September 27, 2016

RESUME

RESOLUTION; AUTHORITY TO EXECUTE PURCHASE ORDER FOR PROVIDING ENGINEERING SERVICES FOR THE SOUTH CRATER ROAD SEWER PUMP STATION REHABILTATION PROJECT

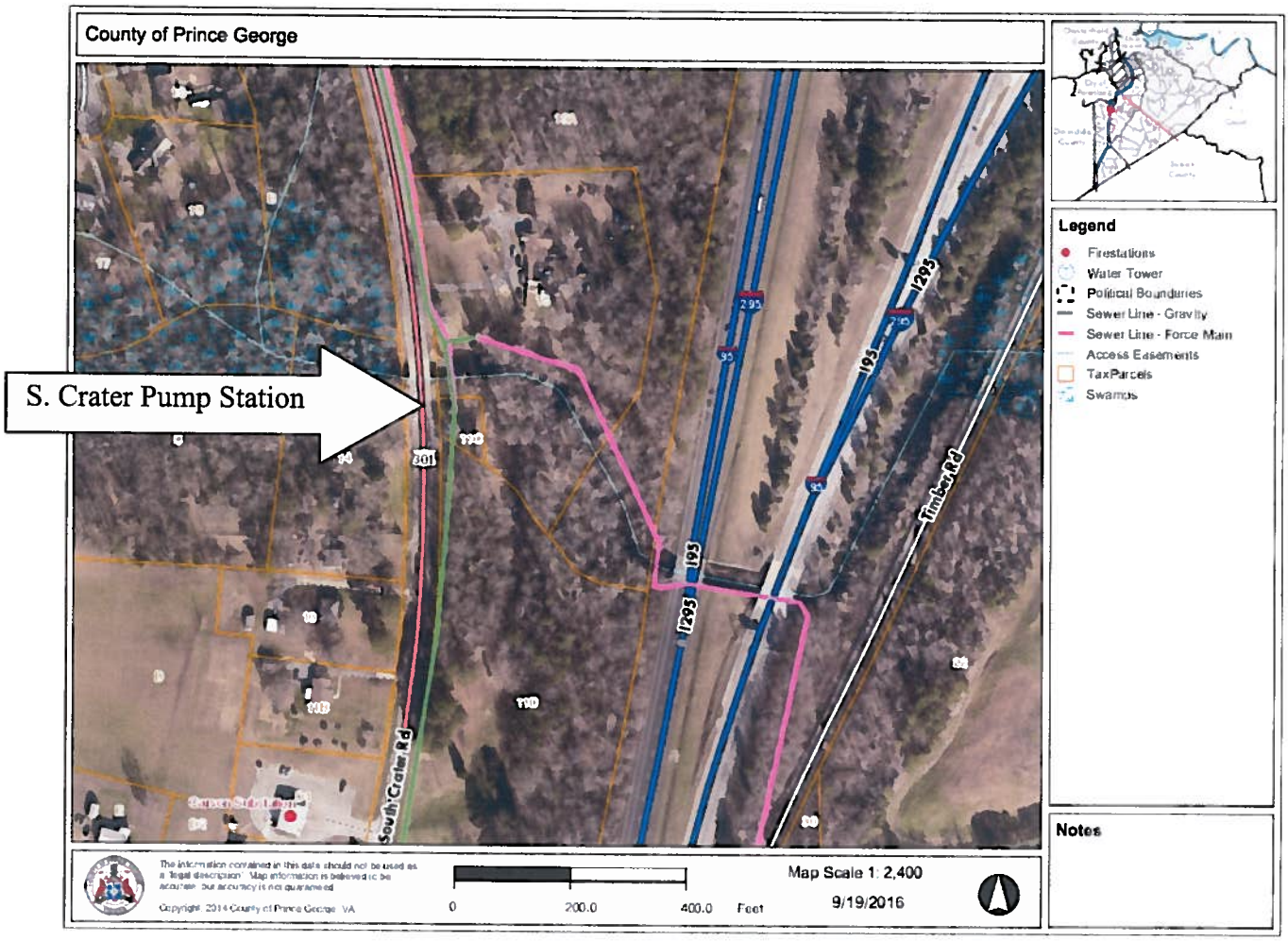
The current South Crater Road Sewer Pumping Station was constructed about 1979. The attached Preliminary Engineering Report outlines several operational concerns and safety hazards with the current facility, as well as the proposed improvements and associated construction cost estimate. The new rehabilitated pumping station reuses the existing wet well, reducing cost significantly by eliminating the need for expensive excavation. The new station also includes provisions for increasing capacity to meet future demands through the 2045 planning period outlined in the 2016 Water and Wastewater Master Plan.

