BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. W-1305, Sub 35

DOCKET NO. W-1300, Sub 77

In the Matter of

Complaint of WLI Investments, LLC

PRE-FILED DIRECT TESTIMONY

of

Michael C. Gallant, PE

On behalf of

PLURIS HAMPSTEAD, LLC

November 4, 2022

Q. PLEASE STATE YOUR NAME FOR THE RECORD.

A. My name is Michael C. Gallant.

Q. PLEASE STATE THE NAME AND BUSINESS ADDRESS OF YOUR EMPLOYER.

A. Michael C. Gallant, PE, PA. My business address is PO Box 4039, Surf City, North Carolina, 28445.

Q. WHAT IS YOUR CURRENT ROLE WITH REGARD TO PLURIS HAMPSTEAD, LLC?

A. I am the President and Principal Engineer of Michael C. Gallant, PE, PA.

Q. PLEASE DESCRIBE YOUR RESPONSIBILITIES IN THAT POSITION.

A. My responsibilities include providing professional engineering design consulting services to commercial and residential real estate developers and builders, municipal, county, and regulated public utilities providing water and wastewater services to the consuming public.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I hold a Bachelor of Science Degree in Mechanical Engineering from University of North Carolina, Charlotte. I am currently licensed as a Professional Engineer in North Carolina and Alabama. In addition to Professional Engineer licenses, I hold a valid North Carolina Operators License for subsurface systems, animal waste operations and land application as well as a Grade IV wastewater treatment operator's license.

My professional affiliation includes membership in the National Society of Professional Engineers, the Professional Engineers of North Carolina, and the Water Environment Federation.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL EXPERIENCE IN THE WATER OR WASTEWATER UTILITY INDUSTRY.

A. My employment experience has been in the regulated and nonregulated water and wastewater utility industry for over 27 years. My professional experience has specialized in the design, operations and maintenance of water and wastewater treatment systems, including de-centralized wastewater systems, conventional and advanced wastewater treatment, collection and distribution systems and subdivision design, and associated permitting. My experience includes all aspects of development including stormwater and erosion control design and permitting. I have served as a member of the State of North Carolina Minimum Design Criteria Team (MDCT) where I headed the development of the hydraulic residence time (HRT) methodology for wet detention basins. I am knowledgeable with regard to North Carolina state agency rules and regulations regarding water, wastewater, stormwater management and erosion control. I am also knowledgeable in the analysis, design and permitting of water, wastewater, stormwater and erosion control systems, particularly those that fall under the North Carolina Department of Environmental Quality (DEQ) Coastal Rules. I have personally designed and secured permitting for conventional drinking water treatment facilities, including related distribution systems,

and advanced wastewater treatment and related collection systems, which collection systems include numerous lift stations for conveyance of wastewater.

I have published papers including, "*Membrane Bioreactor Wastewater Treatment Strategies for Sensitive Coastal Environments*", (European Union, Water Pollution 2020 Conference, Volume 242 of the WIT Transactions on Ecology and the Environment, London) and presented at several state and national conferences including, "*A Market Approach to Water Reuse*", (2018 Carolinas Engineering Conference & Trade Show, Myrtle Beach, SC June 2018) and (Chicago, Illinois, Water Environment Federation National Conference, October 2017).

Q. PLEASE DESCRIBE YOUR WATER AND WASTEWATER SYSTEM DESIGN EXPERIENCE.

A. I designed and secured permitting for two 1 million gallon per day (mgd) drinking water facilities in East Lauderdale County, Alabama drawing water from ground water sources. Capital investment for these projects was in excess of $10 MM.

I designed, secured permitting for, and provided construction oversight of a 1 mgd wastewater treatment plant facility in Onslow County, North Carolina. In addition to treatment facilities, I designed and secured permitting for an innovative high-rate infiltration (HRI) system for disposal of treated effluent. That HRI system is used in conjunction with wastewater treatment plants utilizing a membrane bioreactor (MBR) treatment process and biological

nutrient removal (BNR) strategies to produce effluent of exceptional quality for disposal in a fragile coastal environment. Capital investment for this project exceeded $15 MM.

I also designed, secured permitting for, and provided construction oversight of a 0.5 mgd wastewater treatment plant facility in Pender County, North Carolina built by Pluris Hampstead, LLC (Pluris). In addition to treatment, I designed and secured permitting for the related 12 miles of force main along the Highway 17 corridor, servicing the greater Hampstead Area. This project also features innovative treatment and disposal elements including MBR treatment and BNR for excellent effluent quality.

In addition to the treatment and disposal portions of this project, water reuse infrastructure was designed for plants utilizing the MBR treatment process. This infrastructure provides a sustainable model for the area wide treatment and collection system and to reduce the burden on the potable water system while generating a revenue stream based on monetizing the treated effluent for irrigation. Capital investment for this project exceeded $10 MM.

I designed, secured permitting for, and provided construction oversight of a 0.35 mgd wastewater treatment plant facility in the Jacksonville area in Onslow County, North Carolina. That treatment plant also utilizes a MBR treatment process and BNR strategies to produce effluent of exceptional quality for disposal in a fragile coastal environment through an NPDES permit. Capital investment for this project exceeded $8 MM.

I have also operated and maintained a 100-home retirement community utility system including potable water and on-site wastewater treatment collection for the community known as Coastal Plantation in Hampstead, North Carolina. That development is served by a system comprised of two source wells and a water softening system, as well as a gravity wastewater collection system along with a low pressure pipe (LPP) disposal system.

I also provided complete infrastructure design and secured permitting for a 20-acre commercial subdivision known as The Promenade at Surf City in Surf City, North Carolina. Project responsibilities included, water and sewer line extensions, drainage system collection design, and design of a stormwater Best Management Practices (BMP).

Finally, I have designed and secured permitting for numerous wastewater collection systems in many areas of eastern North Carolina.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. My testimony provides my opinions as a professional engineer relating to design of wastewater collection systems including community gravity flow systems and individual residence low pressure grinder pump systems as they relate to the 308 lot Salters Haven development in Pender County, and the adjoining tract of land consisting of 30 lots owned by the Lea family, relative to the dispute between WLI Investments, LLC (WLI), Pluris and Old North State Water Company, Inc. (ONSWC).

