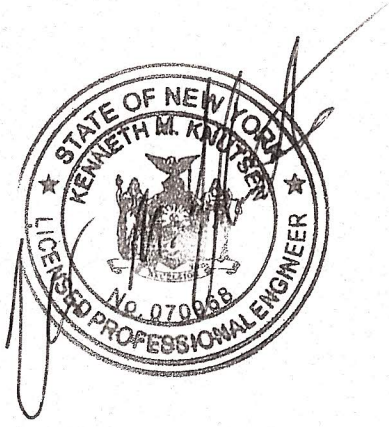
# Oquaga Lake Sewer District Collection System Improvements

## Town of Sanford, Broome County, New York

# Engineering Evaluation and Map and Plan

**December 2011**




Barton & Loguidice

# Oquaga Lake Sewer District Collection System Improvements
# Town of Sanford, Broome County, New York

## Engineering Evaluation and
## Map and Plan

December 2011

Prepared For:

Town of Sanford
91 Second Street
Deposit, New York 13754

Prepared By:

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Syracuse, New York 13220

## Table of Contents

## 1.0 Background and Authorization

The existing wastewater collection system serving the residents of the Oquaga Lake Sewer District utilizes individual septic tanks to remove the solids from the wastewater. For most users, the septic tank "graywater" is then pumped by an effluent pump through small diameter pressure sewer lines, until it discharges into a low-pressure or gravity collector sewer. There are also a limited number of gravity sewer connections where topography allows. Two (2) duplex submersible pump stations are also used to convey the graywater which is ultimately treated at the existing re-circulating sand filter Wastewater Treatment Plant (WWTP), rehabilitated in 2005. The Village of Deposit Department of Public Works (DPW) is contracted by the Town to operate and maintain the entire collection system, including septic tanks, effluent pumping stations, low-pressure and gravity mains.

This collection system was constructed in the mid-1980s and has seen no whole-sale improvements in the approximately 25 years that it has been operational. Many of the existing effluent pump stations have experienced alarm conditions and failures in recent years. According to the DPW, these failures are occurring more frequently as time progresses. Due to these concerns, the Town of Sanford retained Barton & Loguidice, P.C. (B&L) to perform an engineering and hydraulic evaluation of the collection system and to develop a recommended improvement plan for implementing capital improvements to the town-owned collection system.

## 2.0 Existing Collection System Facilities

The district's collection system collects sanitary sewage from the residences and businesses surrounding Oquaga Lake. Because of the topography which generally slopes toward the lake, approximately 120 residences require effluent pumps to pump septic tank effluent through small-diameter, low-pressure sewer lines. Depending on the location, some of these convey the graywater into gravity sewers, and others convey the graywater to one (1) of two (2) duplex submersible pump stations which then pumps the graywater to an elevation from which gravity flow is utilized. All graywater then flows to the other duplex submersible pump station where it is pumped up to the WWTP.

Minimal preventative maintenance had reportedly been performed on the collection system until the Village DPW began maintaining the system. At that point, many of the mechanical devices had begun approaching the end of their useful life. This has resulted in a larger maintenance workload, with many service calls due to equipment failure. It should be noted that the majority of the residences on the lake are seasonal or weekend vacation homes. Therefore, many of the service calls are on weekends when the DPW employees must be paid overtime to perform the necessary work, resulting in ever increasing O&M based charges to district customers.

Descriptions of the various "major" components of the collection system are summarized below, along with a description of current deficiencies which should be addressed by the district:

## 2.1 Concrete Structures

The existing septic tanks and wet wells are precast concrete structures. The wet wells generally consist of 3-foot x 3-foot square bottom sections, and 2.5-foot diameter circular riser sections. Both sections are of varying depths, but the total depth is generally in the 6-foot to 12-foot range. The square bottom sections are generally in excellent shape with no signs of infiltration or visible structural deterioration. The circular riser sections are also in good structural condition, except for leaks (infiltration) at the joints. Infiltration was observed at a few different wet wells where the grout in the joints has failed.

The existing septic tanks are in varying condition. Two (2) tanks are known to have significant infiltration through deteriorated concrete. Other tanks have been cleaned and inspected by Village DPW personnel with no noticeable infiltration or concrete deterioration, but the majority of the tanks have not been inspected thoroughly. It is assumed that many of remaining tanks are in good condition due to the relatively young age of the structures; B&L did not enter/inspect any septic tanks under this evaluation.

All of the concrete structures currently have concrete covers which slide over the riser opening. Each cover has two (2) steel loops in the top which are corroding and becoming fragile. Several of them have already broken, making it very difficult to remove the covers. Many of the riser tops are slightly below grade with poor seals, so inflow is a common occurrence during rain events. This condition increases wear-and –tear on individual pumps, district pump stations and the WWTP equipment.

## 2.2 Effluent Pump Station - Pumps

As described above in Section 1.0, septic tank effluent pumps (STEP) are used to pump the graywater from approximately 120 of the individual users to the treatment plant. Most of these STEPs were installed during the original project approximately 25 years ago. There were originally three (3) different capacity pumps installed (i.e., variable design flows for a given head pressure/elevation), depending on the specific location in the system. As these pumps have begun to fail, the DPW has selected two (2) new pump replacement options; one (1) 0.5HP and one (1) 1HP, which are being used when existing pumps fail. However, the Town was concerned that the current pressure collection system was undersized and contributing to the failure of the pumps.

To analyze the hydraulics of the system, the two (2) larger pressure collection systems on Hanson Road and Oquaga Lake Road, located along the north and east sides of the lake, respectively, were evaluated by installing a total of four (4) pressure recording devices at two (2) select locations in each system over the July 4$^{th}$ weekend, when flows are historically at their highest. The data was collected and analyzed using WaterCAD hydraulic modeling software to gain an understanding of the system pressures that the pumps were being exposed to.

It was determined that the existing small diameter force mains are not undersized. It was also determined that replacement pumps selected by the DPW were good choices based on the hydraulics of the system and individual pump curves. The DPW is replacing the existing smaller capacity pumps (labeled "Pump Type 1 and 2" on the original construction plans) with 0.5HP pumps and the larger capacity pumps (labeled "Pump Type 3" on the

construction plans) with 1.0HP pumps. Based on the hydraulic modeling, this appears to be good practice and this general process is recommended as pump replacement continues. The hydraulic modeling results are included in appendix A.

In order to replace or perform maintenance on these pumps, a DPW employee must enter the confined space of the wet well to disconnect a PVC union fitting in the discharge piping. A polypropylene rope is then used to remove the pump and part of the discharge piping from the wet well.

The discharge piping in the wet wells is glued PVC with minimal thrust restraint. The piping was originally supported by a thrust restraint bar anchored into the wet well wall, but many of these steel supports have corroded to the point of failure, allowing some of the PVC joints to pull apart during pumping. The DPW has repaired and/or replaced the PVC fittings in kind on an as-needed basis.

A more permanent, standardized method of piping and pump removal is warranted to reduce costly "reactive" O&M, and to improve operator safety through elimination of confined space entry.

## 2.3 Effluent Pump Station – Electrical Equipment

Electrical power is supplied from a dedicated breaker in the property owner's building's circuit breaker panel and fed into the STEP control panel. The control panel consists of electrical relays and an alarm circuit which triggers a red light atop the panel when the high level float triggers the alarm. Buried steel conduit carries conductors from the control panel to the wet well, with a steel junction box in the wet well.

The conductors are corroding to the point of failure, most likely due to the unsealed junction box within the wet well which allows the conductors to be exposed to corrosive hydrogen sulfide gases and high humidity within the wet well. While replacing corroded wires, the DPW has also found that the buried conduit is broken and separated in some locations, which makes it impossible to pull new conductors through.

The relays within the control panel have proven to be a common failure point. The relays are out-dated, difficult to find, and very expensive. Each new relay costs approximately $275, and the current area supplier has suggested that they may stop supplying them in the future due to lack of demand. There are three (3) relays in each panel.

