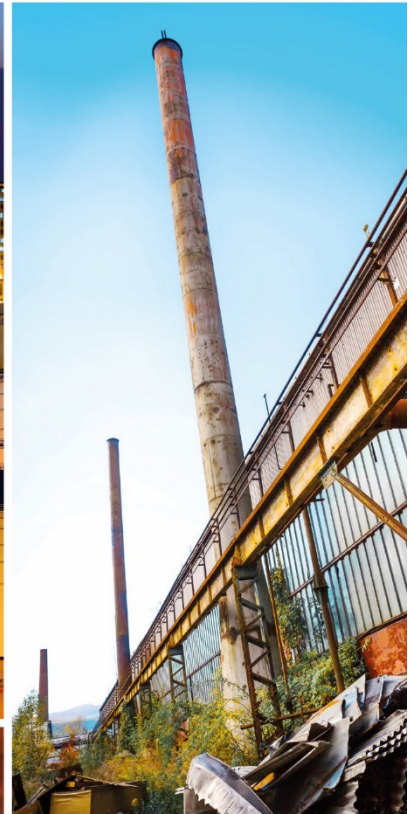
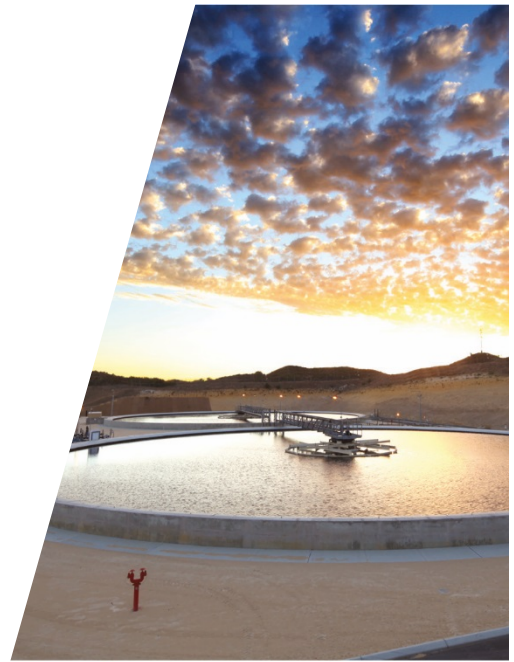




Operation and Maintenance Manual Groundwater Collection System

Former Willow Run Powertrain
Ypsilanti, Michigan





Version Control

Version	Date	Revised Description	Reviewer Initials
001	2-3-2021	Initial O&M Manual	BL,DB

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1. Introduction

This Operation and Maintenance Manual (O&M Manual) has been prepared by GHD Services Inc. (GHD) on behalf of Revitalizing Automotive Communities Environmental Response Trust (RACER) to document and assist in the proper operation and maintenance activities involving the groundwater collection system installed at the former Willow Run Powertrain plant (Site) in Ypsilanti, Michigan.

The groundwater collection system is owned by RACER and GHD operates the system on RACER's behalf. The location of the groundwater collection system is primarily on Yankee Air Museum (YAM) property, however there is a portion of the north end of the system that is on American Center for Mobility (ACM) property. Figure 1 provides the general layout of the groundwater collection system and where is located with respect to the other Site owners/features.

The objective of the O&M Manual is to provide guidance for the efficient management and potential troubleshooting of the Site groundwater collection system.

1.1 General System Description

In 2017 and 2018 the groundwater collection system was installed at the down gradient property boundary of the Willow Run Powertrain Site. This area of the Site includes the remaining portion of the original plant, now referred to as the YAM Building. The system consists of four sections of French drain, a discharge force main, sumps/controls vaults and cleanouts. Each of the French drain sections is operated independently based on submersible pumps and various other sensors. The water collected by the French drain is pumped through the force main and discharged to the local Public Operated Treatment Works (POTW) under and Industrial Pretreatment Program permit. At this time there is no treatment of the collected/discharged water. The system discharge flow rate has been approximately 35-40 gallons per minute when operating in steady state conditions.

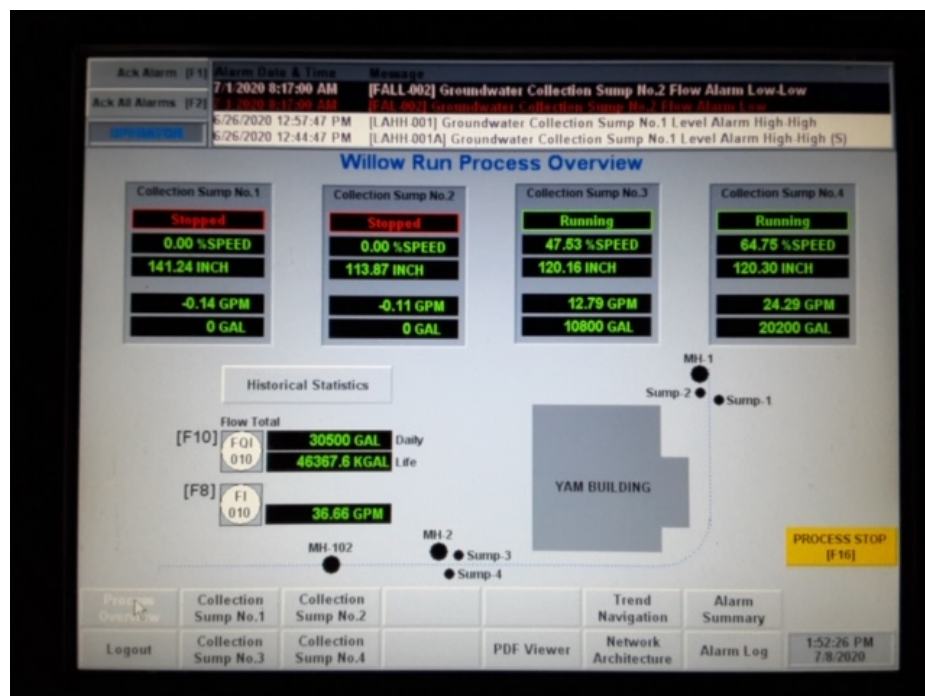
Figures 2 through 8 present the overall layout and components of the groundwater collection system. Brief descriptions of the system components are listed below:

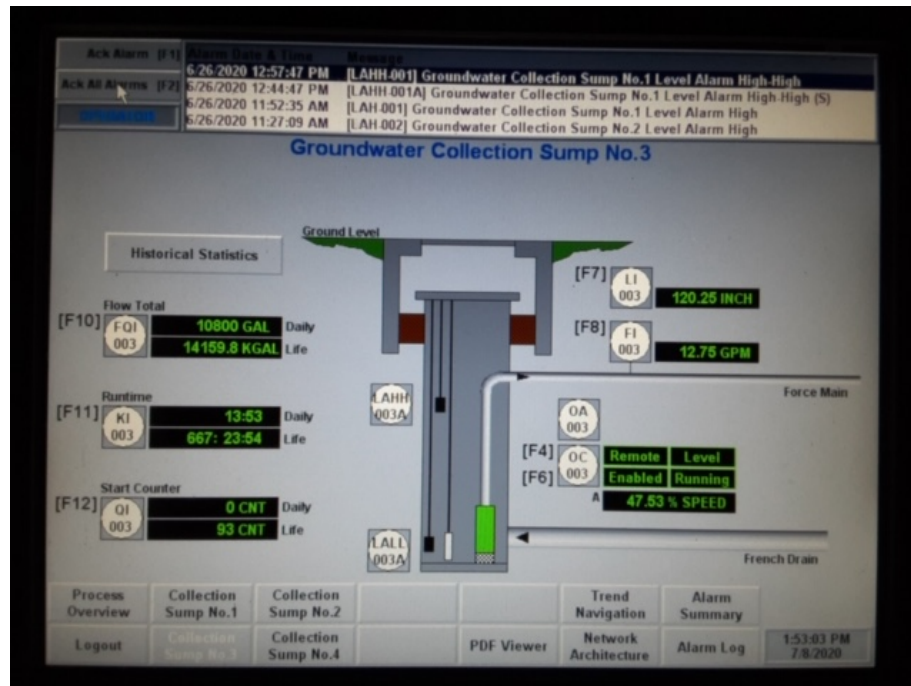
- French drain: Four separate sections of perforated 6" slotted high density polyethylene (HDPE) pipe installed at a depth of approximately 15-17 feet below ground surface (bgs). These pipes were installed utilizing a one pass trencher and are the main collection for Site groundwater.
- Force main: 4" HDPE pipe installed at an elevation of 710 feet bgs, this pipe is the common header that conveys the collected groundwater to the discharge point. The north end of this pipe is capped near the area reserved for a treatment system, the south end of this pipe is open and connected to MH-102.
- MH-102: this manhole is the current discharge location and monitoring point. This is the location where the force main discharges the collected groundwater. From this point the discharged water goes to the local POTW through private and public sanitary sewers.
- Vaults 1 and 2: underground vaults that house various pipe runs, control boxes, and flow meters for the system. Vault 1 located northeast of the YAM building houses the flow meters and force main connections for the French drain sections 1 and 2. Vault 2, located southwest of the YAM



building, houses flow meters and force main connections for the French drain sections 3 and 4. The total system flow meter is also located in Vault 2.

- Sumps 1-4: sump chambers that house the submersible pumps and levels sensors for each of the French drain runs/segments.
- Human Machine Interface (HMI) Panel: this panel is located in the southwest corner inside the YAM building. The HMI displays system information such as sump levels, pump speeds, flow rates etc. The HMI receives this information from a programmable logic controller (PLC) within this cabinet. Additional information regarding these panels is presented later in this report. A cellular modem provides remote communication to the system. The two screenshots below present the general information that is displayed on the HMI:





- Variable frequency drive (VFD) Cabinets: There are four VFD control cabinets, one for each of the submersible pumps. The VFD cabinets are located in the YAM northeast electrical room for pumps 1 and 2, and southwest corner of YAM (adjacent to HMI Panel) for pumps 3 and 4.
- Power and control lines: Buried power and control lines are located between the vaults/sumps and southwest/northeast corners of the YAM building. Overhead power conduits run along the north and west walls of YAM connecting the controls and power entering the building in the northeast electrical room and the VFDs and HMI in the southwest corner of the building.
- The system control (HMI/PLC) may change following construction of a treatment system.

Appendix A presents an updated set of easement figures that were created as part of the ongoing easement documentation process for the Site. Fourteen figures were created and show the overall layout of the groundwater collection system as well as other utilities/buried conflicts within the area of the groundwater collection system easement. Proposed groundwater treatment areas are also included. These figures should be used along with the as built drawings when reviewing the area for new subsurface tasks that may need to be conducted in the area.

1.2 Groundwater Sources

The groundwater collection system has a capture area at the east/southeast down gradient property boundary. This area has historical light non aqueous phase liquid (LNAPL) impacts. Long-term treatment and alternative discharge proposals are currently being evaluated.



1.3 Groundwater System Components

1.3.1 Overview of System Components

The diagrams below show the general layout of the controls system components that are located in each sump chamber. Once the final treatment system is designed and installed, permanent controls as built figures will be completed. The table below provides initial set up conditions for the vaults and sumps/pumps:

Table 1: Initial Set up Conditions

Sump/Vault	Northing	Easting	Elevation of Stainless Steel Sump casing	Elevation of Concrete Steel Vault Rim	Depth to bottom (ft)	Elevation of Bottom of Structure	Pump Intake Elevation	French Drain elevation at sump	Pressure Transmitter Elevation	Low/Low Switch Elevation	High/High Switch depth to switch (709 amsl)	High/High Switch depth to switch (in inch from bottom)
Sump 1	271041.1	13346089.3	711.966		14	697.97	698.0	698.47	697.9	698.47	3.0	132.4
Sump 2	271047.6	13346082.5	712.371		14	698.37	698.4	698.87	698.3	698.87	3.4	127.5
Vault/MH 1	271062.8	13346082.8	n/a	715.36	6.67	708.69	n/a	n/a	n/a	n/a	n/a	n/a
Sump 4	270458.2	13345559.6	713.96		17.9	696.06	696.1	696.56	696.0	696.56	5.0	155.3
Sump 3	270473.6	13345560.4	714.045		18	696.05	696.0	696.55	696.0	696.55	5.0	155.5
Vault/MH 2	270475.7	13345547.2	n/a	716.29	6.67	709.62	n/a	n/a	n/a	n/a	n/a	n/a

Diagram 1 below shows general layout of the system components that are present in each sump chamber:

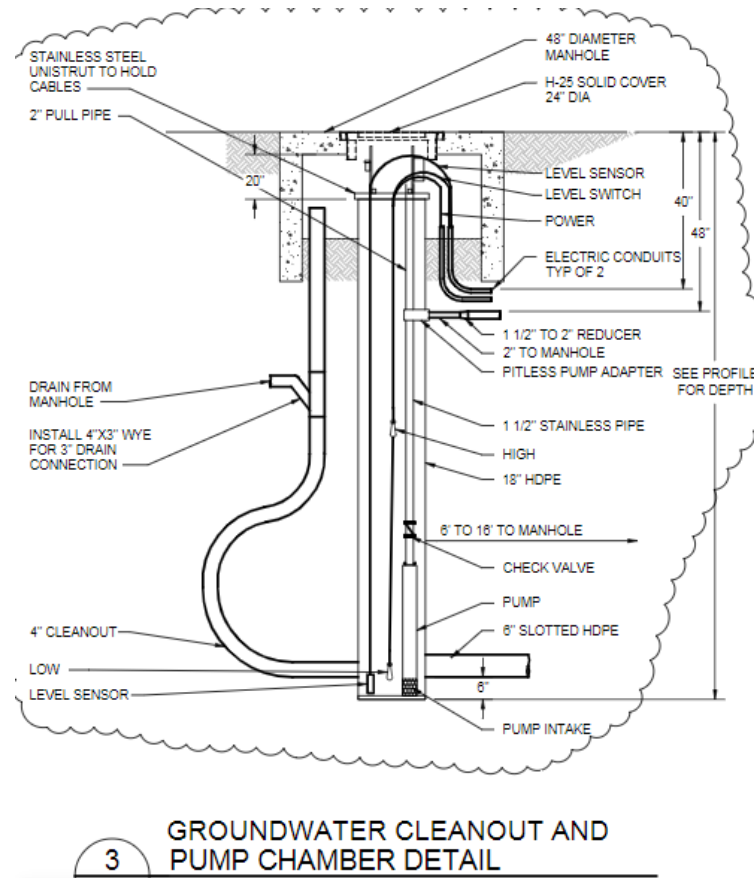


Diagram 1: Example of Sump layout



Notes:

- Pump - set at bottom of sump - intake screen is located at the bottom 3.5 inches of pump
- Low/Low - two sensors (1) ground, always in water, installed at bottom of well, (2) 6-inches off the bottom of the sump
- Pressure Transmitter (Waterpilot) - set at bottom of sump (up 1/2 - 1 inch off bottom)
- High/High switch - set at 709 amsl - but with enough cable left if needed to set it lower by 5 feet

2. System Operation

2.1 Rules for System Operation:

- 1 When operating any system component, you should know, prior to its operation, the expected indications or results of the action and verify that you get the indication or results anticipated.
- 2 Never change the system operating conditions with pumps/flowrates without prior review of proposed changes.
- 3 Never start the system with a known problem unless the problem is fully understood and corrected, or it is determined further damage will not result in starting the system.
- 4 Review ARC Flash safety before operating system components. A full ARC Flash Safety memo is provided in Appendix B.

2.2 Using the HMI

The HMI is the main control panel that is used to operate the system. Some of the main features include:

- System log in
- Pump and level controls
- Process values and set points
- Alarm set points
- Alarm indications and summary
- Trend data and historical statistics
- Network architecture

Appendix C provides the full HMI User Manual that describes general operations of the features listed above.

Appendix D provides an additional operational summary for each control/component summary. It also provides details on the system interlocks including their purpose and actions needed to operate within them.



2.2.1 System Startup through HMI

Position pump control switch in the VFD panels to Auto, this will allow the system to be controlled through the HMI. Each pump can be turned on individually through the HMI and can be controlled by pump speed/power or set to maintain a certain water level in each sump.

Once the system has been started and is discharging water, staff should monitor/confirm that settings and flow rates are in acceptable range.

During operation, staff should check the following:

- Pump speed/power output
- Levels in each sump
- Flow rates for each flow meter and the system totalizer flow meter
- Any alarms that triggered during operation

2.2.2 System Shutdown

As described in Appendix C, the system can be shutdown remotely if the pumps are running in auto. This can be accomplished in the HMI. If the system is running in hand, the pumps will have to be shut off at each individual VFD panel and cannot be done remotely.

The system should not be shut down for extended periods of time unless prior coordination with project staff has been completed.

If the system is shutdown for an extended period of time during winter months, conditions in the vaults and discharge point should be monitored to avoid the pipes freezing that are not buried. Considerations could include maintaining minimal flow or a small heat source in the vaults.

2.2.3 Remote Access

The HMI/PLC panel includes a modem and Verizon cellular account (4G installed in June 2020). The static IP address assigned in June 2020 is 166.148.183.85. Remote access is provided by VNC viewer to provide for monitoring the collection system and controls remotely.

2.3 Routine Inspections and Maintenance

Routine maintenance tasks include checking the flow meters, the pump outputs, and cleaning the pump intakes. Additional details are below:

- Flow meter checks: turn on each individual pump and confirm the flow rate against the system flow totalizer meter (completed quarterly)
- Pump check: Set pump power to 50% (30Hz) and record the pump output/amperage (completed quarterly)
- Visual Inspection of VFDs, sumps, vaults and cleanouts (completed quarterly)
- Discharge basin in MH-102 cleaned/replaced (quarterly)
- Transducer calibration/field check (semiannually)



- Annual pump intake screen cleaning (completed annually)

These system checks will be completed, and records of the results will be maintained by GHD staff. The data collected during these inspections will be reviewed and monitored to identify trends in operational efficiency and potential maintenance activities that may be required.

Appendix E provides the maintenance guides/inspection sheets to be completed for each task listed above. These are completed during these inspections, scanned and saved in a dedicated folder in the GHD project files.

2.4 Troubleshooting

The most effective method of addressing maintenance problems is to avoid them through effective preventative maintenance and system monitoring. When problems do arise, they should be addressed immediately to prevent further equipment damage or operation disruption.

To assist troubleshooting problems, additional staff and subcontractors may be required.

Table 2 below described previously encountered system issues from 2017 through mid 2020. Also listed are the cause of the issue and the solution that was utilized to fix the issue. GHD staff completed most of the troubleshooting listed below. Installing the new driver cards was completed by a 3rd party vendor (Rockwell Technician).

Table 2: Previously Encountered System Issues

System Issue	Symptoms/Description	Cause	Solution/Fix
PLC outage-not restarting	HMI Screen not working, all XXXX in data spots	Weather/power surge	Restart system, pull and reinsert fuse 5
Level sensor Issue	Values appear different/wrong in the HMI	Field instrument not communicating with PLC due to disconnected wire	Confirm correct layout/port and reconnect wire
Power issue with PLC	No power	Blown fuse	Identify fuse and replace
PLC disconnect from field components-power issue	Values errors/wrong output in the PLC i.e., flow meters read "Fault" or stuck at 60 gpm	PLC "brain" error/destroyed during power surge	Replace PLC "brain"
Flow meter not communicating with PLC	Values errors/wrong output in the PLC i.e., flow meters read "Fault" or stuck at 60 gpm	Driver card damaged during power surge	Replace driver card
Vault 1 Flooding	Standing water in the Vault	Backflow from Sump 2	Installed backflow valve to prevent water from Sump 2 entering Vault 1



3. Monitoring and Reporting

3.1 System Monitoring

Once the system has been started and is discharging the collected groundwater, GHD staff should monitor the system outputs at least once a day through the remote HMI viewer. A weekly summary table is generated automatically by the system and sent to GHD staff on a weekly basis. GHD is tabulating an overall/running summary table of the weekly table output from the system. Below is a portion of one of the weekly summary output tables:

Date	Time	FQI-010 (Life GAL)	FQI-010 (Daily GAL)	FIT-010 (Min GPM)	FIT-010 (Avg GPM)	FIT-010 (Max GPM)	FQI-001 (Life GAL)	FQI-001 (Daily GAL)	FIT-001 (Min GPM)	FIT-001 (Avg GPM)	FIT-001 (Max GPM)	LT-001 (Min INCH)	LT-001 (Avg INCH)	LT-001 (Max INCH)
10/4/2020	23:59:00	51902600	49000	33.51	33.97	34.32	5912100	11700	-15	-15	-15	82.18	82.9	83.87
10/5/2020	23:59:00	51950700	48100	32.61	33.28	34.81	5923300	11200	-15	-15	-14.99	81.97	82.97	83.91
10/6/2020	23:59:00	52002200	51500	32.82	35.67	39.09	5934300	11000	-15	-15	-15	81.97	83.89	86.08
10/7/2020	23:59:00	52054900	52600	35.43	36.44	38.64	5944800	10500	-15	-15	-15	84.35	84.91	85.64
10/8/2020	23:59:00	52106200	51300	35.01	35.53	35.95	5955600	10700	-15	-15	-15	83.79	84.77	85.6
10/9/2020	23:59:00	52157100	50800	34.56	35.24	36.83	5965900	10300	-15	-15	-15	83.31	84.11	85.08
10/10/2020	23:59:01	52208000	50800	32.99	35.21	35.7	5976200	10300	-15	-15	-15	83.48	83.99	84.56

During operation the following parameters are checked regularly:

- Pump settings
- Water levels in each sump
- Flow rates
- Alarms

The system will send out automatic notification if alarms occur with the system (as detailed in Appendix C. The system also outputs a daily text (at noon) which indicates that the system is communicating normally. A new modem was installed during the summer of 2020 to switch the system from 3G to 4G. Listed below are the modem details:

- EWON Modem (EWO FLEXY20500_00MA)
- EWON 4G Cellular Card (EWO FLB3203_00)
- EWON 4G Cellular Antenna (EWO FAC90901_0100)

3.2 Compliance Monitoring

3.2.1 Effluent Sampling

Sampling the groundwater collection system effluent is conducted bimonthly. This sampling is conducted to meet the requirements of the Site Industrial User permit, which is issued through the local POTW- Ypsilanti Community Utilities Authority (YCUA). Appendix F provides a copy of the Site discharge permit.

Sample Bottles are ordered through Merit Laboratories Inc (Merit). Once the samples are collected, they are sent back to Merit for analysis. Listed below are the permitted sampling parameters:



- Grab Sample (collected at end of 24-hour composite):
 - Select VOCs
 - Fats/oils and Grease
 - Total Phenolics
 - pH (field reading)
 - PFAS (quarterly sample only)
- 24 Hour Composite Sample:
 - Select SVOCs
 - PCBs
 - Mercury
 - Total Suspended Solids
 - Chemical Oxygen Demand
- Refer to the current Permit (Appendix F) for additional discharge restrictions

3.3 Compliance Reporting

The Site Permit requires quarterly monitoring reports be submitted to YCUA. These reports include analytical results, system flowrate tracking data, and general Site updates. Additional information is submitted if required by YCUA. The quarterly reports are compiled and saved by GHD and are available upon request.

4. Key Contacts

4.1 Equipment Support Vendors

4.1.1 Previously Used Contractors:

AF Smith (contracted directly by RACER or YAM)

- A.F Smith Electric (info@afsmith.com, 734-482-2034)

4.2 Installation Contractors

Rockwell/Rexel-VFD maintenance/repairs: (Previously used-currently setting up contacts with additional companies for VFD maintenance/repairs)

- Scott Geraghty (scott.geraghty@rexelusa.com, 330-749-7890)
- Eric Leffler (eric.leffler@rexelusa.com, 716-327-6804)

HESCO: flow meter checks/calibration

- Dave Burkel (dave.burkel@hesco-mi.com, 586-353-2251)



CSM: mechanical checks/installation

- Mark Kowalski (mark.kowalski@csmmechanical.com, 248-563-4371)

GHD: HMI/PLC checks

- Josh Ezak (Joshua.ezak@ghd.com, 716-362-8861)

4.3 Owner/Engineering/Consulting Services

RACER (GW collection system owner)

- Grant Trigger (gtrigger@racetrust.org, 313-670-6226)

GHD Services, Inc. (operating system on behalf of RACER)

- Beth Landale (beth.landale@ghd.com, 734-545-5423)
- Daniel Beck (Daniel.beck@ghd.com, 906-367-6376)
- Josh Ezak (Joshua.ezak@ghd.com, 716-362-8861)
- Allie Murphy (allie.murphy@ghd.com, 248-410-3589)

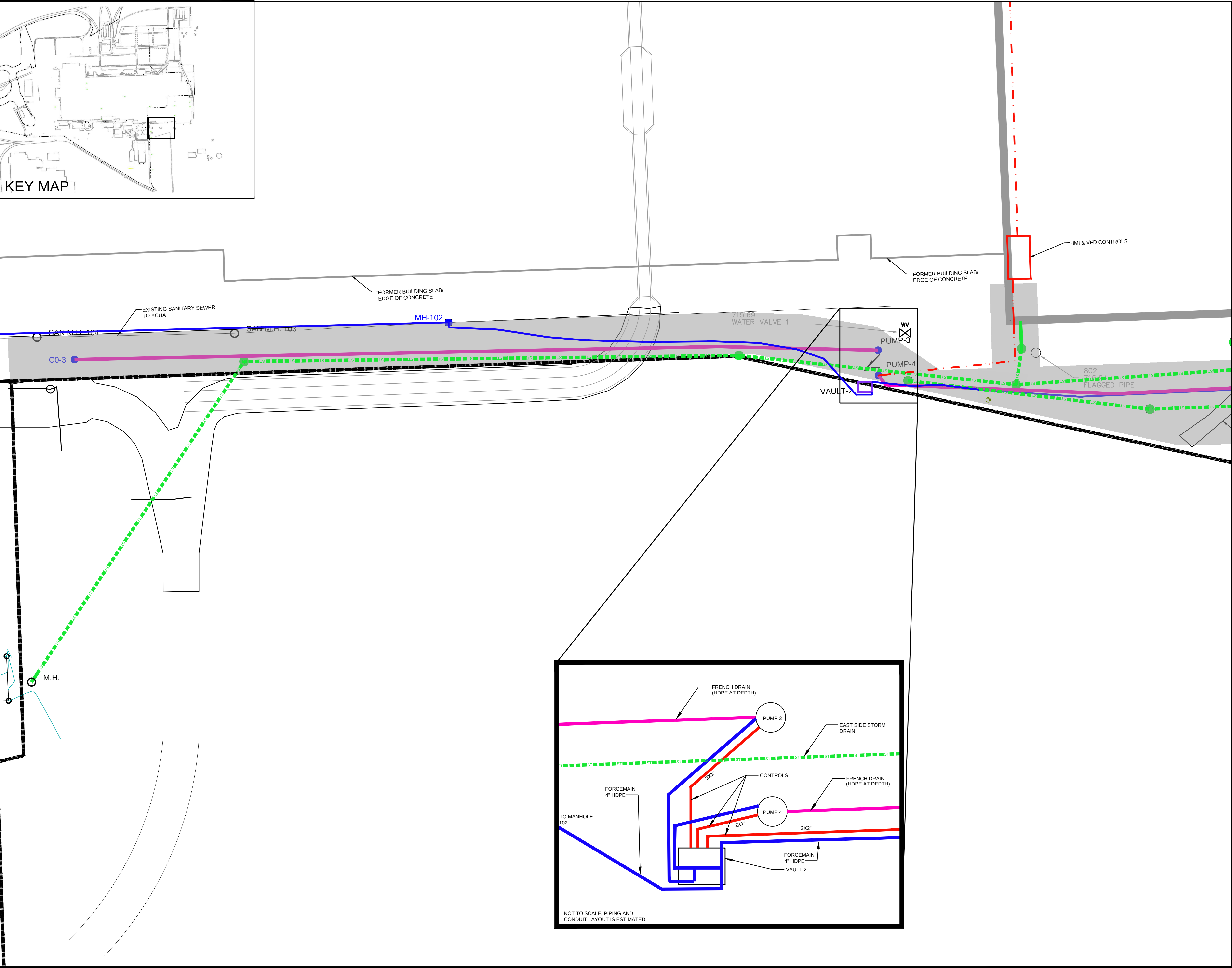
Yankee Air Museum Contacts (Property Owner)

- Kevin Perlongo (kevin.perlongo@yankeeairmuseum.org, 734-637-2357)
- Dennis Norton (dennis@dennisnorton.com, 734-395-4901)
- James Harless (james.harless@yankeeairmuseum.org, 734-260-1130)
- Jim Rozema (jjmr@gmb.com, 616-890-8870)

ACM Contacts (property owner)

- ACM Security - Jim Rollison (jim.rollison@intertek.com, 419-350-7101)
- Ryan Sarmiento (rsarmiento@hntb.com, 313-300-4997)
- Jonathon Bailey (jbailey@hntb.com, 313-350-2139)
- Mark Chaput (mark.chaput@acmwillowrun.org, 517-206-1802)

The contact section/info will be reviewed and updated annually.



Nº	Revision	Date	Initial

LEGEND

- PROPERTY BOUNDARY
- FORMER BUILDING FOOTPRINT
- EAST SIDE STORM DRAIN (YAM AND ACM)
- EXISTING GROUNDWATER SYSTEM ELECTRICAL/CONTROLS - ESTIMATED
- EXISTING DTE ELECTRICAL - SURVEYED
- FRENCH DRAIN CONTROLS
- EXISTING GROUNDWATER COLLECTION SYSTEM (FORCEMAIN) - ESTIMATED
- EXISTING GROUNDWATER COLLECTION SYSTEM (FRENCH DRAIN) - ESTIMATED
- EAST SIDE STORM DRAIN STRUCTURE - SURVEYED
- GROUNDWATER COLLECTION SYSTEM CLEANOUTS AND SUMPS - SURVEYED
- GROUNDWATER COLLECTION SYSTEM ELECTRICAL/CONTROLS HAND-HOLD - SURVEYED
- EXISTING WATER VALVES (YAM) - SURVEYED
- EXISTING VAULT - SURVEYED
- EASEMENT AS RECORDED ON APRIL 30, 2018

NOTES:

- EAST SIDE STORM DRAIN - SANITITE PIPE, NOT OFFICIAL RECORD DRAWING. FOR REFERENCE ONLY.
- DRAWING DOES NOT INCLUDE ALL NEWLY INSTALLED/ PREVIOUS UTILITIES BY YAM AND ACM.
- DRAWING DOES NOT INCLUDE HISTORICAL SITE UTILITIES.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

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Status		Date	Initial

WILLOW RUN POWERTRAIN
YPSILANTI, MICHIGAN

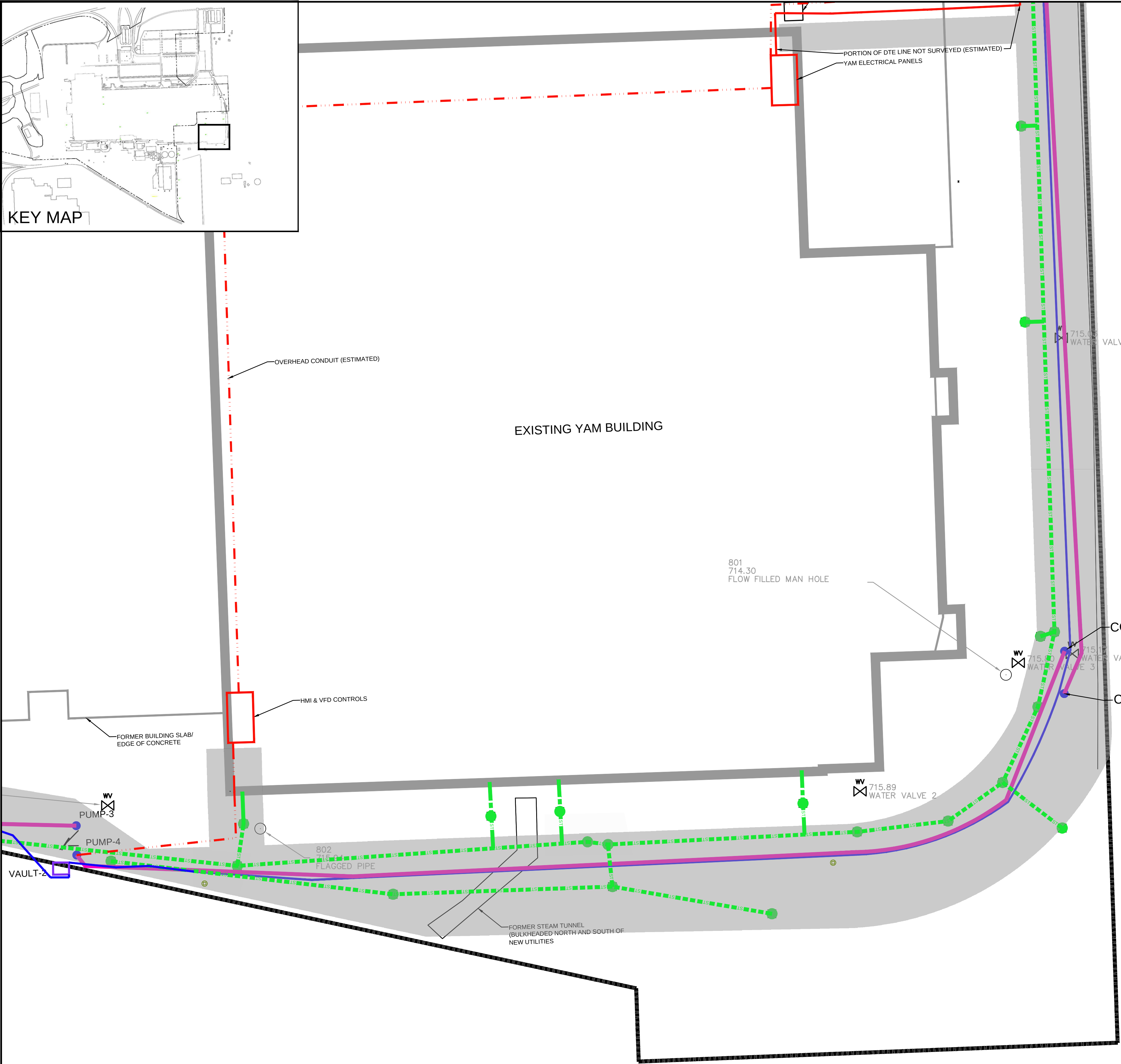
GROUNDWATER COLLECTION SYSTEM

RECORD DRAWING

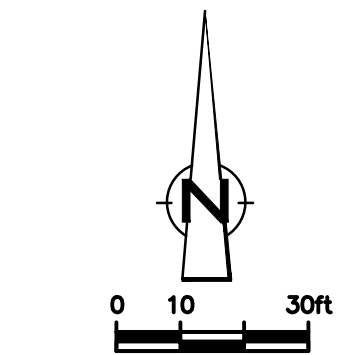
CRA ENGINEERING, INC.

