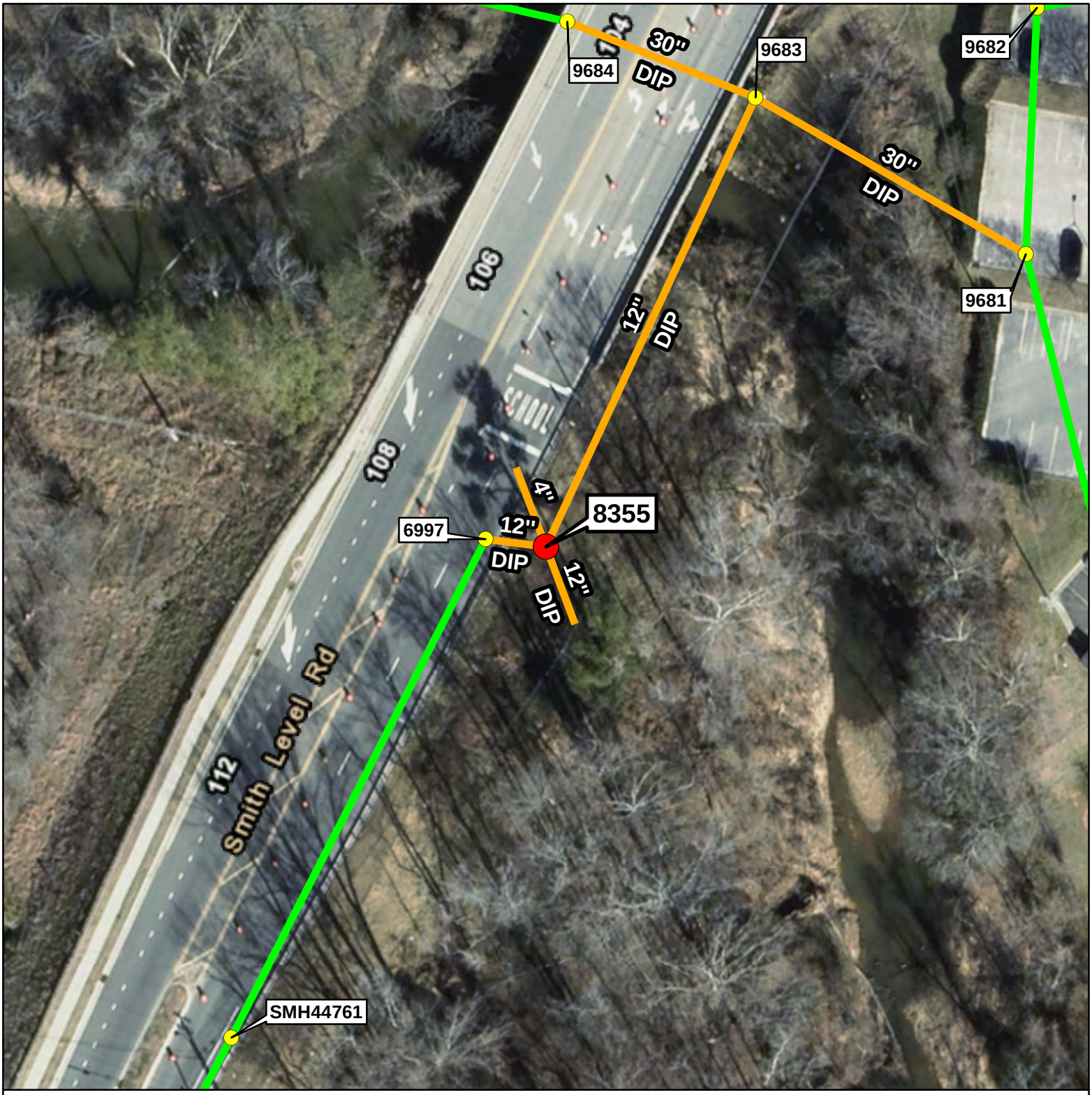
PHOTO 3.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 8355 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:45 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9666 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:28 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Easements / Right-of-way **Weather:** Dry

Comment: N/A

Surface Cover Material: Concrete

Location Coordinates

X: 1980625.59986 **Y:** 781118.109872

Rim to Invert (ft): 9.4 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: No Defects **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 54 in.

Adjustment Rings & Chimney Seal

Ring Condition: N/A **Ring Inflow:** N/A

Rings Material: N/A

Chimney Condition: N/A **Chimney Inflow:** N/A

Chimney Material: N/A

Chimney Seal Present? N/A **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Plastic **Steps Condition:** No Defects

Check if structure is Lined? Yes **Check if Lining is Defective?** No

Flow Depth: 10% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9666 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:28 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	13086	9.4	DIP	GM	RES	30	C	6	ND	
2	INLET	7261	8.1	DIP	GM	RES	8	C	9	ND	
3	INLET	9667	9.4	DIP	GM	RES	30	C	12	ND	
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

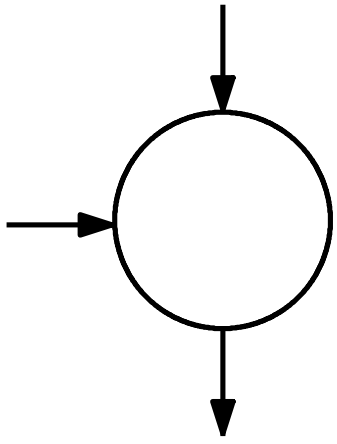
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9666 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:28 AM

Landscape

PHOTO 6.JPG



Down View

PHOTO 5.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Pipe 3

PHOTO 3.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9666 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:28 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9668 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:54 AM

General Information

Inspection Status: Inspected, Remote	**Structure Type:** Manhole
Location: Woods	**Weather:** Dry
Comment: N/A	
Surface Cover Material: Concrete	
Location Coordinates	**Rim to Invert (ft):** 9.4 **Inflow Potential:** N/A
X: 1980248.829945 **Y:** 781229.359977	**Potential Surface Ponding (sq ft)**
Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet	

Frame & Cover

Cover Condition: Corroded, Slight	**Cover Inflow:** N/A
Cover Material: Iron with 1 or 2 Holes	
Frame Condition: Corroded, Heavy	**Frame Inflow:** N/A
Frame Material: Cast Iron	**Frame Seal Condition:** N/A
Cover Diameter: 23.5 in.	**Rim to Grade:** 38.5 in.

Adjustment Rings & Chimney Seal

Ring Condition: N/A	**Ring Inflow:** N/A
Rings Material: N/A	
Chimney Condition: N/A	**Chimney Inflow:** N/A
Chimney Material: N/A	
Chimney Seal Present? N/A	**Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects	**Cone Infiltration:** N/A
Cone Material: Precast Concrete	

Barrel & Steps

Barrel Condition: Good	**Barrel Infiltration:** N/A
Barrel Material: Precast Concrete	
Barrel Diameter: in.	
Steps Material: Plastic	**Steps Condition:** No Defects
Check if structure is Lined? Yes	**Check if Lining is Defective?** No
Flow Depth: 25% of discharge pipe X-section	

Bench & Channel

Debris Build-up? No	**Debris Depth:** in.
Bench Condition: No Defects	**Bench Infiltration:** N/A
Bench Material: Cast-in-Place Concrete	
Channel Condition: No Defects	**Channel Infiltration:** N/A
Channel Material: Cast-in-Place Concrete	

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9668 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:54 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	9667	9.4	DIP	GM	RES	30	C	6	ND	
2	INLET	7234	8.4	DIP	GM	RES	8	C	9	ND	
3	INLET	9669	9.4	DIP	GM	RES	30	C	12	ND	
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

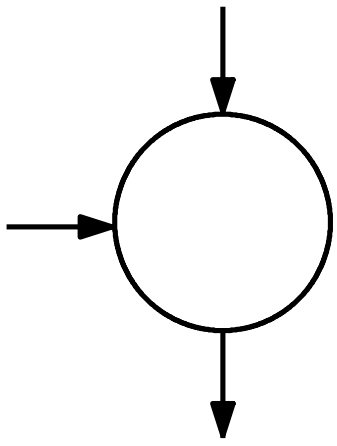
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9668 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:54 AM

Landscape

PHOTO 5.JPG



Down View

PHOTO 4.JPG



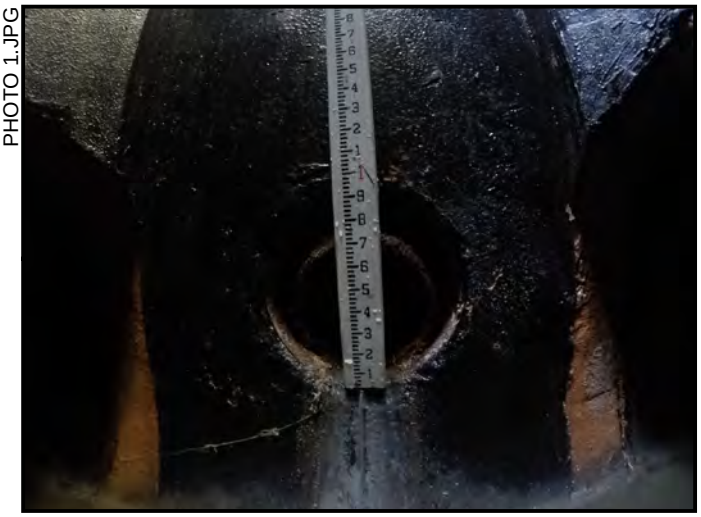
Pipe 1

PHOTO 2.JPG



Pipe 2

PHOTO 1.JPG



Pipe 3

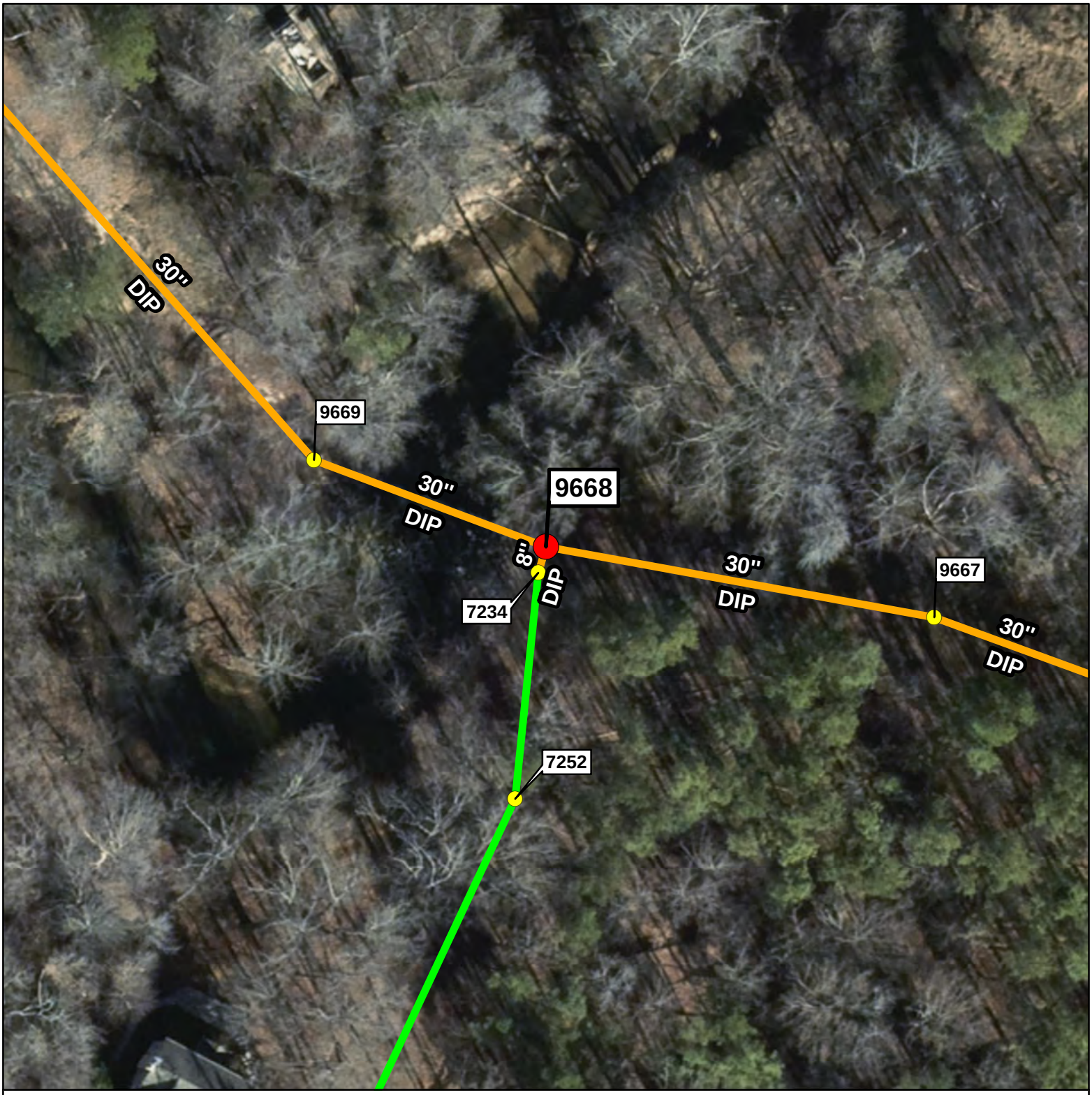
PHOTO 3.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9668 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:54 AM



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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9669 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:19 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Woods **Weather:** Dry

Comment: N/A

Surface Cover Material: Concrete | Grass / Dirt

Location Coordinates

X: 1980162.374409 **Y:** 781261.720477

Rim to Invert (ft): 9.3 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Slight **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 45 in.

Adjustment Rings & Chimney Seal

Ring Condition: N/A **Ring Inflow:** N/A

Rings Material: N/A

Chimney Condition: N/A **Chimney Inflow:** N/A

Chimney Material: N/A

Chimney Seal Present? N/A **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Plastic **Steps Condition:** No Defects

Check if structure is Lined? Yes **Check if Lining is Defective?** No

Flow Depth: 50% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9669 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:19 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	9668	9.3	DIP	GM	RES	30	C	6	ND	
2	INLET	9670	9.3	DIP	GM	RES	30	C	12	ND	
3											
4											
5											
6											
7											
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10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

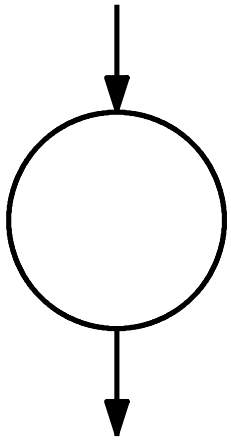
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9669 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:19 AM

Landscape

PHOTO 4.JPG



Down View

PHOTO 3.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9669 DATE: 4/13/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 09:19 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9683 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:04 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Easements / Right-of-way **Weather:** Light Rain

Comment: Side of overpass bridge

Surface Cover Material: Concrete

Location Coordinates

X: 1978071.399916 **Y:** 782447.745008

Rim to Invert (ft): 9.2 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Slight **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 56 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: N/A **Chimney Inflow:** N/A

Chimney Material: N/A

Chimney Seal Present? N/A **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Plastic **Steps Condition:** No Defects

Check if structure is Lined? Yes **Check if Lining is Defective?** No

Flow Depth: 10% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9683 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:04 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	9681	9.2	DIP	GM	RES	30	C	6	ND	
2	INLET	8355	9.2	DIP	GM	RES	12	C	9	ND	
3	INLET	9684	8.1	DIP	GM	RES	30	C	12	ND	
4											
5											
6											
7											
8											
9											
10											
11											
12											

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Comment:

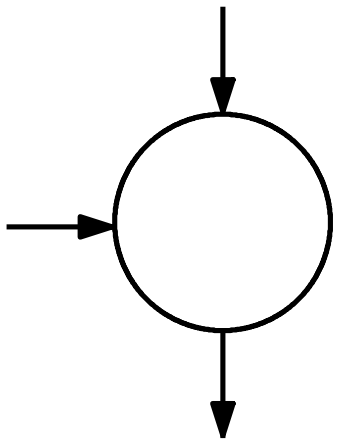
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9683 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:04 AM

Landscape

PHOTO 4.JPG



Down View

PHOTO 8.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

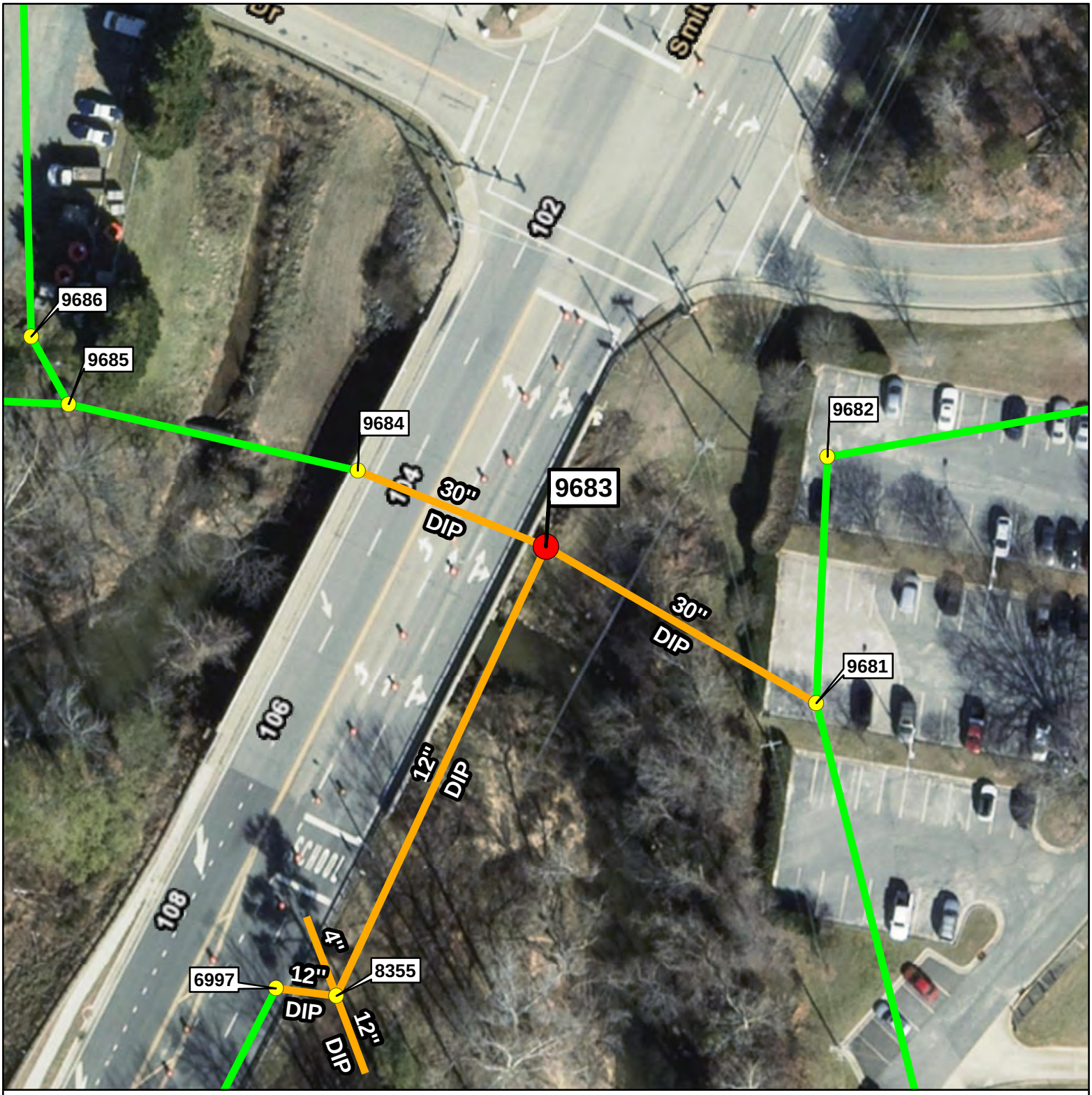
PHOTO 6.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 9683 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:04 AM



