



CITY OF HAVELOCK

Post Office Box 368
Havelock, NC 28532

INVITATION TO BID

Pursuant to North Carolina General Statutes §143-131, the City of Havelock invites informal bids on the following:

Bids must be submitted in accordance with the attached specifications. Bids must include an itemized schedule (including quantity, unit price and total) for each work element. Bids can be submitted by mail, email, fax or hand delivered. Cover sheets, envelopes, etc. should be clearly marked with the words:

*“City of Havelock,
2019 Sewer Repairs”*

Address Bids to: **Lee Tillman, Director of Finance**
 City of Havelock
 P.O. Box 368
 1 Governmental Ave.
 Havelock, NC 28532
 Fax: 252-447-0126
 Email: Ltillman@havelocknc.us

Bids will be accepted until **2:00 PM (EST) on Wednesday, January 30, 2019** at which time they will be reviewed in the office of the City Finance Director. Quotes are not subject to public inspection until the contract is awarded. The bids are good for 75 days after opening.

Bidders are cautioned not to submit bids until the proposed requirements and specifications have been carefully examined. It will be considered that bidders will have satisfied themselves as to the accuracy of the specifications. No proposal will be considered unless prices are submitted for all items requested in any section. The City reserves the right to change the amount of quantities.

The names of certain brands or makes denote quality standard in the article desired, but do not restrict bidders to the specific brand, make or manufacturer named. They are meant to convey to prospective bidders the general style, type, character and quality of the article desired.

The successful bidder on all construction contracts will be required to conduct the operation in accordance with all Federal, State, and Municipal health and safety rules, regulations and laws applicable to the operation. The successful bidder may be asked to provide the City with a copy of the company's safety plan prior to commencing work. For all projects over \$30,000, a general contractor's license must be furnished to the City if applicable.



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N.C.G.S. (North Carolina General Statutes), specifically §160A-20.1(b), prohibit the City from entering into contracts with contractors and subcontractors who have not complied with the requirement of Article 2 or Chapter 64. The Contractor shall submit the E-Verify Affidavit, located in the Bid Proposal section, with their bid. Bids that do not include this Affidavit will be considered non-responsive.

N.C.G.S 147-86.42-84 requires that contractors with a North Carolina Local Government must not utilize any subcontractor found on the State Treasurer's Iran Divestment list or Companies Boycotting Israel list. The referenced lists can be found on the State Treasurer's website at the address www.nctreasurers.com and will be updated every 180 days.

The City of Havelock reserves the right to reject any or all proposals and to purchase items from the state contract in the efforts to award the contract to the bidder it deems to be for the best interest of the City.

This institution is an equal opportunity provider, and employer.

Contact person(s) for information on this bid:

For questions in regards to the bid specifications, the City requires and only responds to questions submitted in writing and sent via email to:

Ltillman@havelocknc.us **AND cc:** Asmith@havelocknc.us

Questions must be received by **2:00 PM (EST) on Wednesday, January 23, 2019**. If questions are received, the City will respond no later than **2:00 PM (EST) on Tuesday, January 29, 2019**.

This is the 21st day of December 2018

CITY OF HAVELOCK

Lee W. Tillman
Director of Finance



**STATE OF NORTH CAROLINA
AFFIDAVIT
CITY OF HAVELOCK**

I, _____ (the individual attesting below), being duly authorized by and on behalf of _____ (the entity hereinafter "Employer") after first being duly sworn hereby swears or affirms as follows:

1. Employer understands that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law in accordance with NCGS §64-25(5).
2. Employer understands that Employers Must Use E-Verify. Each employer, after hiring an employee to work in the United States, shall verify the work authorization of employee through E-Verify in accordance with NCGS §64-26(a).
3. Employer is a person, business entity, or other organization that transacts business in the State and that employs 25 or more employees in this State. (mark Yes or No)
 - a. YES _____, or
 - b. NO _____
4. Employer's subcontractors comply with E-Verify, and if Employer is the winning bidder on this project Employer will ensure compliance with E-Verify by any subcontractors subsequently hired by Employer.

This _____ day of _____, 20____.

Signature of Affiant
Print or Type Name: _____

State of North Carolina County of _____

Signed and sworn to (or affirmed) before me, this the _____ day of _____, 20____.

Signature of Notary Printed Name of Notary

My Commission Expires: _____

Bid Sheet

Base Bid: _____

NC Sales Tax: _____

Delivery Cost (if applicable): _____

Total Cost to City: _____

Bids must include an itemized schedule by quantity, unit price and total for each work element.

Company Name: _____

Company Address: _____

Contact Person: _____

Telephone Number: _____

NC Contractor's License Type and Number _____

Number of Addendums Acknowledged (circle one): N/A 1 2 3 4

**IRAN DIVESTMENT ACT CERTIFICATION
REQUIRED BY N.C.G.S 147-86.55-69**

As of the date listed below, the vendor or bidder listed above is not listed on the Final Divestment List created by the State Treasurer pursuant to N.C.G.S. 147-86.55-69.

The undersigned hereby certifies that he or she is authorized by the vendor or bidder listed above to make the forgoing statement.

Authorized Signature: _____

Print Name of Authorized Signature: _____

Title: _____

Address Bid to:

Lee Tillman, Director of Finance
City of Havelock
P.O. Drawer 368
1 Governmental Avenue
Havelock, NC 28532

Please indicate the Bid name on the outside of the envelope.

Havelock, NC
2019 Sewer Repairs
Proposal

BIDDER _____

DATE OF BID _____, 2019

Basis of Bid

A Lump Sum Price for furnishing all materials, labor, equipment, supervision and all else necessary for complete each of the individual project areas listed below. All Project Areas shall be included in the bid. If the bidder leaves blank any lines or spaces indicated for dollar amounts for any Project Area, that omission will be understood and treated as if the Bidder has written zero dollars (\$0.00) for that Project Area.

A. Project Area 1, Repair between MH P29 and MH P28 (in words and figures):

_____ Dollars and _____ Cents
(\$ _____)

B. Project Area 2, Repair between MH F29 and MH F15 (in words and figures):

_____ Dollars and _____ Cents
(\$ _____)

C. Project Area 3, Repair between MH M12 and MH M11 (in words and figures):

_____ Dollars and _____ Cents
(\$ _____)

D. Project Area 4, Repair between MH HS35 and MH HS40 (in words and figures):

_____ Dollars and _____ Cents
(\$ _____)

E. Project Area 5, Replacement between MH G57 and MH G58 and Replacement between MH G80 and MH G86 (in words and figures):

_____ Dollars and _____ Cents
(\$ _____)

Total for BASE BID Project Areas 1, 2, 3, 4, and 5 (in words and figures):

_____ Dollars and _____ Cents
(\$ _____)

Bidder must completely fill in the City of Havelock Bid Sheet. The Base Bid is the total of Project Areas 1, 2, 3, 4, and 5.

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2019 Sewer Repairs
Scope of Work



1. Summary of Work

A. The work for this project is in five separate Project Areas within the City of Havelock sewer collection system:

- 1) Point repair between manholes P29 and P28 on Speight Street. Point repair is approximately 20 feet west of manhole P29, as shown on Figure 1. This proposed point repair shall begin at a previous point repair which has been completed from manhole P29 to approximately 20 feet west of manhole P29. The existing transition coupling from the previous point repair shall be removed. Following completion of the point repair, the excavation shall be backfilled in 8-inch lifts as specified herein, and in accordance with Detail 0222103R on Figure 6.
- 2) Point repair and CIPP lining between manholes F29 and F15 on Gray Fox Road near Coachman Lane. Point repair is approximately 258 feet southeast of manhole F29, as shown on Figure 2. Existing sewer line material is truss pipe. Connection to existing truss pipe shall be made with a Truss Pipe to SDR Adapter as manufactured by Contech Engineered Solutions or equal. The bell end of the new SDR 35 sewer pipe shall be installed on the spigot end of the adapter. Following point repair, the excavation shall be backfilled in 8-inch lifts as specified herein, and in accordance with Detail 0222103R on Figure 6. The surrounding surface shall be restored to the proper grade. After point repair and backfill have been completed, the 8-inch sewer from MH F29 to MH F15 shall be lined with Cured-in-Place Pipe (CIPP). The length of sewer from MH F29 to MH F15 is approximately 295 feet. Repair for Area 2 shall include all materials and labor required to complete the point repair, backfill, for reconnection to the existing manhole with new boot, and to CIPP line the entire length of pipe.
- 3) Point repair between manholes M11 and M12 on Bristol Lane and well point abandonment. Point repair is approximately 128 feet north of manhole M12 and abandonment of a PVC well pipe approximately 51 feet north of manhole M12, as shown on Figure 3. Existing sewer material is PVC. Following point repair, the excavation shall be backfilled in 8-inch lifts as specified herein, and in accordance with Detail 0222103R on Figure 6. The surrounding surface shall be restored to the proper grade and pavement shall be repaired in accordance with Detail 0251301R. Repair for Area 3 shall include all materials and labor required to replace the defective section of pipe, for reconnection to the manhole with new boot, to cap and abandon the existing PVC well pipe, backfill, and to restore the asphalt surface.
- 4) Point repair and CIPP lining between manholes HS35 and HS40 on Rice Lane. Point repair is approximately 336 feet west of manhole HS35, as

shown on Figure 4. Existing sewer line material is truss pipe. Connection to existing truss pipe shall be made with a Truss Pipe to SDR Adapter as manufactured by Contech Engineered Solutions or equal. The bell end of the new SDR 35 sewer pipe shall be installed on the spigot end of the adapter. Following point repair, the excavation shall be backfilled in 8-inch lifts as specified herein, and in accordance with Detail 0222103R on Figure 6. The surrounding surface shall be restored to the proper grade and pavement shall be repaired in accordance with Detail 0251301R. After point repair and backfill have been completed, the 8-inch sewer from MH HS35 to MH HS40 shall be CIPP lined. The length of sewer from MH HS35 to MH HS40 is approximately 355 feet. Two laterals, one at 93ft and one at 94ft from MH HS35, shall be reinstated to 95% of the original opening, reference Paragraph 3.5-F of Attachment 2 for reinstatement of laterals. Repair for Area 4 shall include all materials and labor required to complete the point repair, for reconnection to the existing manhole with new boot, backfill, pavement repair, and to CIPP line the entire length of pipe.