Q. DESCRIBE THE SIMILARITIES AND THE DIFFERENCES BETWEEN COMMUNITY GRAVITY FLOW COLLECTION SYSTEMS AND

INDIVIDUAL RESIDENCE LOW PRESSURE GRINDER PUMP SYSTEMS.

A. In a typical gravity flow system each lot is served by a gravity service line that runs from a building to a common gravity main. The lateral service line running from a residence to the utility's main is typically a 4" diameter pipe. The common gravity main for municipal and public utility systems is a minimum of 8" diameter pipe. This common main has manholes every 425 feet and at each change of direction in the line. These mains follow the rules and guidelines spelled out in the DEQ's Minimum Design Criteria (MDC) for such systems.

The common main in a gravity collection system is sloped at a minimum design slope according to DEQ's MDC requirements. This common main flows to a duplex lift station (duplex means the lift station has two pumps) which then pumps the sewage to a common force main and/or treatment plant.

Low pressure grinder systems have a simplex lift station at each residence (simplex refers to one pump). These lift stations are usually 5 to 6 feet deep, about two feet wide, and made of fiberglass. These stations pump the wastewater flowing from the residence to a common force main, through a small diameter pipe – typically $1^1/_2$ or 2 inches in diameter - depending on the number of connections. Due to the small diameter of these lines, the pumps in these lift stations are grinder pumps. A grinder pump is a pump

that is fitted with a cutting device which eviscerates solids so that the materials coming into the grinder pump station are greatly reduced in size. The small diameter line running from a grinder pump connects to the common force main, which is laid at a minimum depth of three feet below the surface. The outflow of this system can be to a gravity line, another force main, or a treatment plant.

In general, low pressure grinder pump systems are less expensive to install than gravity flow systems for a developer. In most cases the developer installs the common small diameter force main in or near the street and a corresponding service line running to each residence. The cost of the grinder station installation is typically funded by the builder, who passes that cost through to the homebuyer as part of the purchase price. The grinder station is the property of and the responsibility of the homeowner. This responsibility includes all electrical power costs, grinder pump replacement costs and maintenance costs of the grinder station. The maintenance of a grinder pump collection system is much more involved than a gravity system as there are many more pumps and float switches to maintain.

In a typical gravity collection system the developer installs a gravity service lateral to each lot, the common gravity main, all required manholes and a lift station. The cost of operation and maintenance of all of this infrastructure is the responsibility of the subsequent utility provider of service to the development. In an emergency situation like a power outage, a grinder system only has the capacity to store sewage equal to the small volume of

the individual grinder stations. In a gravity system, sewage can still flow in a power outage to the larger single lift station wet well. Those lift stations are required by DEQ to have emergency backup systems in place or available for such emergencies. This helps assure that there is little or no disruption in service to the customer when there is a power outage.

Q. OTHER THAN TECHNICAL OPERATIONAL REASONS, WHAT ARE OTHER REASONS FOR NOT USING GRINDER PUMPS/LOW PRESSURE SYSTEMS WHEN A TRADITIONAL GRAVITY FLOW SYSTEM CAN BE USED?

A. In a low pressure grinder pump system each home has to have a small lift station, often located near the front property line. Any issues with maintenance, alarms, and spills occur on the homeowner's property. Grinder pump stations should be vented, so there can be odors, and there are individual control panels for each grinder pump station that may be visible in the neighborhood. The end product is a potentially unattractive mini-lift station that must be paid for and maintained by the homeowner/customer who is not trained or licensed to do so. This usually means that the utility provider is contacted to do the maintenance on these systems and the homeowner bears that cost. This taxes the utility's staff which may have to deal with this frequently enough that they may decide to stock parts and supplies to deal with the service issues with grinder pump stations.

Q. BASED ON YOUR DIRECT EXPERIENCE AS A CERTIFIED OPERATOR AND AS A LICENSED PROFESSIONAL ENGINEER, WHICH TYPE OF SYSTEM IS MORE LIKELY TO BE PROBLEMATIC IN OPERATING, AND DESCRIBE THE OPERATING PROBLEMS?

A. Low pressure grinder pump systems require more maintenance and have more problems than gravity flow systems. In any mechanical system the more mechanical devices like pumps, control panels and float switches, the greater the number of things that can go wrong. In this case the number of these devices for a low pressure grinder pump system serving 30 lots is much higher than for a gravity flow system. Also, because the grinder pump stations are under separate ownership the maintenance of individual pump stations will vary depending on the responsiveness of the individual homeowner. There is no specific oversight of these privately owned stations by any regulatory agency except in the case where there is a nuisance and or health risk that is addressed by a local health department or building inspections department. In a gravity system the utility provides licensed operators for the lines and lift station and the systems are inspected periodically by NCDEQ staff. Violations of the permit for these systems can include civil penalties for the utility.

Q. ARE YOU FAMILIAR WITH THE EXTENDED SERVICE AREA (ESA) LAND RETAINED BY THE LEA FAMILY ADJACENT TO THE SALTERS HAVEN DEVELOPMENT – SOMETIMES REFERRED TO IN THESE DOCKETS AS THE “LEA LOTS” OR “LEA TRACT” ?

A. Yes, I have visited / walked the ESA/Lea Lots property several times.

Q. WHERE IS THE ESA/LEA LOTS LOCATED RELATIVE TO THE SALTERS HAVEN DEVELOPMENT?

A. It is west/southwest of Salters Haven.

Q. IN PRACTICAL TERMS WHAT WOULD BE THE DIFFERENCE IF THE ESA/LEA LOTS WERE SERVED BY A GRINDER PUMP SYSTEM AS OPPOSED TO A GRAVITY COLLECTION SYSTEM?