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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 10371 DATE: 4/19/2023
Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:49 AM

General Information

Inspection Status: Inspected, Remote
Structure Type: Manhole
Location: Woods
Weather: Dry
Comment: N/A
Surface Cover Material: Concrete
Location Coordinates
X: 1986254.233616 **Y:** 779583.020094
Rim to Invert (ft): 6.8 **Inflow Potential:** N/A
Potential Surface Ponding (sq ft)
Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Heavy
Cover Inflow: N/A
Cover Material: Iron with 1 or 2 Holes
Frame Condition: Corroded, Heavy
Frame Inflow: N/A
Frame Material: Cast Iron
Frame Seal Condition: N/A
Cover Diameter: 23.5 in.
Rim to Grade: 48 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Heavy
Ring Inflow: N/A
Rings Material: Cast Iron
Chimney Condition: Corroded, Slight
Chimney Inflow: N/A
Chimney Material: Cast-in-Place Concrete
Chimney Seal Present? No
Check if Chimney Seal is Defective? N/A

Cone Section

Cone Condition: Corroded, Slight
Cone Infiltration: N/A
Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Fair
Barrel Infiltration: N/A
Barrel Material: Precast Concrete
Barrel Diameter: in.
Steps Material: Plastic
Steps Condition: No Defects
Check if structure is Lined? No
Check if Lining is Defective? N/A
Flow Depth: 50% of discharge pipe X-section

Bench & Channel

Debris Build-up? No
Debris Depth: in.
Bench Condition: Corroded, Slight | Cracked | Roots
Bench Infiltration: N/A
Bench Material: Cast-in-Place Concrete
Channel Condition: No Defects
Channel Infiltration: N/A
Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 10371 DATE: 4/19/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:49 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7589	6.8	DIP	GM	RES	24	C	6	ND	
2	INLET	10372	5.5	DIP	GM	RES	8	C	3	ND	
3	INLET	7631	6.8	DIP	GM	RES	24	C	12	ND	
4											
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10											
11											
12											

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Comment:

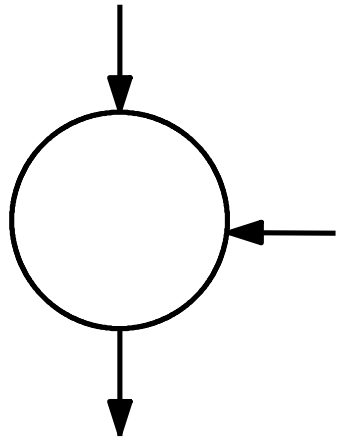
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☐ 4 ☑ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: Coat MH Interior

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 10371 DATE: 4/19/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:49 AM

Landscape

PHOTO 2.JPG



Down View

PHOTO 1.JPG



Pipe 1

PHOTO 3.JPG



Pipe 2

PHOTO 4.JPG



Pipe 3

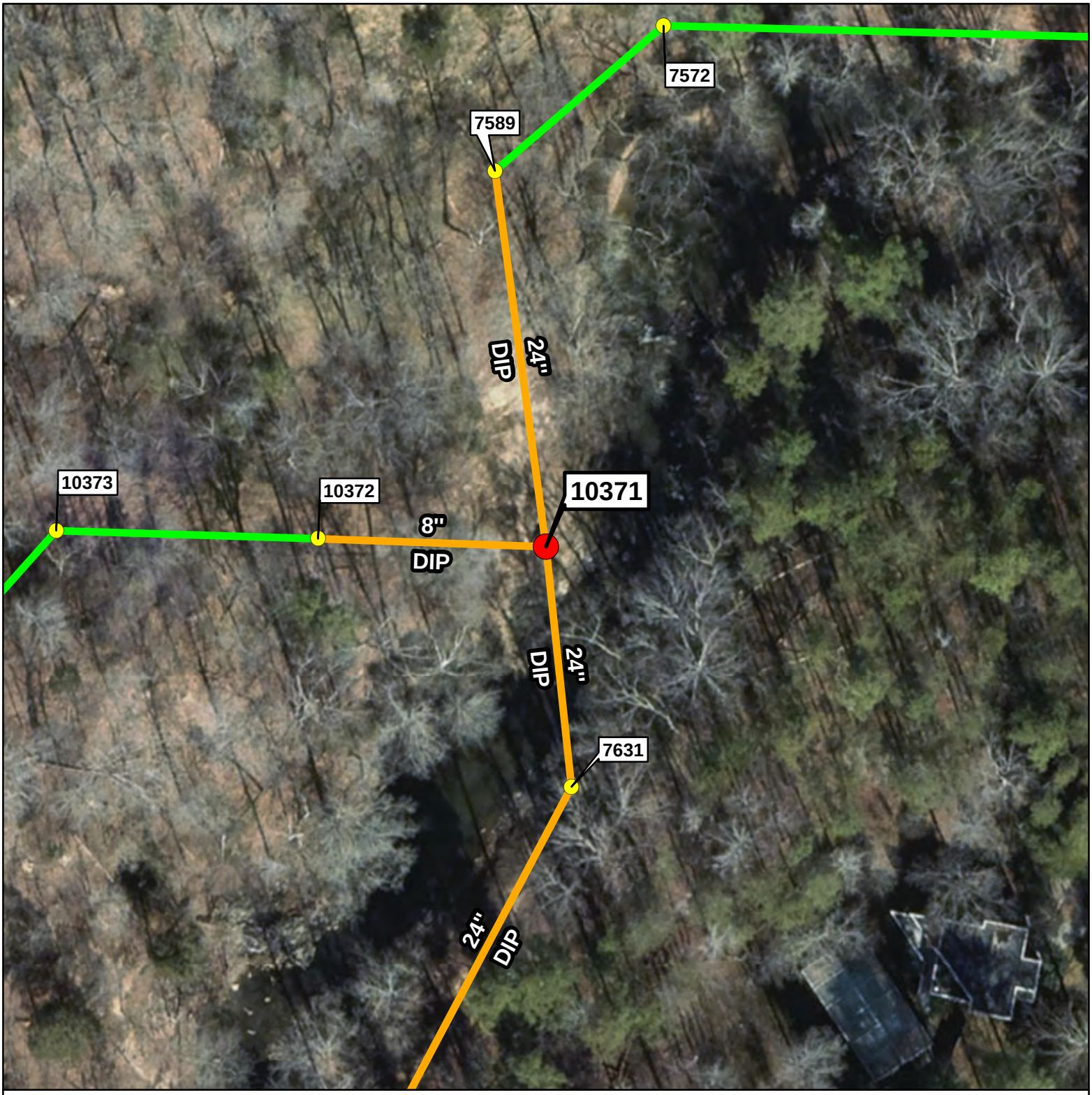
PHOTO 5.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 10371 DATE: 4/19/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:49 AM



0 50 100
Feet

Manhole
Gravity Main (Unchanged)
Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13075 DATE: 4/17/2023
Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:40 AM

General Information

Inspection Status: Inspected, Remote
Structure Type: Manhole
Location: Woods
Weather: Dry
Comment: N/A
Surface Cover Material: Concrete
Location Coordinates
X: 1982527.930045 **Y:** 779790.410099
Rim to Invert (ft): 9.2 **Inflow Potential:** N/A
Potential Surface Ponding (sq ft)
Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: No Defects
Cover Inflow: N/A
Cover Material: Iron with 2+ Holes
Frame Condition: Corroded, Heavy
Frame Inflow: N/A
Frame Material: Cast Iron
Frame Seal Condition: N/A
Cover Diameter: 23.5 in.
Rim to Grade: 22 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Heavy
Ring Inflow: N/A
Rings Material: Cast Iron
Chimney Condition: Corroded, Slight
Chimney Inflow: N/A
Chimney Material: Cast-in-Place Concrete
Chimney Seal Present? No
Check if Chimney Seal is Defective? N/A

Cone Section

Cone Condition: No Defects
Cone Infiltration: N/A
Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good
Barrel Infiltration: N/A
Barrel Material: Precast Concrete
Barrel Diameter: in.
Steps Material: N/A
Steps Condition: N/A
Check if structure is Lined? No
Check if Lining is Defective? N/A
Flow Depth: 25% of discharge pipe X-section

Bench & Channel

Debris Build-up? No
Debris Depth: in.
Bench Condition: Corroded, Slight
Bench Infiltration: N/A
Bench Material: Cast-in-Place Concrete
Channel Condition: No Defects
Channel Infiltration: N/A
Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13075 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:40 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	7606	9.2	CIPP-CI	GM	RES	24	C	6	CR | O	
2	INLET	7593	8.3	DIP	GM	RES	18	C	9	ND	
3	INLET	13076	9.2	DIP	GM	RES	30	C	11	O *(1)	
4											
5											
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7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

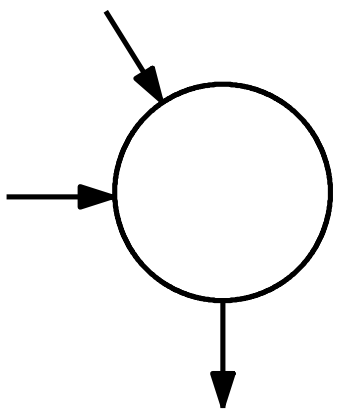
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment: *(1) Corroded

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13075 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:40 AM

Landscape

PHOTO 5.JPG



Down View

PHOTO 4.JPG



Pipe 1

PHOTO 3.JPG



Pipe 2

PHOTO 2.JPG



Pipe 3

PHOTO 1.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13075 DATE: 4/17/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:40 AM



0 50 100
Feet

N

Manhole

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13076 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:49 AM

General Information

Inspection Status: Inspected, Remote	**Structure Type:** Manhole
Location: Woods	**Weather:** Light Rain
Comment: N/A	
Surface Cover Material: Concrete	
Location Coordinates	**Rim to Invert (ft):** 8.8 **Inflow Potential:** N/A
X: 1982395.740021 **Y:** 779948.089902	**Potential Surface Ponding (sq ft)**
Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet	

Frame & Cover

Cover Condition: Corroded, Slight	**Cover Inflow:** N/A
Cover Material: Iron with 2+ Holes	
Frame Condition: Corroded, Heavy	**Frame Inflow:** N/A
Frame Material: Cast Iron	**Frame Seal Condition:** N/A
Cover Diameter: 23.5 in.	**Rim to Grade:** 15 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Heavy	**Ring Inflow:** N/A
Rings Material: Cast Iron	
Chimney Condition: No Defect	**Chimney Inflow:** N/A
Chimney Material: Cast-in-Place Concrete	
Chimney Seal Present? No	**Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects	**Cone Infiltration:** N/A
Cone Material: Cast-in-Place Concrete	

Barrel & Steps

Barrel Condition: Good	**Barrel Infiltration:** N/A
Barrel Material: Precast Concrete	
Barrel Diameter: in.	
Steps Material: N/A	**Steps Condition:** N/A
Check if structure is Lined? No	**Check if Lining is Defective?** N/A
Flow Depth: 10% of discharge pipe X-section	

Bench & Channel

Debris Build-up? No	**Debris Depth:** in.
Bench Condition: Corroded, Slight | Cracked	**Bench Infiltration:** Weeper
Bench Material: Cast-in-Place Concrete	
Channel Condition: Corroded, Slight | Poor deteriorating	**Channel Infiltration:** N/A
Channel Material: Cast-in-Place Concrete	

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13076 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:49 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	13075	8.8	DIP	GM	RES	30	C	6	ND	
2	INLET	13077	7.1	DIP	GM	RES	8	C	9	ND	
3	INLET	13078	8.8	DIP	GM	RES	30	C	1	ND	
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.

Does Structure Require Full Inspection? Y ☐ N ☑

Comment: Manhole cover has missing bolts

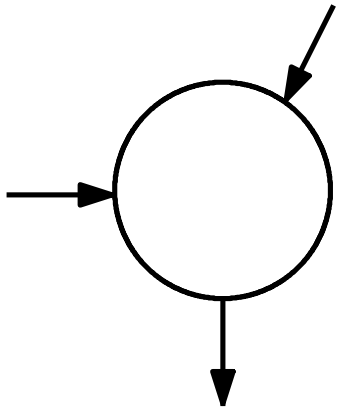
Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13076 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:49 AM

Landscape

PHOTO 6.JPG



Down View

PHOTO 5.JPG



Pipe 1

PHOTO 1.JPG



Pipe 2

PHOTO 2.JPG



Pipe 3

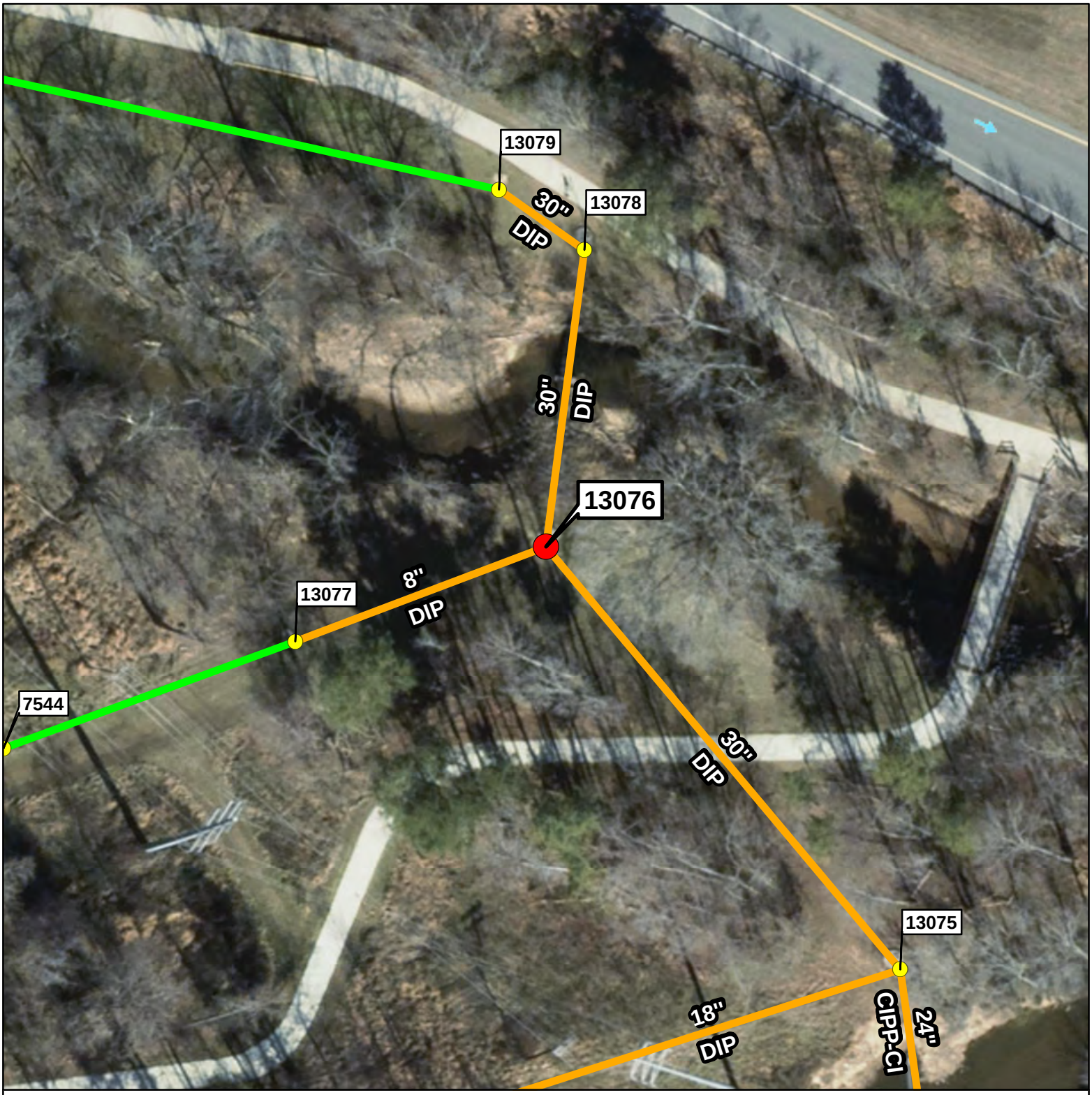
PHOTO 4.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13076 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:49 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13078 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:22 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Easements / Right-of-way | Woods **Weather:** Light Rain

Comment: N/A

Surface Cover Material: Concrete

Location Coordinates

X: 1982410.110071 **Y:** 780058.71993

Rim to Invert (ft): 8.8 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Slight **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Heavy **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 15.5 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: No Defect **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Cast-in-Place Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: N/A **Steps Condition:** N/A

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 10% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13078 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:22 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	13076	8.8	DIP	GM	RES	30	C	6	ND	
2	INLET	13079	8.8	DIP	GM	RES	30	C	10	ND	
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

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Comment:

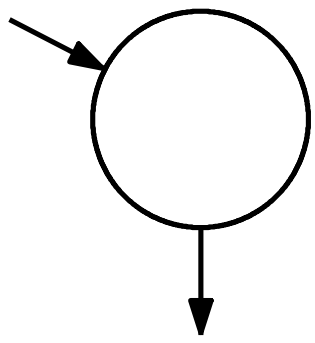
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13078 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:22 AM

Landscape

PHOTO 4.JPG



Down View

PHOTO 3.JPG



Pipe 1

PHOTO 2.JPG



Pipe 2

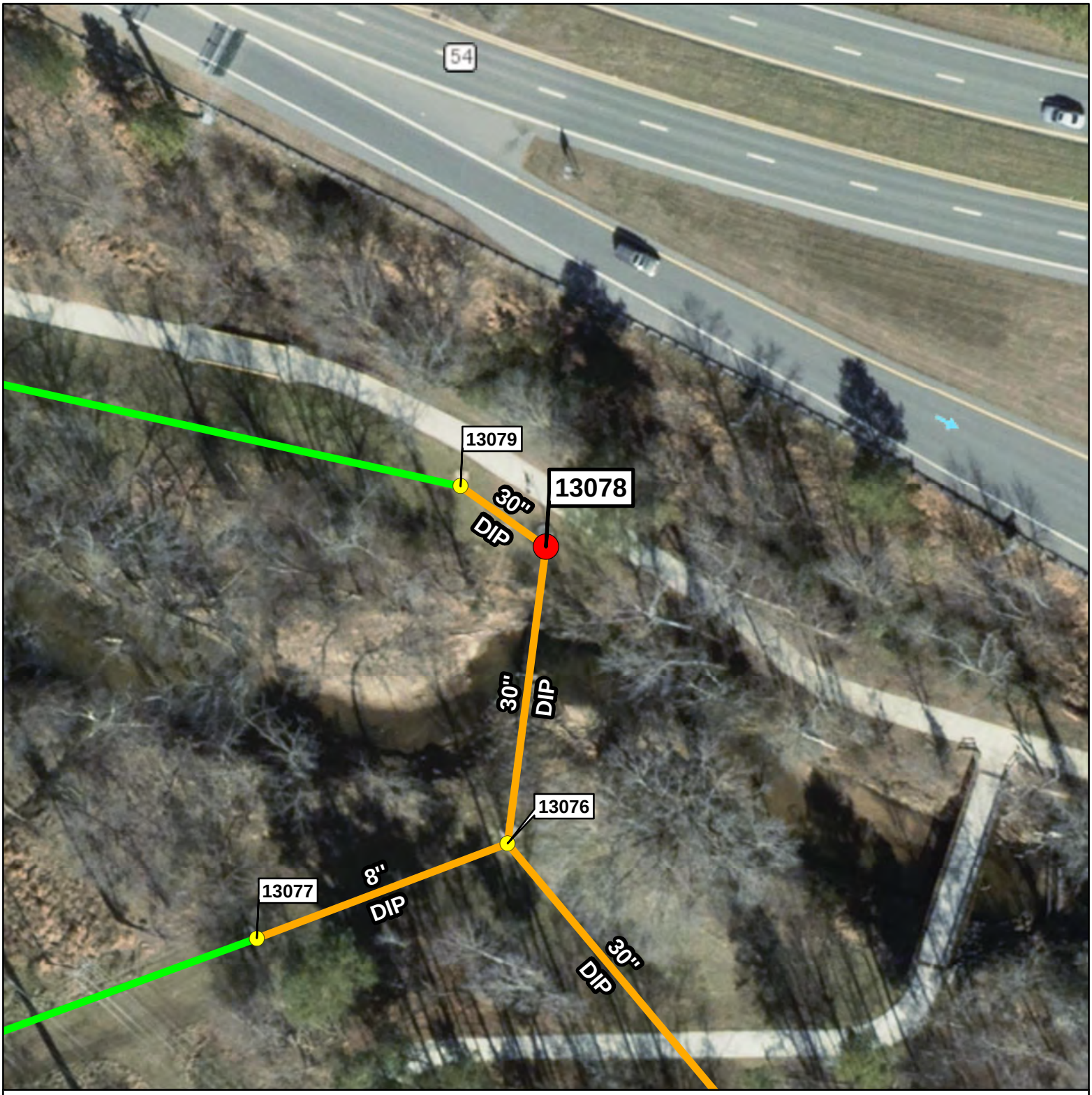
PHOTO 1.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13078 DATE: 4/14/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 08:22 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13086 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 12:54 PM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Easements / Right-of-way | Parking Lot **Weather:** Dry