Source Reference:

Project Manager: B.L.	Reviewed By: N.F.	Date: MARCH 2017
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		Drawing Nº: FIGURE 2



Nº	Revision	Date	Initial



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WILLOW RUN POWERTRAIN
YPSILANTI, MICHIGAN

GROUNDWATER COLLECTION SYSTEM

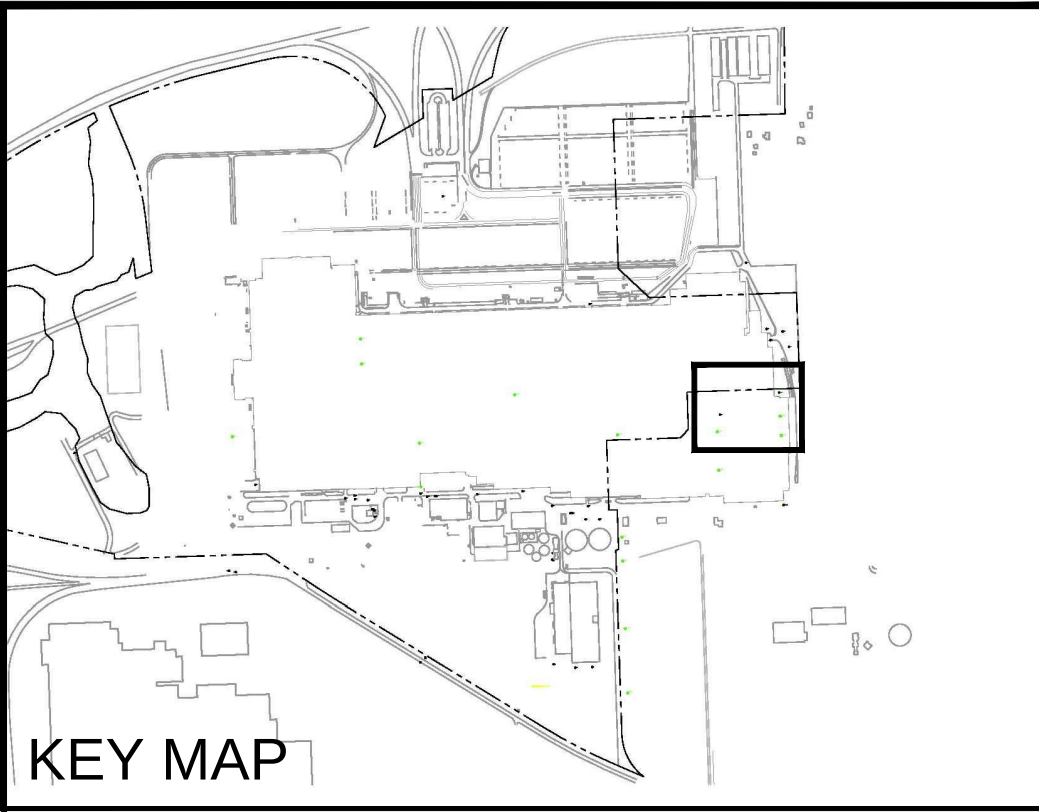
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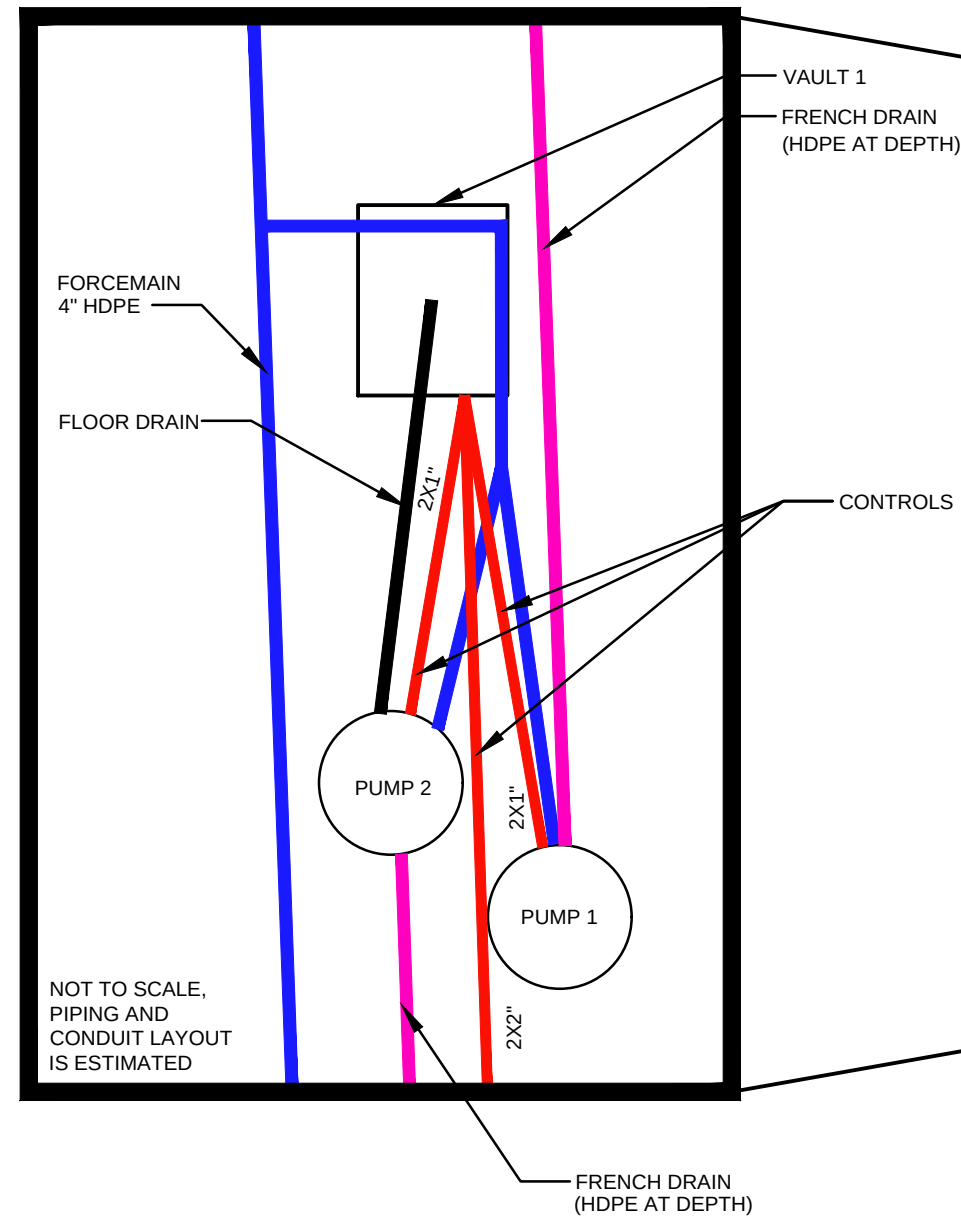
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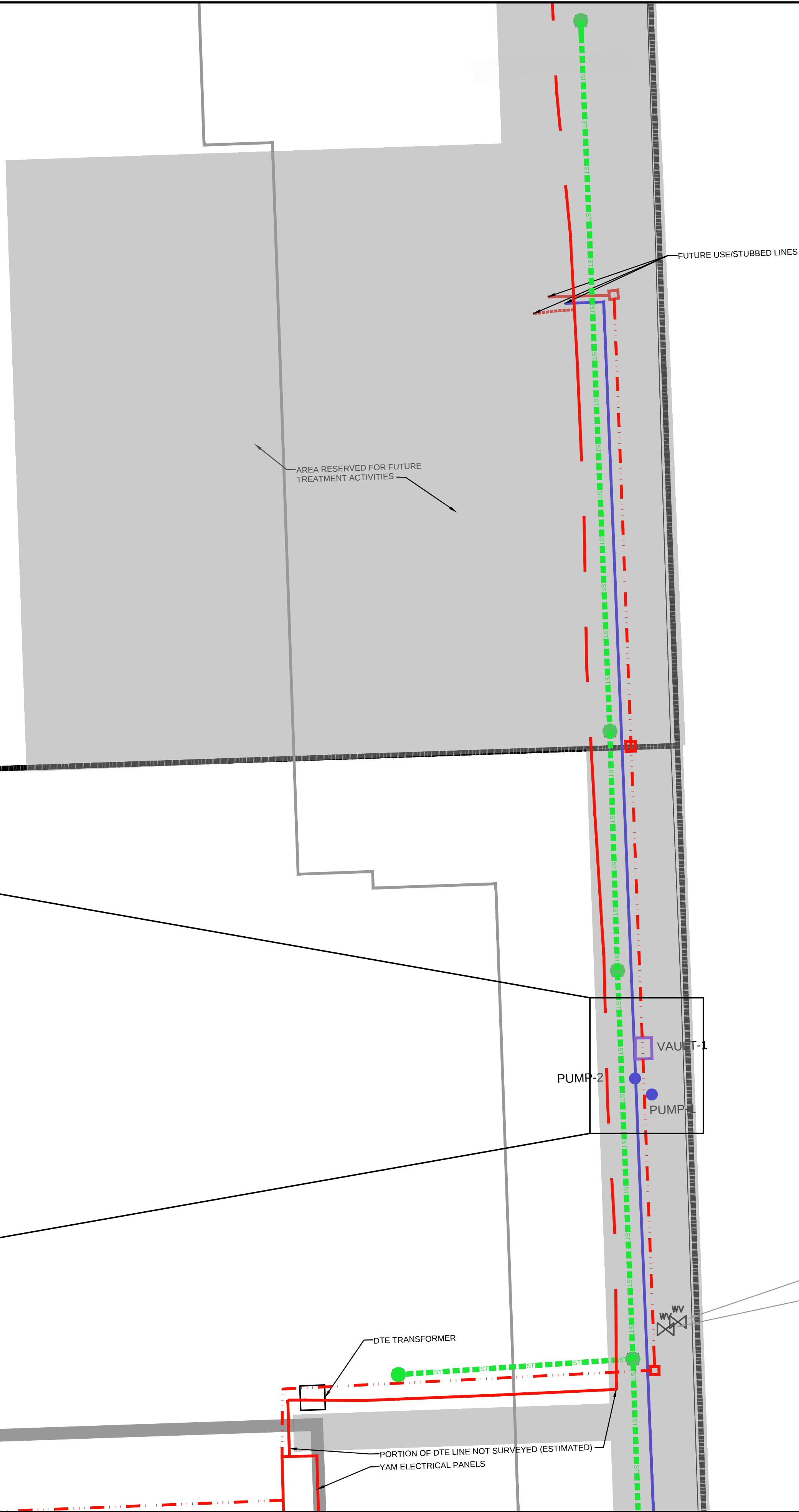
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		Drawing Nº: FIGURE 3



KEY MAP

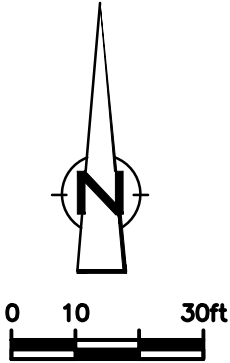


NOT TO SCALE,
PIPING AND
CONDUIT LAYOUT
IS ESTIMATED



715.60
WATER VALVE 5
715.26
WATER VALVE 6

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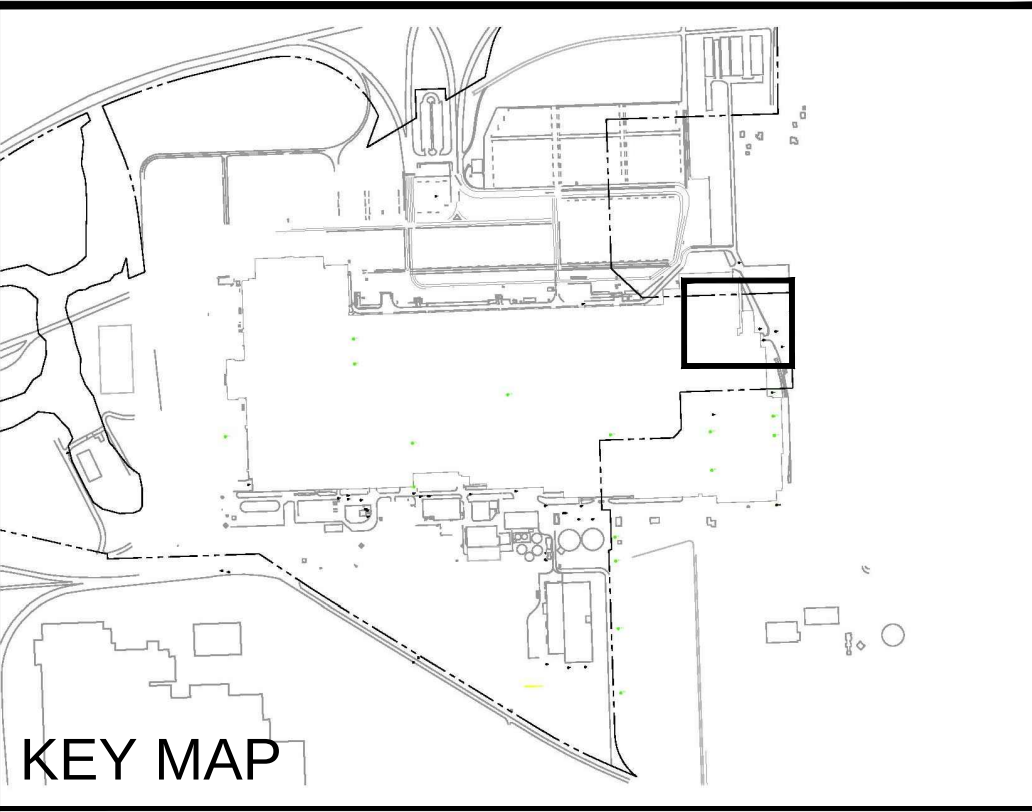
DRAWING STATUS

Status	Date	Initial

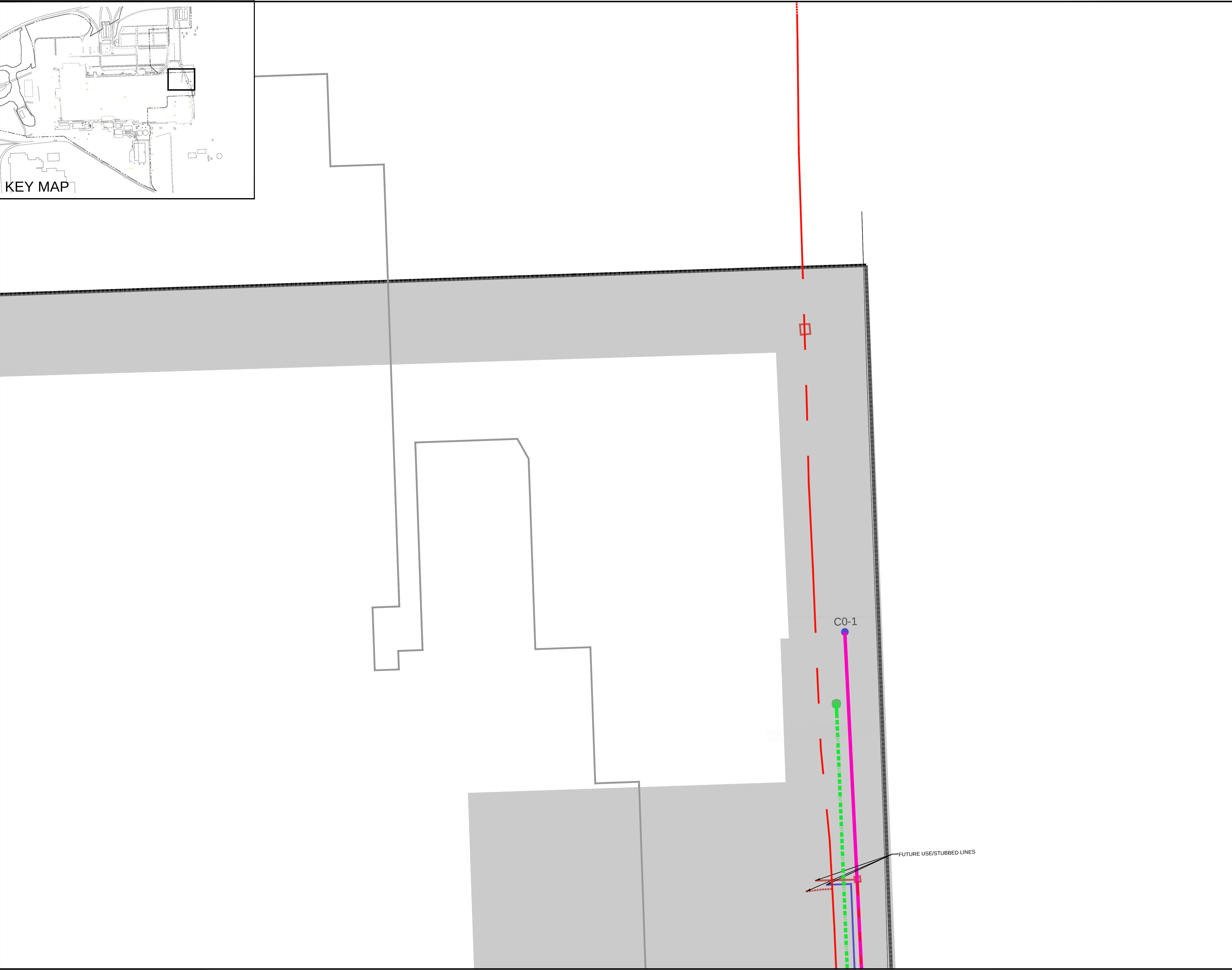
WILLOW RUN POWERTRAIN
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION SYSTEM
RECORD DRAWING



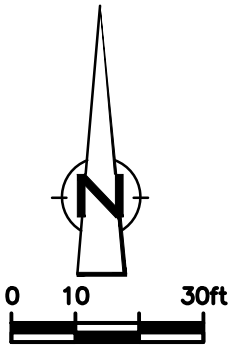
Source Reference:			
Project Manager: B.L.	Reviewed By: N.F.	Date: MARCH 2017	
Scale: 1:70	Project Nº: 017358-T02	Report Nº: MEMO230	Drawing Nº: FIGURE 4



KEY MAP



Nº	Revision	Date	Initial



- LEGEND
- PROPERTY BOUNDARY
 - FORMER BUILDING FOOTPRINT
 - EAST SIDE STORM DRAIN (YAM AND ACM)
 - EXISTING GROUNDWATER SYSTEM ELECTRICAL/CONTROLS - ESTIMATED
 - EXISTING DTE ELECTRICAL - SURVEYED
 - FRENCH DRAIN CONTROLS
 - EXISTING GROUNDWATER COLLECTION SYSTEM (FORCEMAIN) - ESTIMATED
 - EXISTING GROUNDWATER COLLECTION SYSTEM (FRENCH DRAIN) - ESTIMATED
 - EAST SIDE STORM DRAIN STRUCTURE - SURVEYED
 - GROUNDWATER COLLECTION SYSTEM CLEANOUTS AND SUMPS - SURVEYED
 - GROUNDWATER COLLECTION SYSTEM ELECTRICAL/CONTROLS HAND-HOLD - SURVEYED
 - EXISTING WATER VALVES (YAM) - SURVEYED
 - EXISTING VAULT - SURVEYED
 - EASEMENT AS RECORDED ON APRIL 30, 2018

- NOTES:
- EAST SIDE STORM DRAIN - SANITITE PIPE, NOT OFFICIAL RECORD DRAWING. FOR REFERENCE ONLY.
 - DRAWING DOES NOT INCLUDE ALL NEWLY INSTALLED/ PREVIOUS UTILITIES BY YAM AND ACM.
 - DRAWING DOES NOT INCLUDE HISTORICAL SITE UTILITIES.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS		
Status	Date	Initial

WILLOW RUN POWERTRAIN
YPSILANTI, MICHIGAN

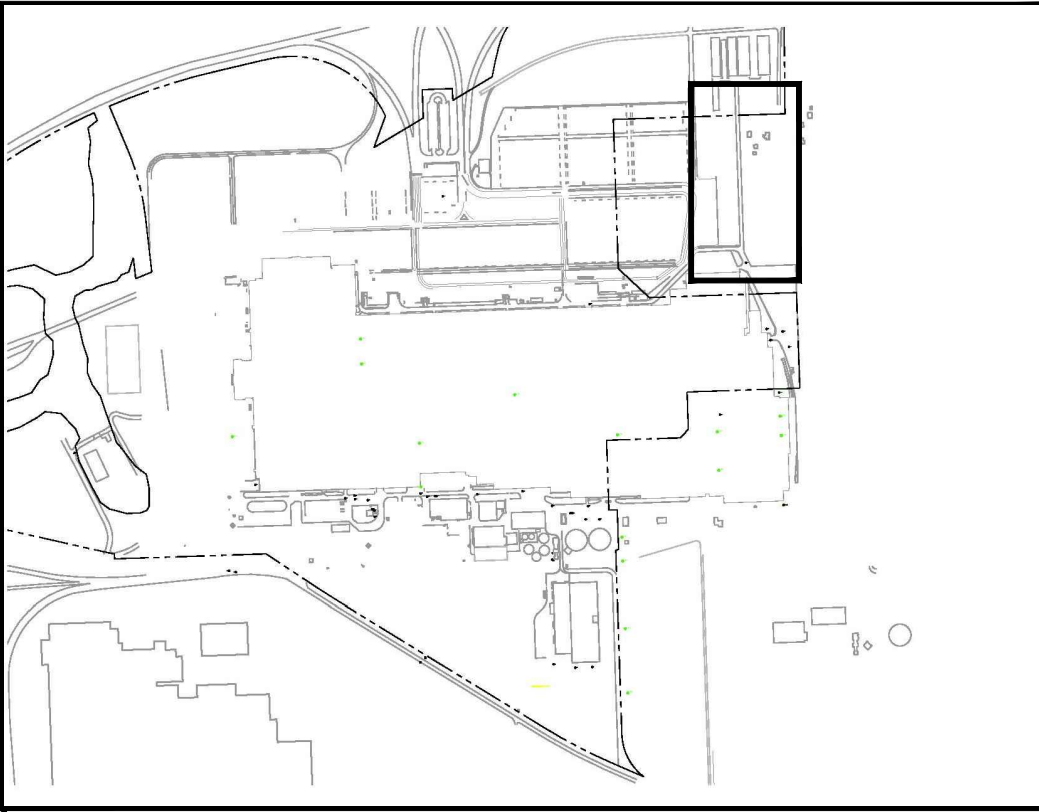
GROUNDWATER COLLECTION SYSTEM

RECORD DRAWING

CRA ENGINEERING, INC.

Source Reference:

Project Manager: B.L.	Reviewed By: N.F.	Date: MARCH 2017
Scale: 1:70	Project Nº: 017358-T02	Report Nº: MEMO230
		Drawing Nº: FIGURE 5

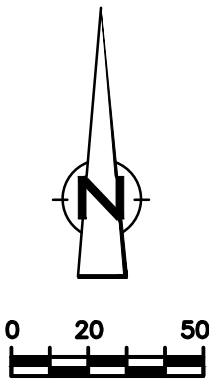


WILLOW RUN AIRPORT PROPERTY



PSC - DTE METER

Nº	Revision	Date	Initial



- LEGEND
- PROPERTY BOUNDARY
 - FORMER BUILDING FOOTPRINT
 - EAST SIDE STORM DRAIN (YAM AND ACM)
 - EXISTING GROUNDWATER SYSTEM ELECTRICAL/CONTROLS - ESTIMATED
 - EXISTING DTE ELECTRICAL - SURVEYED
 - FRENCH DRAIN CONTROLS
 - EXISTING GROUNDWATER COLLECTION SYSTEM (FORCEMAIN) - ESTIMATED
 - EXISTING GROUNDWATER COLLECTION SYSTEM (FRENCH DRAIN) - ESTIMATED
 - EAST SIDE STORM DRAIN STRUCTURE - SURVEYED
 - GROUNDWATER COLLECTION SYSTEM CLEANOUTS AND SUMPS - SURVEYED
 - GROUNDWATER COLLECTION SYSTEM ELECTRICAL/CONTROLS HAND-HOLD - SURVEYED
 - EXISTING WATER VALVES (YAM) - SURVEYED
 - EXISTING VAULT - SURVEYED
 - EASEMENT AS RECORDED ON APRIL 30, 2018

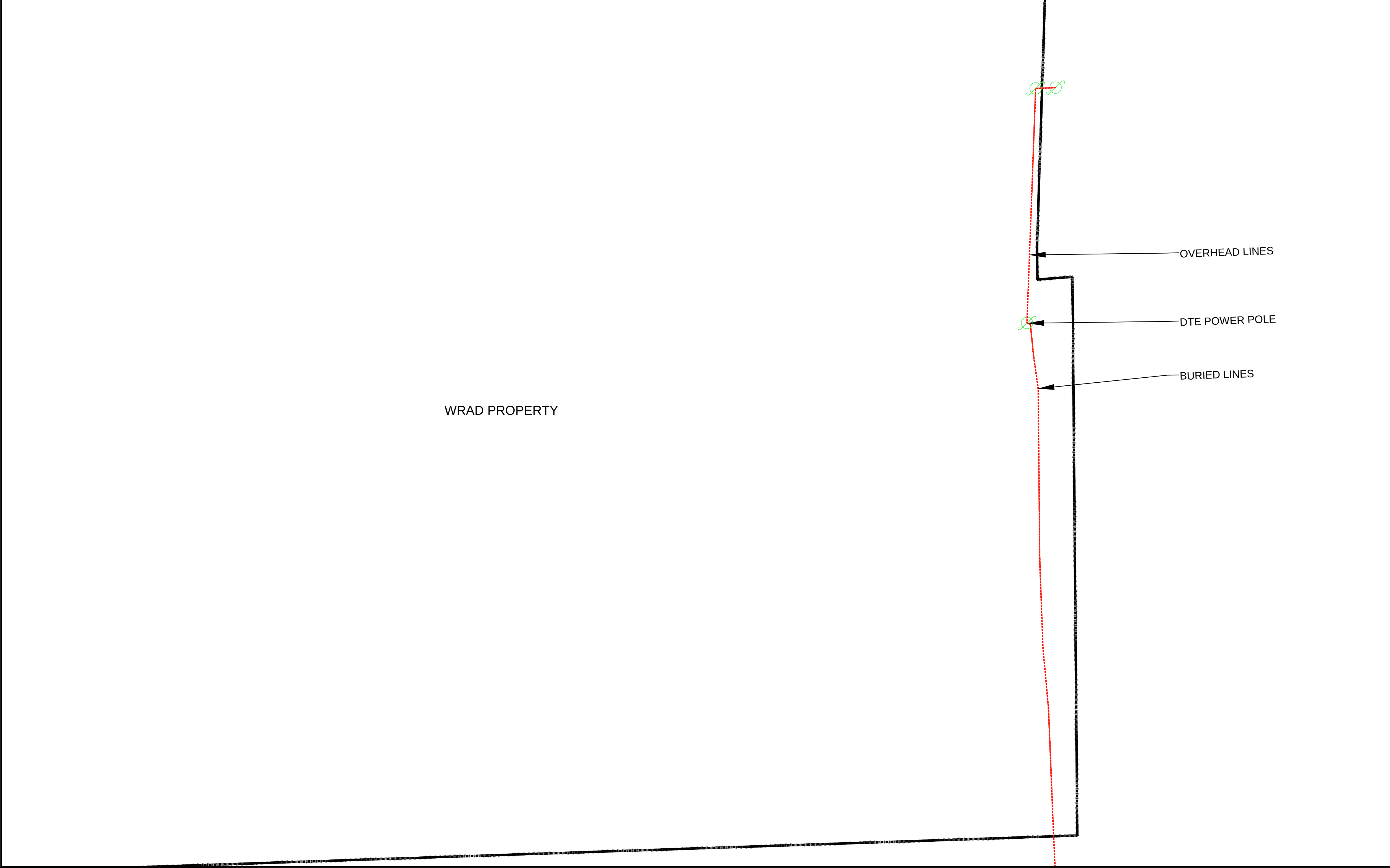
- NOTES:
- EAST SIDE STORM DRAIN - SANITITE PIPE, NOT OFFICIAL RECORD DRAWING. FOR REFERENCE ONLY.
 - DRAWING DOES NOT INCLUDE ALL NEWLY INSTALLED/ PREVIOUS UTILITIES BY YAM AND ACM.
 - DRAWING DOES NOT INCLUDE HISTORICAL SITE UTILITIES.

SCALE VERIFICATION
THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved		
DRAWING STATUS		
Status	Date	Initial

WILLOW RUN POWERTRAIN YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION SYSTEM
RECORD DRAWING

 CRA ENGINEERING, INC.			
Source Reference:			
Project Manager: B.L.	Reviewed By: N.F.	Date: MARCH 2017	
Scale: 1:70	Project Nº: 017358-T02	Report Nº: MEMO230	Drawing Nº: FIGURE 6



Nº	Revision	Date	Initial

LEGEND

- PROPERTY BOUNDARY
- FORMER BUILDING FOOTPRINT
- EAST SIDE STORM DRAIN (YAM AND ACM)
- EXISTING GROUNDWATER SYSTEM ELECTRICAL/CONTROLS - ESTIMATED
- EXISTING DTE ELECTRICAL - SURVEYED
- FRENCH DRAIN CONTROLS
- EXISTING GROUNDWATER COLLECTION SYSTEM (FORCEMAIN) - ESTIMATED
- EXISTING GROUNDWATER COLLECTION SYSTEM (FRENCH DRAIN) - ESTIMATED
- EAST SIDE STORM DRAIN STRUCTURE - SURVEYED
- GROUNDWATER COLLECTION SYSTEM CLEANOUTS AND SUMPS - SURVEYED
- GROUNDWATER COLLECTION SYSTEM ELECTRICAL/CONTROLS HAND-HOLD - SURVEYED
- EXISTING WATER VALVES (YAM) - SURVEYED
- EXISTING VAULT - SURVEYED
- EASEMENT AS RECORDED ON APRIL 30, 2018

NOTES:

- EAST SIDE STORM DRAIN - SANITITE PIPE, NOT OFFICIAL RECORD DRAWING. FOR REFERENCE ONLY.
- DRAWING DOES NOT INCLUDE ALL NEWLY INSTALLED/ PREVIOUS UTILITIES BY YAM AND ACM.
- DRAWING DOES NOT INCLUDE HISTORICAL SITE UTILITIES.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved		
DRAWING STATUS		
Status	Date	Initial

WILLOW RUN POWERTRAIN
YPSILANTI, MICHIGAN

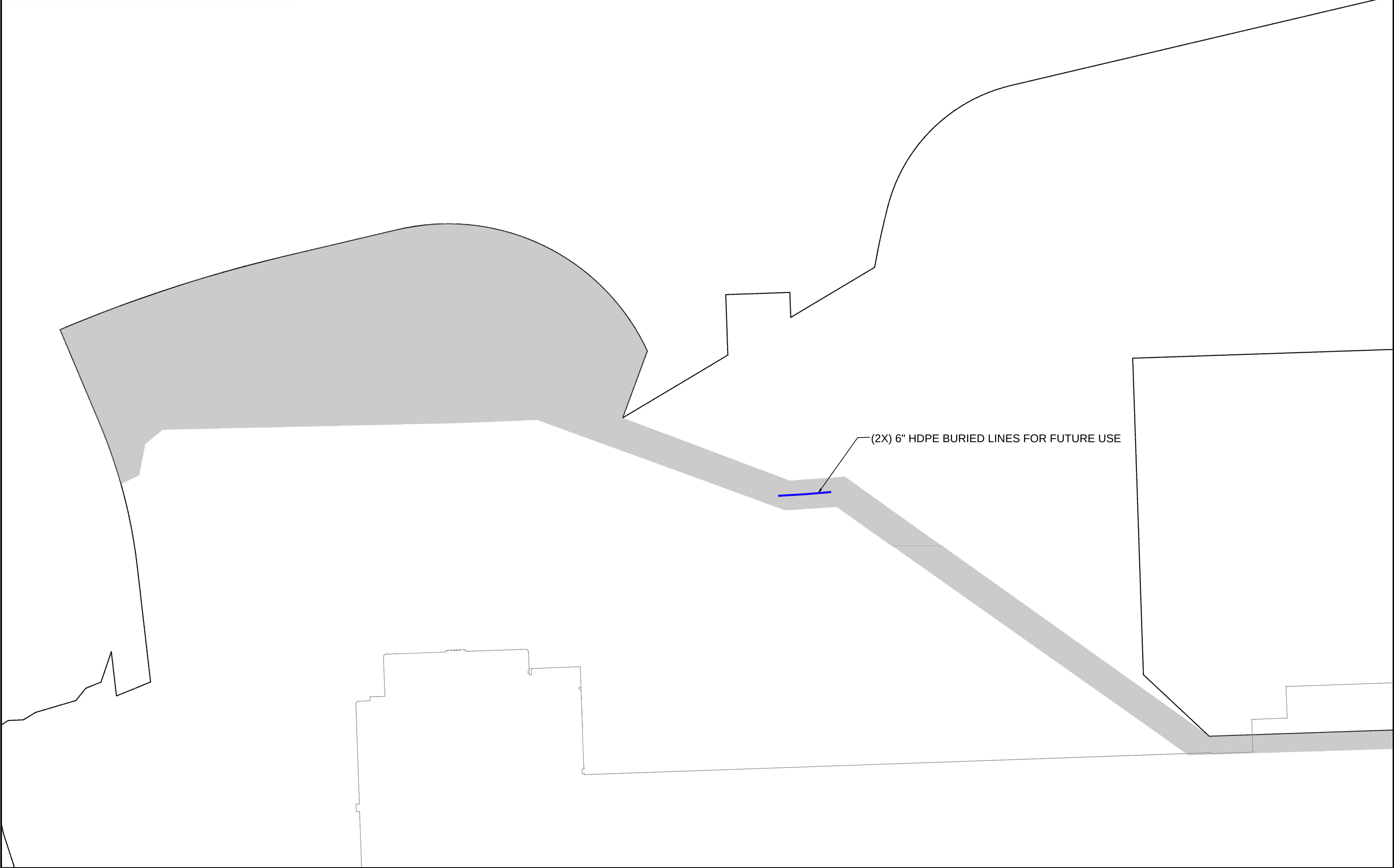
GROUNDWATER COLLECTION SYSTEM

RECORD DRAWING

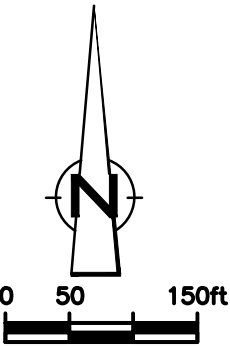
CRA ENGINEERING, INC.

Source Reference:

Project Manager: B.L.	Reviewed By: N.F.	Date: MARCH 2017	
Scale: 1:70	Project Nº: 017358-T02	Report Nº: MEMO230	Drawing Nº: FIGURE 7



Nº	Revision	Date	Initial



- LEGEND
- PROPERTY BOUNDARY
 - FORMER BUILDING FOOTPRINT
 - EAST SIDE STORM DRAIN (YAM AND ACM)
 - EXISTING GROUNDWATER SYSTEM ELECTRICAL/CONTROLS - ESTIMATED
 - EXISTING DTE ELECTRICAL - SURVEYED
 - FRENCH DRAIN CONTROLS
 - EXISTING GROUNDWATER COLLECTION SYSTEM (FORCEMAIN) - ESTIMATED
 - EXISTING GROUNDWATER COLLECTION SYSTEM (FRENCH DRAIN) - ESTIMATED
 - EAST SIDE STORM DRAIN STRUCTURE - SURVEYED
 - GROUNDWATER COLLECTION SYSTEM CLEANOUTS AND SUMPS - SURVEYED
 - GROUNDWATER COLLECTION SYSTEM ELECTRICAL/CONTROLS HAND-HOLD - SURVEYED
 - EXISTING WATER VALVES (YAM) - SURVEYED
 - EXISTING VAULT - SURVEYED
 - EASEMENT AS RECORDED ON APRIL 30, 2018

NOTES:

REFERENCE ONLY.

2. DRAWING DOES NOT INCLUDE ALL NEWLY INSTALLED/ PREVIOUS UTILITIES BY YAM AND ACM.

3. DRAWING DOES NOT INCLUDE HISTORICAL SITE UTILITIES.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS			
Status		Date	Initial

WILLOW RUN POWERTRAIN
YPSILANTI, MICHIGAN

GROUNDWATER COLLECTION SYSTEM

RECORD DRAWING



CRA ENGINEERING, INC.

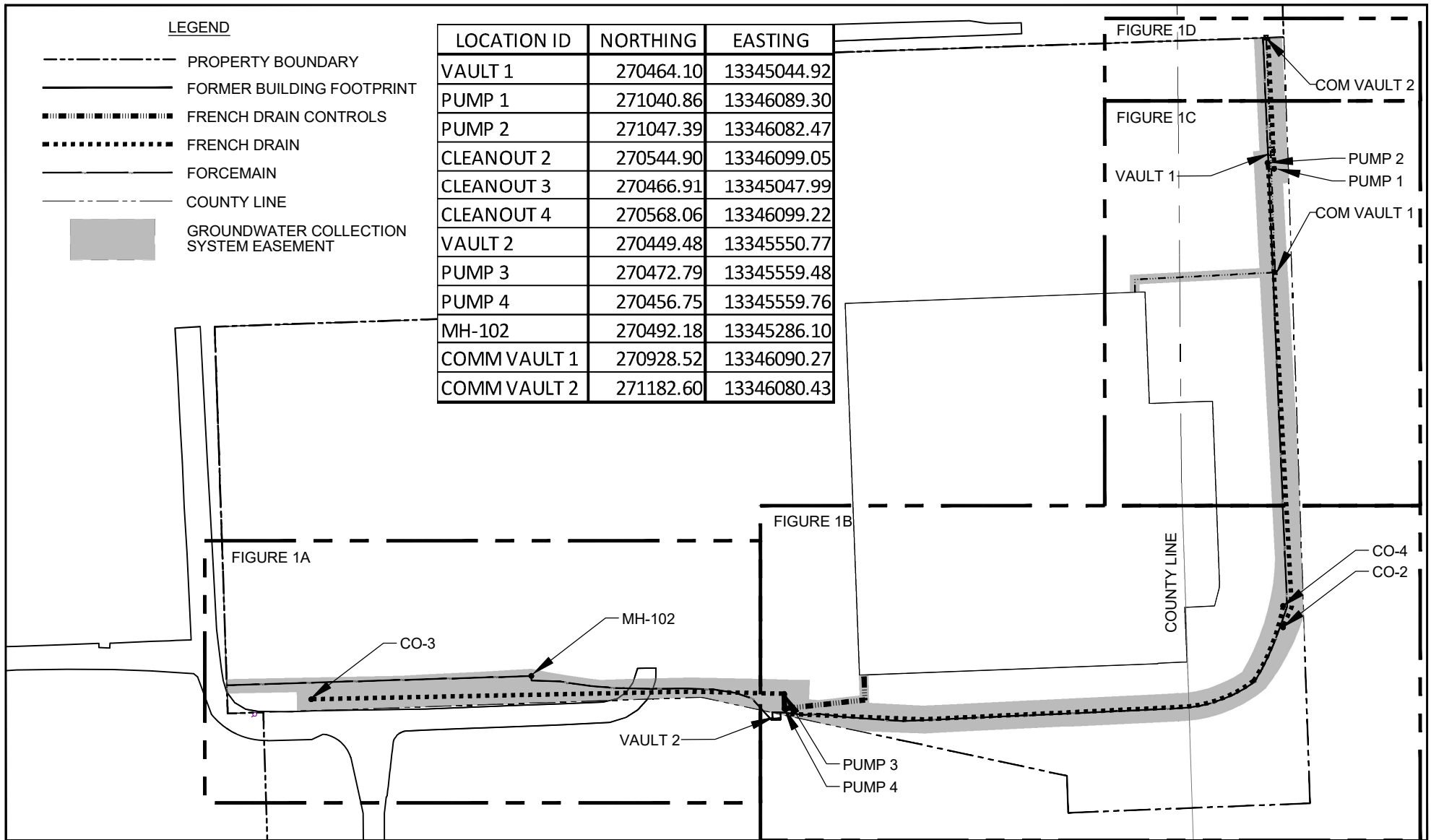
Source Reference:

Project Manager: B.L.	Reviewed By: N.F.	Date: MARCH 2017
Scale: 1:70	Project Nº: 017358-T02	Report Nº: MEMO230
		Drawing Nº: FIGURE 8

