

GCG ASSOCIATES, INC.

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December 31, 2012

Mr. Charles Aspinwall
Town Administrator
Town of Millis
900 Main Street
Millis, MA

RE: Sewage Pump Station Evaluation

Dear Mr. Aspinwall:

GCG Associates, Inc. has conducted an evaluation of the existing sewage pump stations owned and maintained by the town of Millis Department of Public Works. The five (5) pump stations evaluated are located on Water Street, Timberline Street, Norfolk Road, Dover Road and Middlesex Street. Each pump station varies in age, design and average daily sewage flow which directly affect the condition of all station components. See the following table.

Location	Year Built	Age (years)	Av. Daily Flow (gallons/day)	Pumping Rate (gallons/minute)	Pumping Hours	Overall Condition
Water St.	1985	27	120,000	900	16,100	Fair
Timberline St.	1989	23	9,000	280	2,500	Good
Norfolk Rd.	1996	16	10,000	330	2,050	Good
Dover Rd.	1999	13	5,000	120	950	Excellent
Middlesex St.	2006	6	2,000	105	325	Excellent

1. INVESTIGATIONS

GCG Associates visited each pump station and performed a visual inspection of the station components, reviewed and collected available maintenance information and discussed the conditions and known issues for each pump station with DPW personnel. The following report details the summary of our investigation and provides recommendations for repairs, improvements and for maintaining the pump stations.

Water Street Pump Station

Description

The Water Street pump station was built in 1985 and is a multi-level pump station in which the ground level building or 1st level contains the electric service, transfer switch and alarm

controls, the 2nd level below ground contains the pump electrical and SCADA controls, flow meter, discharge piping and two electric motors which separately drive the two pumps which are located further below on the 3rd level. The 3rd level contains the pumps, suction and discharge piping, check valves, vertical drive shafts connected to the second level electric motors and sump pump. The 3rd level is approximately 23 feet below the first level and the lower levels are accessed from above by a vertical steel ladder bolted to the station walls through an opening in the 1st and 2nd level floors.

The pumps are self-priming - centrifugal design with suction piping connected to the exterior concrete wet well or holding tank at the bottom. The level of the wastewater entering the wet well is maintained above the suction piping during pumping cycles to allow constant repriming of the pumps and to prevent air from entering the system. The wastewater is then pumped uphill through a 10" diameter force main piping which is buried along Water, Union and Curve Streets and discharges into the gravity sewer system located at the intersection of Exchange Street and Curve Street. Emergency electrical power is provided by a 75 kilowatt – diesel generator and above ground storage tank which is located outside the pump station building.

Field Inspection and Photos

STATION NAME: Water Street Wastewater Pump Station

DATE: 8/27/2012

YEAR BUILT: 1985 TYPE: Constant head-flooded suction lift-multilevel pump station

SITE & BUILDING

- Exterior: The building consists of textured masonry with aluminum trim in good shape. The rolled rubber roof is in fair shape with some seams lifting requiring patching-no leaks. Downspout disconnected from gutter and should be reattached.
- Interior: Top floor and walls in good shape, 2nd floor walls in good shape, but floor in poor shape should be retiled; bottom floor and walls in good shape but due to numerous pump leaks should be cleaned, disinfected and repainted. Also recommend that drip pans and piping under pumps and valving be cleaned and to direct leaks directly to the sump pump. Heating/Ventilation system not working properly and should be repaired.
- Concrete slab: Slab over wet well and supporting generator in good shape with minor spalling observed.
- Asphalt: None
- Grounds: Pea Stone perimeter provides adequate surface drainage toward the parking lot, Concrete retaining wall in good shape with one area behind the building spalling and requiring patching.

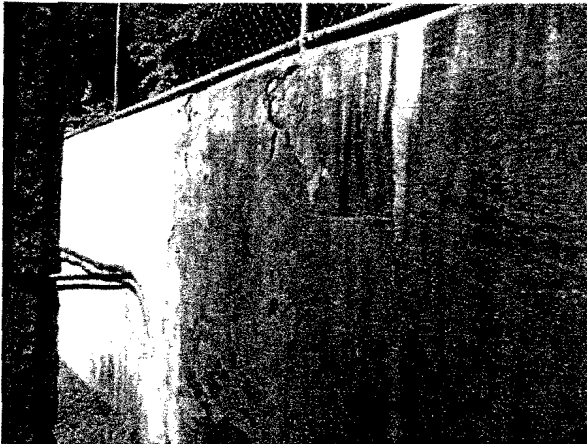
- Fencing and gate: Fencing in good shape with new roller gate providing access to the wet well for cleaning.