Comment: N/A

Surface Cover Material: Concrete

Location Coordinates

X: 1980728.32997 **Y:** 781118.060003

Rim to Invert (ft): 8 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: No Defects **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: No Defects **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 31 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Heavy **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: Corroded, Slight **Chimney Inflow:** N/A

Chimney Material: Cast Iron

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Cast-in-Place Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: N/A **Steps Condition:** N/A

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 10% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13086 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 12:54 PM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	13085	8	DIP	GM	RES	30	C	6	ND	
2	INLET	9666	8	DIP	GM	RES	30	C	12	ND	
3											
4											
5											
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12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

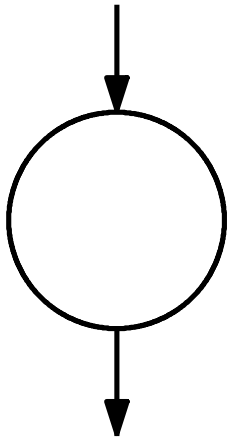
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13086 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 12:54 PM

Landscape

WIN 20220825 10 54 25 PRO.JPG



Down View

PHOTO 3.JPG



Pipe 1

PHOTO 2.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 13086 DATE: 4/12/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 12:54 PM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 28192 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:33 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Woods **Weather:** Light Rain

Comment: N/A

Surface Cover Material: Concrete

Location Coordinates

X: 1974599.46001 **Y:** 781412.850096

Rim to Invert (ft): 10.1 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Slight **Cover Inflow:** N/A

Cover Material: Iron with 2+ Holes

Frame Condition: Corroded, Slight **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 19 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: Corroded, Slight **Chimney Inflow:** N/A

Chimney Material: Cast Iron

Chimney Seal Present? Yes **Check if Chimney Seal is Defective?** Yes

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Cast-in-Place Concrete

Barrel & Steps

Barrel Condition: Fair **Barrel Infiltration:** Fine Roots on Wall

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: Plastic **Steps Condition:** No Defects

Check if structure is Lined? No **Check if Lining is Defective?** N/A

Flow Depth: 25% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 28192 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:33 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	28193	10.4	DIP	GM	RES	18	C	6	ND	
2	INLET	28191	10.2	DIP	GM	RES	12	C	3	ND	
3	INLET	Unknown	10.4	DIP	GM	RES	12	C	11	ND	
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

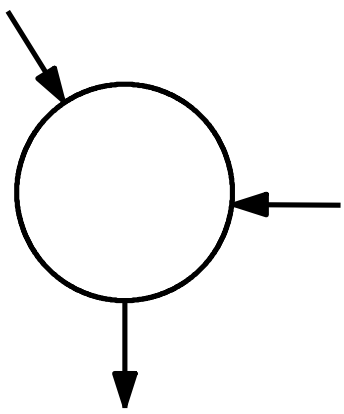
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☐ 4 ☑ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☐ 4 ☑ 5 ☐

Recommended Rehab:

Comment: Remove Roots / Coat MH Interior

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 28192 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:33 AM

Landscape

PHOTO 5.JPG



Down View

PHOTO 4.JPG



Pipe 1

PHOTO 3.JPG



Pipe 2

PHOTO 2.JPG



Pipe 3

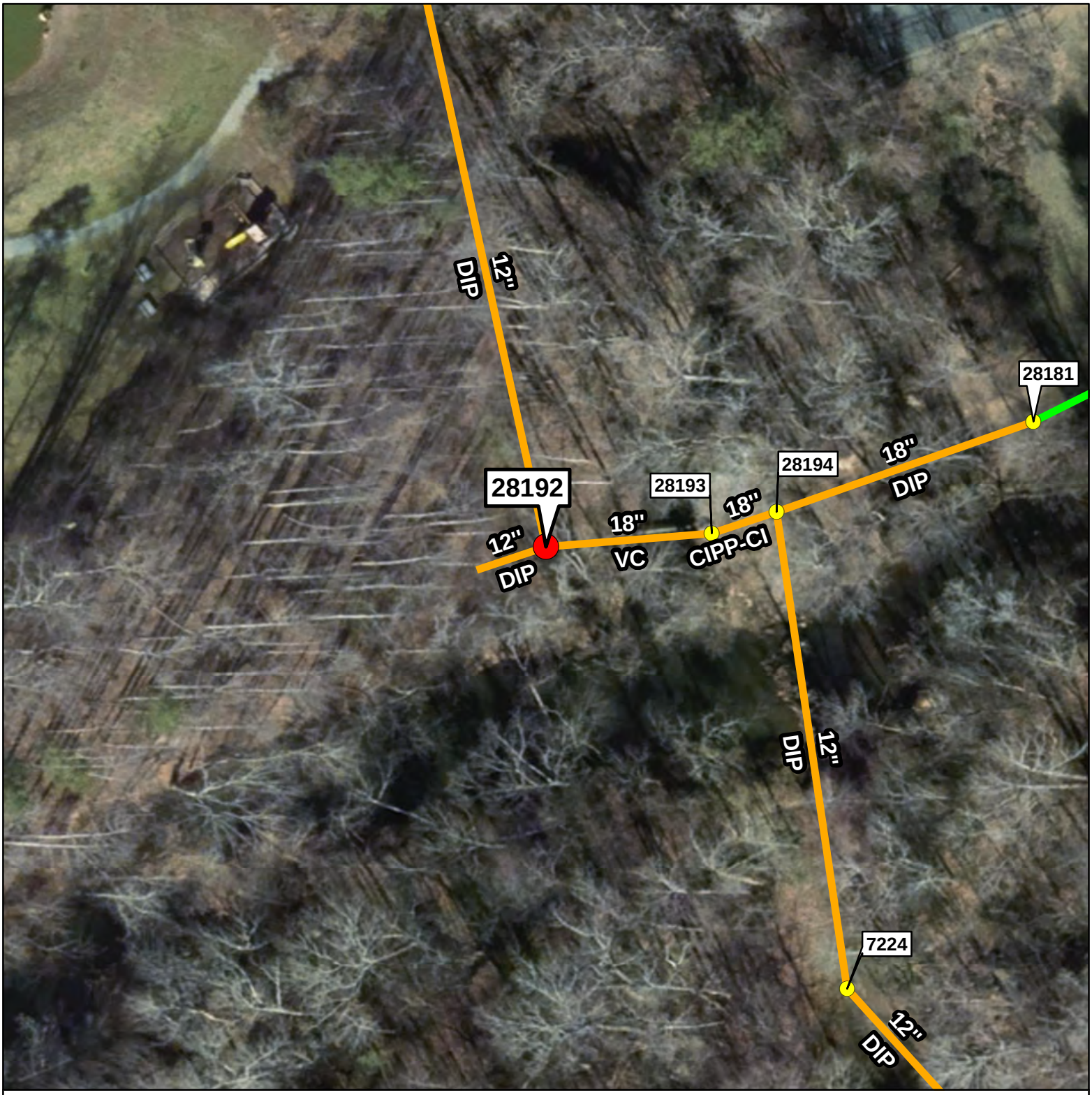
PHOTO 1.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 28192 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 10:33 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 28193 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:25 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Woods **Weather:** Dry

Comment: N/A

Surface Cover Material: Concrete

Location Coordinates

X: 1974661.280096 **Y:** 781417.799889

Rim to Invert (ft): 10.3 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: Corroded, Slight **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Slight **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 30 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Slight **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: No Defect **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: N/A **Steps Condition:** N/A

Check if structure is Lined? Yes **Check if Lining is Defective?** N/A

Flow Depth: 50% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: Corroded, Slight **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 28193 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:25 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	28194	10.3	CIPP-CI	GM	RES	18	C	6	ND	
2	INLET	28192	10.3	VC	GM	RES	18	C	12	ND	
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

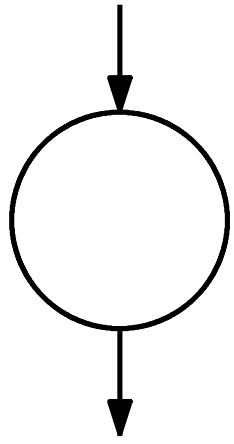
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 28193 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:25 AM

Landscape

PHOTO 2.JPG



Down View

PHOTO 1.JPG



Pipe 1

PHOTO 4.JPG



Pipe 2

PHOTO 5.JPG



Exposed Pipe

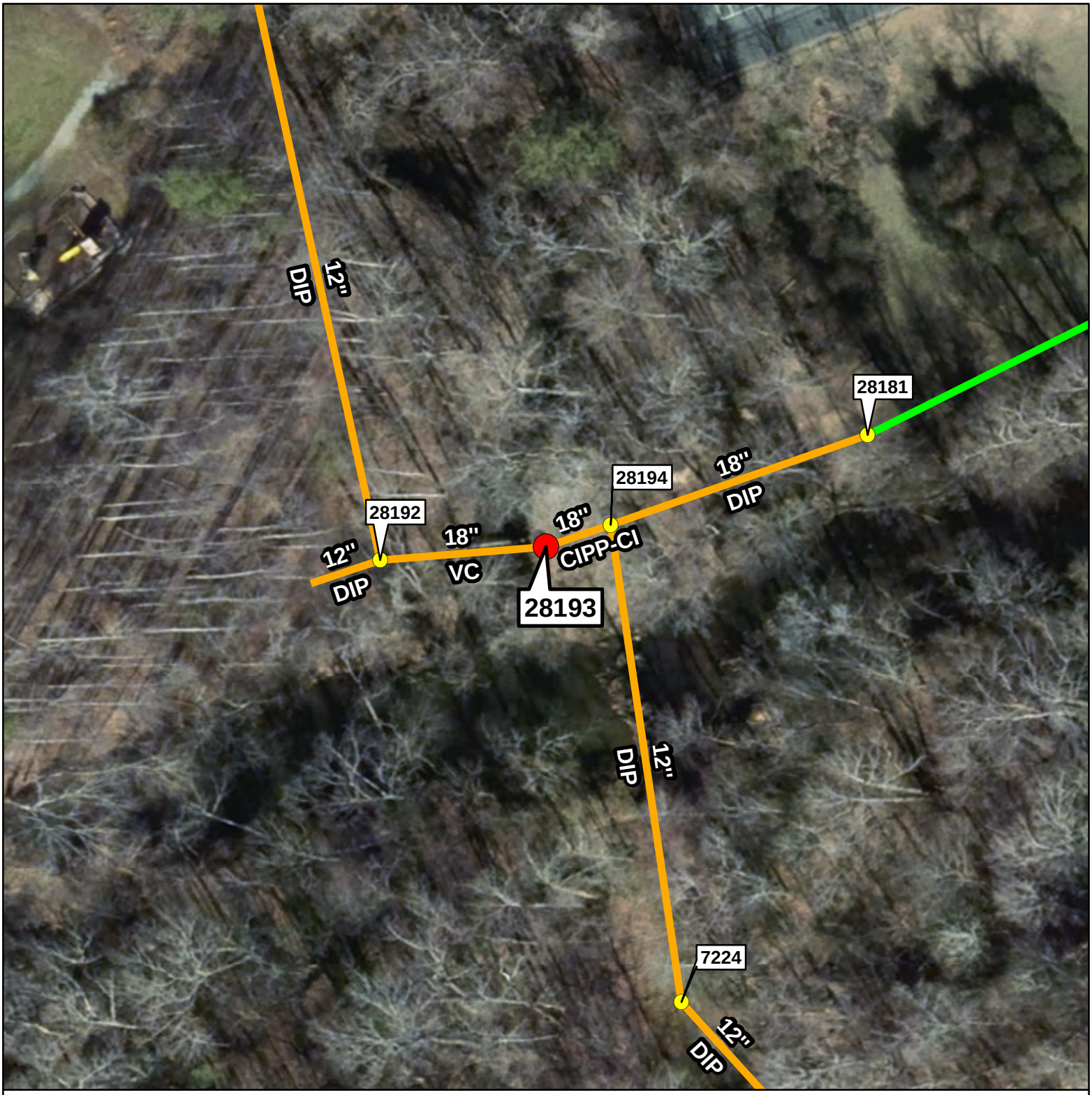
PHOTO 3.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 28193 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:25 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

Map Disclaimer: This product is for informational purposes only and is based on some unverified information provided by others. This product has not been prepared for nor is it suitable for legal, engineering, or surveying purposes. It represents only the approximate relative location of property boundaries. McKim & Creed, Inc. assumes no liability or damages due to inaccuracies, errors or omissions.

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 28194 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:52 AM

General Information

Inspection Status: Inspected, Remote **Structure Type:** Manhole

Location: Woods **Weather:** Dry

Comment: N/A

Surface Cover Material: Concrete

Location Coordinates

X: 1974685.409969 **Y:** 781425.890096

Rim to Invert (ft): 10.6 **Inflow Potential:** N/A

Potential Surface Ponding (sq ft)

Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet

Frame & Cover

Cover Condition: No Defects **Cover Inflow:** N/A

Cover Material: Iron with 1 or 2 Holes

Frame Condition: Corroded, Slight **Frame Inflow:** N/A

Frame Material: Cast Iron **Frame Seal Condition:** N/A

Cover Diameter: 23.5 in. **Rim to Grade:** 33 in.

Adjustment Rings & Chimney Seal

Ring Condition: Corroded, Heavy **Ring Inflow:** N/A

Rings Material: Cast Iron

Chimney Condition: No Defect **Chimney Inflow:** N/A

Chimney Material: Cast-in-Place Concrete

Chimney Seal Present? No **Check if Chimney Seal is Defective?** N/A

Cone Section

Cone Condition: No Defects **Cone Infiltration:** N/A

Cone Material: Precast Concrete

Barrel & Steps

Barrel Condition: Good **Barrel Infiltration:** N/A

Barrel Material: Precast Concrete

Barrel Diameter: in.

Steps Material: N/A **Steps Condition:** N/A

Check if structure is Lined? Yes **Check if Lining is Defective?** N/A

Flow Depth: 10% of discharge pipe X-section

Bench & Channel

Debris Build-up? No **Debris Depth:** in.

Bench Condition: No Defects **Bench Infiltration:** N/A

Bench Material: Cast-in-Place Concrete

Channel Condition: No Defects **Channel Infiltration:** N/A

Channel Material: Cast-in-Place Concrete

Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 28194 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:52 AM

Pipe Codes

Pipe Materials

AC - Asbestos Cement
BR - Brick
CAS - Cast Iron
CIPP - Cured in Place Pipe
CLC - Clay-Lined Concrete
CMP - Corrugated Metal Pipe
CP - Concrete Pipe
CT - Clay Tile
DIP - Ductile Iron
FRP - Fiberglass Reinforced Pipe
HDPE - High-density Polyethylene
PE - Polyethylene
PSC - Plastic / Steel Composite
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe
SP - Steel Pipe
VCP - Vitrified Clay Pipe
WD - Wood
XXX - Not Known
ZZZ - Other

Pipe Shapes

A - Arched
B - Barrel (beer barrel shaped)
C - Circular
E - Egg Shaped
H - Horseshoe (i.e., Inverted U)
O - Oval
R - Rectangle
S - Square
T - Trapezoidal
U - U-shaped with flat top
Z - Other

Pipe Type

SFM - Storm Foce Main
SGM - Storm Gravity Main
PFM - Private Force Main
RD - Roof Drain
FM - Force Main
GM - Gravity Main
CUL - Culvert
OD - Open Drain
LAT - Lateral

Service Types

RES - Residential
COM - Commercial
DOT - Department of Transportation

Interface Defects

ND - No Defects
CR - Cracked
R - Roots
DNS - Does Not Seal

	Flow Direction	To/From Asset ID	Invert Depth	Material	Type	Service Type	Diameter	Shape	Clock	Interface Condition	Comment
1	OUTLET	28181	10.6	DIP	GM	RES	12	C	6	ND	
2	INLET	7224	9	DIP	GM	RES	12	C	9	ND	
3	INLET	28193	10.6	DIP	GM	RES	18	C	12	ND	
4											
5											
6											
7											
8											
9											
10											
11											
12											

☐ - Check if connectivity (TO/FROM Structure) is different than shown on Field Maps. Describe in comment below.
Comment:

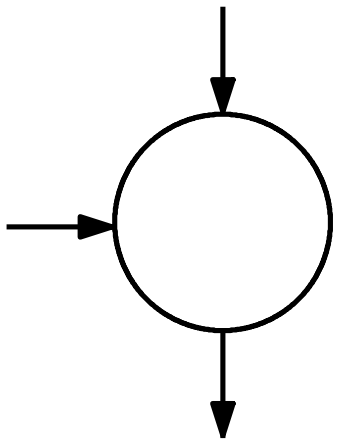
Surcharge: Y ☐ N ☑ Surcharge Depth: _____ ft.
Does Structure Require Full Inspection? Y ☐ N ☑
Comment:

Structural Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐
O & M Rating: 1 ☐ 2 ☐ 3 ☑ 4 ☐ 5 ☐

Recommended Rehab:

Comment: None

Structure Sketch:



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 28194 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:52 AM