## 2.4 Gravity Sewer

The existing gravity sewer manholes have been paved over on both County and Town roadways, and are not accessible at this time. This precludes conducting preventative maintenance within the gravity sewers, including occasional flushing and televising to locate pipe defects that may be infiltration sources.

The Broome County Department of Public Works has agreed to uncover the manholes that they paved over. Because access was not available, the manhole structures and gravity sewer pipes were not inspected under this evaluation and their condition is not known.

## 3.0 Proposed Collection System Improvements

There are several options to correct the deficiencies of all components of the collection system which are explained below. The Lake Association and Town Board are concerned with overall expenditures that have been taken into consideration while developing the recommended improvements. These recommendations represent the minimum level of improvements, or preventative maintenance program, required to return the collection system to a state of reliable operation, reduce annual O&M costs, improve operations staff safety, and prolong equipment and system life.

### 3.1 Concrete Structures – Wet Wells and Septic Tanks

As discussed in Section 2.0, the wet well concrete is generally in good condition and does not require significant rehabilitation. It is recommended that the Town/Village DPW identify the riser sections which are currently allowing the most infiltration through the joints and contract with a concrete repair company to rout the old grout and seal and re-grout to provide a reliable water-tight seal. After the active leaks are stopped, it is recommended that the district institute a preventative maintenance program to apply a cementitious coating uniformly to the wet well bottom and riser sections to provide a further layer of protection against infiltration and concrete corrosion.

Several septic tanks are known to have significant infiltration issues resulting from deteriorating concrete (identified/reported by Village DPW). These septic tanks should be considered for either replacement via conventional open-cut excavation, or for rehabilitation through application of an internal coating system, depending upon specific accessibility issues at each particular site which may significantly affect the costs associated with either option. The remaining septic tanks should be closely inspected when they are pumped out during the

annual septic tank pumping plan that is in place. The results of these inspections should be documented to help develop a long term plan to systematically rehabilitate or replace the septic tanks that are in poor condition.

The concrete access covers should be replaced with new manhole covers and frames that provide a better watertight seal, and are easier for the DPW to open and close. This could be done over a period of several years, in order of priority based on inflow levels and state of deterioration. New covers should consider potential for vehicle loads (i.e., H-20 load rating).

## 3.2 Effluent Pump Station - Pumps

The majority of the existing pumps have been in use for approximately 25 years, and are beginning to reach the end of their useful life. To date, several of the pumps have failed and been replaced by the DPW because it is not economical to rebuild the pumps. The pumps should ultimately be replaced in a systematic replacement process, but it is not essential to replace them until they fail as long as spare pumps are kept in stock to be available for these emergency situations. Until the district has the allowance in the budget, it is recommended to continue using the existing pumps and replace them as they fail.

To alleviate the confined space entry concerns, it is recommended that the Town retrofit the pump discharge piping to allow the pump to be removed without a person entering the wet well. A sketch illustrating the recommended configuration is included in appendix B; this configuration precludes the use of traditional, more costly rail mounted pumps in each wet well.

## 3.3 Effluent Pump Station – Electrical Equipment

While diagnosing alarm conditions over the past several years, the DPW has found that many of the problems are associated with the electrical equipment, not the pumps. To alleviate these recurring problems, it is recommended that all conductors (wires) be replaced between the control panel and the wet well, as well as the electrical components within the panel and wet well. If the buried conduit is broken or too deteriorated to allow for new conductors to be pulled, new direct bury conductors or installation of new conduit may be used. A new fully sealed NEMA 6P rated junction box should be installed inside the wet well to prevent any of the hydrogen sulfide gas from corroding the new conductors.

The existing control panels are generally in good condition, but the relays are becoming difficult to locate and have become extremely expensive. These relays should be eliminated from the system. After discussion with the Town, it is recommended that the existing control panels be salvaged and reused, wherein internal modifications would be made to replace deteriorating electrical equipment and eliminate the expensive relays. A schematic sketch of the proposed improvements is provided in appendix C as guidance to the Town.

## 3.4 Gravity Sewer

After the Broome County Department of Public Works and Town Highway Department uncover the manholes within their respective roadways, it is strongly recommended that the manholes be visually inspected for structural deterioration and infiltration, and that the gravity sewer lines be televised. It is recommended

that the Town contact Rural Water and request their assistance in televising the sewer lines once the manholes are accessible; this would be done at no cost to district customers.

Below is a summary of the recommended preventative maintenance program improvements, ranked in order of decreasing priority:

1) Full electrical conductor rehabilitation at all STEP locations;
2) New pump discharge piping at all STEP locations to eliminate confined space entry;
3) Repair/replace known failing septic tanks and wet well riser sections;
4) Inspect gravity sewer manholes and sewer lines when access is available;
5) Once the collection system is stabilized and functioning reliably, institute a long-term, multi-year preventative maintenance program for remaining issues such as pump replacement and concrete structure inspection and repair/ replacement.

## 4.0 Estimated User Costs and Project Financing

Several scenarios and improvement options were considered throughout the evaluation process, as described in Section 3.0. After several meetings and discussions, it was determined that the Town desired to focus the current work on the most essential improvements to keep the system functional, and then address the remaining deficiencies with a multi-year preventative O&M program. A cost summary for the recommended improvements is included in appendix D. The estimated cost of the recommended improvements is approximately $232,000.

To fund these improvements, the Town is proposing a special assessment to cover the cost of the recommended improvements. Currently, each single-family home, or equivalent dwelling unit (EDU) is charged $350/year for debt retirement on the Oquaga Lake WWTP project, and an additional $175 semi-annually for Operation and Maintenance (O&M) expenses. These O&M expenses cover the district expenses for both collection and treatment.

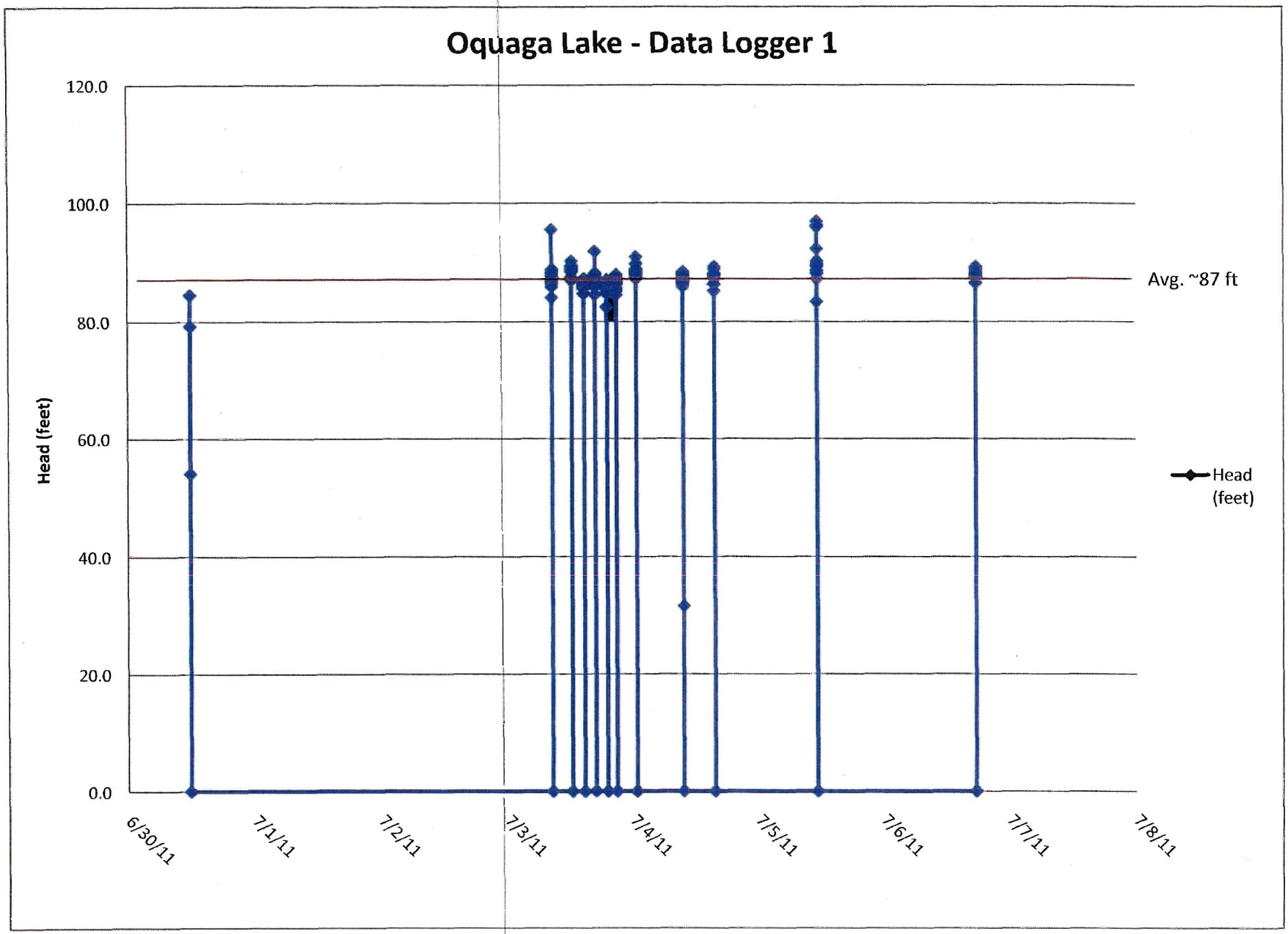
It is proposed that a special assessment of $350 per EDU be assessed for the next three (3) years to pay for the immediate preventative maintenance expenses that have been deemed necessary for achieving reliable operation of the collection system. Scott's Family Resort will be charged a flat rate of $8,200 per year for the same three (3) years. This flat rate is based upon the number of individual houses and cottages on their property which equate to approximately 23.5 EDUs. If additional work is required, the annual special assessment of $350 per EDU, and $8,200 for Scott's Family Resort, will continue for the following one (1) or two (2) years to ensure sufficient funds to complete all of the necessary improvements.

