



**DEPARTMENT OF PUBLIC WORKS
Town of Millis, Massachusetts**

900 Main Street
Millis, MA 02054
(508)-376-5424

**Orchard Street Area Residents
Pump System Sewer Connection Procedure
And Information Packet**

The residents in the Orchard Street area may connect to the sewer system after the sewer main in your street is successfully tested and accepted by the Town. The following is a list of steps to follow to proceed with the sewer connection to your property and abandon your existing septic system according to Millis' requirements.

STEP #1 – Pick up the Sewer Entrance Application, Trench Permit, Town approved Licensed Drainlayers list and this information packet available at the DPW Office at the Millis Town Hall located at 900 Main Street Room #201. The information packet includes information related to the design of your pump sewer system.

STEP #2 – Select a Massachusetts Registered Civil Engineer to prepare a pump system sewer connection plan for your property. The engineer will use the attached information in this packet and the Town of Millis' "Sewer Construction Guidelines" available to download online at the Town's website at https://www.millis.org/sites/millisma/files/uploads/town_of_millis_sewer_guidelines.pdf to prepare a plan and specifications to submit to the DPW for review and approval by the Town Consultant. If the proposed work is within 100 feet of a wetland area, your engineer should discuss the work with the Millis Conservation Commission.

STEP #3 – Select a Drainlayer (the contractor that will connect your house to the sewer system) from the DPW's approved Drainlayer's list available on the Town's Website https://www.millis.org/sites/millisma/files/uploads/drainlayers_2020_1.pdf. The Drainlayer is your contractor. The Town does NOT set their fee. All the Drainlayers will give free estimates for the work to be done. We suggest you obtain more than one estimate. If you prefer to use a contractor not included on the town's list, please have your contractor apply for a Drainlayers License with the DPW; requirements are available on the Town's Website https://www.millis.org/sites/millisma/files/uploads/drainlayer_license_requirements.pdf.

Note: Steps #2 and #3 may be combined and offered as a service by the Drainlayer chosen.

STEP #4 – Submit your completed Sewer Entrance Application, Trench Permit, Sewer System Plan, Specifications and Permit Fees to the DPW. The DPW will notify you if changes need to be made to the plans and specifications and when your permit is approved to begin construction. **The Sewer Entrance Application Fee is \$4,095.00 and the Trench Permit is \$50.00. Two separate checks must be submitted payable to the Town of Millis.**

STEP #5 – Plumbing work performed inside or within 10' of the building foundation and electrical work associated with the pump system requires permitting and inspection from the Building Department.

STEP #6 – The Millis Board of Health must be contacted to abandon the existing septic system.

STEP #7 – Please advise your Drainlayer to check with DIG SAFE before any excavations proceed to be certain that there are no utility conflicts on your property.

General Work Rules

- No work shall be started before 7:00 AM.
- No work shall be done on Saturday and Sunday or Holidays observed by the Town of Millis.
- All water, drain and sewer construction work must be done by a Town of Millis Licensed Drainlayer.
- All underground pipe work must be inspected by the Department of Public Works prior to being backfilled.
- Inspections can be requested from the Department of Public Works between 8:00 AM and 1:00 PM. by calling (508)-376-5424. 48-hour notice is required to schedule inspections.
- A Sewer Connection Permit is required and must be issued before work is started.
- All requirements of Town of Millis Health Department Septic Tank Abandonment Regulations must be complied with.
- A Sewer Connection Permit will be issued only to Town of Millis Licensed Drainlayer.
- The Contractor must identify a "Competent Person" who understands and can enforce OSHA excavation requirements and Commonwealth trench excavation laws and regulations.

Summary Pump System Sewer Guidelines

Low Pressure Sewer Grinder Pump & Force Main Service:

Approval by Department of Public Works	Required
Professional Engineer design	Required
Certified "As-Built" plan	Required
Pipe bedding	Sand; 6" below and to 12" over pipe
Emergency Generator Connection or 24 hours storage	Required
Min. cover over pipe	5'-0"
Flushing manhole(s)	As Required by Dept of Public Works
Min. diameter	2" for Main & 1 1/4" Service
Pipe material	CL200 - SDR 21 PVC, CL200 - SDR 9/11 HDPE
Min. horizontal separation from water main	10'
Min. distance above water main	18" or (encase or sleeve)
Layout	No 90-degree bends
Buried traceable green sewer warning tape	16" below Final Grade

Please call Jim McKay, DPW Director, 508-376-5424 if you have any questions. The DPW office is open Monday from 8:30 AM to 7:30 PM and Tuesday through Friday from 8:30 AM to 4:30 PM.

Attachments

Millis - Grinder Pump Specifications and Drawings
E/One Pressure System Design Report R2 For Orchard Street Area Sewers

Grinder Pump Systems (Building Sewer Connections)

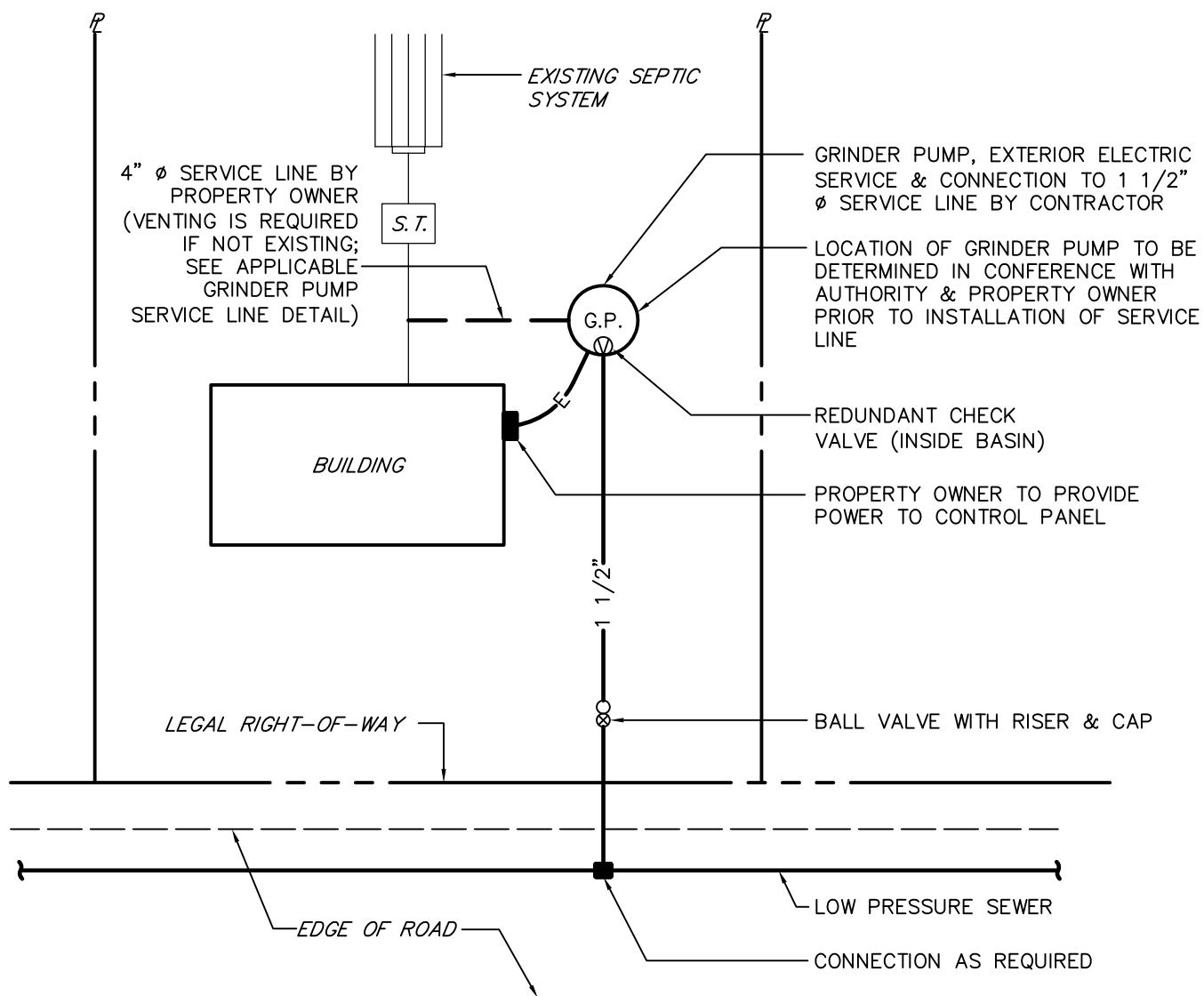
- (a) Individual building sewers which cannot be discharged to the sewer by gravity flow due to elevation or excessive distance shall be discharged into a tightly covered and vented pump chamber, basin, or station, from which the contents shall be lifted (pumped) by automatic, grinder type, pumping equipment or by any equally efficient method approved by DPW and discharged into the gravity sewer system or to a Low Pressure Sewer System which shall discharge to a gravity sewer system.
- (b) Grinder pump stations shall be of the wet pit/dry pit type and shall consist of a grinder pump suitably mounted in a basin having a minimum capacity of 60 gallons and constructed of fiberglass reinforced polyester (FRP) resin or corrugated high density polyethylene (CHDPE) with a smooth inner surface. Each basin shall be furnished with an EPDM grommet or PVC closet flange to accept a minimum 4.5" O.D. DWV pipe. Discharge piping shall be 304 stainless steel and terminate outside the pump chamber with 1-1/4 inch NPT fitting. All penetrations in the tank to be factory installed and sealed.
- (c) All outside installations shall be provided with a poured-in-place, concrete anti-floatation collar of sufficient size and weight to overcome buoyancy forces. Inlet and discharge piping shall be installed at a minimum depth of 4 feet to assure maximum frost protection.
- (d) The Grinder Pump System shall be provided with a **NEMA 4X** electrical quick disconnect, pump removal system, shut-off valve, anti-siphon valve, and full-ported check valve assembled within the basin, with remote **NEMA 3R, UL** listed electrical alarm/disconnect panel with all necessary internal wiring and controls. Pumps to have alarm light and bell with external silence push-button switch, push-to-run switch, and be capable of connection to emergency power source. Duplex units shall have alarm lights which shall indicate which pump requires service. Pump systems must be capable of either inside or outside installation. For ease of serviceability, all pump systems shall be of like type and horsepower as manufactured by Environment One Corporation or Barnes Pumps equal.
- (e) The grinder pumping equipment must include an integral grinder capable of handling any reasonable quantity of "foreign objects" such as plastic, wood, paper, glass, rubber and the like which find their way into a building sewer drain as a result of carelessness or accident on the part of the building occupants. The grinder pump must be capable of processing such foreign objects without jamming, stalling, overloading or undue noise. Grinder shall process these materials to particles which will freely pass through the pump and 1-1/4 inch pipe system. The grinder shall be of a configuration to provide a positive flow of solids into the grinding zone with sufficient action to scour the tank free of deposits or sludge banks which could otherwise accumulate and dislodge and impair the operation of the pump.