Building



Building Roof



Spalling Concrete Wall

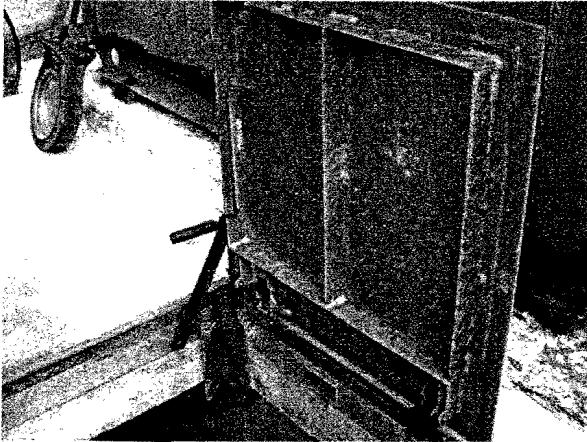


Fence Roller Gate

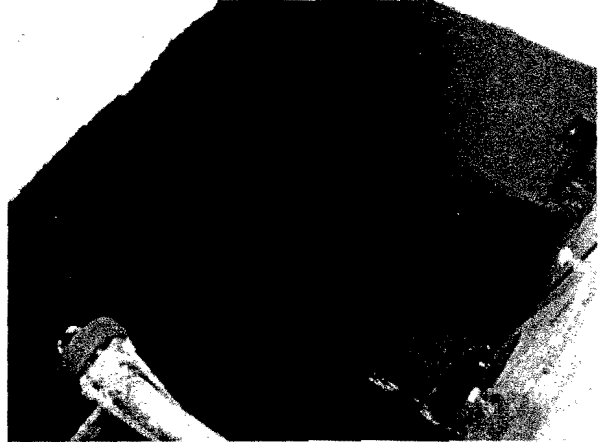
WET WELL

- Interior: The concrete walls of the wet well are in good shape with little signs of deterioration or groundwater leaks. The ventilator should be repaired for use during confined space entry. The platform and ladder system is unsafe and should be replaced. All abandoned wiring, conduit, valves, etc. should be removed as they are deteriorated and may fall into pump suction lines and cause damage to the pumps.
- Grease/floatables buildup: Some buildup 1" to 3" thick, but not excessive for this station volume. Cleaning and additives are definitively managing the severe grease problems observed in the past.
- Interior pipe penetrations: All interior connections are sealed and there are no visible groundwater leaks.

- Interior piping: Suction lines not visible.
- Aluminum hatch: Hatch in good shape but lift assist system rotted away and should be replaced.
- Level control system: Replaced to accommodate the digital SCADA System installed in 2009 consisting of a high and low float system with transducer level control.



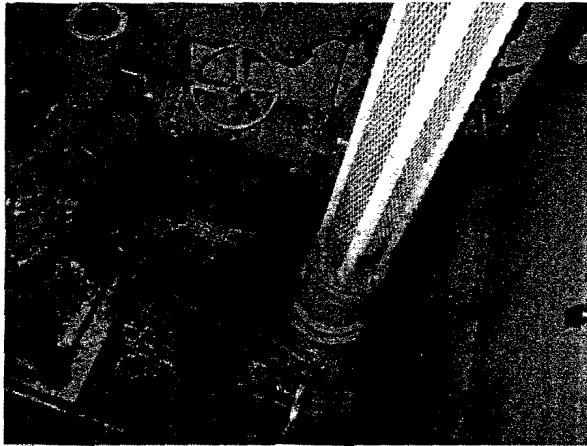
Aluminum Hatch



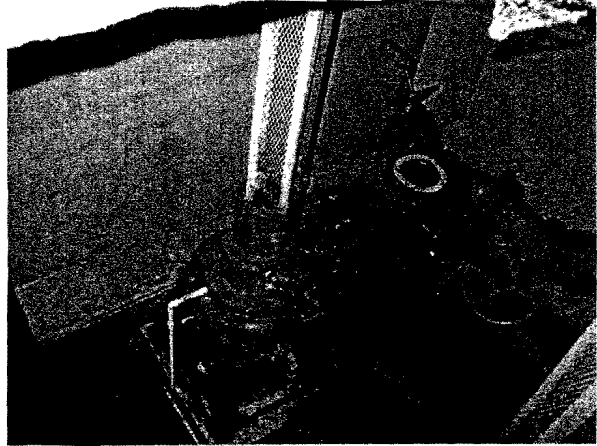
Interior of Wet Well

PUMPS

- Pump #1 and #2- Type and Size: Worthington Centrifugal Pumps located in the lower level and connected to by vertical driveshafts to 50 horsepower-460v-3ph- Westinghouse electric motors located on the second level.
- Pump #1 - Metered Flow Rate and Hours: 840-900 gpm, 16,019 hours
- Pump #2 - Metered Flow Rate and Hours: 840-900 gpm, 16,250 hours
- Pump #1 Condition: Good condition, but mechanical seal leaking severely. Pumping rate seems to be reasonable. Pump was rebuilt and 8" knife valve replaced in 2002. New style-mechanical - pump seal, check valve and driveshaft u-joints rebuilt and motor starter installed in 2004.
- Pump #1 Piping/Valving: No leaks observed and all functioning normally .
- Pump #2 Condition: Good condition. No leaks and pumping rate seems to be reasonable. Pump rebuilt and new style-mechanical pump seal and check valve installed in 2004. Pump rebuilt, mechanical seals replaced and driveshaft u-joints rebuilt in 2012.
- Pump #2 Piping/Valving: No leaks observed and all functioning normally



