
**CITY OF HELENA LANDFILL
GROUNDWATER EXTRACTION SYSTEM
OPERATION AND MAINTENANCE PROCEDURES**

Prepared for:
Mr. Ryan Leland
City of Helena
City/County Building
316 North Park Ave.
Helena, MT 59623

Prepared by:
Hydrometrics, Inc.
3020 Bozeman Avenue
Helena, MT 59601

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CITY OF HELENA LANDFILL GROUNDWATER EXTRACTION SYSTEM OPERATION AND MAINTENANCE PROCEDURES

1.0 BACKGROUND INFORMATION

This report outlines the operation and maintenance procedures for the old City of Helena Landfill groundwater extraction system (GWES). As approved by the Montana Department of Environmental Quality (MDEQ), this system was installed as part of the second addendum to the Corrective Measures Assessment (Hydrometrics, 1999a) for the Helena landfill and began operation on June 12, 2000. Full details can be found in the Contract Documents and Specifications (Hydrometrics, 1999b). The GWES is located just north of the landfill boundary and south of Bill Roberts Golf Course. Figure 1 shows the location as well as all system components. The treatment system includes three extraction wells (HL-99-1, HL-99-2, and HL-99-3) which are intended to intercept tetrachloroethene (PCE) impacted groundwater migrating downgradient of the landfill. The extracted groundwater is pumped through three atomizing spray nozzles into two lined ponds located on Bill Roberts Golf Course before being incorporated into the golf course irrigation system. The system is operated as long as possible during the irrigation season, generally April through October based on weather, and extracts and treats an average of 14 million gallons of water each year.

The volatile nature of PCE allows the contaminant to easily disperse from the water into the air. The treatment of impacted groundwater is thus accomplished in three stages of system operation: atomizing spray through the discharge nozzles into the ponds, surface exposure in the retention ponds, and spray of irrigation sprinklers. In accordance with regulations, the discharged water must be treated to below detect (<0.0005 mg/L PCE) before being land applied as irrigation water on the golf course. To ensure the treatment goals have been met, the pond is sampled annually and the irrigation sprinklers monthly during system operation. All sprinkler samples to date have met the discharge requirements.

The GWES is generally maintained by Hydrometrics personnel but requires the assistance and cooperation of golf course personnel to optimize system performance. This document outlines the regular operation and maintenance procedures performed at the site and the responsible parties for each task.

2.0 SPRING STARTUP PROCEDURS

Each spring, prior to the beginning of the golf course irrigation season as determined by golf course personnel, the system must be prepared for operation. This includes calibrating the flowmeters located in the control vault for each of the extraction wells and installing the three floating fountains in the ponds.

2.1 FLOWMETER CALIBRATION PROCEDURS

Each well control vault consists of a flow control valve, flow meter, three-way flow diversion valve, and check valve as shown in Figure 2. The flowmeters are Omega FTB790 Series turbine flowmeters and need to be calibrated each spring to ensure their accuracy. The following procedures are generally performed by Hydrometrics personnel.

2.1.1 Replace Flowmeter Batteries

1. Remove the corner screws from the flowmeter display box and lift the display from the flowmeter body.
2. Remove the old batteries from the bottom of the display box. Check the battery terminals and remove any corrosion.
3. Install new batteries ensuring the positive posts are positioned correctly.
4. Make sure the O-ring is fully seated on the bottom side of the display box before replacing the display on the flowmeter body and tightening the four screws.

2.1.2 Flowmeter Calibration Procedures Using Secondary Calibrated Flowmeter:

The most accurate method to calibrate the in-line flowmeter is to use a secondary factory-calibrated flowmeter. Hydrometrics has a pre-assembled flowmeter setup along with appropriate hoses and valving to facilitate this procedure.

2.1.2.1 Supplies Required:

The following list of supplies should be assembled before going to the site:

- 1” factory-calibrated flowmeter setup
- Calibration hoses with cam lock fittings and gate valve
- Keys for manholes and electrical panels
- Flow meter batteries
- Phillips screwdriver

5-gallon bucket
Stopwatch
Calculator
Field notebook and pen
Previous year's flow rates for each well

2.1.2.2 Confirm Accuracy of Established Calibration Curve

Before calibrating the flowmeter, check to see if the previous year's calibration (either field or factory) is still accurate. The field setup for the calibration procedures is shown in Figure 3.

1. In the vault box, ensure the upstream ball valve is fully open and the 3-way valve is in the bypass position (handle facing opposite the bypass port).
2. Remove the sampling port from the cam lock located in the 3-way valve bypass port and connect the first calibration hose (without the globe valve) to the bypass port. Place the loose end as far from the valve box as possible.
3. Start the pump. (To start the pump, make sure the main power switch is in the ON position then turn the HOA switch to ON and press START button). Run the pump until the water runs clear. Turn off the pump by turning the HOA switch to OFF.
4. Place the factory-calibrated flowmeter assembly on dry, level ground a few feet from the valve box with the downstream end pointed away from the valve box. Ensure the flowmeter port is facing up and in a stable position. Avoid getting dirt in the flowmeter port or the upstream end of the pipe.
5. Place the secondary flowmeter in the flowmeter port assembly and secure with a 'U' pin.
6. Power on the secondary flowmeter and enter the appropriate correction factor (located on the side of the flowmeter port) into the flowmeter program.
7. Connect the loose end of the first calibration hose to the upstream end of the flowmeter assembly.
8. Connect the second calibration hose (with the globe valve) on the downstream end of the flowmeter assembly. Place the loose end of hose as far from valve box as possible.
9. On the primary flowmeter (located in the valve box), use either the factory calibration curve or the field calibration curve used the previous year. The "FAC" icon will be displayed if using the factory calibration curve and no icon will be displayed if using a

field calibration. On the flow meter, hold down the CALIBRATE and DISPLAY buttons simultaneously until the appropriate calibration (either “FACCAL” for the factory calibration curve or “FldCAL” for the field calibration curve) appears.

10. Turn the pump on and throttle flow through the hose using the calibration hose gate valve until the flow rate displayed on the secondary flowmeter approximates the previous year’s average flow rate for that well. Do not choose a flow rate less than 10 gpm, the primary flowmeter’s minimum flowrate requirement.
11. Confirm the relative accuracy of the secondary flowmeter factory calibration and correction factor. Place an empty 5-gallon on level ground near the loose end of the calibration hose. Simultaneously direct the hose into the bucket and start the stopwatch. Stop the stopwatch when the bucket is full. Turn off the pump by turning the HOA switch to OFF. Divide the volume by the time to fill to determine the approximate flowrate (ie., if the bucket filled in 11 seconds, flowrate = 5 gallons/11 seconds*60 seconds/min = 27 gal/min). If the flowmeter flowrate and calculated flowrate are similar, proceed with the next step of the calibration. If the flowrates are not similar, ensure the correction factor has been entered accurately and repeat this step as necessary.
12. In the field notebook, record the totalizer volume on the secondary flowmeter.
13. Zero the primary flowmeter batch totalizer by holding the DISPLAY button for 3 seconds while the Batch 2 volume is displayed.
14. Turn the pump on and start the stopwatch simultaneously. In the field notebook, record the flowrates on both flowmeters.
15. Run the pump for approximately five minutes and then simultaneously turn off the pump and stop the stopwatch. Record the final time.
16. Record the totalizer volumes on both flowmeters. Calculate the secondary flowmeter volume by subtracting the initial totalizer volume from the final totalizer volume.
17. To check the accuracy of the calibration, compare the dispensed volumes and calculate a percent difference.

$$\begin{aligned} \text{For example: Primary flowmeter volume} &= 245.8 \text{ gal} \\ - \text{Secondary flowmeter volume} &= 252.0 \text{ gal} \\ \hline &= 6.2 \text{ gal} / 252 \text{ gal} * 100\% \\ &= 2.5\% \text{ difference} \end{aligned}$$

18. The percent difference should be less than 5%. If percent difference calculated is less than 5%, the current calibration has been established as accurate and may be used during the next irrigation season to establish the volume of water removed by the groundwater extraction system. If the percent difference calculated is greater than 5%, a field calibration must be performed and used. Proceed to the Field Calibration procedures.
19. Remove the calibration hose from the bypass port and replace the sampling valve.
20. Power off the secondary flowmeter, carefully remove the “U” pin and flowmeter from the flowmeter port assembly and carefully place the flowmeter back in its box.
21. Push the main power switch to the bottom, OFF position. Unlock and open the main power box and reset the hour meter. Close and relock the power box.

