

# Breakfast Hill Water Main Extension



## Preliminary Design and Basis of Design Report

**March 29, 2019**

**Portsmouth/Greenland, NH**

**Drinking Water Groundwater Trust Fund Project#: DWGT-08**

Submitted by:



2303.00

25 Vaughan Mall  
Portsmouth, New Hampshire  
99 North State Street  
Concord, New Hampshire

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## 1. Introduction

The Town of Greenland (TOG) and the City of Portsmouth (COP) have agreed to cooperatively advance the preliminary design phase of a water main extension from the existing Portsmouth system to the Breakfast Hill area of Greenland. The work is being advanced by the City of Portsmouth based on a request of the Town of Greenland with the primary goal of mitigating the risks associated with the presence of certain contaminants in groundwater around the Coakley Landfill groundwater management zone. The municipal system would provide the potable water instead of the individual private wells. This work was complete in conjunction with a Master Plan Supplement dated March 22, 2019.

Preliminary design drawings for the water main extension to the Breakfast Hill service area and conceptual drawings for recommended distribution improvements to the existing Portsmouth Water System have been developed (Appendix A) in accordance with the Work Scope Authorization approved by NHDES on March 14, 2018 (Project #DWGT-08). The purpose of this report is to serve as a basis of design for the following improvements:

- Transmission Water Main (Breakfast Hill Road)
- Neighborhood Water Mains to the Breakfast Hill service area
- Greenland Pressure Zone Water Storage Tank
- Greenland Well Improvements
- Pressure Reducing Valve/Meter Pit – Ocean Road
- Booster Pump Station – Pease C&J Bus Station Site
- Potential Pease Interconnect

This report has been completed in conjunction with a Master Plan Supplement prepared by Underwood Engineers on March 22, 2019.





## 2. Distribution Improvements Background

Three (3) different scenarios were evaluated for providing Portsmouth municipal water to the Breakfast Hill service area. The scenarios are as follows:

1. Create a loop from Post Road to Lafayette Road.
2. Create a stand-alone pressure zone in Greenland.
3. Connect Greenland to the Pease pressure zone.

A complete evaluation of the three (3) alternatives has been completed and is provided in the *Master Plan Supplement* report, dated March 22, 2019, by Underwood Engineers to supplement this basis of design. Scenario No. 2 was found to be the best option of those considered to meet the goals mentioned above. This scenario includes the following:

- 9,000 feet of 12" transmission main extension from Post Road to Lafayette Road.
- 28,000 feet of 8" water main to serve the neighborhoods.
- 500,000-gallon, 91-foot elevated water storage tank.
- Upgrade to the Greenland Well Pump.
- Pressure Reducing Valve on Ocean Road to allow water flow from proposed Greenland pressure zone into Portsmouth (main pressure zone).
- New booster pump station (and PRV) near Grafton Road/Greenland Road intersection – Alternative location at Ocean Road.
- Pease interconnection for emergency on Grafton Road (normally off). The Greenland pressure zone will match the Pease pressure zone.
- Future/potential loop along Lafayette Road.

This preliminary design report considers the basis of design for Scenario No. 2.: creating a standalone pressure zone for the portion of the water system in Greenland (including the existing system in Greenland, the proposed Breakfast Hill service area, and a small part of the system that extends into Newington from Greenland).

### 3. Field Investigations

#### 3.1. Survey

UE subcontracted Doucet Survey, Inc. (DSI) to complete the following work in the Breakfast Hill service area:

Digital orthophotography data from NH Granit (photos compiled from 2010 and 2015) was compiled to generate aerial base plans for the Breakfast Hill service area. This includes Breakfast Hill Road, the neighborhood streets, and Lafayette Road. Lafayette Road was included for future consideration of a loop to Lafayette Road.

Topographic survey was completed by DSI in 2018 for the bridge deck to create 1-foot topographic contours of the bridge top. Additionally, DSI located other features such as structures and observable utilities. DSI used the Leica C10 Scanner to locate I-95 pavement, guardrails, bridge abutments, bridge girders, piers, underside bridge deck, and sleeves.

DSI also field located the following features to supplement base maps:

- Existing drainage including headwalls, catch basins, drain manholes, drain pipes, culverts, inverts, etc.
- Falls Way bridge and concrete open-bottom/box culverts in neighborhood and wetlands beneath
- Existing water system near Post Road (valves, hydrants, etc.)

Due to the limited survey as part of this work, it is recommended to complete detailed field survey for final design.

#### 3.2. Subsurface Investigations

Preliminary field investigations including soil borings and ledge probes were completed by S.W. Cole Explorations, LLC (Bangor, ME) in the Breakfast Hill service area. Approximately 3-days of subsurface work was completed to log 62 ledge probes and 8 soil borings throughout the project area. Subsurface exploration information is provided in Appendix B.

From available subsurface information, rock removal will be required on parts of Breakfast Hill Road to install the water main, specifically the section adjacent to Breakfast Hill Golf Club (STA 40+00 to STA 61+00) and the section from Berry Farm Lane to Lafayette Road (STA 78+00 to 89+00). Borings and probes to date indicate depth to top of ledge ranges 2.7 feet to 11.4 feet in these sections. Rock removal will also be required on sections of Maple Drive, Berry Farm Lane, Falls Way, Ridgecrest Drive, and Pinewood Circle. Borings and probes to date indicate depth to top of rock ranges from 3.0 feet to 9.2 feet in these sections. The amount of total

rock removal required for the service area is estimated to be 2,500 CY assuming 5.5 feet of required pipe cover and a trench width of 5 feet. This should be confirmed during final design.

Note that subsurface investigations were not completed at the tank, booster pump station, PRV vault, or Pease interconnect sites and will be needed to advance the design.

### 3.3. Hazardous Materials Review

A NHDES OneStop Data Mapper review was completed to evaluate the potential for encountering contaminated soil or groundwater in the project area during construction. The following sites within the project area were found on the OneStop Data Mapper:

#### 3.3.1. Palmer Residence (Remediation Site)

- Site number: 201211063
- Address: 19 Maple Drive Greenland, NH 03840
- Project type: OPUF (leaking residential heating oil tank)
- Based on information available on the OneStop Data Mapper, this site is a “closed” site and there are no known sources of risk and no ambient groundwater quality standard violations. Workload priority is considered to be “low priority”.

#### 3.3.2. Breakfast Hill Crossing (Plaza) (Remediation Site)

- Site number: 199503025
- Address: 611 Breakfast Hill Road Greenland, NH 03840
- Project type: UIC (underground injection control; discharges of benign wastewaters not requiring a discharge permit or request to cease a discharge)
- Based on information available on the OneStop Data Mapper, this site is considered to have a low workload priority. However, potential risks for this site have not yet been defined.

#### 3.3.3. A Hair Ahead (Local Potential Contamination Source)

- Site number: PCS00204
- Address: 611 Breakfast Hill Road Greenland, NH 03840
- Project type: CLN (dry cleaners; laundromats; beauty salons; and car washed)

The Coakley Landfill superfund site is adjacent to the project area. The New Hampshire Department of Environmental Services and The United States Environmental Protection Agency

have identified 1,4-Dioxane, Dissolved Arsenic, and Dissolved Manganese as “contaminants of concern”.

Due to the potential issues, special soils and groundwater handling may be required during construction.

## 4. Proposed Water Main

This section describes preliminary design considerations and the basis of design for the Breakfast Hill Road water transmission main extension of the existing Portsmouth Water System as well as the water main extension into the adjacent neighborhoods. Preliminary design drawings for the extension are included in Appendix A.

### 4.1. Transmission Main Description/Alignment

The proposed transmission main extension to the Breakfast Hill service area will begin at the corner of Post Road and Breakfast Hill Road (NHDOT owned road) where there is an existing 12" stub on the north side of the road. The proposed water main will extend east on the north side of Breakfast Hill Road and cross the I-95 bridge.

The proposed main will continue to run east on the north side of Breakfast Hill Road until the intersection with Lafayette Road where the water main will be capped for potential future extension of the system. Note that directional drilling is assumed to be required to cross the existing, paved over, railroad tracks and the three (3) 24" RCP culverts east of the Breakfast Hill Golf Club (STA 61+75 to STA 63+00). Additional details for proposed directional drilling methods can be found in Section 4.3.5.



**Figure 1. Three (3) 24" RCP culverts on Breakfast Hill Road.**

Also note that the transmission main is proposed to connect to the existing water system on Seavey Way that intersects Breakfast Hill road twice. Two tees are proposed to tie into both intersections of Seavey Way and Breakfast Hill Road (STA 66+50 and STA 74+50).

The majority of the preliminary alignment for the water main is located on the northern shoulder of Breakfast Hill Road. The basis for a north alignment is that there is more shoulder available for placement of a water main and that keeping the main on the north side avoids any road crossings. Based on preliminary discussions with NHDOT, this general alignment would be acceptable. However, there is potential for the main to be constructed off the pavement within the R.O.W., but a topographic/R.O.W. survey would be required to provide the level of detail required to assure if there is adequate space. Alignments will be adjusted in final design phases of work.

#### 4.2. I-95 Bridge Crossing

The I-95 bridge was designed in 1971 by Howard, Needles, Tammen, and Bergendoff Consulting Engineers (HNTB). As-built plans for the bridge were provided by NHDOT to aid with the design of the bridge crossing. Per the plans provided, the original intent was to accommodate an insulated 12" cast iron pipe between the bridge girders/cross frames of the bridge and install the pipe through abutment penetrations on each side of the bridge. On each end, the pipe was proposed to be installed through the penetration and extend past the 20' approach slab for potential future hookup to a water system. However, the 12" pipe was never installed beneath the bridge deck and it is assumed that a 12" pipe was never installed in the approach slab to the bridge either.

The proposed bridge crossing method for this project includes installing a 24" DI sleeve that will start at the bridge abutment penetration and extend past the approach slab to the bridge. The sleeve is provided so that the approach slab will not have to be disturbed in the event of any future maintenance. The proposed 12" water main, with polyurethane insulation and a high-density polyethylene (HDPE) casing (total OD = 17.92") will be installed within the 24" sleeve with casing spacers to stabilize the pipe. The 12" main will then be installed through the existing 20" abutment penetration. Link-Seal modular seals are proposed to stabilize the pipe within the penetration.



**Figure 2. Abutment penetration at east abutment of I-95 bridge.**

Once through the penetrations, the watermain (with insulation and HDPE casing) is proposed to be carried from the existing bridge girder/cross frames and secured by proposed utility support rollers. An evaluation was completed by Tirey & Associates, P.C. to confirm that the bridge has the structural capacity to support the load of the proposed water main. Information on the proposed water main weight and the structural evaluation completed by Tirey & Associates is provided in Appendix C. Also proposed is one (1) 12" self-restrained expansion/contraction joint to be constructed between the back wall of the west abutments and the first hanger. Bridge details are provided on Sheet 31 of Appendix A. Technical information sheets for bridge crossing appurtenances including specified 12" ductile iron pipe, polyurethane insulation, HDPE casing, expansion/contraction joint, casing spacers for 24" DI sleeve, Link-Seal modular seals, and pipe support rolls are provided in Appendix D.

#### 4.3. Neighborhood Water Main Description/Alignment

It is proposed to tee off from the proposed 12-inch water main to provide water service to each of the neighborhoods off of Breakfast Hill Road. The neighborhoods include the following streets:

- Maple Drive
- Maple Drive Extension
- Sunnyside Drive
- Coombs Farm Road
- Windsor Green Road
- Stone Meadow Way
- Red Oak Drive
- Berry Farm Lane
- September Drive
- October Drive
- Falls Way
- Skyview Drive
- Ridgecrest Drive
- Balsamic Circle
- Pinewood Circle

Preliminary drawings show alignments for the streets above. The preliminary alignment places the water main near the edge of pavement. However, it is anticipated that the alignment can be modified to decrease impacts to the roadway once a topographic/R.O.W. survey is complete.

It is anticipated that directional drilling is needed in the Falls Way neighborhood to cross a 100-ft long bridge as you enter the neighborhood and six (6) precast concrete box culverts throughout the neighborhood.





Figure 3. 100-ft long bridge on Falls Way.



Figure 4. Example Falls Way neighborhood precast concrete box culvert.





#### 4.4. Basis of Design

The basis of design for the transmission water main on Breakfast Hill Road is summarized as follows:

##### 4.4.1. Water Main

- Diameter: 8-inch and 12-inch, mechanical joint (MJ) piping
- Material: Ductile Iron, Class 52
  - Corrosion control provisions to be provided (either polyethylene pipe-wrap or Zinc coated pipe)
- Minimum cover: 5.5 feet
- Valves: 8-inch/12-inch MJ gate valves
- Valve open direction: right, per City of Portsmouth standards

##### 4.4.2. Hydrants

- Provided for fire protection and water quality flushing purposes
- Type: Kennedy K-81A Guardian, per City of Portsmouth standards
- Valve open direction: right, per City of Portsmouth standards
- Spacing: approximately 600-ft apart (to be reviewed by the City)

##### 4.4.3. Water Services

- Domestic Services: 1" copper
  - Duplexes will be provided two (2) water services
- Commercial Domestic Services: sized to allow  $\leq 1$ -ft of head loss
  - Breakfast Hill Golf Club: 4" ductile iron
  - Garden of Eves Greenhouses: 4" ductile iron
  - Rolling Green Nursery: 4" ductile iron
  - 611 Breakfast Hill Road: 2" copper
  - Bethany Church: 2" copper
- Commercial Fire Protection Services: 4" ductile iron (or as required/requested by property owner)

- Curb stop and box to be provided for all services
- Preliminary drawings do not include work required to connect to existing water plumbing
- Note: this project provides service to the ROW for each improved property. Property owners will need to construct the service from the ROW to their foundation. Additionally, a meter, backflow preventer, and expansion tank will be needed.

#### 4.4.4. I-95 Bridge Crossing

- 24" DI sleeve installed from abutment penetration (20") to beyond existing approach slab on each side of the bridge
  - Sized based on OD of pipe plus insulation and HDPE jacket (17.92")
  - Casing spacers to stabilize pipe within 24" DI sleeve
  - 8" wide stainless-steel band w/ ribbed flanges
- Link-Seal modular seals to stabilize pipe within 20" abutment penetration
- Pipe: 12" DI TR Flex (OD = 13.2")
  - Self-restrained push-on joint pipe
  - ASTM C150 Type II cement mortar lining
  - Maximum 5° deflection angle
  - 4 self-restraining locking segments
- Insulation: foamed in place closed cell polyurethane insulation
  - Thickness: 2.16"
- Casing: HDPE jacket
  - Thickness: 0.2"
- Expansion/contraction joint
  - Model: 200 EX-TEND Series No. 212MO by EBAA Iron, Inc.
  - Nominal pipe size: 12"
  - Expansion (linear): 4"
    - Expansion determined by change in length due to thermal compression/expansion



- 4" expansion provides a temperature delta of 185 °F
- Pipe Supports
  - Cast iron roll and sockets; steel rod roll
    - Model: Grinnell Pipe Role Fig. 171 or Fig. 177
    - Pipe roll to be provided above and below proposed water main
  - Steel pipe hanger rod

#### 4.4.5. Directional Drilling

- Location: stream crossing east of Breakfast Hill Golf Club
  - 8-ft clearance between proposed drilling and existing 24" RCP culverts, per DBU Construction, Inc. field review recommendation
- Location: Falls Way neighborhood
  - 100' bridge on Falls Way
    - 10-ft of clearance required between proposed drilling and existing wetlands, per DBU Construction, Inc. field review recommendation
  - Concrete box/open-bottom culverts within Falls Way neighborhood
    - 5-ft of clearance required between proposed drilling and existing wetlands, per DBU Construction, Inc. field review recommendation
- Diameter: 8inch/12-inch
- Material: HDPE
- Typical min. space required for drill rig equipment: 75' x 100'
- Entry angle at drill rig: 8°-20°
- Drill rig entry point is approx. 10-ft back from entry pit for every foot of depth required at entry pit.
- Gate valves to be provided on both ends of directionally drilled HDPE sections.

#### 4.5. Wetlands Permitting

A wetlands evaluation was not completed in this phase of the design. Required wetlands permitting, if any, should be coordinated with the NHDES Wetlands Bureau for directional drilling operations on Breakfast Hill Road and the Falls Way neighborhood. No other wetland impacts are anticipated.

#### 4.6. NHDOT Coordination and Construction Standards

UE met with Lucas Miller of NHDOT District 6 and Jason Tremblay of NHDOT Bridge Design on July 9<sup>th</sup>, 2018 to discuss the water main extension into the Breakfast Hill service area, specifically construction on Breakfast Hill Road and the I-95 bridge crossing. NHDOT provided the following feedback for project requirements:

##### 4.6.1. General

- Long-form excavation permit with 1 set of full-size plans and 1 set of half-size plans
- Environmental checklist
- Bond amount (to be determined after plan review)
- Signature from the Contractor and Municipality
- Separate permits for work in separate municipalities
- DOT requires both physical and digital submittals
- Design shall conform with 2017 NHDOT UAM requirements

##### 4.6.2. Bridge Work

- Bridge work will be permitted under excavation permit
- LAROW access for construction will require a Use and Occupancy agreement (after final design)
- Structural calcs to support that the existing bridge has adequate capacity to carry the load of a new 12" main.
- Submit final design drawings to NHDOT to be incorporated into bridge record drawings
- A sleeve that extends past the bridge approach slab is required if there is not an existing sleeve through the existing abutment penetration. Note that it is anticipated that the existing sleeve shown on the record drawings was not constructed and does not exist.
- NHDOT suggested that the best plan is likely to cut the approach slab, remove a section, then pour a new slab and tie into the existing after the pipe is placed.

#### 4.7. Final Design Considerations

- Complete topographic survey for project areas including wetlands
- Complete ROW survey at tank site, PRV site, and booster pump station site
- Confirm water main alignment based on existing utility locations and R.O.W. availability
- Complete Geotech report
- Confirm locations of proposed stubbed services based on existing plumbing/well location
- Confirm property owners that will connect
- Consider corrosion control pipe installation methods/pipe specifications
  - Ex: polyethylene pipe-wrap (V-bio or standard) or Zinc coated pipe
- Confirm construction methods for trench repair on Breakfast Hill Road with NHDOT – District 6, trench repair with overlay assumed.
- Further evaluate 24” sleeve design in approach slab to 20” abutment penetration
- Confirm bridge crossing methods/approach slab repair with NHDOT – Bridge Design
- Coordinate with NHDES Wetlands Bureau any permitting requirements for crossing the stream east of the Breakfast Hill Golf Club



## 5. Greenland Pressure Zone Water Storage Tank

Per Master Plan update by UE, a **0.5 MG elevated storage tank is recommended**. This size tank will also provide improved water age conditions compared to a larger tank. The recommended tank type is a composite elevated tank like the existing Pease and Spinney Road tanks (Figure 5) The recommended site for the tank is the Town of Greenland owned land between the Bethany Church and the former Rye landfill. A conceptual tank site plan and details are provided in Appendix A on Sheets 28 and 32, respectively.



Figure 5. Pease composite elevated tank (left) and Spinney Road composite elevated tank (right).

### 5.1. Basis of Design

Major components and features of the tank are provided below:

- Tank type: composite elevated tank
- Tank material: steel w/ steel-lined concrete bottom
- Tank capacity: 500,000-gal
- Tank diameter: 50-ft
- Pedestal diameter: 30-ft
- Head range: 35-ft
  - Tank levels can be controlled using Greenland Well/proposed BPS to control water age
- Reinforced concrete pedestal support shaft
- Tank color: TBD

- Other appurtenances include: overflow pipe w/ concrete splash pad, vent, roof hatch, roof handrail, access tube hatch, interior pedestal ladder w/ OSHA compliant safety climbing device and rest seats at 50-ft maximum spacing, walkway w/ handrail under tank, tank access ladder, and inside tank ladder
- Usable space for miscellaneous storage in pedestal base w/ option for multiple storage floors
- One (1) overhead door to pedestal
- One (1) personnel door to pedestal
- Tank color: TBD in final design phase

## 5.2. Final Design Considerations

- Confirm recommended tank site
- Complete topographic survey at proposed site
- Complete subsurface investigations and geotechnical evaluation at proposed site
- Confirm pedestal storage options
- Confirm tank color

## 6. Greenland Well Pump Improvements

The Greenland Well is located near the Mike Maloney Rec Center off of Post Road. The pump (replaced in 2017 as part of another project) pumps to the main pressure zone's HGL of 171-ft. In order to pump to the proposed Greenland pressure zone (HGL = 230-ft), the existing pump would need to be replaced with a larger pump with a TDH 59-ft larger than the existing pump (230 ft – 171 ft = 59 ft).

### 6.1. Existing Conditions

- Pump type: vertical turbine, 30 HP
- Pump capacity = 450 gpm (Greenland Well limited @ 450 gpm per City of Portsmouth Water Department)
- TDH = 195-ft (per existing pump submittal)

### 6.2. Proposed Conditions

- Pump type: vertical turbine, 40-45 HP (estimated)
- Pump capacity = 450 gpm (Greenland Well limited @ 450 gpm per City of Portsmouth Water Department)
- TDH = 254-ft (increase of 59-ft)
- Pump horsepower may potentially be reduced if 10-in. main has low C factor and is replaced.

Product information and data sheets are provided in Appendix E for a recommended replacement pump from Sulzer Ltd.

### 6.3. Final Design Considerations

- Confirm any other improvements that should be considered.
  - Example: evaluate replacing existing 10" main from the Greenland Well to Post Road with a 12" main for hydraulic purposes – replacement not included currently.



## 7. Pressure Reducing Valve/Metering Vault – Ocean Road

As mentioned above, the water system in Greenland is currently part of the main pressure zone. It is proposed to install pressure reducing valves (PRVs) to isolate the main pressure zone and the proposed Greenland pressure zone. PRVs allow water to move from high pressure to low pressure in the event of a water emergency in the lower pressure zone. Water currently enters Greenland from the main pressure zone in two (2) locations. The Greenland service area is fed water from distribution piping on Ocean Road and from piping on Route 33 near Grafton Road. PRVs are recommended at both these locations. The proposed PRV for the piping near Route 33/Grafton Road is proposed to be installed as part of a proposed booster pumping station (BPS). More information on the proposed BPS is provided in Section 9.

The Ocean Road PRV is proposed to be installed in a vault and, per request by the City of Portsmouth, is to include metering capabilities to track flow between pressure zones. For preliminary purposes, the vault site is proposed to be in proximity to the City of Portsmouth/Town of Greenland border. The preliminary site is on the north side of Ocean Road just west of the Portsmouth/Greenland border. Preliminary evaluations show adequate space for the construction of the vault, but grading impacts should be anticipated to flatten the site. A conceptual site plan is provided in Appendix A on Sheet 28. The vault is proposed to be constructed in line with the existing 10" cast iron water main that is off the north side of the road.

The proposed vault will allow water to pass in both directions; Greenland pressure zone to main pressure zone and vice versa. There are two different sized pipe branches, 6-in. and 10-in. within the proposed vault to transmit water in each direction. Water flowing from Greenland to the main pressure zone will flow through 6-in. piping including the PRV and a 6-in. meter. This is the primary function of the vault. However, when pressure drops to less than 25 psi (to be confirmed in final design phase) a 10-in. check valve will open and allow flow from the main pressure zone to the Greenland pressure zone. This water passes through the 10-in piping and a 10-in. meter. This direction of flow will likely only occur during emergency demand events such as fire flows or tank cleanings. Note that when water is flowing into Greenland, water will flow through the 10-in. and the 6-in. piping.

### 7.1. Basis of Design

Major components and features of the proposed vault as follows:

- Precast concrete vault dimensions: 20' L x 8' W x 9' H
  - Sized to provide adequate straight length pipe for metering purposes and adequate interior height (7-ft) for personnel access, operation, and maintenance
- 10" meter to measure flow from main pressure zone to Greenland pressure zone

- 6" meter to measure flow from Greenland pressure zone to main pressure zone
  - Water flows through 6" meter in reverse direction; meter will measure net flow
- 10" check valve
- 8" pressure reducing valve
  - Upstream pressure set point: 81 psi
  - Downstream pressure set point: 55 psi
  - Pressure set points based on Google Earth elevation of 52-ft
- 30" vault roof hatch/access cover
- Sump pit and sump pump
- PVC vent pipe w/ insect screen
- 5 kW unit heater
- Portable electric dehumidifier w/ drain to sump

## 7.2. Final Design Considerations

- Confirm location and land acquisition/easements.
- Complete topographic survey at proposed site
- Complete subsurface investigations at proposed site
- Confirm final valve sizing with vendors.
- Confirm controls/SCADA requested



## 8. Booster Pumping Station – Pease C&J Bus Station

A booster pumping station (BPS) is required to provide water from Portsmouth's main system which provides the two (2) sources necessary. The Greenland Well is the other source.