A. My understanding is that if the ESA/Lea Lots are ever developed, there will be 30 residences. If served with a low pressure grinder pump system then there would be 30 lift stations, 30 pumps, 30 control panels and 90 float switches (each grinder station works on a three float system) to maintain. Again, the maintenance of each station is the responsibility of each individual homeowner. By comparison, with a gravity collection system the single common community lift station has only two pumps to maintain, one control panel and four float switches – all of which are maintained by the utility's staff that is licensed, trained and equipped to do so.

Q. IS IT YOUR TESTIMONY THAT BOTH COMMUNITY GRAVITY FLOW SYSTEMS AND INDIVIDUAL RESIDENCE LOW PRESSURE GRINDER PUMP SYSTEMS REQUIRE INSTALLATION OF LIFT STATIONS?

A. Yes. As stated above both systems would require lift stations; a low pressure grinder pump system requires one at each residence and a gravity flow system requires a single lift station.

Q. HAVE YOU REVIEWED SECTION 5 OF THE 2018 AGREEMENT BETWEEN ONSWC AND WLI, WHICH IS ENTITLED "DESIGN PERMITTING, AND INSTALLATION OF ESA WASTEWATER COLLECTION SYSTEM"?

A. Yes.

Q. DOES THAT AGREEMENT DESCRIBE ANY OF THE COMPONENTS OF THE WASTEWATER COLLECTION SYSTEM FOR THE ESA/LEA LOTS?

A. Yes. Section 5.3 of that Agreement identifies the component parts of an "EAS Wastewater Service Line," which would be part of the ESA Wastewater Collection system. Section 5.3 of that Agreement provides that "[t]he EAS Wastewater Service Line shall consist of a 4" wastewater service tap, a service line of adequate size to serve the residence, a clean out at the easement or right of way line, and an elder valve."

Q. IN YOUR PROFESSIONAL OPINION, IS THAT DEFINITION OF AN "ESA WASTEWATER SERVICE LINE" COMPATIBLE WITH INSTALLATION OF A LOW PRESSURE GRINDER PUMP SYSTEM IN THE ESA/LEA LOTS?

A. No.

Q. PLEASE EXPLAIN WHY.

A. Certain of the features of the ESA Wastewater Service Line, as defined in the Agreement between ONSWC and WLI, are only found in a gravity wastewater collection system. Specifically, a "4" wastewater service tap" is only found in a gravity collection system. This reference to a "tap" refers to the point where the service lateral from a building connects to or "taps" into

the utility's sewer main. The pipe running from a grinder pump to the utility's main would be a 1½ or 2 inch diameter, not 4 inches. A 4 inch wastewater service tap is not a component of a low pressure/grinder pump system. Also, a "clean out at the easement or right of way line" is a component found only in a line connecting to a gravity collection system. There is no clean out when a grinder pump is used to serve a building. Finally, an "elder valve" is a device installed and owned by the utility to enable the utility to disconnect a customer for non-payment. An elder valve cannot be used with a grinder pump system, and is only used in gravity wastewater collection system.

Q. HAVE YOU REVIEWED THE TESTIMONY FILED BY MR. D.I. LOGAN ON BEHALF OF WLI IN THESE DOCKETS?

A. Yes.

Q. DO YOU AGREE WITH HIS ASSERTION THAT THE ESA/LEA LOTS CAN ONLY BE SERVED THROUGH A LOW PRESSURE GRINDER PUMP SYSTEM?

A. No.

Q. PLEASE EXPLAIN WHY.

A. Mr. Logan's prefiled testimony was to the effect that it would be prohibitively expensive, or amount to "economic waste" to install a gravity collection system in the ESA/Lea Lots. I understand that Mr. Logan testified at this deposition that it would cost approximately $400,000 to install a low pressure collection system with grinder pumps to serve the ESA. While it

would cost WLI more than that to install a gravity collection system to serve the ESA/Lea Lots, I would not consider it "prohibitively expensive" to do so. As shown below, the cost to construct at gravity collection system for the ESA/Lea Lots would be just under $677,000. I expect that Mr. Logan's perspective on the cost issue is a function of the fact that if WLI or another Logan entity is not the developer of the lots in the ESA, then he will not be able to recover the cost of installing the wastewater collection system in that tract through the sale of lots and/or homes there – as WLI is able to do in Salters Haven. A low pressure grinder pump system is the least expensive way for WLI to discharge its obligation to the Lea family to install a sewer collection system in the ESA

Q. DID PLURIS ASK YOU TO DETERMINE WHETHER THE ESA/LEA LOTS COULD BE SERVED BY A GRAVITY COLLECTION SYSTEM?

A. Yes.

Q. WHAT SPECIFICALLY WERE YOU ASKED TO DO BY PLURIS?

A. I was asked to conduct an engineering analysis to determine the feasibility of a gravity sewer system being constructed within the ESA / Lea Lots' property to serve 30 single family residential units.

Q. WHAT WORK DID YOU DO TO PREPARE YOUR ENGINEERING ANALYSIS?

A. I visited and inspected the ESA/Lea Lots' property, reviewed topographic maps of that site, conducted engineering calculations and analysis, and

prepared auto-cad drawings depicting the features of a gravity sewer system for the ESA/Lea Lots.

Q. HAVE YOU DESIGNED AND SECURED PERMITTING FOR COMMUNITY GRAVITY FLOW SYSTEMS IN THE INTERCOASTAL WATERWAY AREAS IN SOUTHEAST PENDER COUNTY?

A. Yes, I have designed a number of gravity flow collection systems that are currently in place in the coastal area, in Surf City, Sneads Ferry, and elsewhere.

Q. DID YOUR ENGINEERING ANALYSIS REVEAL THAT IT IS NECESSARY TO CONSTRUCT A 50-FEET DEEP LIFT STATION IN ORDER TO SERVE THE ESA/LEA LOTS PROPERTY WITH A GRAVITY COLLECTION SYSTEM, AS STATED IN MR. LOGAN'S TESTIMONY?