Appendices

Appendix A

Easement Figures



0 50 150ft

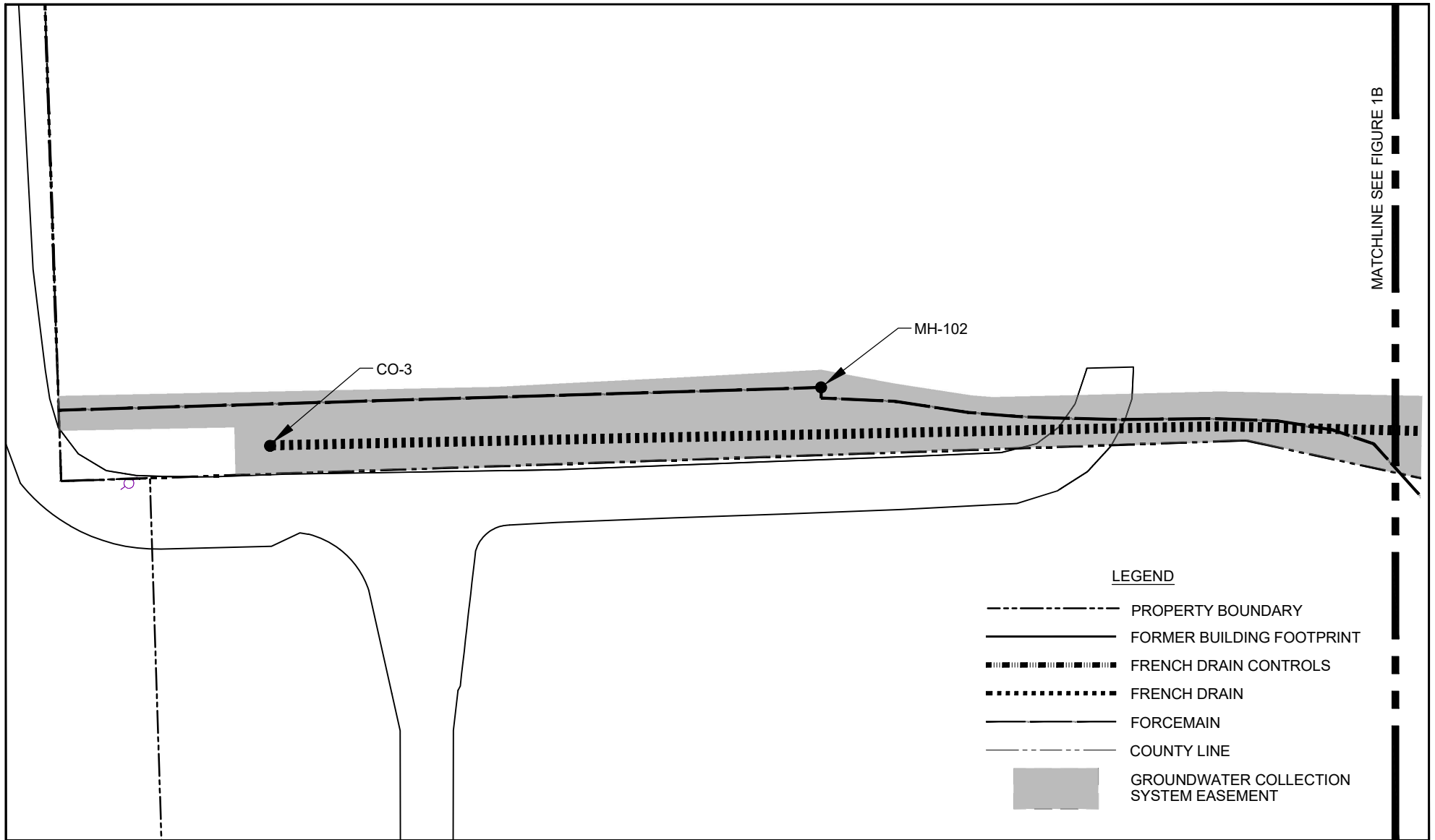


FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION
SYSTEM EASEMENT

11211446-2020

Jun 9, 2020

FIGURE 1



0 20 60ft

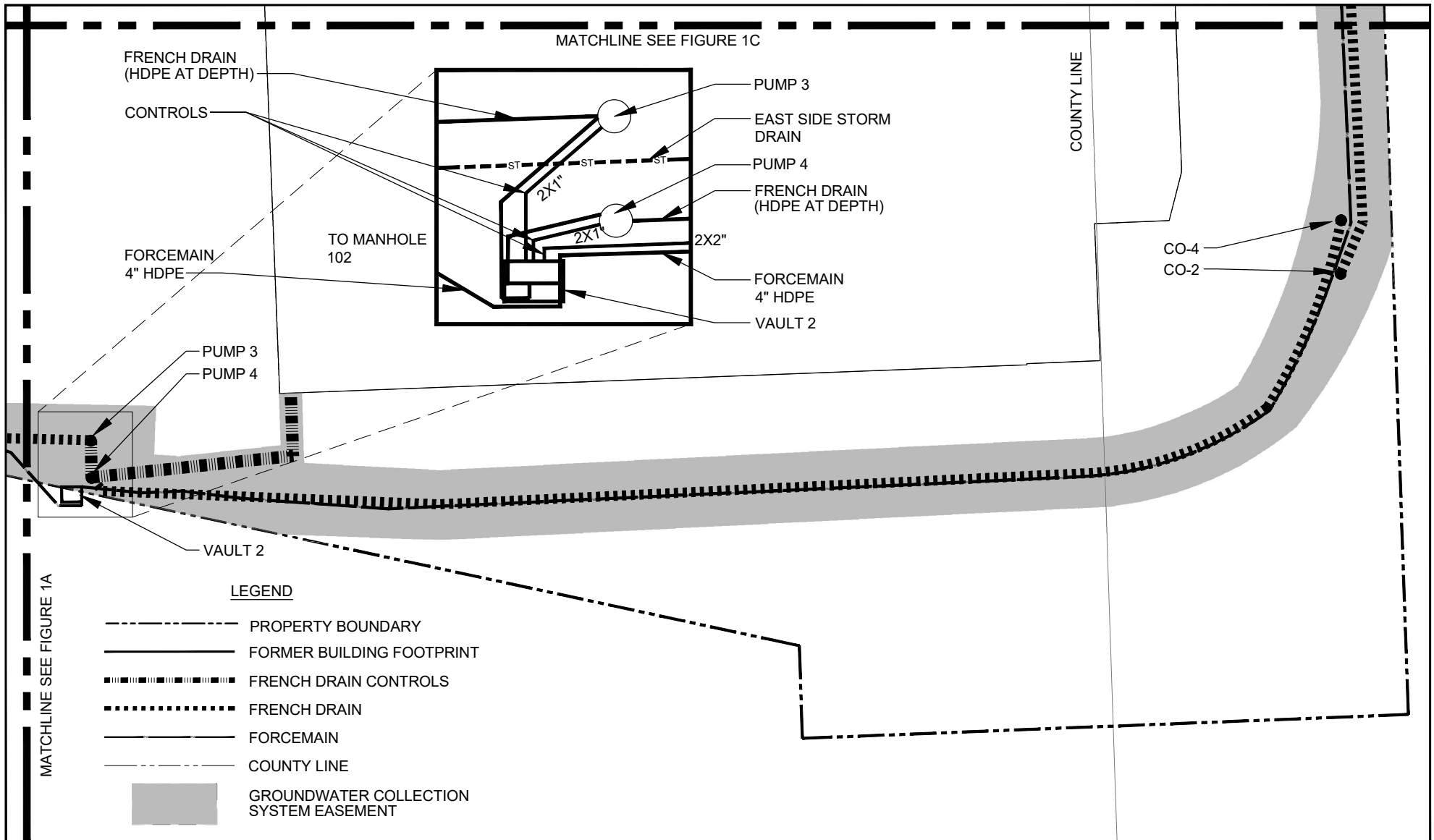


FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION
SYSTEM EASEMENT

11211446-2020

Jun 9, 2020

FIGURE 1A



0 20 60ft

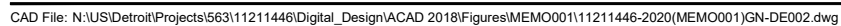


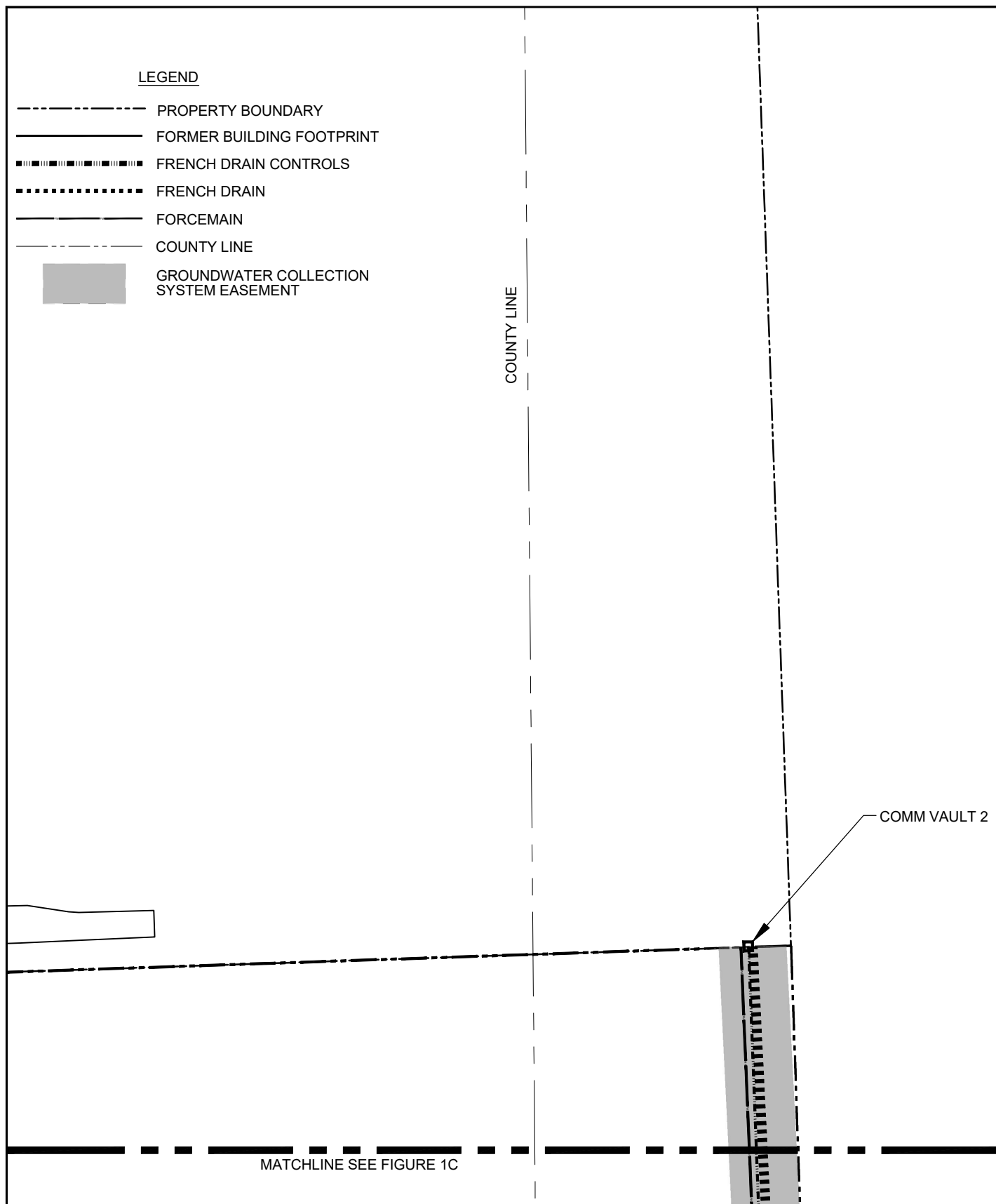
FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION
SYSTEM EASEMENT

11211446-2020

Jun 9, 2020

FIGURE 1B





0 20 60ft

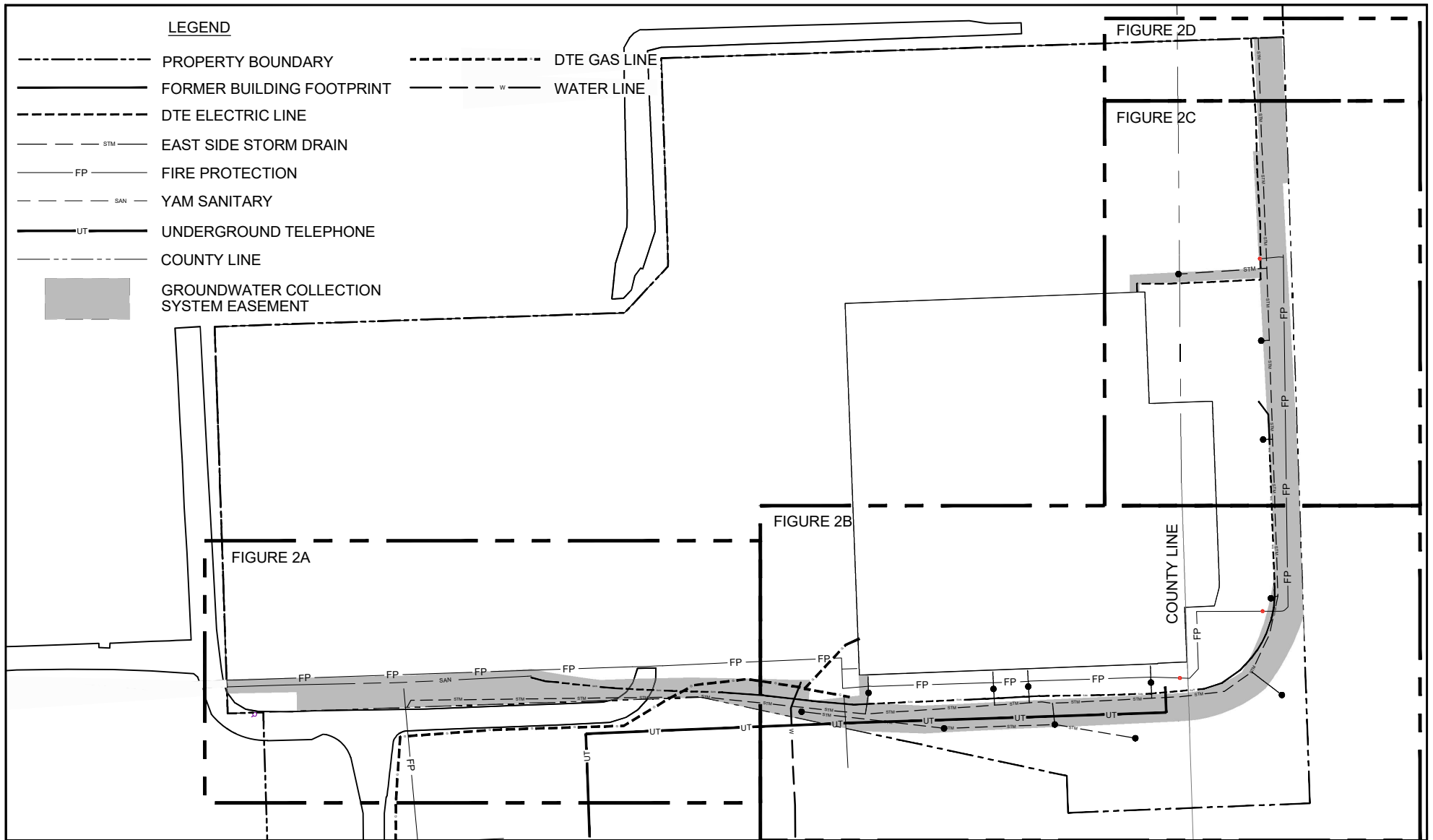


FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION
SYSTEM EASEMENT

11211446-2020

Jun 9, 2020

FIGURE 1D



0 50 150ft

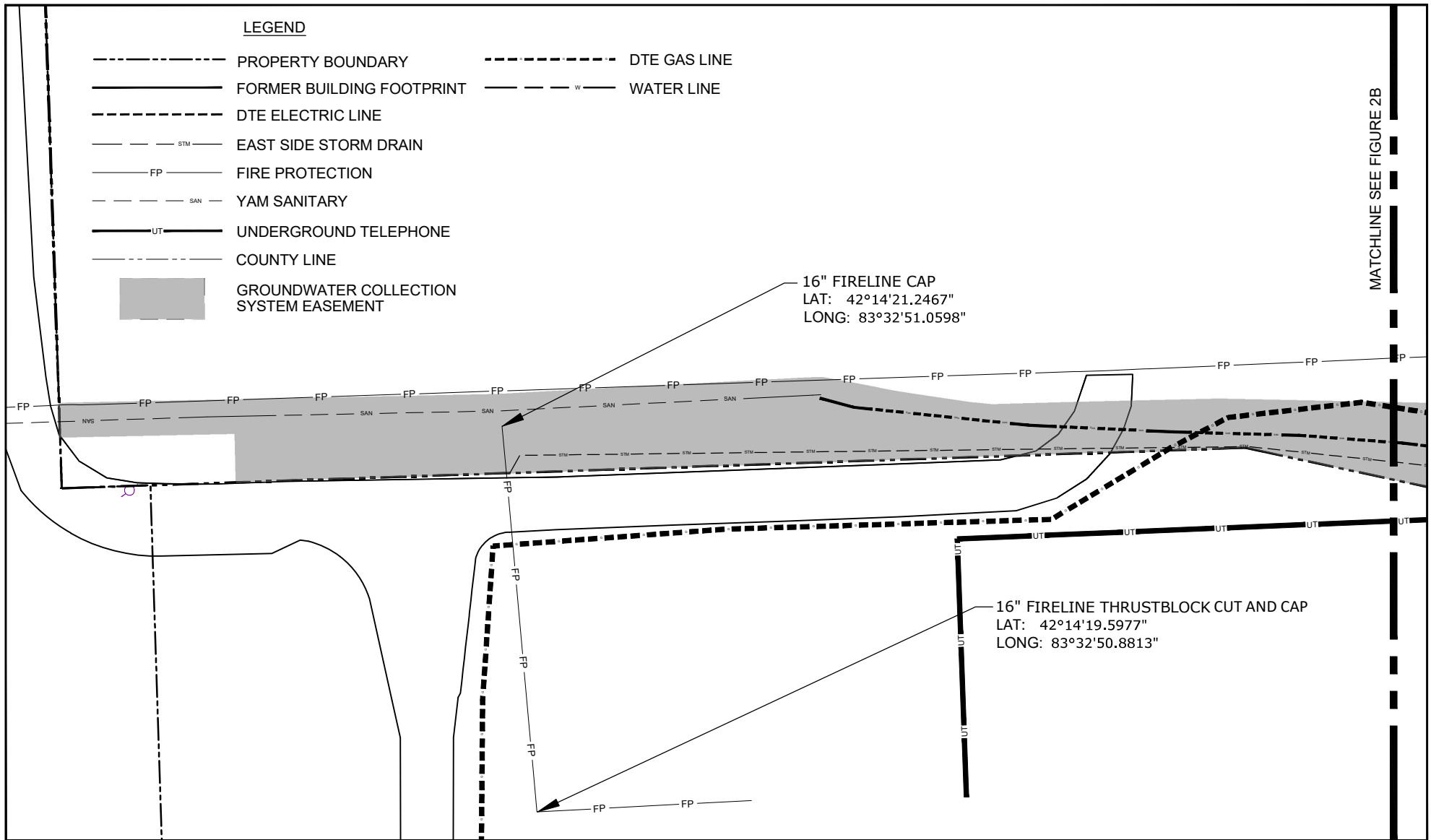


FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION
EASEMENT CONFLICTS

11211446-2020

May 28, 2020

FIGURE 2



0 20 60ft

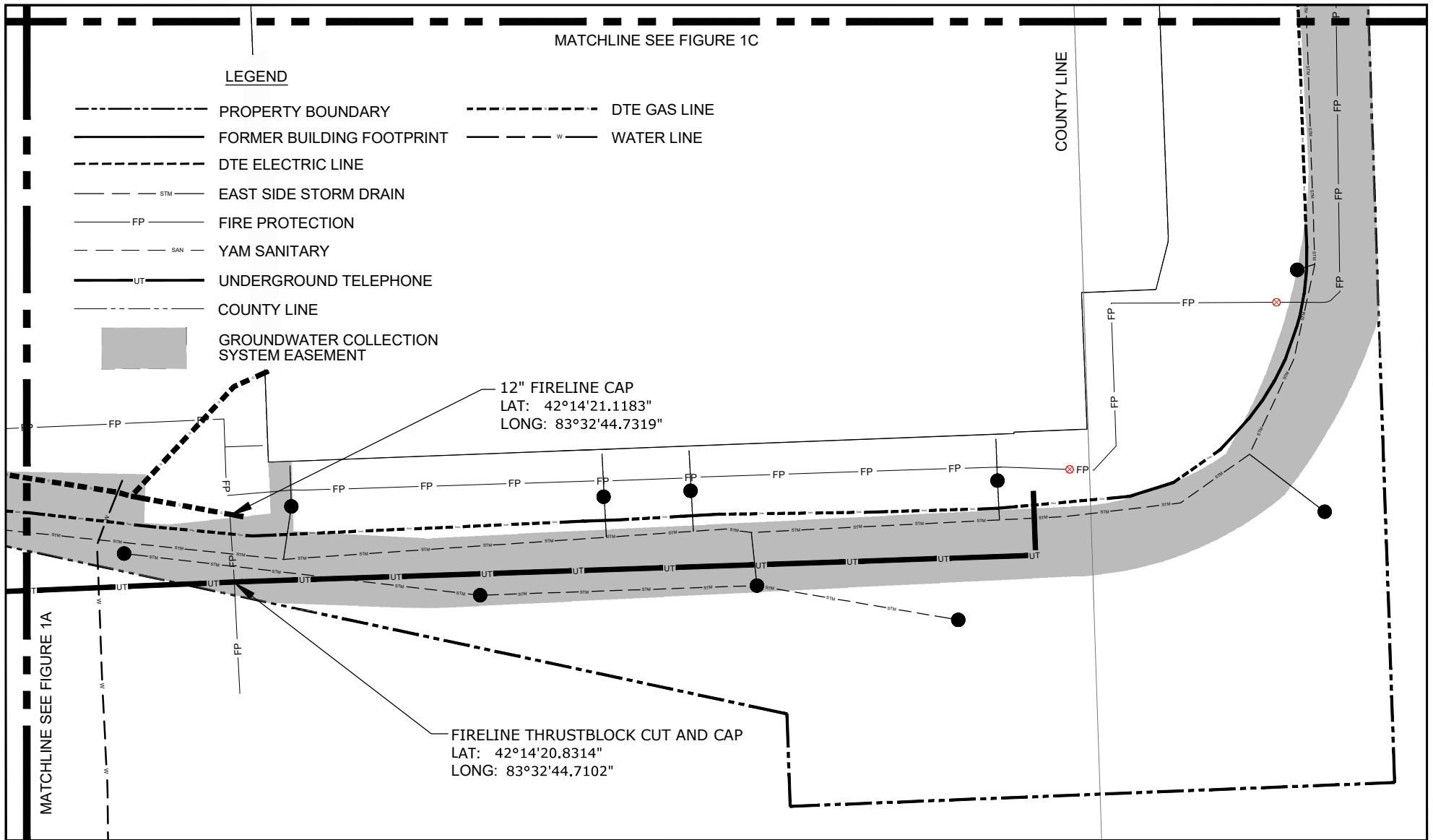


FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION
EASEMENT CONFLICTS

11211446-2020

May 28, 2020

FIGURE 2A



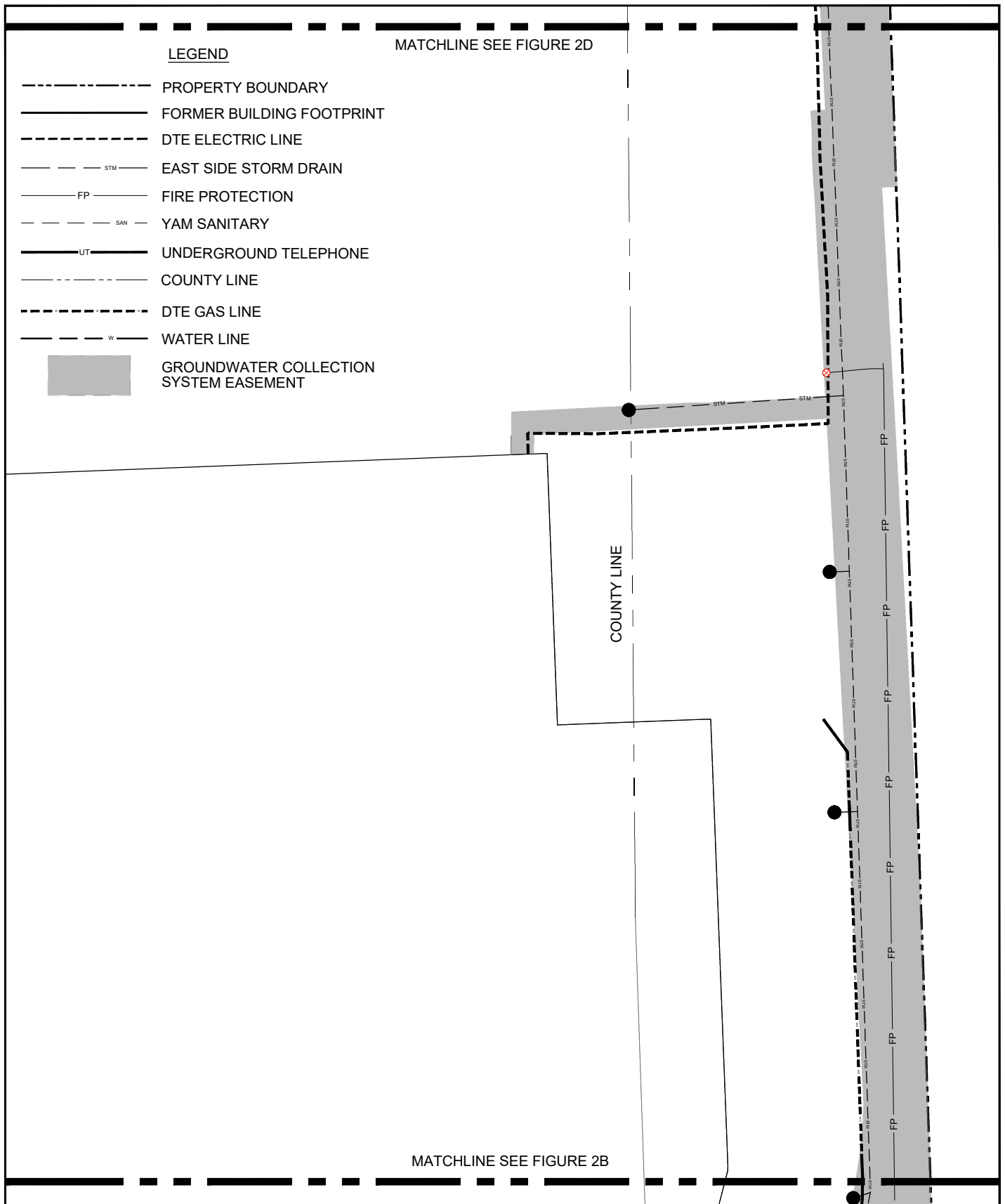
0 20 60ft



FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION
EASEMENT CONFLICTS

11211446-2020
May 28, 2020

FIGURE 2B



0 20 60ft

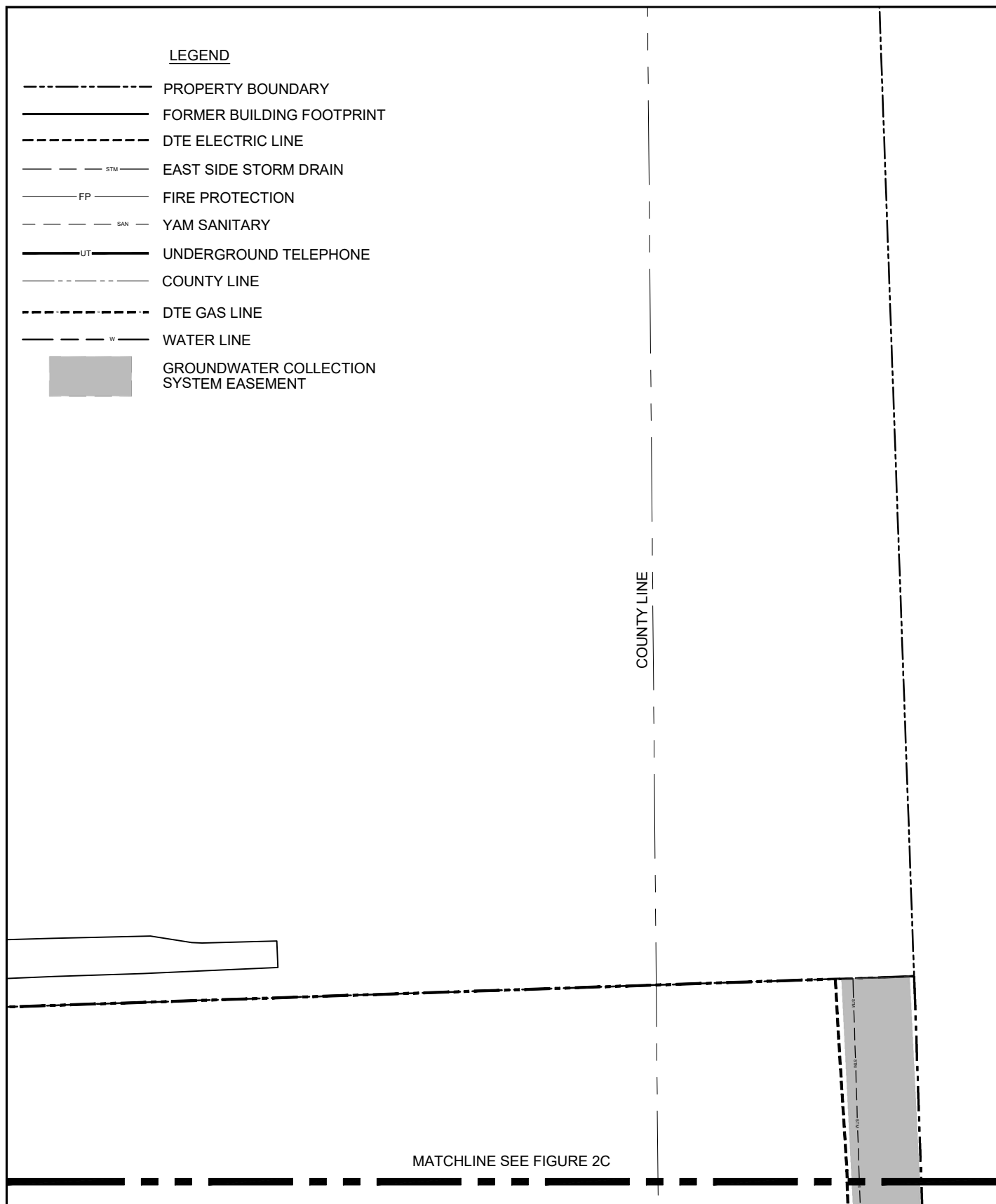


FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION
EASEMENT CONFLICTS

11211446-2020

May 28, 2020

FIGURE 2C



0 20 60ft




FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION
EASEMENT CONFLICTS

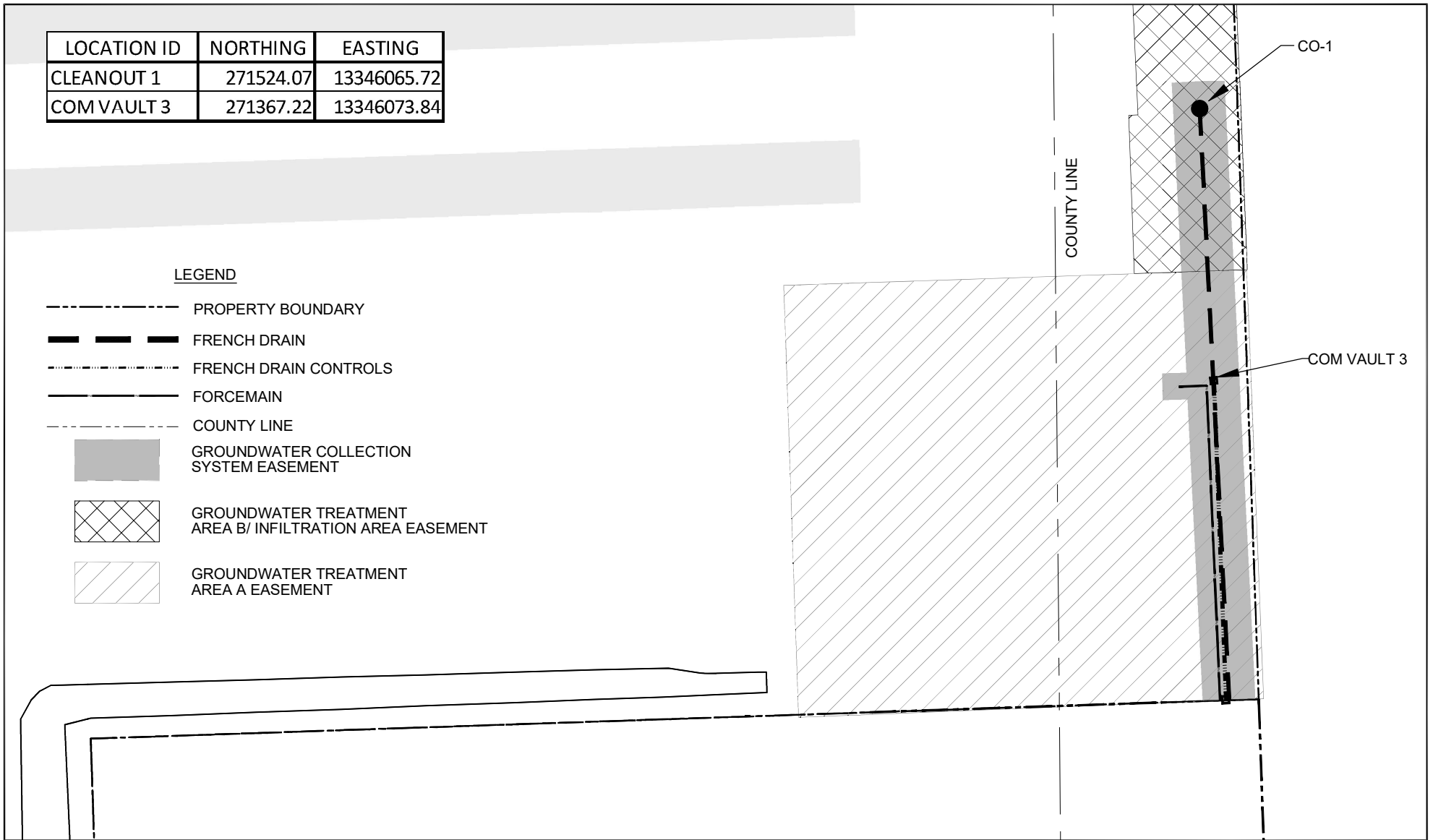
11211446-2020
May 28, 2020

FIGURE 2D

LOCATION ID	NORTHING	EASTING
CLEANOUT 1	271524.07	13346065.72
COM VAULT 3	271367.22	13346073.84

LEGEND

- PROPERTY BOUNDARY
- FRENCH DRAIN
- - - - FRENCH DRAIN CONTROLS
- FORCEMAIN
- COUNTY LINE
-  GROUNDWATER COLLECTION SYSTEM EASEMENT
-  GROUNDWATER TREATMENT AREA B/ INFILTRATION AREA EASEMENT
-  GROUNDWATER TREATMENT AREA A EASEMENT



0 40 80ft

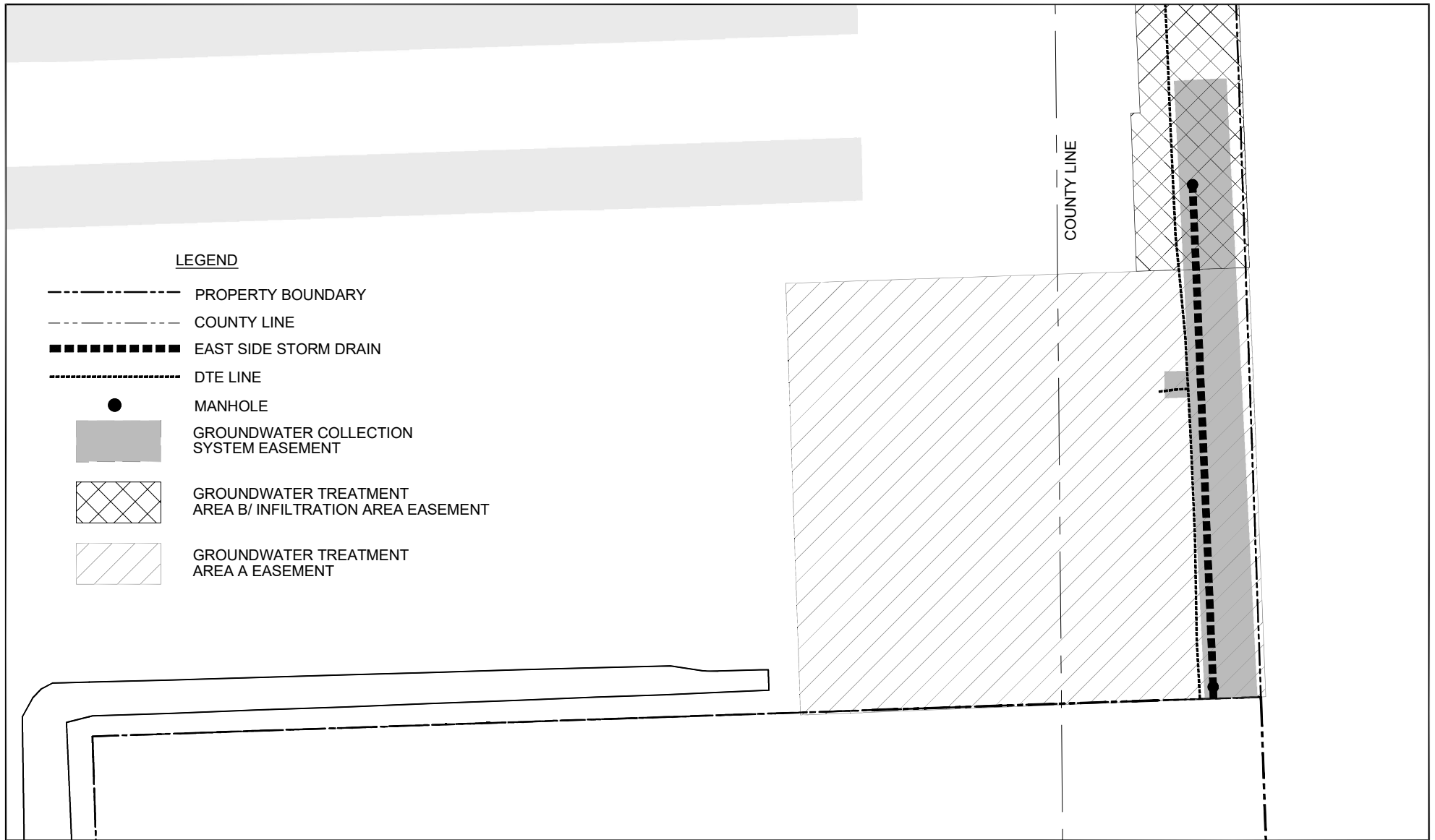


FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION SYSTEM
EASEMENT ON ACM

11211446-2020

May 29, 2020

FIGURE 3



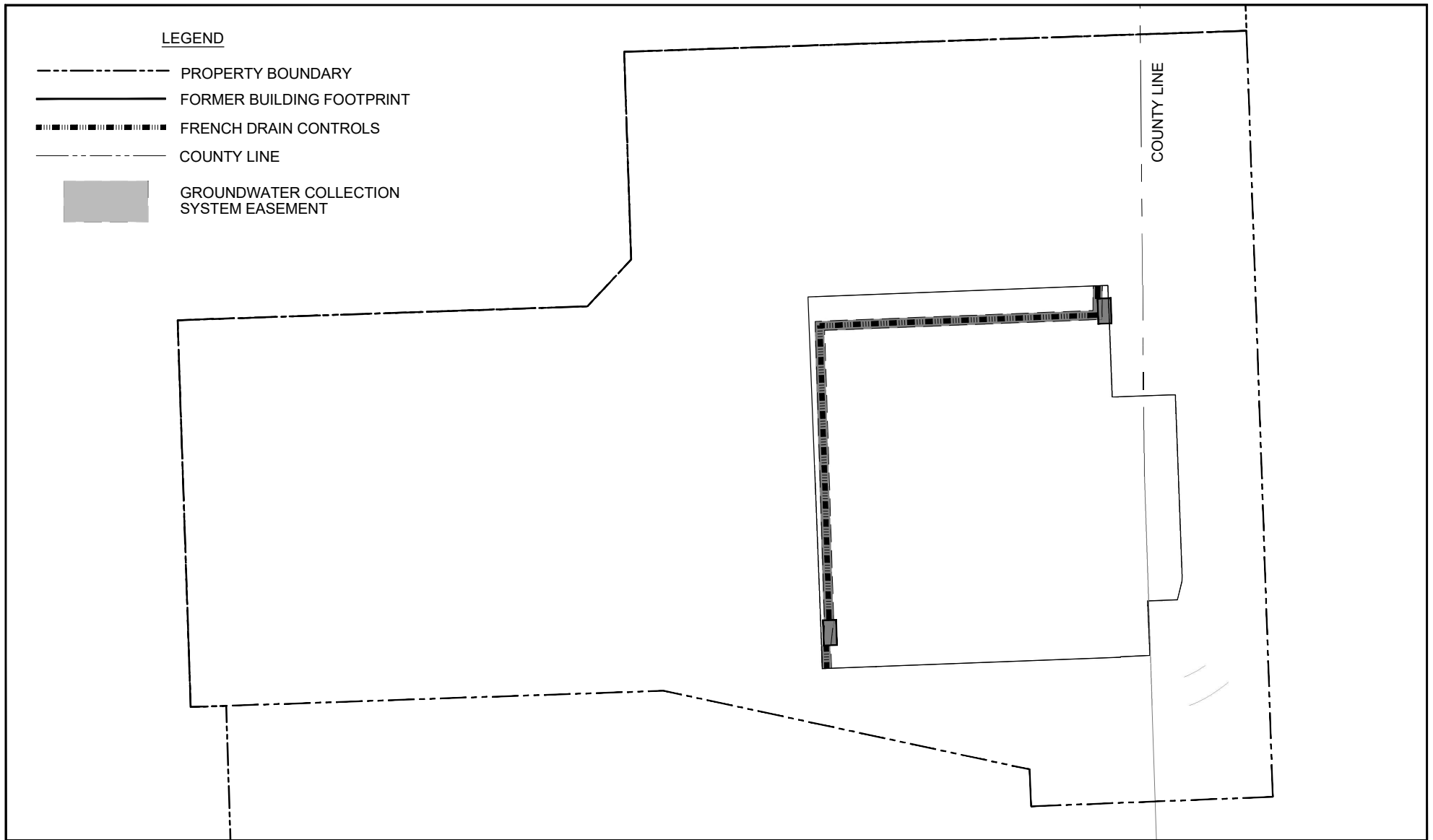
0 40 80ft



FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION SYSTEM
EASEMENT ON ACM CONFLICTS