The booster pumping station will pump water from the main pressure zone HGL (171-ft) to the Greenland high pressure zone HGL (230-ft). Together with the Greenland Well, the BPS maintains levels in the proposed storage tank on Breakfast Hill Road.

It is proposed to install an above-grade factory built pumping system by SyncroFlo or equivalent. The station will house booster pumps (two for redundancy), controls, and metering equipment. The proposed BPS would also include PRVs to allow flow from the Greenland pressure zone to the main pressure zone. An enclosed generator is also proposed outside the BPS for emergency backup power.

There are several potential locations for the BPS all of which are adjacent to the Pease C&J bus station. One possible site is shown on Sheet 28 of the drawings.

Although a BPS on Ocean Road is also possible, preliminary evaluations show that this alternative location increased max water age in the majority of the existing Greenland system. There is also more land availability at the C&J site so that is where conceptual site plans are provided for the BPS. Additional evaluation would be needed if a BPS on Ocean Road were to be pursued.

### 8.1. Basis of Design

The proposed BPS is sized to provide the Greenland pressure zone's maximum day demand (MDD) of 500 gpm and to pump to the proposed Greenland pressure zone HGL (230-ft). We have assumed 13 psi (30-ft) of headloss through the system bringing the total dynamic head (TDH) of the pumps to 89-ft (a pressure differential of 39 psi). Detailed technical information on the proposed BPS is provided in Appendix F. Major BPS components and features include the following:

- Two (2) 20 hp frame mounted end suction pumps each rated at 500 gpm @ 89-ft
  - Pumps rated at 89-ft to include BPS head losses
  - Pumps to operate in duty/standby mode; one pumps to fill proposed tank on Breakfast Hill Road while the other is in standby
- Parallel PRVs to allow flow and reduce pressure in opposite direction
- Flow meter for pump control and metering purposes
- System controls for all logic and motor control with SCADA interface

- Low inlet pressure controllable shut-down
  - Will assist with fire flows in main pressure zone
- Skid approximate minimum footprint: 6' x 6'
- Building: steel self-framed building with exterior brick façade and gable roof
- Preliminary building footprint: 16' x 16'
  - Extra room provided for storage
- Exterior generator w/ weather/sound enclosure (diesel or propane TBD)

## 8.2. Final Design Considerations

- Confirm pumping station location.
- Complete topographic survey at proposed site
- Complete subsurface investigations at proposed site
- Proceed with correspondence with NHDOT for any permits, requirements, and land acquisition needed.
- Obtain land acquisition/easements needed.
- Confirm location of existing water main in respect to drainage swale.
- Confirm site layout.
- Confirm desired building construction/architecture (brick facade and gable roof recommended).
- Confirm final valve sizing with vendors.
- Booster pumps and piping layout: confirm preferences with City to facilitate operation and maintenance. Pump style options may include horizontal centrifugal or vertical turbine pumps.
- Confirm pumping layout. Current recommendation is two (2) 500 gpm pumps.
- Evaluate impacts on pump station location and inlet pressures.

## 9. Potential Pease Interconnect

As mentioned above, the Greenland pressure zone is proposed to match the existing Pease pressure zone at an HGL of 230-ft. The two pressure zones will normally operate separately, but it is proposed to provide a manual connection for emergency purposes. The proposed connection point is based off where the Pease pressure zone comes closest to the proposed Greenland pressure zone. This location is Grafton Road. There is an existing 8" cast iron main on the north end of Grafton Road. There is an existing 12" cast iron main on the opposite end of Grafton Road, approximately 1,600-ft away that is proposed to be part of the Greenland pressure zone. It is proposed to install a 12" water main to connect the two existing pipes. Valves will be provided so that there is not normally flow between the two systems. A conceptual site plan for the interconnect is provided in Appendix A on Sheet 28.

### 9.1. Basis of Design

The following improvements are recommended:

- 1,700 linear feet of total pipe
  - Includes pipe installed on Grafton Road and to tie into existing water mains
- Diameter: 12-inch
- Material: Ductile Iron, Class 52
- Minimum cover: 5.5 feet
- Valves: 12-inch MJ gate valves & 8-inch MJ gate valves (normally closed)
- Valve open direction: right, per City of Portsmouth standards

### 9.2. Final Design Considerations

- Complete topographic survey at proposed site
- Complete subsurface investigations at proposed site
- Coordinate with Pease Development Authority for any required permits/requirements/administrative steps to connect the pressure zones

**APPENDIX A**

**PRELIMINARY DESIGN DRAWINGS**

**(PROVIDED UNDER SEPARATE COVER)**

**APPENDIX B**  
**SUBSURFACE EXPLORATION INFO**





Greenland, NH

1 inch = 400 Feet



June 14, 2018

Ledge probe/soil boring workplan.

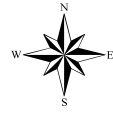


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Greenland, NH

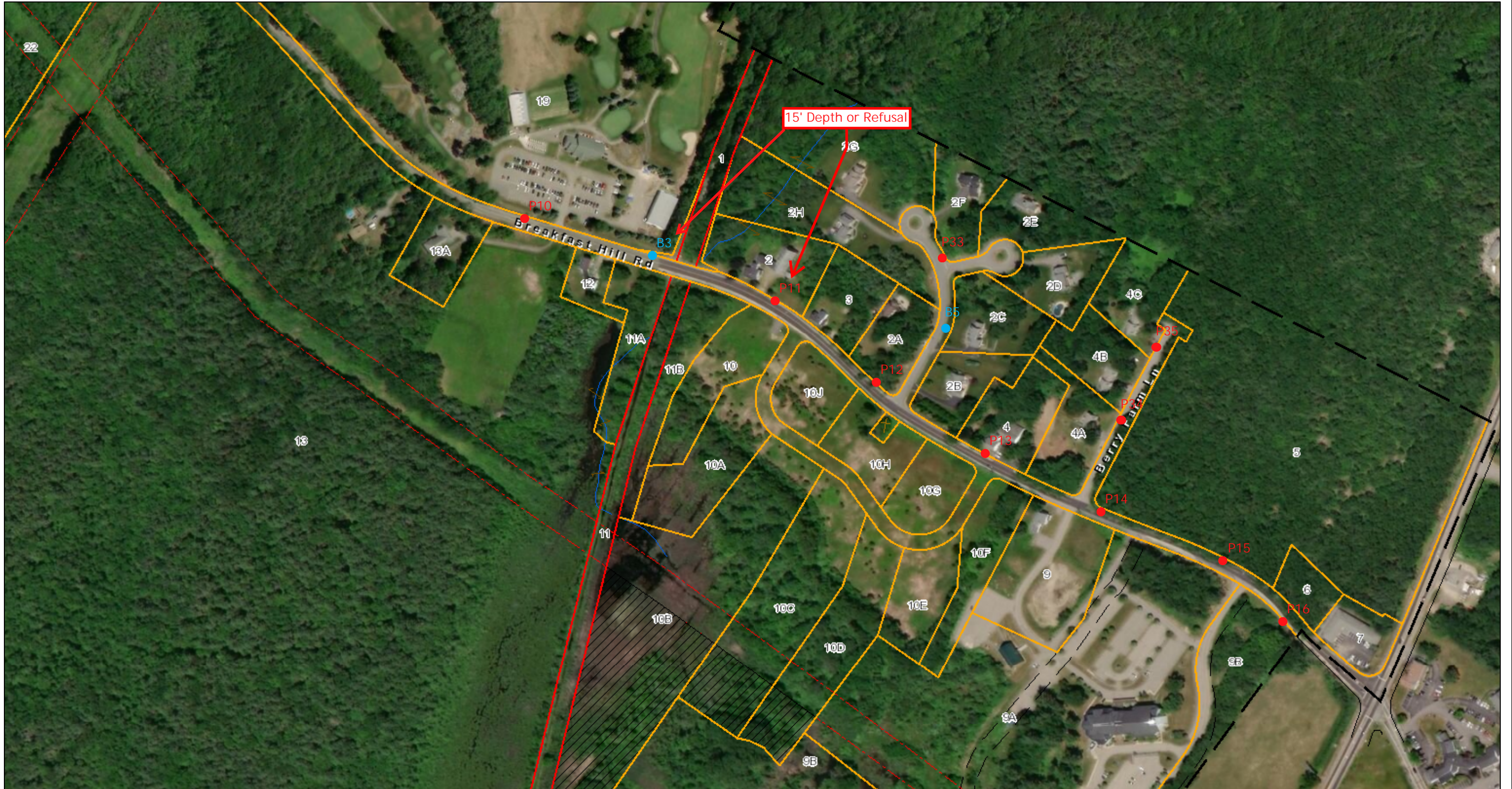
1 inch = 300 Feet



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June 14, 2018

Ledge probe/soil boring workplan.



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Greenland, NH

1 inch = 400 Feet



June 14, 2018

Ledge probe/soil boring workplan.



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**Exploration Log Sheet  
Greenland NH**

<b>Exploration #</b>	<b>Street</b>	<b>Target Depth</b>	<b>Refusal Depth</b>	<b>Groundwater Depth</b>	<b>Soil Type</b>
P1	Breakfast Hill Rd	10	N/A		sand and gravel
P2	Breakfast Hill Rd	10	N/A		sand and gravel
P3	Breakfast Hill Rd	10	N/A		sand and gravel
B1	Breakfast Hill Rd	10	N/A		fine to medium sand
P4	Breakfast Hill Rd	10	N/A		fine sand
P5	Breakfast Hill Rd	10	N/A		fine to coarse sand
P6	Breakfast Hill Rd	10	N/A		fine to coarse sand
P7	Breakfast Hill Rd	10	N/A	5'	silty sand and gravel
B2	Breakfast Hill Rd	10	11.4'		fine to coarse sand and gravel
P8	Breakfast Hill Rd	10	5.2'		sand and gravel
P9	Breakfast Hill Rd	10	5.7'		sand and gravel
P10	Breakfast Hill Rd	10	4.9'		sand and gravel
B3	Breakfast Hill Rd	15	3.5'		sand and gravel
P11	Breakfast Hill Rd	15	N/A		fine sand, trace of gravel
P12	Breakfast Hill Rd	10	6.0'		sand and gravel
P13	Breakfast Hill Rd	10	N/A		sand and gravel
P14	Breakfast Hill Rd	10	7.9'		sand and gravel
P15	Breakfast Hill Rd	10	3.3'		sand and gravel
P16	Breakfast Hill Rd	10	2.7'		sand and gravel

<b>Exploration #</b>	<b>Street</b>	<b>Target Depth</b>	<b>Refusal Depth</b>	<b>Groundwater Depth</b>	<b>Soil Type</b>
P17	Maple Dr Ext	10	N/A		fine sand
P18	Maple Dr Ext	10	N/A		fine to coarse sand and gravel
P19	Maple Dr Ext	10	N/A		sand and gravel
P20	Maple Dr Ext	10	N/A		fine sand and gravel
P21	Maple Dr Ext	10	N/A		fine sand with silt
P22	Maple Dr Ext	10	3.0'		sand and gravel
P23	Maple Dr Ext	10	N/A		fine sand
P24	Maple Dr Ext	10	N/A		sand and gravel
P25	Sunnyside Dr	10	N/A		fine sand
B4	Sunnyside Dr	10	10.3'		fine to coarse sand and gravel
P26	Sunnyside Dr	10	N/A		fine to coarse sand and gravel
P27	Sunnyside Dr	10	N/A		fine to coarse sand and gravel
P28	Coombs Farm Rd	10	N/A		silty fine sand
P29	Coombs Farm Rd	10	N/A		silty fine sand
P30	Winsor Green Rd	10	N/A		silty fine sand
P31	Winsor Green Rd	10	N/A		silty fine sand
P32	Winsor Green Rd	10	N/A		fine to coarse sand and gravel
B5	Stone Meadow Wy	10	11.0'		fine to coarse sand and gravel
P33	Stone Meadow Wy	10	N/A		fine to coarse sand and gravel
P34	Berry Farm Wy	10	5.9'		sand and gravel
P35	Berry Farm Wy	10	6.0'		sand and gravel

<b>Exploration #</b>	<b>Street</b>	<b>Target Depth</b>	<b>Refusal Depth</b>	<b>Groundwater Depth</b>	<b>Soil Type</b>
P36	October Dr	10	N/A		sand and gravel
P37	October Dr	10	N/A		sand and gravel
P38	September Dr	10	N/A		sand and gravel
P39	September Dr	10	N/A		sand and gravel
P40	September Dr	10	N/A		sand and gravel
B6	September Dr	10	N/A	7'	fine to coarse sand and gravel
P41	September Dr	10	N/A	7'	fine to coarse sand and gravel
P42	September Dr	10	N/A		sand and gravel
P43	Falls Way	10	N/A		sand and gravel
P44	Falls Way	25	18.0'		sand and gravel / gray silt
B7	Falls Way	25	5.0'		sand and gravel
P45	Falls Way	10	3.0'		sand and gravel
P46	Falls Way	10	4.0'		sand and gravel
P47	Falls Way	10	4.5'		sand and gravel
P48	Skyview Dr	25	14.5'	7'	sand and gravel
P49	Skyview Dr	10	N/A		sand and gravel
P50	Skyview Dr	10	6.0'		sand and gravel
P51	Skyview Dr	10	N/A		sand and gravel
P52	Skyview Dr	10	N/A		stiff clay/sand and gravel
B8	Skyview Dr	25	18.0'	6'	stiff clay/sand and gravel
P53	Ridgecrest Dr	10	4.5'		sand and gravel

<b>Exploration #</b>	<b>Street</b>	<b>Target Depth</b>	<b>Refusal Depth</b>	<b>Groundwater Depth</b>	<b>Soil Type</b>
P54	Ridgecrest Dr	25	9.2'		sand and gravel
P55	Ridgecrest Dr	25	6.6'		sand and gravel
P56	Ridgecrest Dr	10	N/A		sand and gravel
P57	Ridgecrest Dr	10	6.5'		sand and gravel
P58	Ridgecrest Dr	10	3.4'		sand and gravel
P59	Ridgecrest Dr	10	Electric was not marked / did not drill		
P60	Ridgecrest Dr	25	7.4'		sand and gravel
P61	Ridgecrest Dr	10	N/A		sand and gravel
P62	Balsam Cir	25	22.2'	8.5'	sand and gravel
P63	Balsam Cir	10	Electric was not marked / did not drill		
P64	Pinewood Cir	25	6.0'		sand and gravel















# BORING LOG

BORING NO.: **B-6**  
 SHEET: 1 OF 1  
 PROJECT NO.: 18-16  
 DATE START: 6/27/2018  
 DATE FINISH: 6/27/2018  
 ELEVATION: N/A

PROJECT: PROPOSED WATERLINE  
 LOCATION: SEPTEMBER DRIVE, GREENLAND, NH  
 CLIENT: UNDERWOOD ENGINEERS DRILLER: JEFF LEE

CASING: TYPE HSA SIZE I.D. 2 1/4" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 1 3/8" 140 LB 30"  
 CORE BARREL:

WATER LEVEL INFORMATION  
 WATER AT 7'

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
	1D	24"	13"	2.0'	5	5	6	6	12.0'	FINE TO COARSE SAND AND GRAVEL WITH SILT
	2D	24"	14"	7.0'	19	20	20	32		
	3D	24"	24"	12.0'	10	17	31	46		
										BOTTOM OF EXPLORATION AT 12.0'

SAMPLES: D = SPLIT SPOON C = 2" SHELBY TUBE S = 3" SHELBY TUBE U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  DRILLER - VISUALLY  SOIL TECH. - VISUALLY  LABORATORY TEST

REMARKS: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

BORING NO.: **B-6**





# BORING LOG

BORING NO.: **B-8**  
 SHEET: 1 OF 1  
 PROJECT NO.: 18-16  
 DATE START: 7/12/2018  
 DATE FINISH: 7/12/2018  
 ELEVATION: N/A

PROJECT: PROPOSED WATERLINE  
 LOCATION: SKYVIEW DRIVE, GREENLAND, NH  
 CLIENT: UNDERWOOD ENGINEERS DRILLER: JEFF LEE

CASING: TYPE HSA SIZE I.D. 2 1/4" HAMMER WT. 140 LB HAMMER FALL 30"  
 SAMPLER: SS 1 3/8" 140 LB 30"  
 CORE BARREL:

WATER LEVEL INFORMATION  
 WATER AT 6'

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
	1D	24"	13"	2.0'	21	22	21	16	18.0'	FINE TO COARSE SAND AND GRAVEL
	2D	24"	24"	7.0'	7	9	14	18		OLIVE STIFF SILTY CLAY
	3D	24"	12"	12.0'	7	7	7	9		GRAY SILTY CLAY
	4D	18"	18"	16.5'	20	38	50			FINE SAND AND GRAVEL WITH SILT
										AUGER REFUSAL AT 18.0'

SAMPLES:  
 D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:  
 STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

BORING NO.: **B-8**



# BORING LOG

BORING NO.: **P-44-B**  
 SHEET: 1 OF 1  
 PROJECT NO.: 18-16  
 DATE START: 7/12/2018  
 DATE FINISH: 7/12/2018  
 ELEVATION: N/A

PROJECT: PROPOSED WATERLINE  
 LOCATION: FALLS WAY, GREENLAND, NH  
 CLIENT: UNDERWOOD ENGINEERS DRILLER: JEFF LEE

CASING: TYPE HSA SIZE I.D. 2 1/4" HAMMER WT. 140 LB HAMMER FALL 30"  
 SAMPLER: SS 1 3/8" 140 LB 30"  
 CORE BARREL:

WATER LEVEL INFORMATION  
 WATER AT 3'

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
	1D	24"	14"	7.0'	15	14	11	10	18.0'	FINE TO COARSE SAND AND GRAVEL
	2D	24"	20"	12.0'	9	9	6	7		GRAY FINE SAND AND SILT
	3D	24"	18"	17.0'	4	6	8	8		GRAY FINE SAND AND SILT WITH TRACE OF CLAY
										AUGER REFUSAL AT 18.0'

SAMPLES: D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

BORING NO.: **P-44-B**

**APPENDIX C**

**I-95 BRIDGE – STRUCTURAL EVALUATION**



**TIREY & ASSOCIATES, P.C.**  
CONSULTING STRUCTURAL ENGINEERS

January 7, 2019

Note: See UE files  
for computations.

Mr. Tim K. Noble  
Underwood Engineers, Inc.  
25 Vaughan Mall, Suite 1  
Portsmouth, NH 03801

RE: Breakfast Hill Rd. I-95 Overpass Bridge Evaluation, Greenland, NH

Dear Tim:

At your request, I have reviewed the existing Breakfast Hill Rd. bridge structure which is an overpass of I-95 in Greenland, NH, for the addition of a new 12" nominal diameter forced main pipe beneath the bridge deck, utilizing existing framing which was originally installed to support a 12" insulated water main pipe which was never installed. As part of my review, I made a visit with you to the bridge site on December 6, 2018, to check the constructed conditions against the original design drawings, as well as make observations of the condition of the beams that will be supporting the new pipe, relative to corrosion of the beams.

You have provided us with original design drawings of the bridge, weight information for both the proposed new and originally specified pipe, and pipe insulation systems.

The originally specified 12" nominal pipe with 4" thick insulation and an aluminum jacket is estimated to weigh 103 pounds per linear foot (plf). The proposed new insulated 12" nominal pipe with an HDPE jacket is estimated to weigh 110 plf. The new pipe is proposed to be a 12" ductile iron TR Flex Pipe by US Pipe, with 2" of insulation on the pipe and an HDPE protective jacket. For purposes of evaluating the existing W6x15.5 pipe support beams that are spaced at 5'-0" o/c, we assumed that the new pipe would be located at the same centerline as the originally specified pipe location. In addition to the 12" water main pipe, the W6 beams also support two 3½" diameter conduits with electrical wires in them. The weight of each conduit with wires was estimated to be 15 plf. These conduits are in place under the bridge deck and are located as shown on the original design drawings.

The analysis of the existing W6x15.5 beam was performed using a yield strength of 36 ksi, typical for the 1971 time period when this bridge was designed. With a fully unbraced top flange, our analysis shows that the W6 beam has forces that are less than 10% of its capacity. The condition of the beams show light surface pitting and very light corrosion, but no corrosion plating formed. Even reducing the capacity of the existing beams by 10% for these light conditions will still leave plenty of capacity in the beams for the slightly higher new pipe loads. If the new pipe is shifted slightly towards the centerline of the bridge deck, there will still be plenty of capacity in the W6 beams to carry the new pipe load.

The two bridge girders that support the beams supporting the pipe and conduit were checked for the very slight increase in dead load from the new pipe, insulation and HDPE jacket. A slab analysis was first performed to determine the distribution of the slab dead loads to each girder, accounting for the

Mr. Tim K. Noble  
RE: Breakfast Hill Rd. I-95 Overpass Bridge Evaluation, Greenland, NH

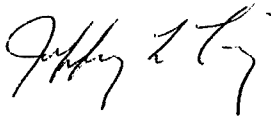
January 7, 2019  
Page 2

continuity of the slab and the cantilevers at each slab edge. Each girder, G1 and G2 referencing the original design drawings, was modeled and dead loads applied to each girder. Our analysis looked at the potential increase in dead load forces only from the original design to the design with the new, slightly heavier insulated pipe. Loads from guardrails, raised concrete walkways, pipe roller supports, pipe support beams, lateral bracing and cross frames for the girders were included in the dead loads applied to the two girders.

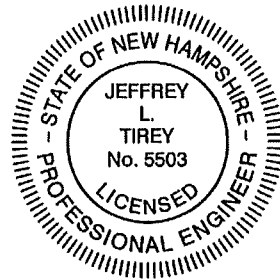
Girder G1 was found to have an increase of 0.2% in dead load forces and deflection with the new loads. This increase is insignificant and will be even smaller when dead plus live load cases are considered. Girder G2 was found to have an increase of 0.28% in forces and dead load deflection with the new loads. This increase is insignificant and will be even less when dead plus live load cases are considered. Therefore, based on the insignificant change in force and deflections in these two girders, it is my opinion that the existing girders have sufficient capacity as is to accept the addition of the new pipe as described above.

Please call if you have any questions or we can be of further assistance.

Truly Yours,

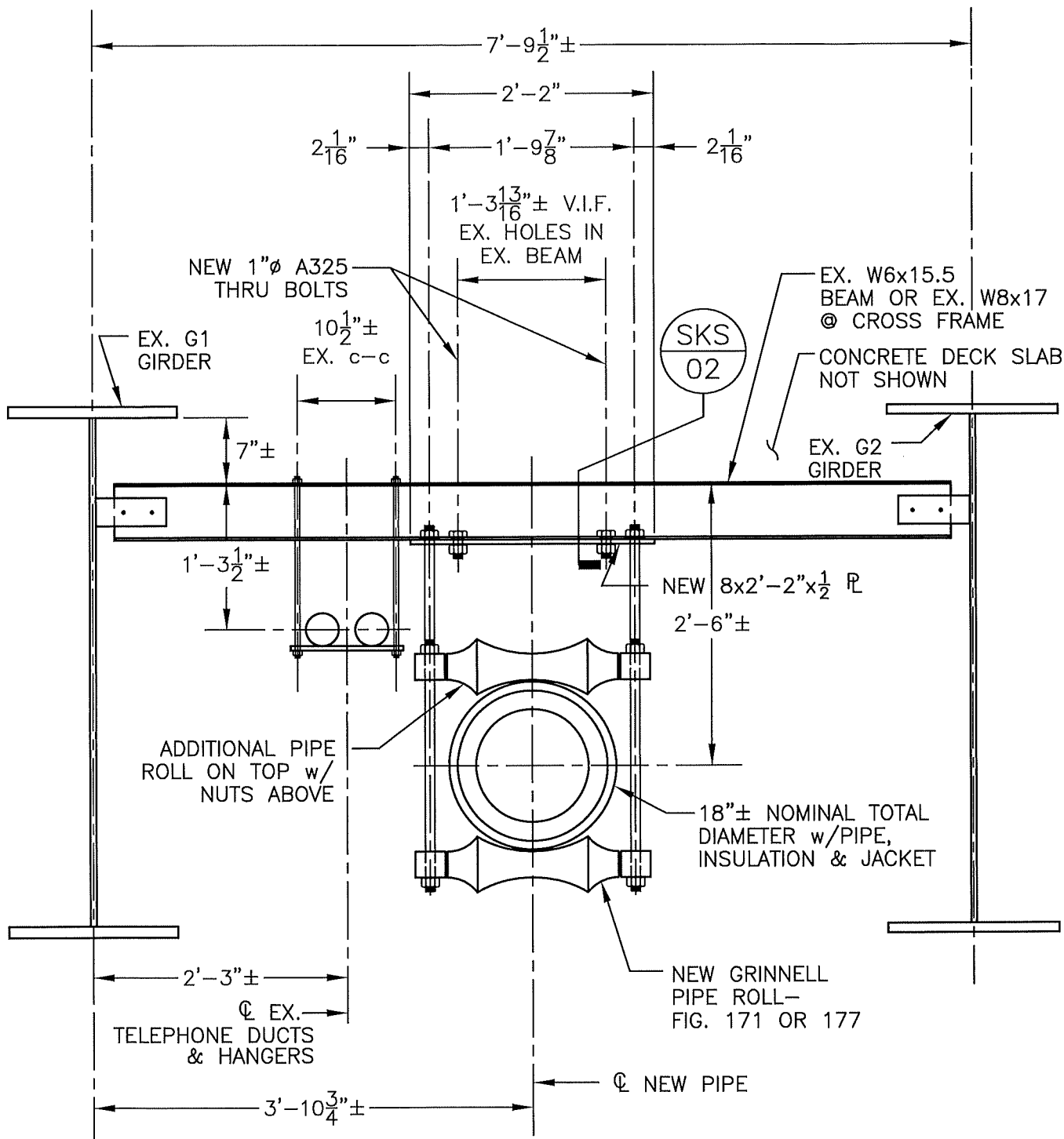


Jeffrey L. Tirey, P.E.



jlt

Enclosure



# UTILITY SUPPORT

SCALE:  $\frac{3}{4}$ " = 1'-0"

TIREY & ASSOCIATES, P.C.