A. No. By constructing a lift station less than 11 feet deep from existing grade, at the lower elevation site in the ESA as shown in my conceptual plan, to collect wastewater from the 30 ESA lots by gravity flow, which would then be pumped to the existing manhole that is directly adjacent to the boundary between the ESA and Salters Haven, all of the ESA/Lea Lots can be served with a gravity collection system.

Q. IN PREPARING YOUR ANALYSIS DID YOU ALSO OBTAIN INFORMATION AS TO THE COST TO CONSTRUCT A GRAVITY 0SEWER COLELCTION SYSTEM TO SERVE THE ESA/LEA LOTS?

A. Yes. I provided my engineering concept plan, including typical gravity system components comprised of gravity lines, force main and a lift station

to a licensed utility contractor with significant experience in the area that I have worked with on other projects. I asked that contractor to provide a firm number for construction of a gravity sewer collection system in the ESA/Lea Lots. A copy of my engineering concept plan for the construction of this system is attached as Gallant Exhibit 1.

Q. WHO IS THE CONSTRUCTION COMPANY YOU CONTACTED AND WHAT WAS THE CONTRACTOR'S PRICE TO CONSTRUCT A GRAVITY SEWER COLLECTION SYSTEM TO SERVE THE ESA/LEA LOTS?

A. The contractor I consulted is T & H Construction of North Carolina, Inc. As shown in attached Gallant Exhibit 2, their quote for constructing such a system is $676,784.

Q. MR. LOGAN STATED IN HIS TESTIMONY THAT 26 OF THE 308 LOTS IN SALTERS HAVEN ARE OR WILL BE SERVED WITH A LOW PRESSURE GRINDER PUMP SYSTEM. IN YOUR PROFESSIONAL OPINION COULD THE ENTIRE SALTERS HAVEN DEVELOPMENT HAVE BEEN SERVED WITH A GRAVITY COLLECTION SYSTEM?

A. Yes. By using the same approach shows in Gallant Exhibit 1 (i.e., putting a single lift station at a lower elevation in Salters Haven and gravity flowing wastewater to it), I believe WLI could have avoided using any grinder pumps in Salters Haven.

Q. DOES THIS CONCLUDE YOUR TESTIMONY AT THIS TIME?

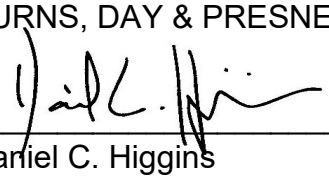
A. Yes.

CERTIFICATE OF SERVICE

I hereby certify that a true and exact copy of the foregoing document has been served on counsel of record for all parties in these dockets, and the Public Staff, by either depositing same in a depository of the United States Postal Service, first-class postage prepaid and mailed by the means specified below, or by electronic delivery.

This the 4th day of November, 2022.

BURNS, DAY & PRESNELL, P.A.



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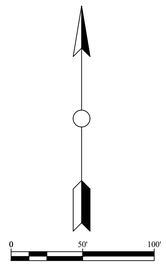
Email: dhiggins@bdppa.com
Attorneys for Pluris Hampstead, LLC

Gallant Exhibit 1

Docket Nos. W-1305, Sub 35 and W-1300, Sub 77



LEA TRACT GRAVITY SEWER CONCEPT PLAN

NOTES:

1. EXISTING GROUND ELEVATIONS TAKEN FROM GOOGLE EARTH.
2. TRACT BOUNDARY APPROXIMATED FROM PENDER COUNTY GIS DATA.
3. THIS SET OF PLANS (SHEETS 1-5) IS INTENDED FOR EXIBIT PURPOSES ONLY. THESE PLANS ARE NOT INTENDED FOR PERMITTING OR CONSTRUCTION.

General Notes

NC FIRM C-1989 AL FIRM CA-4338- E
NC REG NO. 25572 AL REG NO. 32178

PRELIMINARY PLAN
NOT FOR CONSTRIUCTION

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 025572 MICHAEL C GALLANT
10/27/2022

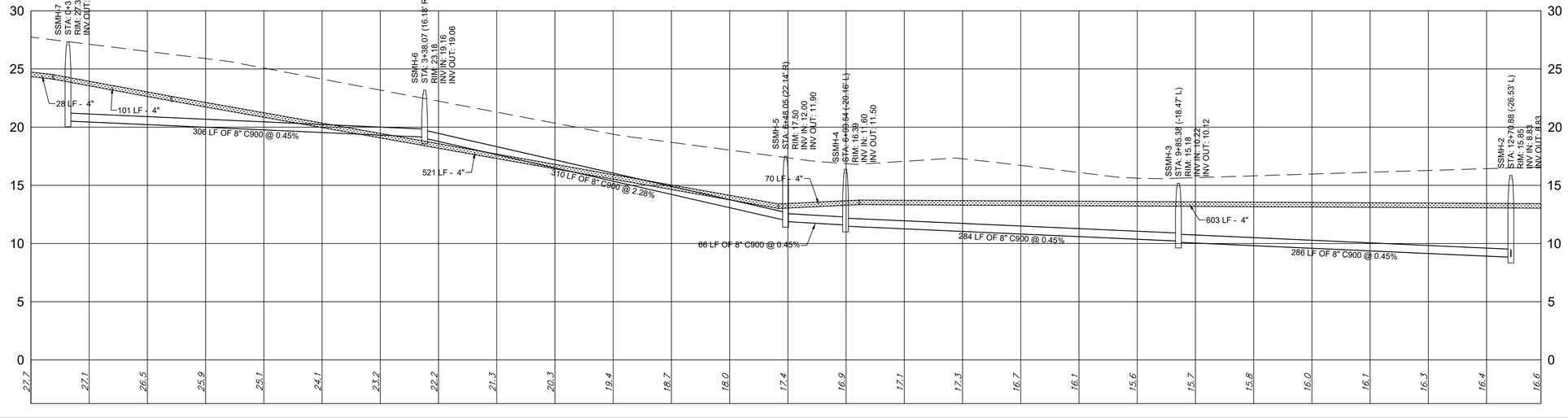
No.	Revision/Issue	Date

MICHAEL C. GALLANT, PE, PA
PO BOX 4039
SURF CITY, NC 28445
910-448-1046
gallantmc@yahoo.com
NC FIRM#: C-1989