Request Board approval to allow County Administrator to issue a Purchase Order to Timmons Group for a lump sum fee of $117,900 to provide engineering design, regulatory coordination, bid phase services, construction administration, record drawings, and part time construction inspection for the South Crater Road Sewer Pumping Station Rehabilitation Project in accordance with the scope of services outlined in the Letter of Agreement dated September 16, 2016 (copy attached) and the terms and conditions of the County's contract with Timmons Group for engineering services (Request for Proposal No. RFP #14-0122-1).

The funding for this project will come from the $2.69 million 2015 bond funding for sewer rehabilitation improvements. The recently completed Upper Blackwater Sewer Rehabilitation Project spent approximately $1 million from this bond funding. The Engineer's total probable cost for this sewer pump station rehabilitation project (which includes these costs for engineering design services) is estimated at $684,950.00. The construction services for this project will be competitively bid in the future and a subsequent resolution authorizing construction spending will be brought to the Board of Supervisors for approval.

With the Board's approval, County Administrator, the Director of Engineering and Utilities, and the Director of Finance will follow the County's standard purchase order requisition process and begin this project as soon as possible.

September 27, 2016



Board of Supervisors
County of Prince George, Virginia

Resolution

At a regular meeting of the Board of Supervisors of the County of Prince George held in the Boardroom, Third Floor, County Administration Building, 6602 Courts Drive, Prince George, Virginia this 27th day of September, 2016:

| Present: | Vote: |
|---|---|
| William A. Robertson, Jr., Chairman | |
| Jerry J. Skalsky, Vice Chairman | |
| Alan C. Carmichael | |
| Donald Hunter | |
| T.J. Webb | |

A-2

On motion of _____, seconded by _____, which carried a vote
the following Resolution was adopted:

RESOLUTION; AUTHORITY TO EXECUTE PURCHASE ORDER FOR PROVIDING ENGINEERING SERVICES FOR THE SOUTH CRATER ROAD SEWER PUMP STATION REHABILTATION PROJECT

NOW, THEREFORE, BE IT RESOLVED That the Board of Supervisors of the County of Prince George this 27th day of September, 2016, does hereby approve the County Administrator, the Director of Engineering and Utilities, and the Director of Finance to follow the County's standard purchase order requisition process and execute this purchase as soon as possible.

A Copy Teste:

Percy C. Ashcraft
County Administrator

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.

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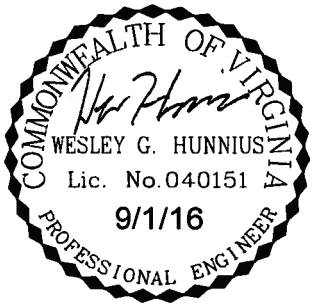
# PRELIMINARY ENGINEERING REPORT FOR THE S. CRATER ROAD PUMP STATION

Prepared for:
Engineering and Utilities Department
Prince George County, Virginia
September 1, 2016




## 1. BACKGROUND, UNDERSTANDING, AND PURPOSE

Timmons Group is currently under contract to provide on call engineering services for the Prince George County Engineering and Utilities Department. The County recently issued a task order for Timmons to write a Preliminary Engineering Report (PER) regarding the S. Crater Road Pump Station, otherwise referred to as the Route 301 Sewer Pump Station (SPS-006) in the Prince George County Water and Wastewater Master Plan submitted by Dewberry in January 2016. The S. Crater Road Pump Station is in need of rehabilitation to alleviate a number operational, maintenance, and safety issues. Timmons has evaluated the available information contained in the Master Plan, As-Built drawings, and data collected from the previously completed site visit and workshop with County operations staff to present a recommended solution accompanied by a detailed Opinion of Probable Cost.