CONSULTING STRUCTURAL ENGINEERS  
P.O. BOX 639, LITTLETON, NH 03561

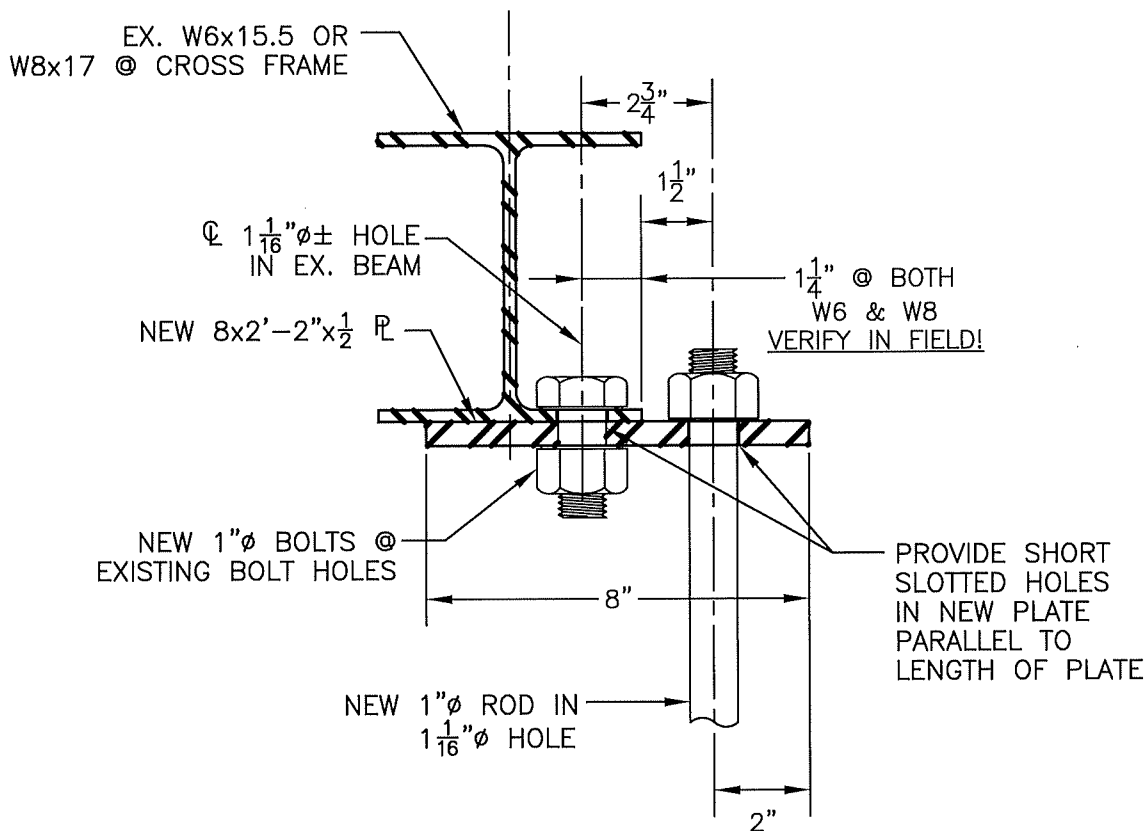
Telephone: (603) 444-6211

E-mail: tirey@tireyandassociates.com

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SKS-01

PROJECT #218.067.1  
BREAKFAST HILL ROAD BRIDGE  
GREENLAND, NEW HAMPSHIRE  
FEBRUARY 22, 2019



## SECTION

SCALE: 3"=1'-0"

- \* NEW STEEL PLATE - ASTM A36, HOT DIPPED GALVANIZED
- \* NEW BOLTS-1"  $\phi$  A325, HOT DIPPED GALVANIZED

TIREY & ASSOCIATES, P.C.

CONSULTING STRUCTURAL ENGINEERS  
P.O. BOX 639, LITTLETON, NH 03561

Telephone: (603) 444-6211

E-mail: tirey@tireyandassociates.com

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SKS-02

PROJECT #218.067.1  
BREAKFAST HILL ROAD BRIDGE  
GREENLAND, NEW HAMPSHIRE  
FEBRUARY 22, 2019

**APPENDIX D**  
**BRIDGE CROSSING DESIGN INFORMATION**



# TR Flex® Pipe & Fittings

DUCTILE IRON

**PIPE** <

FABRICATION

RESTRAINED JOINTS

**FITTINGS** <

GASKETS

COATINGS & LININGS



## ANSI/AWWA STANDARDS

**ANSI/AWWA C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast, for Water.**

Asphaltic outside coating and inside lining are in accordance with ANSI/AWWA C151/A21.51.

**ANSI/AWWA C153/A21.53 Ductile-Iron Compact Fittings For Water Service or ANSI/AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in., For Water.**

TR FLEX® Fittings conform to applicable requirements of ANSI/AWWA C153/A21.53 or ANSI/AWWA C110/A21.10.

**ANSI/AWWA C104/A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.**

Cement lining, in accordance with ANSI/AWWA C104 or special linings and/or coatings can be furnished for specific conditions.

**ASTM A746-03 Standard Specification for Ductile Iron Gravity Sewer Pipe.****ASTM A716-08 Standard Specification for Ductile Culvert Pipe.****ASTM A536 Standard Specification for Ductile Iron Castings.****ASTM C150 Standard Specification for Portland Cement**

# TR FLEX PIPE AND FITTINGS PROVIDE FLEXIBLE RESTRAINED PUSH-ON JOINTS FOR 4" THROUGH 36" DUCTILE IRON PIPE AND FITTINGS.

The TR Flex Restrained Joint has a working pressure rating equivalent to the working pressure rating of the parent pipe, with a maximum restrained joint working pressure rating of 350 psi except that 30"–36" have a 100 psi reduction in joint rating for a given parent pipe pressure class e.g. 30–36" TR Flex Restrained Joints are rated for a maximum 250 psi with Pressure Class 350 parent pipe. Conversely, a 24" PC 200 pipe will have a restrained joint rating of 200 psi.

For fire protection service, 4" through 12" pipe and fittings are listed by Underwriters Laboratories for 350 psi and are approved by Factory Mutual for 250 psi.

TR Flex Pipe and Fittings utilize the conventional Tyton Gasket for 4" through 36" sizes.

Ductile Iron locking segments, inserted through a slot (*or slots*) in the bell face, provide a positive axial lock between the bell interior surface and a retainer weldment on the spigot end of the pipe.

The standard cement-mortar lining supplied in pipe is ASTM C150 Type II. The lining may be supplied in either single or double thickness. Sulfate resistant Type V cement is available on special order.

\*For higher pressure ratings, consult your U.S. Pipe Sales Representative.

For a suggested design procedure for the restraint of thrust forces in pressurized, buried Ductile Iron piping systems, the design engineer should refer to the current DIPRA publication "Thrust Restraint Design for Ductile Iron Pipe" or the U.S. Pipe Brochure "The Use and Application of Restrained Joints for Ductile Iron Pipelines."

**NOTE:** If specifiers or users believe that corrosive soils will be encountered where our products are to be installed, please refer to ANSI/AWWA C105/A21.5 "Polyethylene Encasement for Ductile Iron Pipe Systems" for proper external protection procedures.

For certain wastewater applications a ceramic epoxy lining is available—see PROTECTO 401™ Ceramic Epoxy Lined Pipe and Fittings Brochure.

**NOTE:** Each of the following is a nationally recognized standards organization: American National Standards Institute (ANSI), American Water Works Association (AWWA), American Society for Testing and Materials (ASTM), Underwriters Laboratories (UL), National Fire Protection Association (NFPA), National Sanitation Foundation (NSF), Factory Mutual (FM)

When joint restraint for a 4" through 36" push-on joint pipe installation is required and indicated in the project plans and specifications, restrained push-on joint pipe and fittings utilizing Ductile Iron components shall be provided.

Restrained joint pipe shall be Ductile Iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51. Push-on joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11 "Rubber-Gasket Joints for Ductile-Iron Pipe and Fittings." Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50 "Thickness Design of Ductile-Iron Pressure Pipe," and shall be based on laying conditions and internal pressures as stated in the project plans and specifications.

Restrained joint fittings and the restraining components shall be Ductile Iron in accordance with applicable requirements of ANSI/AWWA C110/A21.10 and/or C153/A21.53 with the exception of the manufacturer's proprietary design dimensions. Push-on joints for such fittings shall be in accordance with ANSI/AWWA C111/A21.11.

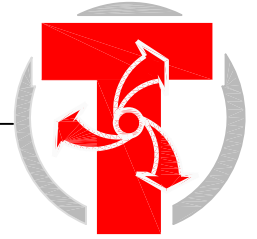
Restrained joint pipe and fittings shall be U.S. Pipe's TR Flex Pipe and Fittings or approved equal. Restraint of field cut pipe shall be provided with U.S. Pipe's TR Flex Gripper Ring, TR Flex Pipe field weldments or approved equal.

Cement mortar lining and seal coating for pipe and fittings, where applicable, shall be in accordance with ANSI/AWWA C104/A21.4. Asphaltic outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 for fittings.

Restrained push-on joints for pipe and fittings shall be designed for a water working pressure of 350 psi for sizes 4" through 24" and 250 psi for sizes 30" through 36".

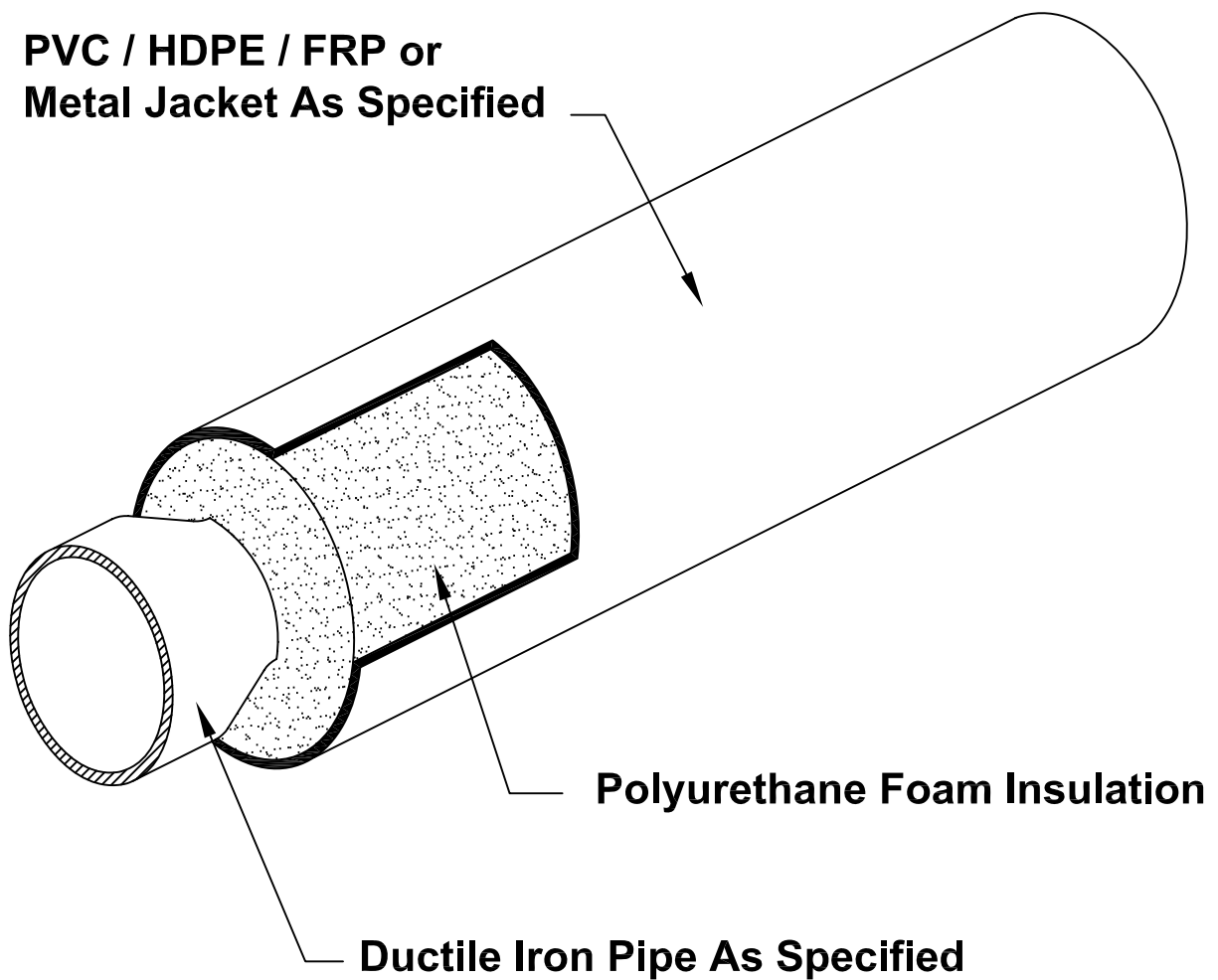


# TRICON DUCTILE IRON PIPE SYSTEM



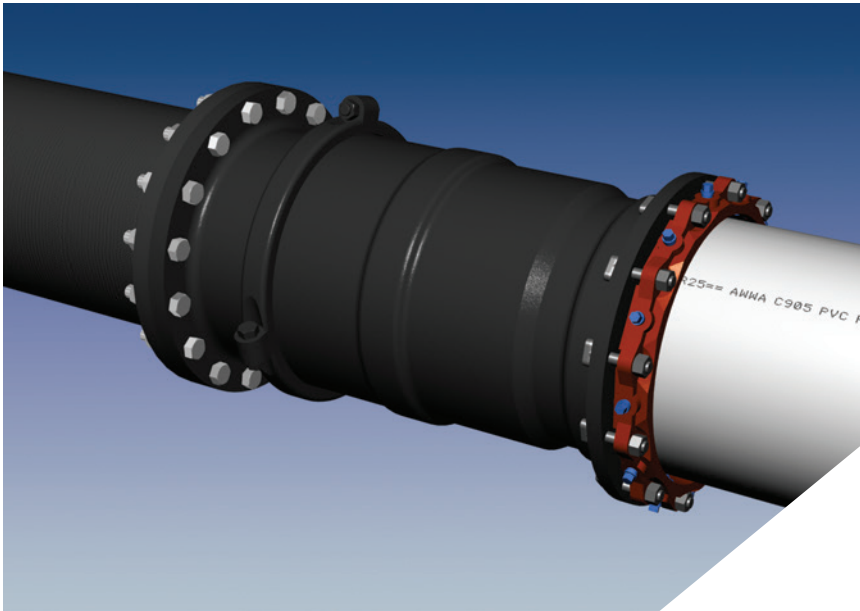
For Applications Up To 225° F Below And Above Ground

- Chilled Water
- Heating Hot Water
- Potable Water
- Waste Water



**TRICON**  
Piping Systems, Inc.®

P.O. Box 361, Canastota, New York 13032  
Tel: 315.697.8787 Fax: 315.697.8788



▲ Series 216C0 EX-TEND, 16 inch combination mechanical joint by flanged expansion joint. (DIP by PVC)  
▼ Series 216C0 EX-TEND, 16 inch combination mechanical joint by flanged expansion joint.



### Features and Applications:

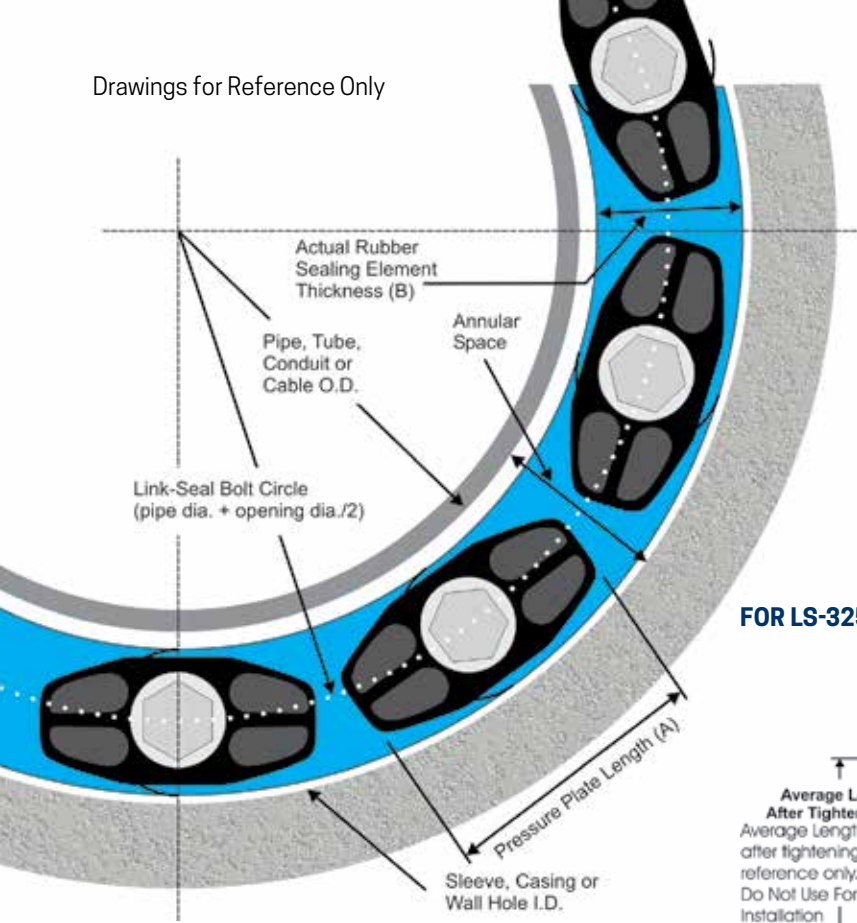
- Sizes 3 inch through 36 inch
- For Ductile Iron, Steel, PVC or HDPE pipe
- 3 inch through 20 inch rated at 350 PSI  
24 inch and greater rated at 250 PSI
- Constructed of ASTM A536 Ductile Iron
- No Periodic Maintenance is Required
- Each unit tested to rated working pressure prior to shipment
- Self restrained at full expansion without the use of external tie bars
- Due to the design of the seals, no periodic maintenance is required
- Seals conform to the applicable requirements of ANSI/AWWA C111/A21.11
- End connections:  
Flanged Joint; 3 inch through 36 inch  
Mechanical Joint; 3 inch through 24 inch  
Combination of the two Joints available
- Flange outlets conform to the dimensional requirements of ANSI/AWWA C110/A21.10 (class 150) with the addition of an O-ring gasket which is provided to ensure a watertight seal
- Mechanical Joint end connections conform to the dimensional requirements of either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53 depending on size
- All "wetted" parts are coated with a NSF61 approved fusion bonded epoxy
- Insertion of additional sleeves for increased expansion capacity can be done at the factory or in the field as the need occurs

### Sample Specification

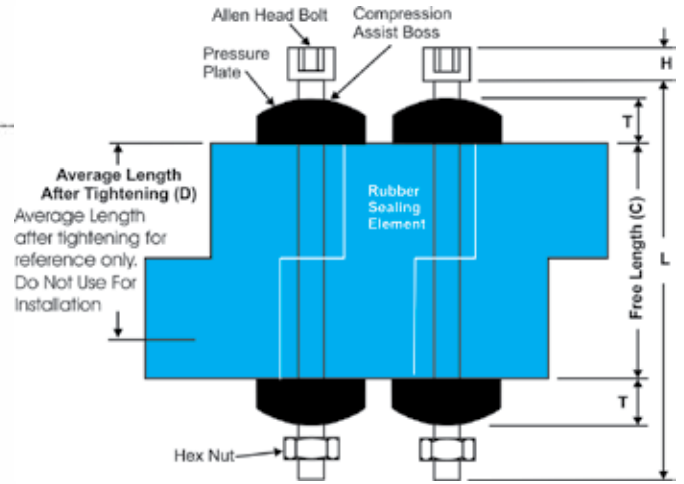
Expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material properties of ANSI/AWWA C153/A21.53. All expansion joints shall be capable of expanding or contracting to the amounts shown on the drawings, or indicated in the specifications, but in no case shall there be less than 4" total axial movement. Separation beyond the maximum extension of the expansion joint shall be prevented without the use of external tie rods. Each expansion joint shall be pressure tested against its own restraint to a minimum of 350 psi (250 psi 24 inch and greater). MEGALUG joint restraint shall be provided with each mechanical joint connection. All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Exterior surfaces shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16. Sealing gaskets shall be constructed of EPDM. The coating shall meet ANSI/NSF-61. All expansion joints shall be EX-TEND 200, as manufactured by EBAA Iron, Inc., or approved equal.

For use on water or wastewater pipelines subject to hydrostatic pressure and tested in accordance with either AWWA C600, C605, or ASTM D2774.