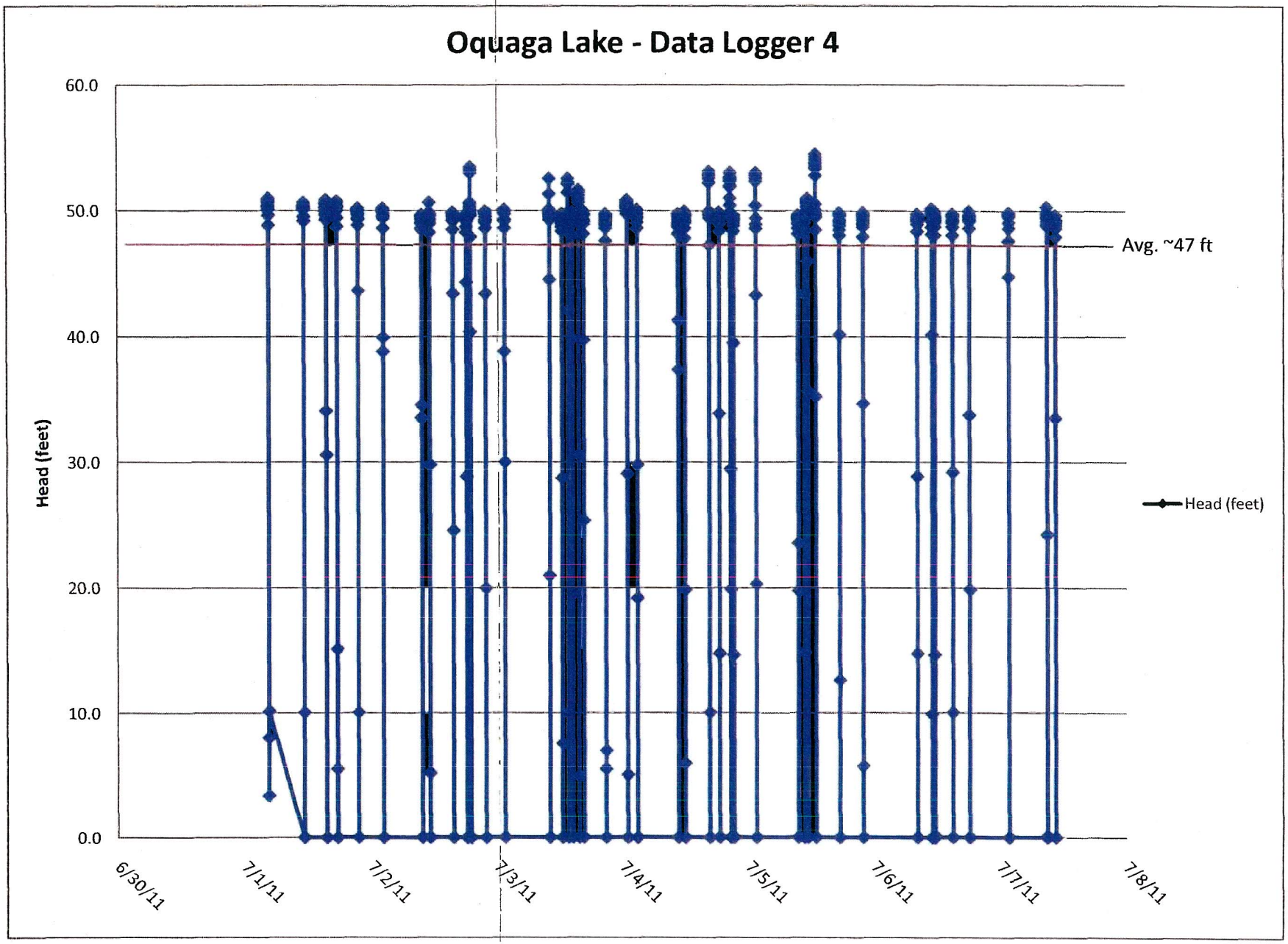
Levying this special assessment will raise a total of $175,800 over the initial period of three (3) years for the recommended program, and up to $293,000 if the special assessment is continued through the full five (5) year period. The Oquaga Lake Sewer District also carries a capital reserve fund balance of approximately $90,000 which is available if needed. When the recommended program is complete, the district's O&M budget should be re-analyzed to ensure that it will be structured to allow for continued maintenance for sustaining the rest of the collection system infrastructure.

## 5.0 Recommended Steps to Proceed

It is recommended that this Engineering Evaluation and Map and Plan be presented to the NYS Department of Environmental Conservation (NYSDEC) for review/approval. It is also recommended that the information contained herein be presented to the property owners of the Oquaga Lake Sewer District during the public informational meeting. Following the public informational meeting, if the Board decides that the project is in the public interest, the Board should then proceed with the capital improvement in accordance with Article 12, Section 202-b of New York State Town Law and applicable provisions of General Municipal Law and the Town of Sanford procurement law, respectively. The Town's attorney should be consulted for compliance with these State and local requirements, and for resolutions to be adopted by the Town Board for assessing the proposed special assessment to district users in 2012.