## 2. EXISTING WASTEWATER INFRASTRUCTURE

Prince George County owns and operates nine separate wastewater systems, which are broken down into service areas for each wastewater treatment facility and then subdivided by discharge locations. The S. Crater Road Pump Station is part of the Route 301 Wastewater System within the Prince George Petersburg/South Central Wastewater Authority (SCWWA) Service Area. The Route 301 Wastewater System is located along the Route 301 corridor from the I-95 interchange north to the discharge location in Petersburg. A portion of the system also extends east along Union Branch Road to serve the Wildwood Farms area. There are approximately six (6) miles of 8" and 10" gravity sewer, three (3) pump stations, and four (4) miles of 2" to 10" force main in the Route 301 Wastewater System.

### 2.1. EXISTING PUMP STATIONS

All three of the pump stations in the Route 301 Wastewater System are owned and operated by the County. The Wildwood Farms Pump Station is located near the intersection of Union Branch Road and Drake Lane. It conveys approximately 230 gallons per minute (GPM) through a 6" force main that discharges into a gravity sewer upstream of the S. Crater Road Pump Station. The Cedarwood Pump Station is located beyond the cul-de-sac at the end of Cedar Run Road. It conveys approximately 118 GPM through a 6" force main that manifolds

into the 6" force main along Union Branch Road from the Wildwood Farms Pump Station. From there, wastewater travels west toward the S. Crater Road Pump Station

### 2.1.1. S. CRATER ROAD PUMP STATION SPS-006

The S. Crater Road Pump Station is located on the eastern side of Route 301 just south of the bridge over Second Swamp. There are two gravity sewer inverts conveying flow from the entire Route 301 Wastewater System into the wet well; a 10" pipe from the north and an 8" pipe from the south. Based on the Master Plan, the design flow of the station is approximately 660 GPM generated at a total dynamic head (TDH) of 66'. Wastewater is discharged through a 10" force main along Route 301 to the connection point in the Petersburg System.

According to the as-built drawings, the pump station was built around 1979 and it includes a 12' diameter, 18' deep concrete wet well with a Smith & Loveless duplex suction-lift pump skid mounted on a recessed concrete floor (see Image 5). There is a concrete foundation from the recessed floor up to existing grade with a 12' x 16' brick over 4" block building above grade (see Image 1). A 2'-4" x 1'-8" metal hatch is located adjacent to the pump skid for access to the wet well (see Image 6). Note this is the only way to access the wet well.

The current setup poses many challenges and safety risks for the County's maintenance staff. There is an exceptionally high amount of solid debris that washes into the wet well from the contributing service area. This requires maintenance staff to frequently use a vacuum truck for debris removal. The only way to get the vacuum hose into the wet well is to carry it into the building, down the stairs, and through the small hatch in the floor. Once the hose is in place, it is difficult to manipulate inside of the wet well due to the small size of the opening and obstructions like suction and discharge piping. It is also more challenging to service the equipment when it is located in a pit. Having to climb a set of stairs just to get to the pump skid is an added hazard.

Another concerning aspect of the station is the safety of maintenance staff as they perform their duties. There is no physical seal to keep potentially toxic and flammable sewer gas from escaping the wet well and entering the building. Hydrogen sulfide is slightly heavier than air, so it accumulates in the recessed area where the pumps are located. Some sewer gases are also flammable, posing an explosion danger in the presence of electrical equipment. In humid environments, condensation can form on exposed components and when combined with hydrogen sulfide and oxygen can form sulfuric acid. These conditions are not only potentially harmful to people, but will cause metal and concrete to deteriorate (see Image 4 and Image 8) if not sufficiently protected.