2.1.2.3 Establish Field Calibration Curve

The following procedures should be performed if the factory calibration or previous year’s calibration are shown to be inaccurate. The field setup for the calibration procedures is shown in Figure 3.

1. Ensure steps 1 through 11 of the previous procedures have been performed correctly.
2. In the field notebook, record the secondary flowmeter totalizer volume.
3. On the primary flowmeter located in the valve box, press and hold the CALIBRATE and DISPLAY buttons for about 3 seconds until you see “FldCAL”. Release both buttons and you will see “dd000.0”. The display will count up while fluid is flowing through the meter.
4. Start the pump (make sure the main power switch is in the ON position then turn the HOA switch to ON and press START button) and start the stopwatch simultaneously.
5. Run the pump for approximately five minutes and then turn off the pump by turning the HOA switch to OFF and stop the stopwatch. Record the final time in the notebook.
6. Record the secondary flowmeter totalizer volume in the field notebook. Calculate the dispensed volume by subtracting the initial totalizer volume from the final totalizer volume.

7. On the primary flowmeter, set the correct volume dispensed as calculated in step 6. Pressing DISPLAY moves the flashing digit from left to right and pressing CALIBRATE changes the value from 0-9.
8. When satisfied with the value, press both the CALIBRATE and DISPLAY buttons simultaneously. "CALEnd" will be displayed and the unit will go back to normal operation, without the "FAC" (factory calibration) icon.
9. Verify the accuracy of the field calibration using procedures outlined in Section 2.1.2.2.

2.1.3 Flowmeter Calibration Procedures Using Weight Method

If a secondary calibrated flowmeter is not available, the flowmeters will need to be calibrated using the weight method. The scale house located at the Transfer Station has previously been used to weigh the truck.

2.1.3.1 Supplies Required

The following list of supplies should be assembled before going to the site:

- Truck with 275-gal bottom-draining tank
- Calibration hose with male cam lock fitting and valve
- Keys for manholes and electrical panels
- Flow meter batteries
- Phillips screwdriver
- 5-gallon bucket
- Stopwatch
- Calculator
- Field notebook and pen
- Previous year's flow rates for each well

2.1.3.2 Confirm Accuracy of Factory Calibration Curve

1. Fill the tank past the drain valve with clean water. With the truck level, open the tank drain valve and leave the valve open until the flow slows significantly, but has not stopped. Use a permanent marker to mark the tank at this level. Weigh truck with the mostly empty tank in the back at the weigh station. Make a note of equipment and personnel in the truck (hoses, etc.) as this is the truck tare weight.

2. In the vault box, ensure the upstream ball valve is fully open and the 3-way valve is in the bypass position (handle facing opposite the bypass port).
3. Remove the sampling port from the female cam lock located in the 3-way valve bypass port and connect the male cam lock on the end of calibration hose. Place the loose end of the calibration as far from the valve box as possible. Open the valve on the calibration hose, place the hose on the ground, and start the pump. (To start the pump, make sure the main power switch is in the ON position then turn the HOA switch to ON). Run the pump until the water runs clear.
4. Use the calibration curve, either the factory values or the field calibration curve, used the previous year. The “FAC” icon will be displayed if using the factory calibration curve and no icon will be displayed if using a field calibration. On the flowmeter, hold down the CALIBRATE and DISPLAY buttons simultaneously until the appropriate calibration (either “FACCAL” for the factory calibration curve or “FldCAL” for the field calibration curve) appears.
5. Press and release the DISPLAY button until FLOWRATE appears. Throttle flow through the system using the calibration hose valve until the flow rate approximates the previous year’s average flow rate for that well. Do not choose a flow rate less than 10 gpm, the flowmeter’s minimum flowrate requirement.
6. Raise the end of the hose to near the tank entrance and close the upstream ball valve located in the valve box. **DO NOT TURN OFF THE PUMP.**
7. Place the hose in the tank. Press the DISPLAY button until “TOTAL 2” is displayed. Hold down the DISPLAY button for three seconds until the display changes to zeros.
8. Open the upstream ball valve while simultaneously starting the stopwatch. The display will begin to totalize the volume dispensed.
9. Run the pump until the tank is full (or at least five minutes has elapsed) then turn off the pump by turning the HOA switch to OFF and stop the stopwatch simultaneously.
10. Record the volume dispensed and the time elapsed in the field notebook.
11. Place the lid on the tank and reload the truck with the equipment and personnel present during the initial weighing. Return to the weigh station and reweigh the truck.

12. Return to the well and open the drain valve on the tank and drain the water onto the ground near the wellhead until the water reaches the previously marked depth.
13. Calculate the volume of water actually dispensed by subtracting the tare weight of the truck from the final weight of the truck plus the full tank of water and dividing by 8.34 pounds per gallon.

For example: Final Weight = 7680 lbs
 - Tare Weight = 5620 lbs
 = 2050 lbs of water/8.34 lbs/gal
 = 245.8 gallons of water dispensed

14. To check the accuracy of the factory calibration, compare the actual gallons of water dispensed (calculated in the previous step) to the batch total recorded by the flow meter and calculate a percent difference.

For example: Actual Vol. = 245.8 gal
 - Meter Vol. = 252.0 gal
 = 6.2 gal different / 245.8 gal *100%
 = 2.5% difference

The percent difference should be less than 5%.

15. Calculate the flow rate of water dispensed by dividing the volume of water dispensed previously calculated by the time elapsed measured by the stopwatch in minutes.

For example: Elapsed Time = 7 minutes 23 seconds
 = 7 min + 23 sec/(60sec/min)
 = 7.38 min
 Flow Rate = 245.8 gal / 7.38 min
 = 33.3 gal/min

16. If percent difference calculated is less than 5%, the factory calibration has been established as accurate and may be used during the irrigation season to establish the volume of water removed by the groundwater extraction system. If the percent difference calculated is greater than 5%, a field calibration must be performed and used. Proceed to the Field Calibration procedures outlined in the next section.
17. Remove the calibration hose and replace the sampling port in the 3-way valve bypass port.

18. Push the main power switch to the bottom, OFF position. Unlock and open the main power box and reset the hour meter. Close and relock the power box.