- 5) Complete replacement of approximately 268 feet of 10 inch sewer between MH G57 and MH G58 and complete replacement of approximately 392 feet of 8 inch sewer between MH G80 and MH G86, as shown on Figure 5. The existing sewer material is truss pipe with sections of VCP, PVC, or concrete pipe. Contractor shall locate all existing service laterals connected to the existing sewer to be replaced prior to installation of proposed sewer main. Service laterals connected to the existing sewer main shall be replaced up to and including the cleanouts. If there is no cleanout or the cleanout is outside the right-of-way, replace service laterals up to the right-of-way and install a new cleanout. Reference Figure 7 for installation of laterals and cleanouts. All existing manholes shall remain in place. Following installation of the proposed sewer, the excavation shall be backfilled in 8-inch lifts as specified herein, and in accordance with Detail 0222103R on Figure 6. Pavement shall be repaired in accordance with Detail 0251301R. Repair for Area 5 shall include all materials and labor required to complete the replacement of the sewer mains, for reconnection to the existing manholes with new boot, backfill, pavement repair, and for reconnection and replacement of all sewer laterals.

- B. Table 1 summarizes the defects, approximate location, and required work at each location. It is recommended that bidding contractors visit each site and review CCTV footage prior to submitting bids. Copies of the CCTV inspections can be requested from the Owner.
- C. Contractor shall be responsible for locating existing utilities and verifying all existing site conditions, including but not limited to pipe diameter, invert elevations, and pipe material prior to beginning each repair. Any documentation of existing site conditions, including any CCTV inspection videos, are provided for the benefit of the Contractor. The City of Havelock assumes no responsibility for the accuracy or completeness of

information concerning existing site conditions provided.

2. Sewer Materials

A. PVC Gravity Sewer Pipe

1. PVC gravity sewer pipe shall conform to all the requirements of ASTM D3034 and shall be capable of withstanding the overburden pressures determined by the depth of burial in the field. Pipe shall be made from clean, virgin, NSF approved Class 12454 or 12364 compound conforming to resin specification ASTM D1784. Minimum pipe stiffness (F/dY) at 5% deflection shall be 115 psi for all sizes when tested in accordance with D2412.
2. Pipe shall have bell and spigot ends and be water tight. Pipe shall have an integral elastomeric-gasket bell end. Gaskets shall be in conformance with ASTM F477.
3. Where the sewer main is to be CIPP lined following point repairs, replace damaged section with PVC gravity pipe, SDR 35 minimum.
4. Where the sewer main is not noted to be CIPP lined following point repairs, replace damaged section with PVC gravity pipe, SDR 26 minimum.
5. Where manhole to manhole replacement is required, replace existing sewer with PVC gravity pipe, SDR 26 minimum.
6. See Attachment 1 "Gravity Sewer Installation and Testing Requirements" for additional requirements.

B. PVC Service Lateral Pipe and Fittings

1. Service laterals to be replaced shall be replaced with ASTM D 1785, Schedule 40 pipe, with plain ends for solvent-cemented joints with ASTM D 2466, Schedule 40, socket-type fittings.

C. PVC Cleanouts

1. Schedule 40 PVC pipe and fittings with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

D. Nonpressure-type Pipe Couplings

1. Couplings for joining PVC gravity sewer pipe to existing sewer shall be solid sleeve type suitable for all types of pipe. Material shall be ductile iron with gaskets suitable for sewer service. Coupling shall be Hymax Coupling or equal.

E. Truss Pipe to SDR 35 Adapter

1. Adapter shall be a gasketed truss pipe to SDR adapter as manufactured by Contech Engineered Solutions or equal.

3. Truss and Solid Wall Plastic Pipe Cutting

- A. Cutting of pipe lengths, where required, shall be performed using tools or equipment that will provide a neat, perpendicular cut without damage to the plastic. All burrs shall be removed using a file, knife or abrasive paper. Spigot ends on cut pipe shall be beveled to prevent gasket damage.
- B. Clean, seal, and lubricate the cut end of truss pipe in accordance with the recommendations of the manufacturer of the Truss Pipe to SDR 35 adapter.

4. CIPP Lining

- A. See Attachment 2 "Sewer Rehabilitation – Cured-in-Place Pipe" for material and installation requirements for CIPP Liner.

5. Dewatering

- A. The Contractor shall dewater as required for the completion of the work. All water removed by dewatering operations shall be disposed of in accordance with the North Carolina Sedimentation Pollution Control Act.
- B. All dewatering flows shall pass through a sediment filter bag. Sediment filter bags shall be of polypropylene nonwoven geotextile fabric with a sewn-in sleeve of sufficient size to accept a 4-inch diameter discharge hose. The discharge hose should be extended into this sleeve a minimum of 6-inches and be tightly secured with a hose clamp or other suitable to prevent leakage. Hose connection through a slit in the bag will not be acceptable. Contractor shall size sediment filter bags as necessary to dewater trenches.
- C. All well points shall be properly abandoned, backfilled, and the surface shall be restored after completion of the work.

6. Excavation and Shoring

- A. The Contractor is responsible for the design and protection of all excavation and shoring. Any shoring shall be designed and sealed by a professional engineer registered in the State of North Carolina.
- B. Contractor shall notify NC 811 prior to any excavations.
- C. In no case shall excavation exceed that which can be backfilled by the end of the workday.

7. Pipe Bedding

- A. Pipe bedding shall be in accordance with Detail 0222103R, Bedding – Type C, attached to this Scope of Work in Figure 6. Pipe bedding shall be 8 inches of No. 57 Stone. Minimum trench width shall be the outside diameter of the pipe plus 18-inches on each side of the pipe. Consolidated ABC stone shall be installed from the top of the 57 stone bedding to the top of the installed pipe.

8. Backfill and Compaction

- A. All excavations shall be backfilled with native soils or select fill if the excavated material is not suitable. Contractor shall be responsible for the removal and disposal of all excavation material and construction debris.
- B. Compaction shall be to 98% Standard Proctor.
- C. Backfill shall be completed in maximum lifts of 8 inches.

9. Erosion and Sediment Control and Surface Restoration

- A. The Contractor shall be responsible for the installation and maintenance of all erosion and sediment control in accordance with the NC Erosion and Sediment Control Manual.
- B. Construction activities shall be completed in such a manner that erosion of disturbed areas and off-site sedimentation is absolutely minimized.
- C. All disturbed areas shall be restored as soon as construction is complete. Seed type shall match existing grass in maintained areas. Follow the NC Erosion and Sediment Control Manual for seeding.
- D. Rolled erosion control matting shall be used to stabilize all disturbed slopes.

10. Pavement Restoration

- A. Replacement of asphalt roadway and/or concrete driveways, to include under driveway culverts, is the responsibility of the contractor and shall be returned to original condition at end of project.
- B. The maximum width of pavement replacement for the installation of new sewer main and point repairs shall be 10 feet. The maximum width of pavement replacement for the replacement of service laterals is 5 feet. If pavement cuts are 24 inches or less from the edge of pavement, then the asphalt must be removed and replaced to the edge of pavement.
- C. All road repairs shall be completed in accordance with Detail 0251301R, Typical Pavement Junction, attached to this Scope of Work in Figure 6.

11. Bypass Pumping

- A. If bypass pumping is required for completion of any point repairs or replacement of existing sewer mains, the Contractor shall design and furnish all materials, labor, equipment, power, fuel, fuel storage, maintenance, etc. to implement a temporary pumping system for the purpose of diverting the existing flow around the work area on a daily basis, for the duration of the project. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction. Contractor shall also be responsible for any fines imposed by local, state, and/or federal agencies for failure to maintain flows or contain spills and/or overflows.
- B. Continuous bypass pumping is allowed in all project areas. Bypass pumping operation must be manned or be set up with floats and automatic on/off mode at all times that pumps are operating. Bypass pumping shall not be allowed to occur during weekends and holidays unless the Contractor receives approval to work during those times and said work requires temporary bypass pumping. When possible, bypass systems shall be removed prior to rain events so that no portion of the bypass system impedes the flow of the sewer.
- C. The minimum pumping capacity of the bypass pumps should match the table below for the diameter of pipe being bypassed:

Pipe Diameter	Pump Capacity
8" – 10"	1500 gpm

- D. For each size pump, Contractor shall have on-hand, a minimum of one spare standby pump with the minimum pumping capacity required. At least 2 wrap around repair clams shall be on-site at all times for each size pipe being used. If flexible hoses or collapsible hose is being used, provide appropriate repair kits onsite for each size hose being used.
- E. Contractor shall be responsible for the maintenance and operation of the bypass pumping for the duration of the installation. Overflows that occur shall be the responsibility of the contractor including cleanup and any fines assessed or damages caused to private or public property.

12. Access

- A. Each project area is within an existing City of Havelock easement or within City street right of way.
- B. If additional access is required through private property the Contractor shall coordinate access with the property owner(s) and restore all disturbed area to the satisfaction of the property owner(s).

13. Traffic Control

- A. Contractor shall submit a Traffic Control Plan in accordance with the Manual of Uniform Traffic Control Devices (MUTCD) for any operations affecting traffic including but not limited to road closures. City must approve the traffic plan prior to implementation.
- B. Access to residences for local traffic shall be maintained throughout contract. Contractor shall provide a minimum of one week (7 days) notice to City of Havelock for any road closure.

14. Water Provided by the City of Havelock

- A. The Contractor shall provide all necessary pipe, fittings, and approved backflow prevention device, and obtain a water meter assembly from the Owner for connection to fire hydrants. The Contractor will be required to record daily meter readings at the beginning and ending of each workday and provide these readings to the Owner with each pay request. The Contractor will not be charged any fees for the use of the meter nor for any water used in the work. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant. No additional payment to the Contractor shall be made for use of the meter or the documentation of water used. The Contractor shall be responsible for providing all other necessary hoses and tools for obtaining the water.

15. General Provisions

- A. Contractor shall comply with all requirements of OSHA 1926.
- B. Contractor shall complete an Activity Hazard Analysis (AHA) for each day's work.
- C. Contractor shall submit a Schedule of Values (SOV) for each Project Area prior to beginning work. Each line item of the SOV shall include a total for that line and a break down between Labor and Materials.
- D. Work hours shall be 7am to 5pm, Monday through Friday. No work shall be performed on City holidays. Work outside established work hours must be scheduled with the City 48 hours in advance and is subject to approval.

CONSTRUCTION SEQUENCE

1. General Sequence
 - A. Contractor shall not proceed with construction or repair until there has been a Pre-Construction Conference attended by the Contractor and City of Havelock Public Services. Notice to Proceed will be issued following the Pre-Construction Conference. The total construction time for this project shall not exceed 120 days from the date of Notice to Proceed.
 - B. All repairs and replacements shall be internally inspected following completion of the individual repair. CCTV inspection videos shall be submitted to the Owner prior to final payment for the repair.