The recessed pump room fills with water and ruins the pump motors and controls whenever the adjacent Second Swamp floods. This is due to the lack of a water tight seal between the pump room and the wet well below. It is also exacerbated by the existing 10" overflow which, due to a faulty check valve, allows water to back up from the swamp into the wet well. Based on conversations with County operations staff, there is

also an infiltration point in the 10" sewer under second swamp. All of these issues contribute to flooding and equipment failures.

Lastly, the Route 301 Pump Station was built around 1979 making the structure and appurtenances in excess of 37 years old. Given its age and condition, most of the station is nearing the end of its useful life and will need replacement in the near future.

## 3. PROJECTED FLOW DEMANDS

The S. Crater Road Pump Station currently discharges at a rate of 660 GPM. A flowrate of 700 GPM will be used to simplify the basis of design for the rehabilitation project provide the capability to convey up to 1 MGD peak flow. The capacity analysis performed in the Master Plan states that all gravity sewer and force main piping is of sufficient size and adequate capacity to meet the existing demands of the Route 301 Wastewater System up to the County's 2045 planning period.

According to the Master Plan, it is anticipated that the maximum demand for the Route 301 Wastewater System could increase to 1.75 MGD around the year 2045. At that time, the pump station discharge rate will need to increase to 1,215 GPM to meet demand, which will require the addition of a third pump in the station.

## 4. PROPOSED REHABILITATION

Timmons has critically analyzed all available information on the existing S. Crater Road Pump Station and we recommend rehabilitation and reconstruction of the existing facility. The following subsections outline our design recommendations to alleviate the issues previously cited in the Master Plan and this PER.

### 4.1. BYPASS PUMPING

A bypass pumping operation will need to be implemented prior to beginning the pump station rehabilitation. There are two gravity sewer pipes entering the wet well from opposite directions requiring two separate bypass pump systems. The northern system will intercept flow at the manhole (see Image 9) approximately 120 feet north of the pump station, across Second Swamp, and discharge into the adjacent existing force main emergency pump connection (see Image 10). The southern system will intercept flow at the manhole approximately 190 feet south of the pump station. Part of the pump station rehabilitation includes the installation of a new force main emergency pump connection outside of the wet well. Timmons recommends discharging the southern bypass pumping system into the new emergency pump connection.

Both bypass pump systems will include two (2) portable diesel driven pumps for a total of four (4) pumps. One pump in each system will handle normal operation with the other pump serving as a standby backup for redundancy. The pumps will operate according to a level sensing device, such as float switches or a level transducer, installed in the respective manhole. The gravity pipe exiting each manhole will be temporarily plugged to prevent

wastewater from flowing to the pump station during construction. It is estimated that the duration of bypass pumping could reach five (5) months.

### 4.2. DEMOLITION

Before construction can begin, most of the existing station needs to be demolished. Timmons proposes demolishing the block building and concrete foundation down to the rectangular slab just over the circular wet well top section. That includes the removal of all internal electrical components, pumping equipment, piping, and T-Lock liner inside of the wet well. The discharge force main should also be removed to a point approximately 15'-20' outside of the building. Regarding the pump station site, the existing generator, fuel tank, and concrete pads should be removed. At this time, it is not anticipated that any additional land clearing is required.

### 4.3. NEW CONSTRUCTION

The proposed design is shown on the enclosed concept drawings and includes adding a new 12' diameter circular wet well section to the existing and extending it up to approximately 6" above grade. Interior walls of the wet well will be treated with Raven Epoxy coating for protection against corrosive sewer gases. A new 20'x20' Smith-Midland precast concrete building is proposed above the wet well, but offset so as to only cover a portion of the wet well top. The building will be equipped with an exposed aggregate finish, double doors, and a thermostat-actuated intake louver and exhaust fan. The exterior portion of the wet well top will include a large Bilco style access hatch to improve maintenance capabilities.

Sizing of the building will be confirmed during design, but should allow space for the addition of a third pump skid in the future. Initially, two Gorman-Rupp pump skids will be located in the building, partially mounted over the wet well so that the suction piping can be routed into the wet well along the wall. The pumps will be controlled by a submersible level transducer in a stilling well with variable frequency drives to allow for pump speed adjustments and controlled ramping up and down. All pump controls, electrical panels, and SCADA components will be housed in the new building. The discharge force main will include a magnetic flow meter either inside of the building or located in a separate concrete valve vault, depending on available space. After the flow meter, the force main will have a new emergency pump connection in the yard and then connect to the existing force main. New site components will also include a generator with belly fuel tank, site lighting, and gravel vehicular access.