2.1.3.3 Establish Field Calibration Curve

1. Ensure steps 1 through 3 in the previous section have been completed.
2. Using a five-gallon bucket and the stopwatch, throttle flow through the hose using the calibration hose ball valve until the flow rate is approximately the previous year's average flow rate for that well. Do not choose a flow rate less than 10 gpm, the meter's minimum flowrate requirement.
3. Raise the end of the hose to near the tank entrance and close the upstream ball valve located in the valve box. **DO NOT TURN OFF THE PUMP.**
4. Place the hose in the tank. Press and hold the CALIBRATE and DISPLAY buttons for about 3 seconds until you see "FldCAL". Release both buttons and you will see "dd000.0". Open the upstream ball valve while simultaneously starting the stopwatch. The display will count up while fluid is flowing through the meter. Run the pump until the tank is full (or at least five minutes have elapsed) then turn off the pump by turning the HOA switch to OFF and stop the stopwatch simultaneously. Remove the hose from the tank.
5. Record the time elapsed in the field notebook.
6. Place the lid on the tank and reload the truck with the equipment and personnel present during the initial weighing. Return to the weigh station and reweigh the truck. After weighing the truck, open the drain valve on the tank and drain the water onto the ground near the wellhead.
7. Calculate the volume of water actually dispensed by subtracting the tare weight of the truck from the final weight of the truck plus the full tank of water and dividing by 8.34 pounds per gallon.

$$\begin{aligned} \text{For example: Final Weight} &= 7680 \text{ lbs} \\ - \text{Tare Weight} &= 5620 \text{ lbs} \\ &= 2050 \text{ lbs of water} / 8.34 \text{ lbs/gal} \\ &= 245.8 \text{ gallons of water dispensed} \end{aligned}$$

8. Return to the flow meter and set the correct volume dispensed as calculated in the previous step. Pressing DISPLAY moves the flashing digit from left to right and pressing CALIBRATE changes the value from 0-9.
9. When satisfied with the value, press both the CALIBRATE and DISPLAY buttons simultaneously. "CALEnd" will be displayed and the unit will go back to normal operation without the "FAC" (factory calibration) icon displayed.
10. Verify the accuracy of the field calibration using the procedures outlined in the previous section.

2.2 INSTALLATION OF FLOATING FOUNTAINS

Each floating fountain consists of a float equipped with a metal plate, stainless steel coupler, and an atomizing spray nozzle. Figures 3 and 4 show the details of the pond valve vaults and floating fountains for the East Pond and West Pond, respectively. White 1 1/4" spa flex hose connects from the pond vault box to the bottom of the stainless-steel coupler on the float. Two ropes attached to each float are anchored on the pond banks to keep the float from moving. These procedures are usually performed by golf course personnel.

2.2.1 Fountain Assembly

Prior to startup, the fountains need to be cleaned and assembled.

1. Locate the three floats, spa-flex hoses, and anchor ropes (stored in the pump house located to the west of the East Pond) as well as the atomizing spray nozzles (stored in the maintenance shop office). Clean the floats and ensure the nozzles and coupler are clean and clear of debris.
2. Install the atomizing spray nozzles into the top of the coupler on each float. Plumber's tape may be used to ensure a leakless seal.
3. Attach two anchor ropes to each float.
4. Connect one hose to the bottom of the coupler on each float.

2.2.2 Fountain Placement

The fountains should be placed in the ponds as shown on Figures 4 and 5.

1. Connect the float with the longest hose to the southern-most adapter near the edge of the

pond in the East Pond.

2. Place the float in the south end of the East Pond. Ensure that there are no kinks or twists in the hose.
3. Attach each anchor rope to permanently installed anchors ($\frac{1}{2}$ " rebar with welded washer) on opposite sides of the pond such that the fountain is centered in the south half of the East Pond. The hose will float until it is filled with water.
4. Open the associated ball valve in the pond valve vault.
5. Repeat this procedure with the second float in the north end of the East Pond.
6. Repeat this procedure again with the third float in the east end of the West Pond.
7. Notify Hydrometrics personnel that all floats have been installed and are ready to receive water.

2.3 SYSTEM STARTUP

After the flowmeters have been calibrated, the float assemblies placed in the ponds, and the valves in the pond vaults opened, the GWES is ready to receive water. These startup procedures are generally performed by Hydrometrics personnel.

1. At the ponds, ensure the ball valves to each float are open.
2. At the well head, open the vault box.
3. Ensure the sample port is securely fitted into the cam lock fitting on the 3-way ball valve and that the sample port is fully closed.
4. Open the 3-way ball valve by rotating the handle ninety degrees until it is parallel to the main discharge line. Leave the upstream ball valve in the open position (parallel to the main discharge line).
5. In the field notebook, record the time and the totalizer 1 flow volume. Zero the flowmeter batch totalizer by holding the DISPLAY button for 3 seconds while the Batch 2 volume is displayed. Press the DISPLAY button to scroll through the display fields.
6. Unlock and open the main power box and record the hour meter reading in the field notebook. Close and relock the power box.

7. Unlock the motor starter by removing the electrical padlock from above the main electrical switch such that it can be switched to the ON position.
8. To turn on the pump, push the main power switch to the top, ON position. Turn the HOA knob on the side of the power box to the ON position and push the START button. Ensure the flowmeter is reading a flowrate.
9. Inspect the system for leaks or problems and fix as necessary.
10. Use the upstream ball valve to throttle the flowrate to the desired flowrate for that well.
11. Repeat from Step 2 for the remaining two extraction wells.
12. At the ponds, ensure water is being emitted from all three atomizing spray nozzles in a fine mist pattern.
13. Back at each well head, readjust the flowrate in each well using the upstream ball valve to the desired flowrate (the flowrate will fluctuate with changes in the pressure head and as the well draws down). In the field notebook, record the flowrate for each well.
14. Close all the vault boxes and lock the gates.
15. Approximately one week later, check the flowrates again and adjust as needed. Record the date, time, and flowrates in the field notebook.

3.0 SAMPLING AND MONITORING PROCEDURES

During the irrigation system, the system should be monitored daily by the golf course personnel to ensure the system is operating and water is being discharged into the ponds. If the system is not operating, golf course and Hydrometrics' personnel should work together to rectify the problem as soon as possible and return the system to normal operation. Additional sampling and monitoring procedures will be performed by Hydrometrics' personnel monthly, semiannually, and annually.

3.1 MONTHLY SYSTEM MONITORING

Once a month during the irrigation system, additional monitoring will be performed to ensure the system is operating correctly. These procedures are generally performed by Hydrometrics' personnel.

1. At the well head, open the vault box.
2. Inspect the system for leaks or problems and fix as necessary.
3. In the field notebook, record the time, the totalizer 1 and Batch 2 totalizer volumes as well as the flowrate. Press the DISPLAY button to scroll through the display fields.
4. Shut off the pump by switching the HOA switch on the side of the power box to OFF. Then push the main power switch to the bottom, OFF position.
5. Unlock and open the main power box and record the hour meter reading in the field notebook. Close and relock the power box.
6. Restart the pump by pushing the main power switch to the top, ON position. Turn the HOA knob on the side of the power box to the ON position and push the START button. Ensure that the flowmeter is reading and that the Batch 2 totalizer is showing dispensed volume.
7. Adjust the flowrate using the upstream ball valve as necessary to maintain the desired flowrate. If the flowrate is adjusted, record the final flowrate in the field notebook.
8. Close the vault box and lock the gate.
9. Repeat these steps for the remaining two extraction wells.

3.2 MONTHLY SPRINKLER SAMPLING

During the irrigation season, a water quality sample will be collected from an operating sprinkler head to the northwest of the pump house near the East Pond as shown on Figure 4. The sample will be collected in a stainless-steel bowl as described in the approved Sampling and Analysis Plan (Hydrometrics, 2019). Sprinkler samples will be analyzed for the VOCs listed in the second half of 40 CFR Part 258 Appendix I using the lowest detection limit for each VOC. Results will be included in the annual GWES performance report submitted to both the City and MDEQ at the end of the irrigation season.