# Appendix A
# Hydraulic Modeling Results


Oquaga Lake - Data Logger 1
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Head (feet)
6/30/11
7/1/11
7/2/11
7/3/11
7/4/11
7/5/11
7/6/11
7/7/11
7/8/11
Avg. ~87 ft
Head (feet)


Oquaga Lake - Data Logger 4
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Head (feet)
Avg. ~47 ft
Head (feet)
6/30/11
7/1/11
7/2/11
7/3/11
7/4/11
7/5/11
7/6/11
7/7/11
7/8/11

Oquaga Lake Road System
Existing Pumps

# Series STEP-DS

Performance Curve
.5 & 1HP, 3450RPM, 60Hz

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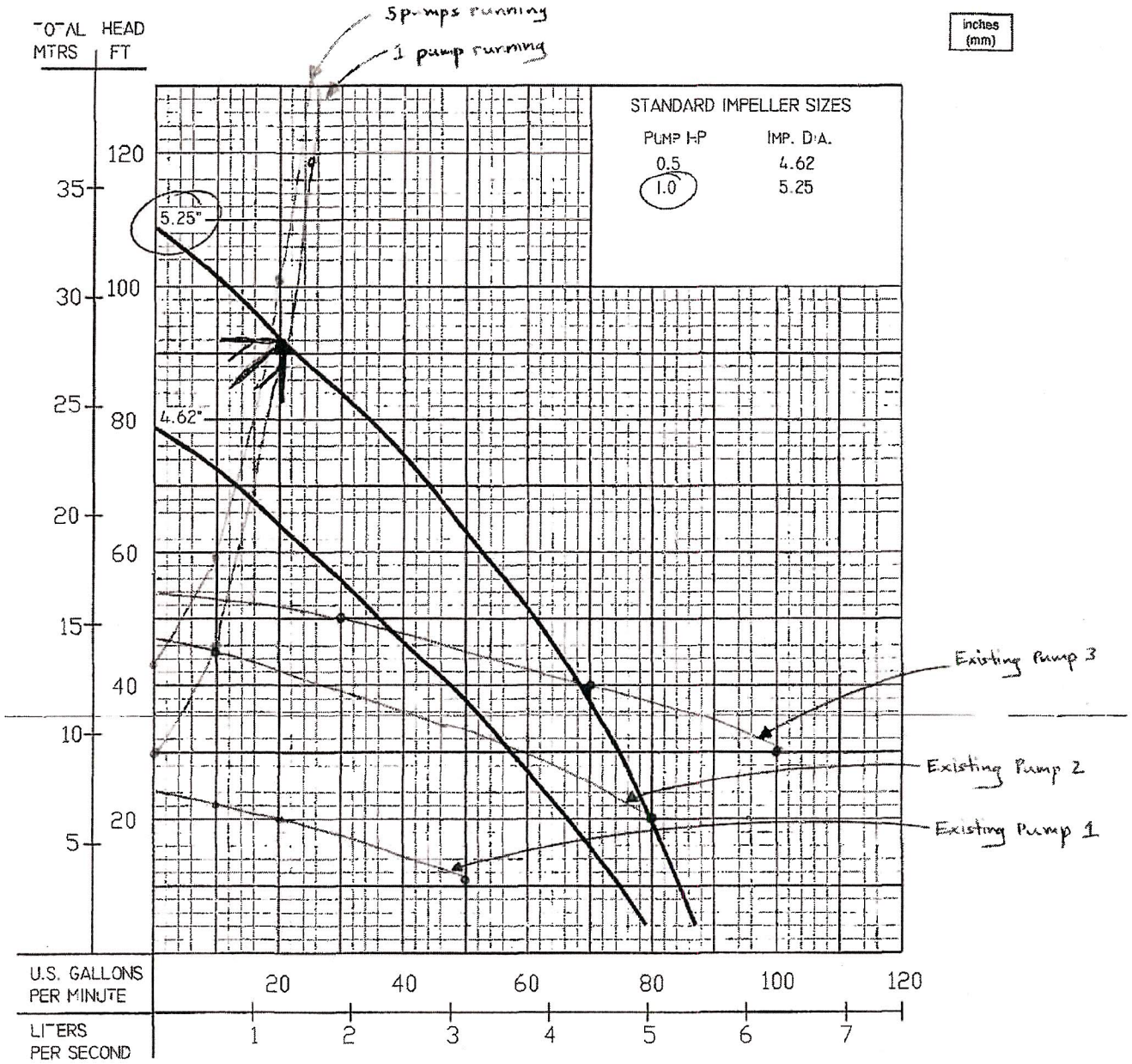
***Submersible Effluent Pumps***




Testing is performed with water, specific gravity 1.0 @ 68° D> &. @\'* mf cpdsgpqk _wt_pwncpdmpk _l ac



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Oquaga Lake Road System

Proposed pumps

# Series STEP-DS

Performance Curve

.5 & 1HP, 3450RPM, 60Hz

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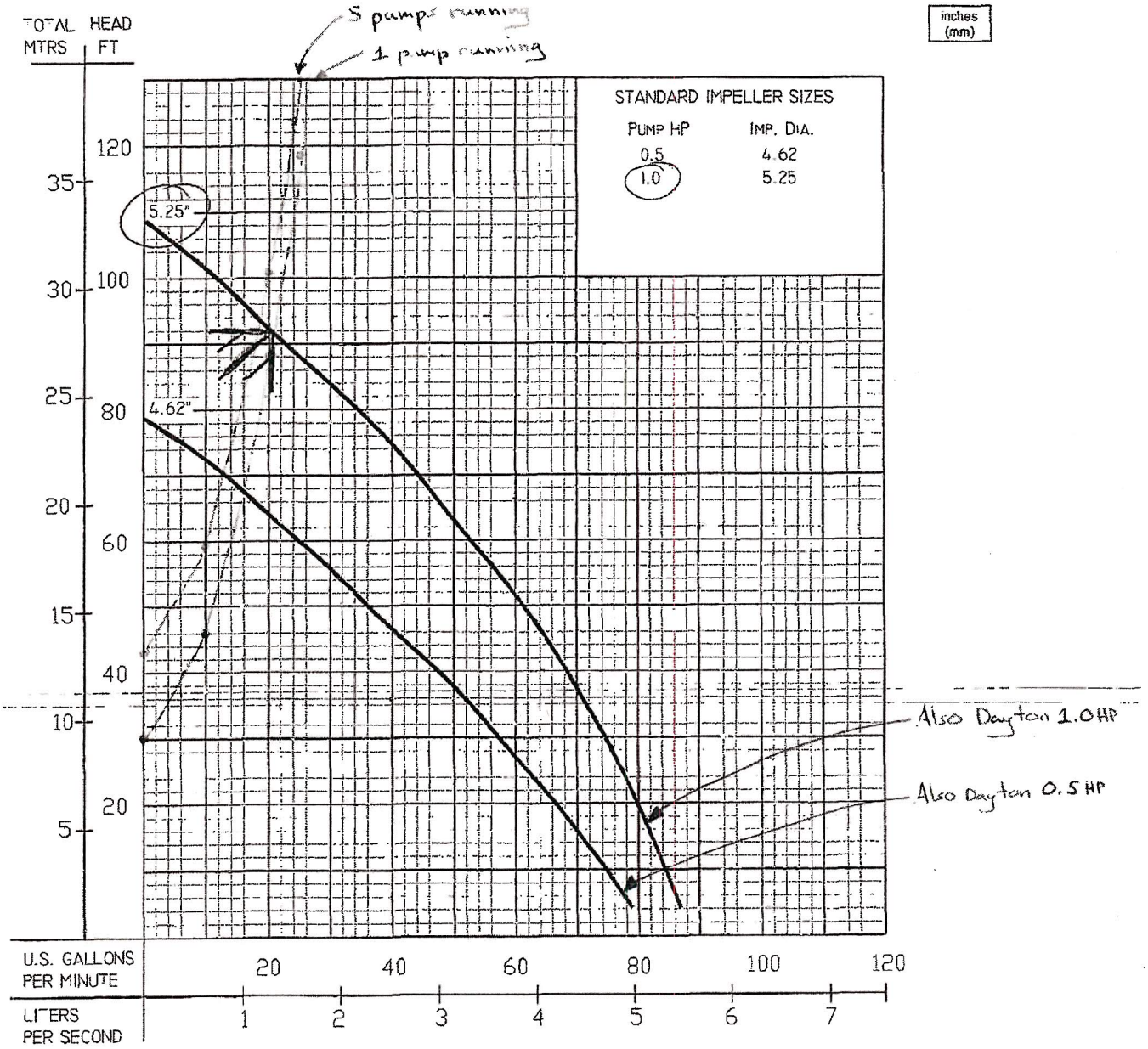
## *Submersible Effluent Pumps*




Testing is performed with water, specific gravity 1.0 @ 68° D> &0. @\'* mrf cpdsgpqk _wt_pwncpdmpk _] ac