### 4.4. PROJECTED FLOW AND HEAD CONDITIONS

The existing pump station operates at a constant speed, producing approximately 660 GPM. It is currently pumping an estimated 60% of the Route 301 Wastewater System Capacity. Timmons proposes to design the new pumps around a flowrate of 700 GPM. Wastewater will be discharged from the new pump station through approximately 6,200' of existing 10" diameter force main to a connection point within the Petersburg system. The overall high point elevation on the force main is approximately 162 feet AMSL – located at the air

release valve near station 112+75 on the as-built drawings. Since this air release valve is essentially equal in elevation to the discharge point, it is assumed that the force main is under pressure for the entire length of the line. Based on an proposed flowrate of 700 GPM and a Hazen Williams C Factor of 120, we project the total dynamic head on the new pumps to be approximately 80'.

The as-builts show the existing 10" force main as PVC but a discussion with County utility operations staff revealed the pipe is thought to be transite asbestos cement instead. During the design phase, additional work should be performed to verify the condition, material and class and look at pressures at the existing pump station in order to better estimate the interior condition of the existing pipe.

## 5. OPINION OF PROBABLE PROJECT COST

As previously stated, the existing pump station presents significant maintenance and operational challenges, as well as safety issues for County staff. Timmons recommends extensive rehabilitation as detailed in prior sections.

The following represents our engineer's opinion of probable project cost to rehabilitate the existing wastewater pump station:

| Pump Station Rehabilitation | | |
|---|---|---|
| Wet Well Section and Top | $ | 35,000 |
| Raven Coating | $ | 25,000 |
| Control Building (Smith-Midland) | $ | 50,000 |
| Pump Skid with Controls (Gorman-Rupp) | $ | 145,000 |
| Flow Meter | $ | 10,000 |
| SCADA (Dorsett) | $ | 20,000 |
| Electrical Service | $ | 35,000 |
| Standby Power Generator w/ belly tank | $ | 70,000 |
| Misc. Site Improvements | $ | 40,000 |
| Piping Connections | $ | 20,000 |
| Bypass Pumping | $ | 45,000 |
| Demo of Existing Pump Station | $ | 20,000 |
| Subtotal | $ | 515,000 |
| Design and Construction Period Services | $ | 118,450 |
| Construction Contingencies | $ | 51,500 |
| Total | $ | 684,950 |

**Exclusions:**

Influent grinder

Odor/corrosion control system

Upstream or downstream system upgrades

## 6. SITE PHOTOGRAPHS

Image 1. Pump station exterior.

Image 2. Generator and fuel tank.

Image 3. Pump station interior.

Image 4. Control panels.

Image 5. Recessed floor and pump skid.