PROJECT:
LEA TRACT GARVITY SEWER

Project	Sheet
Date 10/27/22	1
Scale 1" = 50'	

LEA LANE



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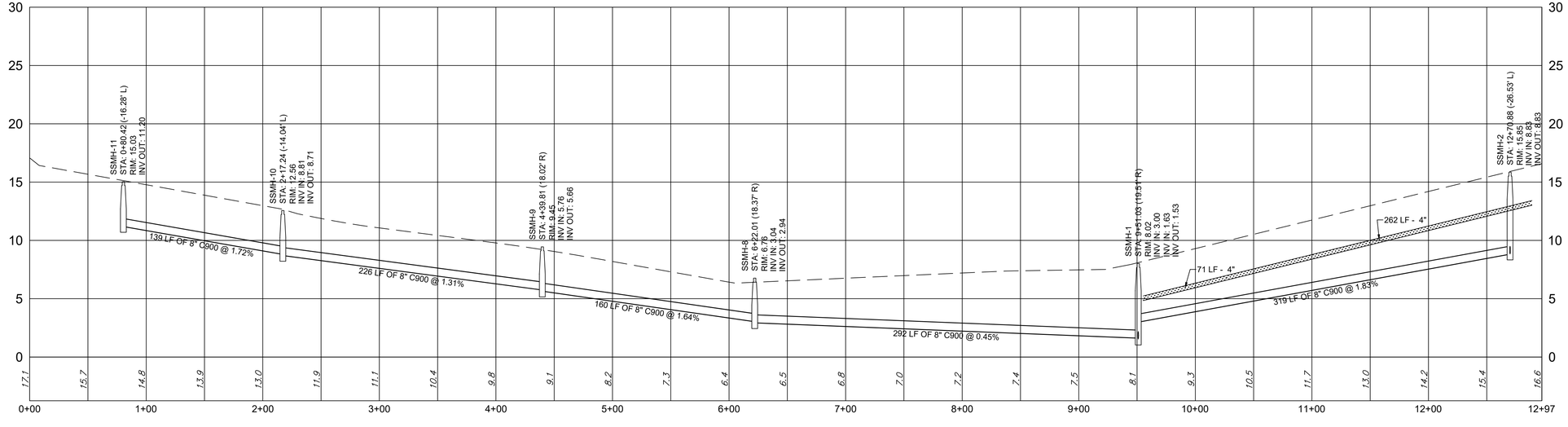
PROJECT:
LEA TRACT GRAVITY SEWER

Project	Sheet
Date 10/27/22	2
Scale 1" = 50'	

LEA LOOP



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PROJECT:
LEA TRACT GRAVITY SEWER

Project	Sheet
Date 10/27/22	3
Scale 1" = 50'	

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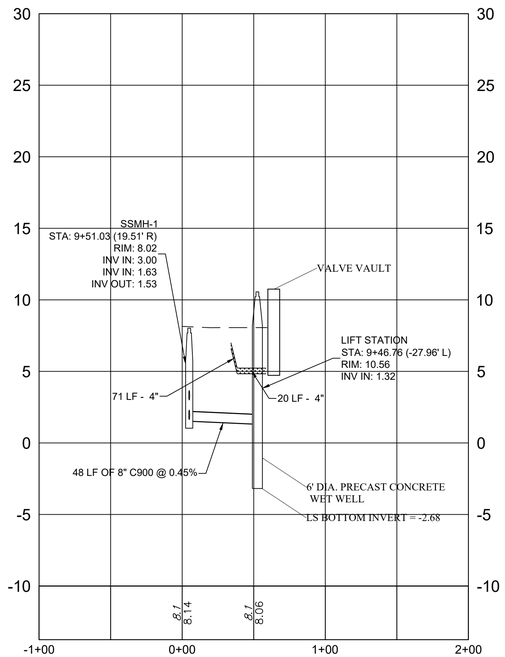
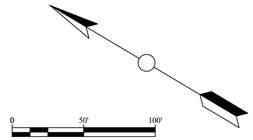
Nov 04 2022

SSSMH-1 TO LIFT STATION





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Nov 04 2022

General Notes

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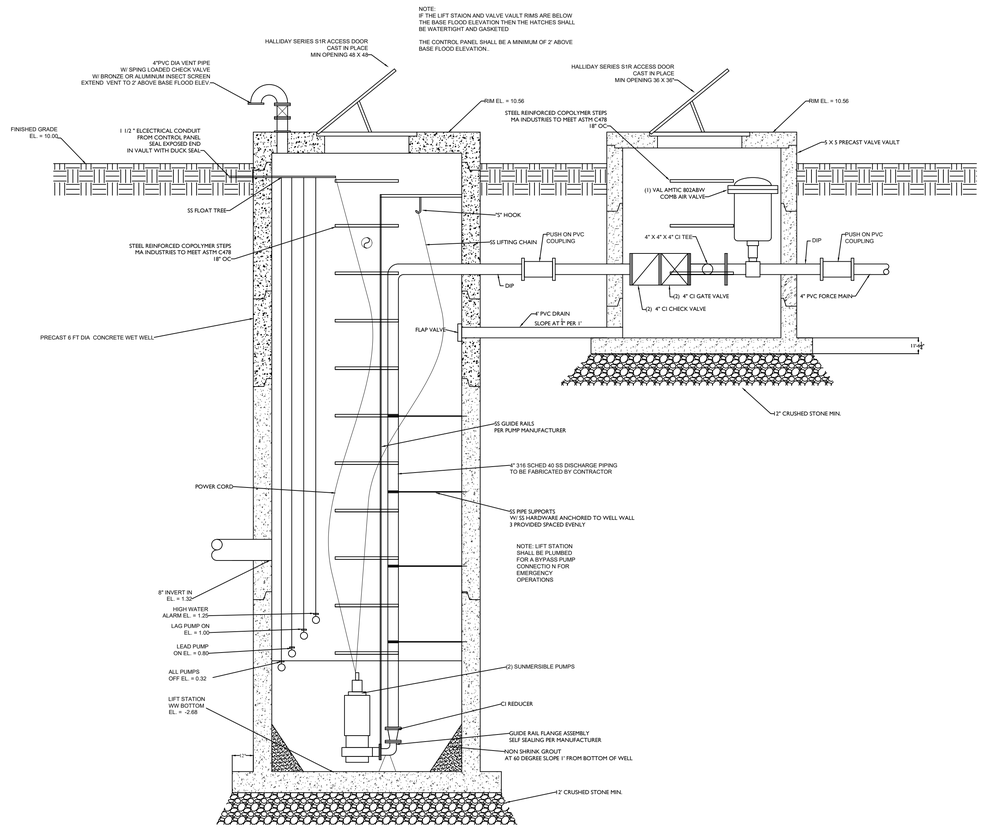
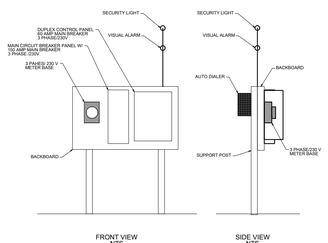
Project	Sheet
Date 10/27/22	4
Scale 1" = 50'	