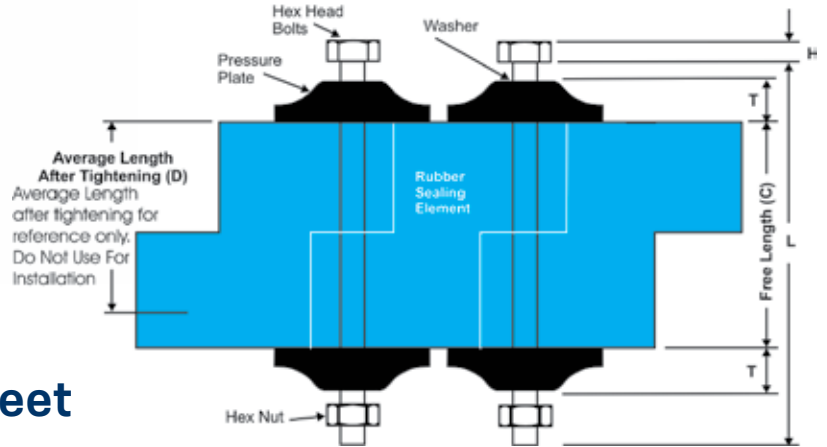
Drawings for Reference Only



**FOR LS-200 THROUGH LS-315**



**FOR LS-325 THROUGH LS-650**



# Technical Data Submittal Sheet

Supplement 11/06/2018

**\* DIMENSIONAL DATA FOR MODELS C, L, O, S-316, S61, LS-316 & OS-316**

LINK-SEAL® Model No.	Rubber Sealing Elements			Pressure Plates		Bolts				Weight for 10 Link Sections (lbs)	Min. Required Seating Width
	Actual Thickness (B)	Free Length (C)	Avg. Length After Tightening (D)	(A)	(T)	Allen Head Hex Across Flats	(H)	Thread Size	(L)		
LS-200-*	0.48"	1.75"	1.38"	1.06"	0.31"	4mm Allen (0.157")	4.95mm (0.195")	M5-0.8	65mm (2.559")	0.70	2.25"
LS-275-*	0.61"	1.75"	1.38"	0.97"	0.31"	4mm Allen (0.157")	4.95mm (0.195")	M5-0.8	65mm (2.559")	0.75	2.25"
LS-300-*	0.69"	2.37"	1.87"	1.56"	0.44"	6mm Allen (0.236")	7.87mm (0.310")	M8-1.25	90mm (3.543")	2.15	3.00"
LS-315-*	0.81"	2.37"	1.87"	1.44"	0.44"	6mm Allen (0.236")	7.87mm (0.310")	M8-1.25	90mm (3.543")	2.30	3.00"
LS-325-*	0.88"	2.63"	2.00"	3.13"	1.00"	13mm (0.511")	5.30mm (0.215")	M8-1.25	110mm (4.33")	5.50	4.00"
LS-340-*	1.00"	2.70"	2.25"	1.48"	0.66"	13mm (0.511")	5.30mm (0.215")	M8-1.25	110mm (4.33")	3.30	4.00"
LS-360-*	1.24"	2.70"	2.25"	2.05"	0.77"	13mm (0.511")	5.30mm (0.215")	M8-1.25	110mm (4.33")	5.10	4.00"
LS-400-*	1.38"	3.50"	2.75"	3.50"	1.06"	17mm (0.669")	6.40mm (0.250")	M10-1.5	130mm (5.118")	12.00	5.00"
LS-410-*	1.43"	3.37"	2.87"	2.52"	0.88"	17mm (0.669")	6.40mm (0.250")	M10-1.5	130mm (5.118")	8.20	5.00"
LS-425-*	1.06"	3.00"	2.25"	3.50"	1.19"	17mm (0.669")	6.40mm (0.250")	M10-1.5	130mm (5.118")	10.00	5.00"
LS-475-*	1.56"	3.38"	2.63"	2.63"	0.88"	17mm (0.669")	6.40mm (0.250")	M10-1.5	130mm (5.118")	10.00	5.00"
LS-500-*	2.25"	3.75"	2.75"	3.63"	1.06"	19mm (0.748")	7.50mm (0.300")	M12-1.75	140mm (5.511")	22.50	5.00"
LS-525-*	2.06"	3.75"	2.87"	3.63"	1.06"	19mm (0.748")	7.50mm (0.300")	M12-1.75	140mm (5.511")	21.00	5.00"
LS-575-*	1.81"	3.75"	3.00"	3.00"	1.00"	19mm (0.748")	7.50mm (0.300")	M12-1.75	140mm (5.511")	15.50	5.00"
LS-615-*	3.09"	4.00"	3.00"	6.00"	1.90"	24mm (0.944")	10.57mm (0.416")	5/8-11	185mm (7.280")	60.60	6.00"
LS-650-*	2.71"	3.98"	3.00"	3.96"	1.19"	19mm (0.748")	7.50mm (0.300")	M12-1.75	140mm (5.511")	26.10	6.00"

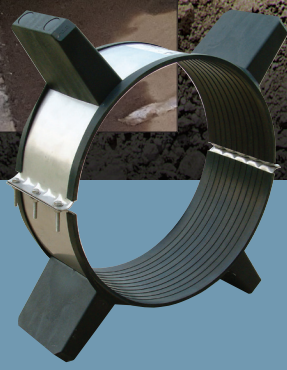
Visit [www.gptindustries.com](http://www.gptindustries.com) for literature and installation instructions





**Casing Spacers with ApogeeAero® Rollers**  
-see page 7

**Casing Spacers with field changeable risers/runners**  
-see page 5



# CASING SPACERS & INSULATORS



**ADVANCE**  
PRODUCTS & SYSTEMS, LLC

ISO 9001:2015 CERTIFIED COMPANY - FM537405





# CASING INSULATOR SPECIFICATION

CUSTOMER APPROVAL

**PART# : SSIM-1826-CR-XV**

PRINT NAME	SIGNATURE

**BAND**

8" WIDE  
 14 GA. (.074") 304 STAINLESS STEEL  
 2-B FINISH  
 RIBBED FLANGES

**LINER**

PVC LINER ( 0.096" )  
 HARDNESS - DUROMETER "A" 80 +/- 5  
 OPERATING TEMP: 140 F  
 DIELECTRIC STRENGTH - 60,000 V

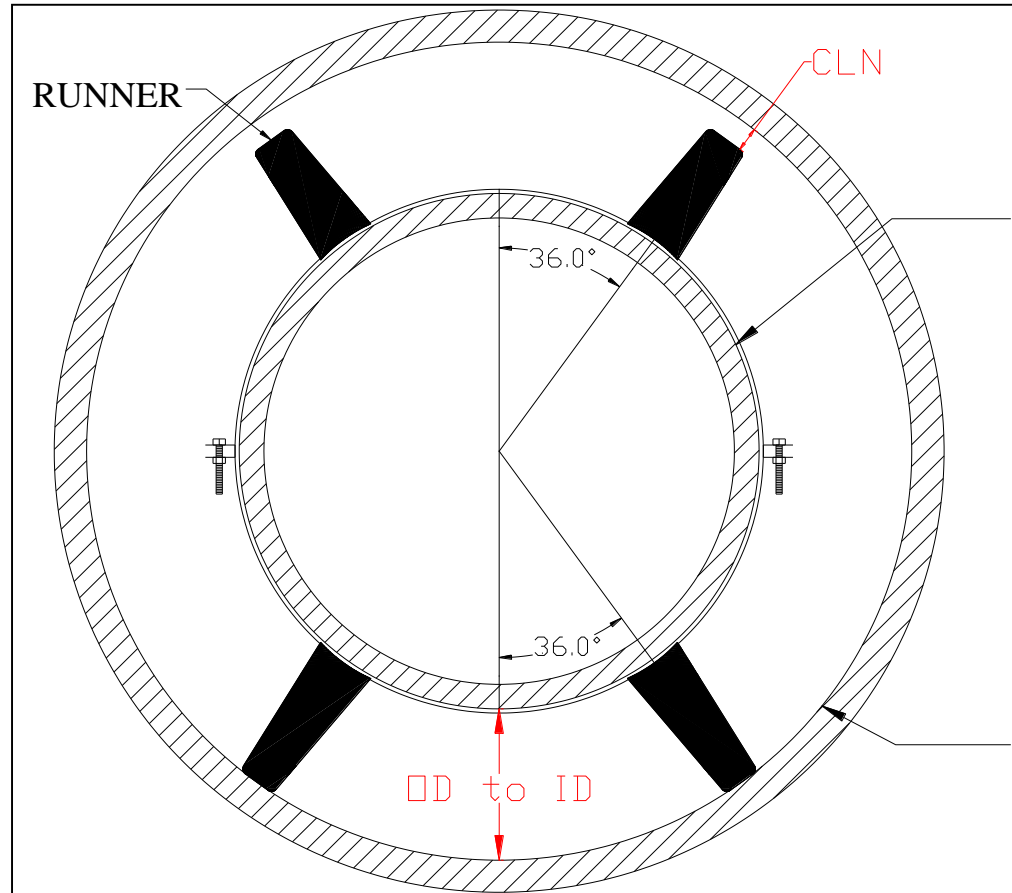
**RUNNER**

2" WIDE X 2" HIGH MOLDED POLYMER-MOD  
 2 TOP

2" WIDE X 3 1/2" HIGH MOLDED POLYMER-MOD  
 2 BOTTOM

**ASSEMBLY HARDWARE**

3 SETS PER FLANGE  
 1/4" - 20 X 2" STAINLESS STEEL BOLTS  
 1/4" STAINLESS STEEL WASHERS  
 1/4" STAINLESS STEEL NUTS



17.9200 "O.D.  
 CARRIER PIPE

24.9400 "I.D.  
 CASING PIPE

STATIC LOAD: **CLN=CLEARANCE= 1.1 ± 1 / 4"**

6,000 LBS

OD TO ID= 3.5 ± 1 / 4"

DYNAMIC LOAD:

(call for exact OD of Carrier to ID of Casing)

3,000 LBS

DRAWING IS NOT TO SCALE
COMMENTS:



PIPE TYPE: XXX		
Advance Products & Systems		
P.O. Box 60399 Lafayette, LA. 70578-0399 Ph.# (337)233-6116 Fax # (337)232-3860		
Casing Spacer	Drawn by:	SALES
	Approved by:	JEW
17.92 X 24.94	2/13/2019	

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## Fig. 171: Pipe Roll

## Single Pipe Roll

**Size Range:** 1" through 30"

**Material:** Cast iron roll and sockets, steel roll rod

**Finish:**  Plain,  Zinc Plated (Hot-Dip Galvanized optional) or  Resilient Coated

**Service:** For suspension of pipe from two rods where longitudinal expansion and contraction may occur.

**Approvals:** Complies with Federal Specification A-A-1192A (Type 41), WW-H-171-E (Type 42), ANSI/MSS SP-69 and MSS SP-58 (Type 41).

**Adjustment:** Adjustable socket permits vertical adjustment at the roll.

**Maximum Temperature:** 400° F at roller, 300° F at resilient coated roller.

**How to size:**

- If the roll is to support non-insulated pipe, select the size directly from nominal pipe size (column 1) in table below.
- If used with pipe covering protection saddle, see Figure 160 to Figure 166A for size of pipe roll.

**Features:**

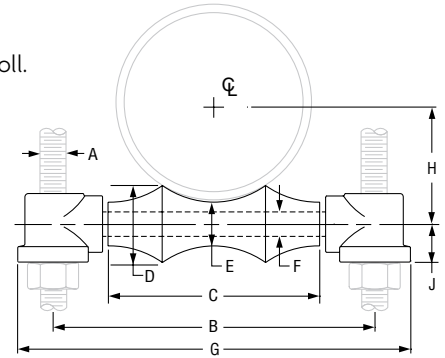
- Provides for vertical adjustment; nut at bottom of hanger rod fits into the socket preventing loosening or turning due to vibration.
- Pipe roll is designed for two point surface contact with pipe or saddle.

**Features:** Advantages of pipe rollers with a protective resilient coated covering.

- Non conductive pipe rollers - prevent the passing of current from pipeline to structure.
- Corrosion resistant - for protection against severe weather conditions, moderate corrosive conditions such as marine atmospheres and weather resistant to ultra-violet radiation.
- Low coefficient of friction between pipe and resilient coated pipe roller.

**Ordering:**

- Specify pipe roll size.
- Order should include figure number, name and finish in all cases. Hanger rods and nuts to be ordered separately.
- Be certain to order oversized rolls when insulation and protection saddles makes this necessary.



**FIG. 171: DIMENSIONS (IN) • LOADS (LBS) • WEIGHT (LBS)**

Pipe Size	Max O.D. Covering	Rod Size A	Max Load	Weight	G	B	C	D	E	F	H	J
1	2	3/8	600	0.45	4 1/8	3	1 1/2	1	3/4	3/8	1 1/16	9/16
1 1/4	2 1/2			0.48	4 1/2	3 3/8	1 7/8	1 1/16			1 1/4	
1 1/2	2 3/4			0.51	4 3/4	3 5/8	2 1/8	1 1/8			1 3/8	
2	3 1/4			0.57	5 1/4	4 1/8	2 5/8	1 3/16			1 5/8	
2 1/2	3 3/4	1/2	660	1.00	6 1/4	4 7/8	3 1/8	1 3/8	7/8	1/2	1 15/16	1 1/16
3	4 1/2		700	1.10	6 7/8	5 1/2	3 3/4	1 7/16			2 1/4	
3 1/2	5		1.40	7 1/2	6 1/8	4 1/4	1 5/8	2 9/16				
4	5 1/2	5/8	750	1.70	8 1/4	6 3/8	4 3/4	1 3/4	1	5/8	2 13/16	3/4
5	7			2.60	9 1/16	8 7/16	5 13/16	2			1 1/8	
6	8 1/4	3/4	1,070	4.50	11 7/16	9 9/16	6 7/8	2 5/16	1 1/4	3/4	4	1
8	10 1/2		1,350	7.20	14 1/16	11 15/16	8 7/8	2 13/16	1 1/2	7/8	5 1/8	
10	12 3/4	7/8	1,730	9.50	16 3/16	14 1/16	11	3 3/8	1 3/4	7/8	6 3/8	1 1/8
12	14 3/4		2,400	15.90	17 15/16	15 13/16	12 1/2	3 7/8	2	1	7 7/16	
14	16 1/4	1	3,130	24.30	20 1/8	17 3/4	14 1/4	4 5/8	2 1/2	1 1/8	8 3/8	1 3/8
16	18		3,970	31.90	22 1/8	19 3/4	16 1/4	5	2 5/8	1 1/4	9 1/16	
18	20 1/4		4,200	35.50	24 1/2	21 7/8	18 1/4	5 7/16	2 3/4	1 1/4	10 1/2	
20	22 1/2	1 1/4	4,550	47.00	27 1/4	24 1/4	20 1/4	6	3	1 1/4	11 5/8	1 5/8
24	26 1/2	1 1/2	6,160	76.30	32 1/8	28 7/8	24 1/4	7 3/16	3 5/8	1 1/2	14	1 3/4
30	32 1/2		7,290	129.90	39	35 1/2	30 1/4	8 15/16	4 1/2	1 3/4	17 7/16	2 7/16

DI/CI ROLL SIZING	
DI/CI Pipe Size	Fig. 171 Roller Size
3	4
4	5
6	6
8	8
10	10
12	14
14	16
16	18
18	20
20	24
24	30
30	No Recom.

PROJECT INFORMATION		APPROVAL STAMP	
Project:		<input type="checkbox"/> Approved	
Address:		<input type="checkbox"/> Approved as noted	
Contractor:		<input type="checkbox"/> Not approved	
Engineer:		Remarks:	
Submittal Date:			
Notes 1:			
Notes 2:			

## Fig. 177

## Adjustable Pipe Roll Support

**Size Range:** 1" through 30"

**Material:** Cast iron roll and sockets; steel roll rod, continuous thread rods and hex nuts

**Finish:**  Plain,  Zinc Plated (Hot-Dip Galvanized optional) or  Resilient Coated

**Service:** For support of pipe where longitudinal movement due to expansion and contraction will occur and where vertical adjustment up to 6" may be necessary.

**Maximum Temperature:** 400° F at roller, 300° F at Resilient coated roller.

**Approvals:** Complies with Federal Specification A-A-1192A (Type 41), WW-H-171-E (Type 42), ANSI/MSS SP-69 and MSS SP-58 (Type 41).

**Installation:** Normally used directly above steel beams, brackets angles, etc.

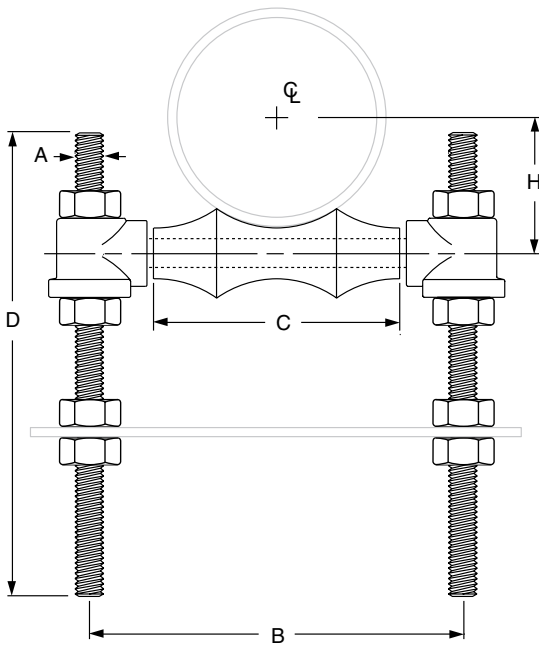
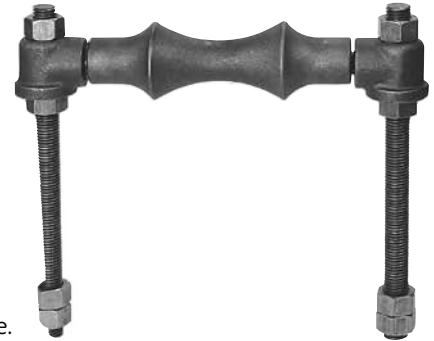
**Features:** Advantages of pipe rollers with a protective resilient coated covering.

- Non conductive pipe rollers - prevent the passing of current from pipeline to structure.
- Corrosion resistant - for protection against severe weather conditions, moderate corrosive conditions such as marine atmospheres and weather resistant to ultra-violet radiation.
- Low coefficient of friction between pipe and resilient coated pipe roller.

**How to size:**

- (1) If roll is to support bare pipe, select the size directly from nominal pipe size (see below).
- (2) If used with pipe covering protection saddle, see Figure 160 to Figure 166A for size of pipe roll.
- (3) If roll is to support covered pipe, the O.D. of the covering should not be greater than the O.D. of the pipe for which the roll was designed.

**Ordering:** Specify size of roll, figure number and name. Be certain to order oversized rolls when insulation and protection saddles makes this necessary.



**FIG. 177: DIMENSIONS (IN) • WEIGHT (LBS)**

Pipe Size	Weight	A	B	C	D	H
1	1.1	3/8	3	1 1/2	12	1 1/16
1 1/4	1.2		3 3/8	1 7/8		1 1/4
1 1/2	1.2		3 5/8	2 1/8		1 3/8
2	1.3	1/2	4 1/8	2 5/8	18	1 5/8
2 1/2	2.3		4 7/8	3 1/8		1 15/16
3	2.4		5 1/2	3 3/4		2 1/4
3 1/2	2.7	5/8	6 1/8	4 1/4	24	2 9/16
4	3.8		6 7/8	4 3/4		2 13/16
5	4.7		8 1/16	5 13/16		3 1/16
6	7.6	3/4	9 9/16	6 7/8	18	4
8	11.0		11 15/16	8 7/8		5 5/8
10	13.7		14 1/16	11		6 3/8
12	19.4	7/8	15 13/16	12 1/2	24	7 7/16
14	31.2		17 3/4	14 1/4		8 3/8
16	42.5		19 3/4	16 1/4		9 7/16
18	46.6	1	21 7/8	18 1/4	18	10 1/2
20	66.2		24 1/4	20 1/4		11 5/8
24	102.5		28 7/8	24 1/4		14
30	186.8	1 1/2	35 1/2	30 1/4	24	17 7/16

DI/CI ROLL SIZING	
DI/CI Pipe Size	Fig. 177 Roller Size
3	4
4	5
6	6
8	8
10	10
12	14
14	16
16	18
18	20
20	24
24	30
30	No Recom.

PROJECT INFORMATION		APPROVAL STAMP	
Project:		<input type="checkbox"/> Approved	
Address:		<input type="checkbox"/> Approved as noted	
Contractor:		<input type="checkbox"/> Not approved	
Engineer:		Remarks:	
Submittal Date:			
Notes 1:			
Notes 2:			

**APPENDIX E**

**GREENLAND WELL PUMP REPLACEMENT INFORMATION**

## Existing Pump Information

<b>Shop Drawing Transmittal</b>				<b>Weston &amp; Sampson</b> <sup>SM</sup>					
<b>Instruction for Preparing Transmittal</b> No action will be taken on any item unless accompanied by this form. TRANSMITTAL NOS. to be consecutive (1, 2, 3, etc.). Each resubmittal of same item shall use same number with suffix letter (A, B, etc.). SPEC. SECT. NO: Only one spec. section no. to each transmittal. DESCRIPTION: Complete identification of document or group of documents. SOURCE: Originator of document(s) being submitted.				DRAWING NO: Identification of document(s). CONTRACT DRAWING REFERENCE: Contract drawing number(s) showing details of document(s). SPECIAL INSTRUCTIONS: Special cases and emergencies, changes in distribution and special handling requests, etc. should be entered here. SIGNATURE OF CONTRACTOR: Signature of individual who reviews and approves material prior to submittal to engineer.					
<b>THIS SECTION TO BE COMPLETED BY CONTRACTOR</b>									
TRANSM. NO.		SPEC. SECT. NO.		DATE		CONTRACTORS JOB NO.	W&S JOB NO.		
30		11210		6/27/2017		T-1638			
PROJECT NAME & CONTRACT NO.				LOCATION					
Greenland Well Replacement				Portsmouth, NH					
Attention: CSD ( <a href="mailto:Davida@wseinc.com">Davida@wseinc.com</a> ) Weston & Sampson Engineers, Inc. 5 Centennial Drive Peabody, MA 01960				F R O M T. Buck Construction, Inc. 302B Auburn Road Turner, ME 04282					
						<b>BY W&amp;S</b>			
ITEM NO.	DESCRIPTION			SOURCE	DRAWING NO. CATALOG NO. BROCHURE, ETC	NO. OF COPIES	CONTRACT DRAWING REF.	ACTION CODE	REVIEWED BY
1	Vertical Turbine Pump Test			Maher		1			
2									
3									
4									
THIS CERTIFIES THAT ALL ITEMS SUBMITTED HEREWITH HAVE BEEN CHECKED BY THE CONTRACTOR, ARE IN CONFORMANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS, EXCEPT AS NOTED, AND ARE APPROVED BY THE CONTRACTOR FOR THIS PROJECT.						SIGNATURE & TITLE			
<b>THIS SECTION TO BE COMPLETED BY W&amp;S</b>									
ACTION CODE: 1. NO EXCEPTIONS TAKEN 2. MAKE CORRECTIONS NOTED 3. AMEND AND RESUBMIT 4. REJECTED- SEE REMARKS 5. ACKNOWLEDGEMENT 6. SUBMITTAL NOT REQUIRED, RETURNED WITHOUT REVIEW						a. INSTALLATION SHALL PROCEED ONLY WHEN ACTION CODE IS 1 OR 2 b. ACTION CODED 3 SHALL BE RESUBMITTED WITHIN TIME LIMIT SET IN CONTRACT c. REVIEW DOES NOT RELIEVE CONTRACTOR FROM RESPONSIBILITY OF COMPLIANCE WITH ALL REQUIREMENTS OF THE CONTRACT DOCUMENTS		<b>Weston &amp; Sampson</b>	

# Submittal Certification

## T. Buck Construction

302B Auburn Road  
Turner, ME 04282  
Phone: 207-783-6223  
Fax: 207-783-3970

Project:	<b>Greenland Well PS Replacement</b>	Project No:	
Date:	<b>27-Jun-17</b>	Engineer:	<b>David A.</b>
Transmittal #:	<b>30</b>	Submittal #:	<b>1B</b>
Spec. Section No:	<b>11210</b>	Titled:	<b>Vertical Turbine Pum</b>
Sub-contractor/Supplier	<b>Maher Services</b>		<b>Pump Test</b>
Manufacturer:			

The above referenced submittal has been reviewed by the undersigned and I/we certify that the material and/or equipment meets or exceeds the project specification requirements with

- No Deviations
- A complete list of deviations as follows

**General Contractor's Certification**

I hereby certify that I have examined the enclosed submittal(s) and have determined and verified all field measurements, construction criteria, materials, catalog numbers and similar data, coordinated the submittal(s) with other submissions and the work of other trades and contractors and that to the best of my knowledge and belief, the enclosed submittal(s) is/are in full compliance with the Contract requirement, except as follows:

T. Buck Construction, Inc.  
Travis Saucier  
  
Signature

**Comments**



71 Concord Street  
North Reading, MA 01864  
Tel: 978-664-WELL (9355) Fax: 978-664-9356  
www.maherserv.com

6/23/2017

Mark McPheters  
T. Buck Construction  
302B Auburn Road  
Turner, Maine 04282  
Phone 207-783-6223 ext 203  
Fax 207-783-3970  
Cell 207-754-8999  
Email: [mark@tbuckcon.net](mailto:mark@tbuckcon.net)

**Proposal No.: MS-2911**

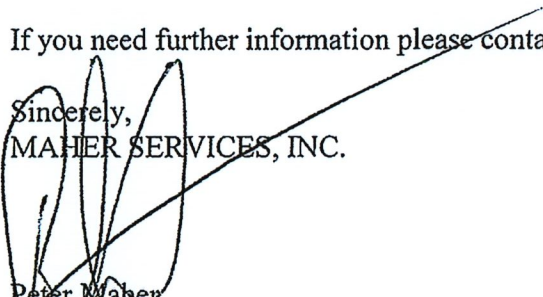
**RE: Greenland Well Pump Station Replacement  
Portsmouth, NH**

Dear Mark,

Attached are the results of the factory pump test. The pump will not ship until the curve is approved.

If you need further information please contact us.

Sincerely,  
MAHER SERVICES, INC.