- (f) The grinder shall be direct driven by a single, one piece stainless steel motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft. The grinder will be of the rotating type with a stationary hardened and ground chrome steel shredding ring spaced in accurate close annual alignment with the driven impeller assembly, which shall carry two hardened type 400 series stainless steel cutter bars.
- (g) Pumps for low pressure sewer systems shall be semi-positive displacement, progressing cavity, type rated at 11 gpm against a total dynamic head of 92 feet (40 psig) and 9 gpm at 138 feet (60 psig.). The pump(s) shall be capable of operating at negative heads without overloading the motor(s). Motor shall be a minimum of 1 HP, 1725 RPM, 240 volt, 60 Hertz, 1 Phase with a high starting torque of 8.4 foot pounds with U.L. certification with protection against locked rotor and overload conditions.
- (h) All maintenance functions for the Grinder Pump Station must be possible without entry of the grinder pump station under" **OSHA 1910.146 Permit Required Confined Spaces.**" Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space. Therefore each pump and motor unit shall be provided with double lifting hooks with nylon lift out-harness to facilitate pump removal. Outside or underground installations shall provide access through an integral extension of the wet well assembly and shall be provided with a lockable fiberglass cover. All electrical and mechanical connections must be provided with easy disconnect accessibility.
- (i) Low pressure sewer systems shall have redundant check valves and anti-siphon valves. Multiple connections to a low pressure sewer system may be permitted if designed by a qualified Professional Engineer and approved by the Town.
- (j) No more than one single family home may be connected to a single pump unit
- (k) Provide a inimum of 24 hours of storage provided or an emergency generator hookup.

RECOMMENDED GRINDER PUMP DESIGN TABLE

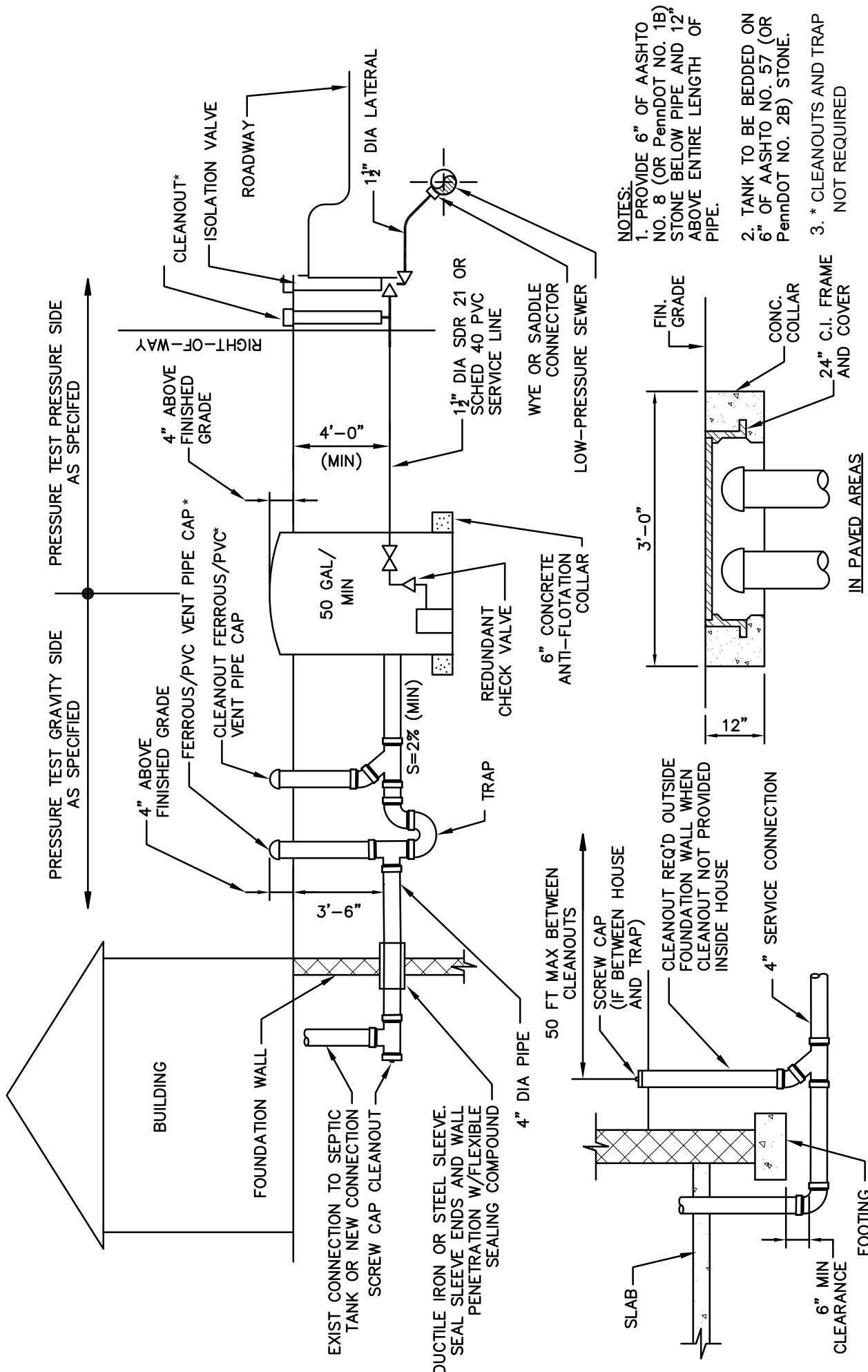
<u>OCCUPANCY TYPE</u>	<u>FLOW</u>	<u>PUMP UNITS</u>	<u>STORAGE - GALLONS</u>
Single Family	0 - 500 gpd	1	60
Duplex	500 -1200 gpd	1	120
Multi-family (3-6 units)	1200-1500gpd	2	120

* Applications with greater than 6 units shall be subject to review on a case by case basis.