2. Construction Sequence for Project Area 1, repair between MH P29 and MH P28 – Reference Figure 1.
 - A. If needed, install sewer bypass system and maintain service until point repair is complete.
 - B. Install erosion control devices as needed to avoid sedimentation loss from the excavation area.
 - C. Excavate and dewater the area around the pipe to be replaced.
 - D. Remove and replace the damaged section of pipe between approximately 20 ft and 28 ft downstream of MH P29. The transition coupling from the previous point repair shall also be removed. Contractor to field verify location of exact repair.
 - E. Backfill and compact the area surrounding the repair in accordance with Detail 0222103R on Figure 6. Immediately upon backfill, final grade shall be established. The area shall be seeded and stabilized.
 - F. Internally CCTV inspect the repair for defects and leaks. If any leaks or defects are noted the Contractor shall make repairs as approved by the Owner. Provide a copy of the final CCTV inspection to the Owner. Payment for repair will not be made before CCTV inspection is provided and repair is approved by the Owner.

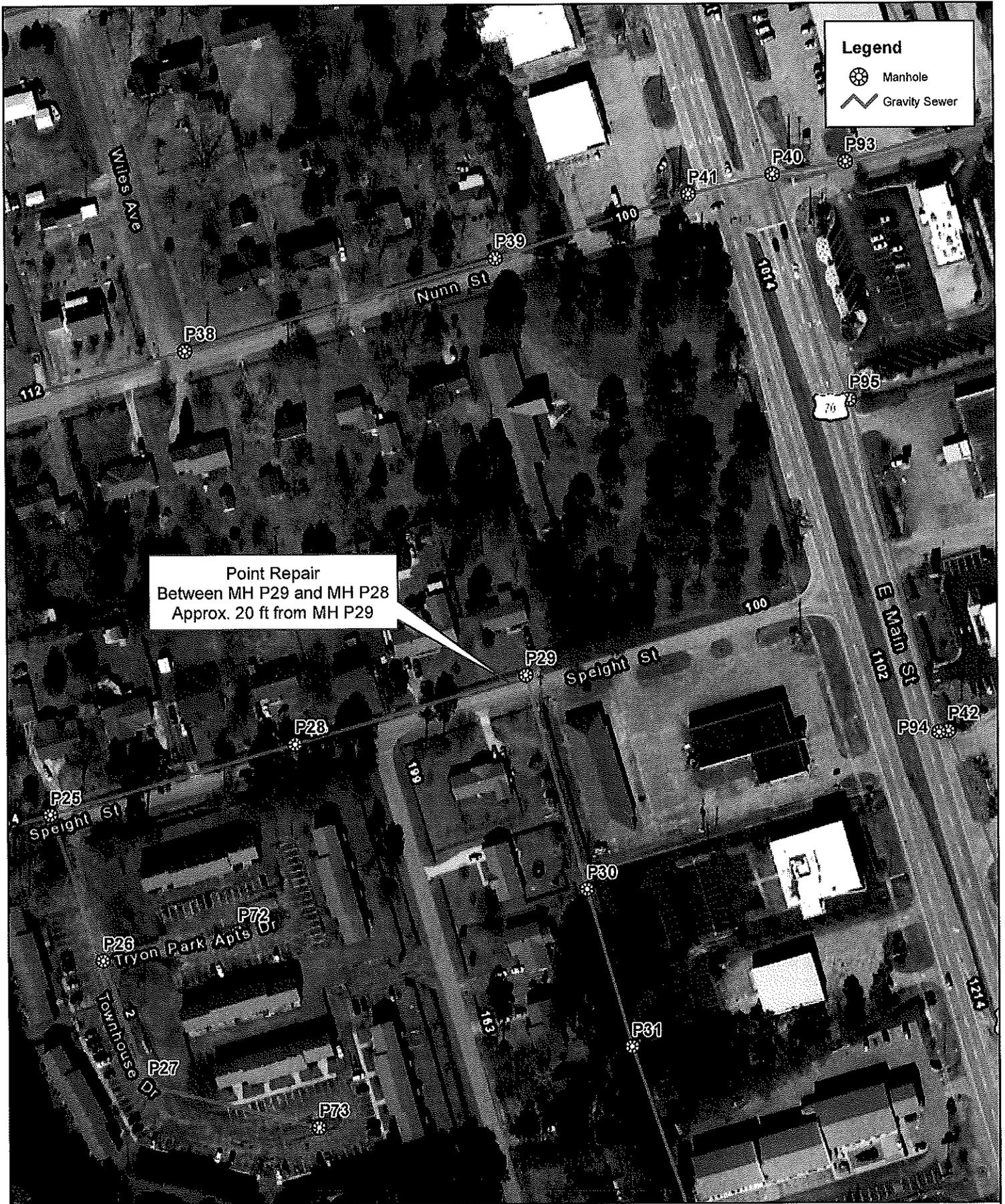
3. Construction Sequence for Project Area 2, repair between MH F29 and MH F15 – Reference Figure 2.
 - A. If needed, install sewer bypass system and maintain service until repair is complete.
 - B. Install erosion control devices as needed to avoid sedimentation loss from the excavation area.
 - C. Excavate and dewater the area around the pipe to be replaced.
 - D. Remove and replace the damaged section of pipe between MH F15 and approximately 258 ft downstream of MH F29. Contractor to field verify location of exact repair.
 - E. Backfill and compact the area surrounding the repair in accordance with Detail 0222103R on Figure 6 and restore the surface to proper grade. Immediately upon backfill, final grade shall be established. The area shall be seeded and stabilized.
 - F. Internally CCTV inspect the point repair for defects and leaks. If any leaks or defects are noted the Contractor shall make repairs as approved by the Owner. Provide a copy of the final CCTV inspection to the Owner.
 - G. CIPP line the entire length of 8-inch sewer (approximately 295 feet) from MH F29 to MH F15.

- H. Internally CCTV inspect the CIPP repair for defects and leaks. If any leaks or defects are noted the Contractor shall make repairs as approved by the Owner. Provide a copy of the final CCTV inspection to the Owner. Payment for repair will not be made before CCTV inspection is provided and repair is approved by the Owner.
 - I. Submit results of CIPP test samples as required by Attachment 2 "Sewer Rehabilitation – Cured-in-Place Pipe."
4. Construction Sequence for Project Area 3, repair between MH M11 and MH M12 – Reference Figure 3.
- A. If needed, install sewer bypass system and maintain service until point repair is complete.
 - B. Install erosion control devices as needed to avoid sedimentation loss from the excavation area.
 - C. Excavate and dewater the area around the pipe to be replaced.
 - D. Remove and replace the damaged section of pipe between MH M11 and approximately 128 ft upstream of MH M12. Contractor to field verify location of exact repair.
 - E. Sawcut and remove the pavement around the existing well pipe approximately 51 feet upstream of MH M12. Excavate around the existing well pipe and cut and cap the well pipe approximately 18-24 inches beneath the asphalt surface.
 - F. Cap the cut end of the well pipe with a PVC pipe cap prior to backfilling.
 - G. Backfill and compact in the locations of the repairs in accordance with Detail 0222103R on Figure 6. Immediately upon backfill, final grade shall be established. Where unpaved areas are disturbed, the area shall be seeded and stabilized.
 - H. Internally CCTV inspect the repairs for defects and leaks. If any leaks or defects are noted the Contractor shall make repairs as approved by the Owner. Provide a copy of the final CCTV inspection to the Owner. Payment for repair will not be made before CCTV inspection is provided and repair is approved by the Owner.
 - I. Repair asphalt in the location of the repairs in accordance with Detail 0251301R on Figure 6.
5. Construction Sequence for Project Area 4, repair between MH HS35 and MH HS40 – Reference Figure 4.
- A. If needed, install sewer bypass system and maintain service until repair is complete.
 - B. Install erosion control devices as needed to avoid sedimentation loss from the excavation area.
 - C. Excavate and dewater the area around the pipe to be replaced.
 - D. Remove and replace the damaged section of pipe between MH HS40 and approximately 336 ft downstream of MH HS35. Contractor to field verify location of exact repair.
 - E. Backfill and compact the area surrounding the repair in accordance with Detail 0222103R on Figure 6 and restore the surface to proper grade.
 - F. Where unpaved areas are disturbed, the area shall be seeded and stabilized.
 - G. Internally CCTV inspect the point repair for defects and leaks. If any leaks or defects are noted the Contractor shall make repairs as approved by the Owner. Provide a copy of the final CCTV inspection to the Owner.

- H. CIPP line the entire length of 8-inch sewer (approximately 355 feet) from MH HS35 to MH HS40.
 - I. Reinstate laterals to 95% of the original opening, per Paragraph 3.5-F of Attachment 2.
 - J. Internally CCTV inspect the CIPP repair for defects and leaks. If any leaks or defects are noted the Contractor shall make repairs as approved by the Owner. Provide a copy of the final CCTV inspection to the Owner. Payment for repair will not be made before CCTV inspection is provided and repair is approved by the Owner.
 - K. Repair asphalt in the location of the repair in accordance with Detail 0251301R on Figure 6.
 - L. Submit results of CIPP test samples as required by Attachment 2 "Sewer Rehabilitation – Cured-in-Place Pipe."
6. Construction Sequence for Project Area 5, replacement between MH G80 and MH G86 and replacement between MH G57 and MH G58 – Reference Figure 5.
- A. If needed, install sewer bypass system and maintain service until replacement is complete.
 - B. Install erosion control devices as needed to avoid sedimentation loss from the excavation area.
 - C. Locate all existing service laterals connected to the existing sewer main.
 - D. Excavate and dewater the area around the pipe to be replaced. Excavation of trench shall not advance more than 100 feet ahead of the installation of the sewer pipe. In no case should the excavation extend beyond that which can be backfilled by the end of the workday.
 - E. Remove existing sewer main and replace with approximately 268 feet of 10-inch PVC pipe between MH G57 and MH G58 and replace with approximately 392 feet of 8-inch PVC pipe between MH G80 and MH G86. Installation of new sewer main shall be in accordance with the requirements of Attachment 1 "Gravity Sewer Installation and Testing Requirements."
 - F. Reconnect service laterals. Service laterals shall be replaced up to and including the cleanout. Where there is no cleanout or where the cleanout is outside the right-of-way, service laterals shall be replaced to the right-of-way line and a new cleanout shall be installed.
 - G. New sewer main shall be reconnected to the existing upstream and downstream manholes. No sanitary sewer manholes will be replaced in this project area.
 - H. Pressure test sewer main as specified in Attachment 1 "Gravity Sewer Installation and Testing Requirements."
 - I. Backfill and compact in the locations of the repairs in accordance with Detail 0222103R on Figure 6.
 - J. Internally CCTV inspect the sewer main for defects and leaks. If any leaks or defects are noted the Contractor shall make repairs as approved by the Owner. Provide a copy of the final CCTV inspection to the Owner. Payment for repair will not be made before CCTV inspection is provided and repair is approved by the Owner.
 - K. Repair asphalt in the location of the repairs in accordance with Detail 0251301R on Figure 6.