11211446-2020
May 28, 2020

FIGURE 3B



0 50 150ft

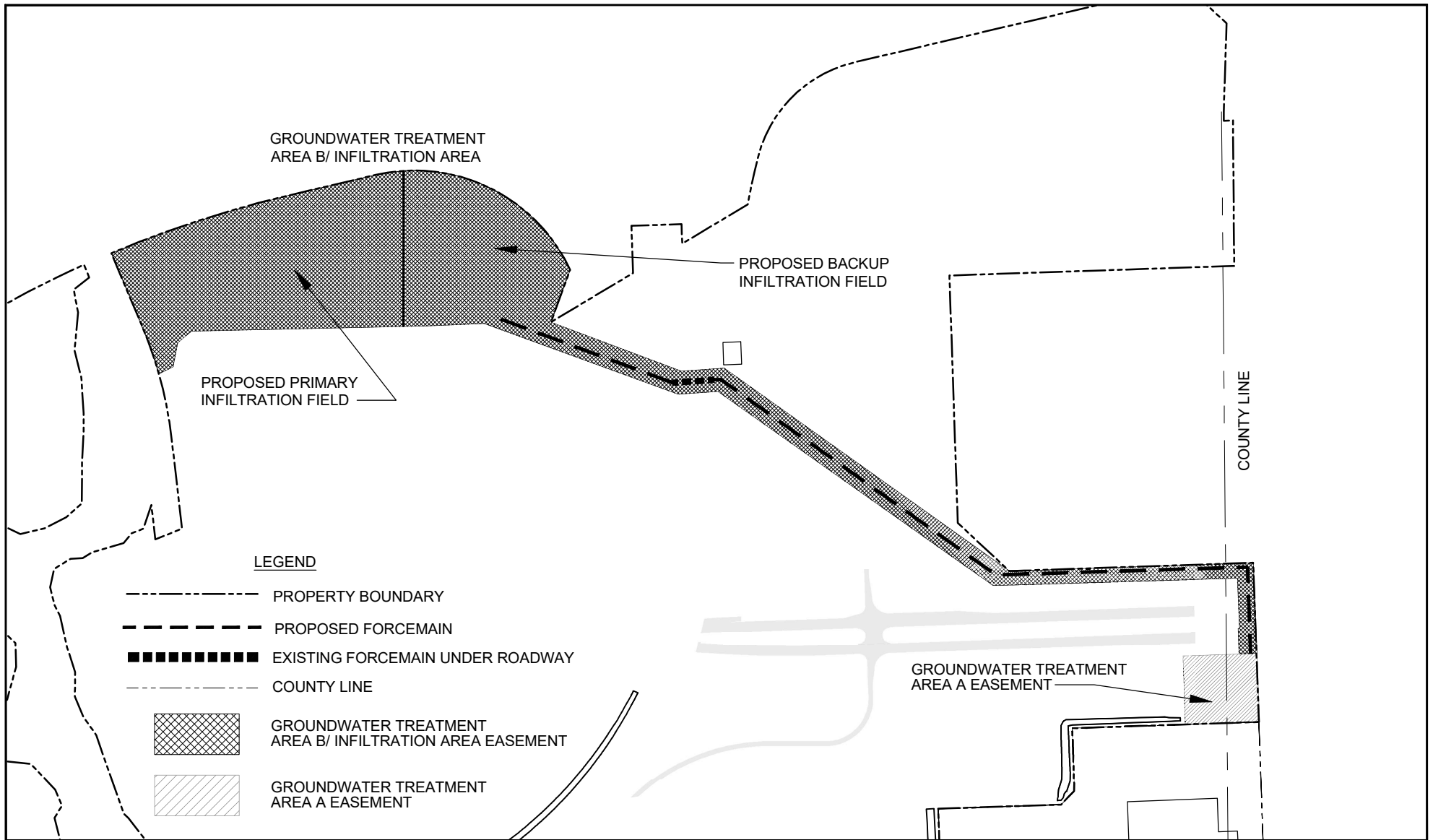


FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
GROUNDWATER COLLECTION SYSTEM
CONTROLS INSIDE YAM BUILDING

11211446-2020

May 28, 2020

FIGURE 4



0 200 500ft



FORMER POWERTRAIN PLANT
YPSILANTI, MICHIGAN
**GROUNDWATER TREATMENT SYSTEM
EASEMENT ON ACM**

11211446-2020

Jun 9, 2020

ACM-A & B

Appendix B

ARC Flash Memo



Memorandum

To: Beth Landale Ref. No.: 017358A-2019-T06.01

From: John Davis Tel: 716-362-8831

CC: Daniel Beck, Matthew Feldman

Subject: Willow Run, RACER Arc Flash Hazard Risk Assessment

1. Arc Flash Hazard Risk Assessment Results

This memo is intended to give a brief overview of the arc flash incident energy results for the Willow Run RACER facility. For an in depth, explanation of electrical safety for qualified persons please refer to the GHD NA-SOP-HSE-030 Workplace Electrical Safety Program (WESP) as well as the Electrical Safety for Qualified Persons Training Program Manual.

All pertinent information such as utility fault data and the incident energy results are provided in this report. Arc Flash labels will be supplied upon an approval of this report.

An arc flash hazard risk assessment was performed for the Willow Run, RACER facility located at:

200 Liberator Way
Ypsilanti, MI

The arc flash incident energy results are as follows:

Table 1 Arc Flash Incident Energy Results

Name of Bus	Incident Energy (cal/cm ²)	Comments
Line Side of the Main Service Disconnect	68.04 cal/cm ²	The incident energy here is fairly high due to it being the main service disconnect, located at the load side of the main utility transformer
VFD Panel 1-2	0.1 cal/cm ²	
VFD Panel 3-4	0.03 cal/cm ²	

2. Arc Flash Labels

Arc Flash labels will be provided for the electrical equipment buses mentioned above. The labels will have values for the Flash Hazard Approach Boundaries, the Limited Approach Boundary, and the Restricted Approach Boundary.



2.1 Flash Hazard Approach Boundary

The flash hazard boundary in inches is variable and refers to the distance the arc flash will emanate from the original short circuit toward the worker.

2.2 Limited Approach Boundary

The limited approach boundary in inches is fixed, and is in reference to the distance from exposed energized parts that require the worker to wear PPE.

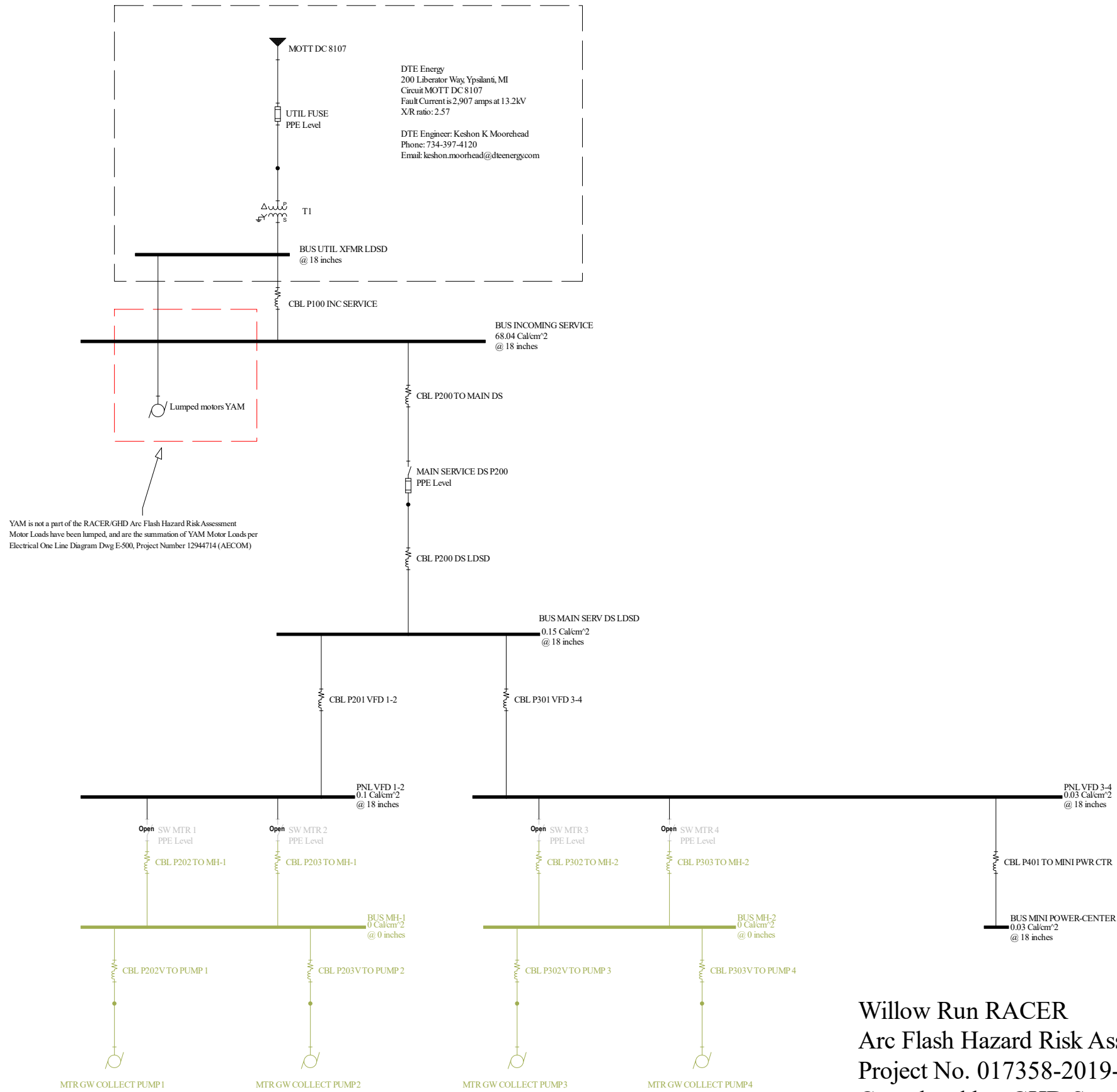
A qualified person must perform activity or work inside this boundary. When there is a need for an unqualified person to cross the limited approach boundary to perform a minor task or look at equipment, a qualified person shall advise him or her of the possible hazards and ensure that the unqualified person is safe guarded. Barricades or appropriate warning signs shall be erected no closer to the live parts than the limited approach boundary.

2.3 Restricted Approach Boundary

This boundary is the closest approach distance for an unqualified person. Under no circumstance shall such unqualified persons be permitted to cross the restricted approach boundary. To Cross the restricted approach boundary, a worker must meet the following requirements:

1. Be a qualified person
2. Have an understand an approved plan
3. Use personal protective equipment appropriate for the conditions
4. Position his or her body in a way that minimizes risk of inadvertent contact.

In some instances, work outside the restricted approach boundary but within the person's reach may be classified as restricted work if, in the judgment of the personnel involved, conductive objects or unguarded body parts could make unintentional contact or cross the prohibited approach boundary.



Willow Run RACER
Arc Flash Hazard Risk Assessment
Project No. 017358-2019-T06.01
Completed by: GHD Services, Matt Feldman
Checked by: GHD Services, John Davis
Proj. Mgr: Beth Landale
Revision 0 - 7/24/19



Date: July 23, 2019

To: John Davis
GHD- Engineering Services

From: Keshon K Moorehead
Distribution Planning Senior Engineer

Subject: **Racer Trust Willow Run Operating Limits**

The following information is in response to your request. This memo documents the operating limits to the following customer as provided to me in your email:

Customer Name:	Racer Trust
Type of Business:	Land Redevelopment for former GM Properties
Location:	200 Liberator Way, Ypsilanti, MI
Transformer Size:	1500kVA, 3-Phase, 480/277V (secondary)
Transformer % Impedance:	5.75
Circuit:	MOTT DC 8107
Voltage:	13.2 kV

Operating Limits for this Customer

The operating limits the customer must not exceed to avoid causing flicker for other customers are contained in the table below. The customer's new equipment is not expected to cause flicker issues for other customers on the circuit.

Rate of Occurrence	Allowable Three Phase KVA Inrush @ 40% P.F.	Voltage drop (120 V base)
Infrequent	3546 kVA	6.0 V
Frequent	1716 kVA	3.0 V
Extremely Frequent	1135 kVA	2.0 V
Cyclic	279 kVA	0.5 V

Infrequent Flicker = 6 times or less in 24 hours, but not more than once between 6 PM and 12:00 AM.

Frequent Flicker = 3 times or less per hour, but not more than once per hour between 6 PM and 12:00 AM.

Extremely Frequent Flicker = Not more often than once per minute.

Cyclic = More often than once per minute, but less than once per second.

Detroit Edison Primary Fault Contribution at Customer's Service Point:

The fault current is 2,907 amps at 13.2 kV, three-phase, RMS, symmetrical.

The future fault contribution could ultimately exceed 300 MVA.

X/R ratio: 2.57

Please contact me if you have any questions at 734-397-4120.

s/ Keshon K Moorehead

cc: File

M. Stefanick

J. Geiger

John Davis

From: Keshon K Moorehead <keshon.moorehead@dteenergy.com>
Sent: Wednesday, July 24, 2019 10:08 AM
To: John Davis
Cc: Mark W Stefanick; Jacob J Geiger
Subject: Re: Willow Run - Arc Flash Hazard Risk Assessment - Utility Data

Hi John,

The closest protection is a 65E at the Primary Switching Cabinet (J2111). The next closest protection is a 65K at the cable pole.

Best Regards,

Keshon

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From: John.Davis@ghd.com <John.Davis@ghd.com>
Sent: Wednesday, July 24, 2019 9:49 AM
To: Keshon K Moorehead
Cc: Mark W Stefanick; Jacob J Geiger
Subject: [EXTERNAL] RE: Willow Run - Arc Flash Hazard Risk Assessment - Utility Data

Hi Keshon,

Could you tell me the trip rating, and style (i.e. 80T standard speed) of the fused cutouts at the primary side of the utility transformer (1500kVA @ MOTT DC 8107) for this site?

John Davis

Engineering Services | Electrical

GHD

Proudly employee owned

T: +1 716 856 2142 | D: +1 716 362 8831 | E: john.davis@ghd.com
285 Delaware Avenue Suite 500 Buffalo NY 14202 USA | www.ghd.com

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Please consider our environment before printing this email

From: Keshon K Moorehead <keshon.moorehead@dteenergy.com>

Sent: Tuesday, July 23, 2019 8:44 AM

To: John Davis <John.Davis@ghd.com>

Cc: Mark W Stefanick <mark.stefanick@dteenergy.com>; Jacob J Geiger <jacob.geiger@dteenergy.com>

Subject: RE: Willow Run - Arc Flash Hazard Risk Assessment - Utility Data

Hi John,

The memo has been updated to reflect the noted clarifications below. Please let me know if there is anything else I can do to assist.

Best Regards,



Keshon K. Moorehead

Engineer - Senior | DTE Energy | Distribution Operations

8001 Haggerty, Belleville, MI 48111

734.397.4120 (O)

From: John.Davis@ghd.com <John.Davis@ghd.com>

Sent: Monday, July 22, 2019 3:56 PM

To: Keshon K Moorehead <keshon.moorehead@dteenergy.com>

Subject: [EXTERNAL] RE: Willow Run - Arc Flash Hazard Risk Assessment - Utility Data

Thank you Keshon.

John Davis

Engineering Services | Electrical

GHD

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285 Delaware Avenue Suite 500 Buffalo NY 14202 USA | www.ghd.com

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Please consider our environment before printing this email

From: Keshon K Moorehead <keshon.moorehead@dteenergy.com>
Sent: Monday, July 22, 2019 3:19 PM
To: John Davis <John.Davis@ghd.com>
Cc: Jacob J Geiger <jacob.geiger@dteenergy.com>; Mark W Stefanick <mark.stefanick@dteenergy.com>
Subject: Re: Willow Run - Arc Flash Hazard Risk Assessment - Utility Data

Hi John,

Thank you for the clarification. We are in the process of restoring customers from a catastrophic storm. As soon as I have time, I will update and resend.

Best Regards,

Keshon

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From: John.Davis@ghd.com <John.Davis@ghd.com>
Sent: Monday, July 22, 2019 10:43 AM
To: Keshon K Moorehead
Cc: Jacob J Geiger; Mark W Stefanick
Subject: [EXTERNAL] RE: Willow Run - Arc Flash Hazard Risk Assessment - Utility Data

Hi Keshon,

The address of our service is 200 Liberator Way for RACER and 1 Liberator Way for YAM. We are interested in the 200 Liberator Way for RACER (YAM is fed from this service as well). Here is an electric bill with some identifying numbers and meter numbers on it.

For Service at 200 Liberator Way, Ypsilanti, MI

DTE Electric Company Business Electric Service

Current Charges

Power Supply Charges

Power Supply Capacity Charge	1692 KWH @ 0.032970	55.79
Power Supply Non Capacity Charge	1692 KWH @ 0.046400	78.51
Power Supply Cost Recovery	1692 KWH @ 0.004100	6.94

Delivery Charges

Service Charge		11.25
LIEAF Factor		0.93
Energy Waste Reduction		38.51
Distribution	1692 KWH @ 0.038660	65.41
Nuclear Surcharge	1692 KWH @ 0.000827	1.40
Commercial Michigan Sales Tax		15.47

Total DTE Electric Company Current Charges 274.21

Current Billing Information

Service Period Jun 1, 2019 - Jul 1, 2019
Days Billed 31
Meter Number 8756864 01
Meter Reading 26417 Actual - 28109 Actual
KWH Used 1692

Your next scheduled meter read date is on or around AUG 1, 2019

Usage History - Average per day

	Current Month	Last Month	Year Ago
KWH Usage	55	53	48
Change		2%	14%

Also, see pictures of our transformer and meters attached, it is a 1500kVA 13.2kV to 480V transformer.

John Davis

Engineering Services | Electrical

GHD

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285 Delaware Avenue Suite 500 Buffalo NY 14202 USA | www.ghd.com

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Please consider our environment before printing this email

From: Keshon K Moorehead <keshon.moorehead@dteenergy.com>

Sent: Thursday, July 18, 2019 2:27 PM

To: John Davis <John.Davis@ghd.com>

Cc: Jacob J Geiger <jacob.geiger@dteenergy.com>; Mark W Stefanick <mark.stefanick@dteenergy.com>

Subject: RE: Willow Run - Arc Flash Hazard Risk Assessment - Utility Data

John,

Per your request, the attached memo should have the information needed to complete the Arc Flash Assessment for Willow Run Bomber Plant. Please let me know if you need anything else.

Best Regards,



Keshon K. Moorehead

Engineer - Senior | DTE Energy | Distribution Operations

8001 Haggerty, Belleville, MI 48111

734.397.4120 (O)

From: John.Davis@ghd.com <John.Davis@ghd.com>

Sent: Thursday, July 18, 2019 1:01 PM

To: Keshon K Moorehead <keshon.moorehead@dteenergy.com>

Subject: [EXTERNAL] RE: Willow Run - Arc Flash Hazard Risk Assessment - Utility Data

Thank you. I have,

One Liberator Way

Ypsilanti, MI 48198

And this is a DTE transformer. When I gather more information I will send it to you.

John Davis

Engineering Services | Electrical

GHD

Proudly employee owned

T: +1 716 856 2142 | D: +1 716 362 8831 | E: john.davis@ghd.com
285 Delaware Avenue Suite 500 Buffalo NY 14202 USA | www.ghd.com

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From: Keshon K Moorehead <keshon.moorehead@dteenergy.com>

Sent: Thursday, July 18, 2019 12:17 PM

To: John Davis <John.Davis@ghd.com>; Jacob J Geiger <jacob.geiger@dteenergy.com>

Cc: Beth Landale <Beth.Landale@ghd.com>; Daniel Beck <Daniel.Beck@ghd.com>

Subject: RE: Willow Run - Arc Flash Hazard Risk Assessment - Utility Data

John,

I have what I need. Working on this now.

Best Regards,



Keshon K. Moorehead

Engineer - Senior | DTE Energy | Distribution Operations

8001 Haggerty, Belleville, MI 48111

734.397.4120 (O)

From: John.Davis@ghd.com <John.Davis@ghd.com>

Sent: Thursday, July 18, 2019 11:12 AM

To: Keshon K Moorehead <keshon.moorehead@dteenergy.com>; Jacob J Geiger <Jacob.Geiger@dteenergy.com>

Cc: Beth.Landale@ghd.com; Daniel.Beck@ghd.com

Subject: [EXTERNAL] RE: Willow Run - Arc Flash Hazard Risk Assessment - Utility Data

Yes Keshon, I will work on getting that information for you.

From: Keshon K Moorehead <keshon.moorehead@dteenergy.com>

Sent: Thursday, July 18, 2019 7:48 AM

To: Jacob J Geiger <jacob.geiger@dteenergy.com>

Cc: Beth Landale <Beth.Landale@ghd.com>; Daniel Beck <Daniel.Beck@ghd.com>; John Davis <John.Davis@ghd.com>

Subject: RE: Willow Run - Arc Flash Hazard Risk Assessment - Utility Data

Jake,

Do you have an address so I can figure out where one the system this customer is located? If this is a DTE owned transformer, the GLN number would be helpful too.

Best Regards,



Keshon K. Moorehead

Engineer - Senior | DTE Energy | Distribution Operations

8001 Haggerty, Belleville, MI 48111

From: John.Davis@ghd.com <John.Davis@ghd.com>

Sent: Wednesday, July 17, 2019 4:32 PM

To: Keshon K Moorehead <keshon.moorehead@dteenergy.com>; Jacob J Geiger <Jacob.Geiger@dteenergy.com>

Cc: Beth.Landale@ghd.com; Daniel.Beck@ghd.com

Subject: [EXTERNAL] Willow Run - Arc Flash Hazard Risk Assessment - Utility Data

Hi Keshon,

We are in the process of performing an arc flash hazard risk assessment for our facility Willow Run. I have attached a one line diagram showing our most recent upgrades, and the power distribution network I am requesting data for.

I am in need of the worst case 3 phase fault current at the primary of the 1500 kVA transformer, its primary operating voltage, transformer impedance, as well as any associated protective devices (fused cutouts) that are owned by DTE. Secondary 3 phase fault current information is acceptable as well.

I am working to get the exact transformer number, and meter number and will send it to you as soon as I have it.

John Davis

Engineering Services | Electrical

GHD

Proudly employee owned

T: +1 716 856 2142 | D: +1 716 362 8831 | E: john.davis@ghd.com
285 Delaware Avenue Suite 500 Buffalo NY 14202 USA | www.ghd.com

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Please consider our environment before printing this email

From: Keshon K Moorehead <keshon.moorehead@dteenergy.com>

Sent: Wednesday, July 17, 2019 1:01 PM

To: Jacob J Geiger <jacob.geiger@dteenergy.com>; John Davis <John.Davis@ghd.com>

Subject: RE: Arc Flash Study

Hi John,

Email would be the best way to get ahold of me. My office number is actually 734-397-4120.

Best Regards,



Keshon K. Moorehead

Engineer - Senior | DTE Energy | Distribution Operations

8001 Haggerty, Belleville, MI 48111

734.397.4120 (O)

From: Jacob J Geiger

Sent: Wednesday, July 17, 2019 11:01 AM

To: John.Davis@ghd.com

Cc: Keshon K Moorehead <keshon.moorehead@dteenergy.com>

Subject: RE: Arc Flash Study

John please contact keshon. He can give you this info on the primary voltage side I guess!

His number is - 734-397-4010

Regards,

Jacob Geiger
Service Planning SW
734-397-4146

Contractor Spec Book:

<https://newlook.dteenergy.com/wps/wcm/connect/dte-web/quicklinks/landing-pages-temp/builders/electric-checklists-guides>

From: John.Davis@ghd.com <John.Davis@ghd.com>

Sent: Tuesday, July 16, 2019 3:05 PM

To: Jacob J Geiger <Jacob.Geiger@dteenergy.com>

Subject: [EXTERNAL] FW: Arc Flash Study

John Davis

Engineering Services | Electrical

GHD

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Appendix C

Human Machine Interface (HMI) User Manual



Human Machine Interface User Manual

Willow Run Powertrain Groundwater Collection System





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Appendix A	List of HMI Screens
Appendix B	Training Checklist for HMI Usage



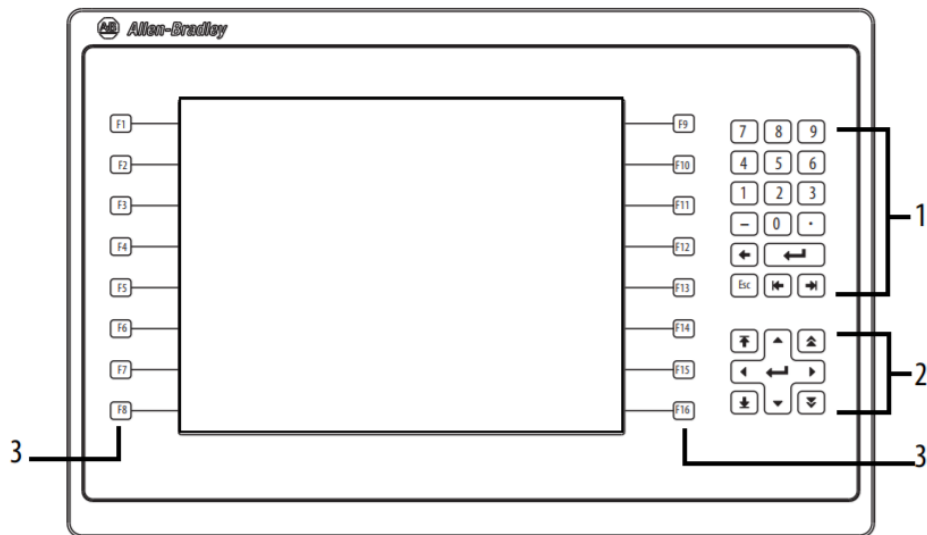
List of Acronyms

HMI	Human Machine Interface
PLC	Programmable Logic Controller
LI	Level Indication
FI	Flow Indication
FQI	Flow Quantity Indication
KI	Runtime
QI	Start Counter
HH	High-High
H	High
L	Low
LL	Low-Low
VFD	Variable Frequency Drive
CV	Control Value

1. Human Machine Interface

A Human Machine Interface (HMI) is a piece of hardware that displays information to the user in various forms; graphics, text, color indications, alarms, historical data and trends. The HMI receives this information typically from a Programmable Logic Controller (PLC) and displays it in such a way that is intuitive to the user.

This facility uses an Allen Bradley PanelView Plus7 Performance HMI Terminal, running Rockwell's FactoryTalkView Machine Edition software. The PanelView Plus7 Performance HMI Terminal has touch screen capabilities, along with physical keys on the front of the unit. Most actions performed on the HMI can utilize both features; touch screen and physical keys.



Item	Feature	Description
1	Numeric keypad	Contains numeric, decimal, minus, and the following keys: - Backspace - deletes the character to the left of the insertion point. - Enter - inputs the currently highlighted key or enters a blank line if the insertion point is in the text box of the virtual keyboard. - Tab-left, Tab-right - selects the previous or next control or input element. - Esc - cancels or dismisses a dialog.
2	Navigation keys	Provides navigation control. - Arrow keys - selects a key on the virtual keyboard that is above, below, left, or right of the selected key. Moves the cursor in selected direction if in the text box. - Home/End - moves the insertion point to the beginning or end of a text or numeric entry field. - Page up/Page down - goes to the next or previous pages of a list.
3	Function keys 6.5-in. terminal 10-in. terminal 15-in. terminal	Performs specific commands if events are configured for a screen or any of its graphic elements. For example, F1 can be configured to navigate to another screen. - F1...F6 and F7...F12 - F1...F8 and F9...F16 - F1...F10 and F11...F20

Figure 1.1: Allen Bradley PanelView Plus7 Performance Human Machine Interface Terminal

When powering up or resetting the HMI terminal, the restore process begins, which takes a few minutes to run through a series of diagnostic checks before the application is ran.

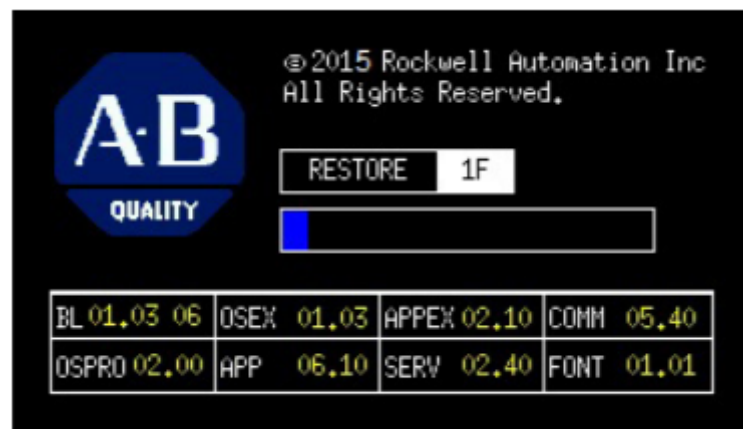


Figure 1.2: Allen Bradley Restore Screen on HMI

1.1 Login User

Once the restore process and diagnostics have completed, the application's **Login Screen** will be displayed. The Login Screen prevents unwanted users from using the application by requiring a username and password before being allowed to navigate to another screen.

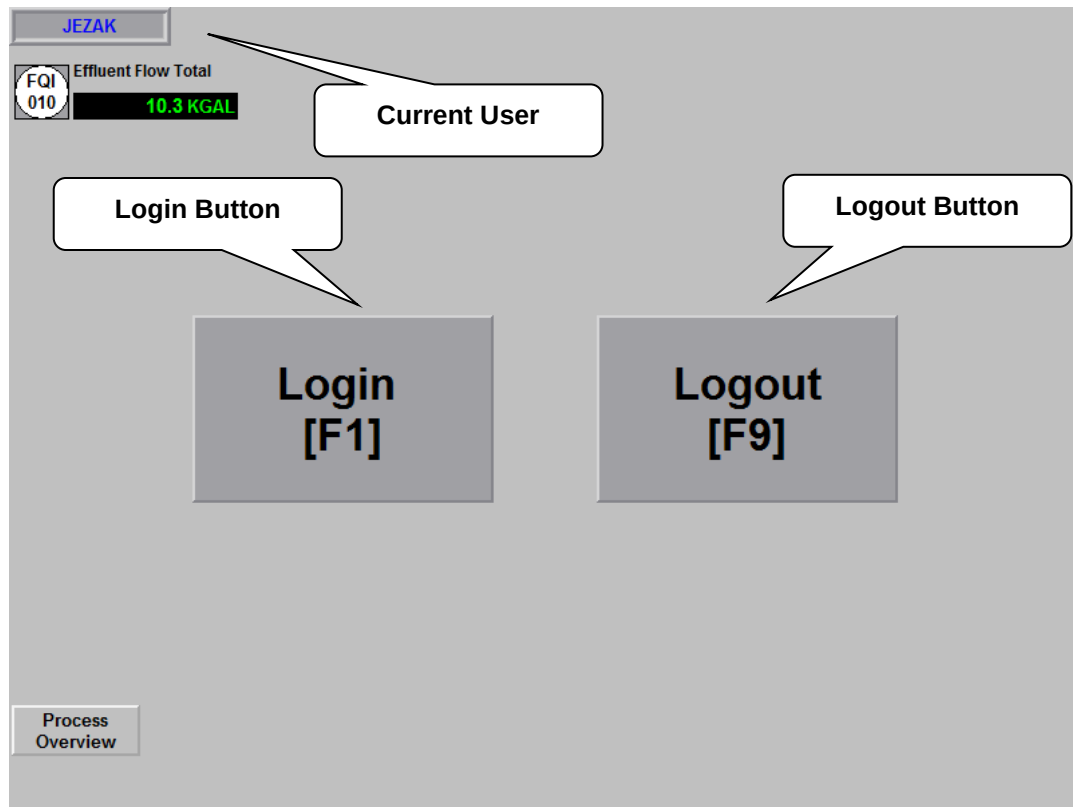


Figure 1.3: Login Screen - Initial HMI Display

The application automatically logs in the Default user, which has no security rights. Once a user logs in, it will grant access to various features; screen navigation, equipment controls, settings, diagnostics and information. Depending on the user's credentials and responsibilities, their approved login will unlock features only they are mainly responsible for. Other features outside of their responsibility will remain hidden or inaccessible.

To login, press the **Login** button on the screen or the **[F1]** function key on the terminal to display the **Login Popup** window. Press the **User Name** button on the screen or the **[F2]** function key on the terminal to type in a username. An on-screen keyboard will be displayed for the user to type in their information. Press the **Enter key (<J>)** on the screen or the terminal to accept the entered username and to return to the Login Popup window. Repeat similar steps to enter the associated password for the username. Once both username and password have been entered, press **Login** button on the popup or the Enter key (<J>) on the terminal to verify credentials. If successful, the blue username displayed in the upper-left corner of the screen will update to the current user.

A screenshot of a 'Login' popup window. The window has a light blue title bar with the word 'Login' in black. The main area is white and contains several elements: a 'User Name' label with '[F2]' below it, followed by a text input field; a 'Password' label with '[F3]' below it, followed by a text input field; a 'Login' button with '[Enter]' below it; a 'Cancel' button with '[Esc]' below it; and a 'Result:' label followed by a wide text input field at the bottom.

Figure 1.4: Login Popup

The user may navigate to the Login Screen and logout manually by pressing the **Logout** button on the screen or the **[F9]** function key on the terminal. Alternatively, if the application remains unused for a duration of time, the current user will be automatically logged out returning to the Default user, and the Login Screen will be displayed.

It should be noted that if multiple users are logged into the system remotely at the same time the screen locally and remotely will show all the movements by any of the users.

If further inactivity ensues, a screen saver will be displayed which dims the backlight and displays a moving image. The screen saver extends the life of the display. To clear the screen saver and return to the application, touch the screen or any function key on the terminal.

The only information the Login Screen shows is the Effluent Flow Total (in kilo-gallons) for the entire facility on the upper-left section of the screen. This information is for outside parties who do not have user credentials to access the application.

2. Common Features

Throughout the application, each screen will represent its specific area appropriately while maintaining common representation and controls. The following sections will explain these common features displayed throughout the application.

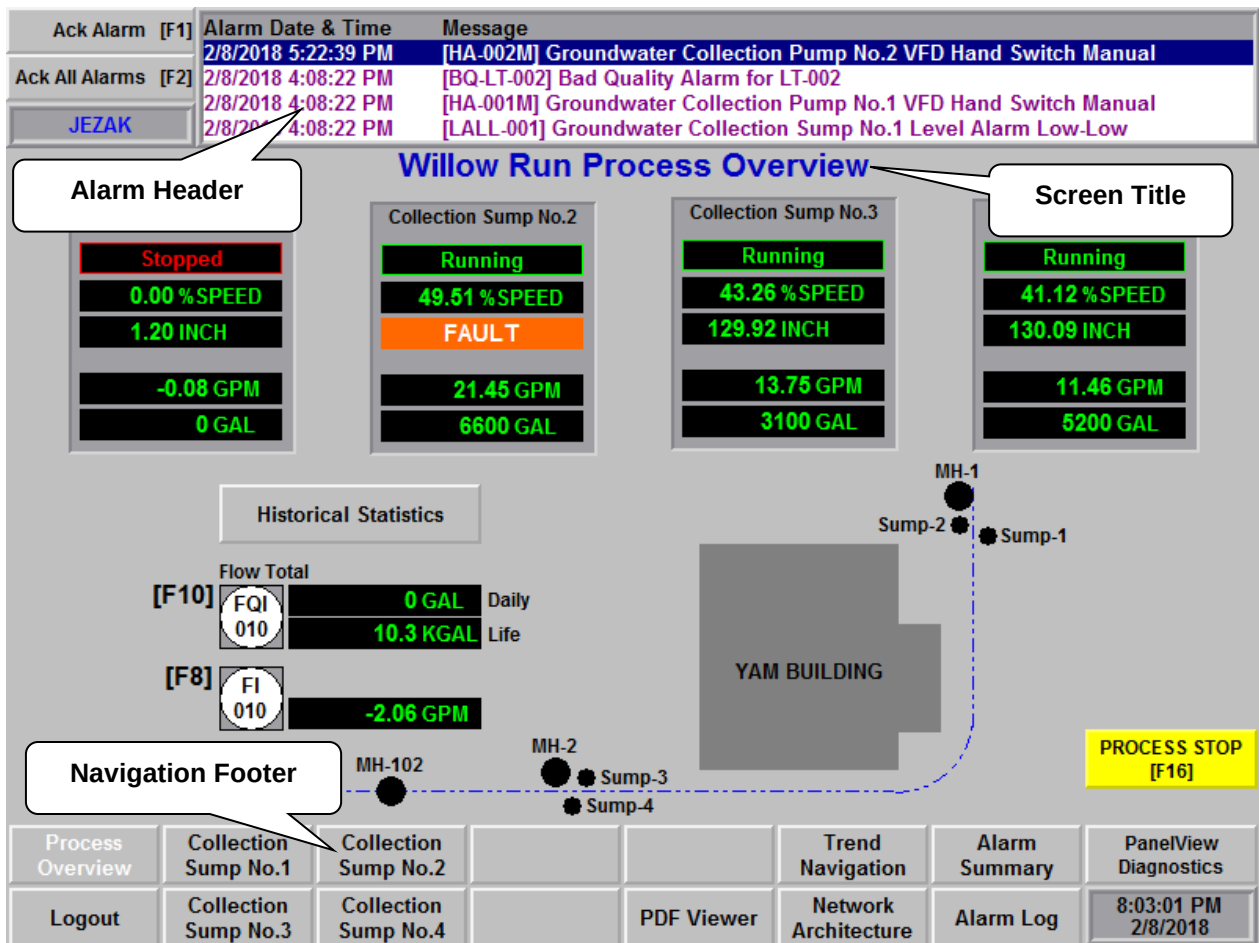


Figure 2.1: Common Features to Process Screens

2.1 Alarm Header

The Alarm Header at the top of each screen displays and manages abnormal situations within the application. These alarms should be further investigated in the field with attempts to clear and prevent alarm occurrences in the future. A healthy system will have no alarms listed.