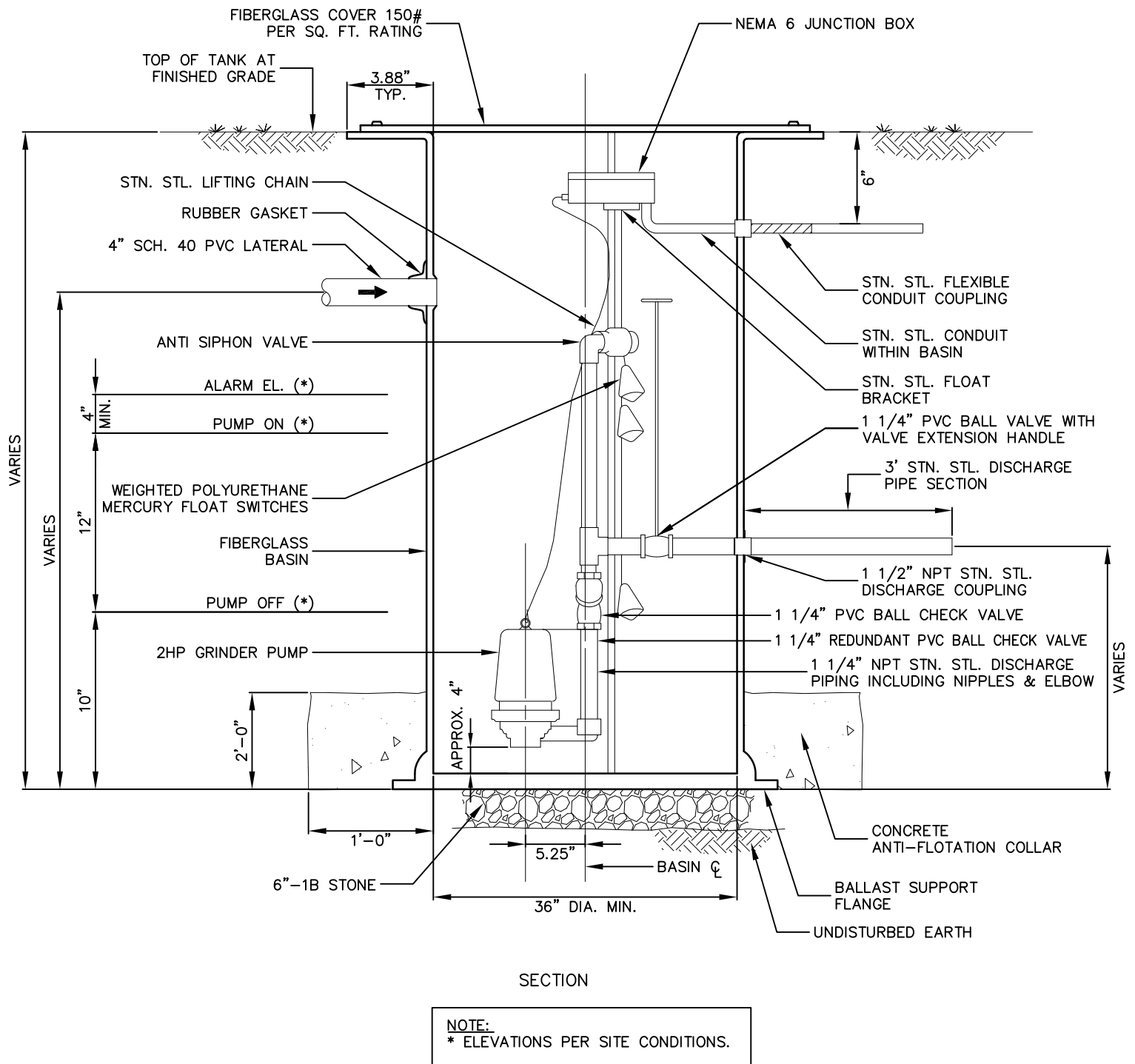
TYPICAL LOW PRESSURE SEWER PROPERTY CONNECTION SCHEMATIC

NO SCALE



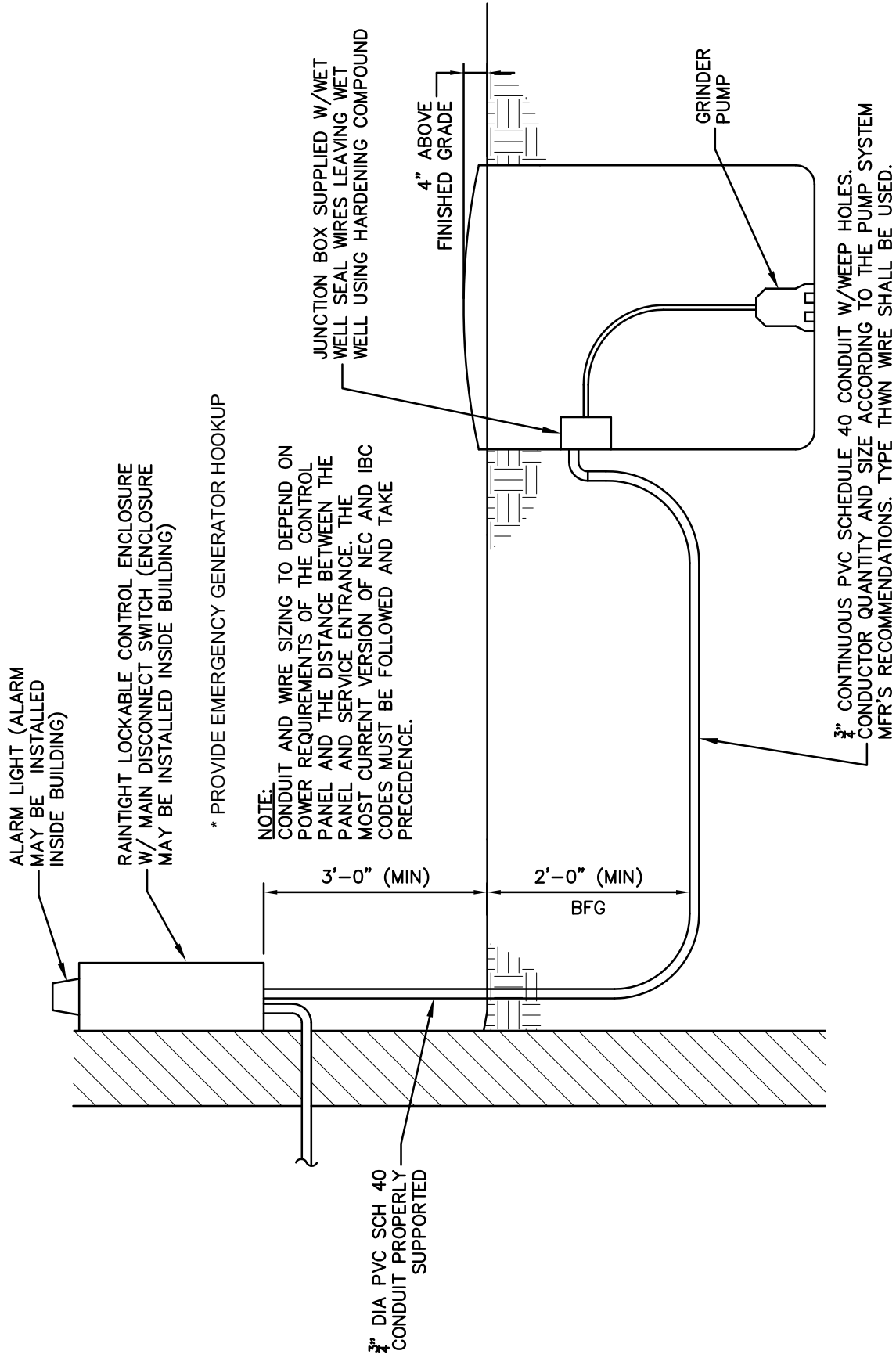
TYPICAL GRINDER PUMP SERVICE LINE TO LOW PRESSURE SEWER SCHEMATIC

NO SCALE



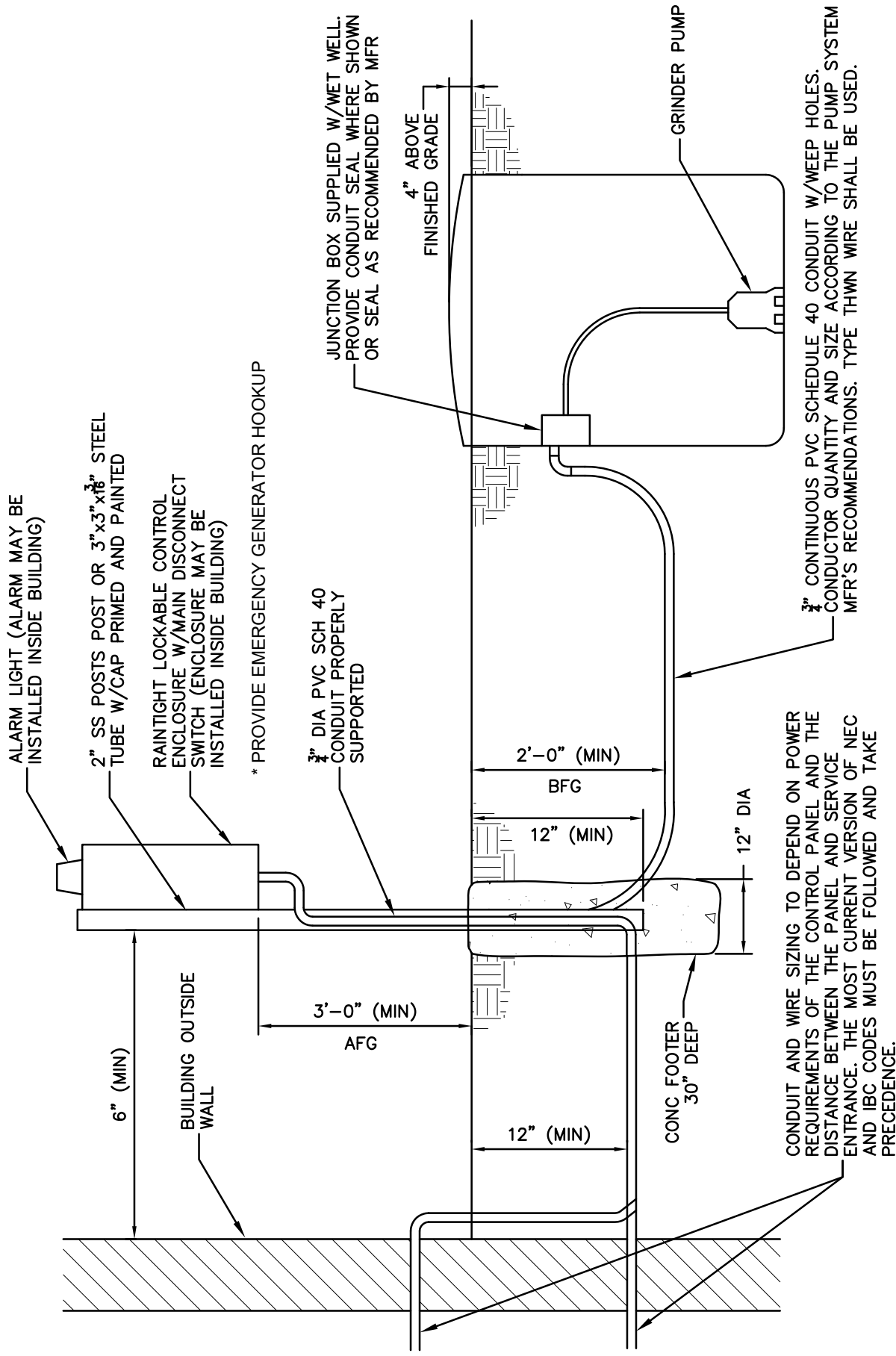
SIMPLEX GRINDER PUMP STATION FIBERGLASS BASIN - SECTION

NO SCALE



GRINDER PUMP WALL MOUNTED CONTROL PANEL

NO SCALE



GRINDER PUMP POST MOUNTED CONTROL PANEL

NO SCALE

**E/ONE Pressure System
Design Report
REVISION 2
For
Orchard Street Area Sewers**

Millis, MA

E/ONE
EXTREME
S E R I E S



April 20, 2018

Scott Miccile
Sr. Land Development Manager
Toll Brothers, Inc., New England Division
134 Flanders Road, Suite 275
Westborough, MA 01581

RE: Orchard Street Area LPSS – **REV 2**

Dear Scott;

This **Revised** preliminary design analysis examines the use of the E/One Pressure Sewer System for your project. E/One has over 40 years of installation and O&M experience along with considerable research and development leading to continuous product and system improvements. E/One remains the worldwide industry standard and industry leader in the pressure sewer technology. The unique characteristics of the E/One Pressure Sewer approach provides not only a technical solution, but also an economic advantage to be realized with low up front and O&M costs.

System Analysis

- ***Please note that our take off dwellings is approximate and needs to be reviewed and finalized. Adding a few more connections should not impact pipe sizing or function of the system as currently proposed.***

Phase 1- Current Connections

This project proposes to run an LPSS line to collect wastewater from approximately 38 individual residential units along Orchard street Laterals will be stubbed to the property line.

Phase 2- Future Connections

As part of the Phase 1 project a design that incorporated future needs areas of approximately 86 homes was required. The areas identified were Orchard Street West (zone 1); Bullard Lane (zone 2) and Bogastow Circle (zone 5). and portions of Walnut Street (zone 7) and Holbrook Way (zone 9) and discharge to gravity sewer manhole on Orchard street as shown in our preliminary layout. Stubs for each of these zones needed to be sized and located.

Using the information you provided and information from Google Earth (distance and elevation), we ran the enclosed preliminary pressure sewer pipe sizing analysis. This was run through our Low-Pressure Sewer Design Software that employs our Flow Velocity and Friction Head Loss vs. Pumps in Simultaneous Operation Spreadsheet.

We have used the surface topography provided to make our analyses.

Zone Layout

Using your site plan we laid out a system encompassing current & future connections consisting of 11 flow Zones leading to the final discharge point. The system will follow the Zone designations noted on the attached plan.

Computations are based on the Hazen-Williams formula for friction loss, using calculations of cross-sectional area and flow rate to determine pipe sizes that create "self-cleaning" velocities of approximately 2.0 fps or higher. A "C" factor of 150, SDR 11 HDPE pipe and the average expected daily volumes for single family homes are also used in this analysis.

The highest Total Dynamic Head generated with all current and future zones connected is approximately 149 feet which is predominately friction loss in the pipeline. This is well below our pump's continuous-run rating of 185 ft, and well within its intermittent, i.e., normal, operating range. Flow velocity throughout the system meets or exceeds 2 fps. These characteristics and low retention time indicate that this will be a reliable, low-maintenance system.

Design Flows & System Velocity

We normally use average daily flows for system designs rather than the peak design flows commonly used for gravity sewer sizing. We do this because the system is sealed and void of inflow and infiltration commonly allowed for in gravity sewer designs. We size the system for an average daily flow of 200+/- gpd generally for single family homes. The pumps selected are rated to flows up to 700 gpd thus peak flows are easily handled. We size the pipelines for the proper scouring velocity based on the pump's output which has a consistent flow rate over a wide range of head conditions. We then look at the pipeline retention time to optimize the line size for the lowest retention that will pass wastewater in a short period of time to reduce sediment in the lines and prevent odor issues. This makes for a very reliable and maintenance free wastewater collection system.

Often we are asked to use the published "State" design values from various flow tables in order to secure approval. We can do this; but then we run the reports based on the actual predicted average flow to optimize the line size as mentioned above.