**2019 Sewer Repairs
Table 1 - Summary of Work**

Project Area	Location	Upstream Manhole	Downstream Manhole	Approximate Depth (ft)	Pipe Size (in)	Pipe Material	Ground Surface	Defect Description	Approximate Location	Rehabilitation Method
1	Speight Street	P29	P28	11	8	Clay	Grass on the side of the road	Broken clay pipe with infiltration near a previous PVC point repair.	The joint between the clay pipe and the previous PVC point repair is approximately 20 feet downstream (west) of MH P29	Perform a point repair beginning at the previous PVC point repair at approximately 20ft to approximately 28ft downstream of MH P29. The existing VCP to PVC transition coupling shall be removed. Proposed point repair shall be connected to the existing VCP pipe at a joint that is not damaged with cracks or fractures.
2	Gray Fox Road near Coachman Lane	F29	F15	8	8	Truss Pipe	Grass on the side of the road	Sag in pipe near MH F15 with the formation of a sinkhole at the surface. Sink hole is currently holding water.	258 ft downstream (southeast) from MH F29	Perform a point repair from approximately 258ft downstream of MH F29 to MH F15. Point repair shall include all materials and labor to connect to existing MH F15. Following the point repair, the excavation shall be backfilled and compacted with select fill in accordance with Detail 0222103R on Figure 6. The surrounding area shall be restored to the proper grade. Once point repair and backfill have been completed, MH F29 to MH F15 shall be CIPP lined. MH F29 to MH F15 is approximately 295 ft.
3	Bristol Lane	M11	M12	10	10	PVC	Pavement	Sag in pipe with the formation of a sinkhole at the surface	128 ft upstream (north) from MH M12	Perform a point repair from approximately 128ft upstream of MH M12 to MH M11. Point repair shall include all materials and labor to connect to existing MH M11. Backfill shall be in accordance with Detail 0222103R and pavement repair shall be in accordance with Detail 0251301R on Figure 6.
3	Bristol Lane	M11	M12	N/A	N/A	PVC	Pavement	Well point at pavement surface	Approximately 51 ft upstream (north) from MH M12	Contractor shall neatly sawcut and remove the asphalt around the existing PVC well pipe. Excavate 18-24 inches deep around the well pipe. The existing well pipe shall be cut and capped approximately 18-24 inches below the asphalt surface. The area surrounding the well pipe shall be backfilled in accordance with Detail 0222103R on Figure 6. Complete a pavement patch in the location of the existing well pipe in accordance with Detail 0251301R on Figure 6.
4	Rice Lane	HS35	HS40	6.5	8	Truss Pipe	Pavement	Sag in pipe with the formation of a sinkhole at the road surface. Road surface is currently plated due to sinkhole.	336 ft downstream (west) from MH HS35	Perform a point repair from approximately 336ft downstream of MH HS35 to MH HS40. Point repair shall include all materials and labor to connect to existing MH HS40. Following the point repair, the excavation shall be backfilled and compacted in accordance with Detail 0222103R on Figure 6. Once point repair and backfill have been completed, MH HS35 to MH HS40 shall be CIPP lined. MH HS35 to MH HS40 is approximately 366 ft. Laterals at 93 and 94 ft from MH HS35 shall be reinstated to 95% of their original opening. The surrounding area shall be restored to the proper grade and pavement repair shall be in accordance with Detail 0251301R on Figure 6.
5	Woodhaven Drive east of Belltown Road	G57	G68	9.5	10	Truss Pipe	Pavement	Sag in pipe with the formation of a sinkhole at the surface	Sag is located immediately upstream (west) of MH G68. Complete replacement of approximately 268 feet will be required.	Replace existing sewer main between MH G57 and MH G68 with 10-inch SDR 26 PVC pipe. Replacement shall include materials and labor required to connect new sewer main to existing manholes. Contractor shall locate service laterals connected to the existing sewer main between MH G57 and MH G68. Service laterals shall be replaced to the property line. Following the installation of the new sewer main and service laterals, the excavation shall be backfilled and compacted in accordance with Detail 0222103R on Figure 6. Pavement shall be repaired in accordance with Detail 0251301R on Figure 6.
5	Woodhaven Drive between Willwood Road and Forest View Drive	G80	G86	6.5	8	Truss Pipe	Pavement	Sag in pipe with the formation of a sinkhole at the surface	Sag is located approximately 56 feet upstream (west) of MH G86. Complete replacement of approximately 392 feet will be required.	Replace existing sewer main between MH G80 and MH G86 with 8-inch SDR 26 PVC pipe. Replacement shall include materials and labor required to connect new sewer main to existing manholes. Contractor shall locate service laterals connected to the existing sewer main between MH G80 and MH G86. Service laterals shall be replaced to the property line. Following the installation of the new sewer main and service laterals, the excavation shall be backfilled and compacted in accordance with Detail 0222103R on Figure 6. Pavement shall be repaired in accordance with Detail 0251301R on Figure 6.



Point Repair
 Between MH P29 and MH P28
 Approx. 20 ft from MH P29

Legend

-  Manhole
-  Gravity Sewer



1 inch = 150 feet

City of Havelock
 2019 Sewer Repairs

Figure 1
Point Repair Location
MHP29 - MHP28



Legend

-  Manhole
-  Gravity Sewer

Following Point Repair, CIPP Line
Between MH F29 and MH F15
Approx. 295 ft of 8" Sanitary Sewer

Point Repair
Between MH F29 and MH F15
Approx. 258 ft from MH F29



1 inch = 100 feet

**City of Havelock
2019 Sewer Repairs**

**Figure 2
Point Repair Location
MHF29 - MHF15**



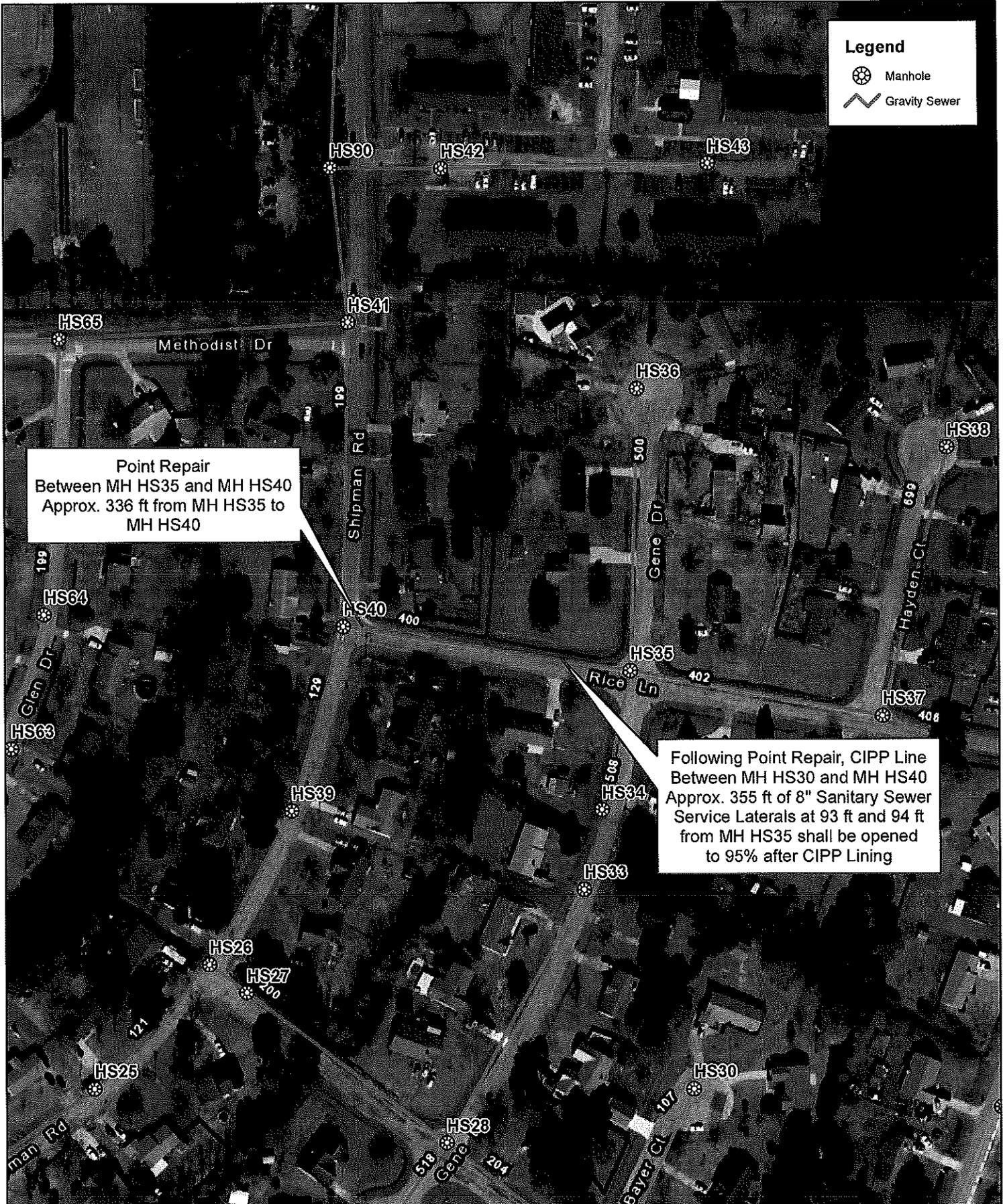
1 inch = 150 feet

**City of Havelock
2019 Sewer Repairs**

**Figure 3
Point Repair Location
M11 - M12**

Legend

-  Manhole
-  Gravity Sewer



1 inch = 150 feet

**City of Havelock
2019 Sewer Repairs**

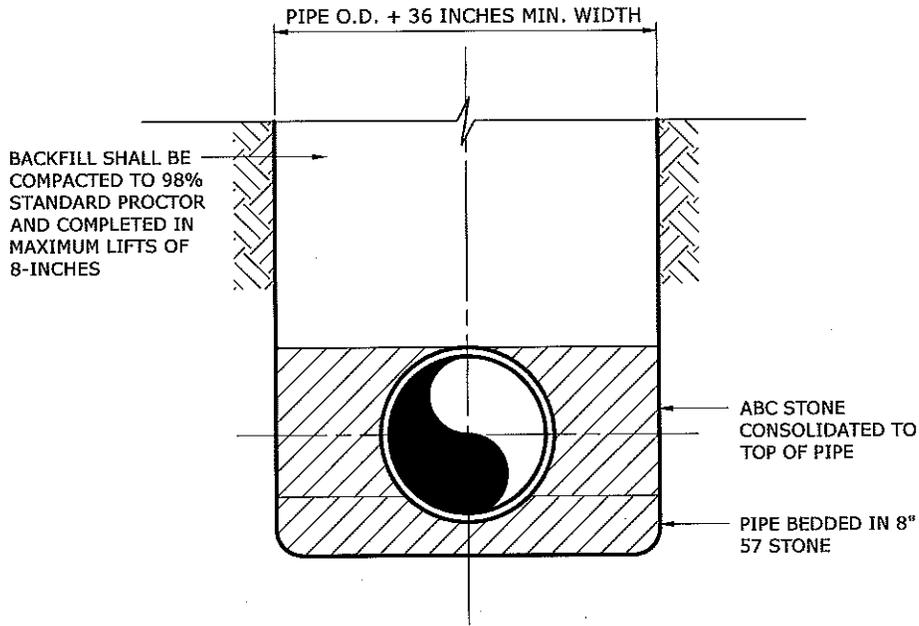
**Figure 4
Point Repair Location
MH HS35 - MH HS40**