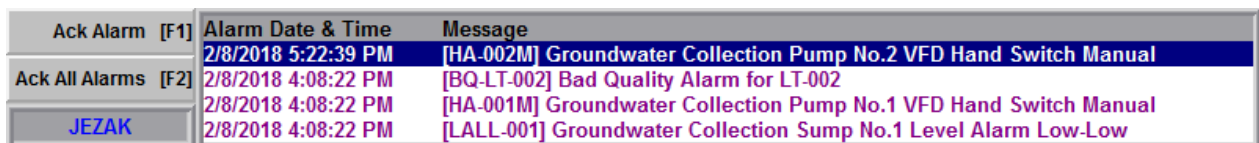


Figure 2.2: Alarm Header

In the middle of the Alarm Header is the **Alarm Summary**. The Alarm Summary displays active alarms with the triggered **Alarm Date**, **Alarm Time** and **Alarm Tag with Message**. Four active alarms can be viewed at once, with the most recent alarm listed at the top. On the terminal there are **Up and Down Arrow** keys, which allows the user to scroll through the various alarms that are active using the highlight cursor if there are more than four active alarms within the application.



The Alarm Summary lists each alarm that is presently active & unacknowledged, active & acknowledged and alarms that have returned to normal from an alarm state but are unacknowledged. Colors for the different alarm states are as followed:

- **Alarm Active & Unacknowledged:** Blinking Red and White Text
- **Alarm Active & Acknowledged:** Solid Purple Text
- **Alarm Returned to Normal & Unacknowledged:** Blinking Green and White Text
- **Alarm Returned to Normal & Acknowledged:** Not Listed in Alarm Summary

On the far left of the Alarm Header, are **Acknowledgment** buttons for the Alarm Summary displayed in the middle of the header. Required user acknowledgement prevents alarms from going undetected while the application is not being viewed. All alarms must be acknowledged and fixed in the field before it is removed from the Alarm Summary.

Ack Alarm [F1]: Acknowledges one alarm, which is presently active and highlighted in the Alarm Summary.

Ack All Alarms [F2]: Acknowledges all of the alarms, which are presently active in the Alarm Summary. Not all alarms may be presently viewable in the Alarm Summary if there are more than four active alarms within the application. It might be required to scroll down to see all alarms.

Below the Alarm Summary Buttons is a display that shows the current user logged into the application. This indication will change depending on which user logs into the system.

The Programmable Logic Controller (PLC) operates the facility while in RUN MODE. If the PLC is taken out of RUN MODE (physical key on processor or within its program), a display status will indicate that the **"PLC IS NOT IN RUN MODE"** for the specific PLC. This is an indication that the system is no longer operational and an Automation Engineer should be contacted.

2.2 Alarm Indications

The process section of the screens will also display the various alarm states to the user, giving a better representation of the alarm condition and location within the facility. The **Alarm Indications** will be displayed in a white box near the associated gray process tag block. Alarm Indicators will use the same color states as the Alarm Summary. [\[See Section 2.1 ALARM HEADER\]](#)

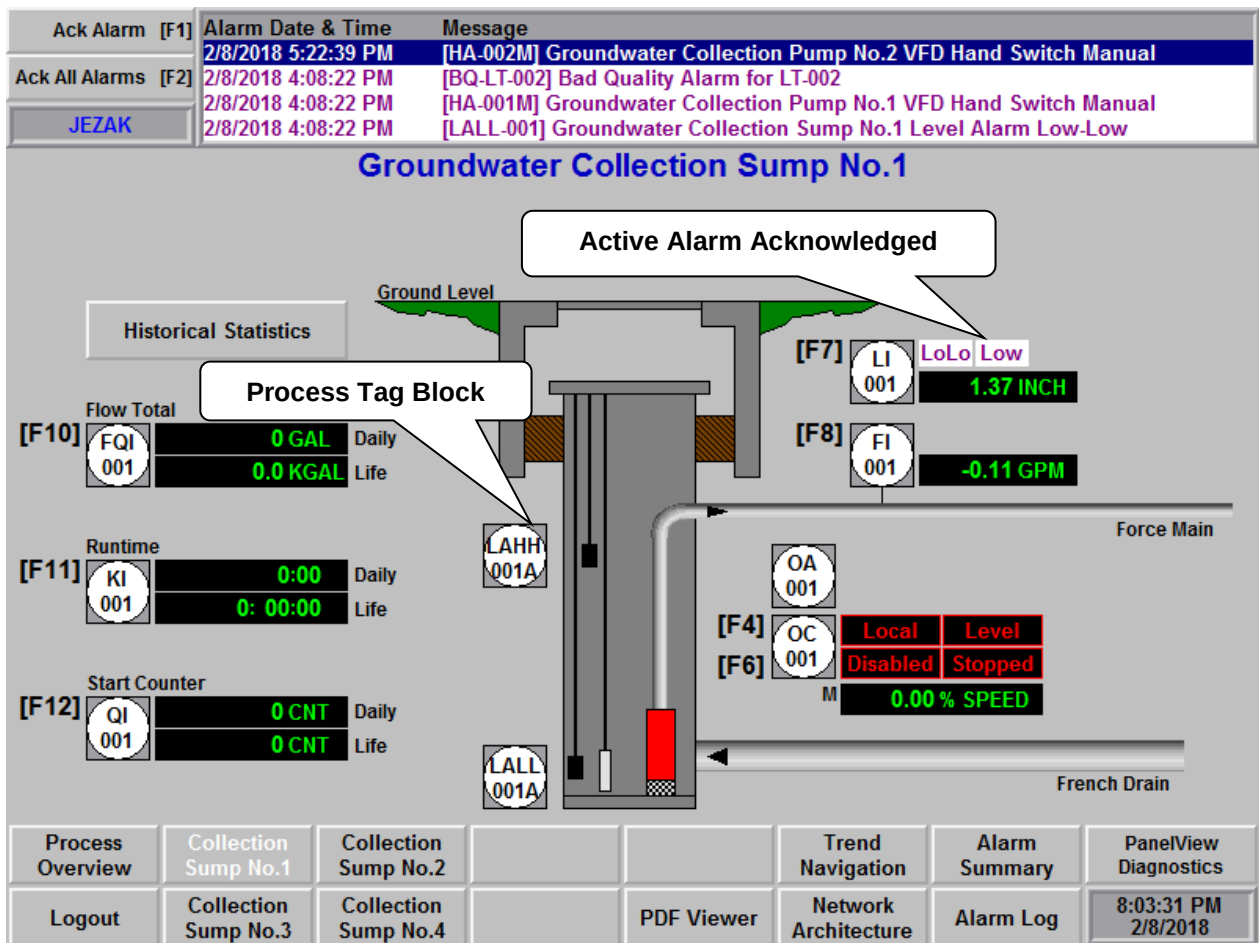


Figure 2.3: Alarm Indications

If the process value or control value has faulted, its numeric display and numeric bar filler will be covered up with an orange box, with white text stating **Fault**. Once the Fault condition has been resolved, the regular numeric displays will be restored.

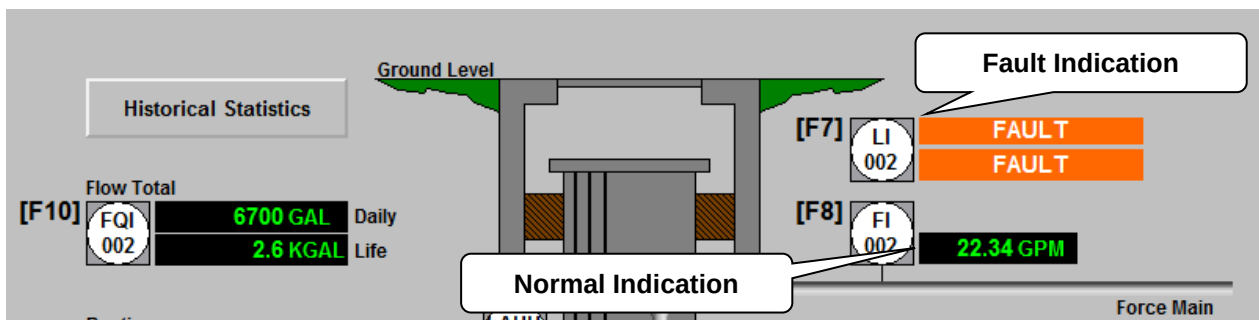


Figure 2.4: Fault Indications

2.3 Navigation Footer

The Navigation Footer is at the bottom of each screen and primarily calls other screens, allowing the user to navigate throughout the application.



Process Overview	Collection Sump No.1	Collection Sump No.2			Trend Navigation	Alarm Summary	PanelView Diagnostics
Logout	Collection Sump No.3	Collection Sump No.4		PDF Viewer	Network Architecture	Alarm Log	8:04:03 PM 2/8/2018

Figure 2.5: Navigation Footer

On the far left of the Navigation Footer are navigation buttons that enables the user to move to various process screens. When the user presses the various navigation buttons, the process screen will change accordingly. The current screen's associated navigation button text will change from black to white, indicating to the user that they are already on that screen.

On the far right of the Navigation Footer are navigation buttons that are primarily used for diagnostics and information; **Alarm Summary**, **Alarm Log**, **Trend Navigation**, **PDF Viewer**, **Network Architecture** and **PanelView Diagnostics**.

2.4 Alarm Summary

The Alarm Summary button will call a popup that displays a bigger Alarm Summary (compared to the one stationed in the Alarm Header). This enables the user to be able to view more than four active alarms. Lined at the top are the Alarm Summary Buttons for the present Alarm Summary Popup. This Alarm Summary will have the same features as the one in the Alarm Header. The popup itself cannot be resized, but can be closed by pressing the white X in the red button on the screen or the **[F9]** function key on the terminal.

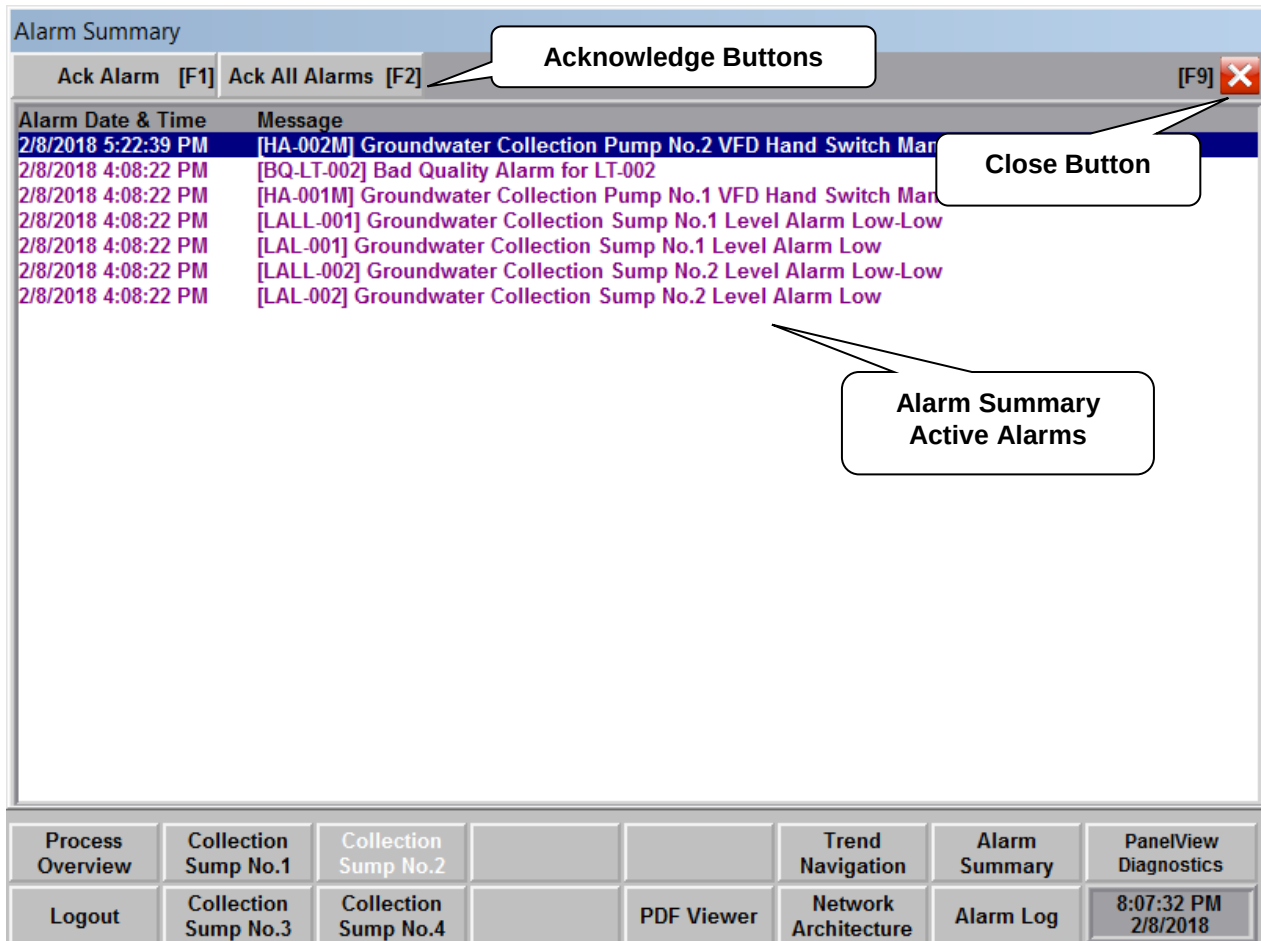


Figure 2.6: Alarm Summary Popup

2.5 Alarm Log

The Alarm Log button will call up the Alarm Log popup that displays a history of all alarm states and acknowledgements that the application has experienced over a duration of time. The Alarm Log displays Alarm Date, Alarm Time, Acknowledged Date and Time and Tag Name with Message. The popup itself cannot be resized, but can be closed by pressing the white X in the red button on the screen or the **[F9]** function key on the terminal.

Certain users will have access to the **Clear Alarm Log** button. This button clears all alarm states from history, leaving no recorded alarms in the Alarm Log. If the button is visible, the user can press the button on the screen or the **[F1]** function key on the terminal to perform the clearing action.



Alarm Log

Clear Alarm Log [F1]

Clear Button

Close Button

[F9] X

Alarm Date & Time	Acknowledge Time	Message
2/8/2018 8:06:53 PM	2/8/2018 8:07:24 PM	[BQ-FIT-002] Bad Quality Alarm for FIT-002
2/8/2018 7:54:27 PM	2/8/2018 7:58:33 PM	[FAL-004] Groundwater Collection Sump No.4 Flow Alarm Low
2/8/2018 7:48:24 PM	2/8/2018 7:48:35 PM	[FALL-003] Groundwater Collection Sump No.3 Flow Alarm Low-Low
2/8/2018 7:47:58 PM	2/8/2018 7:48:35 PM	[FAL-003] Groundwater Collection Sump No.3 Flow Alarm Low
2/8/2018 7:22:31 PM	2/8/2018 7:24:30 PM	[FALL-003] Groundwater Collection Sump No.3 Flow Alarm Low-Low
2/8/2018 7:21:30 PM	2/8/2018 7:24:30 PM	[FAL-003] Groundwater Collection Sump No.3 Flow Alarm Low
2/8/2018 7:16:09 PM	2/8/2018 7:19:30 PM	[FAL-004] Groundwater Collection Sump No.4 Flow Alarm Low
2/8/2018 7:14:37 PM	2/8/2018 7:14:52 PM	[FALL-004] Groundwater Collection Sump No.4 Flow Alarm Low-Low
2/8/2018 7:14:25 PM	2/8/2018 7:14:52 PM	[FAL-004] Groundwater Collection Sump No.4 Flow Alarm Low
2/8/2018 5:23:59 PM	2/8/2018 5:24:07 PM	[FALL-002] Groundwater Collection Sump No.2 Flow Alarm Low-Low
2/8/2018 5:23:59 PM	2/8/2018 5:24:07 PM	[FAL-002] Groundwater Collection Sump No.2 Flow Alarm Low
2/8/2018 5:22:39 PM	2/8/2018 5:22:49 PM	[HA-002M] Groundwater Collection Pump No.2 VFD Hand Switch Manual
2/8/2018 4:30:45 PM	2/8/2018 4:33:44 PM	[FAHH-004] Groundwater Collection Sump No.4 Flow Alarm High-High
2/8/2018 4:30:44 PM	2/8/2018 4:33:44 PM	[FAH-004] Groundwater Collection Sump No.4 Flow Alarm High
2/8/2018 4:08:22 PM	2/8/2018 4:08:22 PM	[BQ-LT-002] Bad Quality Alarm for LT-002
2/8/2018 4:08:22 PM	2/8/2018 4:08:22 PM	[HA-002M] Groundwater Collection Pump No.2 VFD Hand Switch Manual
2/8/2018 4:08:22 PM	2/8/2018 4:08:22 PM	[HA-001M] Groundwater Collection Pump No.1 VFD Hand Switch Manual
2/8/2018 4:08:22 PM	2/8/2018 4:08:22 PM	[LALL-001] Groundwater Collection Sump No.1 Level Alarm Low-Low
2/8/2018 4:08:22 PM	2/8/2018 4:08:22 PM	[LAL-001] Groundwater Collection Sump No.1 Level Alarm Low
2/8/2018 4:08:22 PM	2/8/2018 4:08:22 PM	[LALL-002] Groundwater Collection Sump No.2 Level Alarm Low-Low
2/8/2018 4:08:22 PM	2/8/2018 4:08:22 PM	[LAL-002] Groundwater Collection Sump No.2 Level Alarm Low
2/8/2018 1:17:59 PM	2/8/2018 1:18:04 PM	[LAL-001] Groundwater Collection Sump No.1 Level Alarm Low
2/8/2018 1:17:54 PM	2/8/2018 1:18:04 PM	[LALL-001] Groundwater Collection Sump No.1 Level Alarm Low-Low
2/8/2018 1:17:44 PM	2/8/2018 1:18:04 PM	[BQ-LT-001] Bad Quality Alarm for LT-001
2/8/2018 11:40:24 AM	2/8/2018 11:42:09 AM	[FAH-003] Groundwater Collection Sump No.3 Flow Alarm High
2/8/2018 11:35:18 AM	2/8/2018 11:38:54 AM	[FAHH-004] Groundwater Collection Sump No.4 Flow Alarm High-High

Process Overview	Collection Sump No.1	Collection Sump No.2			Trend Navigation	Alarm Summary	PanelView Diagnostics
Logout	Collection Sump No.3	Collection Sump No.4		PDF Viewer	Network Architecture	Alarm Log	8:07:44 PM 2/8/2018

Figure 2.7: Alarm Log Popup

2.6 Trends

The Trend Navigation button displays another navigation screen in which the user will be able to view the various trends throughout the application. Currently there are seven trends the user can navigate to by pressing the desired button on the screen or the associated function key [F4] – [F7] & [F12] – [F14] on the terminal.

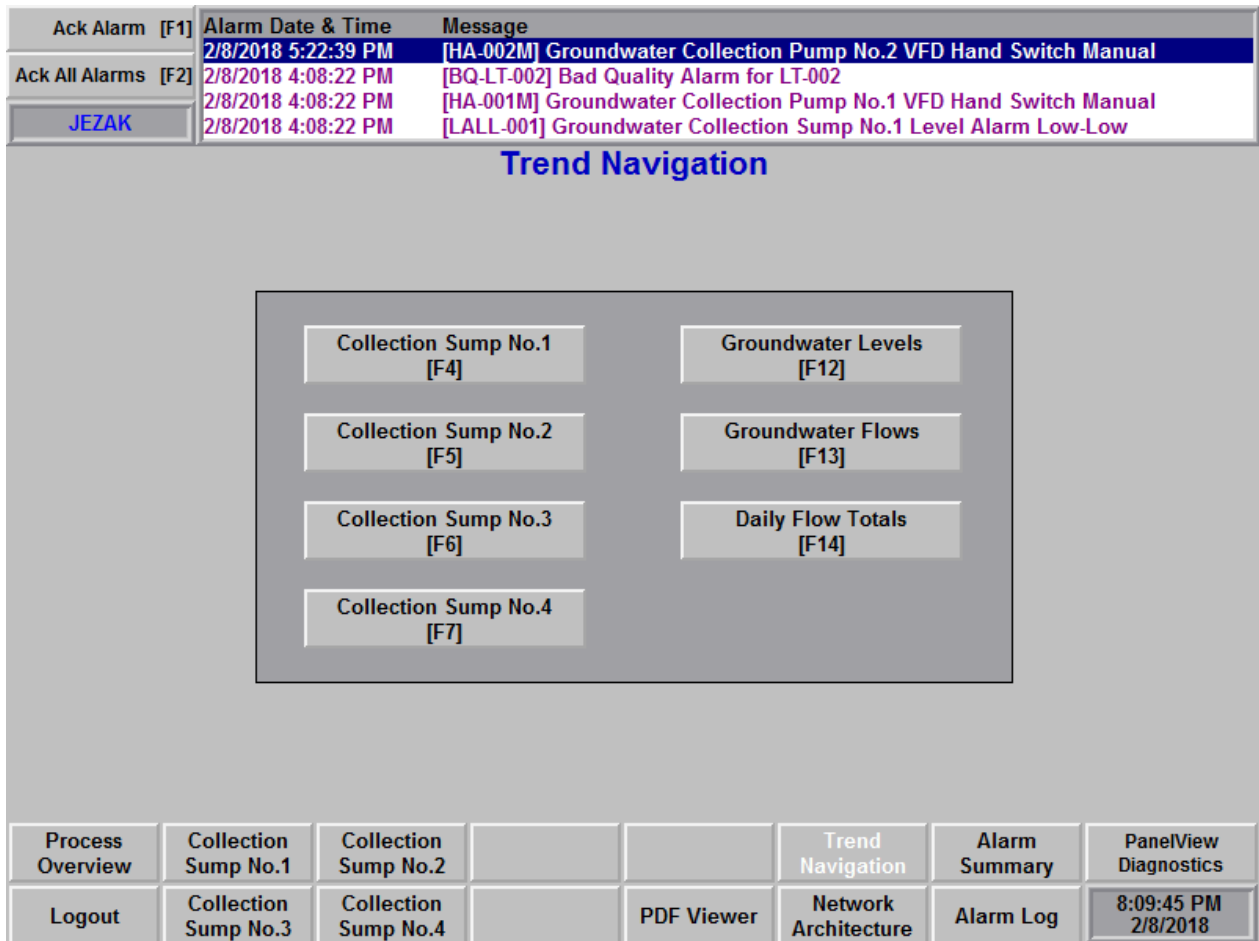


Figure 2.8: Trend Navigation Screen

When the user selects a trend from the Trends Navigation screen, it will display the desired **Historical Trend** and all of its associated pens. The historical pens that are being displayed on the trend are listed in the legend located on the far right column with their current values and engineering units. The vertical scale of the trend changes to reflect the scale of minimum and maximum values for the *selected* pen. Not all displayed pens within a trend have the same minimum and maximum values. To change the Y-Axis to a desired pen, press the **Next Pen** button on the screen or the **[F13]** function key on the terminal. This will cycle through the available pens for this specific trend, changing the color and the range of the Y-Axis to the desired pen.

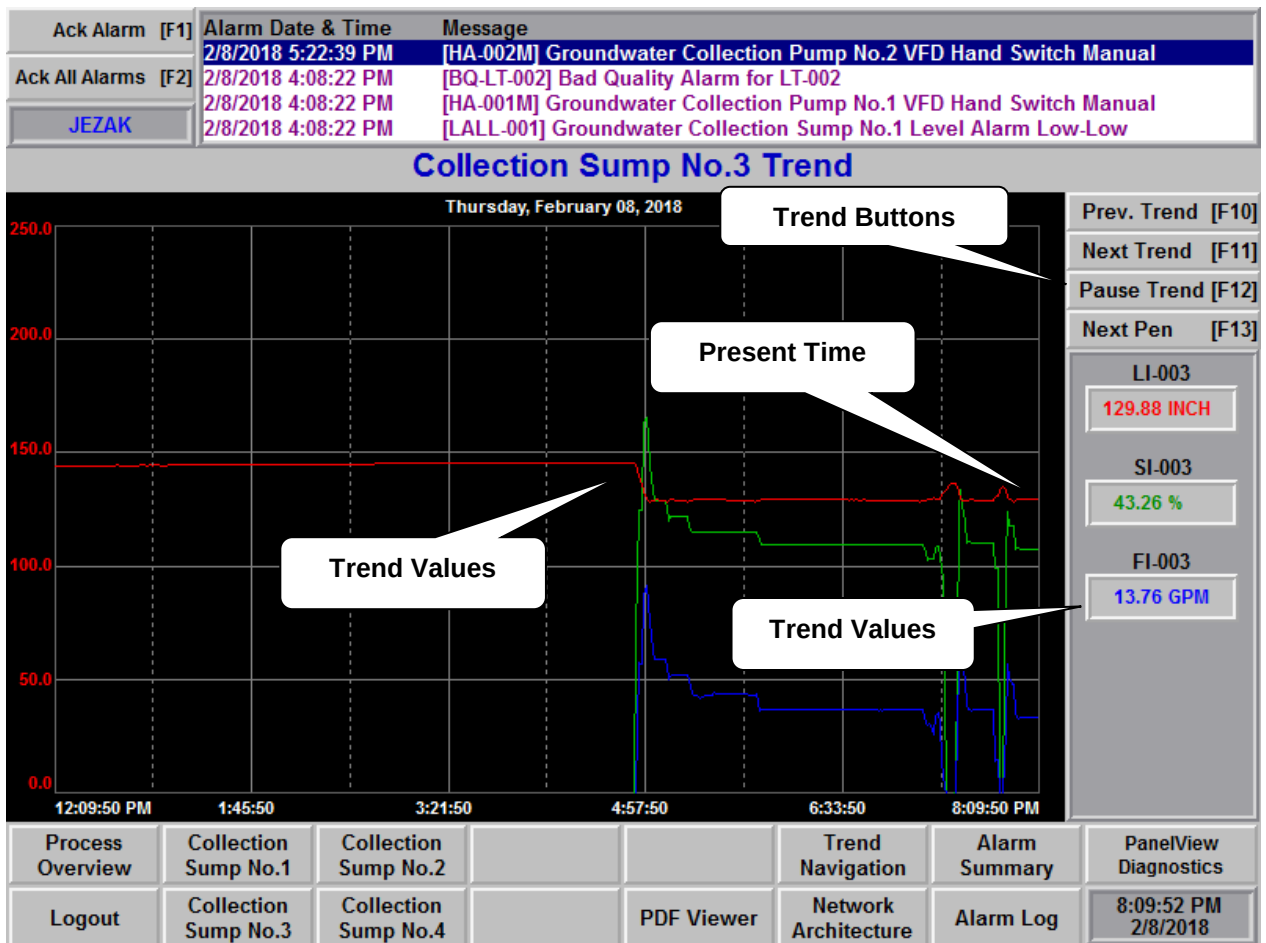


Figure 2.9: Historical Trend Screen

The trend updates every few seconds, placing new data on the right side of the trend. To halt the trend from displaying new data, press the **Pause Trend** button on the screen or the **[F12]** function key on the terminal. To resume displaying new trend data, press the Pause Trend button again or navigate to a new screen.

The trend retains a limited amount of historical data that the user can scroll back in time to view. In order for the user to manipulate the trend, they must bring it into focus. Typically, on all screens the Alarm Header has primary focus. To switch focus to the trend, the user must tap it a couple of times on the screen. Now all function keys on the terminal will be associated with the trend until focus is given back to the Alarm Header by tapping it, or navigating to a new screen.

With the trend in focus, the user can press the Arrow keys within the Navigation group on the terminal to move the trend to display older historical data [See Figure 1.1 HMI Terminal]. To display the oldest trend data, press the **Home key** on the terminal. To return to the newest trend data, press the **End key** on the terminal. To pan vertically, press the up and down arrow keys. Any changes made to the trend will automatically reset when the user navigates to a new screen.

To scroll between trends within the application without having to return to the Trend Navigation screen, press the **Previous Trend** and **Next Trend** buttons on the screen or the associated **[F10]** and **[F11]** function keys on the terminal.



2.7 PDF Viewer

The PDF Viewer button displays a list of PDF documentations that can be viewed from the application. These documents include facility drawings, instrument lists and equipment manuals.

To open one of these files the user must bring the list into focus by tapping it a couple of times on the screen. Now all function keys on the terminal will be associated with the list until focus is given back to the Alarm Header by tapping it, or navigating to a new screen. Use the navigation keys on the terminal to select which file to open, then press **Load Selection** button to confirm the selection and finally press **Launch PDF** button to display the file. Alternatively, the associated terminal keys **[F7]** and **[F15]** on the terminal can be pressed. These instructions on how to view a PDF can be viewed within the application by pressing the question mark in the upper right corner or by pressing the associated **[F9]** function key on the terminal.

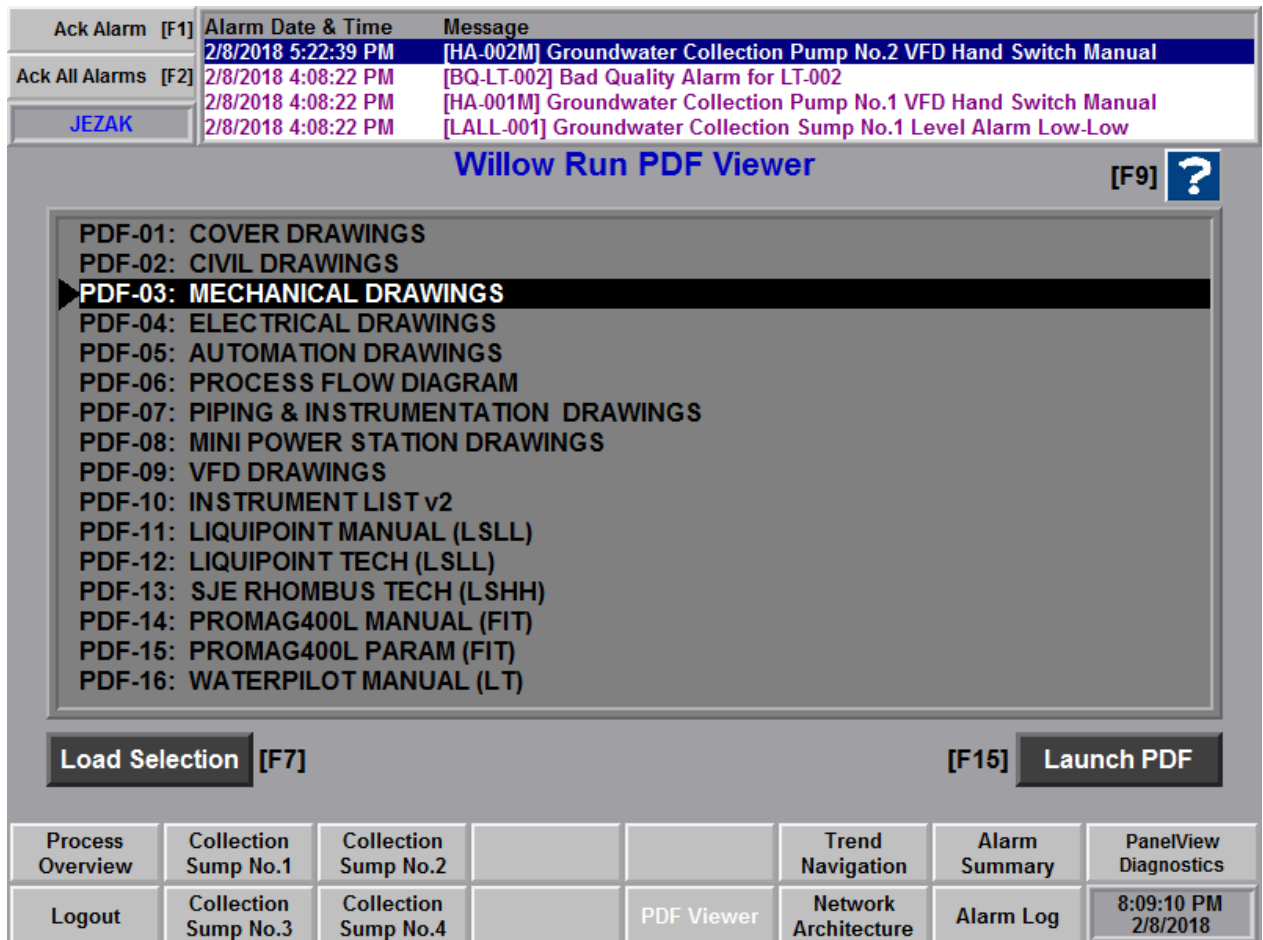
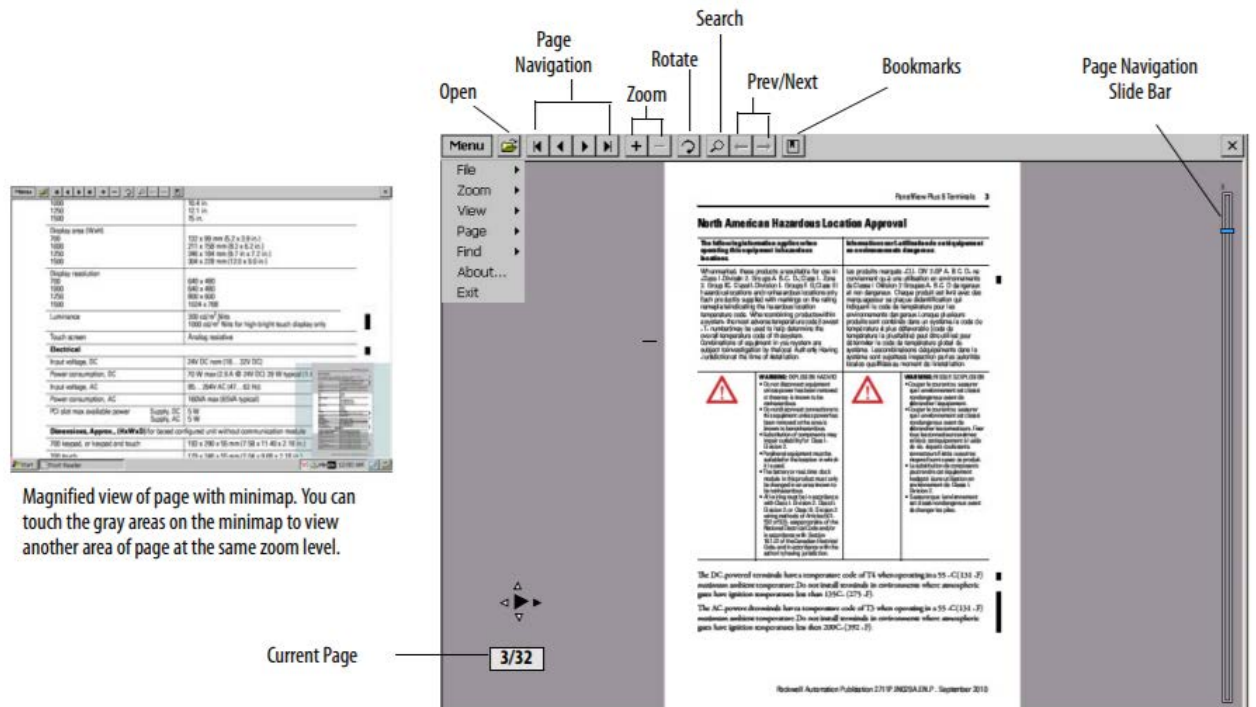


Figure 2.10: PDF Viewer Screen

Once the PDF file is open, the user may manipulate the document by touching the screen or using the toolbar across the top; open files, page navigation, zoom, search, previous page, next page, bookmarks. To return to the application and close the PDF file, press the X in the top right corner.