Many of our installations have seen flows that more closely mirror the EPA water use goals of 70 gpd/capita. We also look at seasonal uses a little more closely due to greater reductions in flow in the offseason. In applications of this type we look to

find the best for both seasons.

FLUSHING CONNECTIONS AND AIR RELEASE

Our normal recommendations for valve placement are as follows: flushing connections at 1,000' to 1,500' intervals and at branch ends and junctions; isolation valves at branch junctions; and air release valves at peaks of 25 ft or more and/or at intervals of 2,000 to 2,500 ft.

DESIGN SYNOPSIS

Current design will allow orchard street to connect with low pressure and function properly.

There will be a 2 inch line on Orchard to the intersection of Bullard Lane and the remainder will be 3 inch to discharge

Required stubs will be 3 inches for lower Orchards St., Bullard Lane and Bogastow circle and 2 inch for Walnut and Holbrook

CURRENT CONNECTIONS

Your project will require **terminal flushing manholes** at the beginning of Zone 2, and **inline flushing manholes** at the intersections of Zones 1,2 &3; Zones 4&5; Zones 6&7&8; and Zones 8&9&10. An **Air release valve manhole** will be required at the high point at elevation 202 approximately 550 feet east of the intersection of zones 4,5&6.

Because of the requirement to run the LPSS line to the west of Bogastow Brook, a 3-inch dead line for the future zone one needs to be run parallel to zone 2 and connect inside or outside a manhole at the intersection of zones 1,2&3.

Zones 3 and 5 will require a 3-inch stub inside or outside the flushing manholes where the zone connect to Orchard street.

FUTURE CONNECTIONS

Future Zones will require terminal flushing manholes at the beginning of Zones 1,3,5,7 & 9, a combination terminal flushing and vacuum release manhole at the start of zone 3, and inline flushing manholes every 1000-1500 feet.

LATERAL CONNECTIONS

Common practice in pressure sewers requires the ability to isolate each lot with a corporation stop off the main and service lateral kit to the lot line. This line can be either 1-1/4 inch or 2-1/2 inch max. E/One has developed a true wastewater rated check valve which is built in to our stainless steel lateral kit shown in this report.

These components are rated to 235 psi and with standard connection fittings rated



273 Weymouth Street • Rockland, MA 02370

water supply and pollution control equipment

tel. 781.982.9300
fax. 781.982.1056

info@frmahony.com
www.frmahony.com

to 150 psi. These items are included in the budget analyses and shown in this report.

We strongly advise against the use of waterworks check valves as they are not rated for sewage environments. We have also seen PVC body check valves with pressure rating to 150 psi that do not have the same rating for back pressure on the check valve. This can result in damage to the check valve and pumping issues as the check valve disc can become dislodged under pressure.

Connections to the main pressure line do not require WYE type fittings. We commonly use a TEE or saddle connection. We isolate each connection to the main line with a stainless-steel corporation valve in the same manner used for other utilities such as gas and water services.

We show both our outdoor Model DH071-93 pumps and indoor Model IH091 pumps as options in this report.

I am looking forward to working with you on this and future projects. Please contact me if you have any questions or require additional information.

Best regards,

Ed Quann

Ed Quann
F.R. Mahony & Associates

Enclosures



273 Weymouth Street • Rockland, MA 02370

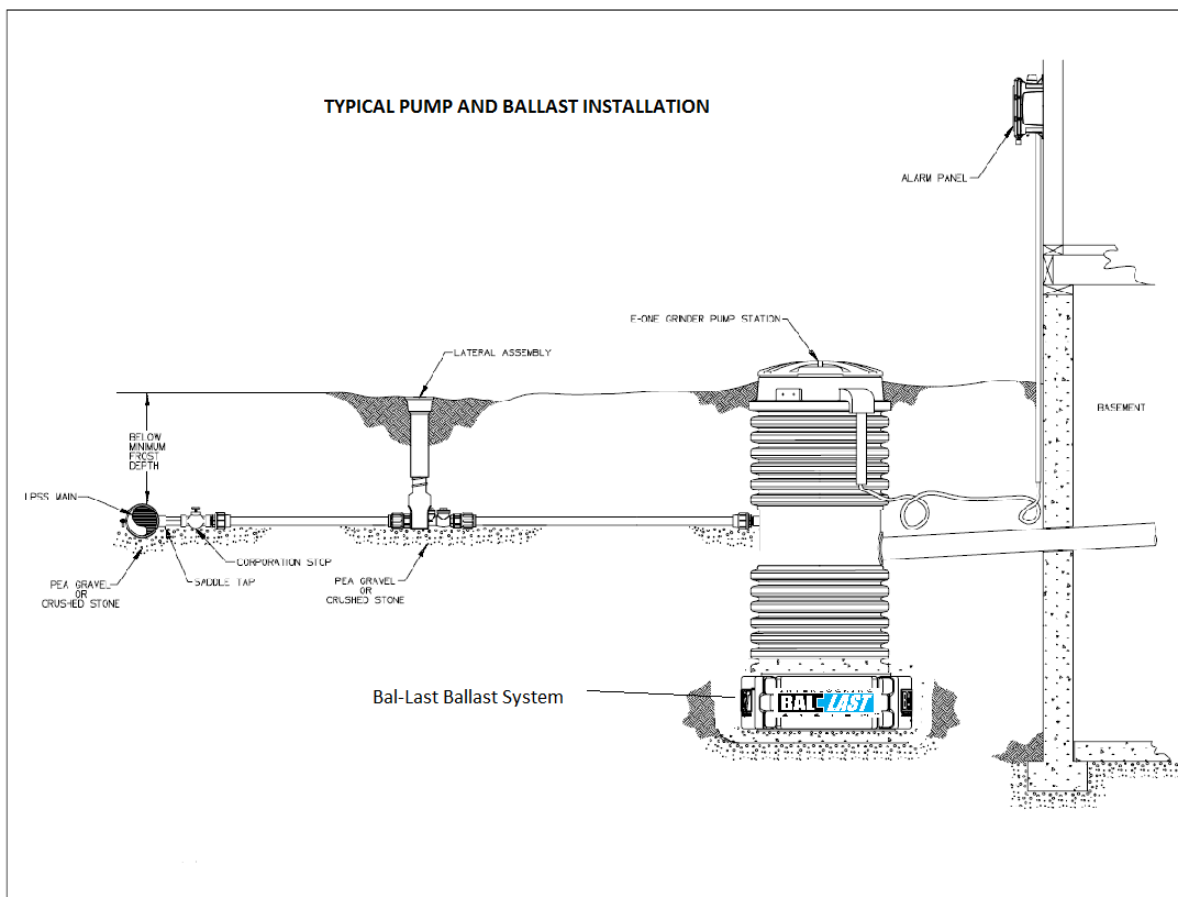
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S E R V I C E S

This image shows the typical layout of an outdoor pump unit for single-family home use. The pump unit is furnished complete, ready for installation. The installer needs to confirm the power cord length and discharge and inlet configuration. Standard products are supplied with 32 foot power supply cable. Standard inlets are 4-inch Schedule 40 Grommets (@ zero degrees) with 1-1/4 inch discharge (@ 180 degrees). Other configurations are available.



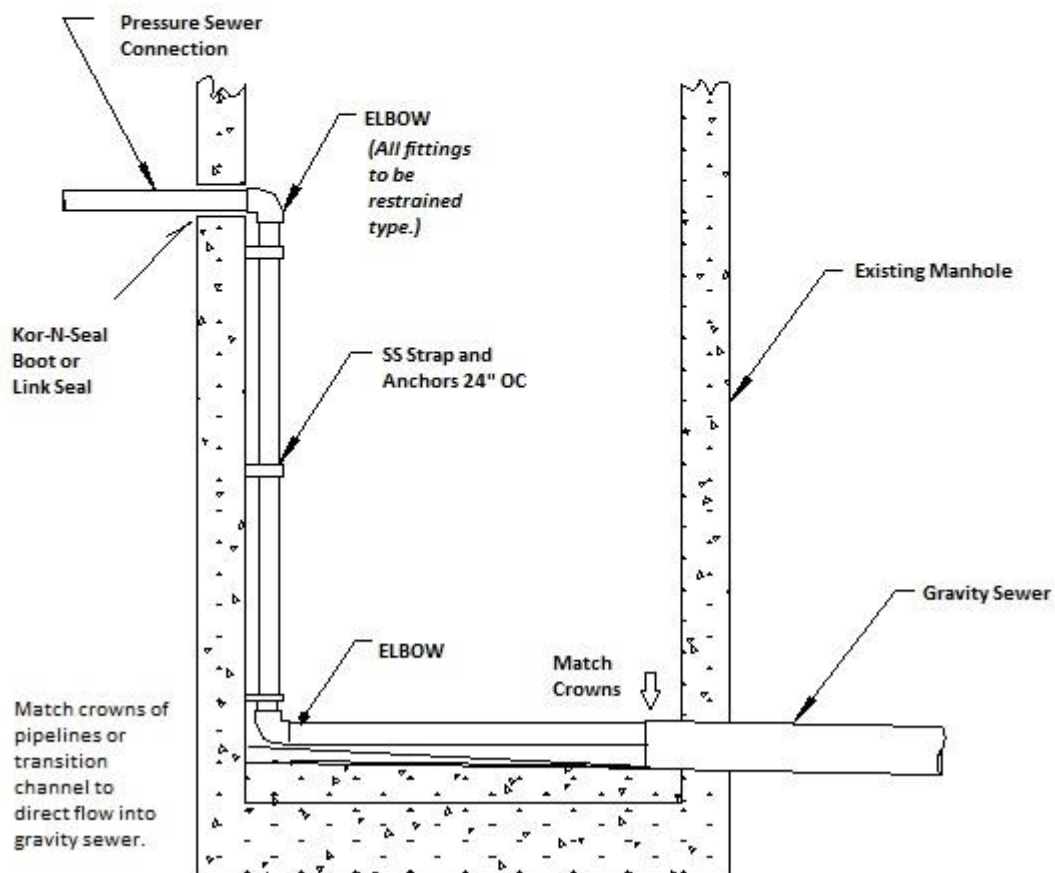
30 DuPaul Street
Southbridge, MA 01550
tel. 508.765.0051
fax 508.765.1244