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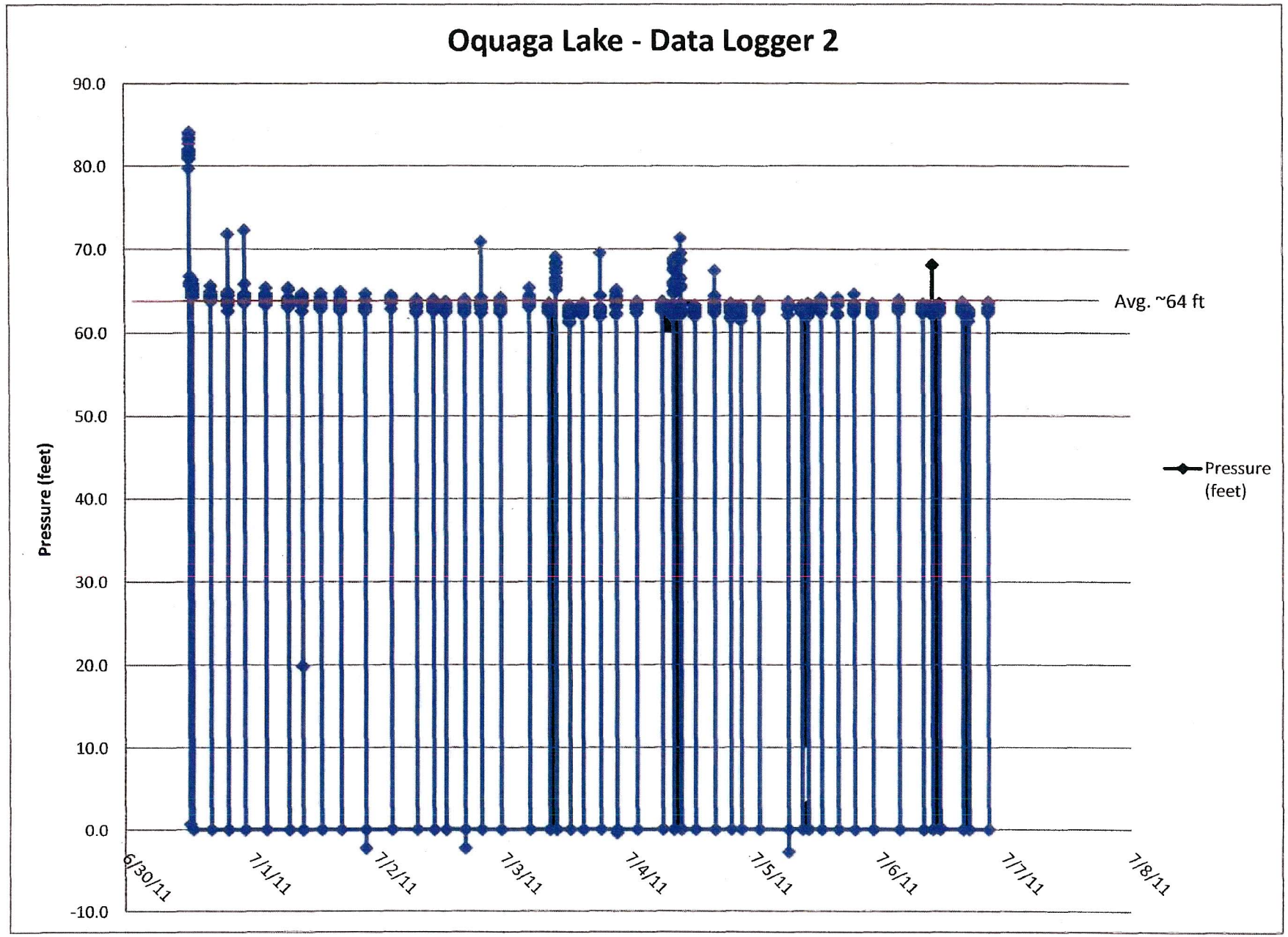
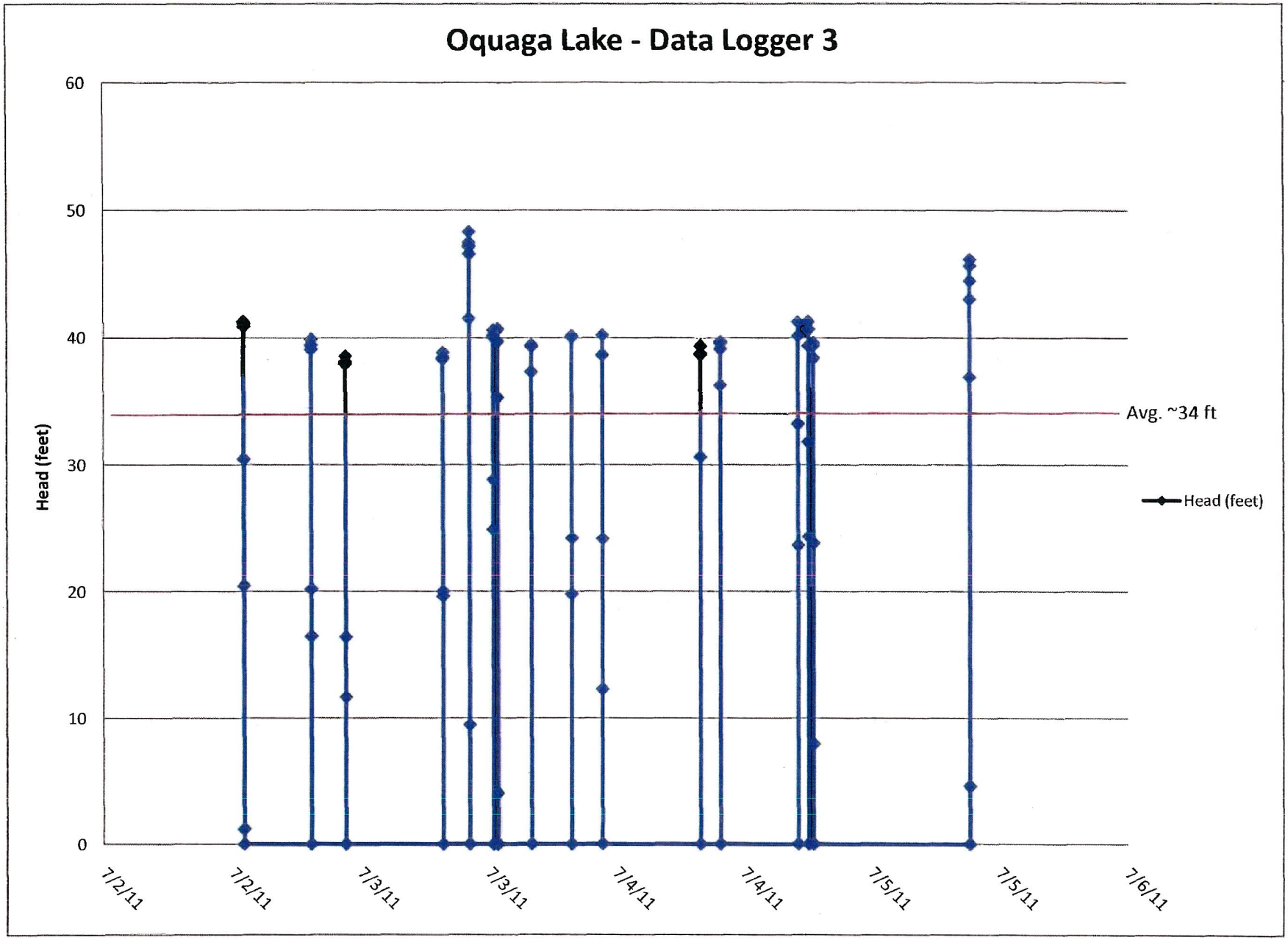

Oquaga Lake - Data Logger 2
Pressure (feet)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
6/30/11
7/1/11
7/2/11
7/3/11
7/4/11
7/5/11
7/6/11
7/7/11
7/8/11
Avg. ~64 ft
Pressure (feet)


Oquaga Lake - Data Logger 3
Head (feet)
60
50
40
30
20
10
0
7/2/11
7/2/11
7/3/11
7/3/11
7/4/11
7/4/11
7/5/11
7/5/11
7/6/11
Avg. ~34 ft
Head (feet)