2.8 Network Architecture

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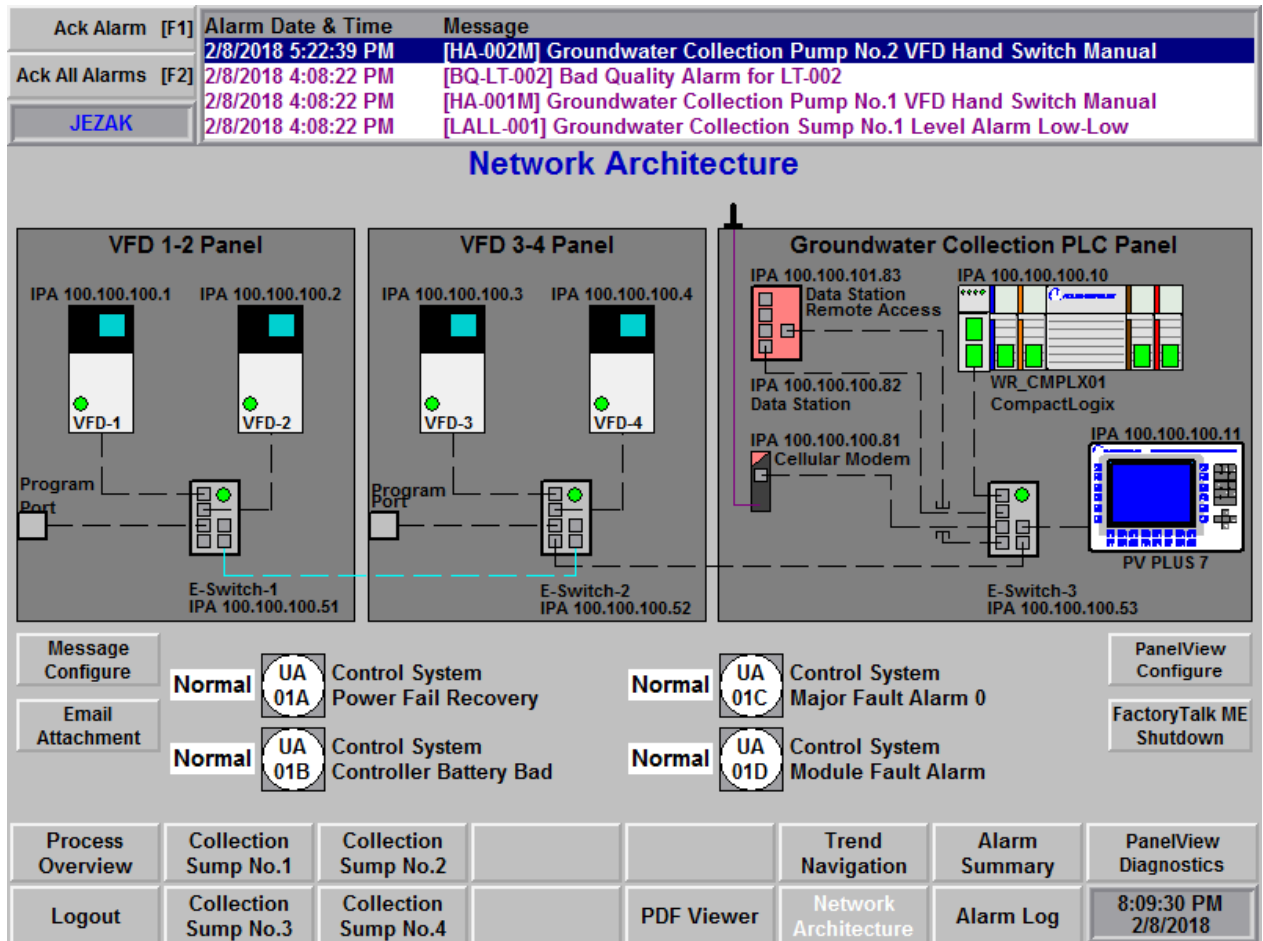


Figure 2.12: Network Architecture Screen

Depending on the user's credentials and responsibilities, their approved login might unlock features on the Network Architecture screen; PanelView Configure, FactoryTalk ME Shutdown, Email Attachment and Message Configure. These features are rarely used or changed once configured.

PanelView Configure button closes the application and opens the settings configuration for the Allen Bradley PanelView Plus7 Performance HMI Terminal, specific to Rockwell's FactoryTalkView Machine Edition software application. While the **FactoryTalk ME Shutdown** button closes the entire application, showing the desktop of the terminal's operating system.

Email Attachment and **Message Configure** are settings that allow the HMI Terminal to communicate with the outside world. Once a week the HMI Terminal sends out an Excel report through Email that contains data on the performance of the application. The HMI Terminal also has the ability to send text messages that notify when an alarm has become active. These screens allow the user to manage who receives these Emails and text messages.



Ack Alarm [F1]	Alarm Date & Time	Message
	12/12/2018 10:04:28 AM	[FAL-002] Groundwater Collection Sump No.2 Flow Alarm Low
Ack All Alarms [F2]	12/3/2018 6:22:04 AM	[FAL-001] Groundwater Collection Sump No.1 Flow Alarm Low

JEZAK

Message Configuration

[F9]

Emails containing Excel Weekly Reports. Each Email entry is limited to 82 characters. Separate entries with commas, no space following.

Email To: beth.landale@ghd.com

Email CC: daniel.beck@ghd.com,allie.murphy@ghd.com

Texts containing Daily Alarms. Each Text entry is limited to 82 characters. Separate entries with commas, no space following.
Enter service provider. Example: 7168562142@vtext.com,7162976150@vmobl.com

AT&T; @txt.att.net BOOST; @myboostmobile.com SPRINT; @messaging.sprintpcs.com
T-MOBILE; @tmomail.net VIRGIN; @vmobl.com VERIZON; @vtext.com or @vzwpx.com
GOGGLE; @msg.fi.google.com

Text To: 2488042850@vtext.com,7345455423@vtext.com

Text CC: 9063676376@txt.att.net,2484103589@vtext.com

Figure 2.13: Email and Messaging User Management

2.9 Panelview Diagnostics

The PanelView Diagnostics popup displays a history of commands, logins and errors that are associated with the application. The popup itself cannot be resized, but can be closed by pressing the white X in the red button on the screen or the **[F9]** function key on the terminal.

Certain users will have access to the **Clear Diagnostic** buttons. These buttons clears one or all diagnostic lines from history in the diagnostics log. If the buttons are visible, the user can press the buttons on the screen or the associated function keys on the terminal to perform the clearing action.

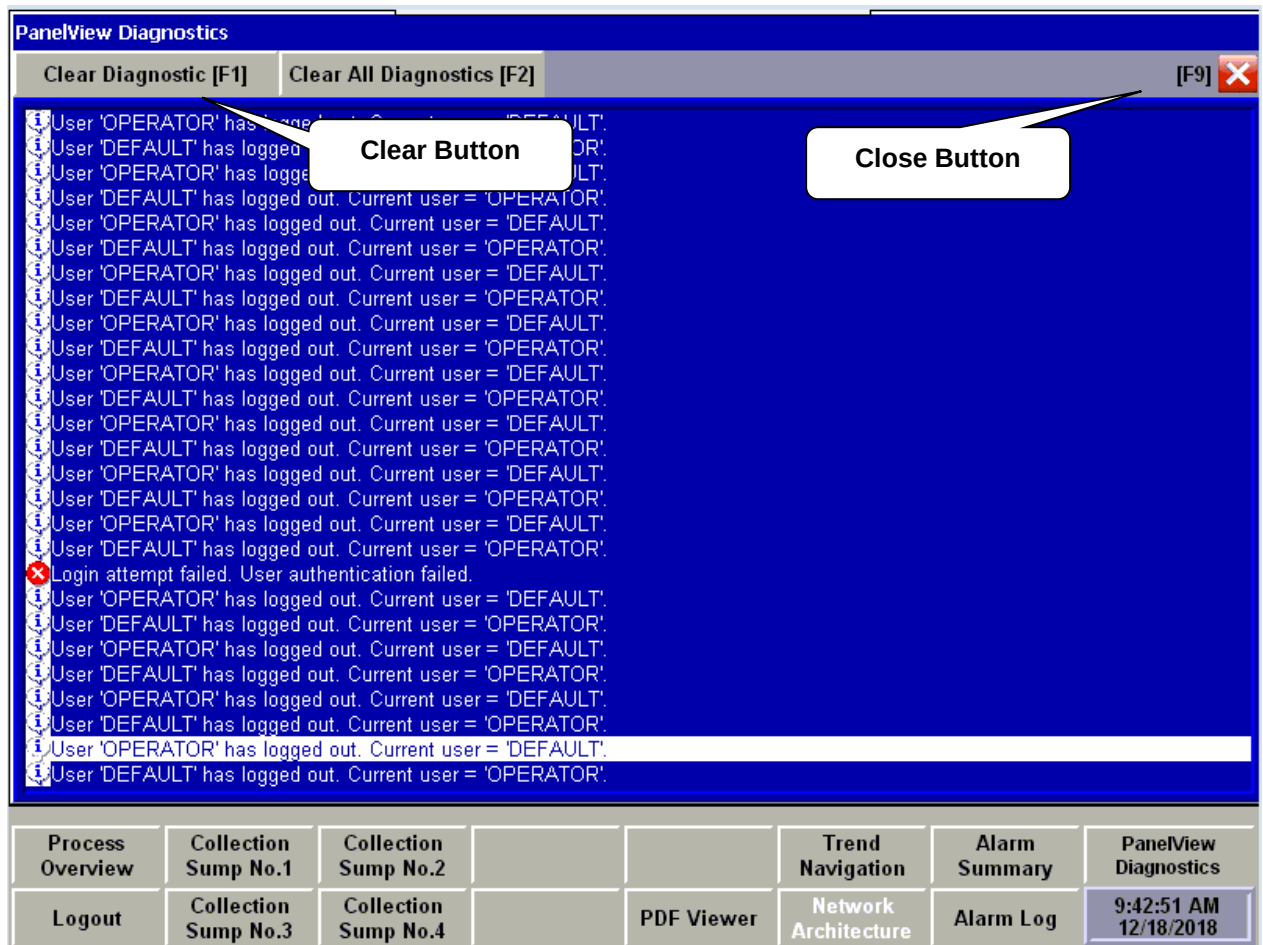


Figure 2.14: PanelView Diagnostic Popup

3. Process Screens

The Process Screen is located in the middle of the display, between the Alarm Header and the Navigation Footer and gives a visual representation of the specific area being controlled by the PLC. These screens provide; process flow direction, process values, daily statistics, operational status indications and popup windows with various information and control. Objects will have various functions if it is associated with a terminal function key [F1 – F16].

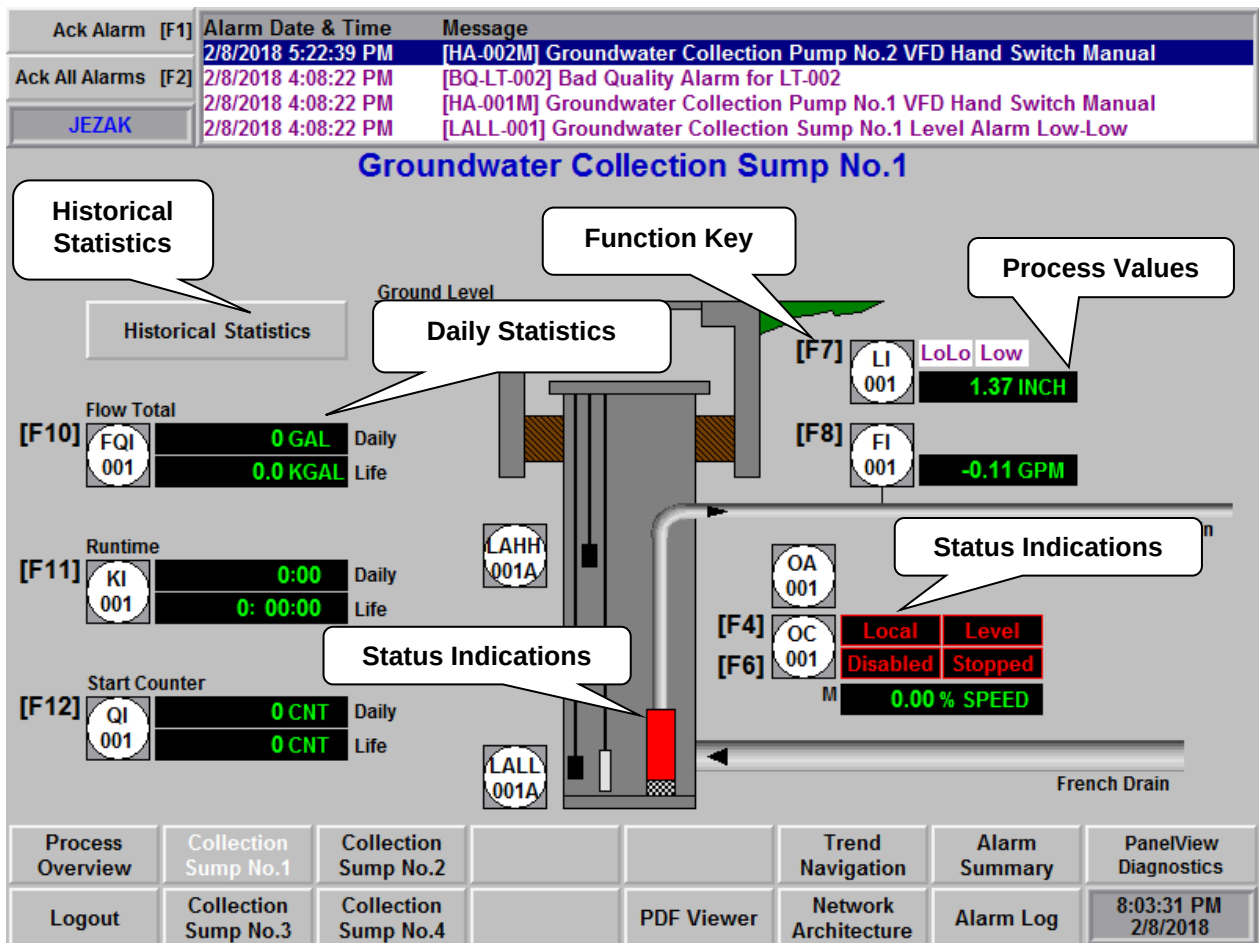


Figure 3.1: Common Process Screen

3.1 Process Values

Process Values are displayed next to a process tag block (grey square with white circle) and have green numeric displays with its associated engineering units on a black background. These indications are typically analog which means it could have a wide range of values depending on what is being represented; Level Indication (LI), Flow Indication (FI), Flow Quantity Indication (FQI), Runtime (KI), Start Counter (QI).

3.2 Alarm Setpoints

Most Process Values have alarms that notifies the user of an abnormal condition within the application. The associated alarms for a Process Value are displayed next to the common process tag block and within the Alarm Summary. [\[See Section 2.2 ALARM INDICATIONS\]](#)

The user can view and modify the alarm setpoints, which are values where the process value has entered an abnormal condition, by pressing the function key label on the screen next to the process tag block or the same function key on the terminal. Each process tag block will have its own designated function key to open an Alarm Setpoint popup specific to the Process Value it represents.

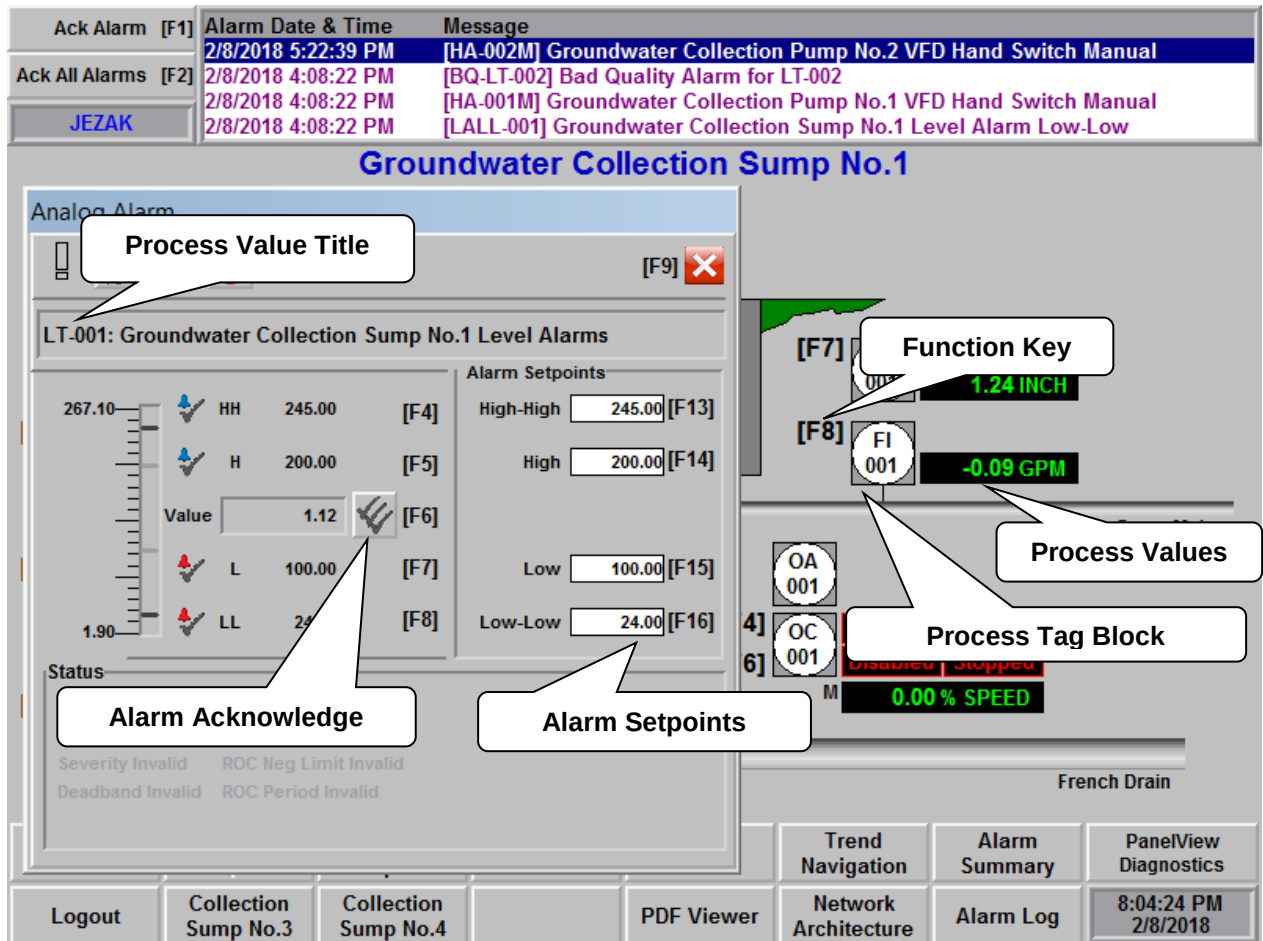


Figure 3.2: Alarm Setpoint Popup

Displayed at the top of the Alarm Setpoint popup is the title of the specific Process Value being represented. The user should realize and take caution, that all Alarm Setpoint popups look similar except for the titles and values. The popup itself cannot be resized, but can be closed by pressing the white X in the red button on the screen or the [F9] function key on the terminal.

A numerical bar graph represents the Process Value and its current reading shown as the green fill. Within the numerical bar graph are four horizontal hashes that represent each of the four Alarm Setpoints: **High-High (HH)**, **High (H)**, **Low (L)** and **Low-Low (LL)**. Each of their values and alarm states are shown to the right of the numeric bar graph; Red Bell – In Alarm Unacknowledged, Red Bell with Check – In Alarm Acknowledged, Blue Bell – Normal Unacknowledged, Blue Bell with Check - Normal Acknowledged. The user may acknowledge any of the alarms from the Alarm Setpoint popup by pressing the associated checkbox button when visible or its associated function key on the terminal.

Depending on the user's credentials and responsibilities, their approved login might allow Alarm Setpoints to be modified. By pressing the associated function key on the terminal, a blue numeric keypad will be displayed on the screen. Enter a value within the limits of the alarm setpoint, shown between the current value and the numeric pad, by touching the screen or using the terminal keys.



If a value outside of the allowable limit is entered, the display will turn red and it will retain its original value.

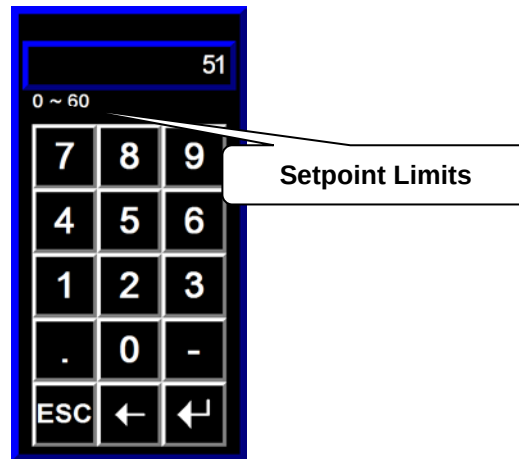


Figure 3.3: Numeric Keypad

Not only does the Alarm Setpoint need to be within its numeric limitations, but the alarm states have to be in sequential order. For example, a High-High Alarm Setpoint has to be the highest value and cannot be lower than the other three alarm conditions. If this is entered as such, the alarm instruction will fault and its status shown in red on the Alarm Setpoint popup. This error will need to be corrected in order for the alarm instruction to work properly.

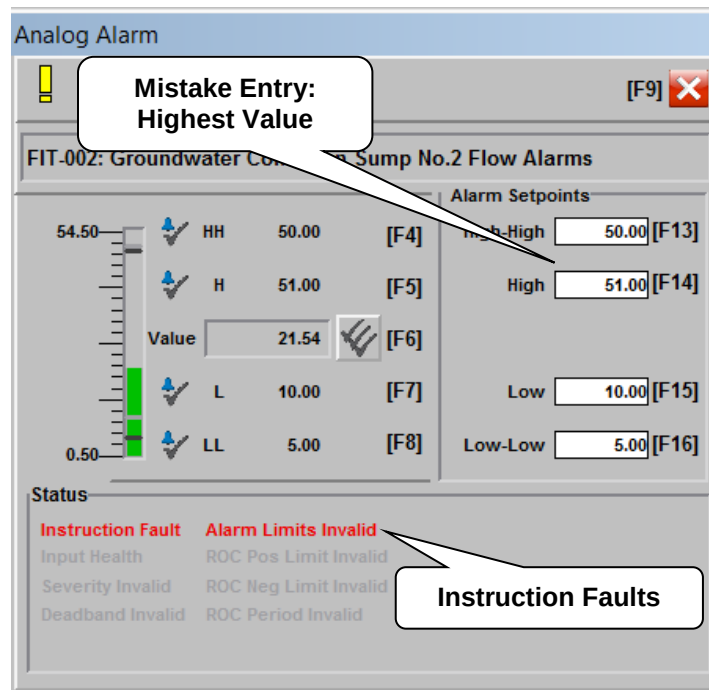


Figure 3.4: Alarm Setpoint Instruction Fault Status



3.3 Reset Values

Some Process Values do not have any associated alarms and are strictly for informational purposes. The FQI, KI and QI display values that steadily increase over time. At some point, it may become necessary or desired to reset these values back to zero.

Depending on the user's credentials and responsibilities, their approved login might allow these values to be reset by pressing the function key label on the screen next to the process tag block or the same function key on the terminal. Each process tag block will have its own designated function key to open a Reset popup specific to the Process Value it represents.

Displayed at the top of the Reset popup is the title of the specific Process Value being represented. The user should realize and take caution, that all Reset popups look similar except for the titles. The popup itself cannot be resized, but can be closed by pressing the white X in the red button on the screen or the **[F9]** function key on the terminal.

Once the action to reset a value has been confirmed, there is no means to undo this decision. Therefore, to decrease the accidental action to reset a value by the user, they must press the **[F8]** function key on the terminal. The touch screen in this situation is not operational, which is represented by the yellow button on the popup.

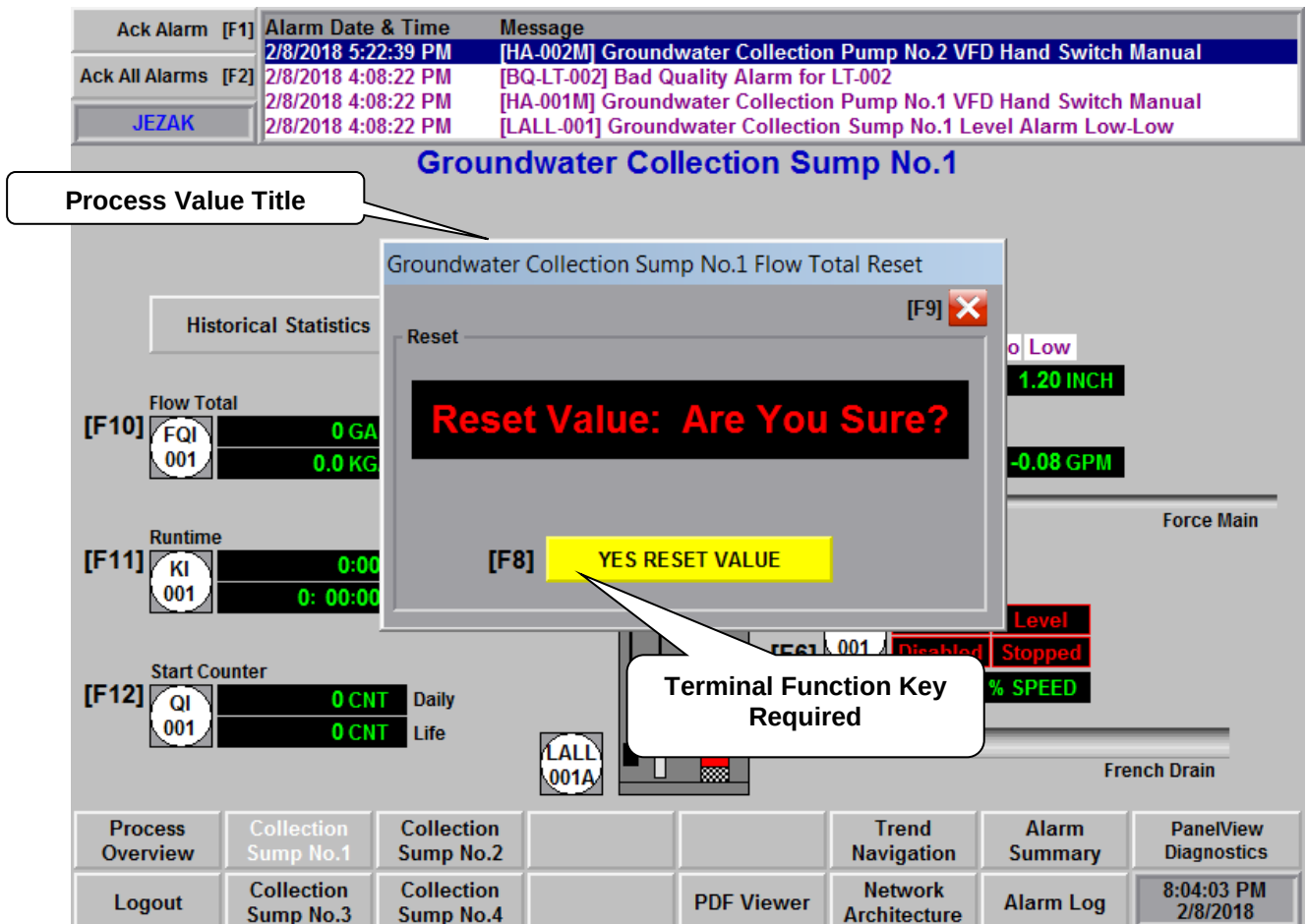


Figure 3.5: Reset Value Popup



3.4 Historical Statistics

The HMI Terminal has limited capabilities for historical data collection. As an alternative, the PLC has additional code to create and capture specific values at the end of the day; minimum and maximum daily values, average daily value, daily flow totalization, daily pump runtime and start counter.

These values are Emailed once at the end of the week from the HMI Terminal. [\[See Section 2.8 NETWORK ARCHITECTURE\]](#) Alternatively, they can be viewed live from the Process Screen by pressing the Historical Statistics button. The Historical Statistics popup shows seven days' worth of data, with the oldest day's data replaced as the days go by.

The Historical Statistics cannot be cleared or manipulated in any fashion. The user may touch one of the seven days to highlight focus on it while viewing the screen. The popup itself cannot be resized, but can be closed by pressing the white X in the red button on the screen or the **[F9]** function key on the terminal.

Ack Alarm [F1]	Alarm Date & Time	Message				
	2/8/2018 5:22:39 PM	[HA-002M] Groundwater Collection Pump No.2 VFD Hand Switch Manual				
Ack All Alarms [F2]	2/8/2018 4:08:22 PM	[BQ-LT-002] Bad Quality Alarm for LT-002				
	2/8/2018 4:08:22 PM	[HA-001M] Groundwater Collection Pump No.1 VFD Hand Switch Manual				
JEZAK	2/8/2018 4:08:22 PM	[LALL-001] Groundwater Collection Sump No.1 Level Alarm Low-Low				
Groundwater Collection Sump No.1 Historical Statistics						
[F9] 						
2/8	2/7	2/6	2/4	2/3	2/2	2/1
Daily Flow Total						
0 GAL	1400 GAL	0 GAL	0 GAL	0 GAL	0 GAL	0 GAL
Flow - GPM						
-0.06 Max	60.00 Max	25.00 Max	25.00 Max	25.00 Max	25.00 Max	25.00 Max
-0.09 Avg	-8.74 Avg	13.27 Avg	25.00 Avg	25.00 Avg	25.00 Avg	25.00 Avg
-0.13 Min	-15.00 Min	-12.50 Min	25.00 Min	25.00 Min	25.00 Min	25.00 Min
Level - Inches						
7.14 Max	12.91 Max	124.56 Max	124.56 Max	124.56 Max	124.56 Max	124.56 Max
1.44 Avg	-40.91 Avg	66.11 Avg	124.53 Avg	124.53 Avg	124.53 Avg	124.53 Avg
0.34 Min	-62.28 Min	-62.28 Min	124.56 Min	124.56 Min	124.56 Min	124.56 Min
Pump						
0:00 Run 0 CNT	0:00 Run 0 CNT	0:00 Run 0 CNT	0:00 Run 0 CNT	0:00 Run 0 CNT	0:00 Run 0 CNT	0:00 Run 0 CNT
Process Overview	Collection Sump No.1	Collection Sump No.2			Trend Navigation	Alarm Summary
Logout	Collection Sump No.3	Collection Sump No.4		PDF Viewer	Network Architecture	Alarm Log
						8:03:42 PM 2/8/2018

Figure 3.6: Historical Statistics Popup



3.5 Pump Controls

The pumps for this application have various areas in which it can receive commands for operation. In general, the pumps can be controlled locally at the variable frequency drive (VFD) enclosure or remotely through the HMI Terminal using PLC code. There is a hand switch on each of the pump's VFD enclosure that dictates what location has operational control. The hand switch must be in Remote to control the pump from the HMI Terminal. The user can view the status of this switch on the Process Screens next to the associated process tag block of the pump. This document only covers controls associated with the pumps through the HMI Terminal screens.

The Process Status of the pumps are shown next to their associated process tag block on the Process Screen. Typically the status will change state and color depending on the feedback of the process; Red – Closed/Stopped/Alarm, Green – Open/Running/Normal, Orange – Fault, Gray – No Status.

The user can view and modify the pump controls by pressing the **[F6]** function key label on the screen next to the process tag block or the same function key on the terminal for the associated pump. From the Pump Control popup, the user can **Enable** or **Disable** the pump by pressing the buttons or the function keys on the terminal. When the pump is disabled, the PLC will not start the pump for any reason. When the pump is enabled, the user has given *permission* to the PLC to start the pump but the pump may remain off due to other process conditions. Once all conditions have been satisfied and the pump has been enabled, will it begin to operate.

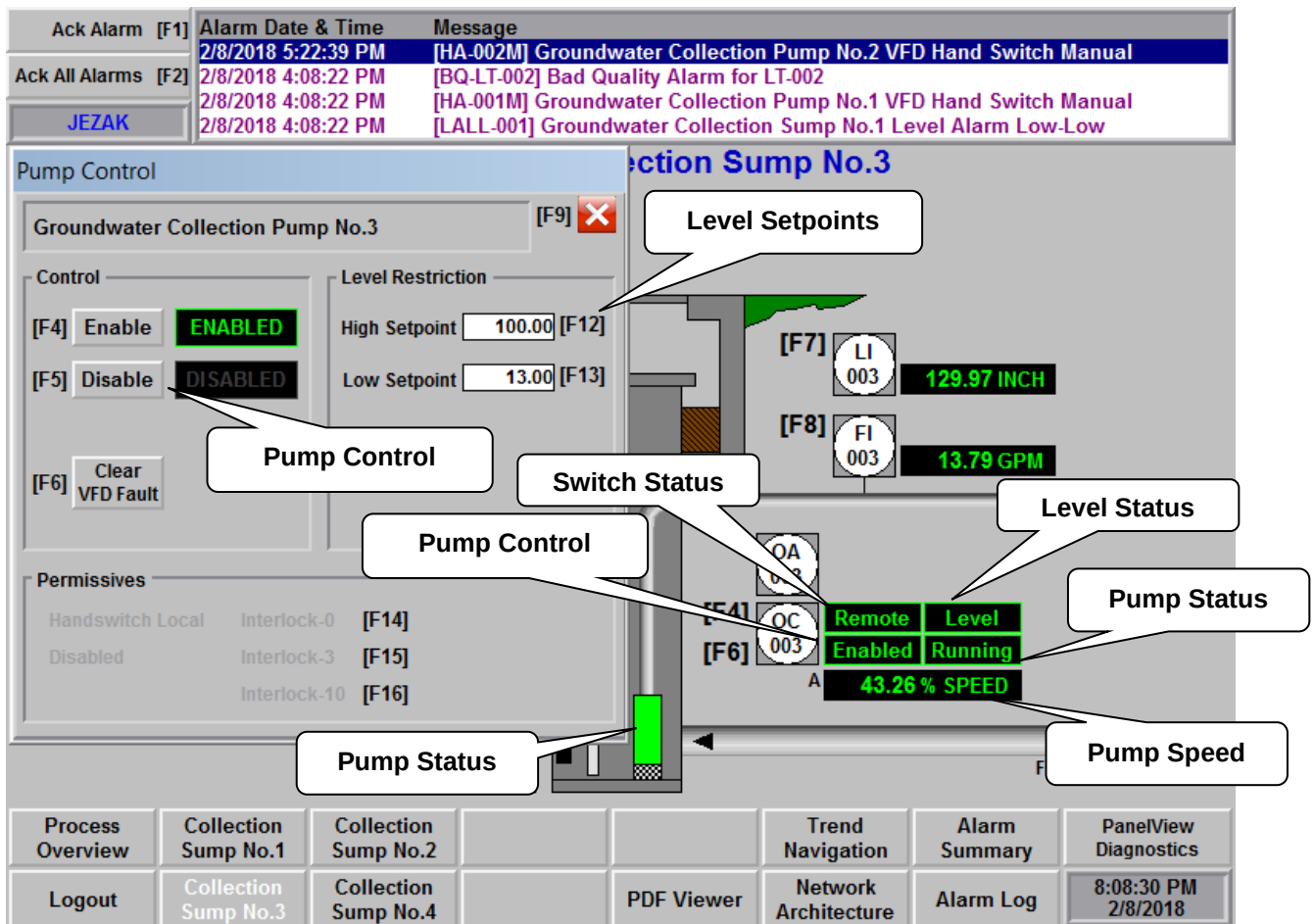


Figure 3.7: Pump Controls Popup

One of the conditions the PLC is viewing for pump operation is the **Level Restriction**. To prevent the pump from running dry or to operate in a set level range, the user may change the Low Setpoint value. Once the water level is below the Low Setpoint, the PLC will automatically turn the pump off until the water level has exceeded the High Setpoint therefore turning the pump back on. By pressing the associated function key on the terminal, a blue numeric keypad will be displayed on the screen to modify these values.

In addition to the Level Restriction, the PLC is looking for other various conditions listed as **Permissives**. If a Permissive is actively preventing the pump from running, it will be highlighted in red on the popup. Common Permissives between the pumps are Level Restriction, Hand Switch in Local, and user Disabled. Unique Permissives are typically the **Interlocks** associated with a specific pump and the alarms that makeup these Interlocks.

Interlocks can be viewed from the Pump Control popup by pressing the function key label on the screen next to the desired Interlock or the same function key on the terminal. This will display another popup specific to the Interlock that will display all alarms associated with it. An alarm is active if its associated circle is red, and green when normal. The pump will not start if any Permissives are in an alarm state.

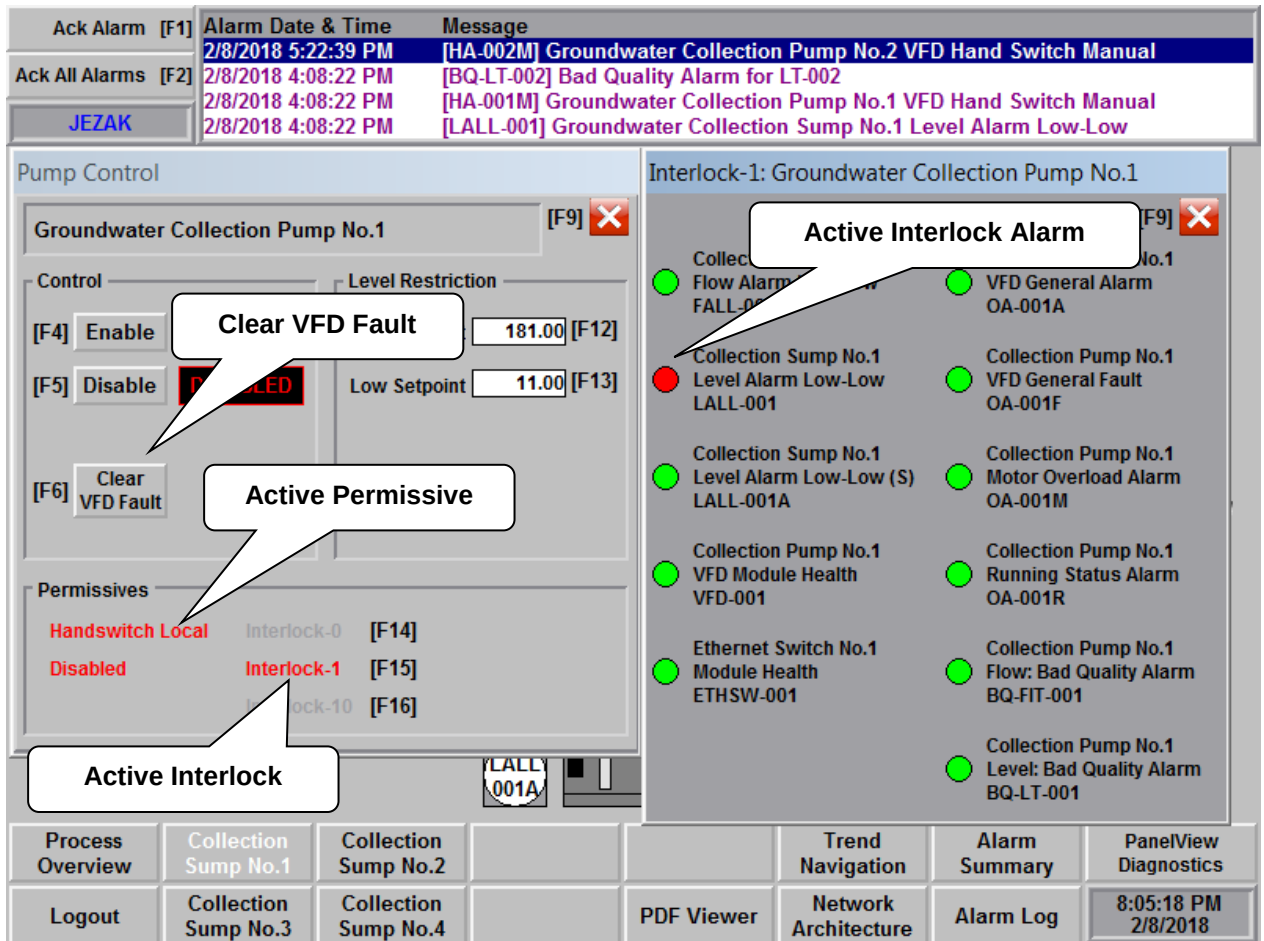


Figure 3.8: Pump Controls Interlock Popup

Faults may occur within the VFD, which will prevent the user from operating the pump remotely on the HMI Terminal. It is highly recommended to physically view the VFD in person to verify conditions and obtain the **Fault Code** from the local VFD Monitor. Once issues have been resolved it is possible to clear the VFD Fault from the VFD Monitor or from the Pump Control popup by pressing the function key label on the screen or the same function key on the terminal.