  
Peter Maher  
[pmaher@maherserv.com](mailto:pmaher@maherserv.com)





# TESTING SERVICES

CO#: 4423323

CUSTOMER: MAHER SERVICES

PUMP TYPE: DWT-DT

BOWL MODEL: 9RCLC

PREPARED BY: Casey Kinman

DATE: 6/22/2017

Customer: MAHER SERVICES  
PO #: 11653

Acceptance Standard: ANSI/HI 14.6-2B  
Project: 0

CO #: 4423323  
Test Date: 6/22/2017

**Bowl Performance Test Conditions**

Pump #:	1	Specific Gravity:	1.00	Required Speed (rpm):	1770
Pump Type:	DWT-DT	Kinematic Viscosity (cST):	1.0	Required Capacity (gpm):	450
Bowl Model:	9RCLC	Water Temp. (°F):	70	Required Bowl TDH (ft):	195.0
Stages:	5	Test Driver:	4-pole 200hp	Required Efficiency (%):	84%
Impeller Material:	1203	Driver S/N:	J01BF82AM	Pressure Trans.:	300psig (Q4021)
Bowl Material:	6911	NOL Power (hp):	30.0	Torque Meter:	10K in-lb (Q4010)
1st Imp. Dia. (in):	6.88	1st Imp. Qty.:	5	Flow Meter:	8in (Q3012)
2nd Imp. Dia. (in):		2nd Imp. Qty.:		Tested By:	Adrian Mindieta

**Readings During Test**

POINTS	1	2	3	4	5	6	7
Discharge Head (ft)	285.4	262.3	247.5	222.6	198.4	188.6	140.7
Gauge Elevation (ft)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Velocity Head (ft)	0.00	0.01	0.04	0.09	0.13	0.15	0.23
Friction Head (ft)	0.00	0.00	0.01	0.02	0.02	0.03	0.04
Expansion Head (ft)	0.02	2.48	4.91	7.65	9.16	9.69	12.01
Miscellaneous Head (ft)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Input Voltage (V)*	0	0	0	0	0	0	0
Input Current (amp)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Input Elec. Power (kW)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0

\* electrical power readings are for reference only.

**Data Recorded at Running Speed**

Speed (rpm)	1798	1798	1798	1797	1797	1797	1797
Capacity (gpm)	1	120	237	369	442	468	580
Bowl TDH (ft)	290.4	269.8	257.5	235.4	212.8	203.4	158.0
Bowl Shaft Power (hp)	15.9	16.8	20.0	25.0	26.4	26.7	27.1
Bowl Efficiency (%)	0.5%	48.6%	76.8%	87.8%	89.9%	90.0%	85.2%

**Data Converted to Customer's Speed**

Speed (rpm)	1770	1770	1770	1770	1770	1770	1770
Capacity (gpm)	1	118	233	363	435	460	571
Bowl TDH (ft)	281.4	261.5	249.5	228.3	206.4	197.4	153.3
Bowl Power (hp)	15.1	16.0	19.1	23.9	25.2	25.5	25.9
Bowl Efficiency (%)	0.5%	48.6%	76.8%	87.8%	89.9%	90.0%	85.2%

**Certified Test Results**  
By: \_\_\_\_\_  
Title: **ENGINEER**  
Date: **June 22, 2017**

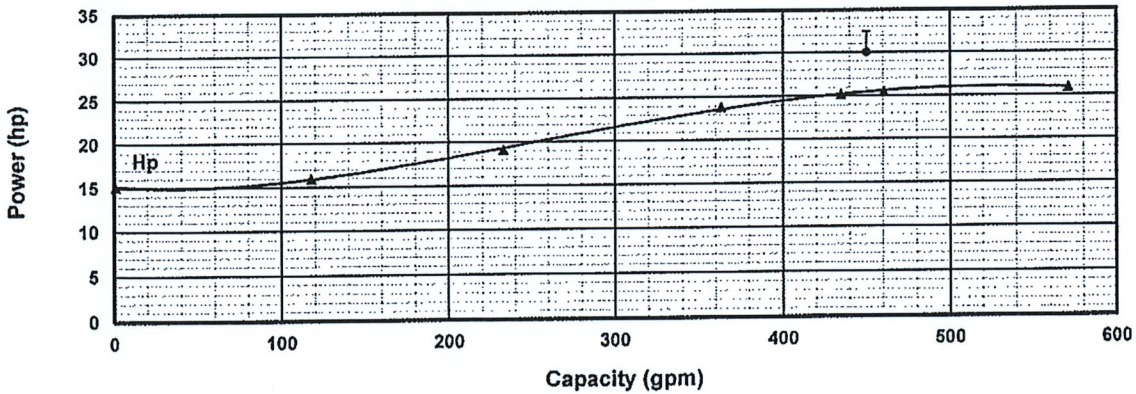
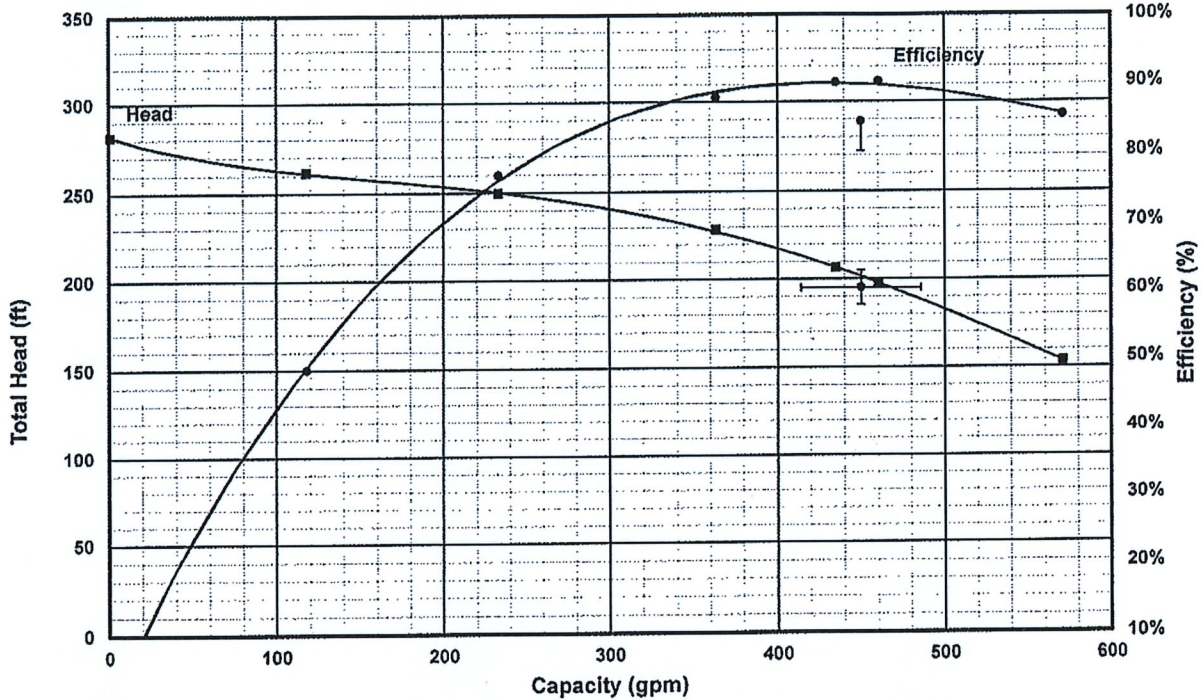
**Witness**  
By: \_\_\_\_\_  
Date: \_\_\_\_\_



Customer: MAHER SERVICES  
PO #: 11653

Acceptance Standard: ANSI/HI 14.6-2B  
Project: 0

CO #: 4423323  
Test Date: 6/22/2017



Pump #: 1  
Bowl Model: 9RCLC  
Stages: 5  
1st Imp. Dia.: 6.88  
2nd Imp. Dia.:

Required Flow (gpm): 450  
Design Head (ft): 201  
Design Efficiency (%): 90

Required Speed (rpm): 1770  
Required Capacity (gpm): 450  
Required Bowl TDH (ft): 195  
Required Efficiency (%): 84%

Certified Test Results

By: [Signature]  
Title: ENGINEER  
Date: 6/22/2017

Witness

By: \_\_\_\_\_  
Date: \_\_\_\_\_



Customer: MAHER SERVICES  
PO: 11653

Acceptance Standard: ANSI/HI 14.6  
Project: 0

CO: 4423323  
Date: 6/22/2017

**CONDITIONS**

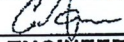
Pump #:	1	Specific Gravity:	1.00	Required Speed (rpm):	1770
Pump Type:	DWT-DT	Shut-Off TDH (ft):	268	Required Capacity (gpm):	450
Bowl Model:	9RCLC	Pressure Gauge:	2000psig (T18008)	Required Bowl TDH (ft):	195
Stages:	5			Tested By:	Adrian Mindieta

Goulds Water Technology Texas Turbine Operations a division of Xylem Inc certifies that the parts or assemblies listed below have been hydrostatically tested to the pressures and length of time indicated.

**TEST READINGS**

Description	Part Number	Material	Quantity	Pressure	Time
Top Bowl	C03254B01	6911	1	158.0 psi	10.0 Minutes
Int Bowl:	A03902B01	0	4	158.0 psi	10.0 Minutes

**Certified Test Results**

By:   
Title: ENGINEER  
Date: June 22, 2017

**Witness**

By: \_\_\_\_\_  
Date: \_\_\_\_\_

## Scope of Supply

Customer	Premier Pump & Supply, Inc.	Sulzer Reference ID	USA.9934-XND.18.0051-P0
Project Name	UE - Greenland, NH	Inquiry Date	11/30/2018
Inquiry Number/ID		Bid Submitted Date	
Item number	Replacement Pump	Date last saved	11/30/2018 2:07 PM
Application	MUW Water Supply & Distribution - 4606	Type / Size / Stages	JTS-9LC / 7
Pump speed	1780 rpm		

## Pump Total

Qty	Description
1	<p><i>JTS-9LC 7 stage(s)</i>  <i>Well pump</i>  <i>Head measured at CL discharge</i>  <i>Product Lube</i>  <i>TPL: 49.99 ft</i></p> <p><b>Bowl Assembly</b>  <b>BOWL ASSEMBLY</b>            BOWL ASSEMBLY MODEL: JTS-9LC            Material: Cast Iron [A48 CL. 30] w/ Coating            Impeller Material: 410 Stainless Steel [A743-CA6NM]            Impeller Wear Ring: Alum Bronze [B148 Alloy C95400]            Stationary Wear Ring: Ni. Al. Bronze [B148 Alloy C95500]            Pump Shaft Material: 12% Chrome [A582 Type 416 Cond. A]            Bowl Bolting: [316SS A276-TP-316] Bolts            Bowl Bearing: Bronze [B584 Alloy C87300]            Suction Bell: Trimmed Bell Cast Iron [A48 CL. 30]            Suction Strainer: None            Bowl Coating: Catalyst Cured Epoxy:Carboline 891</p> <p><b>Column Assembly</b>  <b>COLUMN ASSEMBLY</b>            COLUMN ASSEMBLY: Length 44.3 ft.            Column Selection              Column Selection: Column Selected 60 In. (Qty 2 per pump)              Column Selection: Column Selected 120 In. (Qty 4 per pump)            Max Bearing Spacing: 120 in.            Column Diameter: 6 in.            Column Pipe Material: Carbon Steel [A36 and A53 Gr. B]            Column Connection Type: Threaded            Lineshaft Lubrication: Product Lube            Lineshaft Diameter: 1.25 in.            Lineshaft Bearing Material: Rubber            Lineshaft Material: 12% Chrome [A582 Type 416 Cond. A]            Column Coating: Catalyst Cured Epoxy:Carboline 891</p> <p><b>Discharge Head Assembly</b>  <b>DISCHARGE ASSEMBLY</b>            DISCHARGE HEAD ASSEMBLY: Fab-150# Carbon Steel [A36 and A53 Gr. B]            Discharge Nozzle Diameter: 6 in.            Base Type: Round Base            Base Diameter: 16.5 in.            Separate Motor Stand: None            Discharge Head Bolting: [316SS A276-TP-316] Bolts            Head Shaft Couplings: Threaded Coupling            Seal Selection: John Crane Type 5610 Silicon Carb. Vs Silicon Carb.            Seal Plans: None            Discharge Head Coating: Catalyst Cured Epoxy:Carboline 891-Inside &amp; Outside Diameter            Sole Plate Type: Carbon Steel [A36 and A53 Gr. B]            Soleplate: Soleplate 20"x20" Carbon Steel [A36 and A53 Gr. B]</p>



## Pump Total

Qty	Description
	<p>Sole Plate Coatings: Catalyst Cured Epoxy:Carboline 891</p> <p><b>Buyout Components</b></p> <p><b>Driver Selection</b></p> <p>Motor Frame: Motor Frame: L324TP16</p> <p>Driver Base Diameter: 16.5 in. Base Diameter</p> <p><b>Testing, Quality Inspections, Engineering Analysis</b></p> <p><b>Product Testing</b></p> <p>Non Witnessed Tests (Performance, Pump and Hydro)</p> <p>Non Witnessed Tests (Performance, Pump and Hydro): Pump Performance Test</p> <p><b>Transport and Packing</b></p> <p>Transportation: Not included</p> <p>Packaging: Domestic Packaging</p>

## Driver

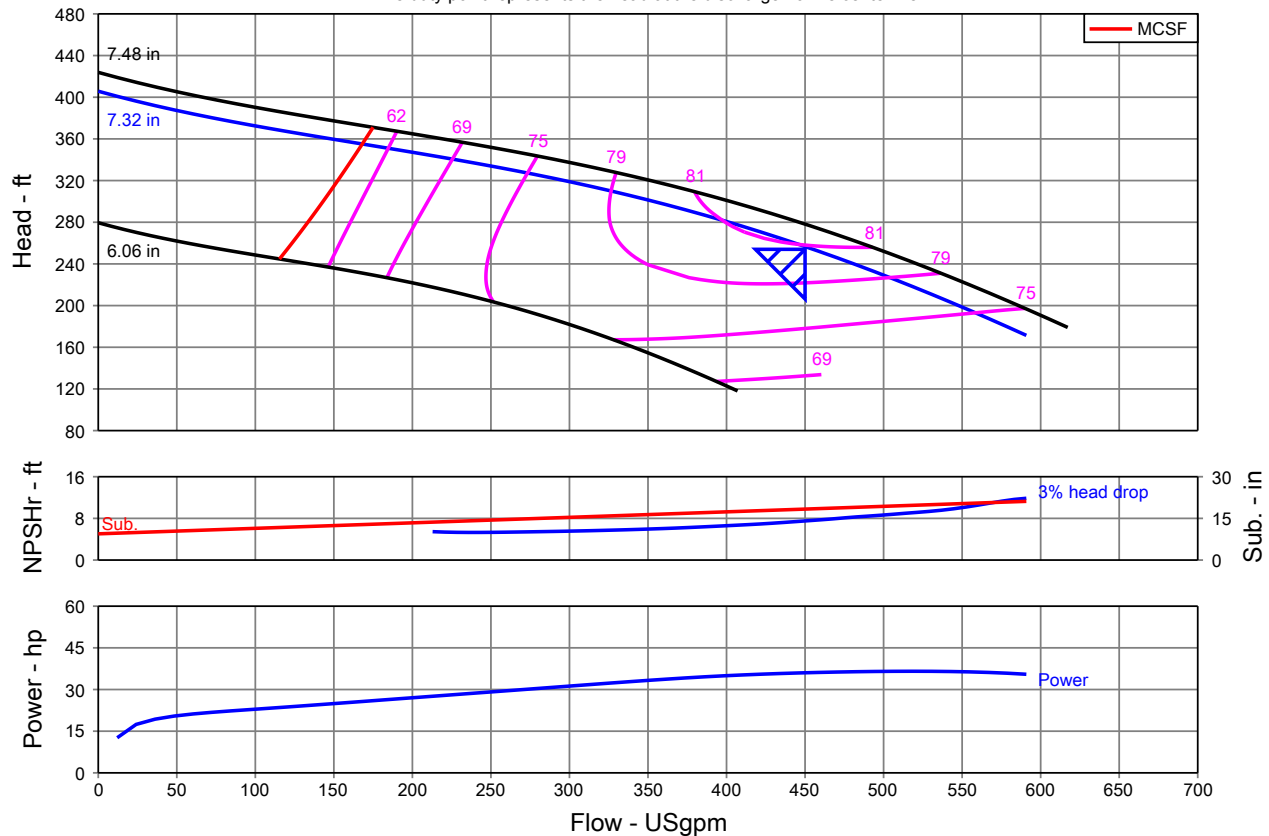
Qty	Description
1	<p><b>Buyout Components</b></p> <p><b>Driver Selection</b></p> <p>Motor manufacturer: VHS NEMA Motor - User Defined</p> <p>Selected Motor And Price: User Defined Motor</p> <p>Driver Manufacturer: [Error: No Description]: GE Motors</p> <p>Driver Efficiency: [Error: No Description]: Premium</p> <p>Driver Shaft Type: Hollow shaft</p> <p>Driver Power: 40 HP</p> <p>Driver Speed : : 1780 rpm</p> <p>Driver Voltage : : 460 V</p> <p>Driver Weight : : 690.0 lb</p> <p>Driver Height : : 32.58 in</p> <p>Additional Driver Data: [Error: No Description]: AEGIS Shaft Grounding Ring, Non-Reverse Ratchet &amp; Steady Bushing</p>

## Pump Performance Datasheet

Customer	: Premier Pump & Supply, Inc.	Sulzer Reference ID	: USA.9934-XND.18.0051-P0
Inquiry Number/ID	:	Type / Size	: JTS-9LC
Item number	: Replacement Pump	Stages	: 7
Service	:	Based on curve number	: JTS-845-000-61-11-10 Rev JTS-9LC
Quantity	: 1	Date of Last Update	: 11/30/2018 2:07 PM

Operating Conditions		Liquid	
Flow, rated	: 450.0 USgpm	Liquid type	: Water
Differential head / pressure, rated (requested)	: 254.0 ft	Additional liquid description	:
Suction pressure, rated / max	: 0.00 / 0.00 psi.g	Solids diameter, max	: 0.00 in
NPSH available, rated	: Ample	Solids concentration, by volume	: 0.00 %
Frequency	: 60 Hz	Temperature, rated / max	: 68.00 / 68.00 deg F
Performance		Fluid density, rated / max	: 1.000 / 1.000 SG
Speed, rated	: 1780 rpm	Viscosity, rated	: 1.00 cP
Impeller diameter, rated	: 7.32 in	Vapor pressure, rated	: 0.34 psi.a
Impeller diameter, maximum	: 7.48 in	Material	
Impeller diameter, minimum	: 6.06 in	Material selected	: I-1 CI Bowl/SS Impeller
Efficiency (bowl / pump)	: 80.94 / 78.91 %	Pressure Data	
NPSH (3% head drop) / margin required	: 7.51 / 3.00 ft	Maximum casing/bowl working pressure	: See the Additional Data page
Submergence, minimum required	: 18.34 in	Maximum allowable working pressure	: See the Additional Data page
nq (imp. eye flow) / S (imp. eye flow)	: 45 / 163 Metric units	Maximum allowable suction pressure	: N/A
MCSF	: 168.1 USgpm	Hydrostatic test pressure	: See the Additional Data page
Head, maximum, rated diameter	: 405.8 ft	Driver & Power Data (@Max density)	
Head rise to shutoff (bowl / pump)	: 58.08 / 59.55 %	Driver sizing specification	: Maximum power
Flow, best eff. point (bowl / pump)	: 421.4 / 415.5 USgpm	Margin over specification	: 0.00 %
Flow ratio, rated / BEP (bowl / pump)	: 106.78 / 108.30 %	Service factor	: 1.15
Diameter ratio (rated / max)	: 97.89 %	Power, hydraulic	: 29.16 hp
Head ratio (rated dia / max dia)	: 92.26 %	Power (bowl / pump)	: 36.02 / 36.61 hp
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00	Power, maximum, rated diameter	: 37.16 hp
Selection status	: Acceptable	Minimum recommended motor rating	: 40.00 hp / 29.83 kW

Bowl performance. Adjusted for construction and viscosity.  
The duty point represents the head at the discharge nozzle centerline.



## Pump Performance - Additional Data

Customer : Premier Pump & Supply, Inc.	Sulzer Reference ID : USA.9934-XND.18.0051-P0
Inquiry Number/ID :	Type / Size : JTS-9LC
Item number : Replacement Pump	Stages : 7
Service :	Speed, rated : 1780 rpm
Quantity : 1	Intellicode :
	Date of Last Update : 11/30/2018 2:07 PM

Performance Data	Stage, Speed and Solids Limits
Head, maximum diameter, rated flow : 278.2 ft	Stages, maximum : 25
Head, minimum diameter, rated flow : 87.64 ft	Stages, minimum : 1
Head, maximum, rated diameter : 405.8 ft	Pump speed limit, maximum : 3600 rpm
Efficiency adjustment factor, total : 0.97	Pump speed limit, minimum : 900 rpm
Power adjustment, total : 0.99 hp	Curve speed limit, maximum : 3600 rpm
Head adjustment factor, total : 1.00	Curve speed limit, minimum : 200 rpm
Flow adjustment factor, total : 1.00	Variable speed limit, minimum : -
Flow adjustment factor, efficiency only (shift BEP) : 1.00	Solids diameter limit : 0.50 in
Typical Driver Data	
Flow adjustment factor, end-of-curve only, total : 1.00	Driver speed, full load : 1780 rpm
MCSF adjustment factor : 1.00	Driver speed, rated load : 1782 rpm
Flow max adjustment factor : 1.00	Driver efficiency, 100% load : N/A
NPSHR adjustment factor, total : 1.00	Driver efficiency, 75% load : N/A
NPSHR slope correction factor : 1.00	Driver efficiency, 50% load : N/A
User applied performance adjustment comments :	
NPSH margin dictated by pump supplier : 3.00 ft	
NPSH margin dictated by user : 0.00 ft	
NPSH margin used (added to 'required' values) : 3.00 ft	

Mechanical Limits
Torque, rated power, rated speed : 2.06 hp/100 rpm
Torque, maximum power, rated speed : 2.09 hp/100 rpm
Torque, driver power, full load speed : 2.25 hp/100 rpm
Torque, driver power, rated speed : 2.25 hp/100 rpm
Torque, pump shaft limit : 11.80 hp/100 rpm
Radial load, worst case : -
Radial load limit : -
Impeller peripheral speed, rated : -
Impeller peripheral speed limit : -

Various Performance Data	Flow (USgpm)	Head (ft)	Efficiency (%)	NPSHr (ft)	Power (hp)
Shutoff, rated diameter	0.00	405.8	-	-	-
Shutoff, maximum diameter	0.00	423.8	-	-	490
MCSF	168.1	355.1	58.66	7.26	25.69
Rated flow, minimum diameter	450.0	87.64	63.63	-	15.65
Rated flow, maximum diameter	450.0	278.2	81.72	-	38.67
BEP flow, rated diameter	421.4	270.8	81.16	6.93	35.50
120% rated flow, rated diameter	540.0	204.9	76.55	9.67	36.50
End of curve, rated diameter	590.9	171.4	72.05	11.86	35.48
End of curve, minimum diameter	407.0	118.1	67.40	8.81	18.00
End of curve, maximum diameter	617.2	179.0	72.67	12.58	38.39
Maximum value, rated diameter	-	405.8	81.16	-	37.16
Maximum value, maximum diameter	-	-	81.74	-	352

System differential pressure	@ Density, rated	@ Density, max
Differential pressure, rated flow, rated diameter (psi)	111.1	111.1
Differential pressure, shutoff, rated diameter (psi)	175.6	175.6
Differential pressure, shutoff, maximum diameter (psi)	183.4	183.4

Discharge pressure	@ Suction pressure, rated	@ Suction pressure, max	@ Suction pressure, rated	@ Suction pressure, max
Discharge pressure, rated flow, rated diameter (psi.g)	111.1	111.1	111.1	111.1
Discharge pressure, shutoff, rated diameter (psi.g)	175.6	175.6	175.6	175.6
Discharge pressure, shutoff, maximum diameter (psi.g)	183.4	183.4	183.4	183.4

Ratios	
Maximum flow / rated flow, rated diameter : 131.31 %	Head rated diameter / head minimum diameter, rated flow : 292.89 %