PSD NO. 25 - TYPICAL DUPLEX LIFT STATION SECTION
DETAIL "LS NTL NO. 1"

NOT TO SCALE



ELECTRICAL RISER DETAIL

UTILITY NOTES:

SUBMITTALS AND STANDARDS

1. THE CONTRACTOR SHALL SUBMIT CUT SHEETS AND JOB SPECIFIC SUBMITTALS FOR ALL MATERIALS TO INCLUDE PVC PIPE, DUCTILE IRON PIPE, PIPE FITTINGS, WATER METERS SANITARY SEWER MANHOLES, FIRE HYDRANTS, SERVICE LINE MATERIALS AND ALL OTHER APPLICABLE MATERIALS.
2. SUBMITTALS SHALL BE PROVIDED BY THE CONTRACTOR AND FURNISHED TO THE ENGINEER FOR APPROVAL.
3. THE ENGINEER WILL BE GIVEN THE OPPORTUNITY TO REVIEW ALL MATERIALS PRIOR TO INSTALLATION.
4. FAILURE BY THE CONTRACTOR TO PROVIDE THE ABOVE REQUIRED SUBMITTALS OR TO ALLOW INSPECTION BY THE ENGINEER WILL CAUSE THE CONTRACTOR TO BE RESPONSIBLE FOR REPLACING ANY SUBSTANDARD OR NON APPROVED MATERIALS, FITTINGS, DEVICES AND STRUCTURE SAT THE CONTRACTOR'S EXPENSE.
5. THE STANDARDS FOR MATERIALS FOR THE PROJECT ARE THOSE OF PLURIS, LLC. THESE STANDARDS ARE AVAILABLE THROUGH THE PLURIS WEBSITE.