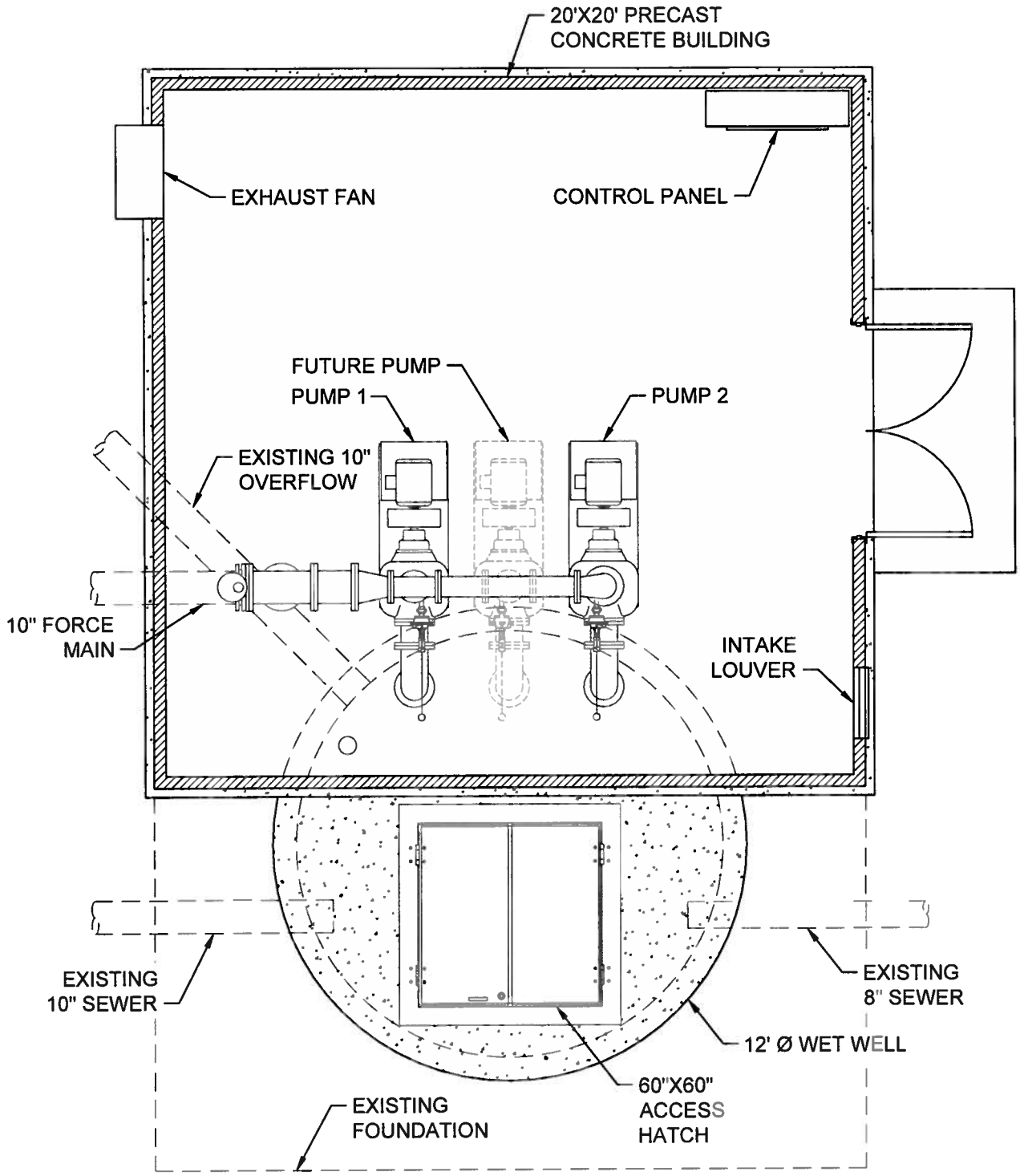
Image 6. Pump skid and access hatch.

Image 7. Trolley hoist.

Image 8. Trolley hoist beam.

Image 9. Northern manhole.

Image 10. Emergency pump connection.




## CONCEPT PUMP STATION FLOOR PLAN

**SCALE: NOT TO SCALE**

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S. CRATER ROAD PUMP STATION REHABILITATION

PRINCE GEORGE COUNTY - VIRGINIA

CONCEPT PUMP STATION FLOOR PLAN

SHEET NO. 1 | JOB NO. 35280.011

| SCALE | CHECKED BY | DESIGNED BY | DRAWN BY | DATE |
|---|---|---|---|---|
| NOT TO SCALE | W. HAMMUS | B. STRICKLAND | B. STRICKLAND | 9/2/16 |