Landscape

BLANK.JPG

Down View

PHOTO 5.JPG



Pipe 1

PHOTO 2.JPG



Pipe 2

PHOTO 3.JPG



Pipe 3

PHOTO 4.JPG



Exposed Pipe

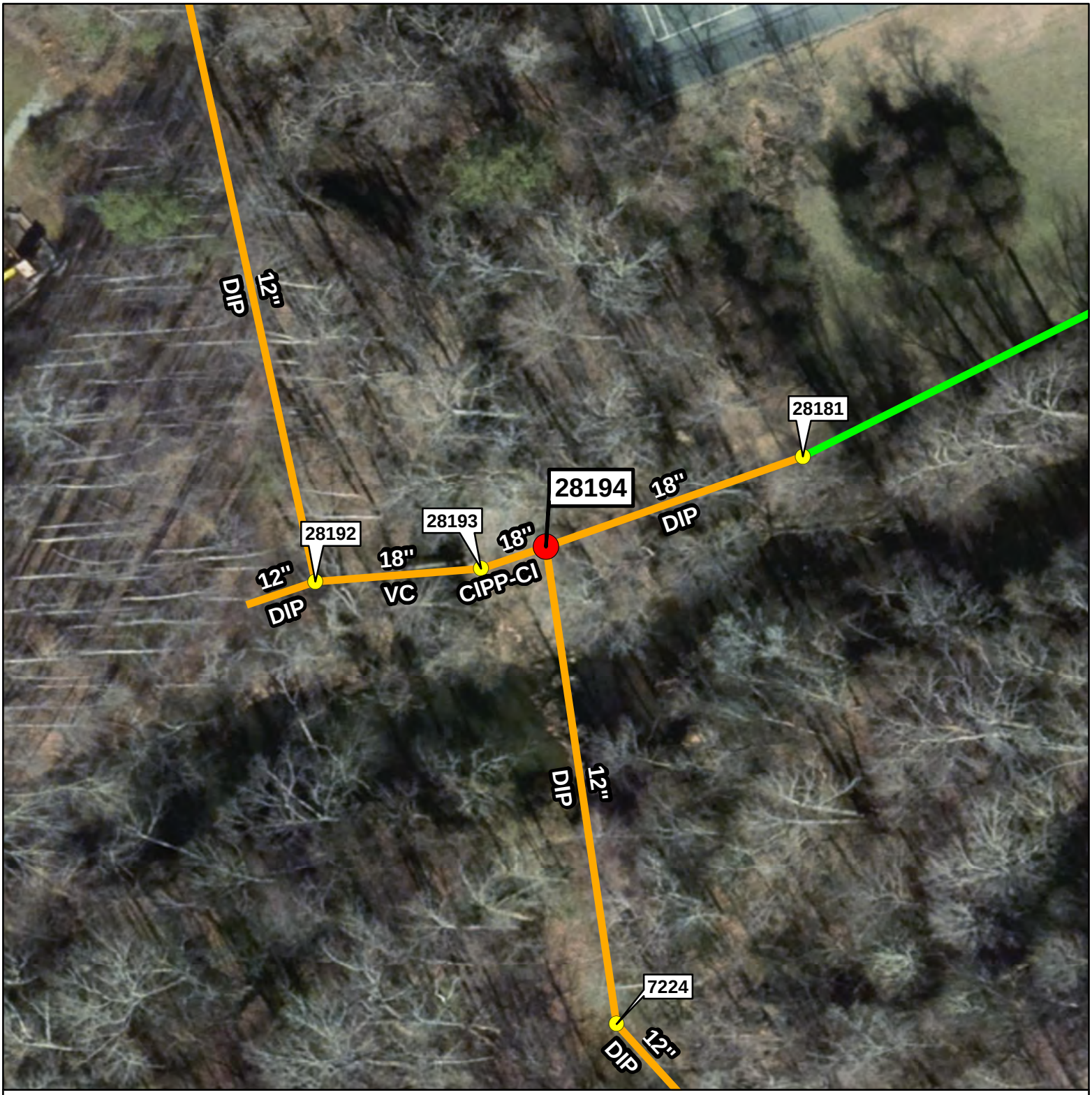
PHOTO 6.JPG



Orange Water and Sewer Authority (Morgan Creek)
Waste Water Field Inspection Form

Asset No. 28194 DATE: 4/15/2023

Inspector's Name: Matthew Cousins Certificate: P0036784-032022 TIME: 11:52 AM



0 50 100
Feet

N

Manhole

Gravity Main (Unchanged)

Gravity Main (Updated Attributes)

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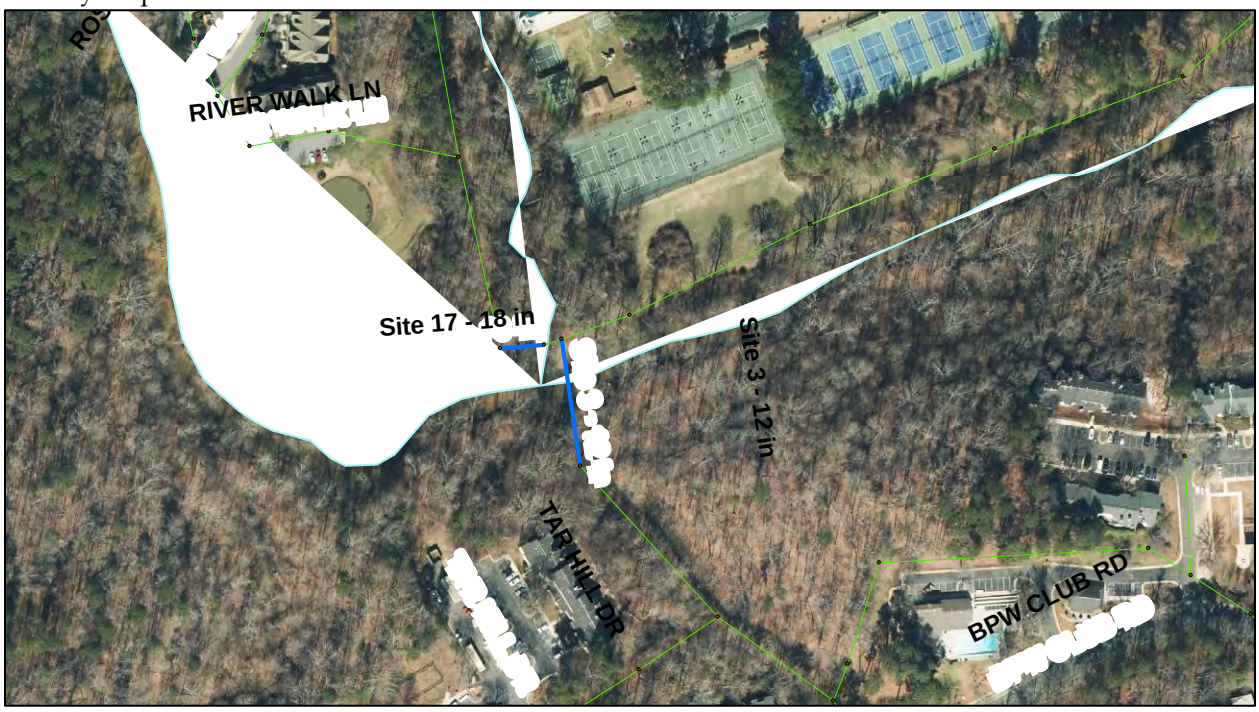
Appendix D

Pier Inspection Results

McKIM&CREED

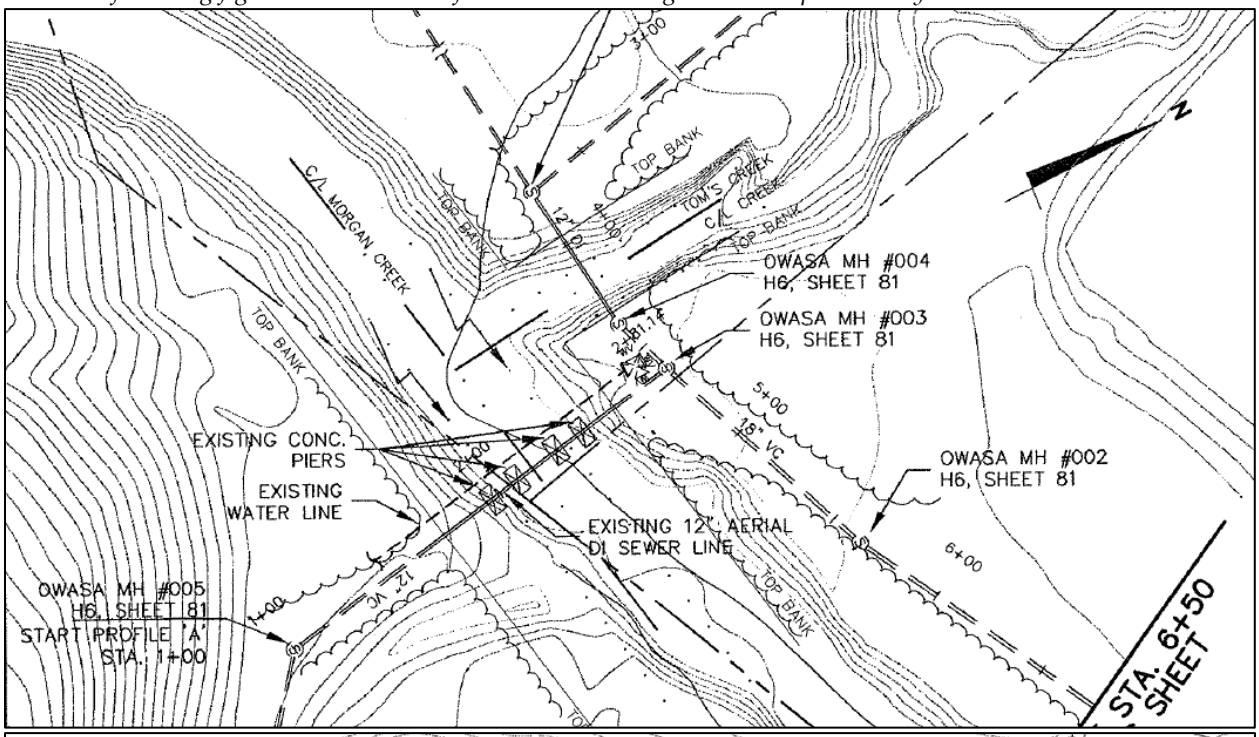
Site 3 – 12in Ductile Iron (DI) | Inspection Date: 05.10.2023

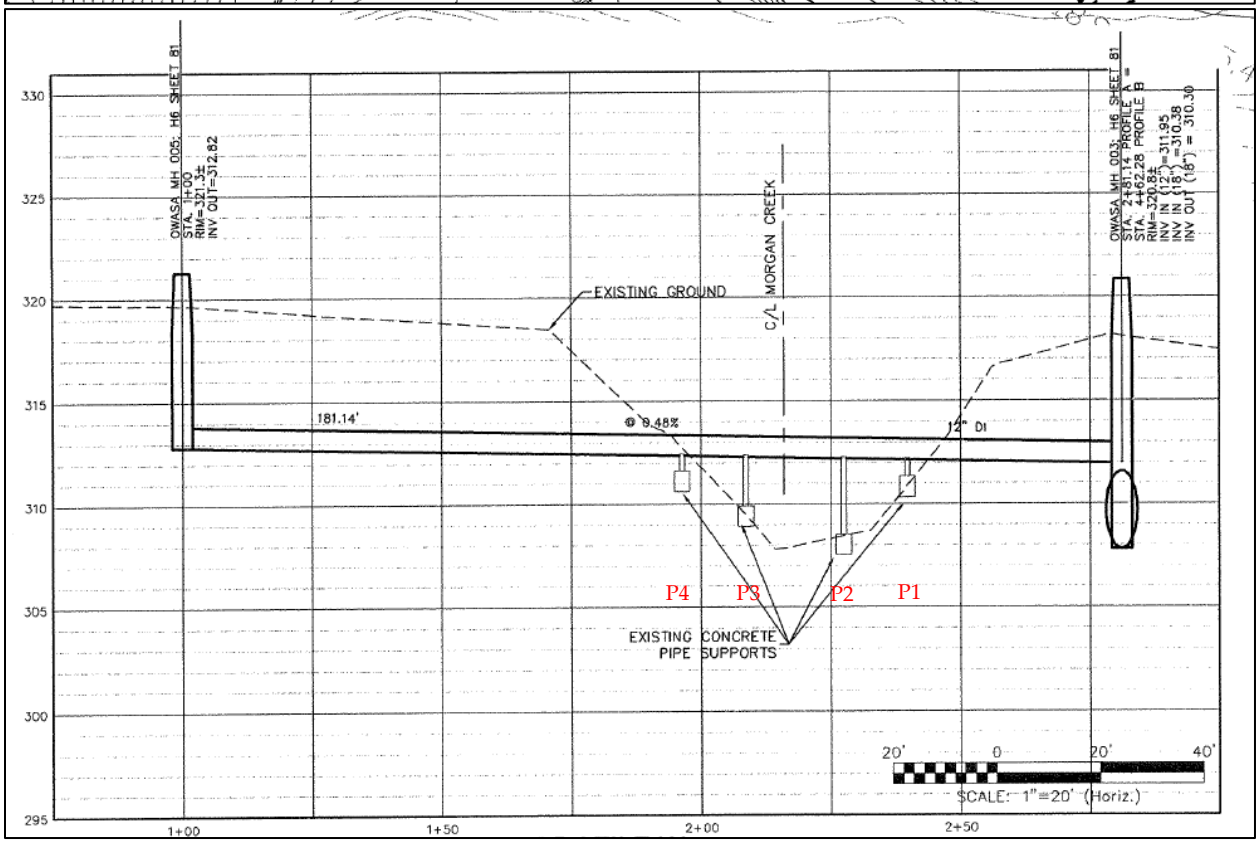
Vicinity Map:



Plan & Profile View:

*Note: The following figures were obtained from record drawing **SMC-S46** provided by OWASA.*





Findings:

P1 to P4: Over All View of Site 3 Aerial Crossing w/ Pier P1 in Foreground.



P1: View Looking at the East Face of the Pier & the Minor Surface Defects in the Form of Bug Holes.



P2: View Looking at the East Face of the Pier Minor Surface Defects and Debris Observed.



P3: View Looking at the South and East Faces of the Pier & Surface Cracks, T.O. Pier Section Loss and Exposed Reinforcing Bars Observed.



P4: View Looking at the East and North Faces of the Pier & Honeycomb Minor Surface Defects and Vegetation around the Pipe & Pier Observed.



P1 to P4: View Looking at Typical Pipe to Pier Anchor Assembly Observed.



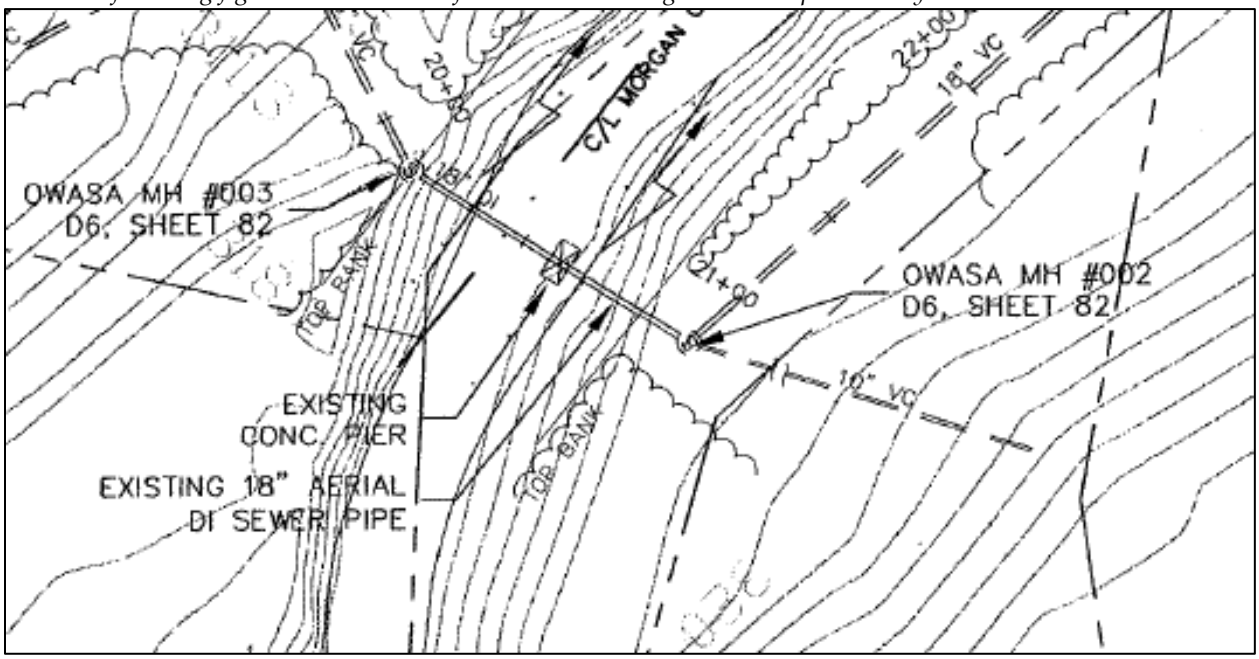
Site 4 – 18in Ductile Iron (DI) | Inspection Date: 05.10.2023

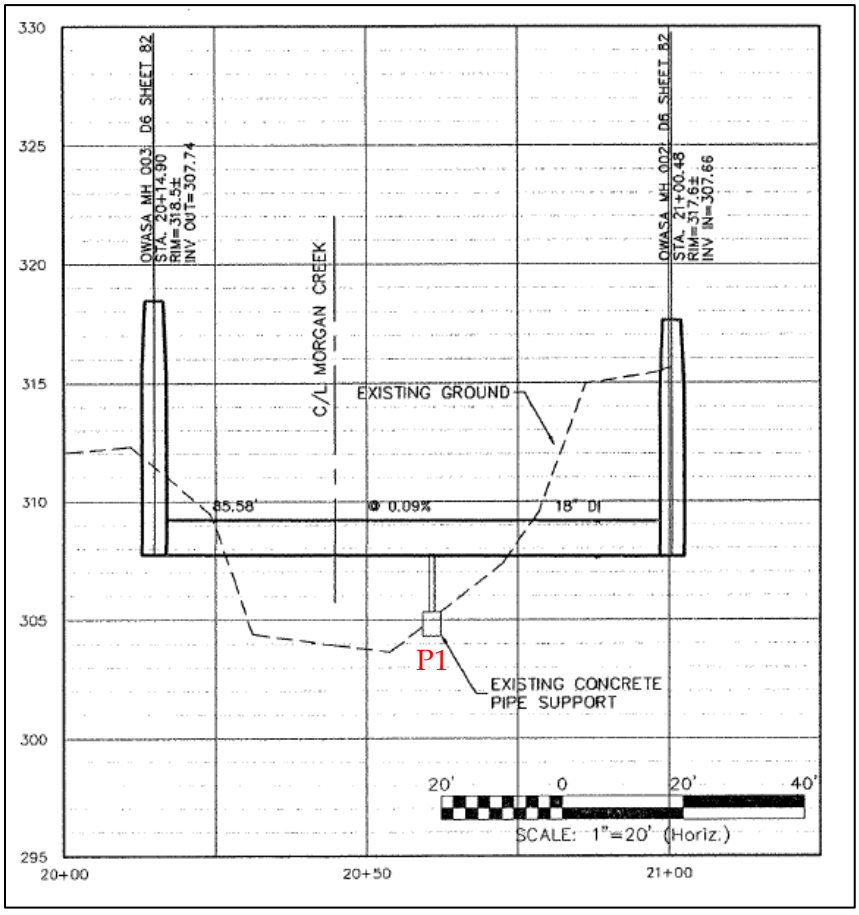
Vicinity Map:



Plan & Profile View:

*Note: The following figures were obtained from record drawing **SMC-S46** provided by OWASA.*





Findings:

P1: Over All View of Site 4 Aerial Crossing w/ Pier P1 in Background.



P1: View of South and West Faces of the Pier & Minor Surface Defects in the Form of Bug Holes.



P1: View of North and East Faces of the Pier. Note the Scour / Surface Wear and Debris Observed.