GRAVITY SEWER, FORCE MAINS AND LIFT STATIONS

1. THE MINIMUM SLOPE FOR ALL 8" GRAVITY SEWER LINES IS .45% UNLESS OTHERWISE NOTED ON THE PLANS.
2. FAILURE TO CONSTRUCT ANY LINE WITHIN 10% OF THE DESIRED GRADE WILL RESULT IN THE SYSTEM NOT BEING CERTIFIED BY THE ENGINEER. (FOR .45% SLOPE THE MINIMUM ACCEPTABLE SLOPE WOULD BE .40%)
3. ALL CROSSINGS OF WATER OR STORM SEWER LINES SHALL BE INSPECTED BY THE ENGINEER AND CFPUA STAFF.
4. AT ALL TMES, WHENEVER POSSIBLE, MAINTAIN A HORIZONTAL SEPARATION OF 10' BETWEEN WATER, STORM SEWER AND SEWER LINES.
5. SEE PLURIS SPECIFICATIONS FOR ALL MATERIAL.
6. ALL SANITARY LINE SHALL BE C-900 PVC PIPE UNLESS SEWER LINE DEPTH EXCEEDS 18'. IF SEWER LINE DEPTH EXCEEDS 18' THEN THE ENTIRE LEG OF GRAVITY LINE WILL BE IN DIP. SERVICE LINES SHALL BE SCHED 40 PVC PIPE UNLESS DEPTH OF LINES REQUIRE DIP.
7. ALL MANHOLES ARE TO BE 4' PRECAST CONCRETE WITH A 6" EXTENSION ON THE BOTTOM UNLESS NOTED ON THE PLANS.
8. FOR MANHOLES OVER 8' DEEP, AN 8" EXTENDED BASE SHALL BE USED. MANHOLES EXCEEDING 15' IN DEPTH SHALL HAVE AN EXTEDED BASE OF 12".
9. ENGINEER SHALL BE NOTIFIED BEFORE ALL WORK BEGINS. ENGINEER SHALL INSPECT ALL MATERIALS INCLUDING PIPE, MANHOLES, WET WELSS ETC, BEFORE WORK BEGINS.
10. TESTING-ALL MANHOLES SHALL BE VACCUM TESTED FOR LEAKS. ALL LINES, INCLUDING LATERALS SHALL BE LEAK TESTED BY PRESSURIZING THE SYSTEM WITH 2 FT OF HEAD. ALL GRAVITY LINES BE TAPED AND RECORDED FOR ALIGNMENT BY REMOTE CAMERA EQUIPMENT. IN ADDITION ALL MAINS SHALL BE TELEVISED AND A COPY OF THE VIDEO PROVIDED TO THE ENGINEER.
11. ALL FORCE MAINS SHALL BE PRESSURE TESTED. ALL FORCE MAINS SHALL WITHSTAND A STATIC PRESSURE OF 150 PSI FOR TWO HOURS.
12. ALL DROP MANHOLES EXCEEDING 24" IN INVERT ELEVATION SHALL BE INSIDE DROP ONLY.
13. IN ALL INSTANCES, INSTALLATION OF GRAVITY SEWER AND FORCE MAIN LINES SHALL CONFORM TO THE MINIMUM DESIGN CRITERIA SET OUT BY NCDEQ. (STANDARDS AVAILABLE ONLINE).
14. ALL MANHOLES BELOW ARE TO HAVE FIBERGLASS FLOOD INSERTS INSTALLED.
15. ALL MANHOLE RINGS AND COVERS BELOW THE 100 YEAR FLOOD LINE TO BE SEALED OR RAISED ABOVE FLOOD ELEVATION. ALL MANHOLES WITH SEALED COVERS SHALL BE VENTED EVERY THREE MANHOLES OR 1000 FEET WHICHEVER IS LESS.
16. LIFT STATIONS SHALL BE TESTED DURING A START UP MEETING ATTENDED BY THE ENGINEER, PLURIS REPRESENTITIVES AND THE CONTRACTOR. THE STATION SHALL BE TESTED FOR PERFORMANCE OF ALL COMPONENTS NOT LIMITED TO THE FOLLOWING:
A. BY-PASS PUMP OPERATION SHALL BE VERIFIED
B. ALL FLOATS SHALL BE TESTED FOR SEQUENCING AND ALARMS.
C. ALL LIFTING MECHANISMS SHALL BE VERIFIED.
D. ALL SS STEEL FASTENERS SHALL BE VERIFIED.
C. OPERATION OF CONTROL PANEL MOTOR STARTERS, SWITCHES AND OTHER EQUIPMENT SHALL BE TESTED FOR CORRECT OPERATION IN ALL MODES.
E. PUMP ROTATION SHALL BE VISUALLY VERIFIED.
F. WET WELL DRAWDOWN SHALL BE VERIFIED BY MEASURING DROP IN WET WELL DEPTH OVER TIME NOT TO BE LESS THAN 2 MINUTES PER PUMP.
G. ALL ASPECTS OF THE STATION, EQUIPMENT, SAFETY EQUIPMENT SHALL BE INSPECTED AND VERIFIED.
H. ALL OPERATIONS AND EQUIPMENT MANUALS SHALL BE FURNISHED TO THE ENGINEER AND PLURIS INCLUDING WARRANTY INFORMATION, GENERATOR AND ATS DOCUMENTATION, PUMP AND CONTROL PANEL MODEL AND OPERATION LITERATURE AND ANY OTHER APPLICABLE INFORMATION.
17. ALL CROSSINGS OF WATERLINE AND SEWER OR STORM SEWER LINES ARE TO BE VISUALLY INSPECTED BY THE ENGINEER AND PLURIS STAFF. IN CASES WHERE WATER LINE CROSSES OVER SEWER OR STORM SEWER LINES, 18" OF VERTICAL CLEARANCE SHALL BE MAINTANED. IF THIS CLEARANCE CANNOT BE MAINTANED BOTH THE SEWER AND WATER LINES SHALL BE IN DUCTILE IRON PIPE WITH 20' JOINTS CENTERED ON THE CROSSING. IN THE EVENT WHERE WATERLINE CROSSES UNDER SEWER OR STORM SEWER LINE ALL LINES IN QUESTION SHALL BE IN DUCTILE IRON PIPE WITH 20' JOINTS CENTERD ON THE CROSSING. ALL CROSSINGS ARE TO BE INSPECTED BY THE ENGINEER.
18. A "PUNCH LIST" FOR ALL LIFT STATION DEFICIENCIES WILL BE SUPPLIED BY THE CONTRACTOR TO CFPUA AND THE ENGINEER. THIS LIST SHALL INCLUDE ALL ITEMS AND ISSUES NOTED DURING THE START UP MEETING. IF NEEDED A SECOND MEETING WILL TAKE PLACE TO VERIFY THAT THE ITEMS NOTED IN THE "PUNCH LIST" HAVE BEEN SATISFACTORILY ADDRESSED.
19. ALL WORK SHALL BE WARRANTED FOR A PERIOD OF NO LESS THAN ONE YEAR FROM THE DATE OF ACCEPTANCE BY TE OWNER.

GENERAL NOTES

1. THE ENGINEER SHALL BE GIVEN THE OPPORTUNITY TO INSPECT ALL MATERIALS SHALL BE NOTIFIED BEFORE ALL WORK BEGINS, AND CONTACTED FOR ALL TESTING OF UTILITY SYSTEMS.
2. ALL EXISTING UTILITIES SHALL BE LOCATED BEFORE ANY WORK BEGINS.
3. ALL WORK SHALL PROCEED IN A SAFE MANNER COMMENSURATE WITH STANDARD INDUSTRY PRACTICES, OSHA AND NC DEPT OF LABOR REGULATIONS.
4. ALL WORK SHALL BE DONE TO THE SATISFACTION OF THE OWNER AND THE DESIGN ENGINEER.
5. CONTACT THE ENGINEER AT 910-448-1046 WITH ANY QUESTIONS.
6. CONTRACTOR SHALL NOT PROCEED WITHOUT FIRST OBTAINING A COPY OF ALL PERMITS.

AS BUILT DRAWINGS REQUIRED

1. THE CONTRACTOR SHALL FURNISH TO THE DEVELOPER AND THE ENGINEER A SET OF STAMPED AND SEALED "AS BUILT DRAWINGS" PREPARED BY A NC PROFESSIONAL LAND SURVEYOR DESIGNATED BY THE DEVELOPER. THESE DRAWINGS SHALL INCLUDE ALL UTILITY STRUCTURE LOCATIONS SUCH AS MANHOLES, VALVES, INLETS, OUTLETS, FIRE HYDRANTS ETC. THE DRAWINGS WILL ALSO INCLUDE ALL PAVEMENT AND SIDEWALK EDGES. IN ADDITION THE PLANS SHALL CONTAIN THE FOLLOWING: ELEVATIONS FOR STRUCTURE RIMS AND INVERTS, THE SLOPE OF ALL GRAVITY SANITARY SEWER AND STORM WATER LINES, ELEVATIONS OF STORM WATER OUTLET STRUCTURES AND INVERTS, ELEVATIONS OF THE STORM WATER WET DETENTION BASIN AS WELL AS A TOPOGRAPHIC MAP OF THE BASIN SHOWING SIDE SLOPES VEGETATED SHELF AND OTHER FEATURES. THESE DRAWINGS WILL BE PROVIDED TO THE ENGINEER IN SEALED PAPER COPIES AS WELL AS ELECTRONICALLY IN A DWG OR DGN FORMAT AS DESIGNATED BY THE ENGINEER.