## Pump Performance - Additional Data

Head and Power Losses				Dimensions	
Friction loss rate, column	: 1.73 %			Minimum clearance below suction bell lip/case	: 4.75 in
Friction loss, column	: 0.77 ft			Minimum well diameter	: 10.00 in
Friction loss, discharge head	: 0.53 ft			Suction nozzle centerline height	: -
Friction loss, can/barrel	: -			Suction to first stage impeller centerline	: 3.94 in
Friction loss, suction bell and strainer	: 0.00 ft			Bowl assembly length, first stage	: 13.94 in
Friction loss, bowl/column adaptor	: 1.06 ft			Bowl assembly length, upper stage	: 8.50 in
Friction loss, total	: 2.36 ft			Bowl assembly length, total	: 64.94 in
Power loss, lineshaft bearings	: 0.37 hp			Suction bearing hub length	: 3.38 in
Power loss, thrust bearing	: 0.22 hp			Strainer length	: 0.00 in
Power loss, total	: 0.59 hp			Bowl to column adaptor length	: 0.00 in
Bowl vs. Pump Performance				Discharge head stick-down	: 0.00 in
Head (bowl / pump)	: 256.7 ft / 254.3 ft			Submersible motor adaptor length	: -
Efficiency (bowl / pump)	: 80.94 % / 78.91 %			Submersible motor length	: -
Power (bowl / pump)	: 36.02 hp / 36.61 hp			Column length	: 44.30 ft
NPSH required at first stage impeller eye	: 7.51 ft			Total pump length	: 49.99 ft
NPSH				Can / barrel length	: -
NPSH at bowl (available / required)	: Ample / 7.51 ft			Stuffing box sleeve diameter	: 1.69 in
NPSH at low liquid level (available / required)	: Ample / -			Suction bell diameter	: 9.44 in
NPSH at suction flange (available / required)	: - / -			Minimum submergence to prevent vortexing	: 18.34 in
Liquid Velocities				Actual submergence (based on LLL)	: 597 in
Column liquid velocity	: 5.22 ft/s			Discharge head height	: 27.00 in
Can liquid velocity	: -			Discharge nozzle centerline height	: 8.50 in
Suction nozzle liquid velocity	: -			Min distance discharge nozzle centerline to suction bell	: 0.00
Pressure Data	Maximum casing/ bowl working pressure ( psi.g )	Maximum allowable working pressure ( psi.g )	Hydrostatic test pressure ( psi.g )	Lineshaft length	: 46.55 ft
Bowl	175.6	455.0	263.0	Bowl shaft diameter	: 1.50 in
Column	175.6	450.0	-	Bowl diameter, outside	: 9.44 in
Discharge head	175.6	275.0	-	Bowl diameter, exit	: 4.04 in
Can/Barrel	-	-	-	Column diameter, inside	: 6.07 in
				Column internal obstruction diameter	: 1.25 in
				Can/barrel diameter, inside	: -
				Can/barrel obstruction diameter	: -
Torque Limits					
Torque, lineshaft limit	: 7.50 hp/100 rpm				
Weights and Down Thrust					
Weight, lineshaft	: 202.5 lb				
Weight, bowl assembly rotating element	: 84.00 lb				
Thrust factor	: 5.60 lb/ft				
Thrust, hydraulic, rated (@ Density, rated / @ Density, max)	: 1,434.8 / 1,434.8 lbf				
Thrust, hydraulic, shutoff (@ Density, rated / @ Density, max)	: 2,268.1 / 2,268.1 lbf				
Thrust, hydraulic, end of curve (@ Density, rated / @ Density, max)	: 958.1 / 958.1 lbf				
Thrust, hydraulic, MCSF (@ Density, rated / @ Density, max)	: 1,985.0 / 1,985.0 lbf				
Thrust, bowl shaft end (@ Suction pressure, rated / @ Suction pressure, max)	: 0.00 / 0.00 lbf				
Thrust, shaft step (@ Suction pressure, rated / @ Suction pressure, max)	: 49.63 / 49.63 lbf				
Thrust, stuffing box sleeve, rated (@ Suction pressure, rated / @ Suction pressure, max)	: -111.50 / -111.50 lbf				
Thrust, stuffing box sleeve, shutoff (@ Suction pressure, rated / @ Suction pressure, max)	: -178.09 / -178.09 lbf				
Thrust, stuffing box sleeve, end of curve (@ Suction pressure, rated / @ Suction pressure, max)	: -73.26 / -73.26 lbf				
Thrust, stuffing box sleeve, MCSF (@ Suction pressure, rated / @ Suction pressure, max)	: -155.67 / -155.67 lbf				
Thrust, total, rated (@ Suction pressure, rated / @ Suction pressure, max)	: 1,659.4 / 1,659.4 lbf				
Thrust, total, shutoff (@ Suction pressure, rated / @ Suction pressure, max)	: 2,426.2 / 2,426.2 lbf				
Thrust, total, end of curve (@ Suction pressure, rated / @ Suction pressure, max)	: 1,221.0 / 1,221.0 lbf				
Thrust, total, MCSF (@ Suction pressure, rated / @ Suction pressure, max)	: 2,165.5 / 2,165.5 lbf				
Momentary upthrust (@ Suction pressure, rated / @ Suction pressure, max)	: 497.8 / 497.8 lbf				
Thrust bearing capacity	: -				

\* Negative values indicate upthrust

## Pump Performance - Additional Data

Conditions			
Pump Type	: Well	Low Liquid Level	: 0.00 ft
Head Measured at	: Discharge Nozzle Centerline	Column Liquid Velocity Limit	: 15.00 ft/s
Pressure Strategy	: Maximum Pressure, Rated Diameter (shut off)	Well Diameter	: 0.00 in
NPSHA Measured at	: Base of Discharge Head	Suction Elevation	: 0.00 in
Length Strategy	: Pump Length	Discharge Location	: Above Ground
Length	: 50.00 ft	Hydrotest Pressure Strategy	: 1.5 x Bowl Working Pressure
Construction			
Pump Construction Standards	: US Standards	Pumpshaft Material	: PSM-416A
Discharge Head Design	: JTLF 150#	Pumpshaft Diameter	: 1.50 in / 38.1 mm
Discharge Nozzle Size	: 6 inch	Shaft Seal Type	: Mechanical Seal
Column Diameter	: 6 inch	Bell Design	: Trimmed Bell
Column Construction	: Threaded	Thrust Bearing	: No Thrust Bearing
Suction Strainer	: None	Seal Size	: Single seal, 1.5 inch
Lineshaft Lubrication	: Open Lineshaft	Seal Chamber Pressure Estimate	: 100 to 150 psi
Lineshaft Material	: LSM-416A	Liquid Viscosity	: Water (any viscosity)
Lineshaft Diameter	: 1.25 inch		



## Centrifugal Pump Data Sheet

Customer:	Premier Pump & Supply, Inc.	Sulzer Reference ID:	USA.9934-XND.18.0051-P0
Project name:	UE - Greenland, NH	Inquiry Date:	11/30/2018
Inquiry Number/ID:		Bid Submitted Date:	
Item number:	Replacement Pump	Date of Last Update:	11/30/2018 2:01 PM
Service:		Quantity:	1

Operating Conditions		Pump Design Data																			
Liquid type:	Water	Pump Type:	Well pump																		
Temperature, Rated / Max:	68.00 deg F / 68.00 deg F	Product Line:	JTS																		
Fluid density, rated / max:	1.000 SG / 1.000 SG	Pump Size / No. of Stages:	JTS-9LC / 7																		
Vapor pressure, rated:	0.34 psi.a	Rotation (viewed from drive end):	Counter-clockwise																		
Viscosity, rated:	1.00 cP	Impeller type:	Single																		
Consistency:	N/A	Casing mounting:	N/A																		
Air Content:	N/A	Casing split:	N/A																		
Discharge Flow, Rated:	450.0 USgpm	Casing Type:	N/A																		
Differential Head, Rated / Actual:	254.0 ft / 257.4 ft	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Nozzle</th> <th style="width: 15%;">Size</th> <th style="width: 15%;">Rating</th> <th style="width: 15%;">Face</th> <th style="width: 15%;">Position</th> </tr> </thead> <tbody> <tr> <td>Suction</td> <td style="text-align: center;">-</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">N/A</td> </tr> <tr> <td>Discharge</td> <td style="text-align: center;">6.00 in</td> <td style="text-align: center;">150#</td> <td style="text-align: center;">RF</td> <td style="text-align: center;">Above</td> </tr> </tbody> </table>					Nozzle	Size	Rating	Face	Position	Suction	-	N/A	N/A	N/A	Discharge	6.00 in	150#	RF	Above
Nozzle	Size	Rating	Face	Position																	
Suction	-	N/A	N/A	N/A																	
Discharge	6.00 in	150#	RF	Above																	
Suction pressure, rated / max:	0.00 psi.g / 0.00 psi.g																				
NPSH Available:	Ample																				

Performance			
Performance Curve No.(s):	-	Lineshaft Diameter:	1.25 in
Pump speed:	1780 rpm	Bearing Type, Radial:	N/A
Frequency:	60 Hz	Lineshaft Bearing / Bowl Bearing (Vert. pumps only):	Bronze [B584 Alloy C87300]
Fixed / Variable Speed:	Constant Speed	Bearing Type, Thrust:	None
Impeller diameter, rated:	7.32 in	Bearing lubrication:	Product lubricated
Impeller diameter, maximum:	7.48 in	Baseplate type:	N/A
Impeller diameter, minimum:	6.06 in	<b>Materials</b>	
Efficiency:	80.94% / 78.91%	API Material Class:	Cast Iron [A48 CL. 30] w/ Coating
NPSH (3% head drop):	7.51 ft / 0.00 ft	Barrel / Can:	N/A
Ns / Nss:	45 Metric: nq (imp. eye flow) / 163 Metric: nq (imp. eye flow)	Case / Bowls:	Cast Iron [A48 CL. 30] w/ Coating
Head, maximum, rated diameter:	405.8 ft	Column:	Carbon Steel [A36 and A53 Gr. B]
Head rise to shutoff:	0.00 ft	Discharge Head:	Fab-150# Carbon Steel [A36 and A53 Gr. B]
Flow, best eff. point:	421.4 USgpm	Impeller:	410 Stainless Steel [A743-CA6NM]
Diameter ratio (rated / max):	97.89 %	Case / Impeller Wear Rings:	Ni. Al. Bronze [B148 Alloy C95500]
Head ratio (rated dia / max dia):	92.26 %	Shaft:	12% Chrome [A582 Type 416 Cond. A]
Viscous Coefficients (CQ / CH / CE):	1 / 1 / 1	Diffusers:	N/A

Pressure Data		Shaft Sealing, Flush & Cooling Piping Plans	
Maximum Working Pressure:	175.6 psi.g	Seal Size / Type:	1.25 in. / Cartridge
Working Pressure Limit:	455.0 psi.g	Seal Code:	5610
Suction Pressure Limit:	0.00 psi.g	Seal Manufacturer:	John Crane
Hydrostatic Test Pressure (Suction/Discharge):	263.0 psi.g	Seal Flush Piping, Primary:	N/A
Suction pressure, rated / max:	0.00 psi.g / 0.00 psi.g	Seal Flush Piping, Secondary:	-
Discharge pressure, rated:	109.9 psi.g	Cooling Water Piping:	-
Differential Pressure, Rated:	111.1 psi	<b>Driver &amp; Power Data</b>	

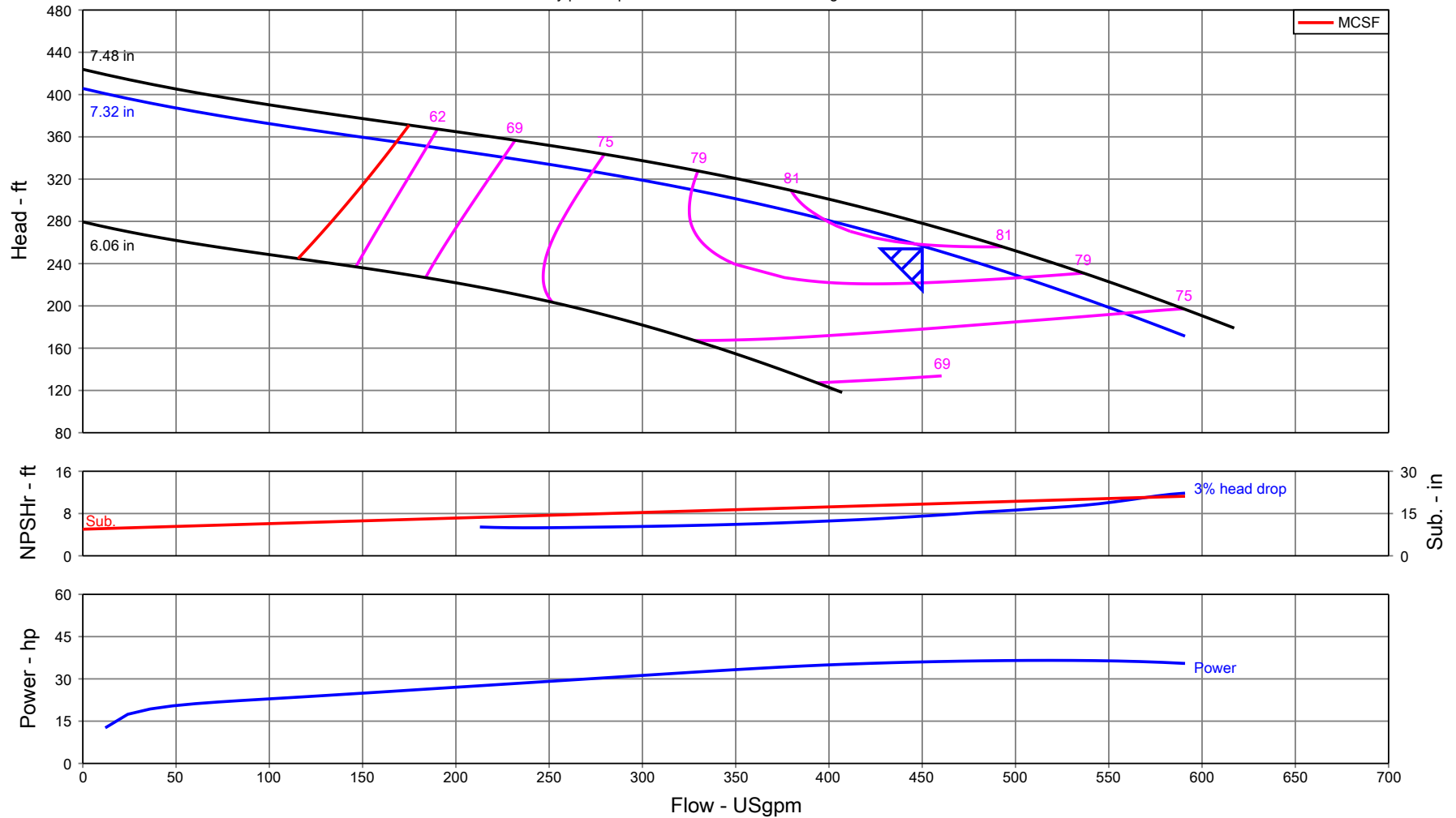
Equipment Weights (Approximate)			
Pump:	1,889.2 lb	Driver Size:	40 HP / 1780 RPM
Driver:	690.0 lb	Volts/ Phase / Hz:	460 V / 3 / 60 Hz
Baseplate:	N/A	Service factor:	1.15
Total Package	2,579.2 lb	Power, rated:	27.302362
		Power, maximum, rated diameter:	27.709307
		Enclosure:	-

Accessories	
Driver:	- 40 HP / 1780 RPM,
Coupling:	Threaded Coupling

Comments	
-	

### Pump Performance Curve

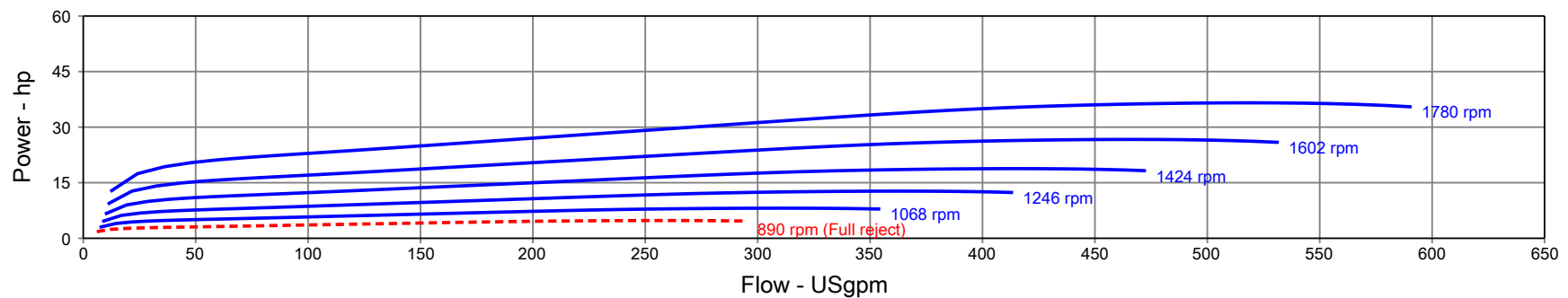
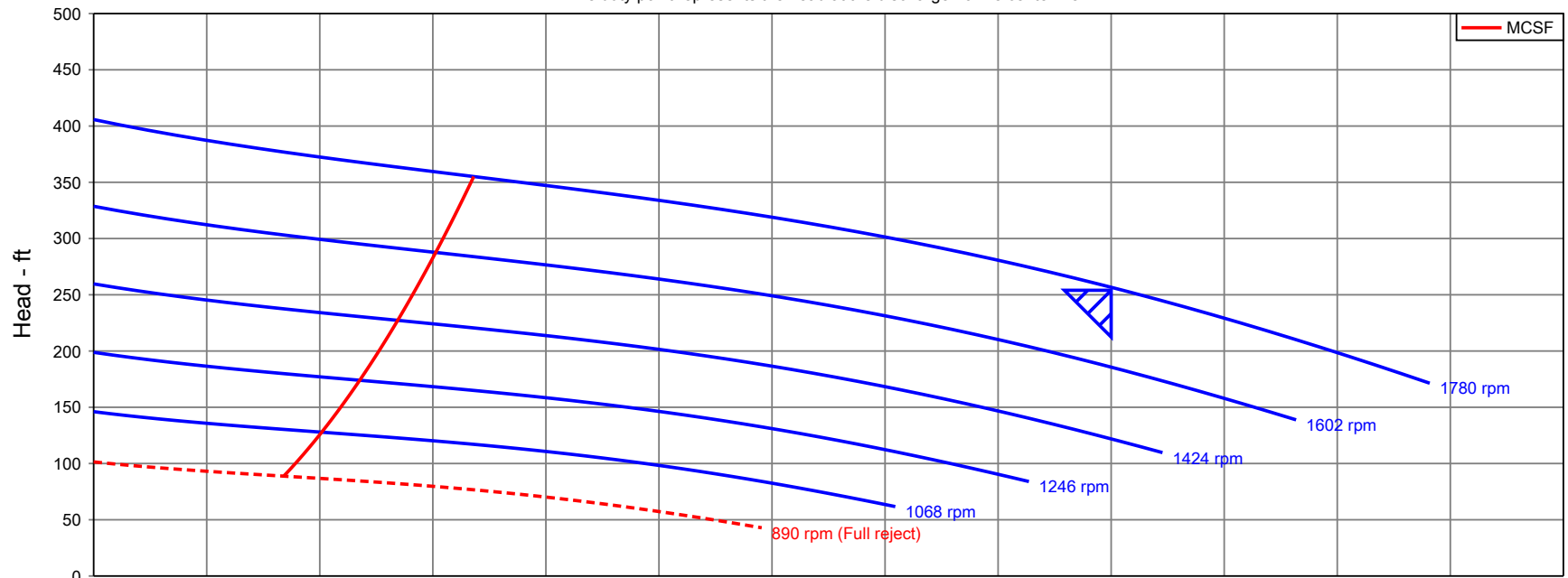
Bowl performance. Adjusted for construction and viscosity.  
The duty point represents the head at the discharge nozzle centerline.



Customer	: Premier Pump & Supply, Inc.	Type / Size	: JTS-9LC	Flow, rated	: 450.0 USgpm
Inquiry Number/ID	:	Stages	: 7	Differential head / pressure, rated	: 254.0 ft
Item number	: Replacement Pump	Speed, rated	: 1780 rpm	Liquid type	: Water
Service	:	Based on curve number	: JTS-845-000-61-11-10 Rev	Additional liquid description	:
Quantity	: 1		JTS-9LC	Temperature, rated / max	: 68.00 / 68.00 deg F
Sulzer Reference ID	: USA.9934-XND.18.0051-P0	Efficiency (bowl / pump)	: 80.94 / 78.91 %	Fluid density, rated / max	: 1.000 / 1.000 SG
Date of Last Update	: 11/30/2018 2:07 PM	Power (bowl / pump)	: 36.02 / 36.61 hp	Viscosity, rated	: 1.00 cP
		NPSH (3% head drop)	: 7.51 ft	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00

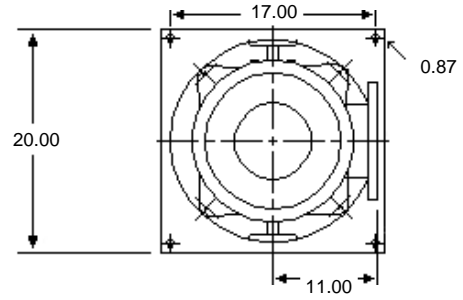
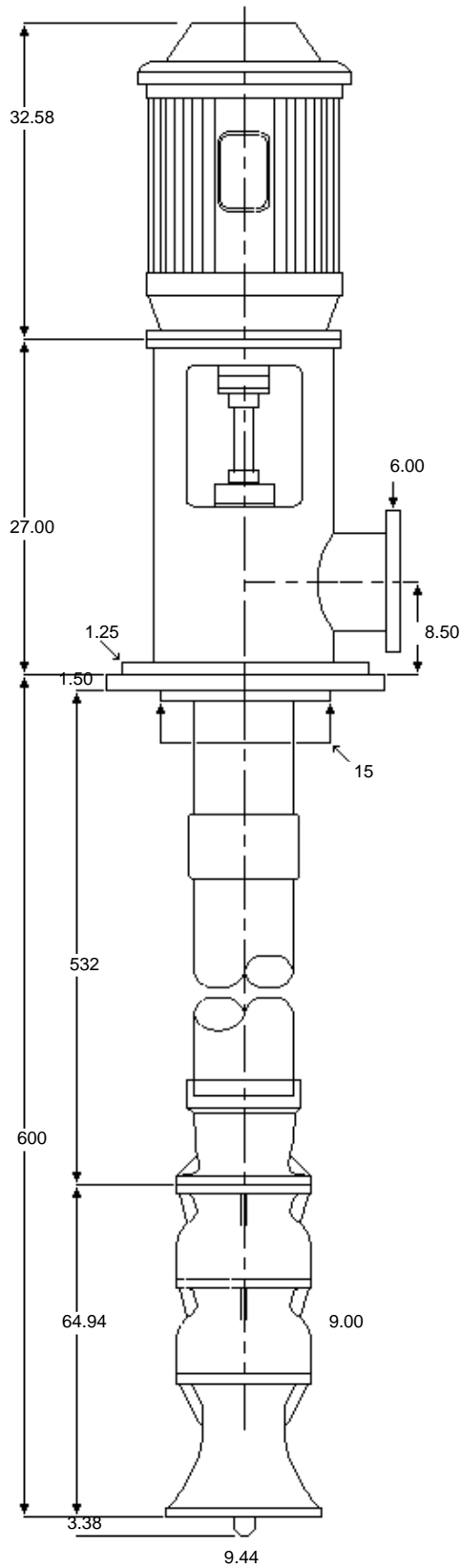
### Multi-Speed Performance Curve

Bowl performance. Adjusted for construction and viscosity.  
The duty point represents the head at the discharge nozzle centerline.