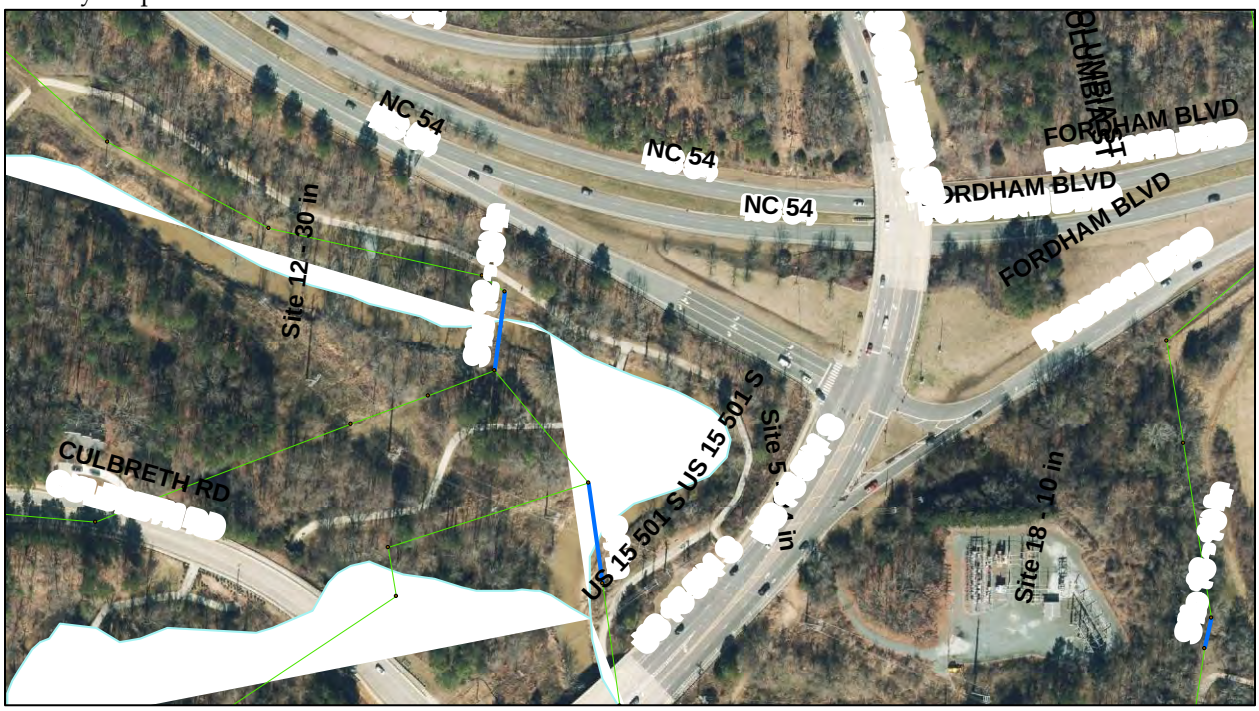


P1: View of Pipe to Pier Anchor Assembly Observed.



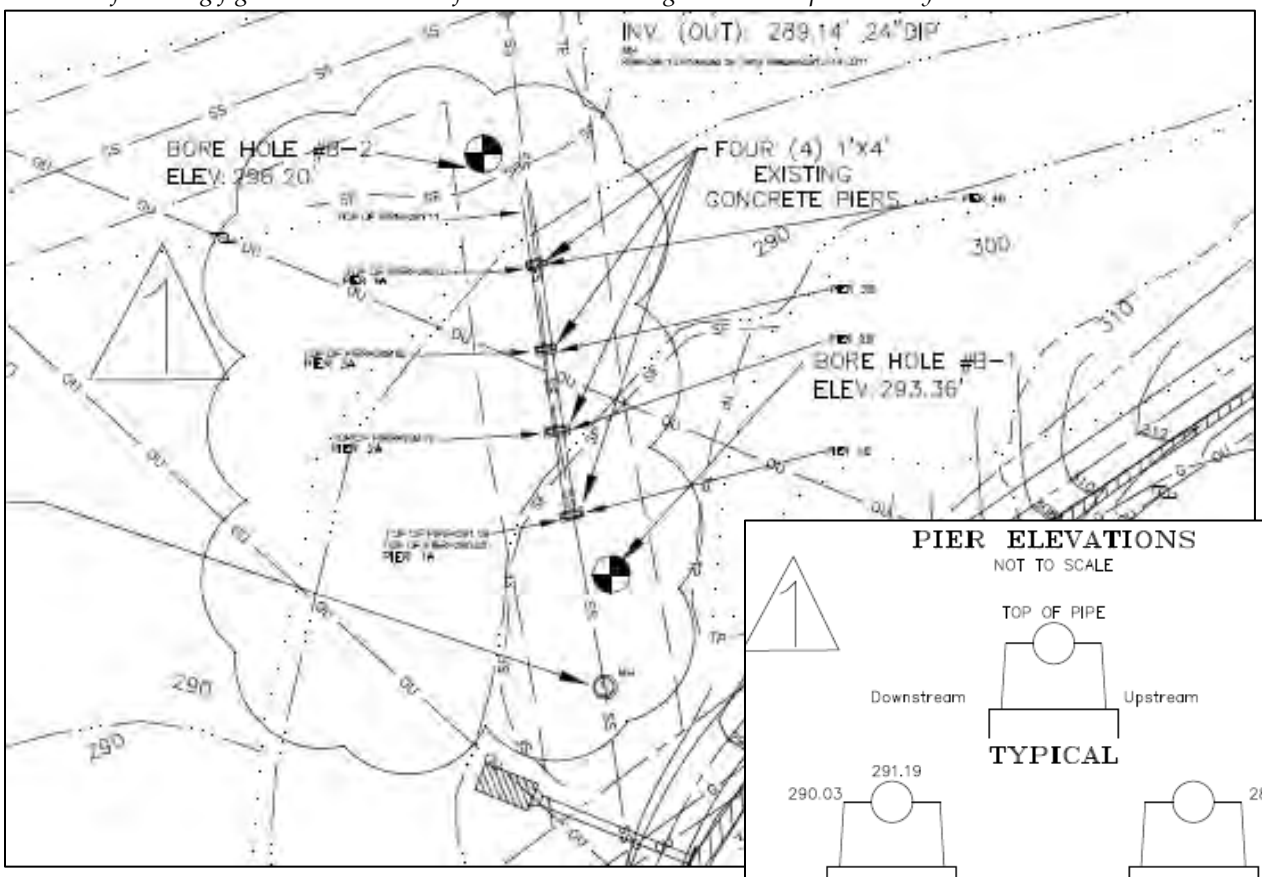
Site 5 – 24in CIPP-CI | Inspection Date: 05.10.2023

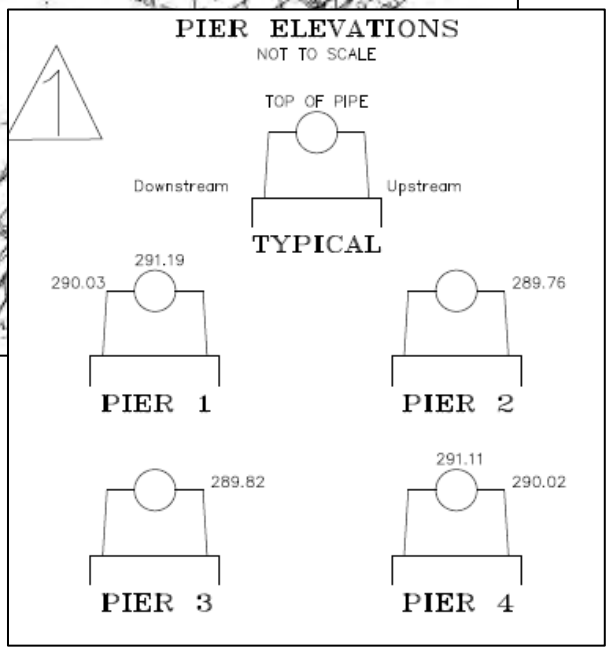
Vicinity Map:



Plan & Profile View:

*Note: The following figures were obtained from record drawing **OSA-M09** provided by OWASA.*





Findings:

P1 to P3: Over All View of Site 5 Aerial Crossing w/ Pier P1 in Foreground.



P2: View of South and East Faces of the Pier & the Surface Wear and Section Loss @ T.O. Pier.



P3: View of the North & West Faces of the Pier & Minor Surface Defects and Debris Observed.



P1 to P3: View Looking at Typical Pipe to Pier Anchor Assemblies Observed.



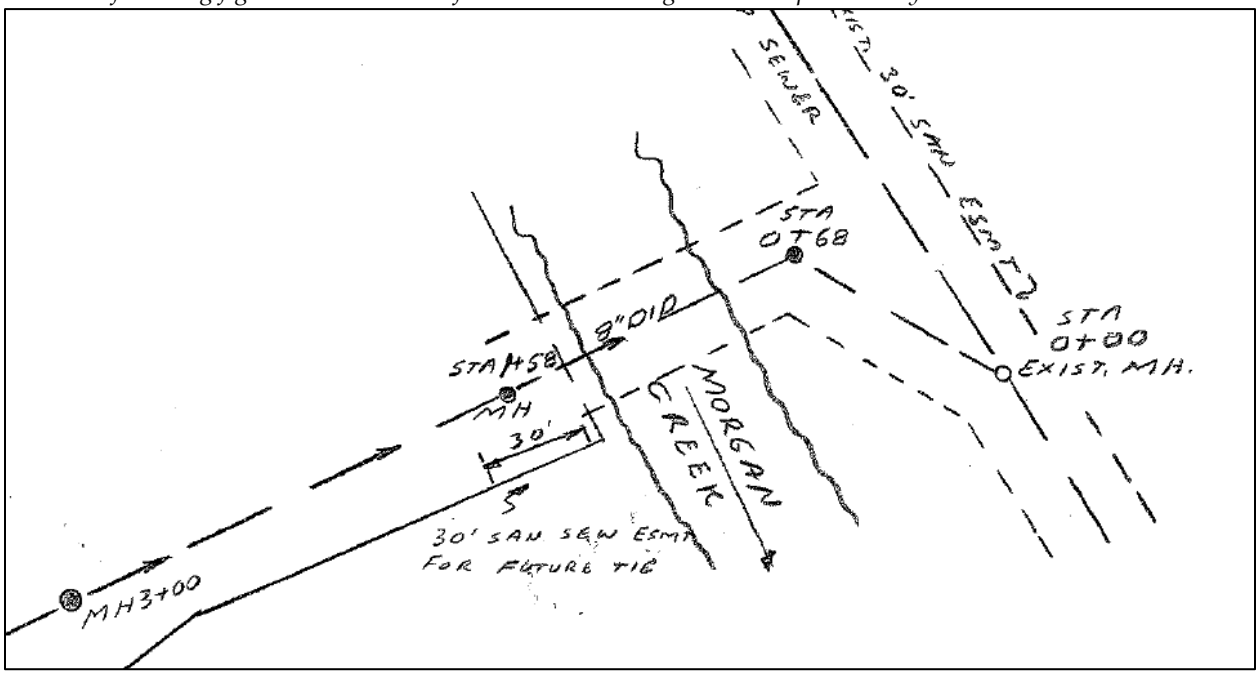
Site 6 – 8in Ductile Iron (DI) | Inspection Date: 05.10.2023

Vicinity Map:



Plan & Profile View:

*Note: The following figures were obtained from record drawing **ACT-S05** provided by OWASA.*



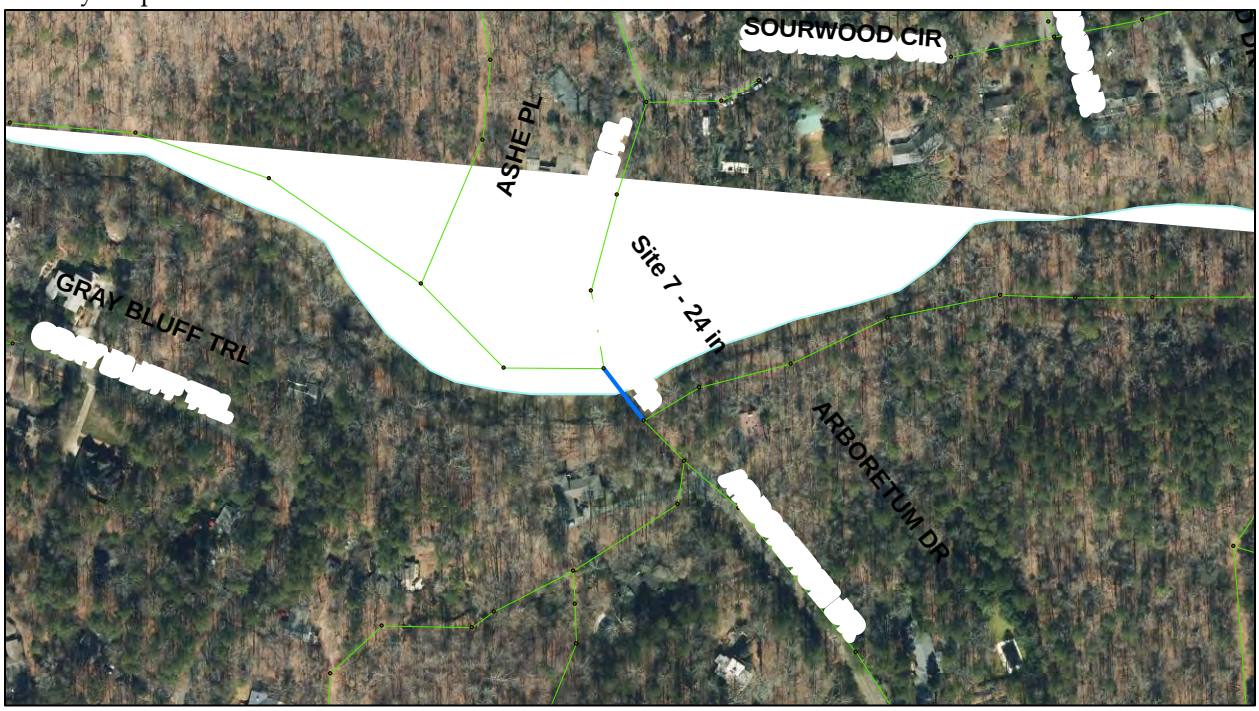
Findings:

P0: Over All View of Site 6 Aerial Crossing w/ No Pier Assemblies Observed.



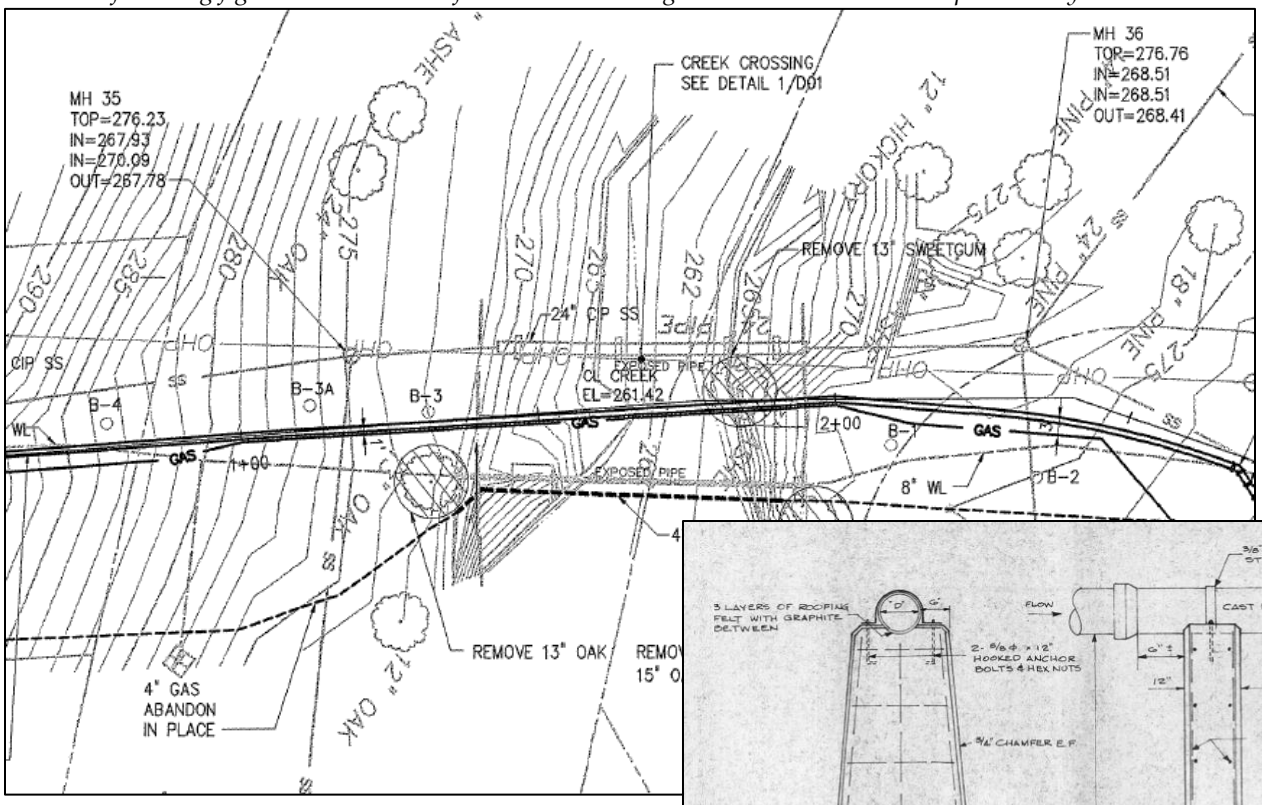
Site 7 – 24in CIPP-CI | Inspection Date: 06.06.2023

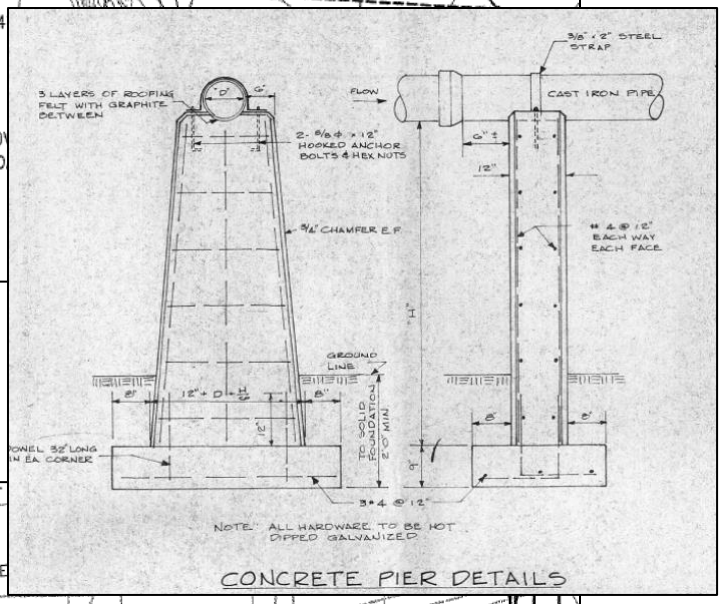
Vicinity Map:

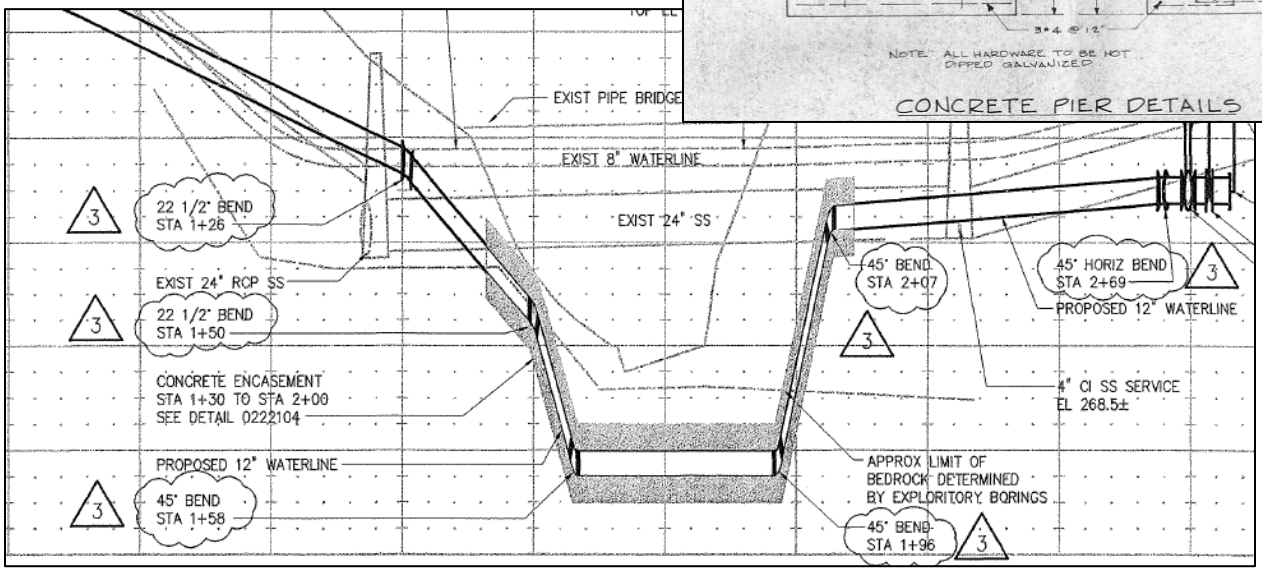


Plan & Profile View:

*Note: The following figures were obtained from record drawings **RES-A06** and **SIE-S14** provided by OWASA.*







Findings:

P1 to P3: Over All View of Site 7 Aerial Crossing w/ Pier P1 in Foreground on the Bank.