1 inch = 400 feet

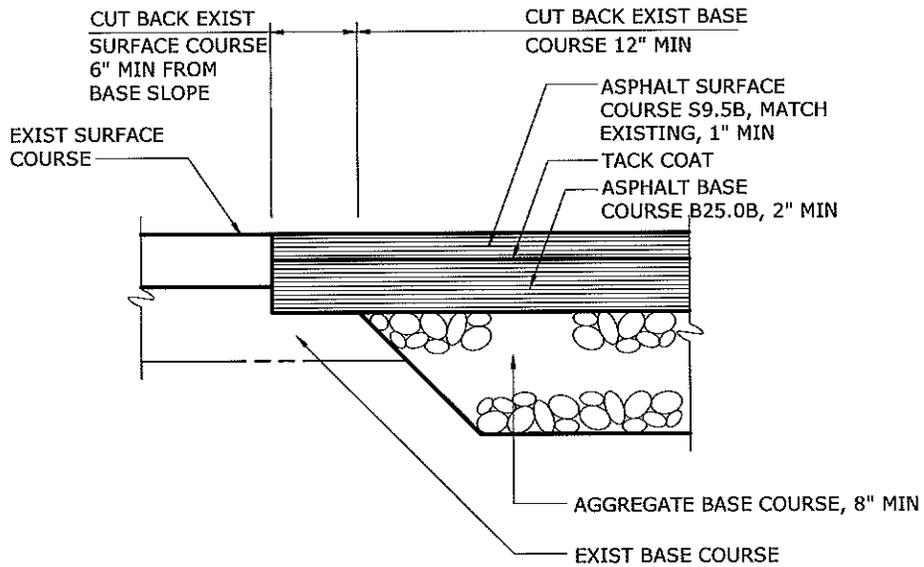
**City of Havelock
 2019 Sewer Repairs**

**Figure 5
 Manhole to Manhole Replacement
 MH G80 - MH G86 and MH G57 - MH G58**



BEDDING - TYPE C

0222103R



TYPICAL PAVEMENT JUNCTION

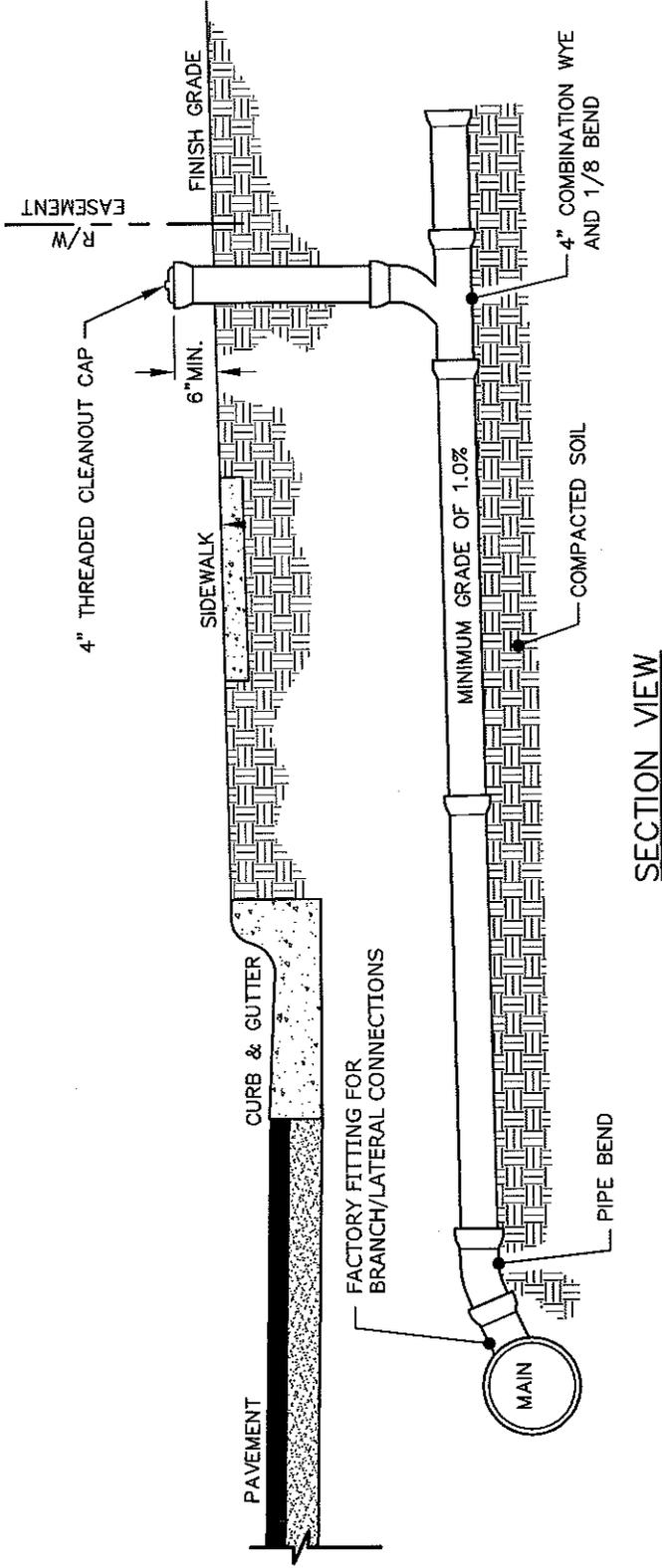
0251301R

CITY OF HAVELOCK
2019 SEWER REPAIRS

DETAIL DRAWINGS

FIGURE 6

- NOTES:
- 1) CLEANOUT SHALL BE PLACED AT RIGHT-OF-WAY LINE OR IN LOCATION OF EXISTING CLEANOUT.
 - 2) DO NOT INSTALL A CLEANOUT INSIDE A FENCE.



SECTION VIEW

FIGURE 7
LATERAL CONNECTION AND CLEANOUT

ATTACHMENT 1

GRAVITY SEWER INSTALLATION AND TESTING REQUIREMENTS

1. Gravity Sewer Installation Requirements
 - A. Install piping beginning at low point at existing sewer, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, fittings, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.
 - B. Use factory fittings for branch/lateral connections. Install lateral connection fittings turned within 10 degrees of vertical, whenever possible.
2. Gravity Sewer Testing Requirements
 - A. Schedule tests and their inspections with the Engineer and Owner with at least 48 hours' advance notice.
 - B. Low Pressure Air Testing:
 1. Conduct an air test between each two consecutive manholes by plugging each end of the section to be tested and all pipe outlets in the section with suitable test plugs; one plug used at a manhole shall have an inlet tap or other provision for connecting an air hose from the air supply equipment.
 2. Pneumatic plugs shall be able to resist internal pressures without external blocking.
 3. The equipment shall include valves to control the rate at which air flows into the test section and pressure gages with minimum graduations of 0.1 psi and an accuracy of +0.04 psi to monitor the air pressure within the test section.
 4. Apply air pressure slowly to the test section until the pressure reaches 4.0 psi, plus an adjustment of 0.433 psi for each foot of ground water above the pipe crown in the line being tested. Internal air pressure, including adjustment for ground water, should never exceed 5.0 psi.
 5. When the pressure reaches 4.0 psi, plus adjustment for ground water, throttle the air supply so that the internal pressure is maintained between 4.0 and 3.5 psi for at least 2 minutes to permit temperature stabilization. When the pressure has stabilized and is at or above 3.5 psi, disconnect the air supply, start a stopwatch, and allow stopwatch to run until the pressure has dropped 1.0 psi.

6. Calculate the permissible time allocated for the 1.0 psi pressure drop on the basis of the diameter and length of main sewer tested, no adjustment being made for service connections included in the test section. The air test for a section shall be considered acceptable if the time elapsed for the 1.0 psi pressure drop is equal to or greater than the time indicated, and shall be considered unacceptable if the elapsed time is less than that indicated in the following tables:

MINIMUM HOLDING TIME (Min:Sec) REQUIRED FOR 1.0 PSI PRESSURE DROP								
PIPE DIAMETER	LENGTH OF MAIN LINE TESTED							
	100'	150'	200'	250'	300'	350'	400'	450'
8"	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10"	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48

7. If the test section fails to meet these requirements, the source of leakage shall be repaired and the pipe section re-inspected.

C. Deflection Test

1. No sooner than thirty (30) days after final backfill installation, each section of PVC pipe shall be checked for vertical deflection using an electronic deflecto meter or a rigid "Go No Go" device. Vertical deflection shall not exceed five (5) percent of the inside pipe diameter for PVC pipe. Where the actual deflection exceeds the allowable, the Contractor shall discover the cause and correct it before the pipe will be acceptable. For the purpose of this subsection, a section of sewer is defined as that length of sewer between successive manholes or special structures or stubouts for future connections.

ATTACHMENT 2

SEWER REHABILITATION - CURED-IN-PLACE PIPE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Lining of existing sanitary sewers using cured-in-place pipe (CIPP) materials either pulled-in-place or inverted into the existing sewer.

1.2 DESCRIPTION

- A. Provide all materials, equipment, labor and incidentals for the installation of cured-in-place pipe lining (CIPPL) within the sewer main.
- B. The sewer main CIPPL process shall consist of inserting a resin-impregnated flexible tube into an existing sewer, expanding the tube out against the sewer pipe, and curing the tube to form a pipe liner. Curing shall be accomplished by circulating heated water or steam or UV light to affect the desired cure throughout the tube extending full length from manhole to manhole.
- C. The CIPPL shall cure into a hard, impermeable liner pipe of the specified thickness and form a structurally sound liner pipe with a uniformly smooth interior.

1.3 REFERENCE DOCUMENTS

- A. This specification references standards from the American Society for Testing and Materials which are made a part hereof by such reference and shall be the latest edition and revision thereof. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.
 - 1. ASTM D578 – Standard Specification Glass Fiber Strands.
 - 2. ASTM D790-07 – Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials.
 - 3. ASTM D2990-01 – Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
 - 4. ASTM D5813-04 – Cured-in-Place Thermosetting Resin Sewer Pipe.
 - 5. ASTM D3567-97(2006) – Standard Practice for Determining Dimensions of "Fiberglass" (Glass Fiber Reinforced Thermosetting Resin) Pipe and Fittings.
 - 6. ASTM D5813-04 – Standard Specification for Cured-in-Place Thermosetting Resin Sewer Pipe.
 - 7. ASTM F1216-09 – Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
 - 8. ASTM F1743 – Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP).
 - 9. ASTM F2019-03 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured In Place Pipeline (CIPP).
 - 10. DIN EN 761 – Glass Reinforced thermosetting plastics (GRP) pipes.