As a convenience to the user, it is possible to turn off all pumps at once from the Overview screen. Therefore, to decrease an accidental action to turn off all pumps by the user, they must press the **[F16]** function key on the terminal. The touch screen in this situation is not operational, which is represented by the yellow button on the screen labeled as **Process Stop** located in the lower-right hand corner.

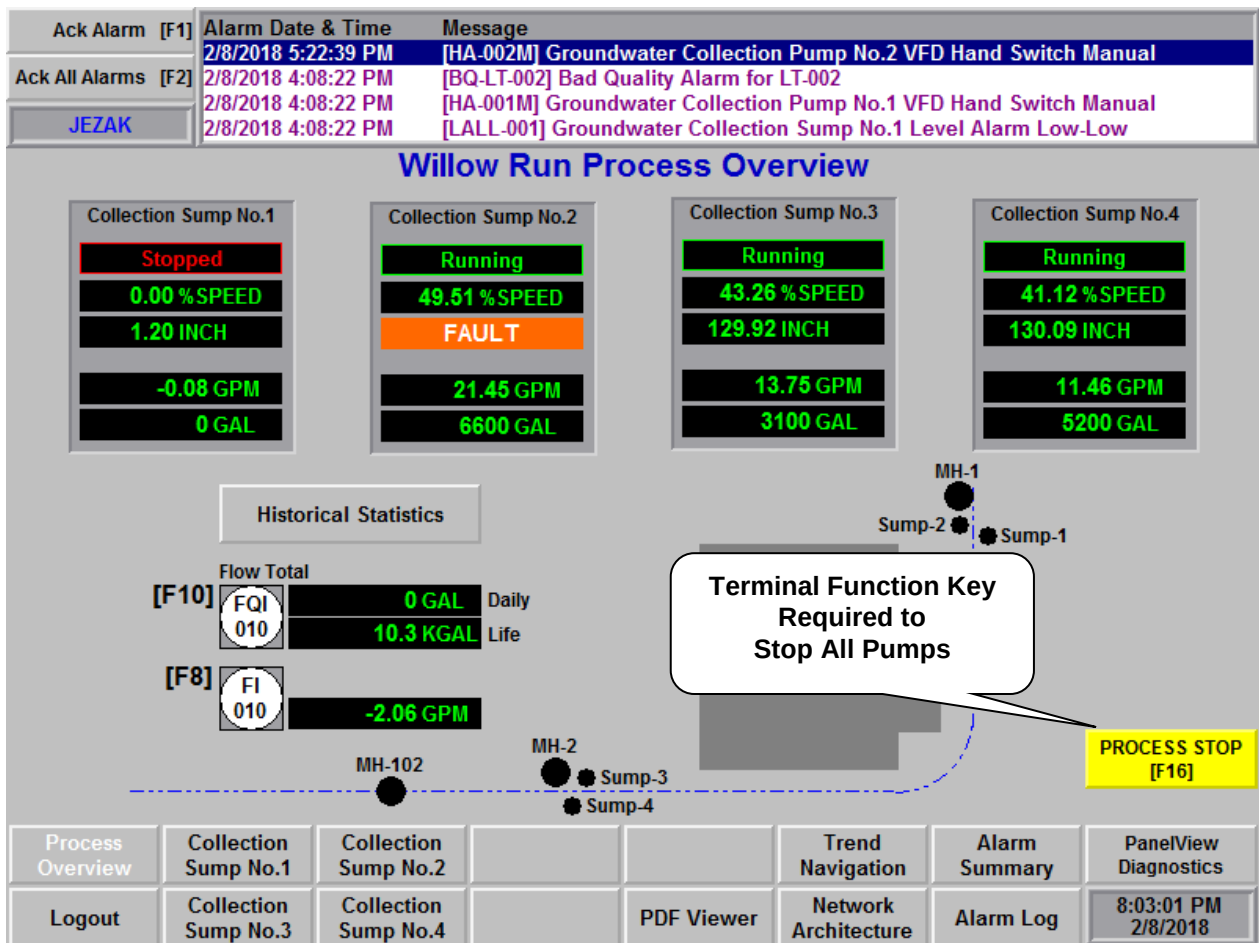


Figure 3.9: Process Stop Pushbutton

3.6 Level Controls

In addition to the Pump Controls, the user may desire to maintain a specific level or pump speed during operations by using the Level Controller. The user can view and modify the level controls by pressing the [F4] function key label on the screen next to the process tag block or the same function key on the terminal for the associated pump.

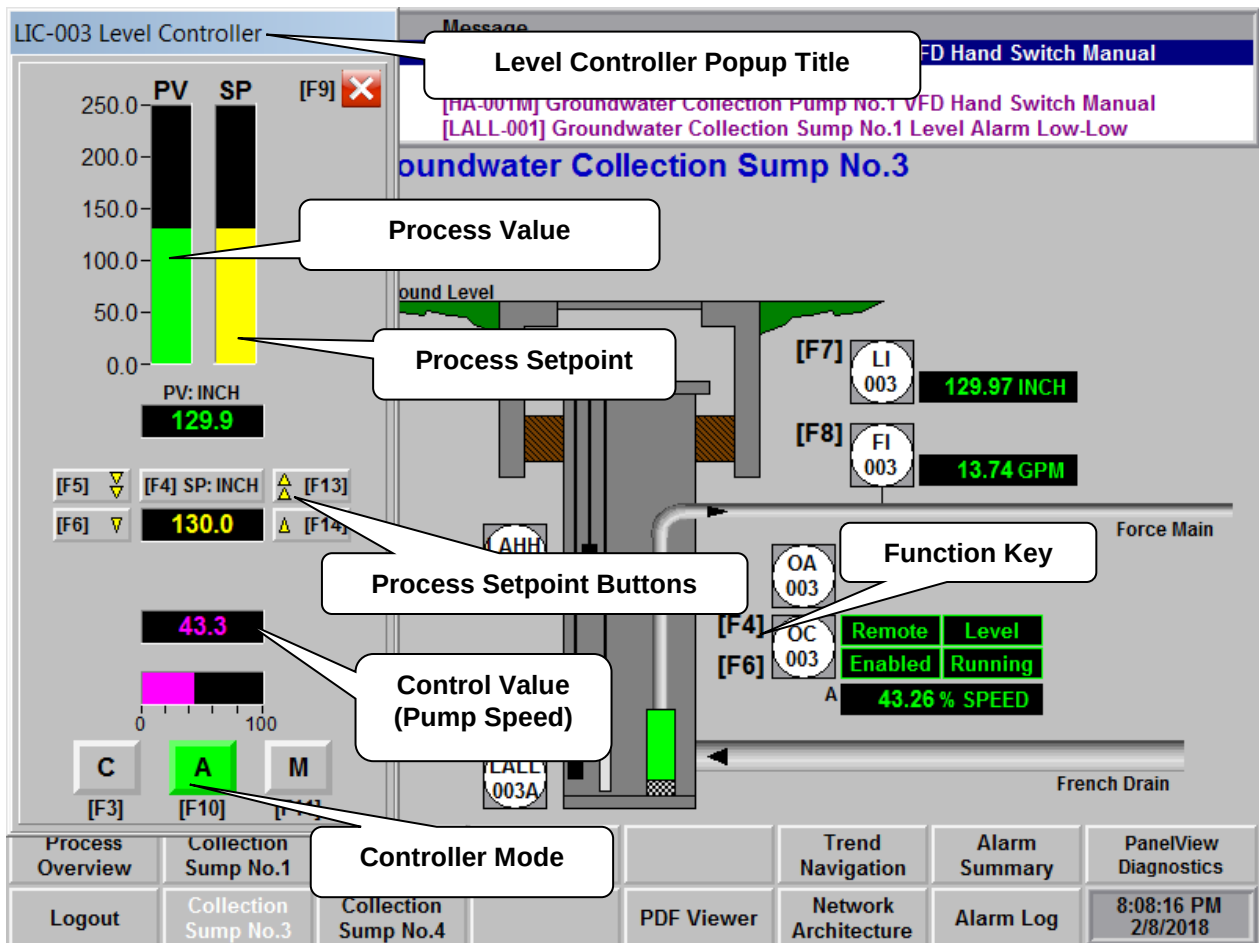


Figure 3.10: Level Controller Popup

Displayed at the top of the Level Controller popup is the title of the specific Process Value being represented. The user should realize and take caution, that all Level Controller popups look similar except for the titles and values. The popup itself cannot be resized, but can be closed by pressing the white X in the red button on the screen or the **[F9]** function key on the terminal.

The numerical bar graphs give a visual representation of the **Process Value** and its current reading shown in green, while comparing it to the desired **Process Setpoint** in yellow. The Process Setpoint is the value the user wishes to maintain the Process Value at while the pump is operational and in Auto Mode. The PLC will vary the **Control Value** (i.e. pump speed) in order to maintain the Process Value at the desired setpoint. The Control Value is represented by the horizontal numerical bar graph shown in magenta. If a value goes into a fault condition, the bar graphs will fill up with an orange background and white lettering stating Fault.

For precise readings of the numerical bar graphs, numeric displays are in the center of the Level Controller popup. They are represented with their associated color and engineering units; Process Value – green, Process Setpoint – yellow, Control Value – magenta.

The user can choose to operate in one of the three different modes: **Cascade (C)**, **Auto (A)**, and **Manual (M)**. To switch between these modes, the user has to press the desired button located on the bottom of the Level Controller or its associated function key on the terminal. The selected mode



of operation will be highlighted in green on the controller. On the process screen next to the associated process tag block, a letter will represent the current mode of operation for the Level Controller.

Cascade: The controller set in Cascade Mode will operate based on another controller's output condition. (**This mode is NOT used in this application**)

Auto: When the controller is in Auto Mode, the PLC will vary the Control Value automatically to maintain the Process Value at the user's desired Process Setpoint. The buttons associated with Manual Mode Control Value will disappear while in this mode.

Manual: The user will manually set the Control Value. While in Manual Mode, the Process Value and Process Setpoint values are disregarded. When initially switching into Manual Mode, the controller retains its current Control Value for a bumpless transfer.

The user has various methods to modify the Process Setpoint while in Auto Mode, and the Control Value while in Manual Mode by using push buttons and numeric entries. All entries are maintained after the controller popup has been closed.

The double arrow buttons pointing in the down or left direction, subtract 1% from the desired value, while the single arrow button subtracts 0.1%. The double arrow buttons pointing in the up or right direction adds 1% to the desired value, while the single arrow button adds 0.1%. To use these buttons, the user may press the button on the screen or press the associated function key on the terminal. The current value is shown in the numeric display.

Alternatively, the user can enter a specific value for the Process Setpoint or Control Value by pressing the button directly above the associated numeric display on the screen or press the associated function key on the terminal. A blue numeric keypad will be displayed on the screen, where the user can then enter the desired value by touching the screen or using the terminal keys. If a value outside of the allowable limit is entered, the display will turn red and it will retain its original value. The user will need to correct this value for it to update properly, or press the escape key **[ESC]** on the keypad. Once properly entered, the current value will be displayed in the numeric display.

When the pump is commanded to stop due it being disabled, a permissive or an Interlock, the Level Controller will be in **CV Initializing**, which is displayed below the Control Value numeric display when active. Essentially the Level Controller is locked out and forced to a Control Value of zero. Once the pump is allowed to operate, CV Initializing will clear and the Level Controller will resume controls.

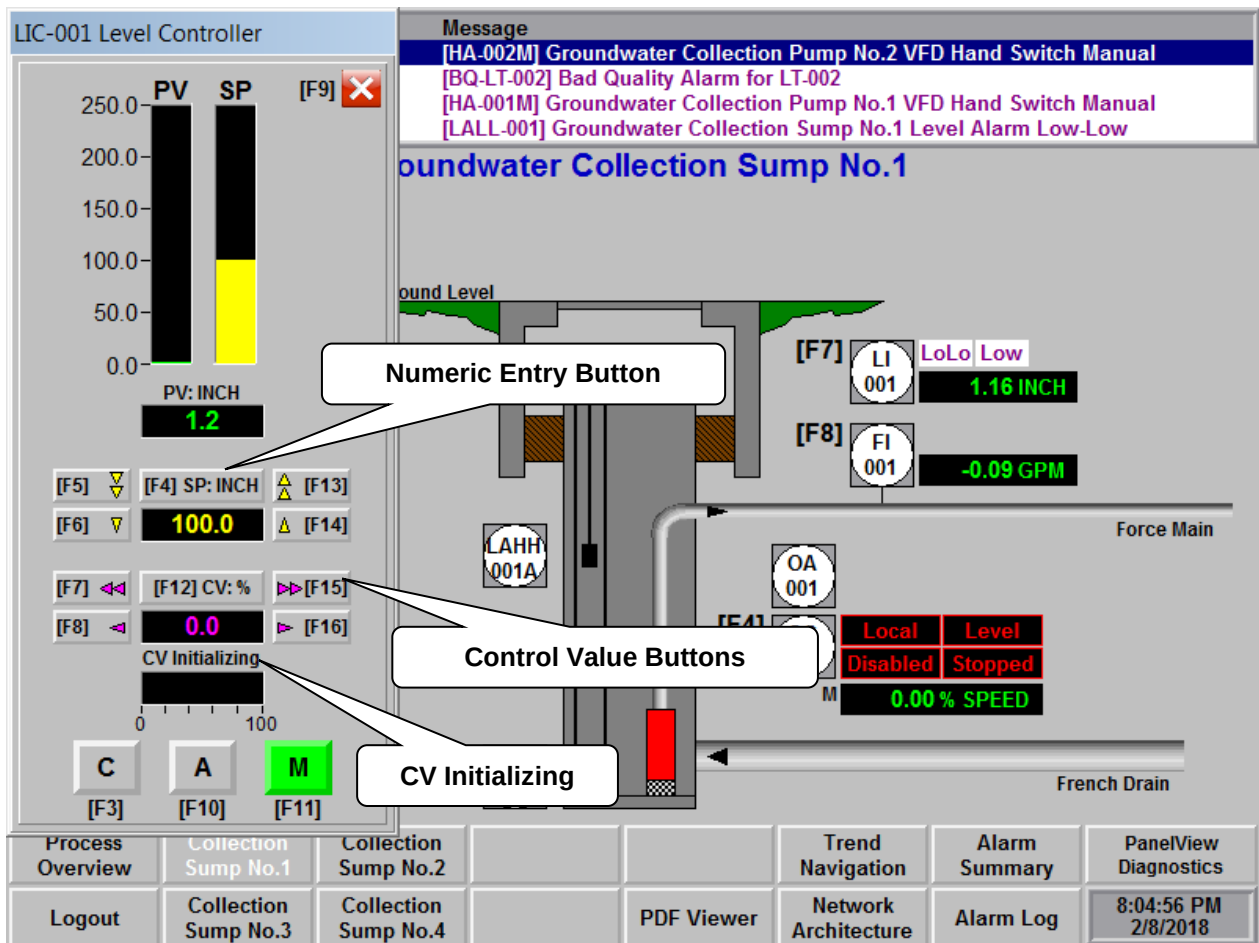


Figure 3.11: Level Controller Popup – CV Initializing

4. Communication Failure

Communication failure occurs when the HMI Terminal no longer has the ability to reach the PLC. Various reasons may cause the situation; power failure, wire failure, Ethernet switch fault, configuration settings or hardware fault.

These indications do not necessarily mean that the PLC and the overall process are no longer operating. Without further troubleshooting, all that is known from the initial observation is that the HMI Terminal is no longer displaying information from the PLC. An Automation Engineer should be notified of these conditions to help diagnose the root cause.

All or some objects displayed on the screen that are associated with a PLC value turns into a Wire Frame (an outline) when communications is lost, indicating to the user, that object is no longer functional. Alarm indicators will appear with orange text stating “Error” within a white box, while some Process Values will display asterisks when the HMI Terminal has lost communications with the PLC.

When communications are re-established, all items should appear and operate as normal.

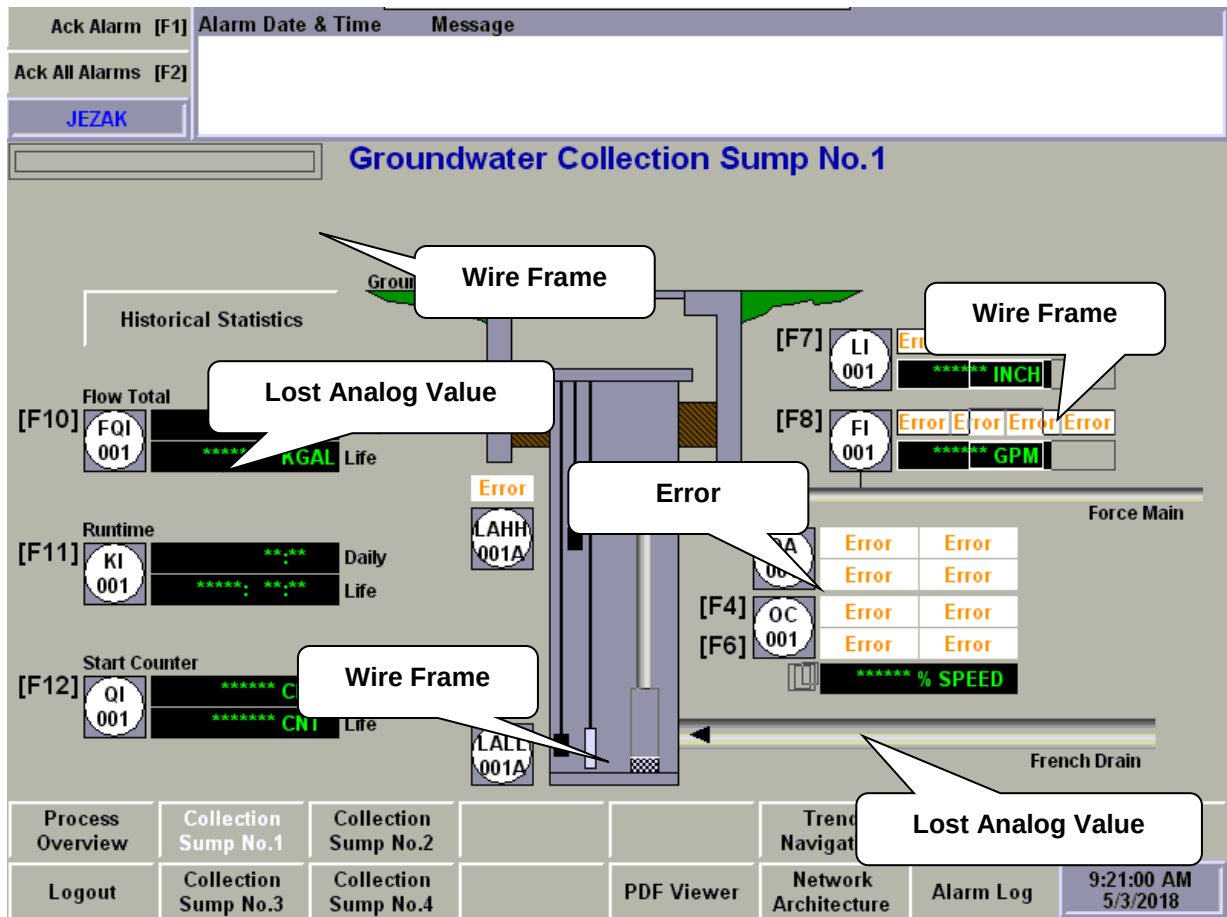


Figure 4.1: Wire Frame and Errors on Process Screen



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Appendices

Appendix A

List of HMI Screens

Appendix A List of HMI Screens

Process Screens:

- 1) Login / Logout
- 2) Willow Run Process Overview
- 3) Groundwater Collection Sump No.1
- 4) Groundwater Collection Sump No.2
- 5) Groundwater Collection Sump No.3
- 6) Groundwater Collection Sump No.4
- 7) PDF Viewer
- 8) Network Architecture
- 9) Trend Navigation
- 10) Collection Sump No.1 Process Values Trend
- 11) Collection Sump No.2 Process Values Trend
- 12) Collection Sump No.3 Process Values Trend
- 13) Collection Sump No.4 Process Values Trend
- 14) Groundwater Level Values Trend
- 15) Groundwater Flow Values Trend
- 16) Daily Flow Totals Trend

Popup Windows:

- 1) Alarm Summary
- 2) Alarm Log
- 3) PanelView Diagnostics
- 4) Historical Statistics
- 5) Level Controller
- 6) Pump Control
- 7) Interlock Status
- 8) Analog Alarm Setpoint
- 9) Reset Value

Appendix B

Training Checklist for HMI Usage

Appendix B Training Checklist for HMI Usage

- ____ 1. System Overview / HMI Function Keys (Tab, Esc, Home, etc.)
- ____ 2. Login User Accounts
- ____ 3. Alarm Header / Alarm Summary / PLC Status
- ____ 4. Alarm Conditions / Alarm and Fault Indicators
- ____ 5. Navigation Footer
- ____ 6. Alarm Summary
- ____ 7. Alarm Log
- ____ 8. Trends / Focus between Trend and Alarm Summary
- ____ 9. PDF Viewer
- ____ 10. Network Architecture / Weekly Emails / Alarm Texts / PV Diagnostics
- ____ 11. Process Screens / Process Values / Process Status
- ____ 12. Alarm Setpoints
- ____ 13. Reset Values
- ____ 14. Historical Statistics
- ____ 15. Pump Controls / Permissives / Interlocks
- ____ 16. Level Controller / Controller Modes / Numeric Entries
- ____ 17. Communication Failure / Wire Frame / Errors

Name _____

Signature _____

Date _____



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Appendix D

Operational Summary Memo



Memorandum

February 1, 2019

To:	Project File	Ref. No.:	017358
	017358/Memo 226		
From:	Beth Landale <i>BL</i>	Tel:	248-893-3428
cc:	Allie Murphy, Daniel Beck, Josh Ezak		
Subject:	Functional and Interlock Summaries Willow Run Groundwater Collection System Ypsilanti, MI		

In 2017 and 2018 a groundwater collection system was installed at the downgradient property boundary at the Willow Run Powertrain plant. This system consists of four sections of French drain, each operated independently based on submersible sumps and various sensors. At this time, there is no post-collection treatment; the collected water is discharged to the Public Operated Treatment Works (POTW) via the sanitary sewer. Post-collection treatment is currently being evaluated.

An Operation and Maintenance manual will be prepared for the operating system. In the meantime, this memorandum serves as a way to file the following two attachments to the future operation and maintenance manual:

- Functional Description – Attachment A
 - This provides an operational summary for each control loop. This includes a component summary, steady state operation and associated alarms with each loop.
- Interlock summary – Attachment B
 - This provides a description of the six interlocks programmed into the collection system, including their purpose, what control actions will take place, when these occur, and what conditions need to be cleared for the interlock to return to normal.

Attachment A

Functional Description

Attachment A Willow Run Functional Description

Complex Loop No.	Service Description
001	Groundwater Collection Sump Pump No. 1
002	Groundwater Collection Sump Pump No. 2
003	Groundwater Collection Sump Pump No. 3
004	Groundwater Collection Sump Pump No. 4
010	Effluent Groundwater Flow

1. Groundwater Collection Sump Pump No. 1

Loop No:	P&ID No:	Service Description
001	EF-01	Collection Sump No. 1 Level Control

1.1 Summary Description

Four submersible pumps are located at intervals along the French drain installed in collection sumps with manhole access. The pumps are VFD controlled to modulate their output speed to maintain a desired sump water level, which is detected by a pressure transducer within the sump. Backup level switches are installed to monitor for extreme water levels: overflow and dry conditions. Each collection sump has a flow transmitter to measure and monitor flow rates being extracted from its specific location.

The submersible pumps can be operated locally at their VFD enclosures or remotely from the HMI Terminal and the PLC.

1.2 Component Summary

Process Tag	Description	Type
OS-001A	Groundwater Collection Sump Pump No. 1 VFD General Alarm	Digital Input
OS-001F	Groundwater Collection Sump Pump No. 1 VFD General Fault	Digital Input
OS-001M	Groundwater Collection Sump Pump No. 1 VFD Motor Overload	Digital Input
OS-001R	Groundwater Collection Sump Pump No. 1 Running Status	Digital Input
HS-001	Groundwater Collection Sump Pump No. 1 Hand Switch	Digital Input
LSHH-001A	Groundwater Collection Sump No. 1 Level Switch High-High	Digital Input
LSLL-001A	Groundwater Collection Sump No. 1 Level Switch Low-Low	Digital Input
FQI-001	Groundwater Collection Sump No. 1 Flow Totalization Pulse	Digital Input
OC-001 (STP)	Groundwater Collection Sump Pump No. 1 VFD Stop	Digital Output
OC-001 (STR)	Groundwater Collection Sump Pump No. 1 VFD Start	Digital Output
OC-001 (CF)	Groundwater Collection Sump Pump No. 1 VFD Clear Fault	Digital Output
SI-001	Groundwater Collection Sump Pump No. 1 VFD Speed Feedback	Analog Input
FIT-001	Groundwater Collection Sump No. 1 Flow Indication	Analog Input
PIT-001	Groundwater Collection Sump No. 1 Pressure Indication	Analog Input
SC-001	Groundwater Collection Sump Pump No. 1 VFD Speed Command	Analog Output

1.3 Steady State Operation

The user may operate the submersible pump locally at the Variable Frequency Drive (VFD) enclosure if the hand switch (HS-001) is placed in the LOCAL position. While in the LOCAL position, the user is completely in control of the pump without any Interlocks or safeguards from the Programmable Logic Controller (PLC). It is the user's responsibility to operate the pump within the guidelines of the treatment process. Therefore, it is highly recommended to use this method of control for troubleshooting or maintenance activity only and not for daily operation.

To start the pump locally, the user may press the green start button located on the front of the VFD enclosure. To verify pump operations, a running status light will illuminate. To increase the speed of the pump, a potentiometer located on the front of the VFD enclosure can be rotated clockwise, while rotating the potentiometer counter clockwise will decrease speed. The operating speed of the pump is shown on the VFD monitor (0Hz – 30Hz – 60Hz) = (0% - 50% - 100%).

To stop the pump locally, the user may press the red stop button located on the front of the VFD enclosure. After a duration of the time, the pump will ramp down in speed, coming to a full stop that can be verified with the running status light turning off.

Preventing the pump from operating locally or remotely, the hand switch (HS-001) can be placed in the OFF position. While in the OFF position, the local equipment is still energized. The hand switch is not a method of electrically locking out equipment.

Operating the pump from the Human Machine Interface (HMI) Terminal provides additional Interlocks, safeguards, alarms and control methods from within the PLC program. Once the user places the hand switch (HS-001) into the REMOTE position, they then must navigate through the HMI interface to operate the pump. For further guidance, read the [HMI User Manual](#).

At first, the user must open the Pump Control popup and verify no Permissives or Interlock alarms are preventing the pump from operating. Alarms associated with the pump must be acknowledged and corrected in the field before attempting to start. These alarms will be highlighted in the Pump Control popup if active.

Level Restrictions may be placed on the pump operations for various reasons; damage prevention, on/off controls, desired water level operation range. When the water level drops below the Level Restriction Low Setpoint, the pump will automatically turn off and wait until the water level replenishes and exceeds the Level Restriction High Setpoint, at that point turning back on automatically. The user may modify these setpoints within the Pump Control popup.

Once all alarms are cleared and level setpoints verified, the user may press the Enable button to start the pump. The pump will remain enabled as long as no associated alarms are present. If an alarm associated with the pump occurs, the pump will automatically disable, forcing the user to clear all alarms and press the Enable button again to resume operations. When the water level drops below the Level Restriction Low Setpoint, the pump will turn off but remain enabled as long as no associated alarms are active. The pump will turn back on automatically once the water level is above the Level Restriction High Setpoint. At any point during operation, the user may press the Disable button to stop the pump.

The pump can be placed in two different modes from the Level Controller popup: AUTO and MANUAL. When the controller is in Auto Mode, the PLC will vary the speed of the pump automatically to maintain the water level at the user's desired setpoint. If the water level exceeds the setpoint, pump speed will increase to attempt to lower the water level, and it will decrease speed (until it reaches its minimum speed)

when the water level is below the setpoint. The water level setpoint can be modified on the Level Controller popup.

While in Manual Mode, the user sets the desired speed of the pump and the PLC ignores the water level and the desired setpoint. The pump will continue to operate in this fashion until the user switches into Auto Mode.

Refer to Interlock-00, Interlock-01 and Interlock-10 for automatic shutdown conditions. These conditions apply only when the hand switch (HS-001) is in the REMOTE position.

1.4 Associated Alarms

Process Tag	Description	Delay
BQ-FIT-001	Groundwater Collection Sump No. 1 Flow Bad Quality Alarm	5 sec
FAHH-001	Groundwater Collection Sump No. 1 Flow Alarm High-High	NA
FAH-001	Groundwater Collection Sump No. 1 Flow Alarm High	NA
FAL-001	Groundwater Collection Sump No. 1 Flow Alarm Low	120 sec
FALL-001	Groundwater Collection Sump No. 1 Flow Alarm Low-Low	120 sec
BQ-LT-001	Groundwater Collection Sump No. 1 Level Bad Quality Alarm	5 sec
LAHH-001A	Groundwater Collection Sump No. 1 Level Alarm High-High (Switch)	5 sec
LAHH-001	Groundwater Collection Sump No. 1 Level Alarm High-High	NA
LAH-001	Groundwater Collection Sump No. 1 Level Alarm High	5 sec
LAL-001	Groundwater Collection Sump No. 1 Level Alarm Low	5 sec
LALL-001	Groundwater Collection Sump No. 1 Level Alarm Low-Low	NA
LALL-001A	Groundwater Collection Sump No. 1 Level Alarm Low-Low (Switch)	5 sec
HA-001M	Groundwater Collection Sump Pump No. 1 VFD Hand Switch in Manual	5 sec
OA-001A	Groundwater Collection Sump Pump No. 1 VFD General Alarm	5 sec
OA-001F	Groundwater Collection Sump Pump No. 1 VFD General Fault Alarm	5 sec
OA-001M	Groundwater Collection Sump Pump No. 1 VFD Motor Overload Alarm	5 sec
OA-001R	Groundwater Collection Sump Pump No. 1 VFD Running Status Alarm	10 sec

All alarms are displayed on the HMI Terminal within the Alarm Summary.

2. Groundwater Collection Sump Pump No. 2

Loop No:	P&ID No:	Service Description
002	EF-01	Collection Sump No. 2 Level Control

2.1 Summary Description

Four submersible pumps are located at intervals along the French drain installed in collection sumps with manhole access. The pumps are VFD controlled to modulate their output speed to maintain a desired sump water level, which is detected by a pressure transducer within the sump. Backup level switches are

installed to monitor for extreme water levels: overflow and dry conditions. Each collection sump has a flow transmitter to measure and monitor flow rates being extracted from its specific location.

The submersible pumps can be operated locally at their VFD enclosures or remotely from the HMI Terminal and the PLC.

2.2 Component Summary

Process Tag	Description	Type
OS-002A	Groundwater Collection Sump Pump No. 2 VFD General Alarm	Digital Input
OS-002F	Groundwater Collection Sump Pump No. 2 VFD General Fault	Digital Input
OS-002M	Groundwater Collection Sump Pump No. 2 VFD Motor Overload	Digital Input
OS-002R	Groundwater Collection Sump Pump No. 2 Running Status	Digital Input
HS-002	Groundwater Collection Sump Pump No. 2 Hand Switch	Digital Input
LSHH-002A	Groundwater Collection Sump No. 2 Level Switch High-High	Digital Input
LSLL-002A	Groundwater Collection Sump No. 2 Level Switch Low-Low	Digital Input
FQI-002	Groundwater Collection Sump No. 2 Flow Totalization Pulse	Digital Input
OC-002 (STP)	Groundwater Collection Sump Pump No. 2 VFD Stop	Digital Output
OC-002 (STR)	Groundwater Collection Sump Pump No. 2 VFD Start	Digital Output
OC-002 (CF)	Groundwater Collection Sump Pump No. 2 VFD Clear Fault	Digital Output
SI-002	Groundwater Collection Sump Pump No. 2 VFD Speed Feedback	Analog Input
FIT-002	Groundwater Collection Sump No. 2 Flow Indication	Analog Input
PIT-002	Groundwater Collection Sump No. 2 Pressure Indication	Analog Input
SC-002	Groundwater Collection Sump Pump No. 2 VFD Speed Command	Analog Output

2.3 Steady State Operation

The user may operate the submersible pump locally at the Variable Frequency Drive (VFD) enclosure if the hand switch (HS-002) is placed in the LOCAL position. While in the LOCAL position, the user is completely in control of the pump without any Interlocks or safeguards from the Programmable Logic Controller (PLC). It is the user's responsibility to operate the pump within the guidelines of the treatment process. Therefore, it is highly recommended to use this method of control for troubleshooting or maintenance activity only and not for daily operation.

To start the pump locally, the user may press the green start button located on the front of the VFD enclosure. To verify pump operations, a running status light will illuminate. To increase the speed of the pump, a potentiometer located on the front of the VFD enclosure can be rotated clockwise, while rotating the potentiometer counter clockwise will decrease speed. The operating speed of the pump is shown on the VFD monitor (0Hz – 30Hz – 60Hz) = (0% - 50% - 100%).

To stop the pump locally, the user may press the red stop button located on the front of the VFD enclosure. After a duration of the time, the pump will ramp down in speed, coming to a full stop that can be verified with the running status light turning off.

Preventing the pump from operating locally or remotely, the hand switch (HS-002) can be placed in the OFF position. While in the OFF position, the local equipment is still energized. The hand switch is not a method of electrically locking out equipment.

Operating the pump from the Human Machine Interface (HMI) Terminal provides additional Interlocks, safeguards, alarms and control methods from within the PLC program. Once the user places the hand

switch (HS-002) into the REMOTE position, they then must navigate through the HMI interface to operate the pump. For further guidance, read the [HMI User Manual](#).

At first, the user must open the Pump Control popup and verify no Permissives or Interlock alarms are preventing the pump from operating. Alarms associated with the pump must be acknowledged and corrected in the field before attempting to start. These alarms will be highlighted in the Pump Control popup if active.

Level Restrictions may be placed on the pump operations for various reasons; damage prevention, on/off controls, desired water level operation range. When the water level drops below the Level Restriction Low Setpoint, the pump will automatically turn off and wait until the water level replenishes and exceeds the Level Restriction High Setpoint, at that point turning back on automatically. The user may modify these setpoints within the Pump Control popup.

Once all alarms are cleared and level setpoints verified, the user may press the Enable button to start the pump. The pump will remain enabled as long as no associated alarms are present. If an alarm associated with the pump occurs, the pump will automatically disable, forcing the user to clear all alarms and press the Enable button again to resume operations. When the water level drops below the Level Restriction Low Setpoint, the pump will turn off but remain enabled as long as no associated alarms are active. The pump will turn back on automatically once the water level is above the Level Restriction High Setpoint. At any point during operation, the user may press the Disable button to stop the pump.

The pump can be placed in two different modes from the Level Controller popup: AUTO and MANUAL. When the controller is in Auto Mode, the PLC will vary the speed of the pump automatically to maintain the water level at the user's desired setpoint. If the water level exceeds the setpoint, pump speed will increase to attempt to lower the water level, and it will decrease speed (until it reaches its minimum speed) when the water level is below the setpoint. The water level setpoint can be modified on the Level Controller popup.

While in Manual Mode, the user sets the desired speed of the pump and the PLC ignores the water level and the desired setpoint. The pump will continue to operate in this fashion until the user switches into Auto Mode.

Refer to Interlock-00, Interlock-02 and Interlock-10 for automatic shutdown conditions. These conditions apply only when the hand switch (HS-002) is in the REMOTE position.

2.4 Associated Alarms

Process Tag	Description	Delay
BQ-FIT-002	Groundwater Collection Sump No. 2 Flow Bad Quality Alarm	5 sec
FAHH-002	Groundwater Collection Sump No. 2 Flow Alarm High-High	NA
FAH-002	Groundwater Collection Sump No. 2 Flow Alarm High	NA
FAL-002	Groundwater Collection Sump No. 2 Flow Alarm Low	120 sec
FALL-002	Groundwater Collection Sump No. 2 Flow Alarm Low-Low	120 sec
BQ-LT-002	Groundwater Collection Sump No. 2 Level Bad Quality Alarm	5 sec
LAHH-002A	Groundwater Collection Sump No. 2 Level Alarm High-High (Switch)	5 sec
LAHH-002	Groundwater Collection Sump No. 2 Level Alarm High-High	NA
LAH-002	Groundwater Collection Sump No. 2 Level Alarm High	5 sec
LAL-002	Groundwater Collection Sump No. 2 Level Alarm Low	5 sec
LALL-002	Groundwater Collection Sump No. 2 Level Alarm Low-Low	NA

Process Tag	Description	Delay
LALL-002A	Groundwater Collection Sump No. 2 Level Alarm Low-Low (Switch)	5 sec
HA-002M	Groundwater Collection Sump Pump No. 2 VFD Hand Switch in Manual	5 sec
OA-002A	Groundwater Collection Sump Pump No. 2 VFD General Alarm	5 sec
OA-002F	Groundwater Collection Sump Pump No. 2 VFD General Fault Alarm	5 sec
OA-002M	Groundwater Collection Sump Pump No. 2 VFD Motor Overload Alarm	5 sec
OA-002R	Groundwater Collection Sump Pump No. 2 VFD Running Status Alarm	10 sec

All alarms are displayed on the HMI Terminal within the Alarm Summary.

3. Groundwater Collection Sump Pump No. 3

Loop No:	P&ID No:	Service Description
003	EF-01	Collection Sump No. 3 Level Control

3.1 Summary Description

Four submersible pumps are located at intervals along the French drain installed in collection sumps with manhole access. The pumps are VFD controlled to modulate their output speed to maintain a desired sump water level, which is detected by a pressure transducer within the sump. Backup level switches are installed to monitor for extreme water levels: overflow and dry conditions. Each collection sump has a flow transmitter to measure and monitor flow rates being extracted from its specific location.

The submersible pumps can be operated locally at their VFD enclosures or remotely from the HMI Terminal and the PLC.