| DATE | REVISION DESCRIPTION |
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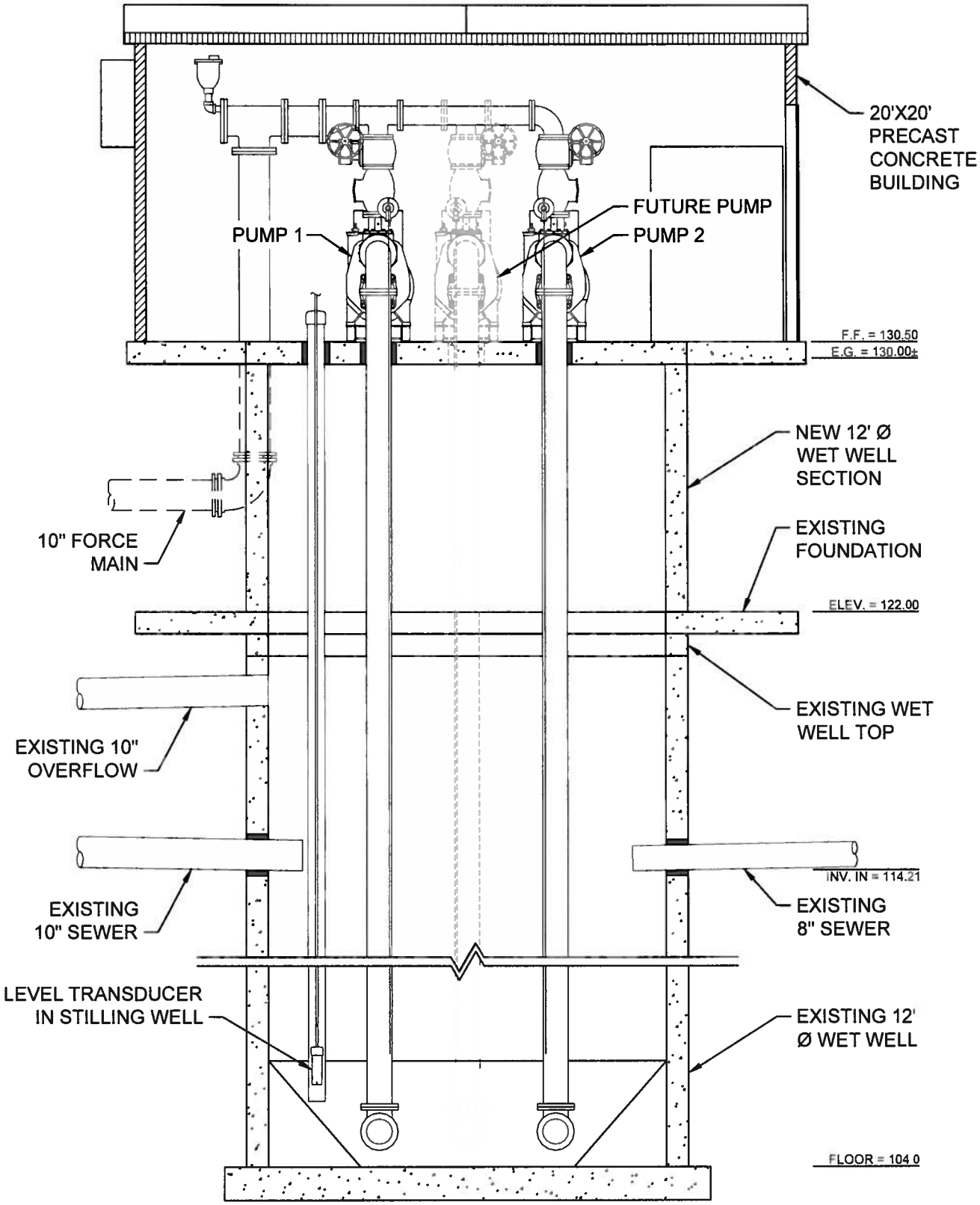


## CONCEPT PUMP STATION SECTION

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S. CRATER ROAD PUMP STATION REHABILITATION
PRINCE GEORGE COUNTY - VIRGINIA
CONCEPT PUMP STATION SECTION

| | |
|---|---|
| JOB NO. | 35280.011 |
| SHEET NO. | 2 |
| SCALE | NOT TO SCALE |
| CHECKED BY | W. HUNNIUS |
| DESIGNED BY | B. STRICKLAND |
| DRAWN BY | B. STRICKLAND |
| DATE | 9/2/16 |

| DATE | REVISION DESCRIPTION |
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