41 Bayberry Hill Road
W. Townsend, MA 01474
tel. 978.597.0703
fax 978.597.0704

140 Country Walk Road
Schenectady, NY 12306
tel. 774-402-0354
fax. 518-356-3266

3906C Tower Hill Road
Wakefield, RI 02879
tel. 781-561-6555

TYPICAL INSIDE DROP DETAIL





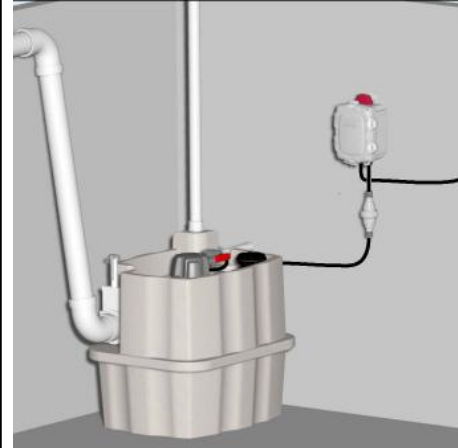
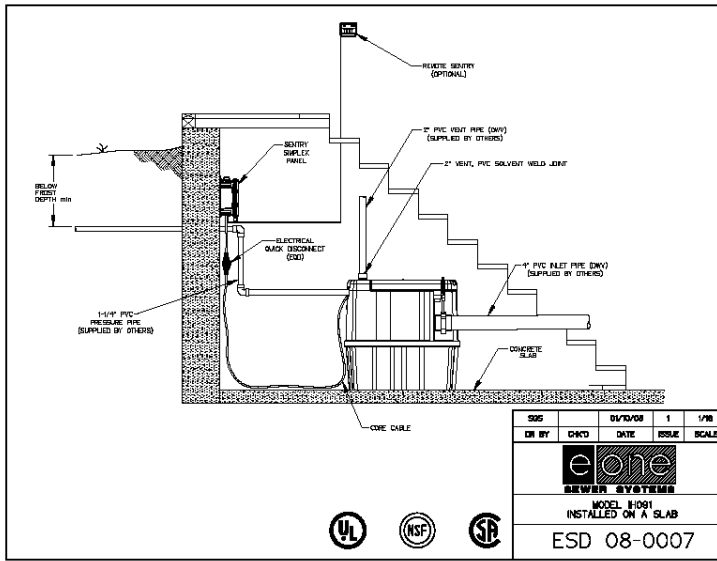
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water supply and pollution control equipment

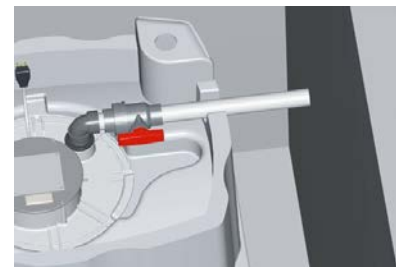
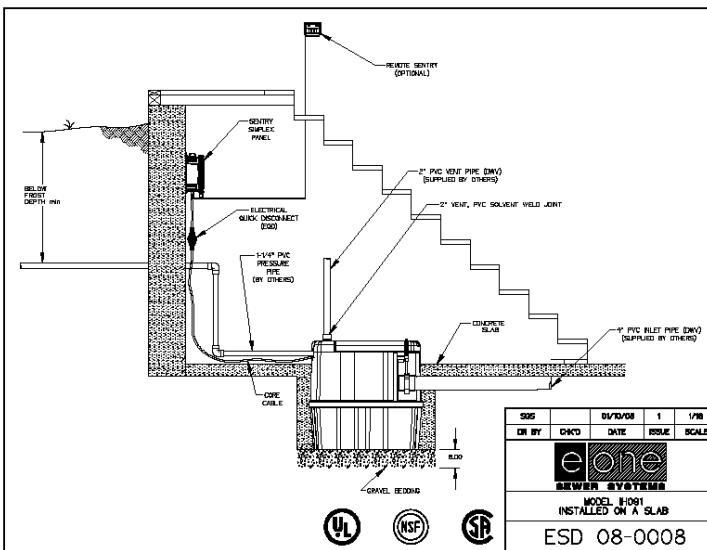
tel. 781.982.9300
fax. 781.982.1056

info@frmahony.com
www.frmahony.com

Model IH091 Indoor Pump Connection options for this station can be adapted to connect above the sill plumbing or below slab plumbing as seen in the sketches below.



EXTRE



30 DuPaul Street
Southbridge, MA 01550
tel. 508.765.0051
fax 508.765.1244

41 Bayberry Hill Road
W. Townsend, MA 01474
tel. 978.597.0703
fax 978.597.0704

140 Country Walk Road
Schenectady, NY 12306
tel. 774-402-0354
fax. 518-356-3266

3906C Tower Hill Road
Wakefield, RI 02879
tel. 781-561-6555



Standard alarm panels are the Sentry® panel mounted outside of the home as shown in the drawing (above).

Options include emergency generator connection (see photo) and Redundant alarm Remote Sentry® panel shown. Other panel configurations are available. See the partial listing of panel options below.



- Basic Panels include circuit breaker for the pump and separate breaker for the alarm. These panels include alarm light, alarm buzzer and alarm silence button. ***All F. R. Mahony panels are equipped with dry contacts to enable the connection of the Remote Sentry® (battery powered redundant alarm panel option)***
- Standard options include auto transfer generator connection shown above. This panel provides automatic power transfer without having to open the alarm panel or having to operate any manual transfer switching. This feature can be added to the basic panel or the panels offered below.
- Popular options include the “**Protection Package**” which monitors and protects the system from:
 - Pump Run Dry Condition (Pump running out of water)
 - Pump Overpressure Condition (Closed valve)
 - Brownout Condition (Main voltage under 12% of nameplate)
 - High Liquid Level
- The “**Protect Plus**” panel features offer the same items in the “Protection Package” plus the following:
 - High & Low Amperage draw by the pump
 - High & Low voltage to the pump
 - Extended Runtime by the pump (indicating wear or excessive flow) (field adjustable settings)
 - Monitoring of:
 - Real-time Pump Voltage and Current
 - Cycles & Hours (can be reset)
 - Minimum & Maximum Amperage (can be reset)
 - Minimum, Maximum, Average, and Last Run Cycle (in minutes, can be reset)

Emergency Generator Transfer Options.

The indoor pump units may be furnished with a receptacle for connection of emergency power supplies. The image to the right shows the connection receptacle on the right side of our Sentry panels. This connection may be connected by your electrician to a remote connection port outside of the home.



Wiring must be performed by a licensed electrician and conforming to NEC and local electrical codes.

The box (left) is shown in the face view (face up) and is intended to be mounted on the outside wall to permit connection of a portable generator to the receptacle on the bottom. Generator operation must always be in well ventilated areas outside of any living space.

The pump may be operated under emergency power provided the automatic transfer option is selected with the Sentry® panel. Normal pump run times are short and should not require the continuous connection of a generator. A single portable generator may be used to service several homes effectively.

S E R I E S



NEMA# L14-20R
 20 Amp
 1-120/240 VAC



Pump models may be the DH071-93 (standard height) for outdoor use or the Model IH091 indoor unit. Both products are UL listed NSF and CSA certified.

Model DH071-93 Outdoor Pump With Bal-Last™

The outdoor model is complete - ready for installation and connection to exterior plumbing and power supply. This unit is fully tested for operation and factory leak tested. No assembly is required and there are no floats to adjust. The pump is furnished complete with the alarm panel and direct bury power supply cable. Standard cable length is 32 feet with 50, 75, and 100 and up to 150 foot cables available. (See Alarm Panel options above)



Other station configurations are available for higher flow requirements. Please contact us for more information. Additional information may be found at www.eone.com

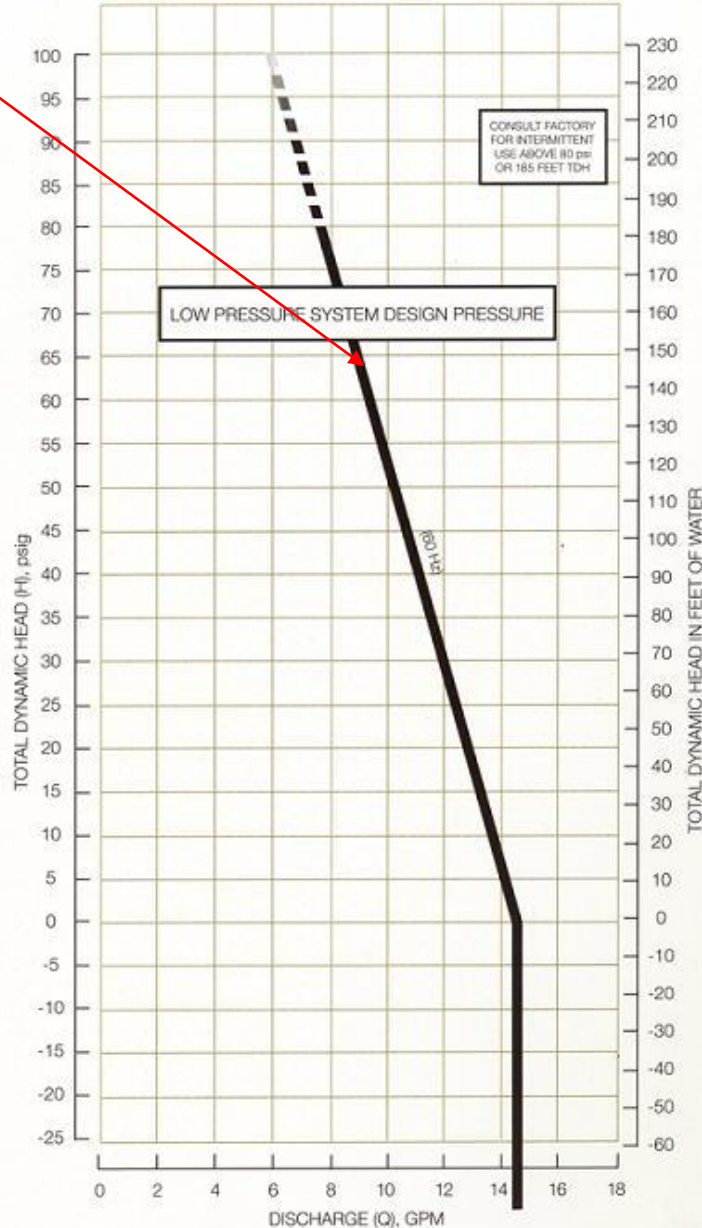
Operation Conditions

149 Feet is the highest TDH at simultaneous operating conditions with the expected number of pumps operating in each zone, or the head of an individual pump operating in a single zone condition.

Operating range of E/One pumps from 0-185 feet TDH and from 0 to -60 feet TDH.

Anti-siphon valves in E/One cores provide for negative head pumping. In common systems with negative heads of 25-30 feet or more we recommend the use of combination air/vacuum release valves as described below.