Hanson Road System
Existing Pumps

# Series STEP-DS

Performance Curve
.5 & 1HP, 3450RPM, 60Hz

**BARNES®**
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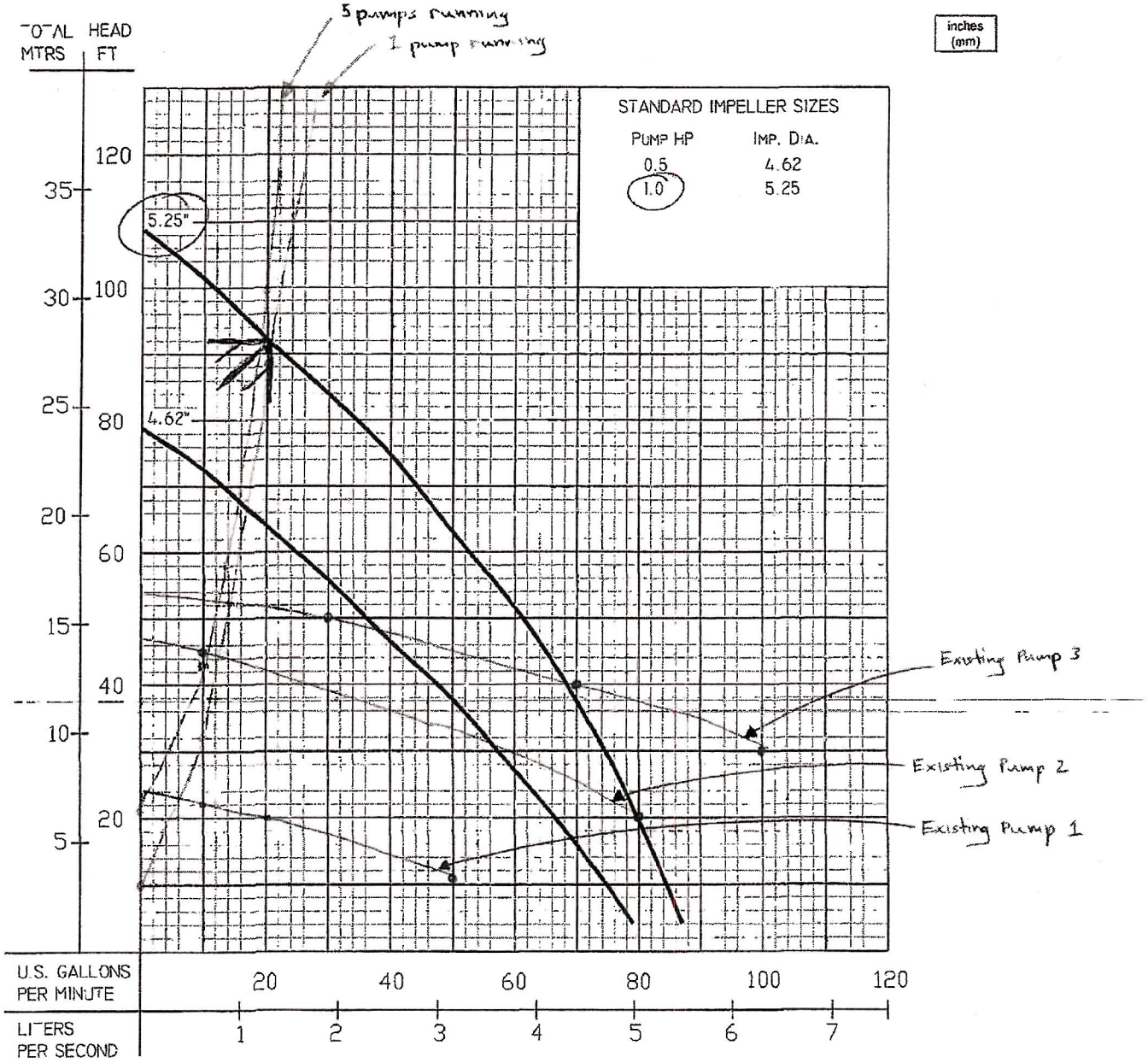
## *Submersible Effluent Pumps*




Testing is performed with water, specific gravity 1.0 @ 68° D> 80. @* mf cpdsgpqk _wt _pwncpdmpk _l ac

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Hanson Road System
Proposed Pumps

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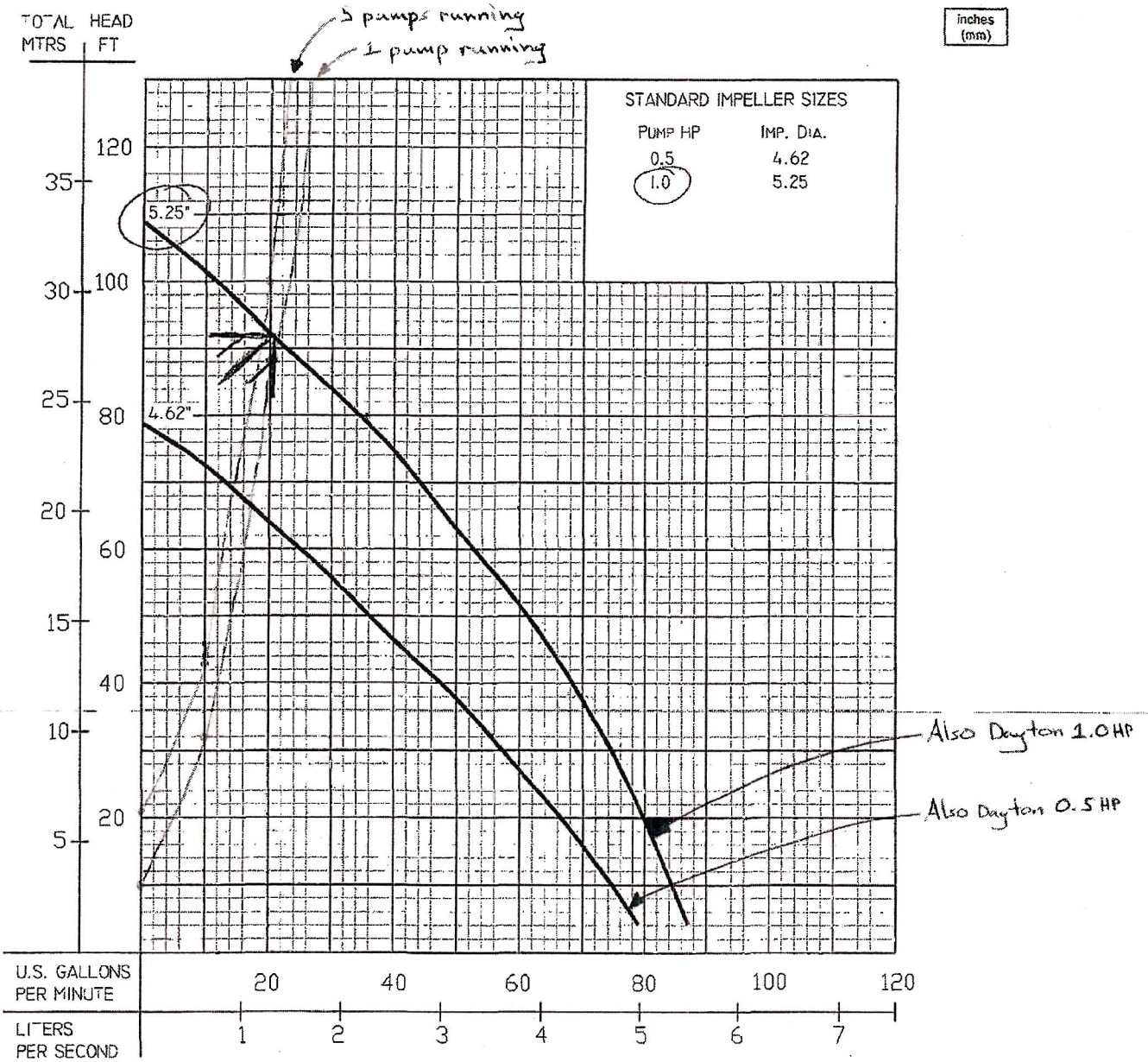