11. DIN EN 13566-4 – Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks.
12. ISO 178- Determination of Flexural Properties.
13. WRc Sewerage Rehabilitation Manual, Type II Design, 4th Edition, 2001.

1.4 DESIGN REQUIREMENTS

- A. Design the CIPP in accordance with ASTM F1216, Appendix XI; assume no bonding to the original pipe wall.
 1. Design Wall Thickness: As required to withstand internal and external pressure as indicated by Site conditions.
 2. Design Life: 50-years.
 3. Rehabilitated Sewer Flow Capacity: Minimum of 100 percent of original pipe capacity.

- B. Structural Standards:

MINIMUM PHYSICAL PROPERTIES				
Property	ASTM Test Method	Polyester System	Filled Polyester System	Vinyl Ester System
Flexural Strength, psi	D790	4,500	4,500	5,000
Flexural Modulus (Initial), psi	D790	250,000	400,000	300,000
Flexural Modulus (50 Yr), psi	D790	125,000	200,000	180,000

1.5 SUBMITTALS

- A. Documentation of meeting the minimum experience requirements specified in Article 1.6 – Quality Assurance of this Section. Include references with names and contact information.

- B. Documentation of safety training of all field staff.

- C. Shop Drawings, submit the following for the CIPPL:
 1. Names of resins and fabrics/strands/fibers/mats/tubes manufacturers, including:
 - a. Independent third party ISO 17025 accredited laboratory test reports identifying by name and demonstrating that the exact resin and, if utilized, fabrics/strands/fibers/mats/tubes to be used for this project meets the requirements for initial structural properties, including short-term flexural modulus of elasticity, short-term flexural strength (bending stress), (performed in accordance with ASTM F1216, ASTM F2019, ASTM F1743, ASTM D638, ASTM D790 and/or ISO 178 with wall thickness measured per DIN EN 13566-4), and chemical resistance (performed in accordance with ASTM F1216-Appendix X2 or ASTM D5813).

- b. If the architecture of the CIPPL is such that the physical properties vary depending on the direction of testing (i.e., axial versus circumferential), submit test data on both directions in accordance with the test methods listed above in this paragraph.
 2. Independent third party accredited laboratory test reports identifying by name and demonstrating that the exact resin and, if utilized, fabrics/strands/fibers/mats/tubes to be used for this project has been tested for long-term flexural modulus of elasticity and long-term flexural strength (i.e. 10,000 hour minimum creep testing performed in accordance with ASTM D2990 or DIN EN 761 for design conditions applicable to this project). If the data submitted is not for the exact liner to be used on this project, submit a detailed description of the physical properties of both the liner used in the test and the liner to be used for this project to demonstrate that the two liners are comparable in terms of physical properties.
 - a. Test will be performed for a minimum of 10,000 hours under test conditions and loadings described below. Independent third party test data of the entire ASTM D-2990/DIN EN 761 data set are required as substantiation of the values used in design. The data points from 1,000 hours to 10,000 hours, or such other time period as determined by the Engineer based on the curve or slope of the plotted data, of the Long-term Flexural Modulus shall be extrapolated using a Microsoft Excel log-log scale linear regression analysis to determine the service life performance characteristics of the proposed liner.
 - b. Testing will be conducted at:
 - 1) Temperature: 21 to 25°C.
 - 2) Relative humidity: 50% minimum.
 - 3) Load: Load shall be equivalent to a load that is 25% of the yield stress as measured by ASTM D790 or ISO 178, or as approved by Engineer.
 - c. The type and volume of catalysts and promoters added to the resin, the time of addition, the method of incorporation into the resin, and the quality control procedures required that ensure adequate dispersal and minimization of air entrainment.
 3. Quality Control Report for the Wet-Out Facility:
 - a. To ensure proper materials and amounts are used in the resin impregnation process and in liner shipping and storage. At a minimum, the Quality Control Report for production should include, for each CIPPL segment:
 - 1) Resin lot numbers.
 - 2) Volumes of resin, catalyst, and enhancers.
 - 3) Date of wet-out.
 - 4) Storage and transportation controls and quality assurance procedures.
 - 5) Include a checklist showing that each critical step in the resin impregnation process is checked off and initialed.
 4. Quality Control Plan for Installation:
 - a. Bypass pumping plans.
 - b. Mainline sewer cleaning plan and cleanliness requirements.
 - c. Liner shot plan and sequence.
 - d. Liner installation standard procedures, including, but not limited to:
 - 1) Minimum and maximum allowable installation pressures and speeds.
 - 2) Minimum and maximum allowable curing temperatures, pressures, and curing durations and speeds.
 - 3) Boiler sizing calculations.
 - 4) Temperature monitoring plan.
 - 5) Odor controls procedures.

- 6) Plan to manage wastewater flows during lining.
5. For each CIPPL segment, include:
 - a. Individual liner lengths.
 - b. Transition locations.
 - c. Resin quantities.
 - d. Curing schedule for each liner, including heating, curing, and cool-down schedule.
 - e. Liner materials.
 - f. Liner thicknesses and layers.
 - g. Inversion or spray application pressures (maximum and minimum) for each segment.
6. Structural Design Calculations and Specification Data Sheets:
 - a. List all parameters used in the liner design and thickness calculations based on Appendix X1 of ASTM F1216 for each pipe segment with less than 10% ovality or based on the WRc Sewerage Rehabilitation Manual, Type II Design, Section 5.3.2.iii for non-round pipe or circular pipes with greater than 10% ovality.
 - b. All calculations shall be prepared under and sealed by a Professional Engineer registered in the State of North Carolina.
7. Field Sample Preparation Plan:
 - a. Outline of detailed procedure for preparing samples.
 - b. Include material and method of installation for hydrophilic end seals and pre-liners.
8. Curing Logs:
 - a. CIPPL temperatures.
 - b. Pressures/water head at the upstream and downstream manholes during the curing process to document that proper temperatures, pressures and cure times have been achieved.
 - c. Temperature of the hot water or steam.
 - d. Temperature of external thermocouples.
 - e. Liner pressures at least once every fifteen minutes or as recommended by the resin and tube manufacturers, whichever is more frequent.
9. Name and location of ISO 17025 testing laboratory to perform CIPPL tests.
 - a. Provide certification that each test shall be performed by a laboratory with an American Association for Laboratory Accreditation (A2LA) for the specific test to be performed.
10. Performance Quality testing results.
11. Contingency Plan, including:
 - a. Methods and equipment to be used to repair unacceptable liner defects and for removing failed liners.
 - b. Include method of avoiding liner stoppage due to conflict and friction at pinch and snag points.
 - c. Availability and accessibility of backup equipment such as air compressors and lateral reinstatement cutters.

1.6 QUALITY ASSURANCE

A. General:

1. CIPPL shall be provided by a single manufacturer. The supplier shall be responsible for the provision of all test requirements specified herein as applicable. In addition, all liner to be installed under this Contract may be inspected at the field or plant for compliance with this Section by an independent testing laboratory acceptable to the

Owner. The Contractor shall require the manufacturer's cooperation in these inspections.

2. Inspection of the CIPPL may also be made by any representative of the Owner after delivery. The CIPPL shall be subject to rejection at any time on account of failure to meet any of the requirements specified, even though sample liner may have been accepted as satisfactory at the place of manufacture. CIPPL rejected after delivery shall be marked for identification and shall be removed from the job site immediately.

B. Qualifications:

1. The manufacturer and installer of the CIPPL shall have a minimum of 10 years active experience in commercial installation with a minimum of 200,000 linear feet of CIPPL similar in size and scope of work to that proposed for the Project. Referenced installations shall have been in service for a minimum of 5 years in the United States.
2. The installer's field superintendent shall have a minimum of 3 years of CIPPL installation experience, be currently licensed or approved by the CIPPL manufacturer to install the proposed products, and have demonstrated experience successfully installing a minimum of 50,000 feet of CIPPL.
3. If over-the-hole wet out is proposed for this installation, the installer's wet out superintendent shall have a minimum of 3 years of CIPPL wet out installation experience, be currently licensed or approved by the CIPPL manufacturer to wet out the proposed products over the hole, and have demonstrated experience successfully conducting on-site wet out of a minimum of 5,000 feet of liner with diameters equal to or greater than 48 inches.
4. Installer's field superintendent must be on Site at all times during the installation of the CIPPL.

1.7 REGULATORY REQUIREMENTS

- A. This Contract requires work in active sewers. Follow all federal, state and local requirements for safety in confined spaces.
- B. Conduct worker safety training within one year of start of work that includes reviewing the hazards associated with all equipment, materials, and work practices. Additional safety considerations including safely handling, mixing, and transporting of reagents should be provided by the liner manufacturer, and should include safe operating practices and procedures, appropriate personal protective equipment (PPE) for the various lining operations, and proper storage, transportation, mixing, and disposal of resins, additives, and their associated containers.

1.8 DELIVERY STORAGE AND HANDLING

- A. Care shall be taken in shipping, handling and storage to avoid damaging the liner. Extra care shall be taken during hot weather construction. Any liner damaged in shipment shall be replaced as directed by the Owner at no additional cost to Owner.
- B. While stored, the CIPPL shall be adequately supported and protected. CIPPL shall be stored in a manner as recommended by the manufacturer and as approved by the Engineer and/or Owner's Representative.