P2: View Looking at the South Face and T.O. Pier & the Minor Surface Defects & Debris Observed.



P3: View Looking at the South Face of the Pier, Minor Surface Defects and Pipe to Pier Connection.

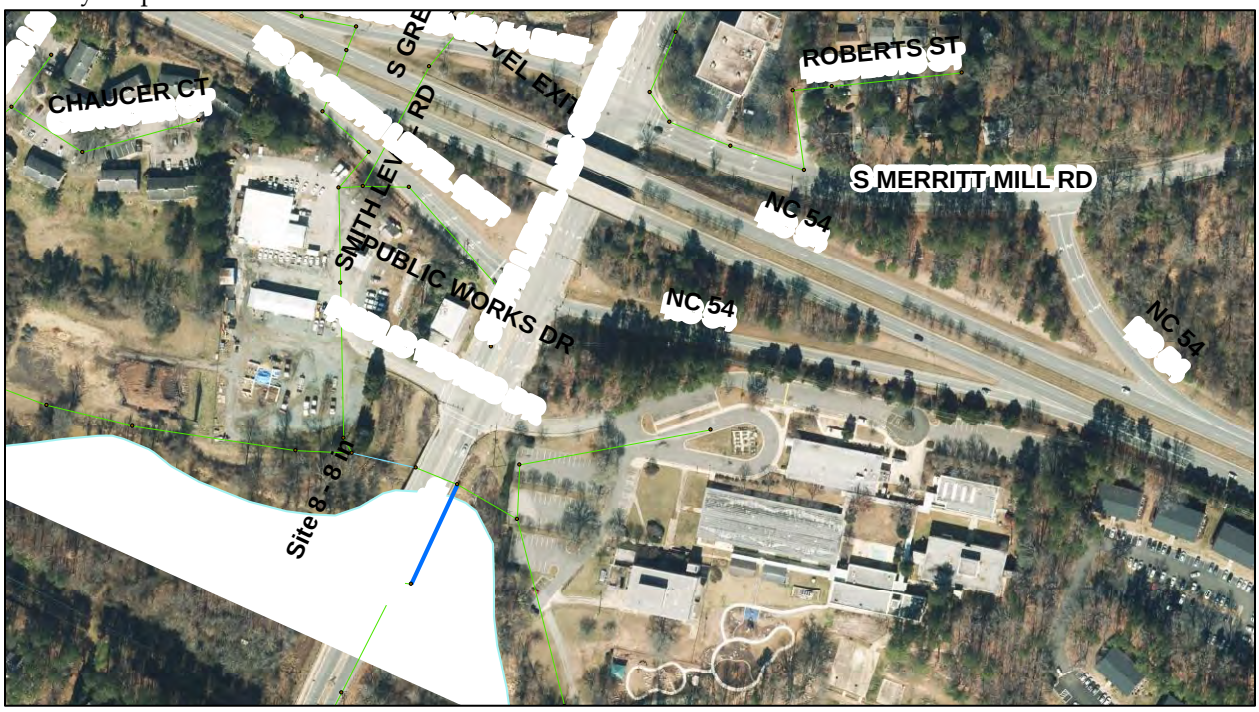


P4: View Looking at the South Face of the Pier Minor Surface Defects and the Pipe to Pier Connection Requiring Repair.



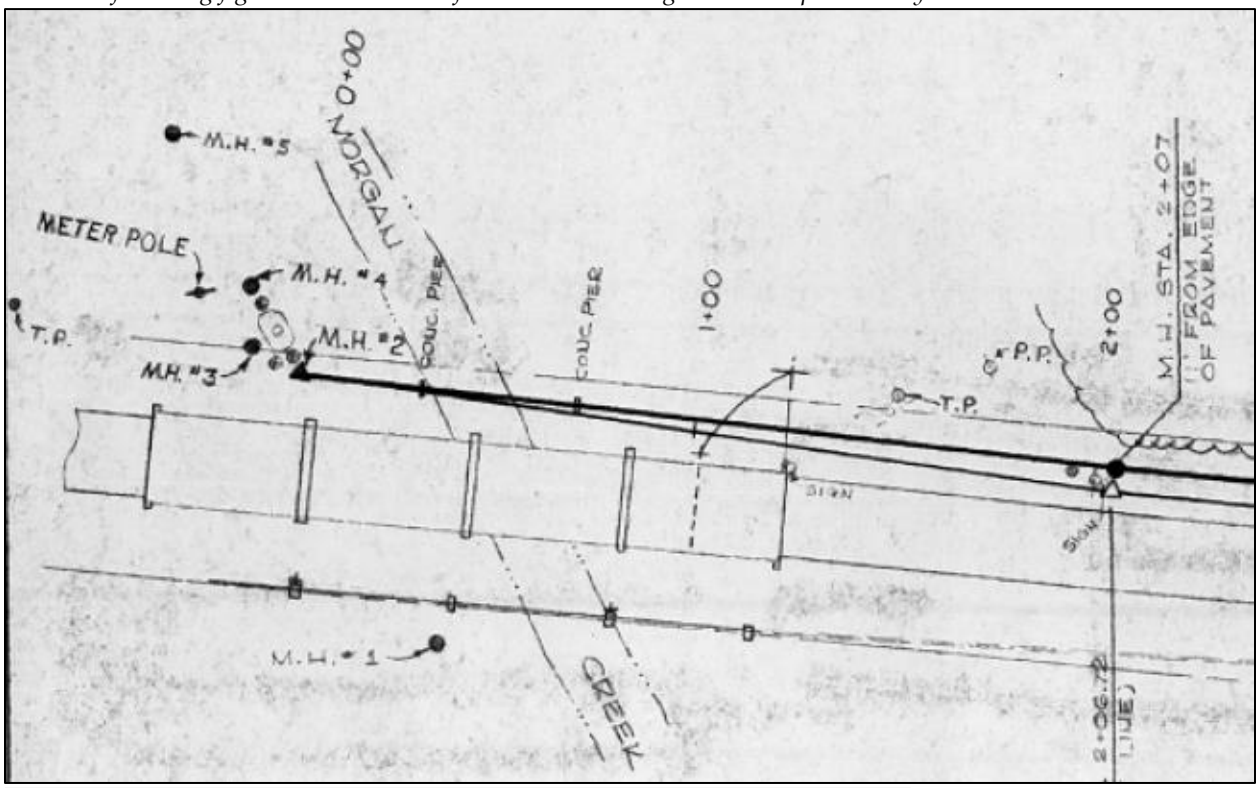
Site 8 – 8in Ductile Iron (DI) | Inspection Date: 05.10.2023

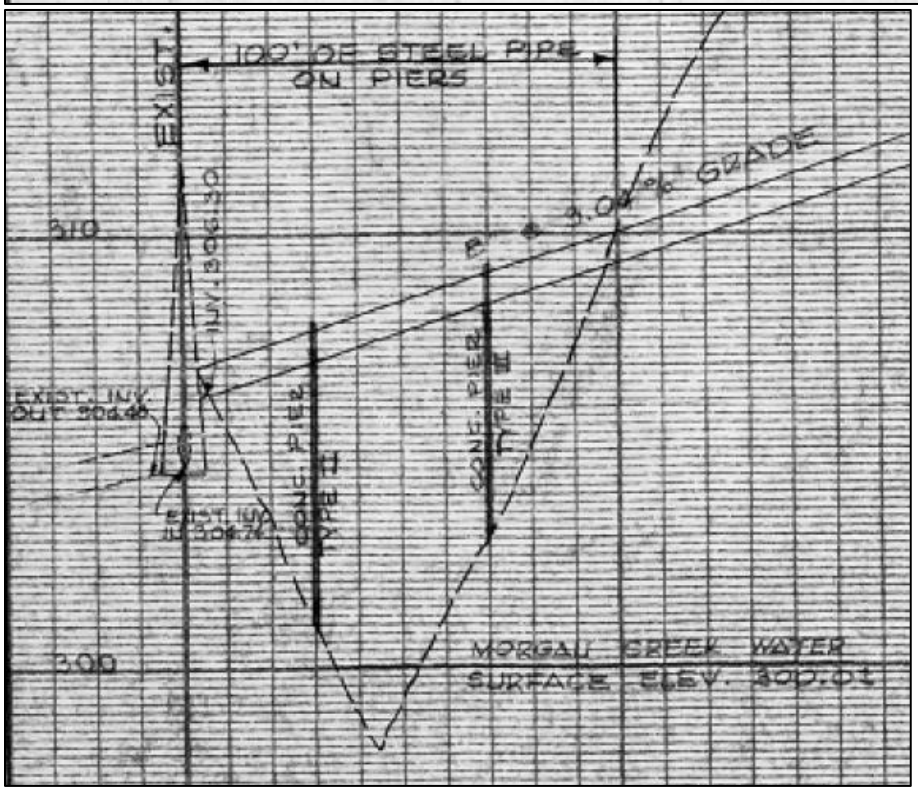
Vicinity Map:



Plan & Profile View:

*Note: The following figures were obtained from record drawing **SMC-S51** provided by OWASA.*





Findings:

P1 to P2: Over All View of Site 8 Aerial Crossing w/ Pier P1 in Foreground.



P1: View of the South Face of the Pier, the Minor Surface Defects; Bug Holes & Scour / Surface Wear.



P2: View of the South and East Faces of the Pier and the Minor Surface Defects Linear Cracks.



P3 Close-Up View Looking at the South Face and T.O. Pier Surface Cracks and Gaps Between Connection Straps and Concrete Surfaces Observed.



McKIM&CREED

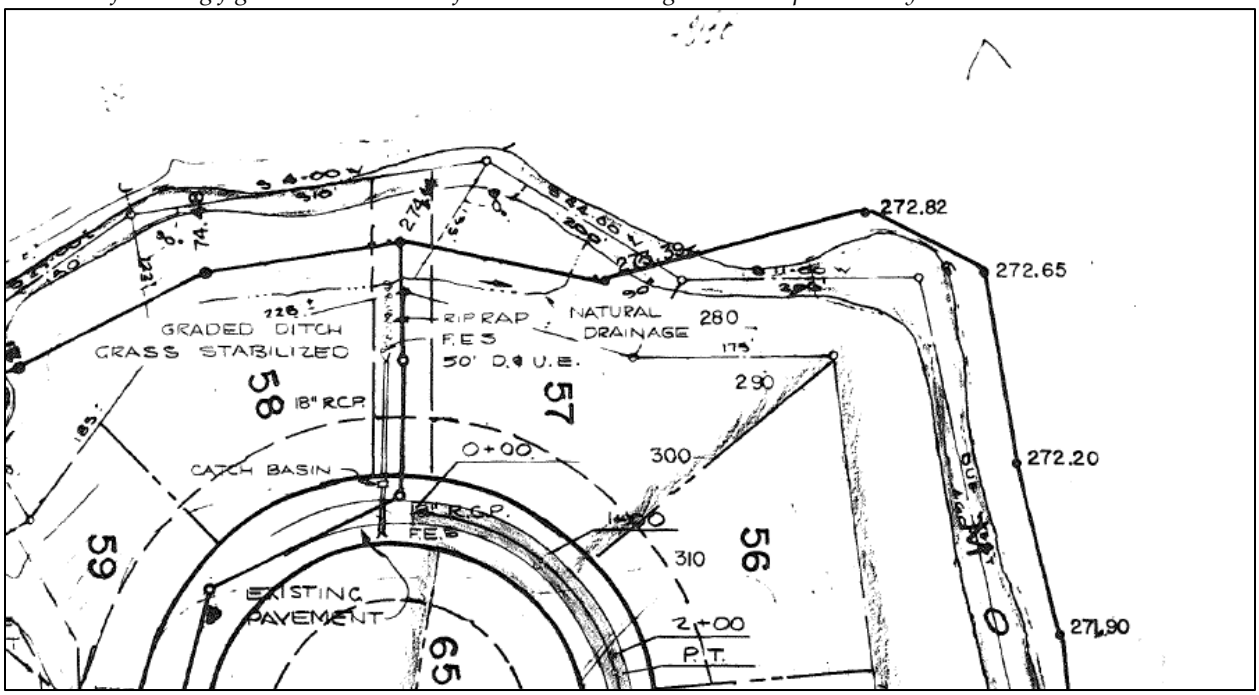
Site 11 – 24in Ductile Iron (DI) | Inspection Date: 06.06.2023

Vicinity Map:



Plan & Profile View:

*Note: The following figures were obtained from record drawing **RES-F25** provided by OWASA.*



Findings:

P1 to P4: Over All View of Site 11 Aerial Crossing w/ Pier P1 in Foreground.



P1: View Looking at the South Face of the Pier, the T.O. Pier Spall and Exposed / Bent Anchor Bolts.



P2: View Looking at the North Face of the Pier Minor Surface Defects Observed.



P3: View Looking at the South and East Faces of the Pier and the Minor Surface Defects in the Form of Bug Holes Observed.



P4: View Looking at the South Face of the Pier, the Minor Surface Defects and the Exposed Vertical Reinforcing Bar at the Base & Above the Water Line Observed.

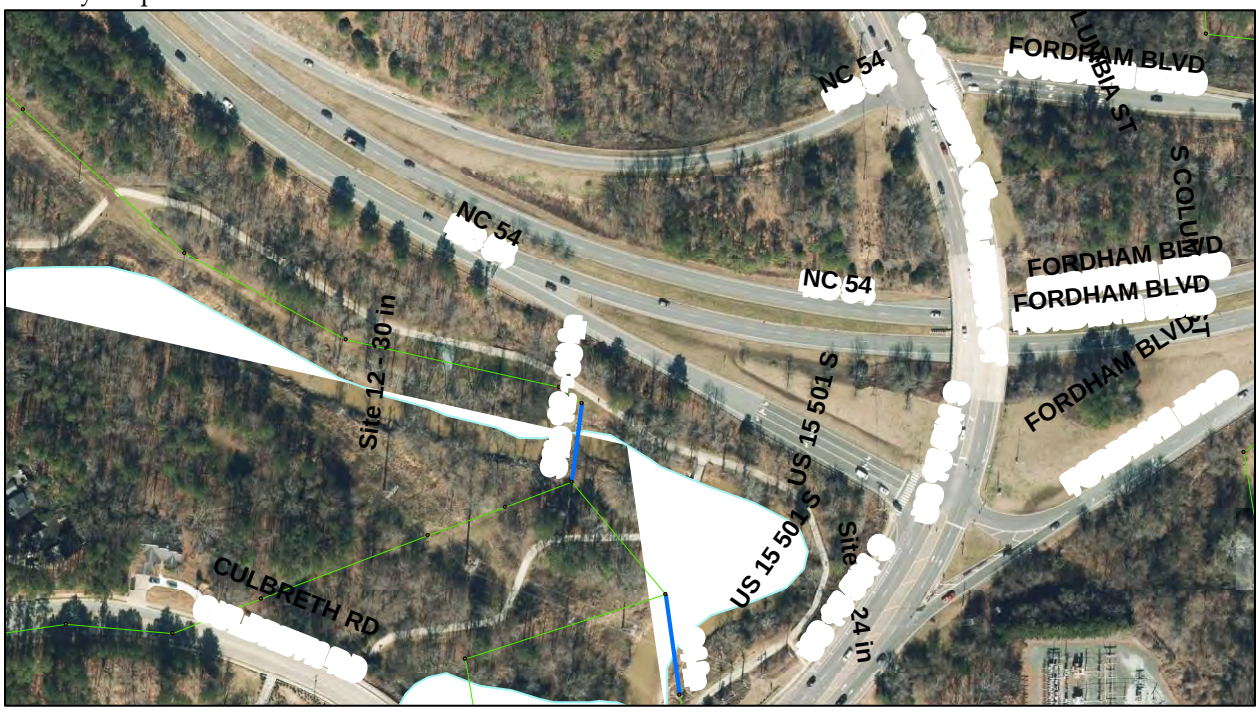


P1 to P4: View Looking at Typical Pipe to Pier Anchor Assembly Observed.



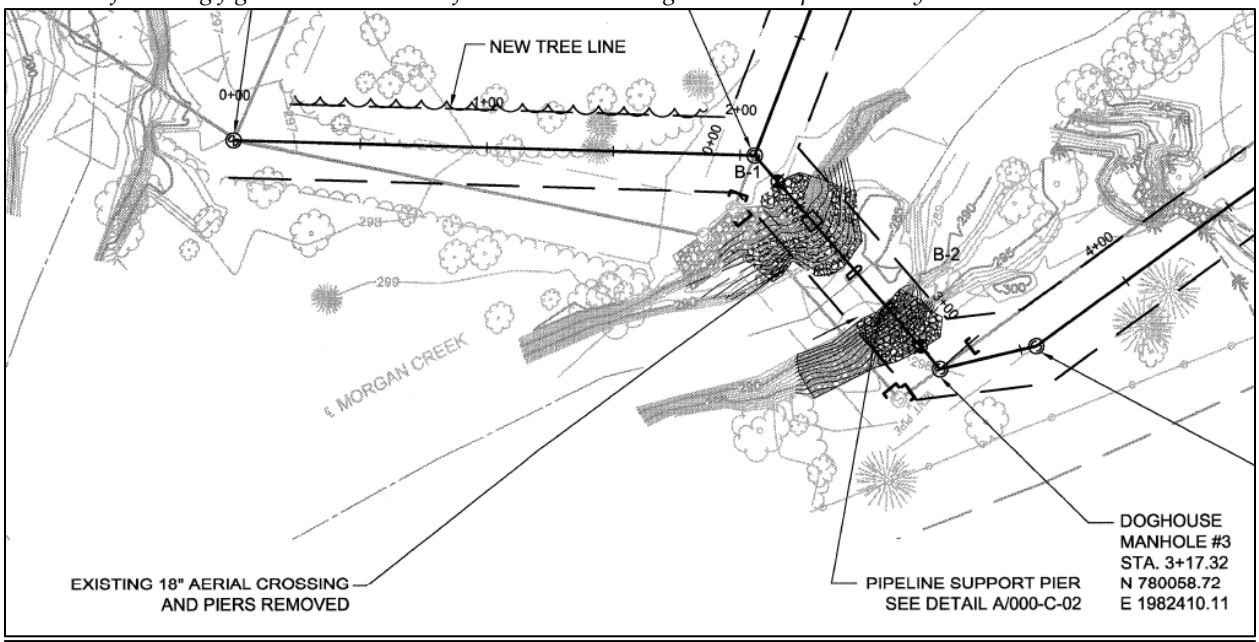
Site 12 – 30in Ductile Iron (DI) | Inspection Date: 05.10.2023

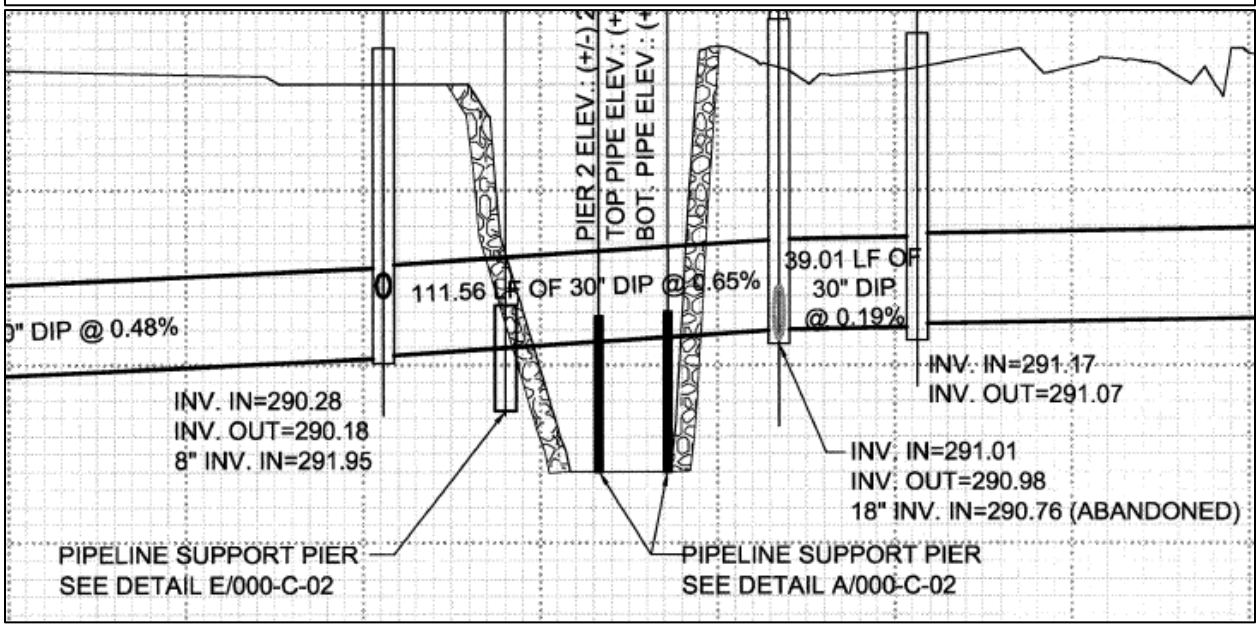
Vicinity Map:



Plan & Profile View:

*Note: The following figures were obtained from record drawing **SMC-S52** provided by OWASA.*





Findings:

P1 to P2: Over All View of Site 3 Aerial Crossing w/ Pier P1 in Foreground.