Testing is performed with water, specific gravity 1.0 @ 68° D> &. @A'* mf cpdsdpqk _wt_pwncpdmpk _l ac



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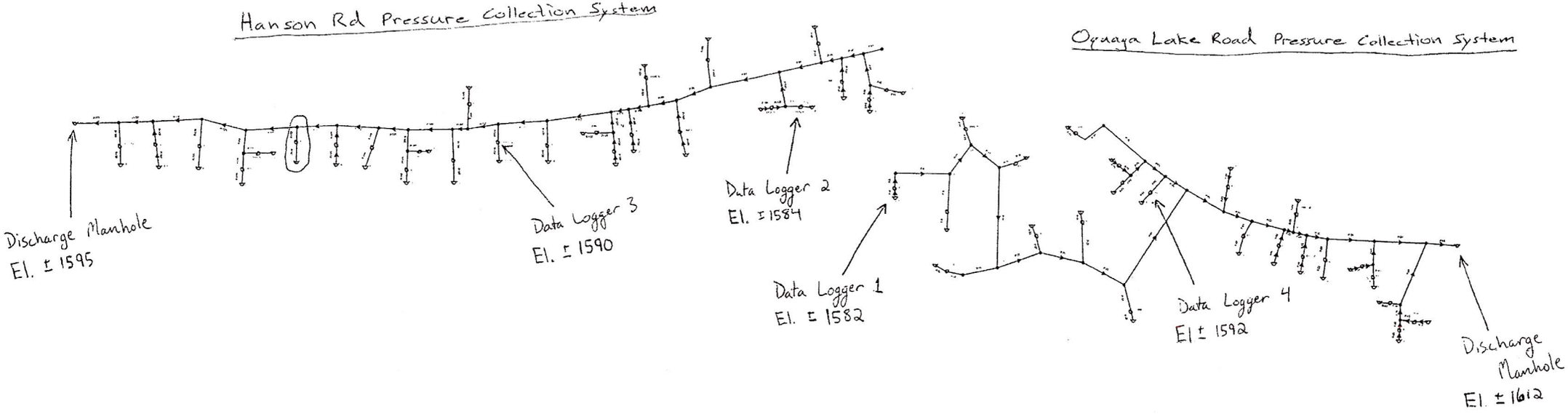
# Appendix B

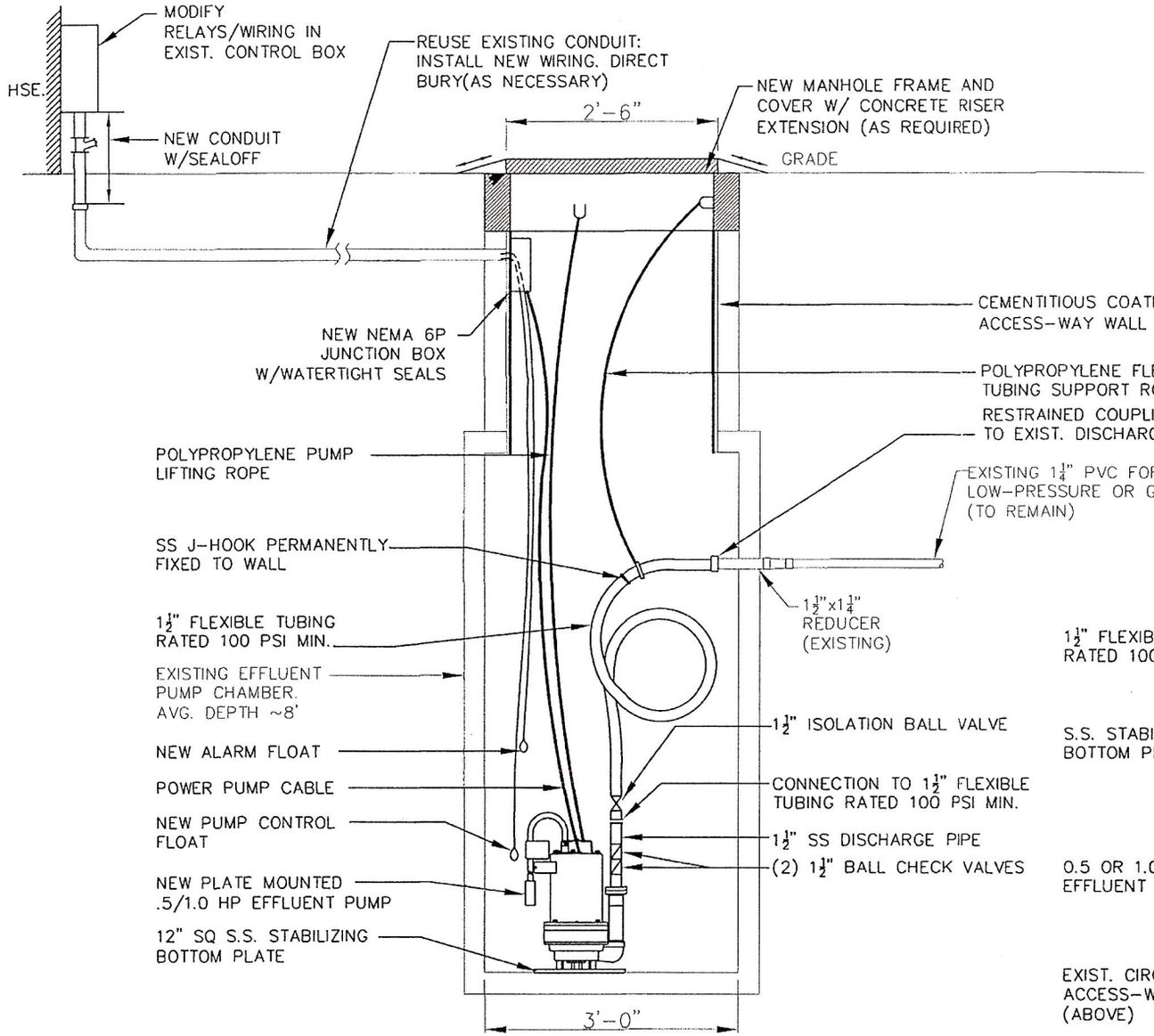
# STEP Discharge Piping Schematic

**Scenario: Base**

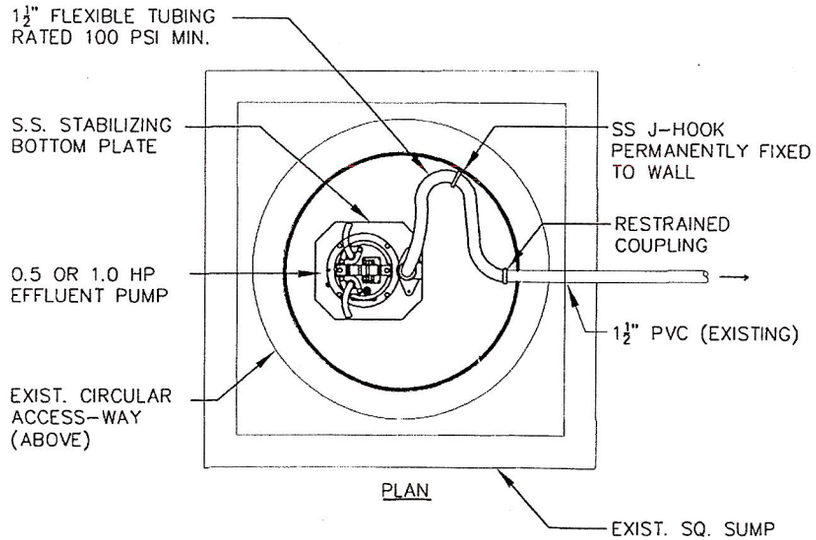


# Appendix C

# Recommended Electrical Improvements Schematic




SECTION




PLAN

NOTE:

FLEXIBLE TUBING SHALL BE OF SUFFICIENT LENGTH TO ALLOW THE PUMP TO BE REMOVED AND SET ON THE SURFACE BEFORE BEING DISCONNECTED FROM THE SS PUMP DISCHARGE PIPE.