LEA TRACT LIFT STATION

LS NO.1

WET WELL AND PUMP CALCULATIONS

30 LOTS@240 GPD/LOT 7,200 gpd

FLOW	7,200	gpd
PEAK FACTOR	4.5	
PEAK FLOW	22.50	gpm
CYCLE TIME	15	minutes
Qdf	5.00	gpm
Qp	80.00	gpm
ACTIVE STORAGE VOLUME	70.31	gallons
MANHOLE ID	6	ft
MIN STORAGE DEPTH	0.83	ft
EXISTING GROUND ELE	10.00	ft
LOWEST INVERT IN	1.32	ft
MIN WET WELL DEPTH	13.24	ft
LIFT STATION RIM INV	10.56	ft
LIFT STATION BOTTOM INV	-2.68	ft
PUMPS OFF FLOAT ELE	0.32	ft

14.94141

PUMP RUN TIME
0.88 minutes
CYCLES PER HOUR
4.00
ACTUAL STORAGE DEPTH
1.00 ft

PUMP OPERATING POINT	*80.00*	*GPM*	*20.00*	*PSI*
TDH CALCULATIONS				
FORCE MAIN LENGTH	1700	ft		
FORCE MAIN ID	4	in		
AREA	0.087	sq ft		
PUMP RATE	0.178	cfs		
VELOCITY	2.044	ft/s		
FRICTION HEAD	7	ft h2o		
ELEV HEAD	31	ft h2o		
STATIC HEAD	0	ft h2o		
TDH	38	ft h2o	16.45	psi
ANTI-FLOTATION CALCULATIONS				
AREA OF WW STORAGE	28.26	sf		
INSIDE DEPTH OF WW	13.24	ft		
VOLUME OF WW WATER	374.16	cu ft		
WALL THICKNESS	0.75	ft		
LID THICKNESS	0.5	ft		
BASE THICKNESS	1	ft		
BASE FLANGE EXTENSION	1	ft		
LID VOLUME	22.08	cu ft		
CYLINDER VOLUME	202.52	cu ft		
CYLINDER VOL ABOVE GRADE	0.92	cu ft		
BASE VOLUME	70.85	cu ft		
VOLUME OF CONCRETE	295.44	cu ft		
TOTAL WW DISPLACEMENT VOL	646.61	cu ft		
WEIGHT OF WATER	64.4	lbs/cf		
BOUYANCY FORCE	41642	lbs		
REQRD. RESIST.	62462	lbs		
WEIGHT OF SOIL	120	lbs/cf		
WEIGHT OF CONCRETE	150	lbs/cf		
WEIGHT OF WET WELL	44316.4	lbs		
VOLUME OF SOIL ON WW FLANGE	338.4	cu ft		
WEIGHT OF SOIL ON WW FLANGE	40611.5	lbs		
TOTAL RESISTANCE PROVIDED	84927.9	lbs		
RESIST. PROV. > RESIST. REQU.	YES			

OFFICIAL COPY

Nov 04 2022

General Notes

NC FIRM C-1989 AL FIRM CA-4338- E
NC REG NO. 25572 AL REG NO. 32178

PRELIMINARY PLAN
NOT FOR CONSTRUCTION

NORTH CAROLINA PROFESSIONAL SEAL 025572 ENGINEER MICHAEL C. GALLANT
10/27/22

No.	Revision/Issue	Date

MICHAEL C. GALLANT, PE, PA
PO BOX 4039
SURF CITY, NC 28445
910-448-1046
gallantmc@yahoo.com
NC FIRM#: C-1989

PROJECT:
LEA TRACT GRAVITY SEWER

Project

Date 10/27/22

Scale 1" = 50'

Sheet 5

LIFT STATION DETAIL / SNAITARY SEWER NOTES

T & H Construction of NC, Inc.

94 Merchants Circle, Suite 201
Hampstead, N.C. 28443

Estimate/Quote

Date	Estimate #
10/19/2022	4345

Name / Address
Attn: Mike Gallant

Phone #	Fax #	E-mail	Project
910-617-7979	910-270-1760	thconstructionnc@yahoo.com	Lea Trac

Item	Description	Qty	Cost	U/M	Total
4001	Mobilization	1	3,500.00	LS	3,500.00
4001	Survey/As-builts	1	9,300.00	LS	9,300.00
4001	Asphalt Patch	100	90.00	SY	9,000.00
4001	Electrical	1	15,000.00	LS	15,000.00
4004	Pump Station	1	190,000.00	EA	190,000.00
4001	Valve Vault	1	20,000.00	EA	20,000.00
4004	Sewer Services	30	1,500.00	EA	45,000.00
4004	Sewer Service Bores	15	2,500.00	EA	37,500.00
4004	C-900	2,478	80.00	FT	198,240.00
4004	Force Main	1	60,000.00	LS	60,000.00
4004	ManHoles	11	5,000.00	EA	55,000.00
4004	Sewer service Camera	30	100.00	FT	3,000.00
4004	Sewer Main Camera	2,436	4.00	FT	9,744.00
4001	Testing	1	8,000.00	LS	8,000.00
4004	Core Manhole	1	4,000.00	EA	4,000.00
4001	Curb	100	35.00	FT	3,500.00
4001	Seeding/Straw	1	6,000.00	LS	6,000.00
			Total		$676,784.00