Customer	: Premier Pump & Supply, Inc.	Type / Size	: JTS-9LC	Flow, rated	: 450.0 USgpm
Inquiry Number/ID	:	Stages	: 7	Differential head / pressure, rated	: 254.0 ft
Item number	: Replacement Pump	Based on curve number	: JTS-845-000-61-11-10 Rev	Speed, rated	: 1780 rpm
Service	:		JTS-9LC	Impeller diameter, rated	: 7.32 in
Quantity	: 1	Efficiency (bowl / pump)	: 80.94 / 78.91 %	Fluid density, rated / max	: 1.000 / 1.000 SG
Sulzer Reference ID	: USA.9934-XND.18.0051-P0	Power (bowl / pump)	: 36.02 / 36.61 hp	Viscosity, rated	: 1.00 cP
Date of Last Update	: 11/30/2018 2:07 PM	NPSH (3% head drop)	: 7.51 ft	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
		Frequency	: 60 Hz		
		Nominal speed	: 1780 rpm		

**GENERAL ARRANGEMENT DRAWING**



**PUMP INFORMATION**

Pump Size / stages	: JTS-9LC / 7
Discharge Head	: JTAJ Fabricated Discharge Head
Discharge Nozzle	: 6 in. / 150 # RF
Suction Nozzle	: N/A
Column	: 6 in. / Threaded Connection
Lineshaft	: 1.25 in. / Product Lube
Shaft Turndown	: N/A
Can Assembly	: N/A
Strainer	: None
Min Submergence	: 18.3434911973137 in.
Coupling	: Threaded Coupling
Seal Manufacturer	: John Crane

**Motor Information**

Manufacturer	: -
Enclosure	: -
Type	: Vertical hollow shaft
Speed	: 1780 RPM
Power / S.F.	: 40.00 hp / 1.15
Volts/Phase/Freq	: 460 V / 3 / 60 Hz
Motor BD	: 16.5 in. Base Diameter

**Equipment Weights (Approximate)**

Motor	: 690.0 lb
Discharge Head	: 350.0 lb
Column	: 1,085.2 lb
Bowl Assembly	: 564.0 lb
Total	: 2,579.2 lb

**Project Information**

Customer	: Premier Pump & Supply, Inc.
End user	: Premier Pump & Supply, Inc.
Project Name	: UE - Greenland, NH
Country of Install	: United States
Tender	: USA.9934-XND.18.0051-P0
Curve Number	: -
Inquiry number	: -
Item number	: Replacement Pump
Date last saved	: 11/30/2018

**Certification**

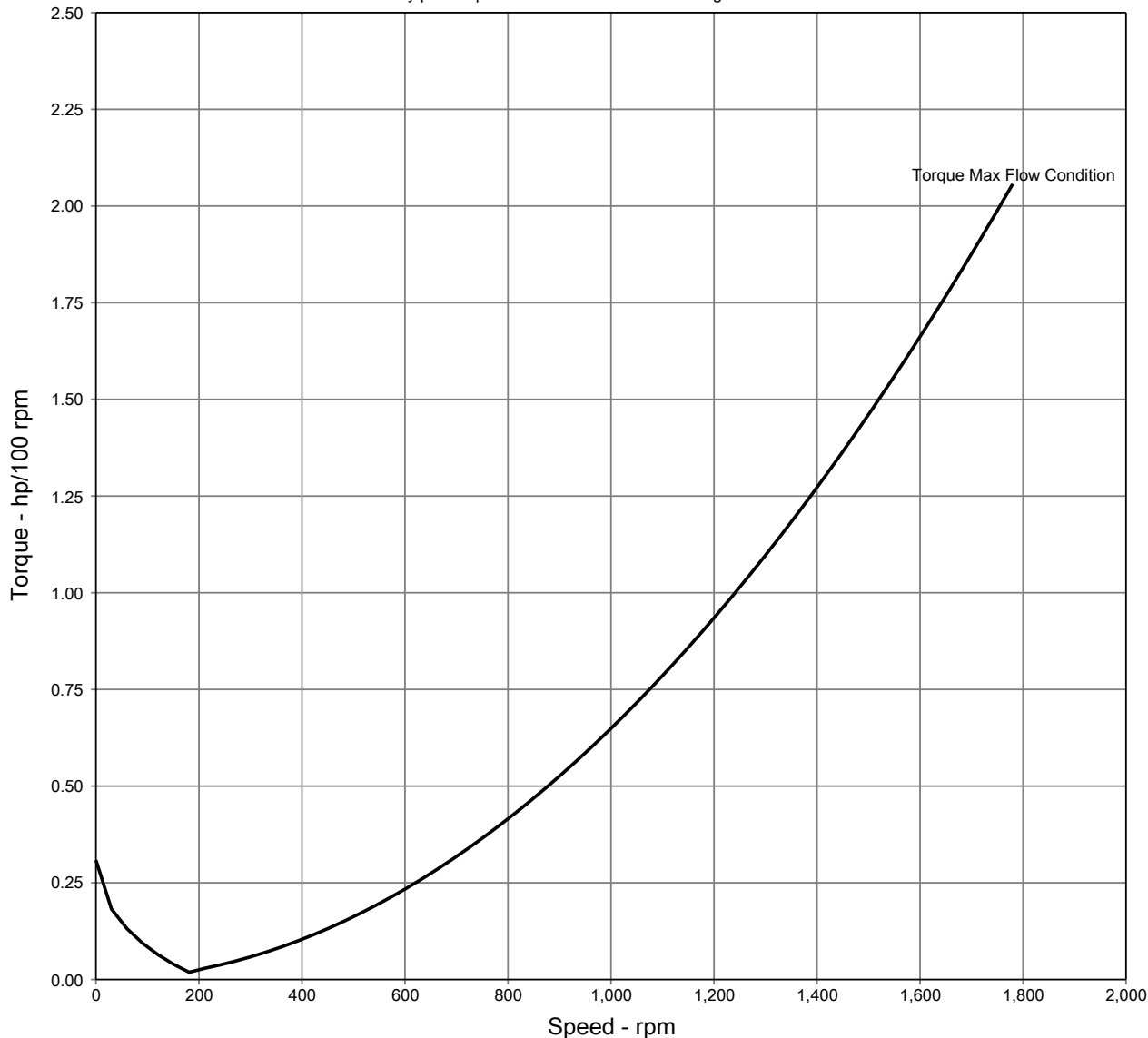
Dimensions in inches, unless otherwise specified.

**NOTE : Image is not drawn to scale**  
**NOTE : DO NOT USE FOR CONSTRUCTION**  
**UNLESS SIGNED AS CERTIFIED BELOW**

**SULZER**

### Pump Speed Torque Curve

Bowl performance. Adjusted for construction and viscosity.  
The duty point represents the head at the discharge nozzle centerline.



Speed torque curve for defined pump operating range:

Minimum flow = ZERO Flow  
Maximum flow = Rated flow

Item number : Replacement Pump  
Type / Size : JTS-9LC  
Service :  
Quantity : 1  
Sulzer Reference ID : USA.9934-XND.18.0051-P0  
Date of Last Update : 11/30/2018 2:07 PM

Speed, rated (pump / driver) : 1780 / 1780 rpm  
Pump shaft power (max torque condition) : 36.61 hp  
Maximum torque (driver speed) : 2.06 hp/100 rpm  
Minimum torque (driver speed) : -0.76 hp/100 rpm

#### Moment of inertia

	Component inertia (pump speed)	Speed ratio	Driver reflected inertia (driver speed)
Driver coupling	-	-	0.00 lb.ft2
Gearbox	-	1 : 1.00	0.00 lb.ft2
Pump coupling	0.00 lb.ft2		0.00 lb.ft2
Pump	2.45 lb.ft2		2.45 lb.ft2
Geared fluid coupling (pump side)	0.00 lb.ft2		-
	-		0.00 lb.ft2
<b>Total</b>	-		<b>2.45 lb.ft2</b>



**Pump Speed Torque Table of Values**

Table of values		
SPEED rpm	Torque Max Flow hp/100 rpm	Torque Min Flow hp/100 rpm
0	0.31	-0.11
181	0.02	-0.01
362	0.09	-0.03
543	0.19	-0.07
724	0.34	-0.13
905	0.53	-0.20
1086	0.77	-0.28
1267	1.04	-0.38
1448	1.36	-0.50
1629	1.72	-0.63
1780	2.06	-0.76

# Product Information Packet

May 6, 2017

Data shown is for the current revision model #. Ensure your nameplate model # matches.

<b>Model Number:</b>	<b>5KS324DAJ6021B</b>
<b>Catalog Number:</b>	<b>V4513</b>
<b>Instruction Manual:</b>	GEK-95353
<b>Connection Diagram:</b>	GEM2034E-FIG9
<b>Outline Drawing:</b>	148CB32VMHKBCLA0001

Accessory Connection Diagrams			
<b>Bearing Thermocouple:</b>	None	<b>Heater:</b>	3027JE-1C
<b>RTD:</b>	None	<b>Thermistor:</b>	None
<b>Thermostat:</b>	None	<b>Winding Thermocouple:</b>	None
<b>Bearing RTD:</b>	None		

## Table of Contents

Specification	01
Performance Characteristics	02
Outline Drawing	03
Connection Drawing(s)	04
Spare parts	05



**Marks:**

<b>MODEL NUMBER:</b>	<b>5KS324DAJ6021B</b>	<b>Estimated Weight:</b>	690 Lbs
<b>Outline Drawing:</b>	148CB32VMHKBCLA0001	<b>Time Rating:</b>	CONT
<b>Connection Diagram:</b>	GEM2034E-FIG9	<b>Enclosure:</b>	WPI
<b>Instruction Book:</b>	GEK-95353	<b>Encl Construction:</b>	OPEN
<b>Design Code:</b>	32BD1241AA	<b>Ambient Max(°C):</b>	40
<b>Type:</b>	KS	<b>Alt Ambient Max(°C):</b>	--
<b>Frame:</b>	L324TP16	<b>Insulation Class:</b>	H
<b>Phases:</b>	3	<b>NEMA Design:</b>	B
<b>Poles:</b>	4	<b>Nominal Efficiency:</b>	94.1 %
<b>Output Power:</b>	40HP 29.6KW	<b>Guaranteed Efficiency:</b>	93.0
<b>RPM:</b>	1780	<b>3/4 Load Efficiency:</b>	--
<b>Voltage:</b>	230/460	<b>KVA Code:</b>	G
<b>Hertz:</b>	60	<b>Max KVAR:</b>	15.7
<b>Amps - FL:</b>	101.2/50.6	<b>Power Factor:</b>	79.0
<b>Service Factor:</b>	1.15	<b>Bearing - DE:</b>	6212C3
<b>Alt Service Factor:</b>	--	<b>Bearing - ODE:</b>	235A2523AD01

**Enclosure is Weather Protected One**

**Stamped Nameplate Notes:**

HTR LDS HE1-HE2 115V 100W  
 ROT CCW FACING ODE LEAD/PH SEQ 1-2-3/1-2-3  
 INVERTER DUTY PER NEMA MG1 PART 31  
 ALTERNATE RATING FOR PWM CONTROL:1.0SF 40C AMBIENT  
 VAR TORQUE RANGE 5-60 HZ  
 UPPER BRG LUBE OIL: 2.1 QTS  
 0 DEG C TO 40 DEG C : ISO 32(MINERAL OR SYNTHETIC)  
 -15 DEG C TO 0 DEG C : ISO 32 SYNTHETIC  
 SUITABLE FOR 30 HP, 190/380V, 50 HZ WITH  
 92.0/46.0 AMPS AND 1480 RPM AT 1.0 SF

**Additional Information:**

4P, VERT HOLLOW SHAFT HIGH THRUST (1D)  
 SPECIAL BALANCE  
 346 CU IN - 3.00" NPT  
 OIL RESISTANT SLEEVING ON LEADS  
 115V HTR LDS TO MAIN CONDUIT BOX  
 COUPLING NOT INCLUDED IN BOM, WILL BE  
 ORDERED SEPERATELY  
 GROUND PAD  
 SHAFT GROUNDING RING MOUNTED ON LOWER END BRG CAP  
 BEARING LIFE 8760 HRS AT 6324 LB THRUST  
 CG:13.86 IN FROM P-BASE FACE,STAT DEF:0.0025 IN  
 RCF:3600 CPM AT C/BOX SIDE, 3870 CPM AT  
 90 DEG FROM C/ BOX SIDE  
 NON-REVERSE BALL CARRIER

**Performance Characteristics**

1st Winding 1st Connection

**Design: 32BD1241AA**

**Marks:**

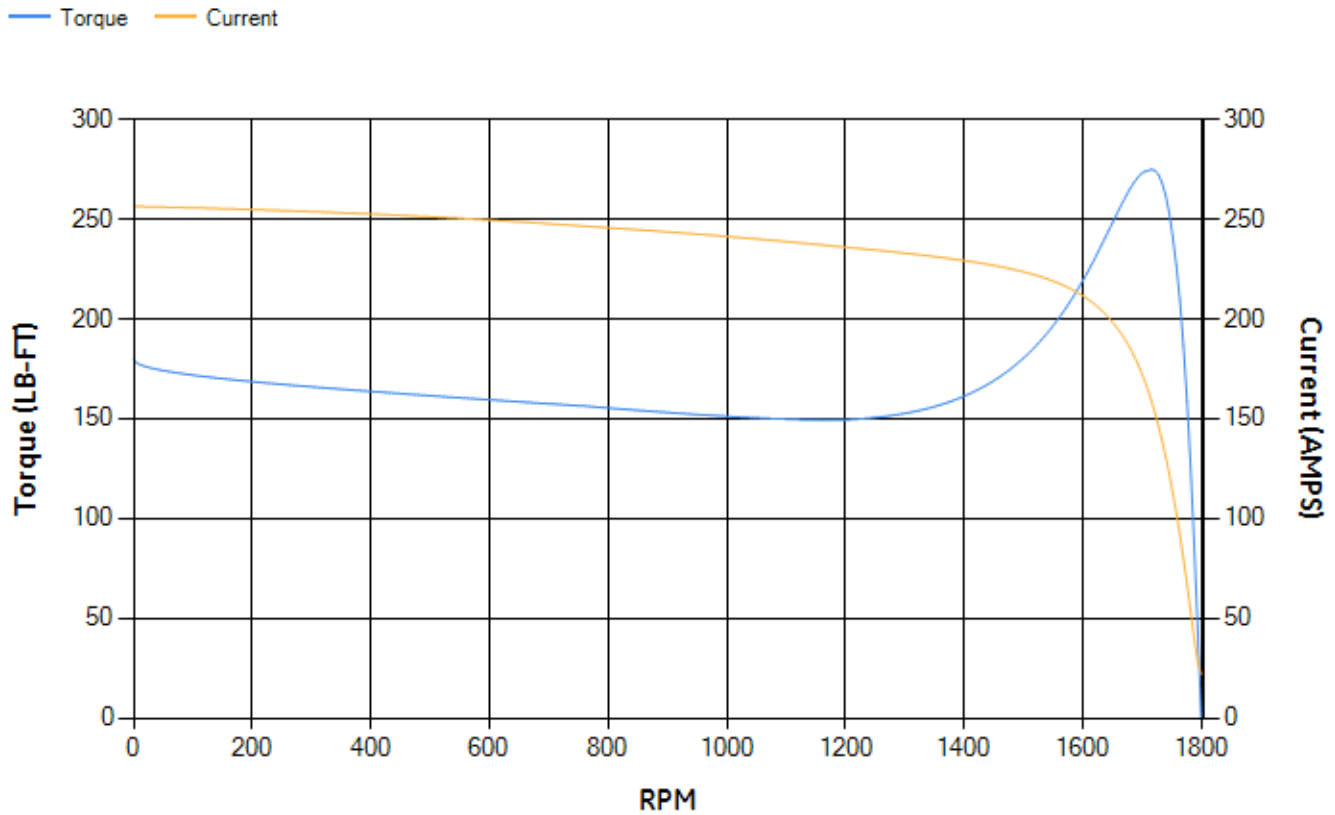
LOAD %	125.0	115.0	100.0	75.0	50.0	25.0	0.0
% EFF	93.13	93.41	93.93	93.92	93.29	89.79	0.00
% PF	81.26	80.69	79.23	74.3	63.68	41.7	4.06
AMPS	61.84	57.12	50.19	40.24	31.51	25	21.92

<b>TORQ(FL)#FT</b>	118.03	<b>TORQ(LR)%FL</b>	152.25	<b>TORQ(BD)%FL</b>	232
<b>AMPS(LR)</b>	256.37	<b>PF AT START</b>	0.33		

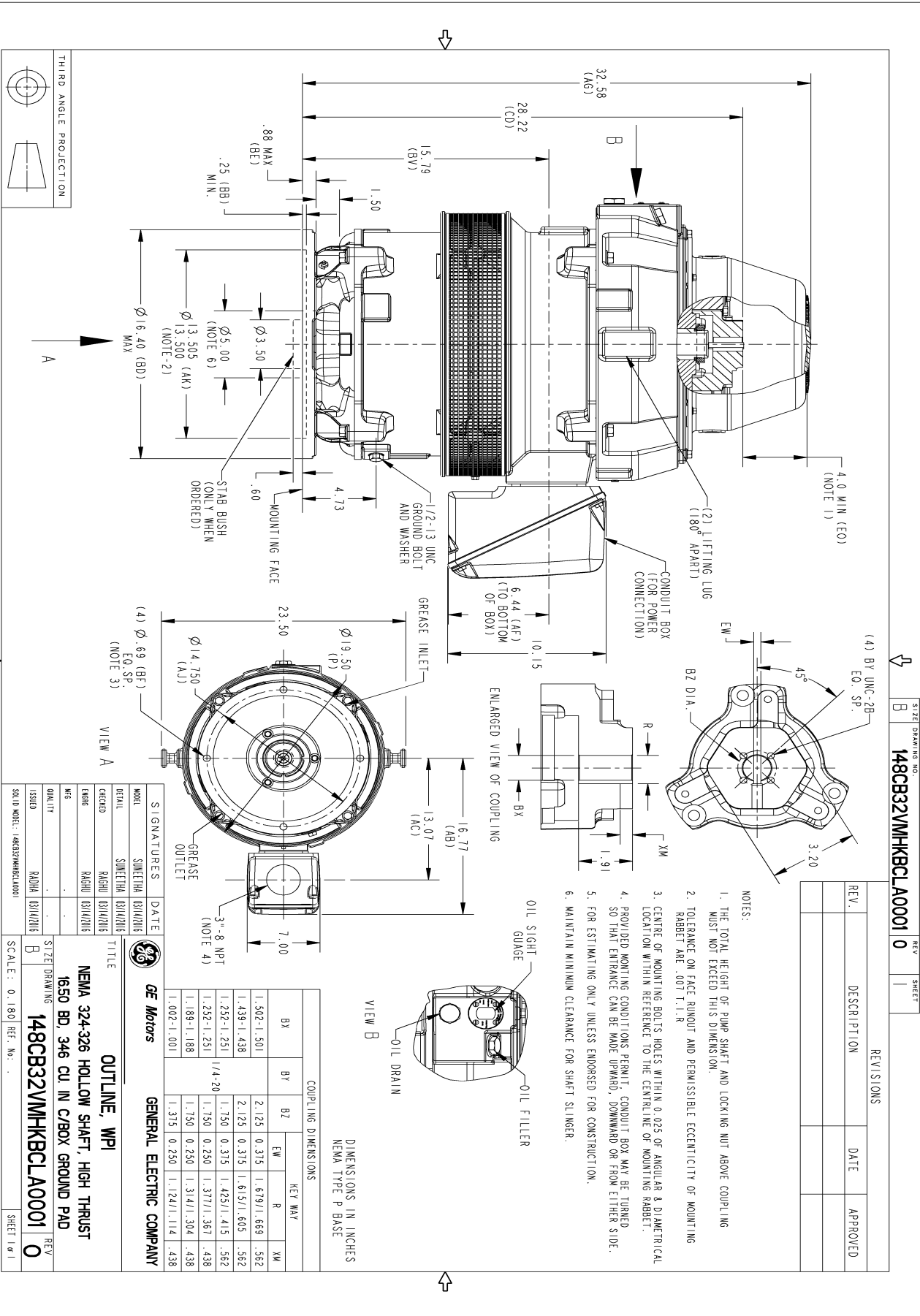
This motor is capable of two cold or one hot start with a maximum connected load inertia of 1146 Lb-Ft Sq (48.25 Kg-meter Sq)at 100% voltage, where the load torque varies with the square of the speed. Acceleration time with maximum inertia and the above load type is 51 seconds. Safe stall time at 100% voltage is 87 seconds cold, 62 seconds hot. Rotor inertia is 6.38 Lb-Ft Sq (0.27 Kg-meter Sq).

<b>Open Circuit A-C:</b>	0.497	<b>Short Circuit D-C:</b>	0.023
<b>Short Circuit A-C:</b>	0.035	<b>X/R Ratio:</b>	8.686
<b>Stator Slots:</b>	48	<b>Rotor Slots:</b>	38

**Speed Torque Current Curve (First Connection, First Speed)**



Marks:



REVISONS

REV.	DESCRIPTION	DATE	APPROVED

- NOTES:
1. THE TOTAL HEIGHT OF PUMP SHAFT AND LOCKING NUT ABOVE COUPLING MUST NOT EXCEED THIS DIMENSION.
  2. TOLERANCE ON FACE RINOUT AND PERMISSIBLE ECCENTRICITY OF MOUNTING RABBIT ARE .007 T. I. R.
  3. CENTRE OF MOUNTING BOLTS WITHIN 0.025 OF ANGULAR & DIAMETRICAL LOCATION WITHIN REFERENCE TO THE CENTRLINE OF MOUNTING RABBIT.
  4. PROVIDED MONTING CONDITIONS PERMIT, CONDUIT BOX MAY BE TURNED SO THAT ENTRANCE CAN BE MADE UPWARD, DOWNWARD OR FROM EITHER SIDE.
  5. FOR ESTIMATING ONLY UNLESS ENDORSED FOR CONSTRUCTION.
  6. MAINTAIN MINIMUM CLEARANCE FOR SHAFT SLINGER.

DIMENSIONS IN INCHES  
NEMA TYPE P BASE

COUPLING DIMENSIONS		KEY WAY			
BX	BY	BZ	EW	R	XM
1.502-1.501	2.125	0.315	1.615/1.605	.562	.562
1.439-1.438	2.125	0.315	1.615/1.605	.562	.562
1.292-1.291	1.750	0.315	1.425/1.415	.562	.562
1.252-1.251	1/4-20	1.750	0.250	1.377/1.367	.438
1.189-1.188	1.750	0.250	1.314/1.304	.438	.438
1.002-1.001	1.315	0.250	1.124/1.114	.438	.438

**GE Motors**  
GENERAL ELECTRIC COMPANY

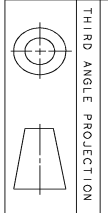
**SIGNATURES** DATE

MODEL: 5KS324DAJ6021B  
 DETAIL: SUNEETHA 03/14/2016  
 CHECKED: RAJESH 03/14/2016  
 ENG: RAJESH 03/14/2016  
 QC: RAJESH 03/14/2016  
 ISSUED: RAJESH 03/14/2016  
 SOLID MODEL: 148CB32VMHKBCLA0001

**TITLE**  
 OUTLINE, WPI  
 NEMA 324-326 HOLLOW SHAFT, HIGH THRUST  
 1650 BD, 346 CU. IN. C/BOX GROUND PAD  
 148CB32VMHKBCLA0001

SCALE: 0.180 REF. No. SHEET 1 OF 1

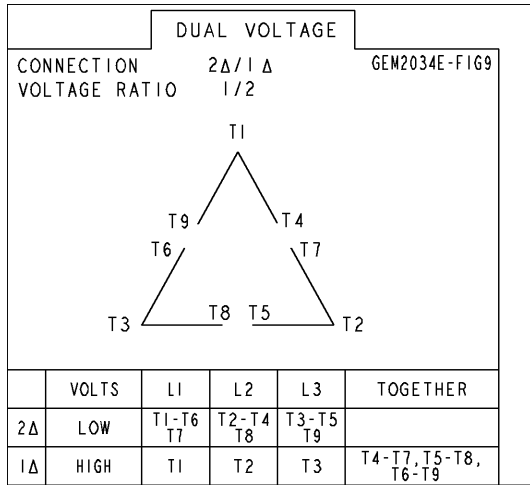
SIZE DRAWING NO. B 148CB32VMHKBCLA0001 0  
 REV SHEET 1





Marks:

**Connection Diagram**  
**GEM2034E-FIG9**



**Heater Connection**  
**3027JE-1C**



End shield Assembly		
Part Description	DE Side Part#	ODE Side Part#
End Shield	115E7205AA1	115E7208LA1
Bearing	235A2509BE01	235A2523AD01
Slinger/Inproseal	235A2300FM1	

Fan & Fan Cover Assembly	
Part Description	Part#
Fan	
Fan Cover	161C1052AA1

Conduit & Accessories Box Assembly	
Part Description	Part#
Conduit Box	149C4429AA2

Mechanical Accessories	
Part Description	Part#
Brake	
Tachometer	



**APPENDIX F**

**BOOSTER PUMP STATION INFORMATION**



# THE MAHER CORP.

## **SyncroFlo Elite Proposal System**

Project Name: Breakfast Hill Water Main Extension Project

SyncroFlo Proposal Number: 18153

Proposal Date: December 4, 2018



**Syncroflo Inc.**  
2905 Pacific Drive  
Norcross, GA 30071



DECEMBER 4, 2018

**Maher Corp.**  
192 Pleasant Street  
Rockland, MA 02370

Dear Mr. Sussman,

We want to thank you for considering us for the supply of the pumps/system and look forward to supporting you on the Breakfast Hill Water Main Extension Project. Please let us know if you have any questions.