1.9 WARRANTY

- A. All lining work shall be fully guaranteed by the Contractor for a period of 2 years from the date of Final Completion unless otherwise stipulated in writing by the Owner prior to the date of Conditional Acceptance per Article 3.7 – CIPPL Conditional Acceptance of this Section. During this period, all defects discovered by the Owner or Engineer shall be addressed by the Contractor in a satisfactory manner at no additional cost to the Owner. In addition to the Warranty Inspection specified herein, the Owner may conduct independent inspections, at its own expense, of the lining Work at any time prior to the completion of the guarantee period.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

- A. Field verify all dimensions prior to manufacturer of the liner.
- B. Design the CIPPL in accordance with ASTM F1216, Appendix X1; assume no bonding to the original pipe wall.
1. Design wall thickness: As required to withstand internal and external pressure as indicated by Site conditions.
 2. Design life: 50-years continuous service.
 3. Rehabilitated sewer flow capacity: 100 percent of original pipe capacity.
- C. Structural Properties:
1. 50-Year Flexural Strength (ASTM D790, D2990, or DIN EN 761): 2,500 psi minimum.
 2. 50-Year Flexural Modulus (ASTM D790, D2990, or DIN EN 761): 200,000 psi minimum, with no greater than a 55% reduction from initial (hour 0.02) strength.
- D. CIPPL Design Thickness:
1. For a circular host pipe with 10% ovality or less, use ASTM F1216, Appendix X1, Design Considerations for a fully deteriorated pipe.
 2. For non-round pipe without wall intersections and for circular host pipe with ovality greater than 10%, use WRc Sewerage Rehabilitation Manual, Type II Design, Section 5.3.2.iii.
 3. Safety Factor: 2.
 4. Minimum Service Life: 50 years under continuous service.
 5. Modulus of Soil Reaction: Minimum 900 psi.
 6. Soil Density: 120 lbs/ft³.
 7. Poisson's Ratio: 0.3.
 8. Enhancement Factor: 7.
 9. Water Depth above Top of Pipe: Fully saturated surrounding soil, with water level assumed at surface grade.
 10. Ovality: Contractor shall estimate the ovality for each segment to be lined by reviewing videotape, photos or other available information. If video is not available, the Contractor shall assume an ovality of 4% for bidding purposes.
 11. Live Loads: AASHTO H-20 with two trucks passing (for CIPPL in streets).
 12. The long-term flexural modulus and long-term flexural strength used in the design shall be the values as rated for the specified service life and as submitted in Article 1.5 – Submittals of this Section. Contractor may elect to use weaker long-term

flexural modulus and long-term flexural strength values than indicated in the submittal for these properties to account for differences in field prepared liners versus laboratory prepared liners, so long as other requirements regarding limits to thickness are not compromised.

13. The liner thickness of each pipe segment shall be determined by the Contractor and submitted per Article 1.5 - Submittals of this Section.

2.2 INSTALLED CHARACTERISTICS

- A. Field verify all dimensions and lengths prior to delivery of the liner.
- B. Containing no intermediate or encapsulated elastomeric layer, with no dry or unsaturated layers and free from visual defects such as foreign inclusions, dry spots, pinholes, and delamination.
 1. Uniformly bonded layers such that it is not possible to cleanly separate any two layers with a probe or point of a knife blade such that the knife blade moves freely between the layers.
 2. Should separation of the layers occur during testing of field samples, additional samples will be cut from the liner.
 3. Evidence of separation in additional samples is cause for rejection of the liner.
- C. Homogeneous, meeting or exceeding the minimum wall thickness across entire wall thickness.
 1. Thicknesses that exceed the design thickness by the greater of 2 mm or 15 percent, as certified by an independent testing laboratory in accordance with Article 3.6 – Field Quality Control of this Section may be considered non-compliant, if, in the judgment of the Engineer, the installed thickness will impede O&M and future work.
 2. CIPPL with thicknesses less than 95% of design thickness will be assessed for conditional acceptance under Article 3.7 – CIPPL Conditional Acceptance of this Section.
- D. When cured, the CIPPL shall form a continuous, hard, impermeable liner resistant to chemicals found in domestic sewage per ASTM F1216, Appendix X2 and to abrasion.
- E. Liner Fit:
 1. The liner shall be fabricated to a size that when cured will tightly fit the sewer being rehabilitated.
 2. Field verify all dimensions prior to delivery of the liner. Make allowance for longitudinal and circumferential expansion when sizing and installing the liner.
 3. Contact tolerance for pipe with a conic section (i.e., oval or round): 4 mm.
 - a. If the space or gap between the outside surface of the liner and the inside surface of the host pipe exceeds 4 mm, as visually evident, determined using mandrel or by laser profiling, the liner fit may be deemed deficient and requiring corrective action.
 - b. Where irregularities of the existing pipe exist such as offset joints, protrusions, bumps, and deformations, and the irregularities remain after the sewer has been prepared in accordance with this Section, an exception to the contact tolerance will be allowed. The exception shall not present an obstruction to sewage flow.

- F. The length of the liner shall be that deemed necessary by the Contractor to effectively carry out installation and seal the liner at the inlet and outlet of each manhole/structure.

2.3 CURED-IN-PLACE LINER SYSTEM

A. Manufacturers:

- 1. Insituform Technologies, Inc.
- 2. Layne-Inliner Technologies, LLC.
- 3. Inland Pipe Rehabilitation (IPR).
- 4. Or equal.

B. Description:

- 1. Resin-impregnated flexible tube which, when inverted and installed through the existing pipe sewer and cured, will form a continuous, structurally sound and tight-fitting pipe.
- 2. Flexible Tube: One or more layers of flexible needled felt or an equivalent woven or non-woven material(s) or both; compatible with resin system.
- 3. Resin:
 - a. Thermosetting polyester, vinyl ester, or epoxy and catalyst system.
 - b. Of sufficient quantity for tube impregnation to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the potential loss of resin during installation through cracks and irregularities in the original pipe wall.
 - c. Capable of curing in the presence of water with an initiation temperature for cure less than 180°F (82.2°C).
 - d. Uniformly distributed throughout the tube using a vacuum impregnation process in conjunction with a roller system.
- 4. Inner film: Plastic film applied to the tube on what will become the interior wall of the finished CIPPL; compatible with the resin system used; and translucent so that resin is clearly visible.
 - a. Firmly bond plastic film to the felt material.
 - b. Mark manufacturer's name or identifying symbol on CIPPL interior at regular intervals along the entire length; not to exceed 5 linear feet.

C. Hydrophilic End Seals:

- 1. Provide hydrophilic end seals to prevent groundwater from migrating between the liner and host pipe into the manhole or structure. Provide INSIGNIA End Seal Sleeve or approved equal.

PART 3 EXECUTION

3.1 GENERAL

A. Scheduling the CIPPL installation:

- 1. Provide Engineer and Owner the proposed CIPPL installation schedule a minimum of 7 days in advance of planned work.
- 2. Provide a minimum of 48-hours advance verbal notice for television inspection to Engineer to give sufficient time to schedule field observers (including notification of extended work shifts beyond the normal eight-hour day).

3. Review NOAA National Weather Service weather forecast for wet weather events which could inversely impact wastewater flow control prior to and throughout the CIPPL installation.
 - a. Where anticipated weather conditions are such that anticipated sewage flows may exceed the Contractor's bypass pumping capacity, delay commencement of the installation until favorable weather is forecast.
 - b. Lining shall only be performed when all the following site conditions are met:
 - 1) No rainfall event greater than 0.5" has occurred in the sewershed and within 48 hours of lining or is forecasted to occur in twice the liner bypass pumping installation time (i.e., if liner installation takes 12 hours, monitor weather for 24 hours), and that no rainfall greater than 0.25" is predicted to occur within the sewershed during the planned installation time period.
 - 2) Contractor has provided weather reports from National Weather Service using www.weather.gov, clicking local forecast, and using the hourly weather graph predictor confirming above site conditions are met.
 - 3) Flow conditions are monitored just prior to installation in the manholes upstream of where the work is to occur.
- B. Verify the length and the inside diameter of host pipe to be lined.
- C. Field measure sewer section lengths before cutting the tube to length.
- D. Locate all designated manhole access points and maintain accessibility for performance of the Work.

3.2 SEWER CLEANING

- A. Sanitary Sewer Cleaning: Prior to television inspection, but after making identified point repairs and root treatment, clean the sanitary sewer for CIPP lining installation.
- B. Cleaning Equipment:
 1. Hydraulically Propelled Equipment: The equipment used shall be of movable dam type and be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper around the outer periphery to insure removable of grease. If sewer cleaning balls or other equipment which cannot be collapsed is used, special precautions to prevent flooding of the sewer and public or private property shall be taken.
 2. High-Velocity Jet (Hydrocleaning) Equipment: All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size lines designated to be cleaned. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel.
 3. Mechanically Powered Equipment: Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be allowed. A power rodding machine shall be either a sectional or

continuous rod type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To insure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

C. Cleaning Fluids:

1. When possible, the flow of sewage in the sewer lines shall be utilized to provide the necessary pressures for hydraulic cleaning devices. When additional water from fire hydrants is necessary to avoid delay in normal working procedures, the water shall be conserved and not used unnecessarily.
2. Contractor to provide all necessary pipe and fittings and obtain an approved backflow prevention device and water meter assembly from Owner for connection to fire hydrants. The Contractor will be required to record daily meter readings at the beginning and ending of each workday and provide these readings to the Engineer with each pay request. The Contractor will not be charged any fees for the use of the meter nor for any water used in the work. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant. No additional payment to the Contractor shall be made for use of the meter or the documentation of water used. The Contractor shall be responsible for providing all other necessary hoses and tools for obtaining the water.
3. Some locations may not have access to nearby fire hydrants.

D. Sewer Cleaning – Execution

1. During sewer cleaning operations, satisfactory precautions shall be taken in the use of cleaning equipment. When hydraulically propelled cleaning tools (which depends upon water pressure to provide the cleaning force) or tools which retard the flow in the sewer line are used, precautions shall be taken to ensure that the water pressure created does not damage or cause flooding of public or private property being served by the sewer.
2. Cleaning just prior to CIPP: Contractor shall fully clean the sewers including removal of all roots, grease and debris. The cleaning shall be performed prior to the pre-repair TV inspection.
3. Sanitary sewer sections between manholes shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment. Selection of the equipment used shall be based on the conditions of lines at the time the work commences. The equipment and methods selected shall be satisfactory to the Owner. The selected equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the sewer lines and manholes. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or the equipment fails to traverse the entire manhole section, it will be assumed that a major blockage exists and the cleaning effort shall be abandoned. Contractor to notify Owner and Engineer of such abandonment immediately.
4. Specialty Cleaning:
 - a. When bucket machines are used, the bucketing process shall be done in one line section at a time. A bucket of the proper size shall be placed into the downstream manhole and pulled, in intervals, towards the upstream manhole.
 - b. The bucket shall be retrieved and emptied at varying intervals depending upon the amount of materials being removed. When a bucket is retrieved and it is completely full or overflowing with materials, then the length of travel into the line shall be reduced to ensure total removal of debris. This process shall be

repeated until the bucket has been pulled through the entire line section. Upon completion of the bucketing or rodding operation, hydraulically propelled cleaning equipment or high velocity hydro-cleaning equipment shall be used to complete the cleaning work.

5. Bucket machines or rodding machines shall be used very carefully because of their tendency to "hang-up" on or "wedge against" the sewer pipe and break it. Only experienced and well-trained operators shall operate the machines.
 6. Any damage to the sewer lines caused by the Contractor's operations shall be repaired in a manner approved by the Owner at the Contractor's expense. The Owner reserves the right to make said repairs itself and charge the Contractor accordingly.
 7. Damage due to flooding of any public or private property being served by any line section which is over-filled by Contractor's cleaning operations shall also be repaired or otherwise paid for by the Contractor.
- E. Contractor shall be responsible for removal and proper disposal of all debris from cleaning. All sludge, dirt, sand, grease, roots, and other solid or semi-solid material resulting from the cleaning operation shall be removed from the Site and disposed of at a location approved by the Owner. All materials and debris will be removed from the Site no less than the end of every work day. Passing material from manhole section to manhole section, which could cause line stoppages, accumulations of sand in wet wells, or damage to pumping equipment, shall not be permitted. Under no circumstances shall this debris be dumped or spilled into the streets, ditches or storm drains or other sewer mains.