3.3 SEMIANNUAL EXTRACTION WELL SAMPLING

The three extraction wells will be sampled semiannually to monitor water quality. These events are scheduled for June and December of each year to coincide with maximum and minimum groundwater levels, respectively. These wells will be sampled in accordance with the approved Sampling and Analysis Plan (Hydrometrics, 2019). Samples will be analyzed for field parameters including pH, specific conductivity, and water temperature; metals and commons including those compounds listed in the first half of 40 CFR Part 258 Appendix I; and volatile organic compounds including those listed in the second half of 40 CFR Part 258 Appendix I. Results will be included in the semiannual data validation and statistical evaluation reports submitted to both the City and MDEQ.

3.4 ANNUAL POND SAMPLING

During the June sprinkler sampling event, an additional water quality sample will be collected from the edge of the east lined holding pond near the pump house as shown in Figure 4. The sample will be collected as described in the approved Sampling and Analysis Plan (Hydrometrics, 2019). Pond samples will be analyzed for the VOCs listed in the second half of 40 CFR Part 258 Appendix I using the lowest detection limit for each VOC. Results will be included in the annual GWES performance report submitted to both the City and MDEQ at the end of the irrigation season.

4.0 WINTERIZATION PROCEDURES

At the end of each irrigation season, the following procedures need to be performed to winterize the system and prevent damage from freezing conditions. Golf course personnel will notify Hydrometrics' personnel when they are ready to terminate the irrigation season.

4.1 SYSTEM SHUTDOWN

These procedures are generally performed by Hydrometrics personnel.

1. Open the vault box. Record the flow rate. If the flow rate is not showing, press the DISPLAY button until the flow rate is visible.
2. Repeat step 1 for the other two extraction wells. (The flow rates change if one well is turned off first due to the decrease in head pressure.)
3. Shut off the pump by switching the HOA switch on the side of the power box to OFF. Then push the main power switch to the bottom, OFF position.
4. In the field book, record the time and the totalizer flow volumes. Press the DISPLAY button to scroll through the display fields.
5. Close the 3-way ball valve by rotating the handle ninety degrees until it is perpendicular to the discharge line. Leave the upstream ball valve in the open position (parallel to the discharge line).
6. Remove the sample port from the cam lock fitting and place on top of the electrical junction box in the vault box. Allow the water to drain from the discharge line.
7. Unlock and open the main power box and record the hour meter reading. Close and relock the power box.
8. Lock out the motor starter by placing one of the electrical padlocks above the main electrical switch such that it cannot be switched to the ON position.
9. Close the vault box and lock the gate.
10. Repeat from Step 3 for the remaining two extraction wells.

4.2 FLOAT REMOVAL AND STORAGE

After Hydrometrics' personnel have turned off the pumps, golf course personnel will complete the float removal and storage procedures.

1. Close the ball valve for the float in the pond valve vault.
2. Detach the anchor ropes from the permanently installed anchors on the sides of the ponds.
3. Carefully pull the float to the bank of the pond and remove from the pond.
4. Disconnect the spa-flex hose from the bottom of the coupler on the float. Carefully coil the hose so that there are no kinks or sharp twists.
5. Detach the two anchor ropes from the float and coil neatly.
6. Remove the atomizing spray nozzles from the top of the coupler on the float. Clean the nozzles so they are clean and clear of debris and algal growth.
7. Repeat these procedures with the remaining two floats.
8. Pressure-wash the floats to remove any debris and algal growth.
9. Place the floats, spa-flex hoses, and anchor ropes in the pump house located to the west of the East Pond. Place the spray nozzles in the maintenance shop office.

4.3 BLOW OUT HEADER LINES

Finally, golf course personnel will blow out the GWES header lines using the same equipment they use to blow out the golf course sprinkler lines.

1. Open the three ball valves for the float lines in the pond valve vaults.
2. Open the blowout valve box located just west of extraction well HL-99-1 as shown on Figure 1.
3. Remove the cap from the end of the main header line and connect the air compressor.
4. Inject air into the system until no water remains in the system as indicated by no flow

from the pond valve vaults discharge.

5. Disconnect the air compressor and replace the cap on the header line.
6. Replace the blowout vault box lid and lock the gate.

5.0 REPORTING

An annual land application compliance report will be completed by Hydrometrics' personnel at the end of each irrigation season. This report will include a complete set of analyses of collected pond and sprinkler water samples along with a summary of the work performed and the total volume of water extracted and treated during that irrigation season. The report will be submitted to the City and MDEQ.

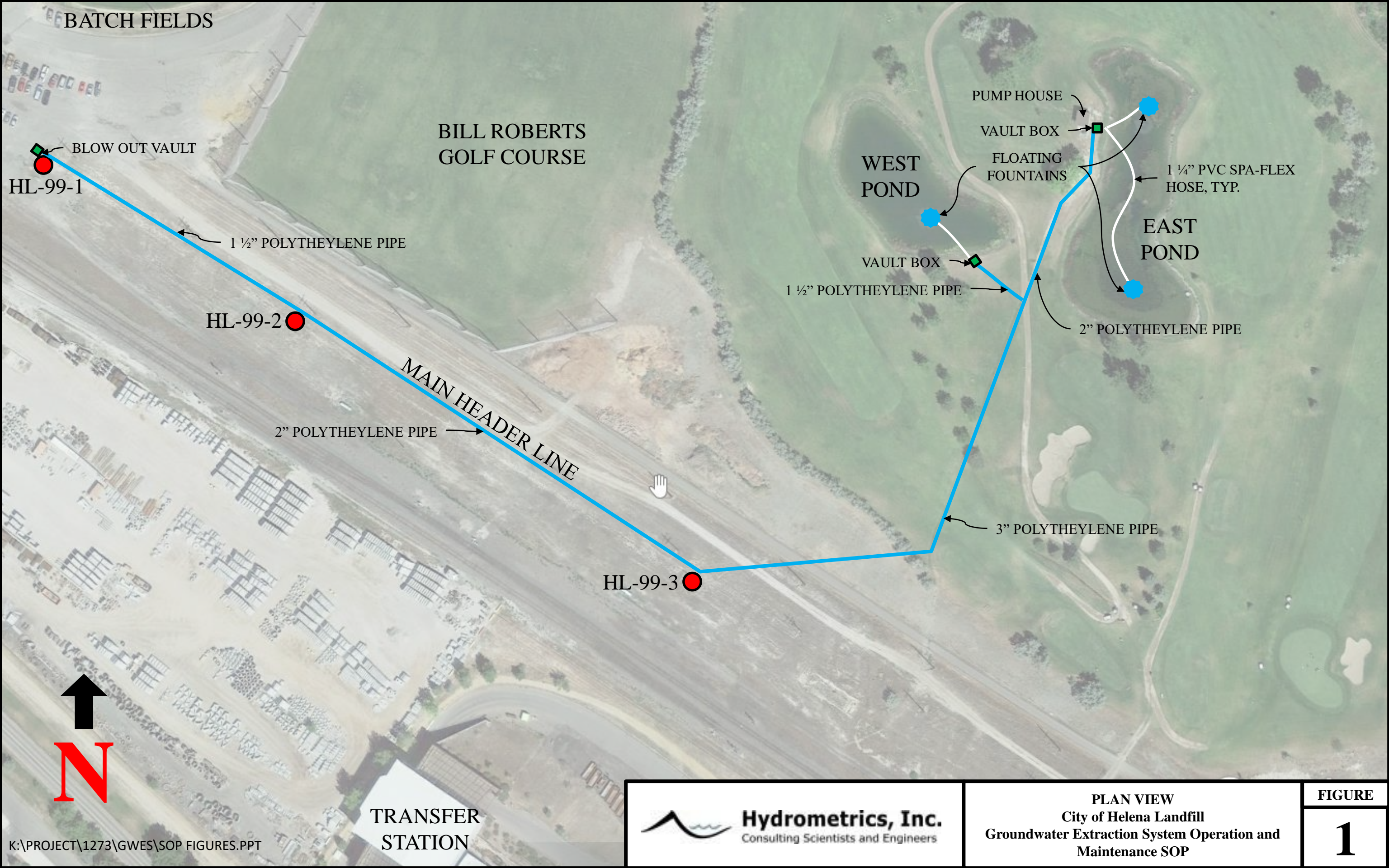
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FIGURES



BATCH FIELDS

BILL ROBERTS
GOLF COURSE

BLOW OUT VAULT
HL-99-1

HL-99-2

HL-99-3

TRANSFER
STATION

WEST
POND

EAST
POND

PUMP HOUSE

VAULT BOX

FLOATING
FOUNTAINS

VAULT BOX

1 1/4" PVC SPA-FLEX
HOSE, TYP.