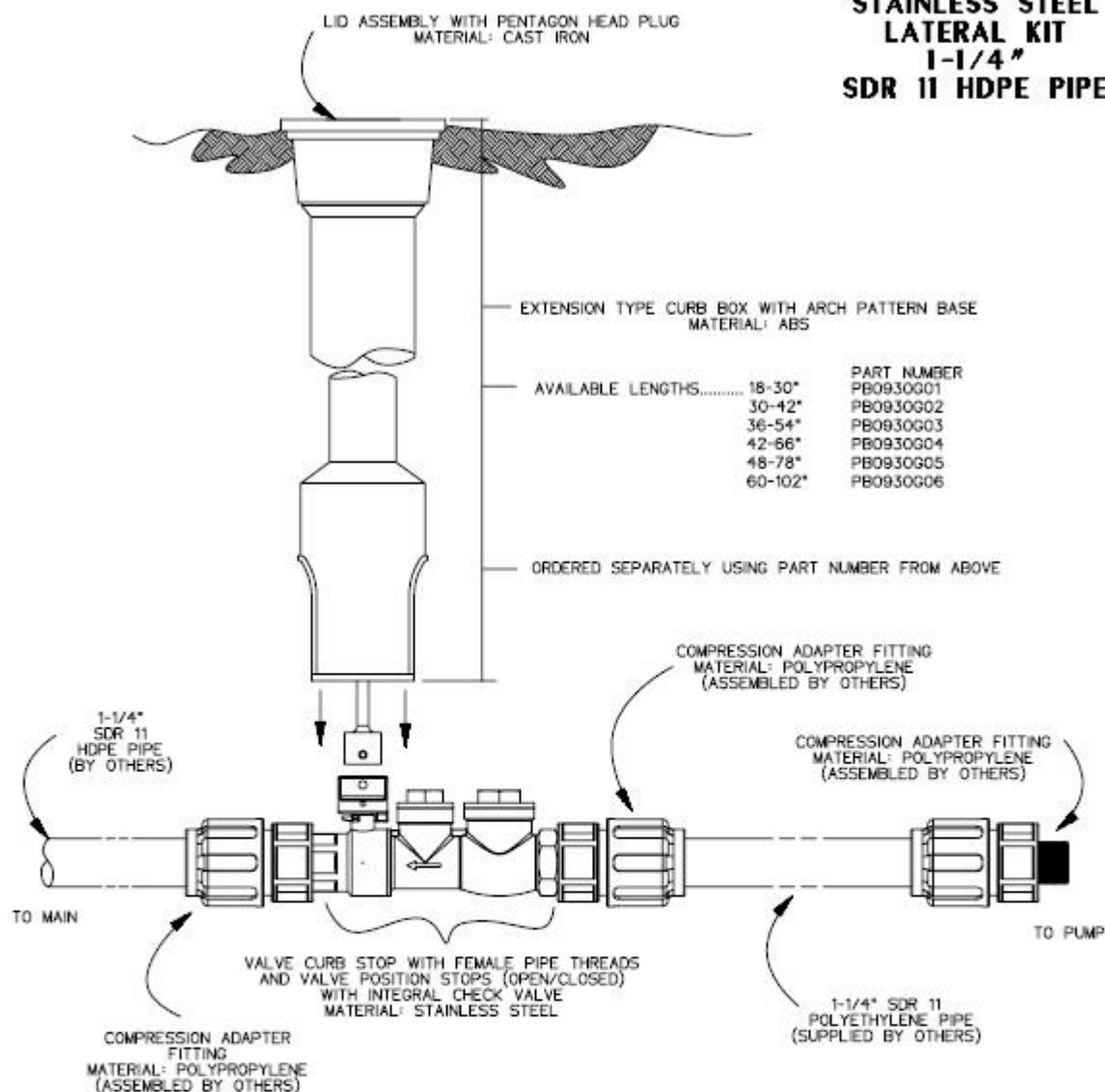
GRINDER PUMP PERFORMANCE CHARACTERISTICS



e one
 SEWER SYSTEMS

Environment One Corporation

**STAINLESS STEEL
 LATERAL KIT
 1-1/4"
 SDR 11 HDPE PIPE**



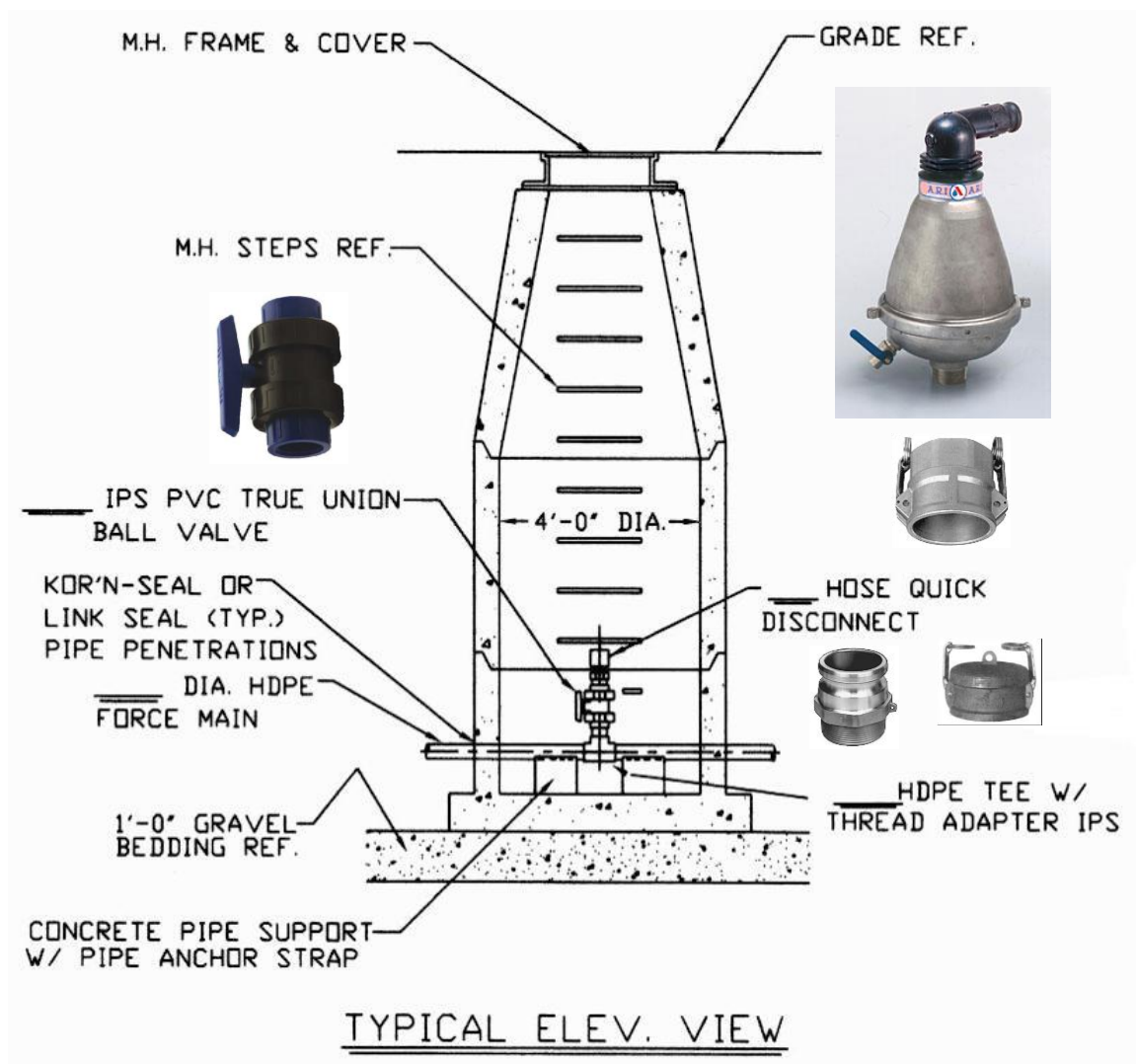
NOTES:

1. SS CURB STOP/CHECK VALVE AND FITTINGS ARE PROVIDED SEPARATELY, TO BE ASSEMBLED BY OTHERS
2. TO ASSEMBLE, APPLY A DOUBLE LAYER OF TEFLON TAPE, AND A LAYER OF PIPE DOPE (SUPPLIED BY OTHERS) TO THE THREADS ON THE PLASTIC FITTINGS AND INSTALL PER THE MANUFACTURER'S INSTRUCTIONS
3. ASSEMBLY IS TO BE PRESSURE TESTED (BY OTHERS)
4. ASSEMBLY IS TO BE USED WITH SDR11 HDPE PIPE
5. TO ORDER SS LATERAL KIT, USE PART NUMBER NC0193G01
6. CURB BOX IS TO BE ORDERED SEPARATELY, SEE ABOVE

KIT PARTS ARE NOT ASSEMBLED

SGS	DN	11/02/11	A	3/16
DR BY	CHK'D	DATE	ISSUE	SCALE
SEWER SYSTEMS				
STAINLESS STEEL LATERAL KIT 1-1/4" SDR 11 HDPE PIPE				
NA0330P02				

Typical Cleanout Detail (Optional Air/Vacuum Valve shown –right)



Cleanout detail can be modified to match typical installation needs. Inline shut offs may be added to isolate flow direction. Image shown is flow through cleanout. These structures can be terminal end of line cleanouts, or junction cleanouts as may be required. Optional air and vacuum relief valves may be added when required.

Pressure Sewer System Monitoring (Option)



We are pleased to introduce the **GRINDER PUMP GUARDIAN** system from High Tide Technologies, Inc. This remarkable system has the ability to track and monitor performance of pressure sewer system grinder pumps as well as that of main lift stations.

The **GRINDER PUMP GUARDIAN** is a cost effective solution to wirelessly monitor the health or status of individual grinder pumps. The **GPG** System consists of compact wireless modules for each grinder control panel. The system uses a neighborhood collector to transmit alarm data via satellite or cellular service to a central server and a web based application to view current status and historical information.

When any pump is in Alarm, the **GPG** System automatically notifies maintenance staff of the street address via voice or text message.

Utility personnel or service providers can view the status of every pump in their system from any Internet-connected computer, thus eliminating drive-by expenses and time.

We offer this on new projects and on septic tank replacement projects as a means to improve service reliability and to reduce service costs. This is a system that we think you may find useful for projects of this nature.

System Components

- HTT Model 1100 A/C Powered Collector available with cellular or satellite communications. Used to monitor lift stations and GPG Units.
- Collector can communicate with main lift station as well as up to 180 GPG remotes, depending on terrain.
- Guardian Remotes are A/C powered. They easily connect to alarm panel and are available in simplex and duplex models.
- Universal system works with all manufacturers' control boxes.
- Integrated system using mesh radio based remotes with wireless communication to collector.
- Collector can monitor up to 8 digital and 4 analog inputs at your lift station.
- Web Based software www.gpgview.com.