PROPOSED "BASE" ELECTRICAL AND PUMP SYSTEM IMPROVEMENTS
NTS

TOWN OF SANFORD
OQUAGA LAKE SEWER DISTRICT
RESIDENTIAL EFFLUENT PUMP
STATION REHABILITATION

BROOME COUNTY, NY

TOWN OF SANFORD

Barton & Loguidice, P.C.

Date
AUGUST, 2011

Scale
AS SHOWN

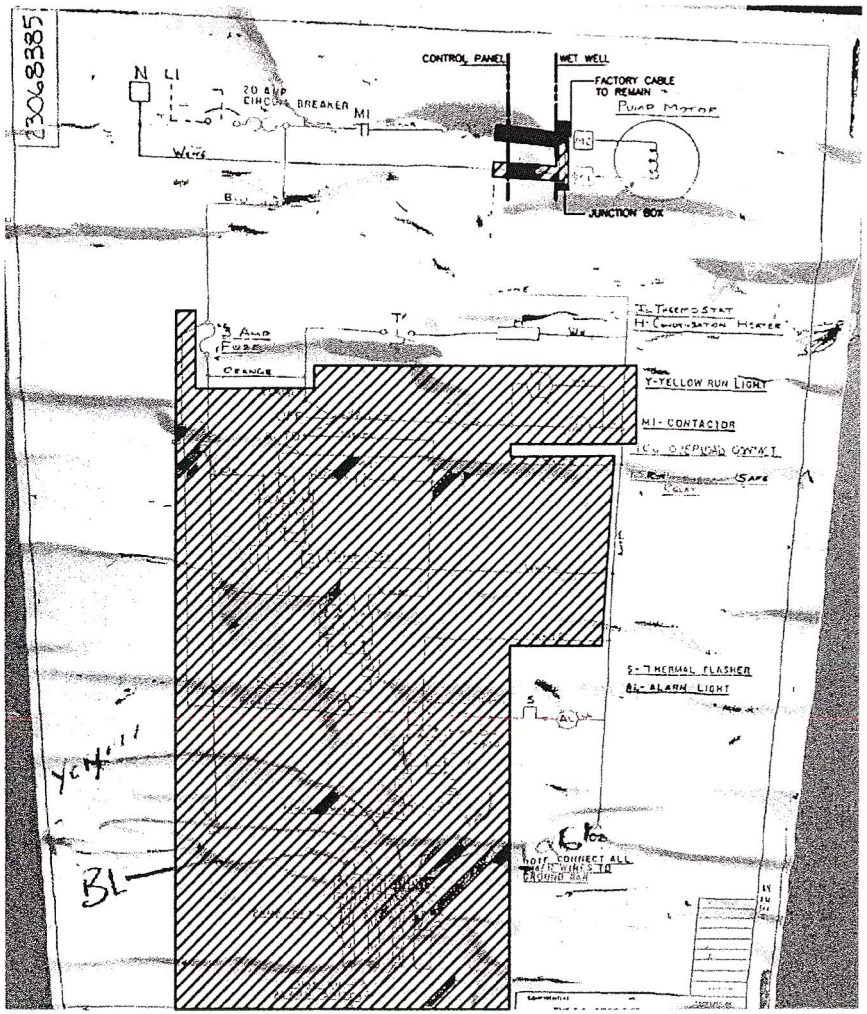
Figure Number
SK-1

Project Number
874.003

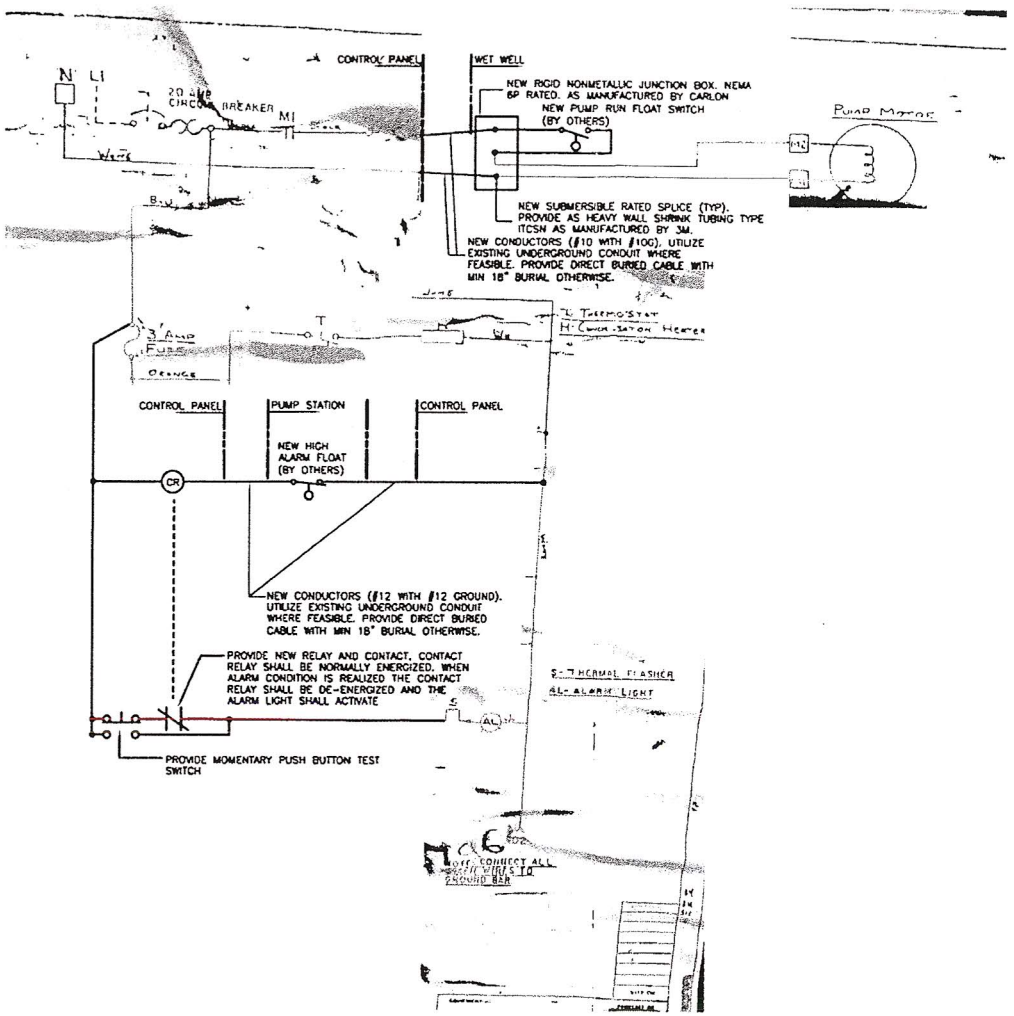
Plotted: Aug 24, 2011 - 1:15PM SYR By: bdh
I:\Shared\800\874003\Effluent Pump Chamber.dwg

# Appendix D

## Cost Estimate for Recommended Preventative Maintenance Program




ELECTRICAL DEMOLITION




ELECTRICAL NEW WORK

| Summary of Recommended Preventative Maintenance Program | | | |
|---|---|---|---|
| **Electrical Improvements** | **Estimated Quantity** | **Estimated Unit Cost** | **Estimated Total Cost** |
| Rehabilitation and Replacement of Components | 120 | $700.00* | $84,000.00 |
| | | | |
| Pump Discharge Piping | | | |
| Flexible Hose Discharge Connections | 120 | $1,050.00 | $126,000.00 |
| | | | |
| Concrete Structures - Immediate Need | | | |
| Septic Tank Replacements | 3 | $8,000.00 | $24,000.00 |
| Seal Wet Well Riser Sections | 5 | $1,200.00 | $6,000.00 |
| | | | |
| Total Cost for Recommended Preventative Maintenance Program: | | | $240,000.00 |

* This value may increase if the existing conduit is too deteriorated to be utilized.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