1 1/2" POLYTHEYLENE PIPE

2" POLYTHEYLENE PIPE

1 1/2" POLYTHEYLENE PIPE

2" POLYTHEYLENE PIPE

3" POLYTHEYLENE PIPE

MAIN HEADER LINE

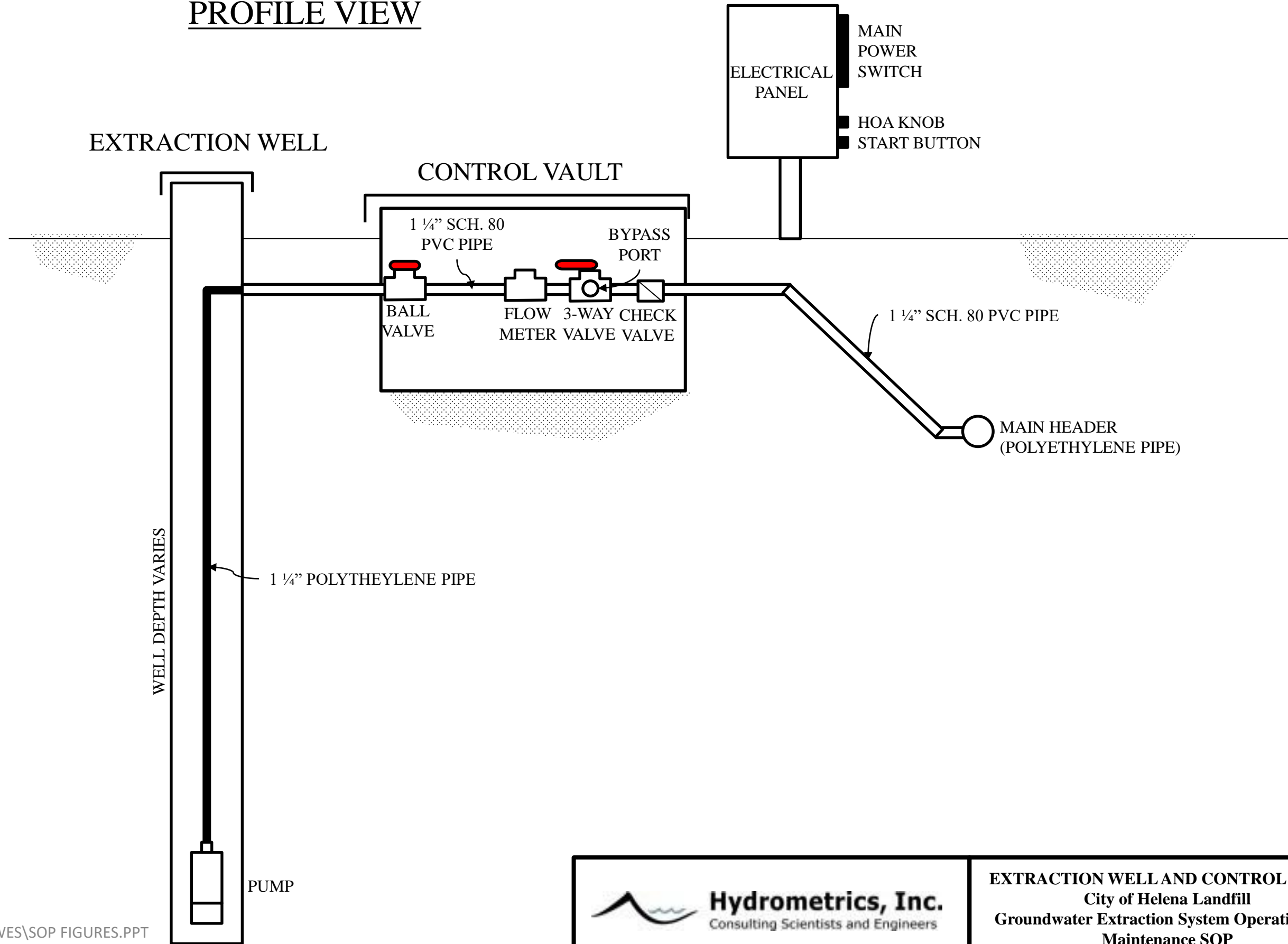


PLAN VIEW
City of Helena Landfill
Groundwater Extraction System Operation and
Maintenance SOP