System Benefits

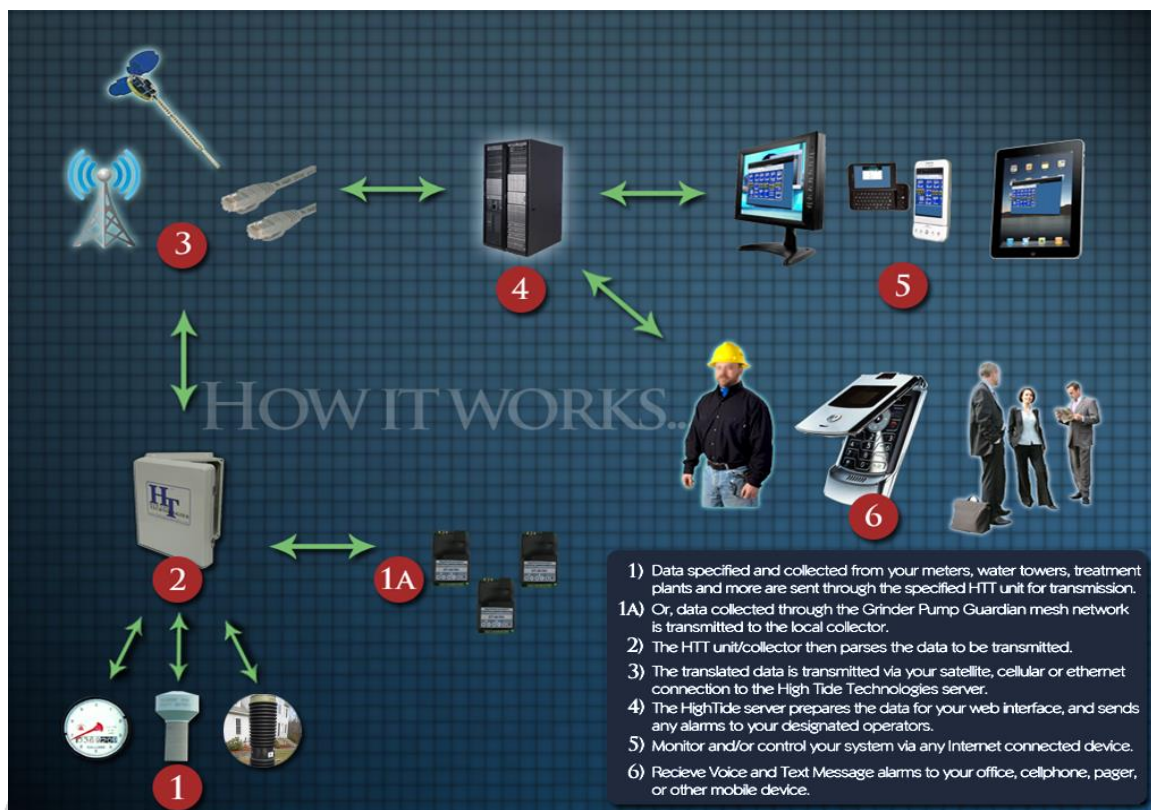
- Monitors and reports alarms on high water and power failure.
- Alerts service personnel on excessive pump starts and stops and runtimes.
- Start/Stop and runtime alerts will provide advance notice of upcoming service needs.
- Manage labor force more efficiently.
- Reduces overtime labor by allowing for preemptive service
- Make timely maintenance repairs to reduce costly pump overhauls.
- Timely notification avoids tank overflows.
- Reduce gas & vehicle use.
- No more driving around looking for “red lights”.

Reporting

- User defined 24 hour totals.
- Tailor reports and screens as desired.
- Download, print and modify reports as desired
 - Equipment run-times.
 - Equipment starts/stops.
 - Time-Stamped Alarm events to eliminate doubt when an alarm came in.
 - Store and view alarm history reports.
 - Store and view service history records.

Mapping Component

- Provides a map view of Guardian locations and unit status.
- Locate stations with GPS.
- See the status of all pumps at a glance.
- Provides a full overview of service area.



The High Tide system comes with all of the necessary hardware and equipment and is ready to install and go live! No software licenses or radio licenses are needed. HTT updates software throughout the year. It works with any grinder pump system.

The Collector can be used to monitor lift station conditions. Monitor run times; start/stop cycles, wet well levels all from your office, laptop or smartphone. We have larger collectors to add other items to your lift station monitoring. Monitor chemical feed rates, or meters that provide an output signal.

Operating and ownership costs are the lowest in the industry and provide a wide range of functionality. System managers can monitor all of their grinder pumps for pennies each month.

The cost savings of just a few avoided overtime calls will pay for most systems.

1) Data collected from your meters, water towers, treatment plants, and more are sent through the HTT unit for transmission.

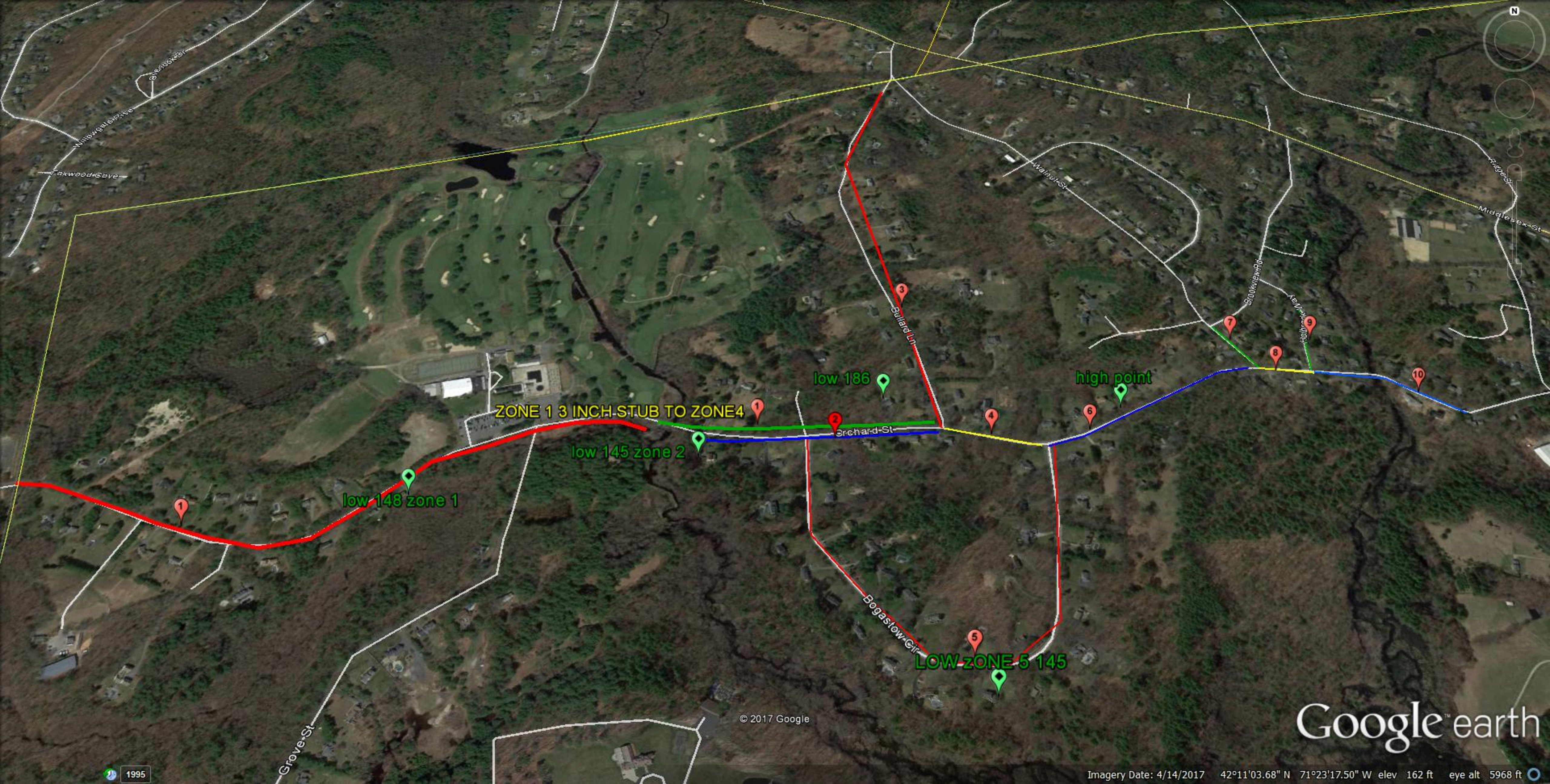
1A) Data collected through the Grinder Pump Guardian mesh network is transmitted to the local collector.

2) The HTT unit/collector then parses the data to be transmitted.

3) The translated data is transmitted via your satellite, cellular or ethernet connection to the High Tide Technologies server.

4) The High Tide server prepares the data for your web interface, and sends any alarms to your designated operators

5) Monitor and or control your system via any internet connected device.