3rd level Pump #1/Valving



Pump #2/Valving



2nd level-Electric Motors and Discharge Piping



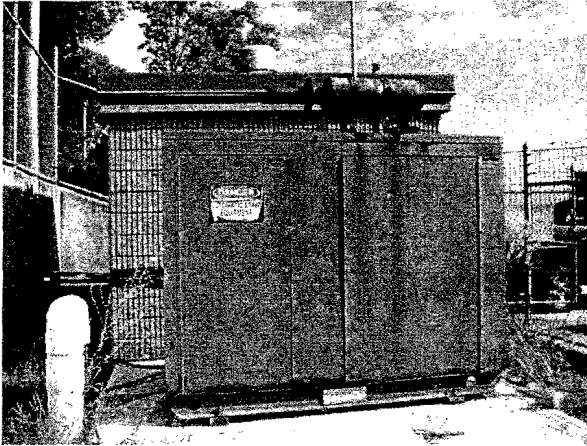
Pump Control Panel

CONTROL PANEL/COMPONENTS

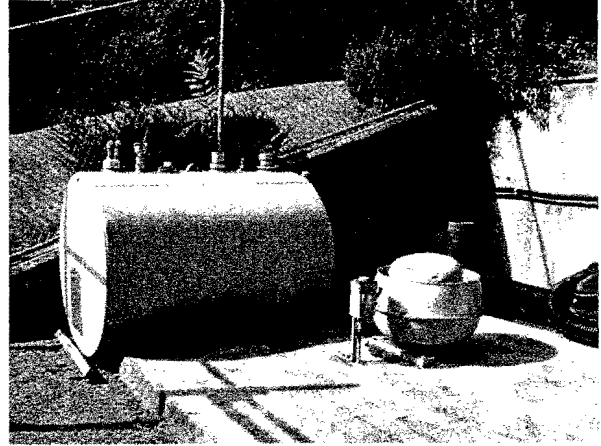
- Flow meter and motor starter replaced in 2004. No major repair history. In 2009 a SCADA monitoring system and level control system were installed. The original station alarm system was incorporated into the SCADA system. There were false alarms indicated by SCADA system during inspection.

STAND BY GENERATOR

- Generator: 150KW - 277/480 - 3 phase - Diesel generator with 1065 hours and manufactured by Consolidated Power and serviced bi-annually. Above ground diesel storage tank installed around 2005.
- Condition: Exterior enclosure beginning to rust and could use repainting. New battery and charger installed during last servicing. Overall appears to be in good shape. Transfer switch located in pump station in good shape.



Generator



Fuel Tank

ADDITIONAL COMMENTS

- Safety and air quality concerns within the station due to multi-level below ground access design by vertical ladder and lower level heating/ventilation system.



SERVICE PROVIDERS

- Pumps: Williamson New England Electric Motor Service Corp.
- Standby Generator: Power Up Generator Service, Inc.
- SCADA System: Woodward and Curran
- Instrumentation/Calibration: R E Erickson Company Inc.
- Electrical: Walco Service Company

OPERATIONS & MAINTENANCE MANUALS

- O&M manuals: None available

Condition

Overall, the Water Street pump station is in fair condition. The station is 27 years old and the major station components are nearing the end of their service life due to high demand and usage. Each pump has approximately 16,100 hours of run time and the pumps are pumping an average of 120,000 gallons per day of wastewater. This is more than six times as many hours and 10 times the flow seen at the other stations. Over the last 10 years the town has replaced or rebuilt many of these components. The rebuilt components usually never last as long as new replacement components and often repairs are performed on an emergency basis which is costly as compared to planned component replacement.

The pump manufacturer is no longer in business and exact pump replacement is not an option. Pump # 2 was rebuilt recently rebuilt for a second time in 8 years and pump #1 is now ready to be rebuilt for a second time in 10 years. The pump #2 was removed and brought to a Williamson's repair facility. Due to excessive wear of internal components, the pump required a major overhaul. The pump shaft required resleeving and boring, bearing and seal replacement; impeller trimming etc. By design, the pumps are not very serviceable in the field and require extensive work to remove from the lowest level of the station and then dismantle at a repair facility. The cost for this overhaul was approximately \$25,000. The pumps can only be rebuilt a limited number of times depending on the wear of the internal pump components and the sleeving and boring of components. Based upon this, our office recommends that the Town consider replacing the pumps in the near future which may require a major redesign of the pump system and/or station.

Recommended Repairs

- Building rubber roofing should be patched.
- Building downspout should be repaired.
- Heating and ventilation on all levels within the building should be inspected by a licensed technician and repaired.
- Ventilator for wet well should be repaired for confined space entry.
- Platform, ladder, abandoned conduits and valves should be removed from the wet well before failure and falling into the flow causes problems with the pumps.
- Lift assist/lock on aluminum hatch to wet well should be repaired.
- Repair the leaking seals on Pump #1. This might also be the time to rebuild again as 10 years have passed since the last rebuild. Replacing only the seals might require the removal of the pump and is recommended by Williamson, therefore a rebuild is recommended. Exact replacement of the pump is not an option because the pump manufacturer is no longer in business.
- Clean and disinfect the bottom level. Wastewater is unsanitary and contains many