FIGURE

1

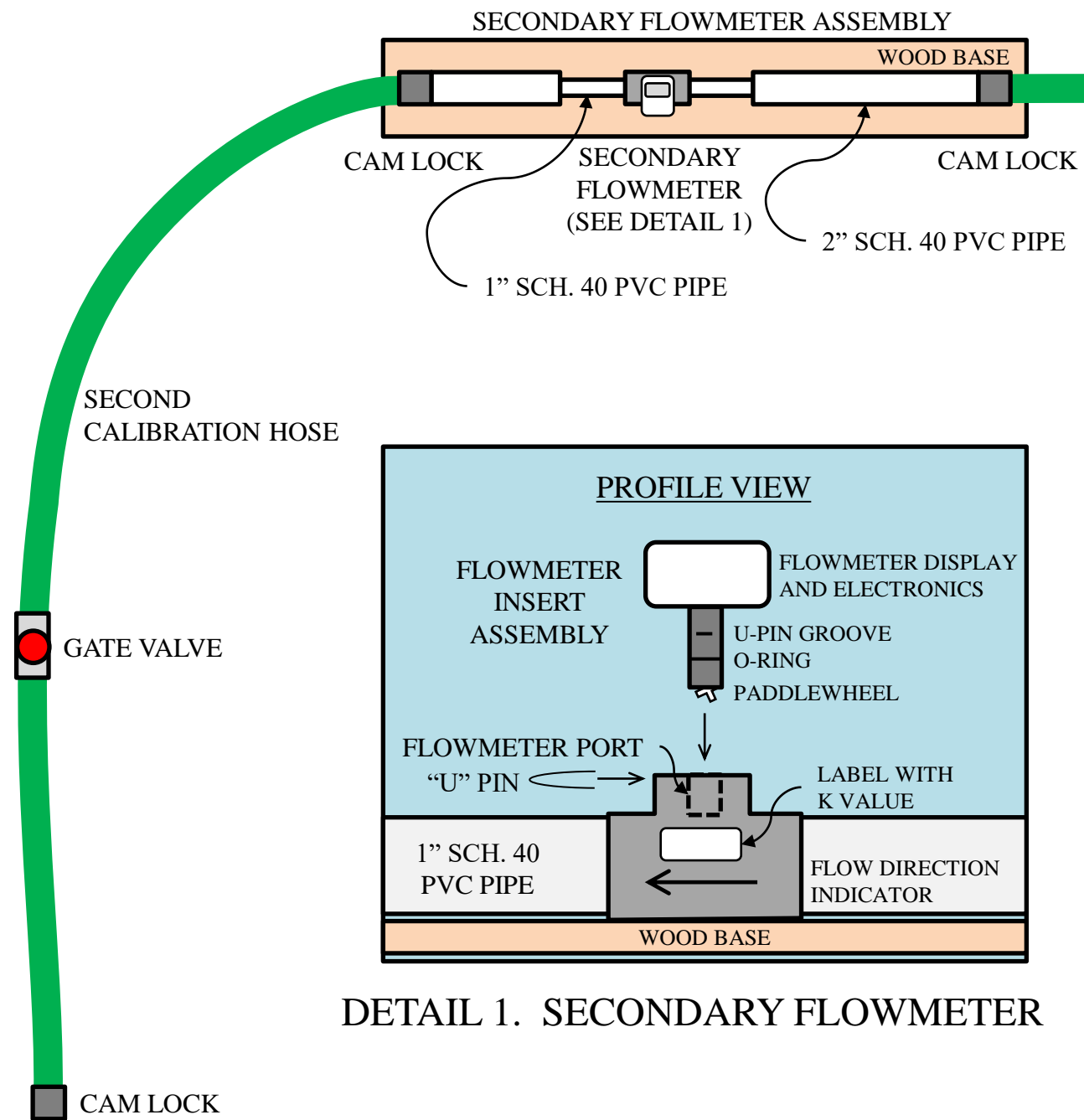
PROFILE VIEW



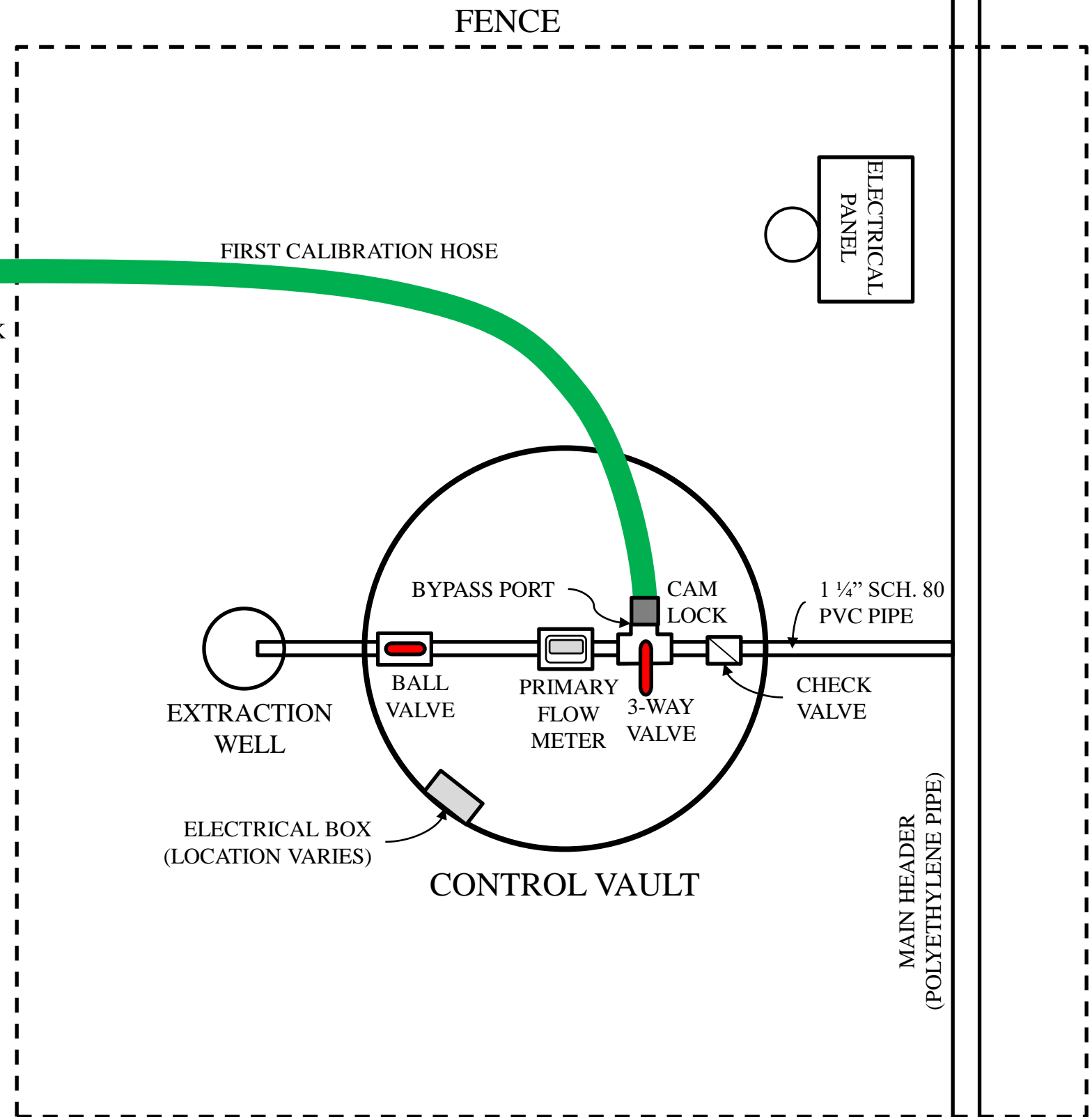
EXTRACTION WELL AND CONTROL VAULT
City of Helena Landfill
Groundwater Extraction System Operation and
Maintenance SOP