ZONE 1 3 INCH STUB TO ZONE4

low 148 zone 1

low 145 zone 2

low 186

high point

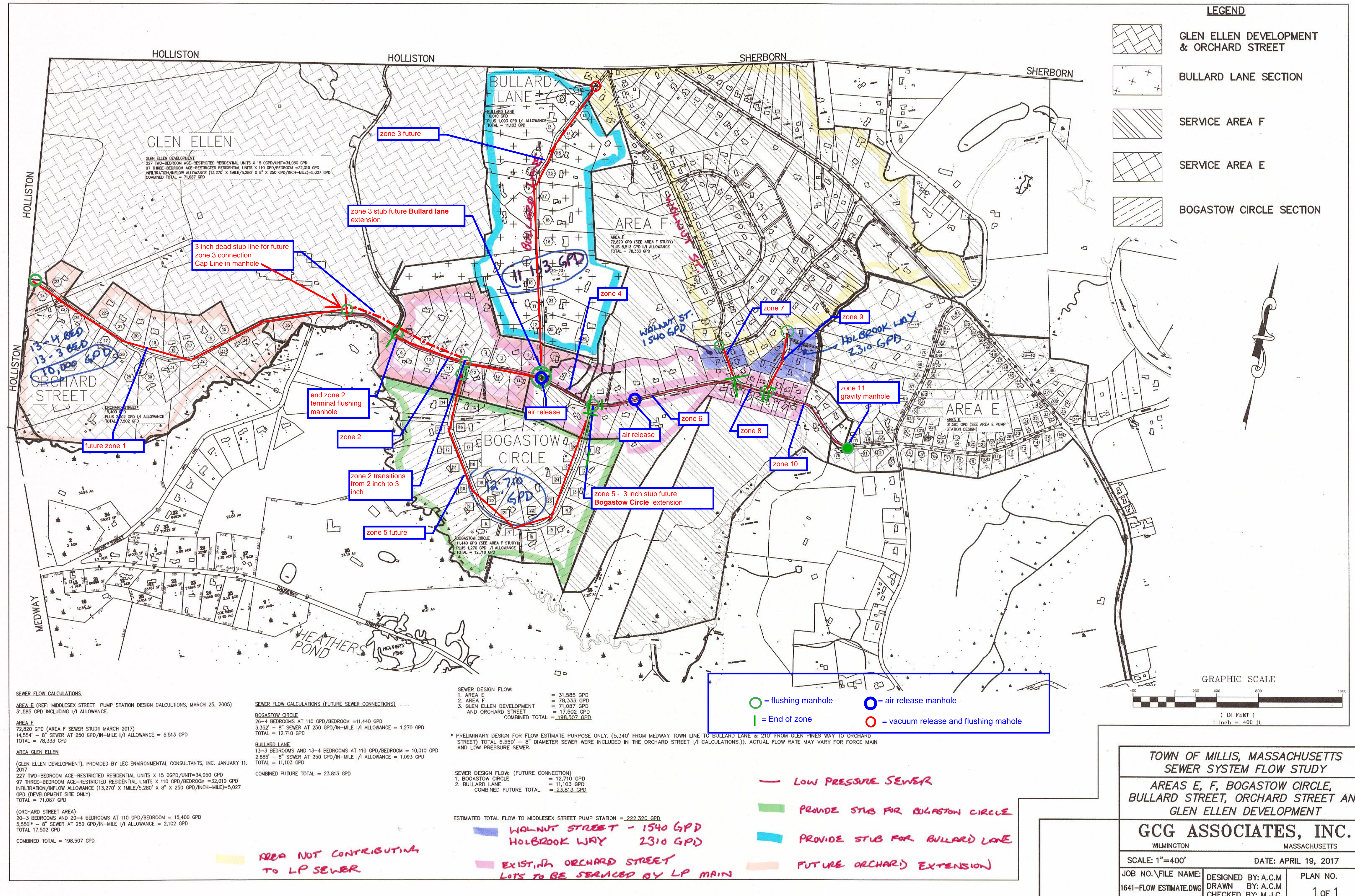
LOW-ZONE 5 145

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Google™ earth

1995

Imagery Date: 4/14/2017 42°11'03.68" N 71°23'17.50" W elev 162 ft eye alt 5968 ft





Environment One Corporation

Pressure Sewer Preliminary

Cost and Design Analysis

For

Orchard Street Area LPSS Millis, MA

Orchard street ONLY REV 1

Prepared For:
Toll Brothers New England

Westborough MA

Tel:

Fax:

Prepared By: FRMA/efq

October 13, 2017

Orchard Street Area LPSS Millis, MA
Orchard street ONLY

Prepared by : FRMA/efq

On: October 13, 2017

Notes :

Orchard street only connected

Zones not shown are 1,3,5,7 & 9 as they are future connections

Run with SDR 11 HDPE

SDR 21 PVC can also be used

Design will allow orchard street to connect with low pressure and function properly.

There will be a 2 inch line on Orchard to the intersection of Bullard Lane and the remainder will be 3 inch to discharge

Required stubs will be 3 inch for lower Orchards St., Bullard Lane and Bogastow circle and 2 inch for Walnut and Holbrook

<<<<< END OF NOTES >>>>>

PRELIMINARY PRESSURE SEWER - PIPE SIZING AND BRANCH ANALYSIS

Prepared By:

Orchard Street Area LPSS Millis, MA

FRMA/efq

Orchard street ONLY

October 13, 2017

Zone Number	Connects to Zone	Number of Pumps in Zone	Accum Pumps in Zone	Gals/day per Pump	Max Flow Per Pump (gpm)	Max Sim Ops	Max Flow (GPM)	Pipe Size (inches)	Max Velocity (FPS)	Length of Main this Zone	Friction Loss Factor (ft/100 ft)	Friction Loss This Zone	Accum Friction Loss (feet)	Max Main Elevation	Minimum Pump Elevation	Static Head (feet)	Total Dynamic Head (ft)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE										Friction loss calculations were based on a Constant for inside roughness "C" of: 150							
2.00	4.00	13	13	150	9.11	4	36.42	2.00	3.94	1,300.00	3.02	39.32	74.59	202.00	145.00	57.00	131.59
4.00	6.00	4	17	150	12.73	4	39.83	3.00	1.98	600.00	0.54	3.24	35.27	202.00	187.00	15.00	50.27
6.00	8.00	11	28	150	13.14	5	56.04	3.00	2.79	1,380.00	1.02	14.04	32.03	202.00	193.00	9.00	41.03
8.00	10.00	4	32	150	14.17	6	69.47	3.00	3.46	300.00	1.51	4.54	17.99	191.00	191.00	0.00	17.99
10.00	11.00	6	38	150	13.35	6	71.15	3.00	3.54	850.00	1.58	13.45	13.45	166.00	143.00	23.00	36.45
11.00	11.00	0	38	150	14.97	6	71.15	3.00	3.54	0.00	1.58	0.00	0.00	166.00	166.00	0.00	0.00

PRELIMINARY PRESSURE SEWER - ACCUMULATED RETENTION TIME (HR)

Prepared By:
FRMA/efq

Orchard Street Area LPSS Millis, MA

Orchard street ONLY

October 13, 2017

Zone Number	Connects to Zone	Accumulated Total of Pumps this Zone	Pipe Size (inches)	Gallons per 100 lineal feet	Length of Zone	Capacity of Zone	Average Daily Flow	Average Fluid Changes per Day	Average Retention Time (Hr)	Accumulated Retention Time (Hr)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE							Gals per Day per Dwelling		150	
2.00	4.00	13	2.00	15.40	1,300.00	200.24	1,950	9.74	2.46	8.69
4.00	6.00	17	3.00	33.47	600.00	200.80	2,550	12.70	1.89	6.23
6.00	8.00	28	3.00	33.47	1,380.00	461.84	4,200	9.09	2.64	4.34
8.00	10.00	32	3.00	33.47	300.00	100.40	4,800	47.81	0.50	1.70
10.00	11.00	38	3.00	33.47	850.00	284.46	5,700	20.04	1.20	1.20
11.00	11.00	38	3.00	33.47	0.00	0.00	5,700	1.#J	0.00	0.00



Environment One Corporation

Pressure Sewer Preliminary

Cost and Design Analysis

For

**Orchard Street Area LPSS Millis, MA
PRESENT & FUTURE ZONES REV 1**

**Prepared For:
Toll Brothers New England**

Westborough MA

Tel:

Fax:

Prepared By: FRMA/efq

October 13, 2017

**Orchard Street Area LPSS Millis, MA
PRESENT & FUTURE ZONES**

Prepared by : FRMA/efq

On: October 13, 2017

Notes :

All present and future zones connected.
Zones 1,3,5,7 & 9 are future connections

Run with SDR 11 HDPE
SDR 21 PVC can also be used

<<<< END OF NOTES >>>>

PRELIMINARY PRESSURE SEWER - PIPE SIZING AND BRANCH ANALYSIS

Prepared By:

Orchard Street Area LPSS Millis, MA

FRMA/efq

PRESENT & FUTURE ZONES

October 13, 2017

Zone Number	Connects to Zone	Number of Pumps in Zone	Accum Pumps in Zone	Gals/day per Pump	Max Flow Per Pump (gpm)	Max Sim Ops	Max Flow (GPM)	Pipe Size (inches)	Max Velocity (FPS)	Length of Main this Zone	Friction Loss Factor (ft/100 ft)	Friction Loss This Zone	Accum Friction Loss (feet)	Max Main Elevation	Minimum Pump Elevation	Static Head (feet)	Total Dynamic Head (ft)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE								Friction loss calculations were based on a Constant for inside roughness "C" of: 150									
1.00	4.00	26	26	150	8.42	5	42.08	3.00	2.10	5,300.00	0.60	31.72	91.36	202.00	148.00	54.00	145.36
2.00	4.00	13	13	150	8.24	4	32.95	2.00	3.57	1,300.00	2.51	32.66	92.30	202.00	145.00	57.00	149.30
3.00	4.00	22	22	150	10.36	5	51.82	3.00	2.58	3,000.00	0.88	26.39	86.03	202.00	186.00	16.00	102.03
4.00	6.00	4	65	150	11.60	7	64.65	3.00	3.22	600.00	1.33	7.95	59.64	202.00	187.00	15.00	74.64
5.00	6.00	26	26	150	9.04	5	45.20	3.00	2.25	3,400.00	0.68	23.23	74.92	202.00	145.00	57.00	131.92
6.00	8.00	11	102	150	12.23	8	76.07	3.00	3.79	1,380.00	1.79	24.72	51.69	202.00	193.00	9.00	60.69
7.00	8.00	6	6	150	12.99	3	38.98	2.00	4.22	350.00	3.43	12.00	38.97	191.00	186.00	5.00	43.97
8.00	10.00	4	112	150	13.75	8	78.78	3.00	3.92	300.00	1.91	5.73	26.97	191.00	191.00	0.00	26.97
9.00	10.00	6	6	150	12.27	3	36.82	2.00	3.98	580.00	3.09	17.90	39.14	168.00	147.00	21.00	60.14
10.00	11.00	6	124	150	12.99	9	91.05	3.00	4.53	850.00	2.50	21.24	21.24	166.00	143.00	23.00	44.24
11.00	11.00	0	124	150	14.97	9	91.05	3.00	4.53	0.00	2.50	0.00	0.00	166.00	166.00	0.00	0.00

PRELIMINARY PRESSURE SEWER - ACCUMULATED RETENTION TIME (HR)

Prepared By:

Orchard Street Area LPSS Millis, MA

FRMA/efq

PRESENT & FUTURE ZONES

October 13, 2017

Zone Number	Connects to Zone	Accumulated Total of Pumps this Zone	Pipe Size (inches)	Gallons per 100 lineal feet	Length of Zone	Capacity of Zone	Average Daily Flow	Average Fluid Changes per Day	Average Retention Time (Hr)	Accumulated Retention Time (Hr)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE							Gals per Day per Dwelling			150
1.00	4.00	26	3.00	33.47	5,300.00	1,773.72	3,900	2.20	10.92	12.64
2.00	4.00	13	2.00	15.40	1,300.00	200.24	1,950	9.74	2.46	4.19
3.00	4.00	22	3.00	33.47	3,000.00	1,003.99	3,300	3.29	7.30	9.03
4.00	6.00	65	3.00	33.47	600.00	200.80	9,750	48.56	0.49	1.73
5.00	6.00	26	3.00	33.47	3,400.00	1,137.86	3,900	3.43	7.00	8.24
6.00	8.00	102	3.00	33.47	1,380.00	461.84	15,300	33.13	0.72	1.23
7.00	8.00	6	2.00	15.40	350.00	53.91	900	16.69	1.44	1.95
8.00	10.00	112	3.00	33.47	300.00	100.40	16,800	167.33	0.14	0.51
9.00	10.00	6	2.00	15.40	580.00	89.34	900	10.07	2.38	2.75
10.00	11.00	124	3.00	33.47	850.00	284.46	18,600	65.39	0.37	0.37
11.00	11.00	124	3.00	33.47	0.00	0.00	18,600	1.#J	0.00	0.00