3.3 SEWER REPAIR

- A. Repair areas of the existing host pipe and remove obstructions as required for proper liner installation.
- B. Seal all leaks that would inhibit liner from curing properly.
- C. After sewer repair, repeat the pre-construction TV inspection at no additional cost to the Owner.

3.4 TELEVISION INSPECTION

- A. Perform all television inspections in the presence of the Engineer and/or the Owner's Representative.
- B. Post-Construction TV Inspection: After all Work is completed, inspect each lined sewer section by television. Any additional post-construction TV inspections required to document repairs or replacement, or check for leaks that are suspected in the post-construction inspection video, will be at Contractor's expense.

3.5 CIPPL INSTALLATION

- A. Field verify length of sewer sections to be lined.
- B. Confirm the prepared host pipe pre-construction video is observed by and found acceptable to the Engineer before beginning the lining process.

- C. Resin Impregnation (Wet Out):
1. Designate a location where the flexible tube will be impregnated with resin.
 2. Thoroughly saturate flexible tube prior to installation.
 3. For tubes with exposed resin faces, add five to ten percent excess resin to account for resin migration in pipe defects and joints and resin loss through the ends of the liner. Tubes that have a coating between the inside surface of the host pipe and the exterior surface of the tube do not require excess resin.
 4. Adjust roller gap setting so that the excess resin is uniformly distributed throughout the length of the liner.
 5. Provide wet-out logs to document proper amount of resin was added.
 6. A catalyst system, or additive compatible with the resin and flexible tube, may be used as recommended by the manufacturer and with approval of the Engineer.
 7. Handle the resin-impregnated flexible tube to retard or prevent resin setting until it is ready for insertion.
- D. Install CIPPL in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6 and manufacturer's instructions:
1. Insert hydrophilic end seals.
 2. Tube insertion:
 - a. Position the wet out tube in the pipeline using either inversion or a pull-in method as defined within relevant ASTM standards previously stipulated. If pulled into place, a power winch or its equivalent should be utilized and care should be exercised not to damage the tube as a result of pull-in friction.
 - b. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.
 - c. Use only lubricants approved by the tube manufacturer.
 - d. Notify Engineer and Owner of any construction delays during insertion process.
 3. Resin curing: Per the manufacturer's instructions.
 - a. Curing temperature: Per the manufacturer's established procedures utilizing hot water under hydrostatic pressure, or steam, or UV light.
 - b. Place temperature gauges between the tube and the host pipe's invert position to monitor the temperatures during the cure cycle.
 - c. Conduct a cool-down process in compliance with resin manufacturer's specifications.
 - d. Temperature gauges shall be placed at the upstream and downstream ends of the segment being lined to monitor the pressurized fluid's (air or water) temperature. In addition to monitoring the temperature inside the tube, temperature gauges shall be placed between the host pipe and the liner at as many points as is practical to record the heating that takes place on the outside of the liner.
- E. Trim and seal liner ends at manholes and structures after cool down period as recommended by manufacturer.
1. Produce watertight flared ends at manholes and structure walls.
 2. Smoothly finish the inside of upstream manhole inverts with a quickset cement grout to raise the invert to the grade of the liner pipe and prevent debris from snagging on lip of liner.
- F. Immediately following lining, all live service laterals, taps, or side connections shall be reinstated by the Contractor from within the existing sewer by suitable CCTV monitored,

robotic cutting equipment. Lateral connections shall be reinstated to 95% of the original opening. Should it become necessary to access a sanitary sewer by excavation, for the purpose of lateral reconnection, such access excavations will be completed by the Contractor, only with the prior approval of the Engineer and at a negotiated price. All other means of repairing damaged or unopened service laterals will need to be approved by Engineer prior to work being done. If any service laterals are determined by field inspector and contractor to not be reinstated this shall be noted on the post CCTV report for record.

- G. Repair any defects which affect the liner integrity and strength, collect solids, or reduce flow capabilities as determined unacceptable by Owner, or remove and replace with a new CIPPL or pipe at no additional cost to the Owner. All repairs, replacements and new pipes are subject to requirements of this Section.

3.6 FIELD QUALITY CONTROL

- A. Collect one (1) restrained pipe sample per installation by placing a section of PVC pipe on the B-Side end (opposite of insertion side) of the liner in the downstream manhole for steam cures and on the insertion end, A-Side of the liner in the insertion side manhole for water cures. Select PVC material and size to match the inside diameter of the pipe being lined as closely as practical. The length of PVC pipe shall be equal to the length of the required sample plus 12 inches, minimum. Run the impregnated tube through the pipe and cure the CIPPL under restrained conditions. Cut two cylindrical samples from the center of the restrained pipe sample. Each sample shall be a minimum of 12 inches long or 25 times the CIPPL thickness, whichever is greater.
 - 1. Mark each sample in waterproof, indelible ink with contract name and number, batch number, date of installation, street location, segment number(s), and specified thickness.
 - 2. Send one sample to an independent third-party laboratory for testing for every 1,000 feet of liner installed for each diameter of liner installed. A minimum of one sample in each diameter shall be tested.
 - 3. Test samples in compliance with applicable ASTM Standards and by an independent accredited ISO 17025 laboratory with an American Association for Laboratory Accreditation (A2LA) for the specific test to be performed.
 - a. Short-term Flexural (Bending) Properties:
 - 1) For initial tangent flexural modulus of elasticity and flexural yield strength measured in accordance with ASTM D790.
 - b. Required Design Thickness:
 - 1) Measured in accordance with ASTM D 3567.
 - 4. Certified results to be submitted to Engineer within 30 days of installation of liner.
 - 5. If tests are not satisfactory, Engineer may request additional tests for each CIPPL section.

3.7 CIPPL CONDITIONAL ACCEPTANCE

- A. Conditional acceptance of the CIPPL shall be based on:
 - 1. Compliance with the required physical strength properties and design thickness, based on Engineer's evaluation of the resin impregnation quality control reports, CIPPL temperature curing logs, post-construction TV inspection, and laboratory test results for the installed pipe plate samples.
 - 2. Compliance with the required chemical resistance properties.

3. No defects which cause significant backwater or loss of hydraulic capacity, or structural stability.
 4. No evidence of groundwater infiltration through the body of the liner or at the manhole ends. All active service connections are properly opened.
 5. No evidence of dry spots, uncured resin, voids between the liner and the host pipe, delaminations, or excessive wrinkles, fins, splits, cracks, breaks, lifts, kinks, scalds, blisters, crazing, protrusions, or other visible defects in the liner.
 6. Compliance with required length and diameter of liner.
- B. CIPPL meeting or exceeding the specified strengths and certified thicknesses, as evidenced by the certified laboratory test results, and in compliance with this Section shall be paid for in full in accordance with the contract Bid Price.
- C. At the Owner's option, the Owner may have the Engineer conduct an evaluation of the diminished value of any visually defective CIPPL and recommend a reduced payment for the liner. At his option, Contractor may accept the recommended reduced payment or address all defective conditions until an acceptable condition is achieved. Acceptance of reduced payment may necessitate the Contractor making a refund payment to the Owner.
1. For CIPPL segments that have observed groundwater infiltration, poorly opened lateral taps, or excessive wrinkles, fins, splits, cracks, breaks, lifts, kinks, scalds, blisters, delamination, crazing, or other defects in the liner, Engineer will make an estimation of reduced value. Reduced CIPPL value will be calculated by the following criteria:
 - a. Hydraulic defects (pinhole stains, active leakage, missing end seals): Up to 20 percent of CIPPL value.
 - b. Structural defects, applies to defects above the springline (such as protrusions): Up to 50 percent of CIPPL value.
 - c. O&M defects, applies to defects below the springline (such as protrusions): Up to 20 percent of CIPPL value.
 2. For CIPPL segments that do not meet the minimum design thickness based on installed material performance test data, partial payment will be determined by multiplying the price for that liner by the actual installed liner thickness divided by the calculated required thickness of the liner. No payment will be made for exceeding the minimum design thickness.
 3. For CIPPL segments that do not meet the required chemical resistance, 0.5 percent reduction in price will be made for each percentage point below the required percent of strength retention. Only the single worst performing chemical resistance will be used to determine the deduction.
 4. The deductions for hydraulic, structural, O&M, installed thickness, and chemical resistance are additive, but in no case will an individual CIPPL segment deductions be greater than 50 percent be levied.

3.8 CLEAN UP

- A. Upon completion and acceptance of rehabilitation work and testing, clean and restore project area affected by the Work to original conditions. Dispose of excess materials and debris.

3.9 WARRANTY INSPECTION

- A. Owner will provide a warranty inspection approximately 1.5 years (or at other time selected by Owner) before warranty period expires. Actual period for inspection shall be determined by the Owner and will ideally be conducted during high groundwater conditions. Contractor will be provided with a 60-day notice prior to period of inspection.
- B. Contractor shall correct all defects discovered during the warranty inspection at no additional compensation. Contractor shall inspect the sewer after the defects are corrected at no additional compensation.
- C. Owner retains the right to either demand Contractor provide corrective action to address the Warranty Inspection defects or accept a monetary penalty from Contractor for the defective work. The Contractor retains the right to correct the defective liner during the warranty period. The acceptability of all repairs shall be determined solely by the Owner.
 - 1. For CIPPL liners that do not meet specifications and for which a negotiated reduction in price is agreed upon, the out-of-specification condition becomes the basis upon which future corrective actions during the warranty period is based. The physical record of the condition will be the post-rehabilitation inspection submitted by the Contractor and accepted by the Engineer. Only defects beyond those in place at the time of the negotiated price reduction will be considered the Contractor's responsibility.
 - 2. If additional defects are discovered during the warranty period, the Owner may request the Contractor to correct these additional defects or request an additional price reduction. If, in correcting these defects, the Contractor corrects the previous defects (for which the negotiated reduction was incurred), the Owner shall pay the Contractor the difference between the originally negotiated reduced value of the liner and the new, improved/corrected value of the liner, the value of which will be solely determined by the Engineer. No payment over 100 percent of the bid price of the liner will be made.
 - 3. The Owner retains the right to either demand corrective action to address the additional defects or to offer the Contractor a further negotiated reduction in the value of the liner. The Contractor retains the right to correct the defective liner at any point during the warranty period and receive full payment for the liner.
 - 4. The acceptability of all repairs and the finished value of liner after said repairs continue to be solely the Owner's determination.

END OF SECTION