Warmest Regards,

Chris

Christopher Lott  
Application Engineer  
832-389-1136  
[clott@syncroflo.com](mailto:clott@syncroflo.com)



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## **1. PROPOSAL SECTIONS**

- 1.1. Pricing Summary and Scope
- 1.2. ISO Certificate
- 1.3. Field Service Rate Sheet
- 1.4. Standard Terms and Conditions

## **2. TECHNICAL PROPOSAL**

- 2.1. Pump Documentation
- 2.2. Accessories Documentation
- 2.3. Example General Arrangement Drawing
- 2.4. Brochures

## SECTION 1 COMMERCIAL PROPOSAL

## SECTION 1.1 PRICING SUMMARY AND SCOPE

# YOUR SINGLE-SOURCE PACKAGED PUMPING SYSTEMS MANUFACTURER

**TO: Maher Corp.**  
**ATTN: Paul Sussman**

**DATE: December 4, 2018**  
**QUOTE NUMBER: 18153**

**QUOTED BY: C. Lott**

**PROJECT: Breakfast Hill Water Main Ext.      LOCATION: Portsmouth, NH**  
**ENGINEER: Underwood Engineers**

---

## Schedule

- Submittals:** 3-4 weeks after acceptance and acknowledgement of purchase order. Include this proposal as part of the purchase order for this system. One copy in pdf is offered for representative and contractor. Contractor may print as many hard copies as he requires from the pdf.
- Resubmittals:** If required, resubmittals will be provided within 4 weeks after review of submittal comments, and after all questions generated by the engineer's submittal comments are received, clarified, and accepted by SyncroFlo.
- Production:** Process begins on receipt of approved submittals and release to production (release for production consists of a signed and approved or accepted submittal, signed general arrangement drawing and written release from the purchaser).
- Shipment:** 6 weeks after receipt of all equipment necessary for manufacturing (estimated at 16 weeks from receipt of approved submittals and release to production). Shipment date may change, depending on component availability from key vendors.
- Delivery:** Delivery date may be up to 10 days after shipment date, depending on carrier and distance from the factory in Norcross, GA 30071.

## Scope of Equipment

Factory built pumping system. Principal components are as listed below. Station shall be UL Listed as a complete unit under UL and ETL categories. Control panel shall be UL 508 listed.

System is quoted per specification 2145 BPS Basis of Design and no addenda.  
SyncroFlo is **ISO 9001:2015** certified, certificate number 109240Q.

# YOUR SINGLE-SOURCE PACKAGED PUMPING SYSTEMS MANUFACTURER

## System Particulars

- System Model Number: SFIMC2-2P500-FMES74
- System Design Flow Rate (GPM): 500
- System Rated Suction Pressure (PSI): 42
- System Rated Boost Pressure (PSI): 32
- Power to Be Provided (Voltage/Phase/Hertz): 460/3/60
- System Approximate Dry Weight (lbs.): 4,700
- System Approximate Footprint: 6' x 6'

## Mechanical

- Qty (2) Peerless F11030A M Frame Mounted End Suction Pumps with mechanical seals, each rated at 500 GPM @ 89 ft including station losses.
- Qty (2) 20 hp 1800 RPM TEFC premium efficient motors.
- Qty (2) 6" pump suction 150 PSI AWWA gates valves, and flex connectors.
- Qty (2) 6" pump discharge flex connectors, check valves and 150 PSI AWWA gates valves.
- Qty (1) 8" system inlet connection flange.
- Qty (1) 8" steel suction manifold, lined with fusion bonded epoxy.
- Qty (1) set of steel branch piping, lined with fusion bonded epoxy.
- Qty (1) 8" steel discharge manifold, lined with fusion bonded epoxy.
- Qty (1) 1/2" sample tap.
- Qty (1) 3/4" hose bibb with vacuum breaker.
- Qty (2) 1" air release valves.
- Qty (1) 8" system outlet connection flange.
- Qty (2) 4.5" glycerin filled pressure gauges with isolation valves, sub-panel mounted.
- Qty (4) Skid anchor clips and stainless steel anchor bolts.
- Station skid, suitable for grouting on site.
- System to be blasted to SSPC-SP6.
- System to be primed and painted with an ISO 121944 C3 coating system, comprised of:
  - One coat of PPG Amerlock 2 series primer, 4.0-8.0 mils DFT
  - Two coats of PPG's Amercoat 450H Acrylic Aliphatic Polyurethane, 2.0-5.0 mils DFT per coat

## Controls:

- Qty (1) UL listed NEMA 12 rated dead front control panel with key lockable handle to house all logic and motor control for the pump system, including:



## YOUR SINGLE-SOURCE PACKAGED PUMPING SYSTEMS MANUFACTURER

- Qty (1) Secondary surge & lightning arrestor.
- Qty (1) Main disconnect circuit breaker, 25kAIC rated, with through outer door operator.
- Qty (1) Power monitor.
- Qty (1) Phase monitor.
- Qty (2) Motor circuit breakers, 25kAIC rated, with through inner door operator.
- Qty (2) Full solid state soft starters, with NEMA sized isolation contactor and bypass starter.
- Qty (1) 110 volt control disconnect circuit breaker (from 120/208/3/60 power), 25kAIC rated, with through inner door operator.
- Qty (1) 15A GFCI duplex receptacle mounted adjacent to control panel
- Qty (1) Uninterruptable Power Supply to support PLC, OIT, pressure transmitters, and RTU interface devices in the event of power failure (either utility or generator)
- Qty (1) Set of 30.5 mm operator controls including:
  - Local/Remote switch for selecting either RTU or local control installed on the inner panel door
  - Pump H-O-A switches installed on the inner panel door
  - Alarm reset & silence push button installed on the outer panel door
  - Pump run lights – Green, Push to Test installed on the inner panel door
  - Alarm light - Red, Push to Test installed on the inner panel door
  - Control power light - White, Push to Test installed on the inner panel door
  - Alarm horn rated NEMA 1 will be installed on the outer panel door.
- Qty (2) run time meters for pumps.
- Qty (1) 24VDC power supply.
- Qty (2) Pressure transmitters, one on suction header and one on discharge header.
- Qty (1) Allen Bradley MicroLogix 1400 programmable controller with successive and 24 hour pump alternation, sequence shifting, power failure restart sequence, pressure sequencing with staging delay, alarm systems, etc.
- Qty (1) Maple HMI5070NL color touch screen OIT (800 x 480 pixels). System can be used to access registers within the Microprocessor from the front of the control panel.
- Qty (1) Set of station OIT displayed items:
  - Selection of lead pump or selection of automatic alternation
  - Current suction pressure
  - Current discharge pressure
  - Pump run times
  - Pumping system diagnostics
  - Low inlet pressure alarm display

# YOUR SINGLE-SOURCE PACKAGED PUMPING SYSTEMS MANUFACTURER

- Low discharge pressure alarm display
- High discharge pressure alarm display
- Phase failure alarm display
- Pump failure alarm display
- Alarm beacon, NEMA 4X rated (shipped loose for mounting on building exterior)
- Audible alarm, NEMA 4X rated (shipped loose for mounting on building exterior)
- Audible alarm with silence button on the control panel outer door
- Panel intruder alarm on the outer door
- Qty (1) Terminal strip in control panel dedicated to SCADA interface.
- Schedule 40 PVC conduit with non-metallic flexible conduit as required.

### **Spare Parts:**

- Qty (1) Spare pump and motor
- Qty (1) Set of control panel replacement fuses
- Qty (1) Set of pilot light replacement lamps

### **SCADA Interface:**

- Qty (2) auxiliary analog Ethernet signals including:
  - Suction Header Pressure (AO)
  - Discharge Header Pressure (AO)
- Qty (10) auxiliary Ethernet contacts including:
  - Each Pump Call (DI x 2)
  - Each Pump Running (DO x 2)
  - Each Pump Fault (DO x 2) (as determined by overload relay trip)
  - Each H-O-A in Hand (DO x 2)
  - Each H-O-A in Auto (DO x 2)
  - Each System Alarm (DO x 5):
    - Low inlet pressure
    - Low discharge pressure
    - High discharge pressure
    - Loss of power
    - Phase Failure

### **Building:**



## YOUR SINGLE-SOURCE PACKAGED PUMPING SYSTEMS MANUFACTURER

- Steel self-framed building with Gable Roof, mounted on pump skid.
- 115 MPH rated building and 30 PSF rated roof.
- 4" walls, insulated to R-21.
- Qty (1) Double doors.
- Qty (1) Building power supply disconnect, 22.5 kVA transformer, load center and circuit breakers.
- Qty (1) Exhaust fan and intake louvers.
- Qty (1) Air conditioner and heater, 2 ton and 5 kW.
- Qty (4) 48" dual fluorescent fixtures.
- Qty (2) External lights at doors.
- Qty (2) Internal emergency lights
- Qty (3) GFCI Receptacles – general purpose, interior
- Qty (2) GFCI Receptacles – general purpose, exterior, weather protected
- Qty (1) Smoke alarm
- Qty (1) Door Switch for Intruder Alarm
- Qty (1) Dehumidifier – with dedicated GFCI receptacle
- Exterior Brick Façade.
- All skid mounted with pumping system.
- Rigid conduit to be run under the skid deck to each motor and sensor

### **Post Production:**

- Full factory functional and performance testing with X-Y plot.
- Freight to site is not included.
- Installation is not included.
- Start-up, station calibration & operator training is included, 1 trip 1 days allotted.
- Warranty is as listed below.

### **Notes:**

- Pumps will be primed to provide sufficient NPSHA. Suction lift has not been considered.
- Controls: No harmonic testing is included. Field Harmonic analysis to be provided by others. No external operating devices are included.
- No actuating devices outside the control panel are included.

# YOUR SINGLE-SOURCE PACKAGED PUMPING SYSTEMS MANUFACTURER

## Package Price

- 1) **Base Bid: Please see reference email.**

## Commercial Items

- 1) Submittals: All drawings are generated in AutoCAD. Unless otherwise stated the submittals will be electronically transmitted and no printed copies will be supplied. The following components make up the standard submittal:
  - a. General arrangement drawings
  - b. Component & equipment cut sheets
  - c. Complete electrical diagrams
  - d. Enclosure assembly drawings
  - e. Controls diagram
  - f. Panel assembly drawings
  - g. IO&M provided 6 weeks after shipment
- 2) Shipment: 16 weeks after full approval and full “Release for Fabrication” (release for fabrication consists of a signed submittal, signed general arrangement drawing and written release from the customer) and full receipt of customer supplied equipment.
- 3) Lead times may vary based on plant capacity and component availability at the time of release.
- 4) Prices quoted are firm for thirty (90) days.
- 5) Prices do not include any: Federal, state, local or use taxes.
- 6) SyncroFlo standard terms and conditions apply.
  - a. Payment terms NET 30 days.
  - b. Progress payments are required on all orders over \$100,000.00 per the schedule below:
    - i. 20% Due with purchase order
    - ii. 20% Due with drawing approval
    - iii. 30% Upon receipt of major equipment
    - iv. 30% Due net 30 after shipment
- 7) Rigging and off loading at the site is not included and will be coordinated with the contractor at the time of shipment.
- 8) Standard Warranty: 1 Year parts warranty on complete pumping station one year from startup or 18 months from the date of shipment. A non-standard warranty has been offered.
- 9) As a company, we are always conscious of cost, and we work hard to minimize how market raw material price adjustments impact our customers. Recent governmental changes however (March 2018), regarding import tariffs on raw steel and aluminum, have created a certain level of uncertainty in the market, and as a company, we are already seeing price rises



## YOUR SINGLE-SOURCE PACKAGED PUMPING SYSTEMS MANUFACTURER

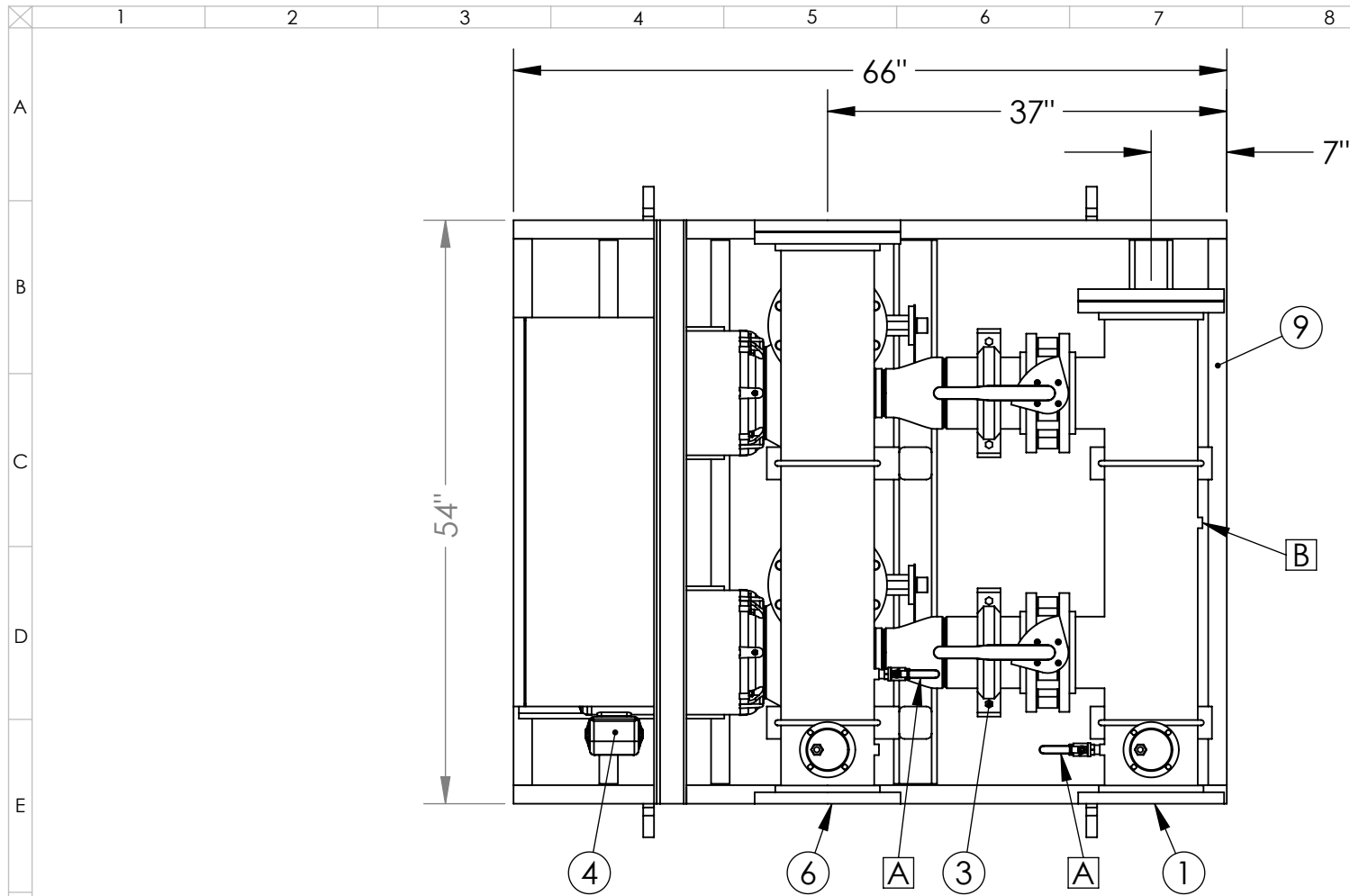
for some key components / raw material. Due to this current uncertainty, we as a company must advise, that we reserve the right to amend our package prices, if raw material costs escalate beyond typical yearly increase levels. We apologize for any inconvenience this causes, and assure you that we will do everything possible to minimize this impact.

Submitted by:  
Chris Lott  
Application Engineer  
[clott@syncroflo.com](mailto:clott@syncroflo.com)  
[www.syncroflo.com](http://www.syncroflo.com)



**SECTION 2.3**  
**EXAMPLE GENERAL ARRANGEMENT**  
**DRAWING**

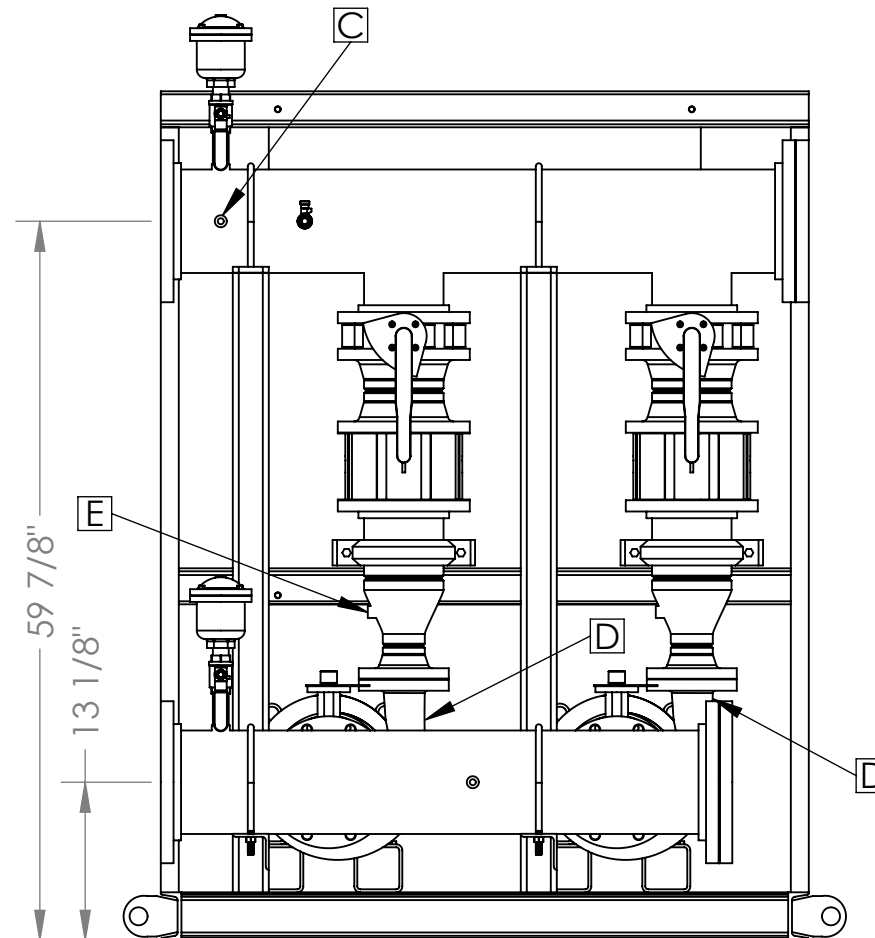
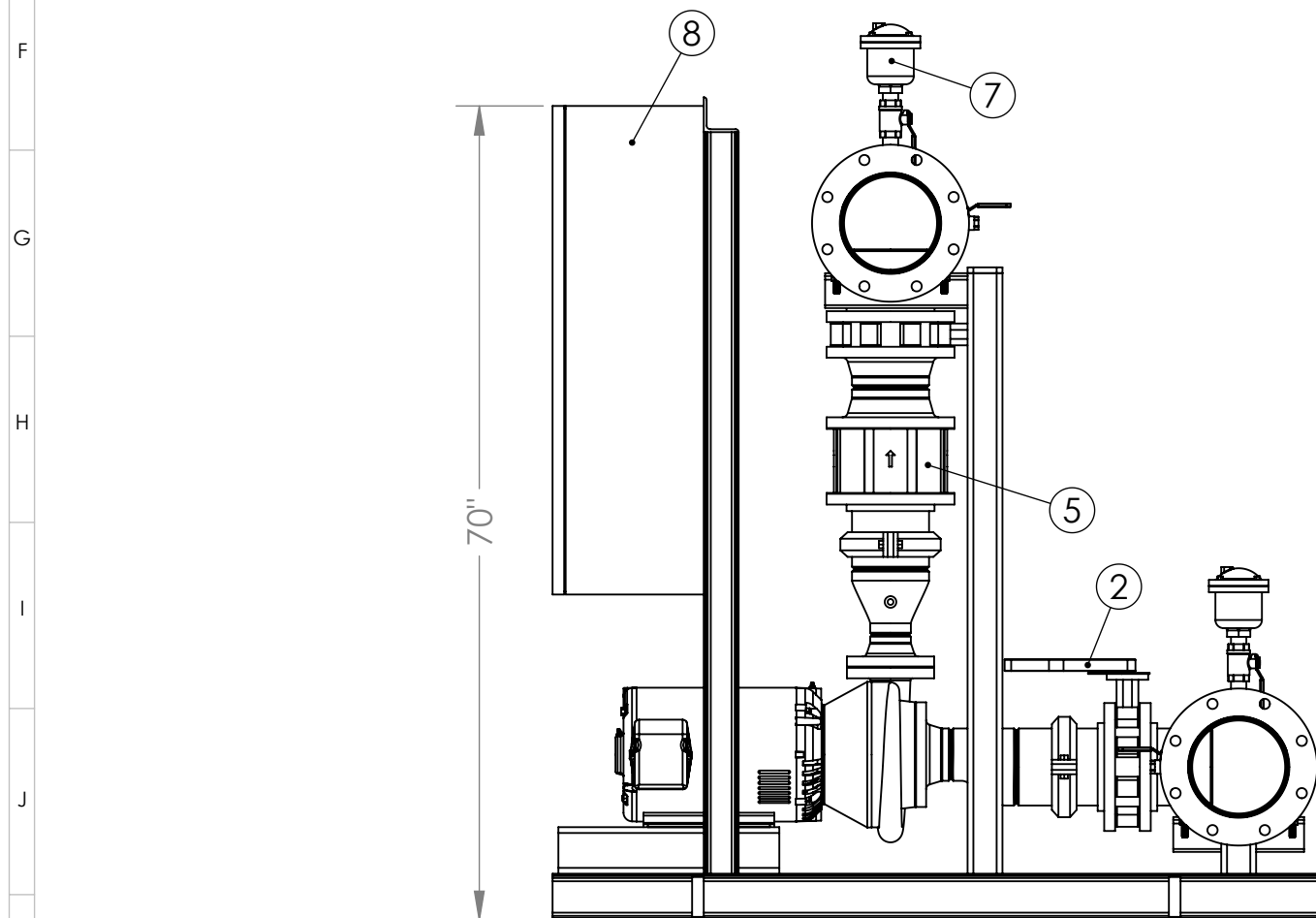




ITEM NO.	DESCRIPTION	QTY.
1	8" SYSTEM SUCTION CONNECTION	1
2	6" LUG ISOLATION BUTTERFLY VALVE	4
3	6" GROOVE COUPLING	4
4	CCES PUMP W/15HP MOTOR	2
5	6" CHECK VALVE WAFER STYLE	2
6	8" SYSTEM DISCHARGE CONNECTION	1
7	1" AUTOMATIC AIR RELEASE VALVE	2
8	CONTROL PANEL	1
9	4" SKID	1

INSTRUMENTATION CONNECTIONS

ITEM NO.	DESCRIPTION	QTY.
A	PRESSURE GAUGE AND TRANSMITTER	2
B	3/4" HOSE BIBB W/ VACUUM BREAKER	1
C	1/2" SAMPLE TAP	1
D	THERMAL RELIEF VALVE	2
E	PUMP PRESSURE GAUGE	2



**PROPRIETARY DRAWING**  
 THIS CONFIDENTIAL DOCUMENT IS THE PROPERTY OF  
**SyncroFlo**  
 NORCROSS, GEORGIA  
 NOT TO BE DUPLICATED WITHOUT WRITTEN PERMISSION  
 OR USED IN ANY WAY DETRIMENTAL TO THE COMPANY

1	REMOVE GAUGE PANEL BOARD. SWITCH DISCHARGE PRESSURE AND SAMPLE TAP.	KS 03/23/16
REV	DESCRIPTION	BY DATE

ALL DIMENSIONS +/- TOLERANCE OF 1/2"

**SYSTEM DRAWING**  
**PRODUCTION NO. 20156689**

DRAWN BY: MK    ENG. BY: MK    DATE: 8-19-15



2905 Pacific Drive - Norcross, GA 30071 - (770) 447-4443 - Fax (770) 447-0230

SCALE: 1:16    DWG: 351379A1



ArcelorMittal Mine, Liberia



NSF / ANSI 61  
AS CERTIFIED  
BY IAPMO



2905 Pacific Drive  
Norcross, GA 30071  
Tel: (770) 447-4443  
www.syncroflo.com

### TOTAL COMMITMENT

Since 1962, our commitment to excellence has enabled SyncroFlo to become the world's leading manufacturer of pumping stations. The SyncroFlo name has become synonymous with quality-built, cost-effective pumping systems. We pioneered pre-assembled pumping systems decades ago. Today, our installed base includes some of the largest pumping systems ever built.