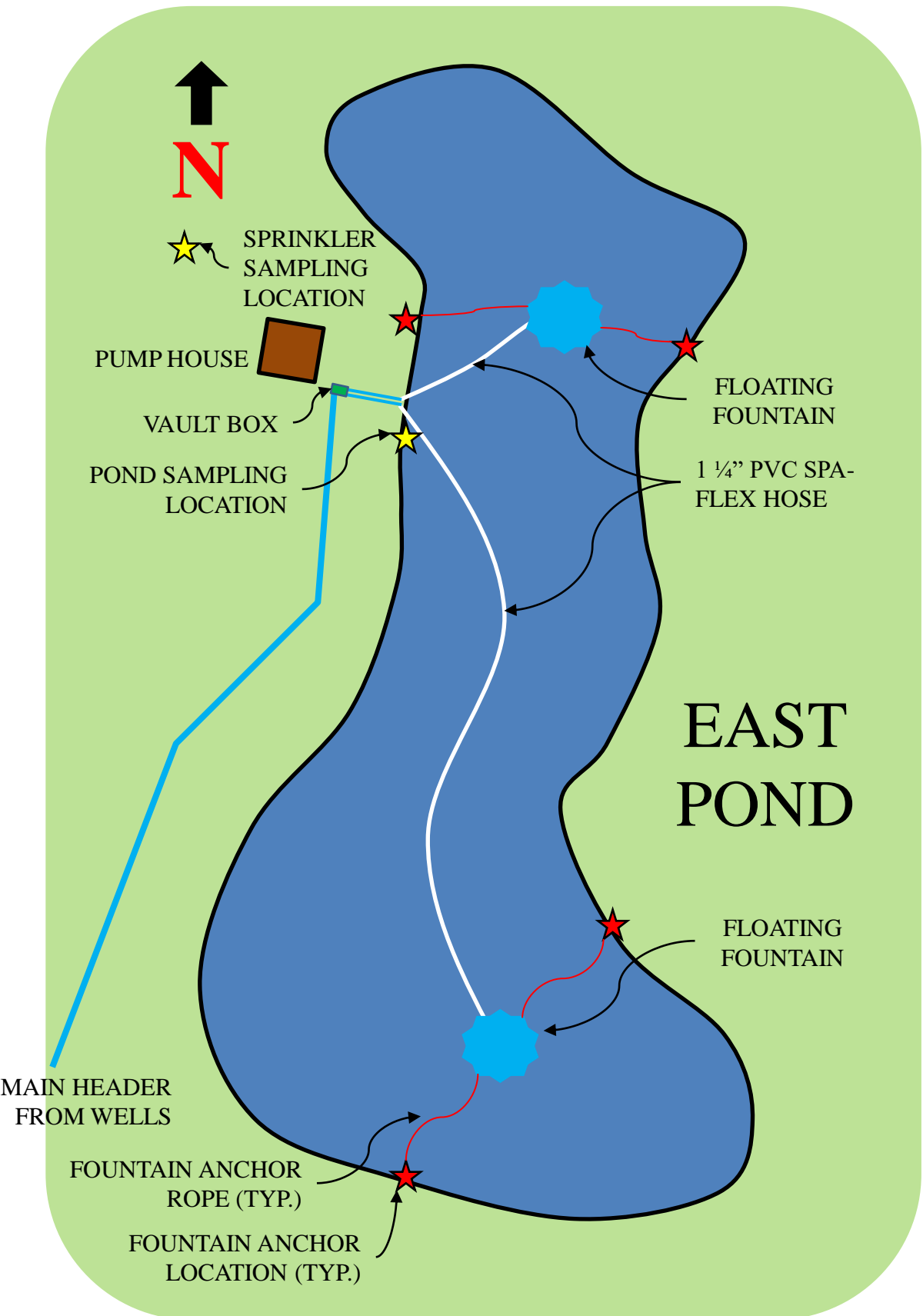
FIGURE
2

PLAN VIEW

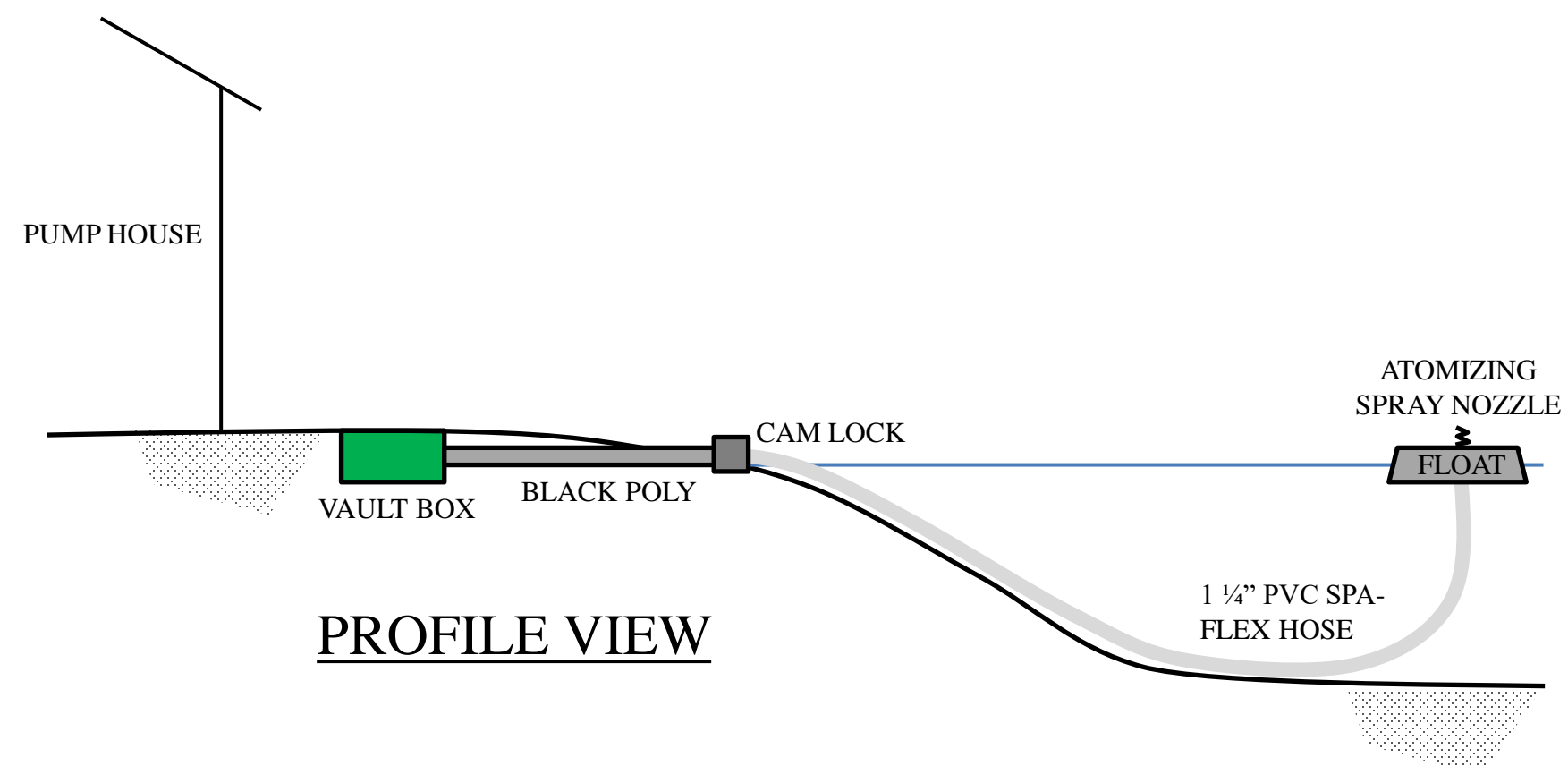


DETAIL 1. SECONDARY FLOWMETER

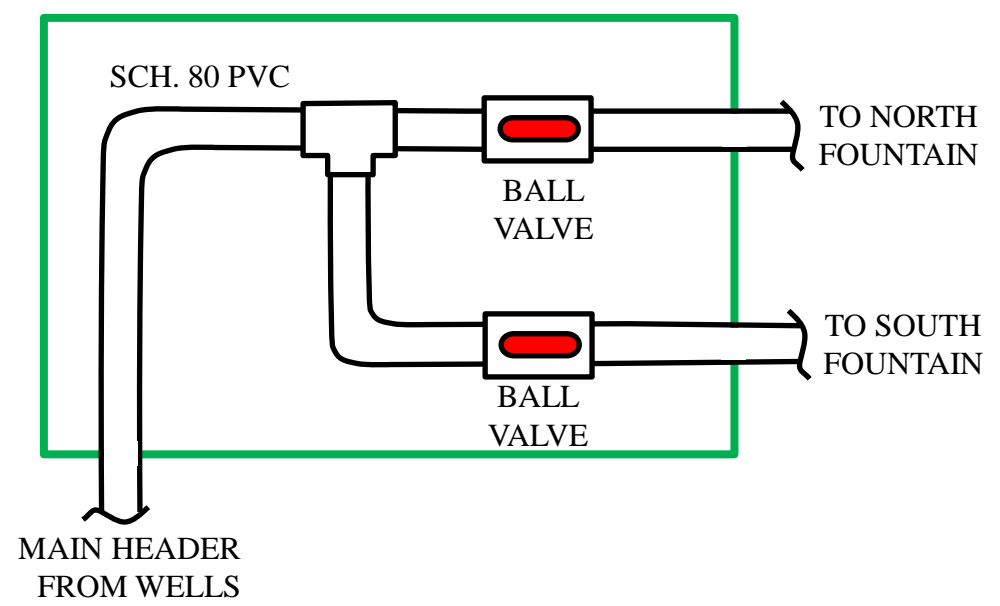