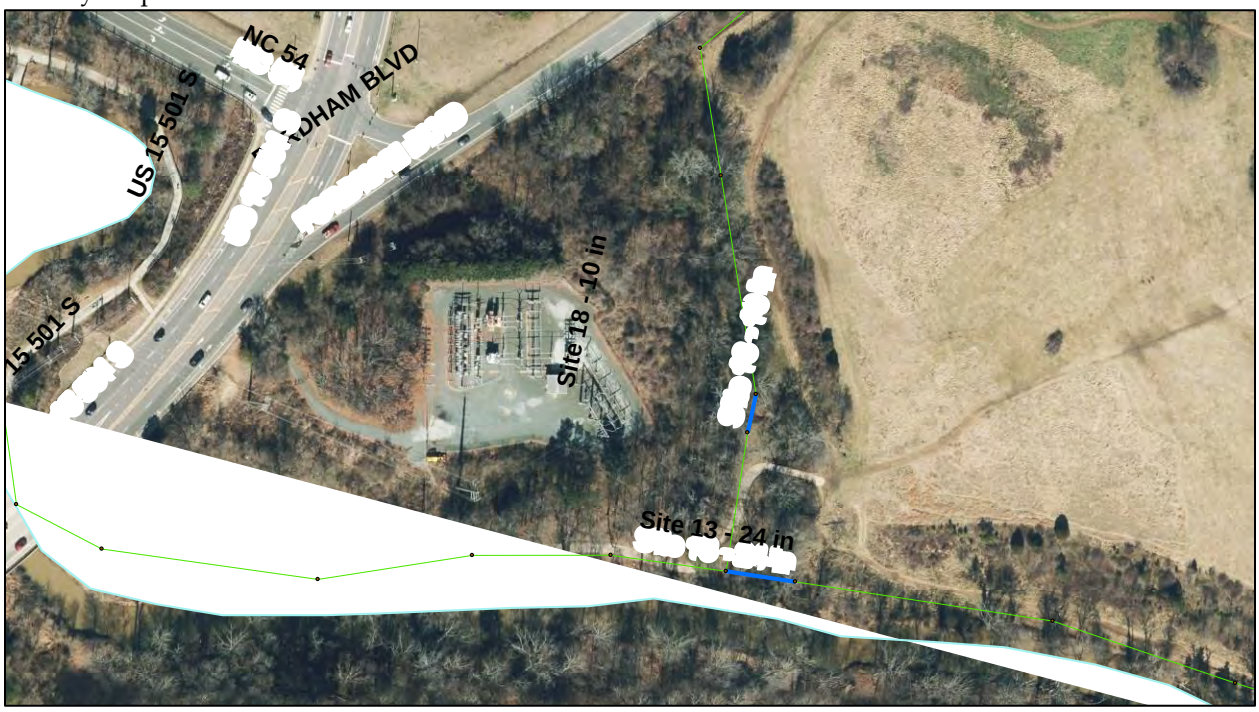


P1 to P2: View Looking at Typical Pipe to Pier Anchor Assembly Observed.



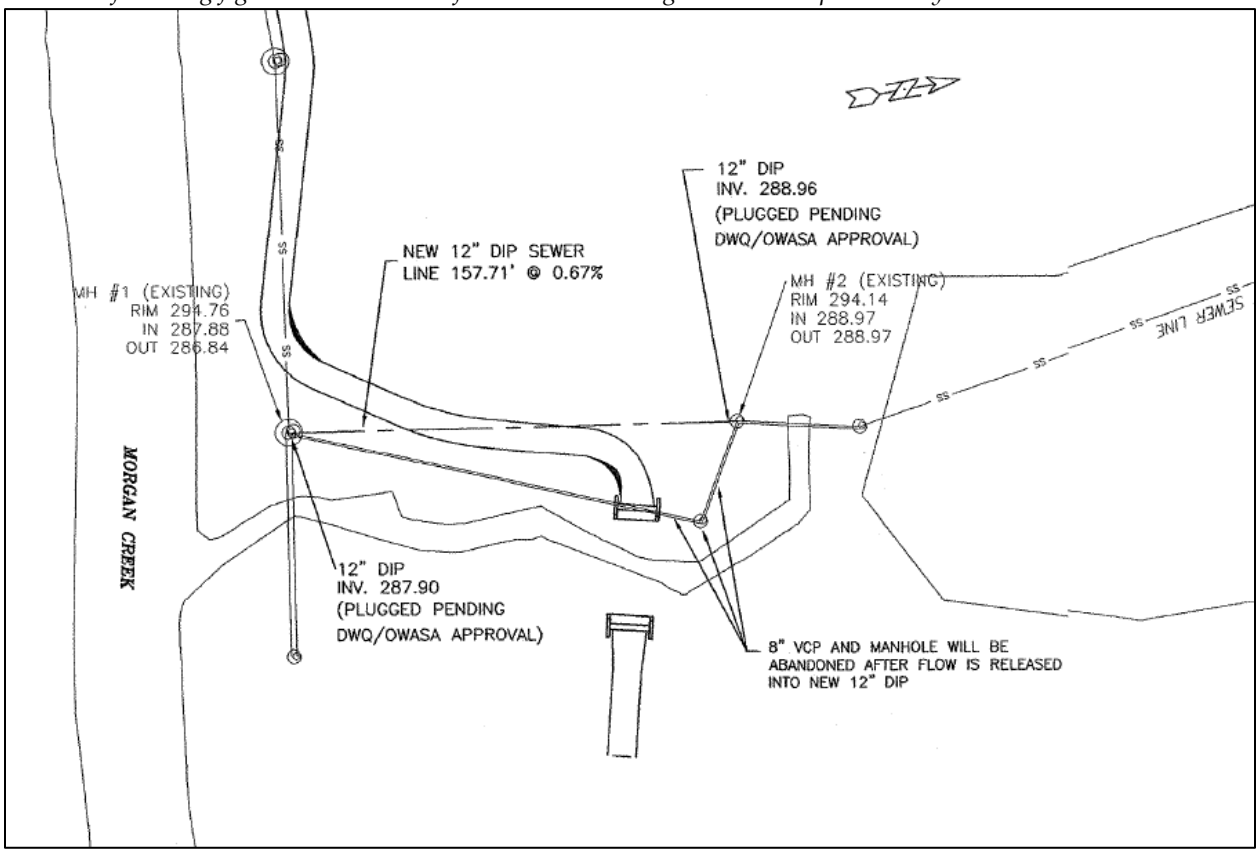
Site 13 – 24in Ductile Iron (DI) | Inspection Date: 05.10.2023

Vicinity Map:



Plan & Profile View:

*Note: The following figures were obtained from record drawing **MUN-M01** provided by OWASA.*



Findings:

P1: Over All View of Site 13 Aerial Crossing.



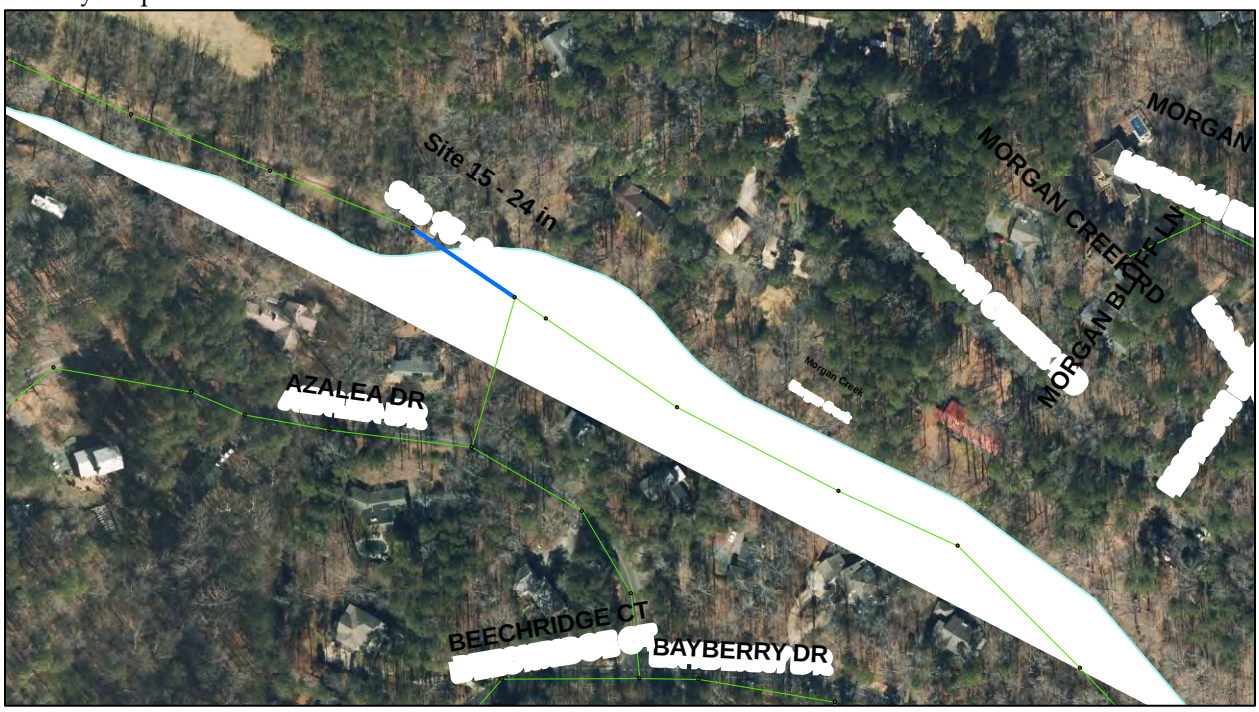
P1: View Looking at the East Face of the Pier & the Large Amount of Debris Around the Pier.



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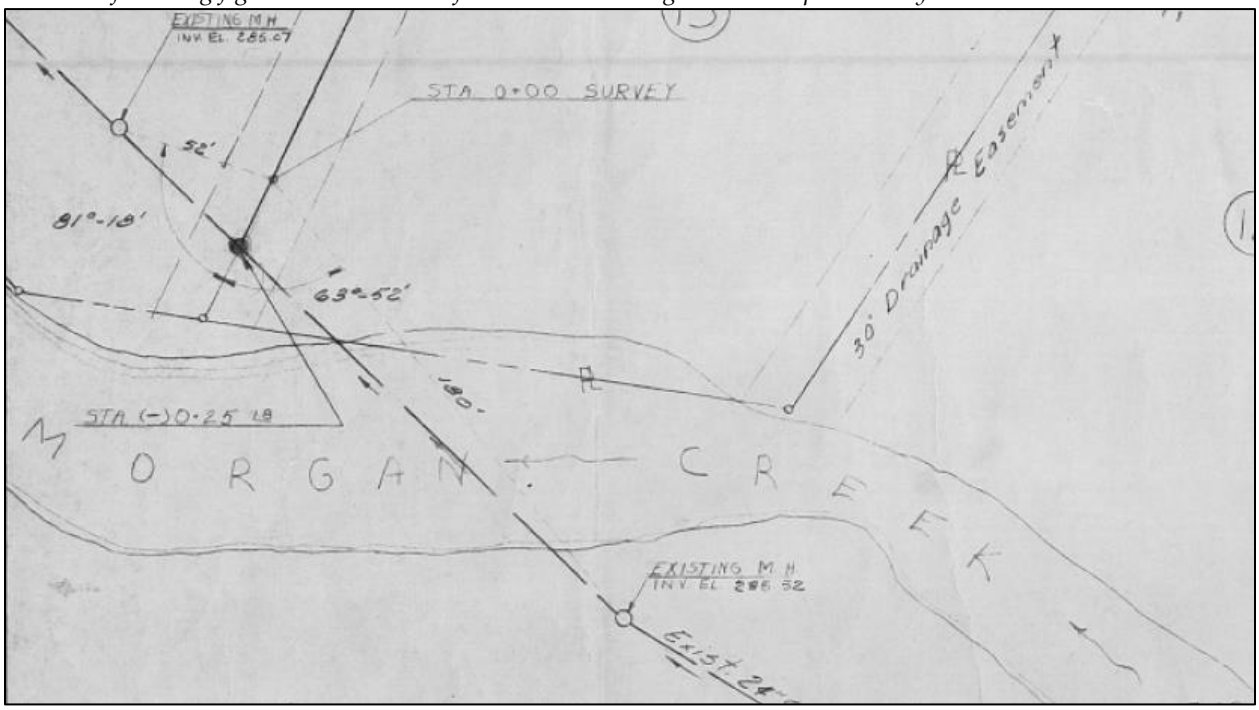
Site 15 – 24in CIPP-CI | Inspection Date: 05.10.2023

Vicinity Map:



Plan & Profile View:

*Note: The following figures were obtained from record drawing **RES-M02** provided by OWASA.*



Findings:

P1 to P6: Over All View of Site 15 Aerial Crossing w/ Pier P2 in Foreground (P1 Out of View).



P1: View Looking Down at the T.O. Pier. Note the Assembly is Primarily Below Grade.



P2: View Looking at the East Face of the Pier Minor Surface Defects and Debris Observed.



P4: View Looking at the South and West Faces of the Pier & Minor Surface Defects in the Form of Bug Holes and Void Observed.



P6: View Looking Down at the T.O. Pier. Note the South Side of the Assembly is Primarily Below Grade.

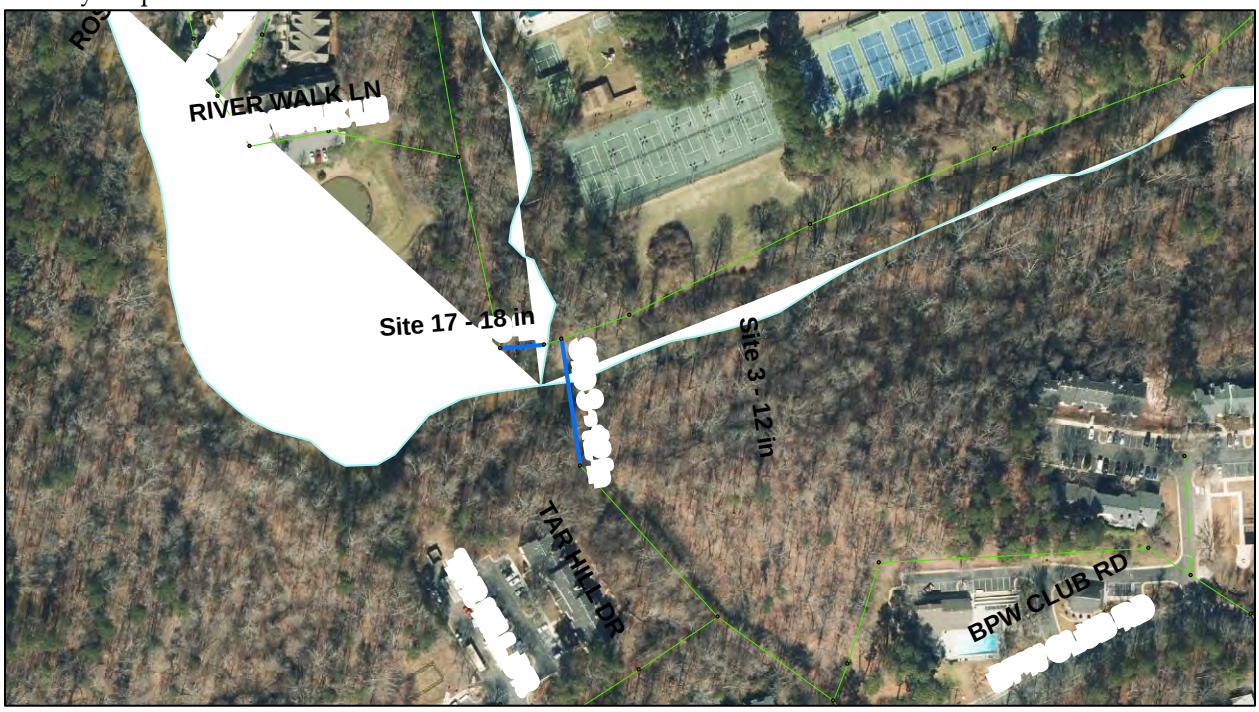


P1 to P6: View Looking at Typical Pipe to Pier Anchor Assembly Observed.