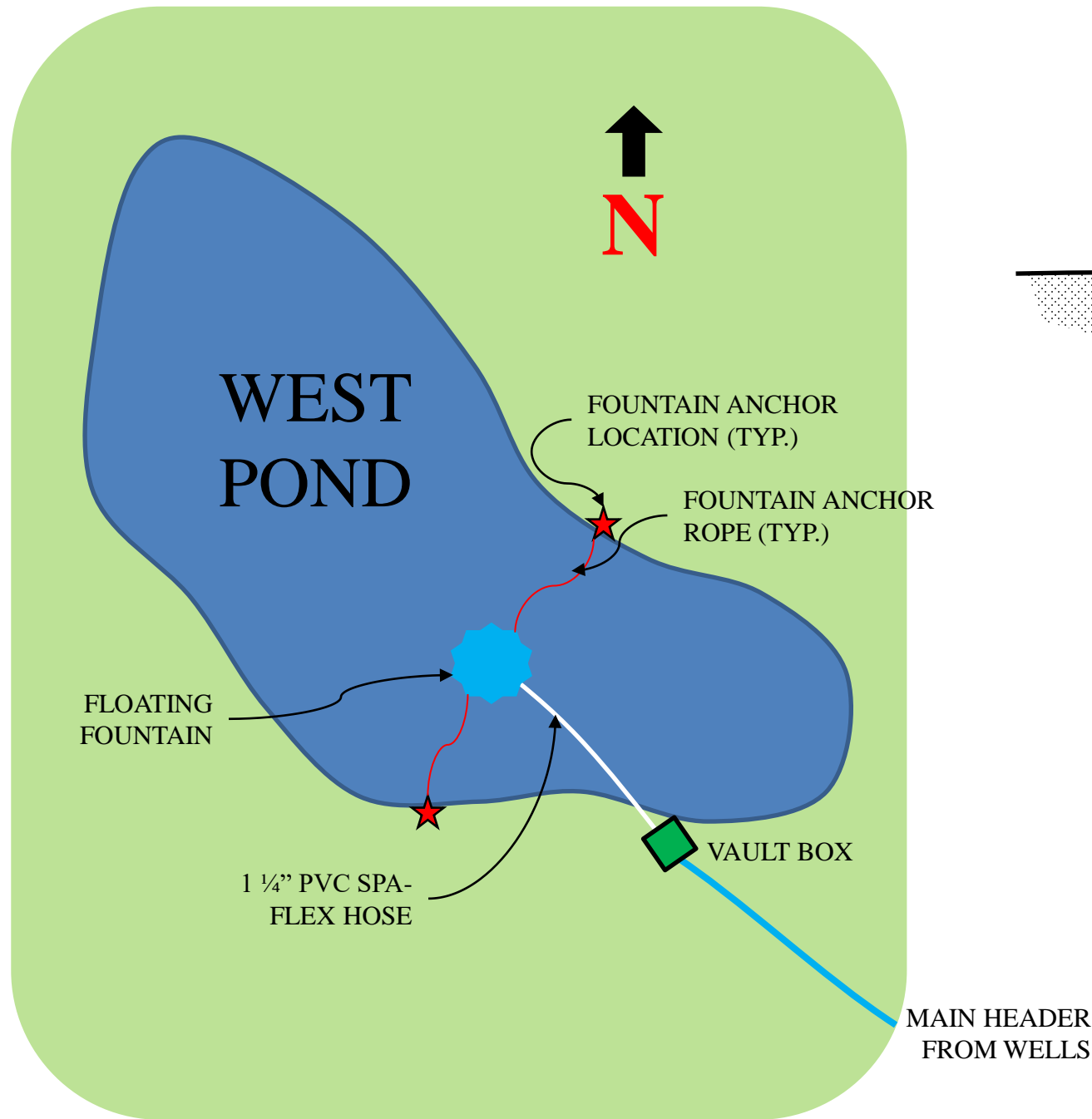
PLAN VIEW



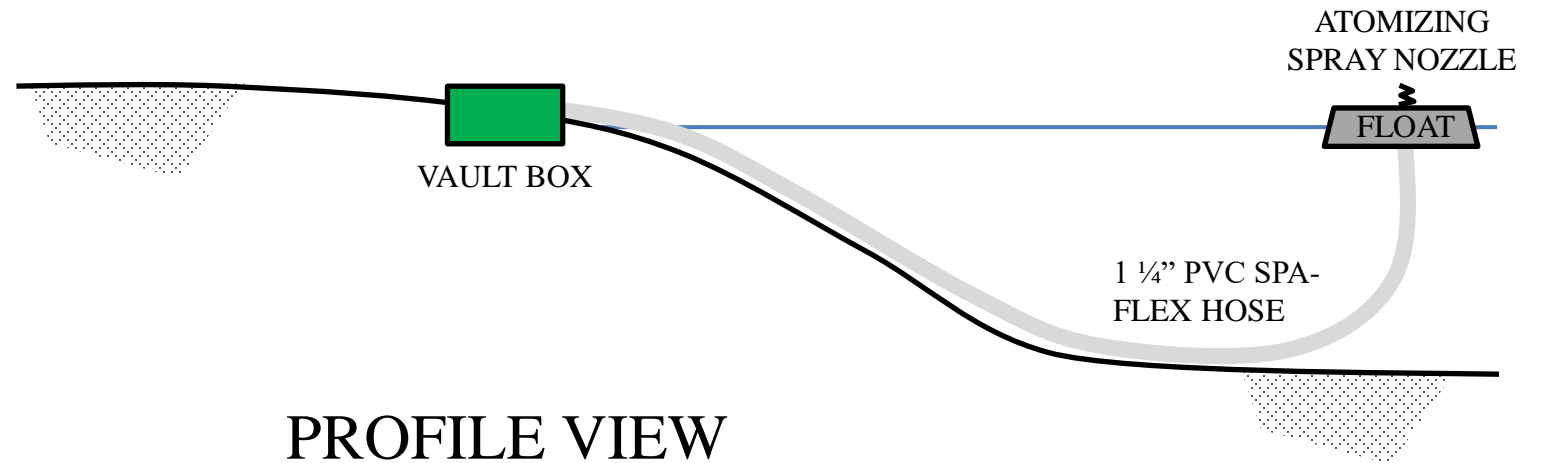
PROFILE VIEW



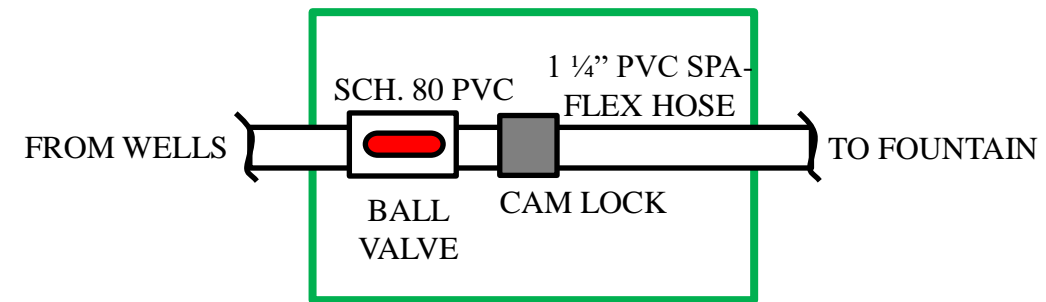
VAULT BOX DETAIL



PLAN VIEW



PROFILE VIEW



VAULT BOX DETAIL