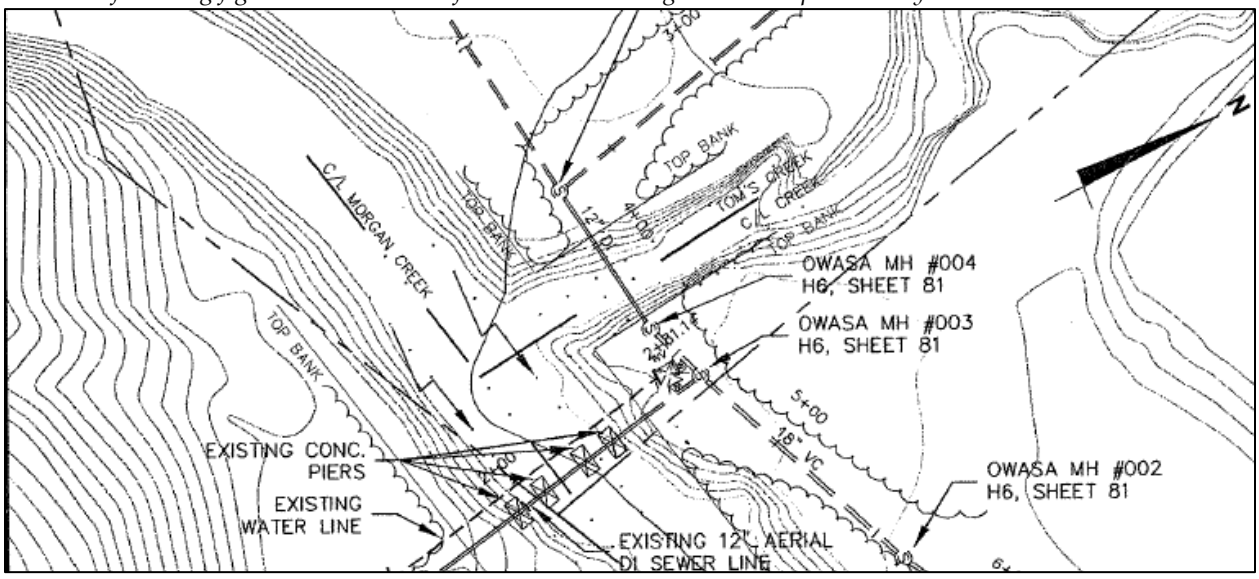
Site 17 – 18in Vitrified Clay (VC) | Inspection Date: 05.10.2023

Vicinity Map:



Plan & Profile View:

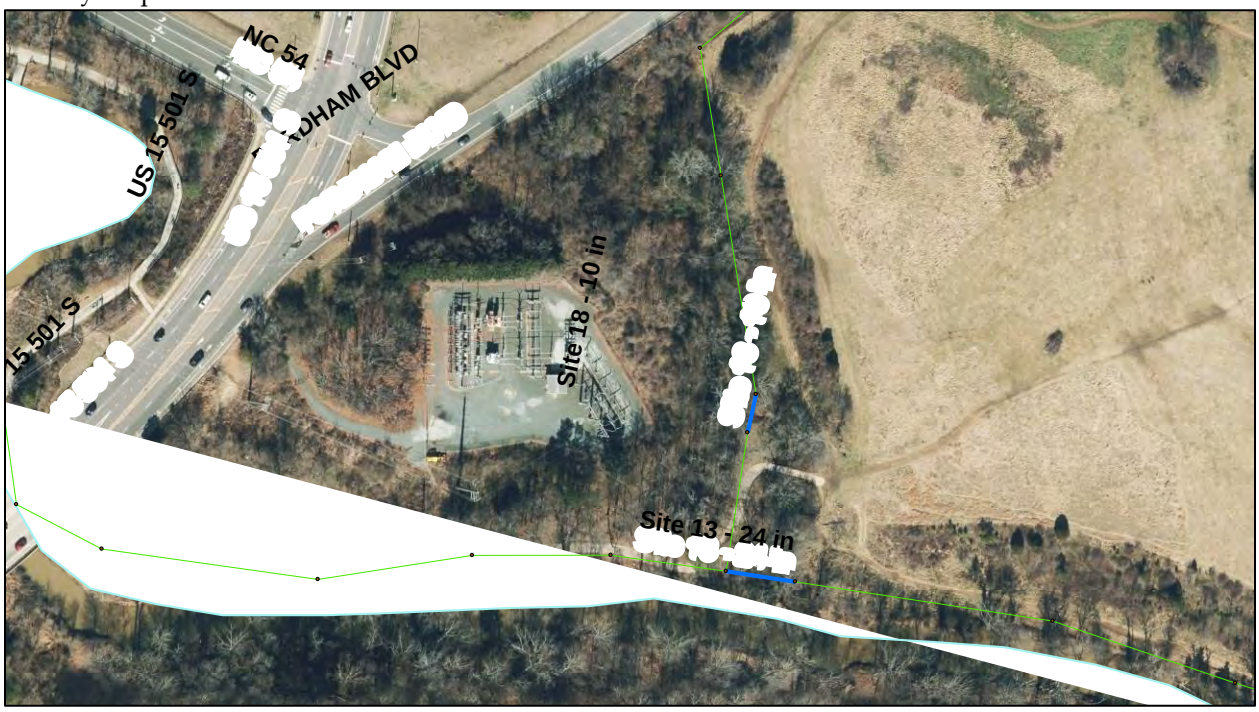
*Note: The following figures were obtained from record drawing **SMC-S46** provided by OWASA.*



Findings:
No piers.

Site 18 – 10in Vitrified Clay (VC) | Inspection Date: 05.10.2023

Vicinity Map:



Plan & Profile View:

Note: The following figures were obtained from record drawings provided by OWASA.

Findings:

P1: Over All View of Site 18 Aerial Crossing. Note the Amount of Debris Surrounding the Pier.



P1: View of East End of Pier and the Minor Surface Defects, Wood Base & Pipe to Pier Connection.



Appendix E

Detailed Budgetary OPCC

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Site 3

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Critical Action Items					
1	Mobilization	1	LS	$ 15,000.00	$ 15,000.00
2	Remove and Replace Existing 12-inch DI Sanitary Sewer w/ 12-inch 401-Lined RJ DIP Sanitary Sewer (0'-10' Depth)	182	LF	$ 350.00	$ 63,700.00
3	Furnish and Install 24-inch Steel Encasement	100	LF	$ 255.00	$ 25,500.00
4	Remove and Replace Existing Precast Concrete Manhole (0'-10' Depth)	2	EA	$ 20,000.00	$ 40,000.00
5	Remove and Replacement of Aerial Piers	4	EA	$ 30,000.00	$ 120,000.00
6	Stream Restoration	1	LS	$ 50,000.00	$ 50,000.00
7	Temporary Construction Access	1	LS	$ 50,000.00	$ 50,000.00
8	Bypass Pumping	1	LS	$ 150,000.00	$ 150,000.00
				SUBTOTAL	$ 514,200.00
				Estimating Contigency (30%)	$ 154,260.00
				TOTAL	**$ 668,460.00**

Site 4

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Critical Action Items					
1	Mobilization	1	LS	$ 12,000.00	$ 12,000.00
2	Remove and Replace Existing 18-inch DI Sanitary Sewer w/ 18-inch 401-Lined RJ DIP Sanitary Sewer (0'-10' Depth)	172	LF	$ 480.00	$ 82,560.00
3	Furnish and Install 30-inch Steel Encasement	70	LF	$ 340.00	$ 23,800.00
4	Remove and Replace Existing Precast Concrete Manhole (0'-10' Depth)	2	EA	$ 20,000.00	$ 40,000.00
5	Remove and Replacement of Aerial Piers	1	EA	$ 30,000.00	$ 30,000.00
6	Stream Restoration	1	LS	$ 50,000.00	$ 50,000.00
7	Temporary Construction Access	1	LS	$ 15,000.00	$ 15,000.00
8	Bypass Pumping	1	LS	$ 150,000.00	$ 150,000.00
				SUBTOTAL	$ 403,360.00
				Estimating Contigency (30%)	$ 121,008.00
				TOTAL	**$ 524,368.00**

Site 5

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Operations/Maintenance Action Items					
1	Mobilization	1	LS	$ 1,000.00	$ 1,000.00
2	Replace 24-inch Stainless Steel Pier Straps	4	EA	$ 1,125.00	$ 4,500.00
				SUBTOTAL	$ 5,500.00
				Estimating Contigency (30%)	$ 1,650.00
				TOTAL	**$ 7,150.00**
Other Action Items					
1	Mobilization	1	LS	$ 14,000.00	$ 14,000.00
2	Remove and Replace Existing 24-inch DI Sanitary Sewer w/ 24-inch 401-Lined RJ DIP Sanitary Sewer (0'-10' Depth)	145	LF	$ 600.00	$ 87,000.00
3	Furnish and Install 36-inch Steel Encasement	90	LF	$ 425.00	$ 38,250.00
4	Remove and Replace Existing Precast Concrete Manhole (0'-10' Depth)	2	EA	$ 20,000.00	$ 40,000.00
5	Remove and Replacement of Aerial Piers	4	EA	$ 30,000.00	$ 120,000.00
6	Stream Restoration	1	LS	$ 50,000.00	
7	Temporary Construction Access	1	LS		
8	Bypass Pumping	1	LS	$ 150,000.00	$ 150,000.00
				SUBTOTAL	$ 449,250.00
				Estimating Contigency (30%)	$ 134,775.00
				TOTAL	**$ 584,025.00**

Site 6

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Critical Action Items					
1	Mobilization	1	LS	$ 11,000.00	$ 11,000.00
2	Remove and Replace Existing 8-inch DI Sanitary Sewer w/ 8-inch 401-Lined RJ DIP Sanitary Sewer (0'-10' Depth)	90	LF	$ 330.00	$ 29,700.00
3	Furnish and Install 16-inch Steel Encasement	70	LF	$ 280.00	$ 19,600.00
4	Remove and Replace Existing Precast Concrete Manhole (0'-10' Depth)	2	EA	$ 20,000.00	$ 40,000.00
5	Remove and Replacement of Aerial Piers	2	EA	$ 30,000.00	$ 60,000.00
6	Stream Restoration	1	LS	$ 40,000.00	$ 40,000.00
7	Temporary Construction Access	1	LS	$ 50,000.00	$ 50,000.00
8	Bypass Pumping	1	LS	$ 100,000.00	$ 100,000.00
				SUBTOTAL	$ 350,300.00
				Estimating Contigency (30%)	$ 105,090.00
				TOTAL	**$ 455,390.00**

*NOTE Existing pipe bridge replacement not priced due to assumption of replacement with new steel encasement

Site 7

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Critical Action Items					
1	Mobilization	1	LS	$ 1,000.00	$ 1,000.00
2	Coat Interior of Existing Precast Concrete Manholes (0'-10' Depth)	2	EA	$ 5,000.00	$ 10,000.00
3	Bypass Pumping	1	LS	$ 12,000.00	$ 12,000.00
				SUBTOTAL	$ 23,000.00
				Estimating Contigency (30%)	$ 6,900.00
				TOTAL	**$ 29,900.00**

Operations Action Items					
1	Mobilization	1	LS	$ 1,000.00	$ 1,000.00
2	Replace 24-inch Stainless Steel Pier Straps	4	EA	$ 1,125.00	$ 4,500.00
				SUBTOTAL	$ 5,500.00
				Estimating Contigency (30%)	$ 1,650.00
				TOTAL	

Other Action Items					
1	Mobilization	1	LS	$ 15,000.00	$ 15,000.00
2	Remove and Replace Existing 24-inch DI Sanitary Sewer w/ 24-inch 401-Lined RJ DIP Sanitary Sewer (0'-10' Depth)	110	LF	$ 625.00	$ 68,750.00
3	Furnish and Install 36-inch Steel Encasement	70	LF	$ 455.00	$ 31,850.00
4	Remove and Replace Existing Precast Concrete Manhole (0'-10' Depth)	2	EA	$ 20,000.00	$ 40,000.00
5	Remove and Replacement of Aerial Piers	4	EA	$ 30,000.00	$ 120,000.00
6	Stream Restoration	1	LS	$ 50,000.00	$ 50,000.00
7	Temporary Construction Access	1	LS	$ 15,000.00	$ 15,000.00
8	Bypass Pumping	1	LS	$ 150,000.00	$ 150,000.00
				SUBTOTAL	$ 490,600.00
				Estimating Contigency (30%)	$ 147,180.00
				TOTAL	**$ 637,780.00**

Site 8

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Other Action Items					
1	Mobilization	1	LS	$ 1,000.00	$ 1,000.00
2	Install CIPP Liner for 12-inch Diameter Sanitary Sewer	100	LF	$ 205.00	$ 20,500.00
				SUBTOTAL	$ 21,500.00
				Estimating Contigency (30%)	$ 6,450.00
				TOTAL	**$ 27,950.00**

Operations Actions Items					
1	Mobilization	1	LS	$ 1,000.00	$ 1,000.00
2	Replace 12-inch Stainless Steel Pier Straps	2	EA	$ 1,140.00	$ 2,280.00
2	Install Repair Clamp for 12-inch Sanitary Sewer	1	EA	$ 3,000.00	$ 3,000.00
				SUBTOTAL	$ 6,280.00
				Estimating Contigency (30%)	
				TOTAL	**$ 6,280.00**

Site 10

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Other Action Items					
1	Mobilization	1	LS	$ 1,000.00	$ 1,000.00
2	Install CIPP Liner for 30-inch Diameter Sanitary Sewer (0'-10' Depth)	103	LF	$ 290.00	$ 29,870.00
3	Coat Interior of Existing Precast Concrete Manholes (0'-10' Depth)	2	EA	$ 5,000.00	$ 10,000.00
				SUBTOTAL	$ 40,870.00
				Estimating Contigency (30%)	$ 12,261.00
				TOTAL	**$ 53,131.00**

Site 11

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Critical Action Items					
1	Mobilization	1	LS	$ 13,000.00	$ 13,000.00
2	Remove and Replace Existing 24-inch DI Sanitary Sewer w/ 24-inch 401-Lined RJ DIP Sanitary Sewer (0'-10' Depth)	100	LF	$ 645.00	$ 64,500.00
3	Furnish and Install 36-inch Steel Encasement	70	LF	$ 455.00	$ 31,850.00
4	Remove and Replace Existing Precast Concrete Manhole (0'-10' Depth)	2	EA	$ 20,000.00	$ 40,000.00
5	Remove and Replacement of Aerial Piers	4	EA	$ 30,000.00	$ 120,000.00
6	Stream Restoration	1	LS	$ 40,000.00	$ 40,000.00
7	Temporary Construction Access	1	LS	$ 25,000.00	$ 25,000.00
8	Bypass Pumping	1	LS	$ 100,000.00	$ 100,000.00
				SUBTOTAL	$ 434,350.00
				Estimating Contigency (30%)	$ 130,305.00
				TOTAL	**$ 564,655.00**

Operations Action Items					
1	Mobilization	1	LS	$ 1,000.00	$ 1,000.00
2	Install Repair Clamp for 24-inch Sanitary Sewer	1	EA	$ 3,000.00	$ 3,000.00
3	Replace 24-inch Stainless Steel Pier Straps	4	EA	$ 1,125.00	$ 4,500.00
				SUBTOTAL	$ 25,500.00
				Estimating Contigency (30%)	$ 7,650.00
				TOTAL	**$ 33,150.00**

Other					
1	Mobilization	1	LS	$ 1,000.00	$ 1,000.00
2	Restoration of Stream Banks	1	LS	$ 25,000.00	$ 25,000.00
				SUBTOTAL	$ 26,000.00
				Estimating Contigency (30%)	$ 7,800.00
				TOTAL	**$ 33,800.00**

Site 12

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Critical Action Items					
1	Mobilization	1	LS	$ 2,000.00	$ 2,000.00
2	Install CIPP Liner for 30-inch Diameter Sanitary Sewer (0'-10' Depth)	112	LF	$ 280.00	$ 31,360.00
3	Coat Interior of Existing Precast Concrete Manholes (0'-10' Depth)	2	EA	$ 5,000.00	$ 10,000.00
				SUBTOTAL	$ 43,360.00
				Estimating Contigency (30%)	$ 13,008.00
				TOTAL	**$ 56,368.00**

Operations Action Items					
1	Mobilization	1	LS	$ 1,000.00	$ 1,000.00
2	Install Repair Clamp for 30-inch Sanitary Sewer	3	EA	$ 3,500.00	$ 10,500.00
3	Replace 30-inch Stainless Steel Pier Straps	4	EA	$ 1,300.00	$ 5,200.00
				SUBTOTAL	
				Estimating Contigency (30%)	$ -
				TOTAL	**$ -**

Site 13

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Critical Action Items					
1	Mobilization	1	LS	$ 1,000.00	$ 1,000.00
2	Install CIPP Liner for 24-inch Diameter Sanitary Sewer	80	LF	$ 280.00	$ 22,400.00
3	Replace Precast Concrete Manhole Cone and Ring and Cover	2	EA	$ 1,200.00	$ 2,400.00
4	Coat Interior of Existing Precast Concrete Manholes (0'-10' Depth)	1	EA	$ 5,000.00	$ 5,000.00
				SUBTOTAL	$ 30,800.00
				Estimating Contigency (30%)	$ 9,240.00
				TOTAL	**$ 40,040.00**

Site 15

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Other Action Items					
1	Mobilization	1	LS	$ 15,000.00	$ 15,000.00
2	Remove and Replace Existing 24-inch DI Sanitary Sewer w/ 24-inch 401-Lined RJ DIP Sanitary Sewer (0'-10' Depth)	175	LF	$ 585.00	$ 102,375.00
3	Furnish and Install 36-inch Steel Encasement	100	LF	$ 410.00	$ 41,000.00
4	Coat Interior of Existing Precast Concrete Manholes (0'-10' Depth)	2	EA	$ 5,000.00	$ 10,000.00
5	Remove and Replacement of Aerial Piers	4	EA	$ 30,000.00	$ 120,000.00
6	Stream Restoration	1	LS	$ 50,000.00	$ 50,000.00
7	Temporary Construction Access	1	LS	$ 25,000.00	$ 25,000.00
8	Bypass Pumping	1	LS	$ 150,000.00	$ 150,000.00
				SUBTOTAL	$ 513,375.00
				Estimating Contigency (30%)	$ 154,012.50
				TOTAL	**$ 667,387.50**

Site 16

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Other Action Items					
1	Mobilization	1	LS	$ 1,000.00	$ 1,000.00
2	Replace Vent Stack on Existing Precast Concrete Manhole	1	EA	$ 2,500.00	$ 2,500.00
				SUBTOTAL	$ 3,500.00
				Estimating Contigency (30%)	$ 1,050.00
				TOTAL	**$ 4,550.00**

Site 17

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Critical Action Items					
1	Mobilization	1	LS	$ 11,000.00	$ 11,000.00
2	Remove and Replace Existing 18-inch DI Sanitary Sewer w/ 18-inch 401-Lined RJ DIP Sanitary Sewer (0'-10' Depth)	100	LF	$ 540.00	$ 54,000.00
3	Furnish and Install 30-inch Steel Encasement	70	LF	$ 365.00	$ 25,550.00
4	Remove and Replace Existing Precast Concrete Manhole (0'-10' Depth)	2	EA	$ 20,000.00	$ 40,000.00
5	Remove and Replacement of Aerial Piers	1	EA	$ 30,000.00	$ 30,000.00
6	Stream Restoration	1	LS	$ 40,000.00	$ 40,000.00
7	Temporary Construction Access	1	LS	$ 25,000.00	$ 25,000.00
8	Bypass Pumping	1	LS	$ 125,000.00	$ 125,000.00
				SUBTOTAL	$ 350,550.00
				Estimating Contigency (30%)	$ 105,165.00
				TOTAL	**$ 455,715.00**

Site 18

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Critical Action Items					
1	Mobilization	1	LS	$ 8,000.00	$ 8,000.00
2	Remove and Replace Existing 10-inch DI Sanitary Sewer w/ 10-inch 401-Lined RJ DIP Sanitary Sewer (0'-10' Depth)	44	LF	$ 495.00	$ 21,780.00
3	Furnish and Install 20-inch Steel Encasement	30	LF	$ 480.00	$ 14,400.00
4	Remove and Replace Existing Precast Concrete Manhole (0'-10' Depth)	2	EA	$ 20,000.00	$ 40,000.00
5	Remove and Replacement of Aerial Piers	1	EA	$ 30,000.00	$ 30,000.00
6	Stream Restoration	1	LS	$ 30,000.00	$ 30,000.00
7	Temporary Construction Access	1	LS	$ 25,000.00	$ 25,000.00
8	Bypass Pumping	1	LS	$ 100,000.00	$ 100,000.00
				SUBTOTAL	$ 269,180.00
				Estimating Contigency (30%)	$ 80,754.00
				TOTAL	**$ 349,934.00**

*NOTE Operations costs excluded due to negligible costs associated