3.2 Component Summary

Process Tag	Description	Type
OS-003A	Groundwater Collection Sump Pump No. 3 VFD General Alarm	Digital Input
OS-003F	Groundwater Collection Sump Pump No. 3 VFD General Fault	Digital Input
OS-003M	Groundwater Collection Sump Pump No. 3 VFD Motor Overload	Digital Input
OS-003R	Groundwater Collection Sump Pump No. 3 Running Status	Digital Input
HS-003	Groundwater Collection Sump Pump No. 3 Hand Switch	Digital Input
LSHH-003A	Groundwater Collection Sump No. 3 Level Switch High-High	Digital Input
LSLL-003A	Groundwater Collection Sump No. 3 Level Switch Low-Low	Digital Input
FQI-003	Groundwater Collection Sump No. 3 Flow Totalization Pulse	Digital Input
OC-003 (STP)	Groundwater Collection Sump Pump No. 3 VFD Stop	Digital Output
OC-003 (STR)	Groundwater Collection Sump Pump No. 3 VFD Start	Digital Output
OC-003 (CF)	Groundwater Collection Sump Pump No. 3 VFD Clear Fault	Digital Output
SI-003	Groundwater Collection Sump Pump No. 3 VFD Speed Feedback	Analog Input
FIT-003	Groundwater Collection Sump No. 3 Flow Indication	Analog Input
PIT-003	Groundwater Collection Sump No. 3 Pressure Indication	Analog Input
SC-003	Groundwater Collection Sump Pump No. 3 VFD Speed Command	Analog Output

3.3 Steady State Operation

The user may operate the submersible pump locally at the Variable Frequency Drive (VFD) enclosure if the hand switch (HS-003) is placed in the LOCAL position. While in the LOCAL position, the user is completely in control of the pump without any Interlocks or safeguards from the Programmable Logic Controller (PLC). It is the user's responsibility to operate the pump within the guidelines of the treatment process. Therefore, it is highly recommended to use this method of control for troubleshooting or maintenance activity only and not for daily operation.

To start the pump locally, the user may press the green start button located on the front of the VFD enclosure. To verify pump operations, a running status light will illuminate. To increase the speed of the pump, a potentiometer located on the front of the VFD enclosure can be rotated clockwise, while rotating the potentiometer counter clockwise will decrease speed. The operating speed of the pump is shown on the VFD monitor (0Hz – 30Hz – 60Hz) = (0% - 50% - 100%).

To stop the pump locally, the user may press the red stop button located on the front of the VFD enclosure. After a duration of the time, the pump will ramp down in speed, coming to a full stop that can be verified with the running status light turning off.

Preventing the pump from operating locally or remotely, the hand switch (HS-003) can be placed in the OFF position. While in the OFF position, the local equipment is still energized. The hand switch is not a method of electrically locking out equipment.

Operating the pump from the Human Machine Interface (HMI) Terminal provides additional Interlocks, safeguards, alarms and control methods from within the PLC program. Once the user places the hand switch (HS-003) into the REMOTE position, they then must navigate through the HMI interface to operate the pump. For further guidance, read the [HMI User Manual](#).

At first, the user must open the Pump Control popup and verify no Permissives or Interlock alarms are preventing the pump from operating. Alarms associated with the pump must be acknowledged and corrected in the field before attempting to start. These alarms will be highlighted in the Pump Control popup if active.

Level Restrictions may be placed on the pump operations for various reasons; damage prevention, on/off controls, desired water level operation range. When the water level drops below the Level Restriction Low Setpoint, the pump will automatically turn off and wait until the water level replenishes and exceeds the Level Restriction High Setpoint, at that point turning back on automatically. The user may modify these setpoints within the Pump Control popup.

Once all alarms are cleared and level setpoints verified, the user may press the Enable button to start the pump. The pump will remain enabled as long as no associated alarms are present. If an alarm associated with the pump occurs, the pump will automatically disable, forcing the user to clear all alarms and press the Enable button again to resume operations. When the water level drops below the Level Restriction Low Setpoint, the pump will turn off but remain enabled as long as no associated alarms are active. The pump will turn back on automatically once the water level is above the Level Restriction High Setpoint. At any point during operation, the user may press the Disable button to stop the pump.

The pump can be placed in two different modes from the Level Controller popup: AUTO and MANUAL. When the controller is in Auto Mode, the PLC will vary the speed of the pump automatically to maintain the water level at the user's desired setpoint. If the water level exceeds the setpoint, pump speed will increase to attempt to lower the water level, and it will decrease speed (until it reaches its minimum speed)

when the water level is below the setpoint. The water level setpoint can be modified on the Level Controller popup.

While in Manual Mode, the user sets the desired speed of the pump and the PLC ignores the water level and the desired setpoint. The pump will continue to operate in this fashion until the user switches into Auto Mode.

Refer to Interlock-00, Interlock-03 and Interlock-10 for automatic shutdown conditions. These conditions apply only when the hand switch (HS-003) is in the REMOTE position.

3.4 Associated Alarms

Process Tag	Description	Delay
BQ-FIT-003	Groundwater Collection Sump No. 3 Flow Bad Quality Alarm	5 sec
FAHH-003	Groundwater Collection Sump No. 3 Flow Alarm High-High	NA
FAH-003	Groundwater Collection Sump No. 3 Flow Alarm High	NA
FAL-003	Groundwater Collection Sump No. 3 Flow Alarm Low	120 sec
FALL-003	Groundwater Collection Sump No. 3 Flow Alarm Low-Low	120 sec
BQ-LT-003	Groundwater Collection Sump No. 3 Level Bad Quality Alarm	5 sec
LAHH-003A	Groundwater Collection Sump No. 3 Level Alarm High-High (Switch)	5 sec
LAHH-003	Groundwater Collection Sump No. 3 Level Alarm High-High	NA
LAH-003	Groundwater Collection Sump No. 3 Level Alarm High	5 sec
LAL-003	Groundwater Collection Sump No. 3 Level Alarm Low	5 sec
LALL-003	Groundwater Collection Sump No. 3 Level Alarm Low-Low	NA
LALL-003A	Groundwater Collection Sump No. 3 Level Alarm Low-Low (Switch)	5 sec
HA-003M	Groundwater Collection Sump Pump No. 3 VFD Hand Switch in Manual	5 sec
OA-003A	Groundwater Collection Sump Pump No. 3 VFD General Alarm	5 sec
OA-003F	Groundwater Collection Sump Pump No. 3 VFD General Fault Alarm	5 sec
OA-003M	Groundwater Collection Sump Pump No. 3 VFD Motor Overload Alarm	5 sec
OA-003R	Groundwater Collection Sump Pump No. 3 VFD Running Status Alarm	10 sec

All alarms are displayed on the HMI Terminal within the Alarm Summary.

4. Groundwater Collection Sump Pump No. 4

Loop No:	P&ID No:	Service Description
004	EF-01	Collection Sump No. 4 Level Control

4.1 Summary Description

Four submersible pumps are located at intervals along the French drain installed in collection sumps with manhole access. The pumps are VFD controlled to modulate their output speed to maintain a desired sump water level, which is detected by a pressure transducer within the sump. Backup level switches are

installed to monitor for extreme water levels: overflow and dry conditions. Each collection sump has a flow transmitter to measure and monitor flow rates being extracted from its specific location.

The submersible pumps can be operated locally at their VFD enclosures or remotely from the HMI Terminal and the PLC.

4.2 Component Summary

Process Tag	Description	Type
OS-004A	Groundwater Collection Sump Pump No. 4 VFD General Alarm	Digital Input
OS-004F	Groundwater Collection Sump Pump No. 4 VFD General Fault	Digital Input
OS-004M	Groundwater Collection Sump Pump No. 4 VFD Motor Overload	Digital Input
OS-004R	Groundwater Collection Sump Pump No. 4 Running Status	Digital Input
HS-004	Groundwater Collection Sump Pump No. 4 Hand Switch	Digital Input
LSHH-004A	Groundwater Collection Sump No. 4 Level Switch High-High	Digital Input
LSLL-004A	Groundwater Collection Sump No. 4 Level Switch Low-Low	Digital Input
FQI-004	Groundwater Collection Sump No. 4 Flow Totalization Pulse	Digital Input
OC-004 (STP)	Groundwater Collection Sump Pump No. 4 VFD Stop	Digital Output
OC-004 (STR)	Groundwater Collection Sump Pump No. 4 VFD Start	Digital Output
OC-004 (CF)	Groundwater Collection Sump Pump No. 4 VFD Clear Fault	Digital Output
SI-004	Groundwater Collection Sump Pump No. 4 VFD Speed Feedback	Analog Input
FIT-004	Groundwater Collection Sump No. 4 Flow Indication	Analog Input
PIT-004	Groundwater Collection Sump No. 4 Pressure Indication	Analog Input
SC-004	Groundwater Collection Sump Pump No. 4 VFD Speed Command	Analog Output

4.3 Steady State Operation

The user may operate the submersible pump locally at the Variable Frequency Drive (VFD) enclosure if the hand switch (HS-004) is placed in the LOCAL position. While in the LOCAL position, the user is completely in control of the pump without any Interlocks or safeguards from the Programmable Logic Controller (PLC). It is the user's responsibility to operate the pump within the guidelines of the treatment process. Therefore, it is highly recommended to use this method of control for troubleshooting or maintenance activity only and not for daily operation.

To start the pump locally, the user may press the green start button located on the front of the VFD enclosure. To verify pump operations, a running status light will illuminate. To increase the speed of the pump, a potentiometer located on the front of the VFD enclosure can be rotated clockwise, while rotating the potentiometer counter clockwise will decrease speed. The operating speed of the pump is shown on the VFD monitor (0Hz – 30Hz – 60Hz) = (0% - 50% - 100%).

To stop the pump locally, the user may press the red stop button located on the front of the VFD enclosure. After a duration of the time, the pump will ramp down in speed, coming to a full stop that can be verified with the running status light turning off.

Preventing the pump from operating locally or remotely, the hand switch (HS-004) can be placed in the OFF position. While in the OFF position, the local equipment is still energized. The hand switch is not a method of electrically locking out equipment.

Operating the pump from the Human Machine Interface (HMI) Terminal provides additional Interlocks, safeguards, alarms and control methods from within the PLC program. Once the user places the hand

switch (HS-004) into the REMOTE position, they then must navigate through the HMI interface to operate the pump. For further guidance, read the [HMI User Manual](#).

At first, the user must open the Pump Control popup and verify no Permissives or Interlock alarms are preventing the pump from operating. Alarms associated with the pump must be acknowledged and corrected in the field before attempting to start. These alarms will be highlighted in the Pump Control popup if active.

Level Restrictions may be placed on the pump operations for various reasons; damage prevention, on/off controls, desired water level operation range. When the water level drops below the Level Restriction Low Setpoint, the pump will automatically turn off and wait until the water level replenishes and exceeds the Level Restriction High Setpoint, at that point turning back on automatically. The user may modify these setpoints within the Pump Control popup.

Once all alarms are cleared and level setpoints verified, the user may press the Enable button to start the pump. The pump will remain enabled as long as no associated alarms are present. If an alarm associated with the pump occurs, the pump will automatically disable, forcing the user to clear all alarms and press the Enable button again to resume operations. When the water level drops below the Level Restriction Low Setpoint, the pump will turn off but remain enabled as long as no associated alarms are active. The pump will turn back on automatically once the water level is above the Level Restriction High Setpoint. At any point during operation, the user may press the Disable button to stop the pump.

The pump can be placed in two different modes from the Level Controller popup: AUTO and MANUAL. When the controller is in Auto Mode, the PLC will vary the speed of the pump automatically to maintain the water level at the user's desired setpoint. If the water level exceeds the setpoint, pump speed will increase to attempt to lower the water level, and it will decrease speed (until it reaches its minimum speed) when the water level is below the setpoint. The water level setpoint can be modified on the Level Controller popup.

While in Manual Mode, the user sets the desired speed of the pump and the PLC ignores the water level and the desired setpoint. The pump will continue to operate in this fashion until the user switches into Auto Mode.

Refer to Interlock-00, Interlock-04 and Interlock-10 for automatic shutdown conditions. These conditions apply only when the hand switch (HS-004) is in the REMOTE position.

4.4 Associated Alarms

Process Tag	Description	Delay
BQ-FIT-004	Groundwater Collection Sump No. 4 Flow Bad Quality Alarm	5 sec
FAHH-004	Groundwater Collection Sump No. 4 Flow Alarm High-High	NA
FAH-004	Groundwater Collection Sump No. 4 Flow Alarm High	NA
FAL-004	Groundwater Collection Sump No. 4 Flow Alarm Low	120 sec
FALL-004	Groundwater Collection Sump No. 4 Flow Alarm Low-Low	120 sec
BQ-LT-004	Groundwater Collection Sump No. 4 Level Bad Quality Alarm	5 sec
LAHH-004A	Groundwater Collection Sump No. 4 Level Alarm High-High (Switch)	5 sec
LAHH-004	Groundwater Collection Sump No. 4 Level Alarm High-High	NA
LAH-004	Groundwater Collection Sump No. 4 Level Alarm High	5 sec
LAL-004	Groundwater Collection Sump No. 4 Level Alarm Low	5 sec
LALL-004	Groundwater Collection Sump No. 4 Level Alarm Low-Low	NA

Process Tag	Description	Delay
LALL-004A	Groundwater Collection Sump No. 4 Level Alarm Low-Low (Switch)	5 sec
HA-004M	Groundwater Collection Sump Pump No. 4 VFD Hand Switch in Manual	5 sec
OA-004A	Groundwater Collection Sump Pump No. 4 VFD General Alarm	5 sec
OA-004F	Groundwater Collection Sump Pump No. 4 VFD General Fault Alarm	5 sec
OA-004M	Groundwater Collection Sump Pump No. 4 VFD Motor Overload Alarm	5 sec
OA-004R	Groundwater Collection Sump Pump No. 4 VFD Running Status Alarm	10 sec

All alarms are displayed on the HMI Terminal within the Alarm Summary.

5. Effluent Groundwater Flow

Loop No:	P&ID No:	Service Description
010	EF-01	Effluent Groundwater Flow

5.1 Summary Description

Four submersible pumps are located at intervals along the French drain installed in collection sumps with manhole access. A summation of these effluent flows rates are measured and monitored to total the amount being extracted from the facility as a whole.

5.2 Component Summary

Process Tag	Description	Type
FQI-010	Effluent Groundwater Flow Totalization Pulse	Digital Input
FIT-010	Effluent Groundwater Flow Indication	Analog Input

5.3 Steady State Operation

No operation is involved with the Effluent Groundwater Flow. Monitoring of the flow rates and totalization in comparison to the individual wells, to insure instrumentation is functioning properly.

5.4 Associated Alarms

Process Tag	Description	Delay
BQ-FIT-010	Effluent Groundwater Flow Bad Quality Alarm	5 sec
FAHH-010	Effluent Groundwater Flow Alarm High-High	NA
FAH-010	Effluent Groundwater Flow Alarm High	NA
FAL-010	Effluent Groundwater Flow Alarm Low	240 sec
FALL-010	Effluent Groundwater Flow Alarm Low-Low	240 sec

All alarms are displayed on the HMI Terminal within the Alarm Summary.

Attachment B Interlock Summary

Attachment B Willow Run Interlock Summary

Interlock

00

01

02

03

04

10

Service Description

Automation Hardware Major Fault

Groundwater Collection Sump Pump No. 1

Groundwater Collection Sump Pump No. 2

Groundwater Collection Sump Pump No. 3

Groundwater Collection Sump Pump No. 4

Overall Treatment Facility Process

Automation Hardware Major Fault

Reference: P&ID Drawing EF-01

Purpose: To stop operations of the entire treatment facility

The following control actions will take place:

- Interlock-00 will alarm
- Groundwater Collection Sump Pump No. 1 will stop and become disabled
- Groundwater Collection Sump Pump No. 2 will stop and become disabled
- Groundwater Collection Sump Pump No. 3 will stop and become disabled
- Groundwater Collection Sump Pump No. 4 will stop and become disabled

When any of the conditions listed below occur:

- CompactLogix Programmable Logic Controller Major Fault Alarm [UA-01C]
- Ethernet Switch-03 Module Health Alarm [ETHSW-003], [UA-01D]

After ALL conditions above return to normal, then:

- Interlock-00 will clear
- Groundwater Collection Sump Pump No. 1 will remain off, waiting for user to enable
- Groundwater Collection Sump Pump No. 2 will remain off, waiting for user to enable
- Groundwater Collection Sump Pump No. 3 will remain off, waiting for user to enable
- Groundwater Collection Sump Pump No. 4 will remain off, waiting for user to enable

Groundwater Collection Sump Pump No. 1

Reference: P&ID Drawing EF-01

Purpose: To stop operations of Groundwater Collection Sump Pump No. 1

The following control actions will take place:

- Interlock-01 will alarm
- Groundwater Collection Sump Pump No. 1 will stop and become disabled

When any of the conditions listed below occur:

- Groundwater Collection Sump No. 1 Flow Alarm Low-Low [FALL-001]
- Groundwater Collection Sump No. 1 Level Alarm Low-Low [LALL-001]
- Groundwater Collection Sump No. 1 Level Alarm Low-Low Switch [LALL-001A]
- Groundwater Collection Sump No. 1 Flow Bad Quality Alarm [BQ-FIT-001]
- Groundwater Collection Sump No. 1 Level Bad Quality Alarm [BQ-LT-001]
- Groundwater Collection Sump Pump No. 1 VFD General Alarm [OA-001A]
- Groundwater Collection Sump Pump No. 1 VFD General Fault Alarm [OA-001F]
- Groundwater Collection Sump Pump No. 1 VFD Motor Overload Alarm [OA-001M]
- Groundwater Collection Sump Pump No. 1 VFD Running Status Alarm [OA-001R]
- Groundwater Collection Sump Pump No. 1 VFD Module Health Alarm [VFD-001], [UA-01D]
- Ethernet Switch-01 Module Health Alarm [ETHSW-001], [UA-01D]

After ALL conditions above return to normal, then:

- Interlock-01 will clear
- Groundwater Collection Sump Pump No. 1 will remain off, waiting for user to enable

Groundwater Collection Sump Pump No. 2

Reference: P&ID Drawing EF-01

Purpose: To stop operations of Groundwater Collection Sump Pump No. 2

The following control actions will take place:

- Interlock-02 will alarm
- Groundwater Collection Sump Pump No. 2 will stop and become disabled

When any of the conditions listed below occur:

- Groundwater Collection Sump No. 2 Flow Alarm Low-Low [FALL-002]
- Groundwater Collection Sump No. 2 Level Alarm Low-Low [LALL-002]
- Groundwater Collection Sump No. 2 Level Alarm Low-Low Switch [LALL-002A]
- Groundwater Collection Sump No. 2 Flow Bad Quality Alarm [BQ-FIT-002]
- Groundwater Collection Sump No. 2 Level Bad Quality Alarm [BQ-LT-002]
- Groundwater Collection Sump Pump No. 2 VFD General Alarm [OA-002A]
- Groundwater Collection Sump Pump No. 2 VFD General Fault Alarm [OA-002F]
- Groundwater Collection Sump Pump No. 2 VFD Motor Overload Alarm [OA-002M]
- Groundwater Collection Sump Pump No. 2 VFD Running Status Alarm [OA-002R]
- Groundwater Collection Sump Pump No. 2 VFD Module Health Alarm [VFD-002], [UA-01D]
- Ethernet Switch-01 Module Health Alarm [ETHSW-001], [UA-01D]

After ALL conditions above return to normal, then:

- Interlock-02 will clear
- Groundwater Collection Sump Pump No. 2 will remain off, waiting for user to enable

Groundwater Collection Sump Pump No. 3

Reference: P&ID Drawing EF-01

Purpose: To stop operations of Groundwater Collection Sump Pump No. 3

The following control actions will take place:

- Interlock-03 will alarm
- Groundwater Collection Sump Pump No. 3 will stop and become disabled

When any of the conditions listed below occur:

- Groundwater Collection Sump No. 3 Flow Alarm Low-Low [FALL-003]
- Groundwater Collection Sump No. 3 Level Alarm Low-Low [LALL-003]
- Groundwater Collection Sump No. 3 Level Alarm Low-Low Switch [LALL-003A]
- Groundwater Collection Sump No. 3 Flow Bad Quality Alarm [BQ-FIT-003]
- Groundwater Collection Sump No. 3 Level Bad Quality Alarm [BQ-LT-003]
- Groundwater Collection Sump Pump No. 3 VFD General Alarm [OA-003A]
- Groundwater Collection Sump Pump No. 3 VFD General Fault Alarm [OA-003F]
- Groundwater Collection Sump Pump No. 3 VFD Motor Overload Alarm [OA-003M]
- Groundwater Collection Sump Pump No. 3 VFD Running Status Alarm [OA-003R]
- Groundwater Collection Sump Pump No. 3 VFD Module Health Alarm [VFD-003], [UA-01D]
- Ethernet Switch-01 Module Health Alarm [ETHSW-002], [UA-01D]

After ALL conditions above return to normal, then:

- Interlock-03 will clear
- Groundwater Collection Sump Pump No. 3 will remain off, waiting for user to enable

Groundwater Collection Sump Pump No. 4

Reference: P&ID Drawing EF-01

Purpose: To stop operations of Groundwater Collection Sump Pump No. 4

The following control actions will take place:

- Interlock-04 will alarm
- Groundwater Collection Sump Pump No. 4 will stop and become disabled

When any of the conditions listed below occur:

- Groundwater Collection Sump No. 4 Flow Alarm Low-Low [FALL-004]
- Groundwater Collection Sump No. 4 Level Alarm Low-Low [LALL-004]
- Groundwater Collection Sump No. 4 Level Alarm Low-Low Switch [LALL-004A]
- Groundwater Collection Sump No. 4 Flow Bad Quality Alarm [BQ-FIT-004]
- Groundwater Collection Sump No. 4 Level Bad Quality Alarm [BQ-LT-004]
- Groundwater Collection Sump Pump No. 4 VFD General Alarm [OA-004A]
- Groundwater Collection Sump Pump No. 4 VFD General Fault Alarm [OA-004F]
- Groundwater Collection Sump Pump No. 4 VFD Motor Overload Alarm [OA-004M]
- Groundwater Collection Sump Pump No. 4 VFD Running Status Alarm [OA-004R]
- Groundwater Collection Sump Pump No. 4 VFD Module Health Alarm [VFD-004], [UA-01D]
- Ethernet Switch-01 Module Health Alarm [ETHSW-002], [UA-01D]

After ALL conditions above return to normal, then:

- Interlock-04 will clear
- Groundwater Collection Sump Pump No. 4 will remain off, waiting for user to enable

Overall Treatment Facility Process

Reference: P&ID Drawing EF-01

Purpose: To stop operations of the overall treatment facility process

The following control actions will take place:

- Interlock-101 will alarm
- Groundwater Collection Sump Pump No. 1 will stop and become disabled
- Groundwater Collection Sump Pump No. 2 will stop and become disabled
- Groundwater Collection Sump Pump No. 3 will stop and become disabled
- Groundwater Collection Sump Pump No. 4 will stop and become disabled

When any of the conditions listed below occur:

- Effluent Groundwater Flow Alarm Low-Low [FALL-010]
- Effluent Groundwater Flow Alarm High-High [FAHH-010]
- Effluent Groundwater Flow Bad Quality Alarm [BQ-FIT-010]

After ALL conditions above return to normal, then:

- Interlock-10 will clear
- Groundwater Collection Sump Pump No. 1 will remain off, waiting for user to enable
- Groundwater Collection Sump Pump No. 2 will remain off, waiting for user to enable
- Groundwater Collection Sump Pump No. 3 will remain off, waiting for user to enable
- Groundwater Collection Sump Pump No. 4 will remain off, waiting for user to enable

Appendix E

System Inspection Sheets

017358A Former Willow Run Powertrain: Quarterly System Checks

Date:

Completed By:

Weather Conditions:

ITEM				CHECKED	ADDITIONAL OBSERVATIONS				MAINTENANCE / REPAIR NEEDED	
Flow Meter Calibration/Field Check										
1. Turn off all pumps 2. Restart pumps individually (50% power) , record flow rate for each pump vs totalizer reading in table below 3. Restart all pumps in auto 4. Notes: _____				☐ ☐ ☐						
Flow Meter 1 Test		Flow Meter 2 Test		Flow Meter 3 Test		Flow Meter 4 Test		Flow Totalizer Check		
Pump 1 Flow Meter Reading (GPM)	Flow Totalizer Reading (GPM)	Pump 2 Flow Meter Reading (GPM)	Flow Totalizer Reading (GPM)	Pump 3 Flow Meter Reading (GPM)	Flow Totalizer Reading (GPM)	Pump 4 Flow Meter Reading (GPM)	Flow Totalizer Reading (GPM)	Sum of all four pumps (GPM)	Flow Totalizer Reading (GPM)	
Pump Test										
1.) Set all pumps to manual 2.) Set pump setting/ power to 30Hz/50%, record pump amperage output. Amperage output can be found on the top of the small green VFD screen 3. Restart all pumps in auto 4. Notes: _____				☐ ☐ ☐						
Pump1 Test		Pump 2 Test		Pump 3 Test		Pump 4 Test				
Hertz/ % Setting	Amperage Output	Hertz/ % Setting	Amperage Output	Hertz/ % Setting	Amperage Output	Hertz/ % Setting	Amperage Output			
Additional Notes										
Has the quarterly PFAS sample been collected				YES/NO _____						
MH-102 Stilling basin cleaned/or replaced				YES/NO _____						
Completed forms to be submitted to project filing (email)				YES/NO _____						
Complete semi annual check of level transducer: pull meter, dip in bucket/known depth and check reading on HMI to confirm it matches										

017358A Former Willow Run Powertrain: Quarterly Visual Inspection

Date:

Completed By:

Weather Conditions:

ITEM					NOTES
VFD Panel Inspection					
	VFD Panel 1	VFD Panel 2	VFD Panel 3	VFD Panel 4	
1. Exterior/surrounding item Visual inspection (All pump controls are easily accessible, electrical stickers are on)					
2. Interior Visual Inspection (VFD in good condition, no loose wires)					
3. Picture taken					
Visual Sump Inspection					
	Sump 1	Sump 2	Sump 3	Sump 4	
1. Exterior/surrounding item Visual inspection (Manhole lids are in good condition etc)					
2. Interior/Visual inspection (All pumps are easily accessible)					
3. Picture taken					
Visual Clean out Inspection					
	Clean out 1	Clean out 2	Clean out 3	Clean out 4	
1. Exterior/surrounding item Visual inspection (Manhole lids are in good condition etc)					
2. Interior/Visual inspection					
3. Picture taken					
Visual Vault Inspection					
	Vault 1	Vault 2			
1. Exterior/surrounding item visual inspection (water isn't pooling around vault, etc.)					
2. Interior visual inspection (no flooding, flow meters in good condition)					
3. Picture taken					
French Drain Visual Inspection					
Any site activities that would affect the French drain? (Excavating etc.)					

Date: _____
Completed By: _____

Weather Conditions:

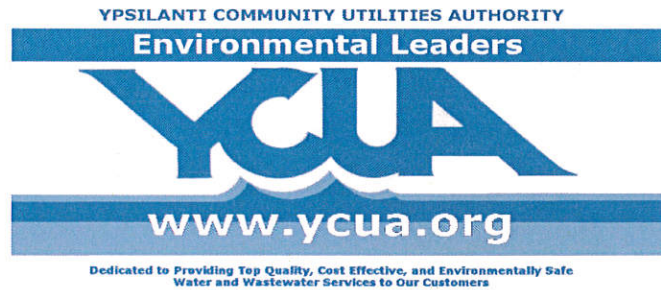
ITEM	CHECKED	ADDITIONAL OBSERVATIONS	MAINTENANCE / REPAIR NEEDED
Pump Cleaning Procedure (Pumps 1-4) 1. Turn off all pumps 2. Remove sump MH/lid 3. Clear any debris/wires out of the way to allow pump to be removed/lifted out of the sump chamber 4. Position drill rig near the sump, hook and secure winch to the top of the pump (T-handle) 5. Lift pump out of the bracket/pitless 6. Continue to lift the pump out of the sump chamber until the screen/intake is accesible 7. Clean the screen/pump intake with a hard bristle brush to clear away all visible debris (use powerwasher if necessary) 8. Lower the pump back into the sump chamber 9. Return the pump to the bracket/pitless, tap top of pump to secure/seal the pump back into the seated position 10. Turn the pump back on to confirm that the pump is seatd correctly in the bracket/pitless (no leaking water) 11. Place sump MH/lid over sump chamber			

Pump 1 Description	<u>Before Cleaning:</u>
	<u>After Cleaning:</u>
Pump 2 Description	<u>Before Cleaning:</u>
	<u>After Cleaning:</u>
Pump 3 Description	<u>Before Cleaning:</u>
	<u>After Cleaning:</u>
Pump 4 Description	<u>Before Cleaning:</u>
	<u>After Cleaning:</u>

Include pictures from each pump, before and afer cleaning

Appendix F

YCUA Discharge Permit



INDUSTRIAL USER PERMIT #RT 12-22
*Revitalizing Auto Communities Environmental
Response Trust – Willow Run Plant*

200 Liberator Way
(Formerly 2930 Ecorse Road)
Ypsilanti, MI 48198

is hereby authorized to discharge industrial wastewater from the above-identified facility and through the outfall identified herein into the Ypsilanti Community Utilities Authority's sewer system in accordance with the conditions set forth in this permit. Compliance with this permit does not relieve the permittee of its obligation to comply with any or all applicable pretreatment regulations, standards or requirements under local, State, and Federal laws, including any such regulations, standards, requirements, or laws that may become effective during the term of this permit.

Non-compliance with any term or condition of this permit shall constitute a violation of the Ypsilanti Township Sewer Use Ordinance.

Effective Date: **January 1, 2020**
Revision Date(s): December 5, 2019
Expiration Date: **December 31, 2022**

If the permittee wishes to continue to discharge after the expiration date of this permit, an application must be filed for a renewal permit in accordance with the requirements of the sewer use ordinance, a minimum of ninety (90) days prior to the expiration date.

Issued this 11th day of, December 2019

By: Jeff Castro
Jeff Castro, YCUA Director

Part I – Discharge Requirements

- A. During the effective period of the permit, the permittee is authorized to discharge process wastewater to the Ypsilanti Community Utilities Authority's sewer system from the following outfall(s):

Description of Outfall: New common header pipe collecting wastewater from sumps on the french drain and discharging Sanitary Manhole 102. The outfall is referenced as outfall 003.

- B. For compliance purposes, the permittee shall collect all samples from the following location:

Sample Point: Sanitary Manhole 102 commonly known as outfall 003, located approximately 272 feet west of French drain sump 4 and 31 feet south of former plant building foundation.

- C. During the effective period of the permit, the discharge from outfall(s) described in Part 1(A) shall not exceed the effluent limitations identified in Part III and/or Part X.
- D. During the effective period of the permit, unless specified otherwise, the effluent from all other outfalls shall be of domestic or non-process wastewater only.
- E. All discharge shall comply with all other applicable laws, regulations, standards, and requirements contained in the sewer use ordinance and any applicable state and federal pretreatment laws, regulations, standards, and requirements including any such laws, regulations, standards, or requirements that may become effective during the term of this permit.

Part II – Monitoring Requirements

- A. During the effective period of the permit, the permittee shall monitor the outfall(s) described in Part 1(A) for the parameters and frequencies set forth in Part III of the permit.
- B. All handling and preservation of collected samples and laboratory analyses of samples shall be performed in accordance with 40 CFR Part 136 and amendments thereto unless specified otherwise in the monitoring conditions of this permit.
- C. In addition to the self-monitoring requirements specified in Part III of the permit, the YCUA will perform sampling and analysis of the permittee's wastestream a **minimum of four (4) times per year**.
- D. During the effective period of the permit, the permittee shall comply with the following Best Management Practices: **Not Applicable**.
- E. Monitoring frequencies identified in Part III are based upon a calendar year. Quarterly monitoring periods are defined as follows: January through March, April through June, July through September, and October through December. Semi-Annual monitoring periods are defined as follows: January through June and July through December.
- F. If the collection of flow proportional composite samples are required, the permittee shall install, calibrate, and maintain an effluent flow meter at the specified outfall.

Part III – Discharge Limitations/ Self-Monitoring Requirements

Facility/ Discharge Location: **Revitalizing Auto Communities Environmental Response Trust – Willow Run Plant**
200 Liberator Way
 (Formerly 2930 Ecorse Road)
Ypsilanti, MI 48198

Permit Type: **Non-Categorical Significant Industrial User**

Sample Point: **Sanitary Manhole 102 commonly known as outfall 003, located approximately 272 feet west of French drain sump 4 and 31 feet south of former plant building foundation.**

Reporting Schedule: **Quarterly**

The permittee is required to monitor the industrial wastewater discharge from the identified outfall(s) in Part 1(a) of this permit to the YCUA sanitary sewer in accordance with methods set forth in 40 CFR Part 136 for the following parameters at the stated frequency. The permittee shall **not** discharge wastewater such that the concentration of pollutants exceed the following limits for each pollutant. The permittee shall collect **24-Hour Time Proportioned Composite Samples** for all parameters specified in Part III, except for the following which shall be obtained as a grab sample: **pH; Fats, Oil, and Grease; Total Phenolic Compounds; Volatile Organic Compounds (EPA Method 624).**

Parameter	Surcharge Threshold	Daily Limit	Monitoring Frequency
Flow (Daily Average)		Report	2 X Monthly
Fats, Oils, and Grease (FOG)		100 mg/l	2 X Monthly
Chemical Oxygen Demand (COD)	600 mg/l	2000 mg/l	2 X Monthly
Polychlorinated Biphenyls (PCBs)		<0.0002 mg/l ⁽¹⁾	2 X Monthly
Semi-Volatile Organic Compounds ⁽²⁾		Report	2 X Monthly
Volatile Organic Compounds ⁽³⁾		Report	2 X Monthly
pH		≥ 5.0 and ≤ 11.0 s.u.	2 X Monthly
Total Phenolic Compounds		1.00 mg/l	2 X Monthly
Total Suspended Solids (TSS)		350 mg/l	2 X Monthly
Mercury (Hg)		<0.0002 mg/l ⁽¹⁾	2 X Monthly

- Any discharge at or above the level of detection shall be a specific violation of the Permit. For PCBs, the sampling and analytical protocol for compliance shall be in accordance with EPA Method 608 employing a detection level of 0.0002 mg/l unless a higher detection level is appropriate due to sample matrix interference. For Mercury, the sampling and analytical protocol for compliance shall be in accordance with EPA Method 245.1 employing a detection level of 0.0002 mg/l unless a higher detection level is appropriate due to sample matrix interference.
- Analysis and reporting shall include the following Semi-Volatile Organic Compounds: o-Cresol; m-Cresol; p-Cresol; Total Cresols; 2,4-Dinitrotoluene; Hexachlorobenzene; Hexachlorobutadiene; Hexachloroethane; Nitrobenzene; Pentachlorophenol; Pyridine; 2,4,5-Trichlorophenol; 2,4,6-Trichlorophenol.
- Analysis and reporting shall include the following Volatile Organic Compounds: Benzene; Carbon Tetrachloride; Chlorobenzene; Chloroform; 1,4-Dichlorobenzene; 1,2-Dichloroethane; 1,1-Dichloroethene; Methyl Ethyl Ketone; Tetrachloroethene; Trichloroethene; Vinyl Chloride.

Part IV – Reporting Requirements

- A. All reports required by this permit shall be submitted to the YCUA at 2777 State Road in Ypsilanti, MI 48198-9112. If an official postmark is available on a report, the YCUA will consider the date of receipt to be the same.
- B. Monitoring Reports: Monitoring results shall be reported as required in Part III. The first report is due on the 20th day of the month following the reporting period. Reporting periods are quarterly or semi-annual as based upon a calendar year.

Quarterly Reporting Schedule:

- ☐ 1st Quarter Report (January – March Monitoring Period): Due on or before April 20th.
- ☐ 2nd Quarter Report (April – June Monitoring Period): Due on or before July 20th.
- ☐ 3rd Quarter Report (July – September Monitoring Period): Due on or before October 20th.
- ☐ 4th Quarter Report (October – December Monitoring Period): Due on or before January 20th.

Semi-Annual Reporting Schedule:

- ☐ 1st Semi-Annual Report (January – June Monitoring Period): Due on or before July 20th.
- ☐ 2nd Semi-Annual Report (July – December Monitoring Period): Due on or before January 20th.

The report shall indicate the nature and concentration of all pollutants in the effluent for which sampling and analyses were performed as required, including flow measurements if required. The report format traditionally used, or a similar format, will continue to be an acceptable report format. Monitoring reports shall include a cover letter with a signed certification statement, laboratory reports, QA/QC data, and chain of custody for all parameters collected and analyzed.

- C. Increased Monitoring: If the permittee monitors any pollutant more frequently than required by this permit, using test procedures prescribed in 40 CFR Part 136 or amendments thereto, or otherwise approved by the EPA or as specified in this permit, the results of such monitoring shall be included in any calculations of actual daily maximum or monthly average pollutant discharge and results shall be reported in the periodic report submitted to the YCUA. Such increased monitoring frequency shall also be indicated in the periodic report.
- D. Split Sampling: At the permittee's request, YCUA will provide split samples from control authority sampling events when an appropriate amount of samples is available. Split samples are not to be used for the permittee's monitoring data and shall be properly identified on monitoring report submittals.
- E. Automatic Resampling: If the results of the permittee's wastewater analysis indicates **that a violation of this permit has occurred, the permittee shall:**
1. Inform the YCUA of the violation within 24 hours of becoming aware of the violation (notification must occur by phone, fax, or email).
 2. Conduct repeat sampling and pollutant analysis within thirty (30) days of becoming aware of the violation.
 3. Submit a written follow up report to the YCUA within thirty (30) days of **becoming aware of the violation**. The report shall include the following elements:
 - 1) Laboratory report with chain of custody for wastewater analysis that indicated the violation.
 - 2) Laboratory report with chain of custody for pollutant re-sampling.

- 3) A description of the violation, the cause thereof, and the violation's impact on the user's compliance status.
- 4) Duration of the violation, including exact dates and times of the violation, and if not corrected, the anticipated time the violation is expected to continue.
- 5) All steps taken or intended to be taken to reduce, eliminate and prevent reoccurrence of such a violation.
- 6) Cover letter (if YCUA report form is not used) with a certification statement.

F. Accidental Discharge Report: the permittee shall notify the YCUA immediately upon the occurrence of an accidental discharge of substances prohibited by sewer use ordinance or any slug loads or spills that may enter the public sewer system or the 'Surface Waters of the State' (includes storm water drains). The YCUA shall be notified by telephone at (734) 484-4600. The notification shall include location of discharge, date and time thereof, type of waste, including concentration and volume, and corrective actions taken. The permittee's notification of accidental releases in accordance with this section does not relieve it of other reporting requirements that arise under local, State, or Federal laws.

Within five days following an accidental discharge, the permittee shall submit to the YCUA a detailed written report that specifies at minimum the following:

1. Description and cause of the upset, slug load or accidental discharge, the cause thereof, and the impact on the permittee's compliance status. The description should also include location of discharge, type, concentration and volume of waste.
2. Duration of noncompliance, including exact dates and time of noncompliance and, if the non-compliance is continuing, the time by which compliance is reasonably expected to occur.
3. All steps taken or to be taken to reduce, eliminate, and/or prevent recurrence of such an upset, slug load, accidental discharge, or other conditions of noncompliance.

G. Slug Discharge Management Plan: all permittees are required to develop and submit a current Slug Discharge Management Plan to the YCUA unless notified otherwise. If your facility does not have a Slug Discharge Management Plan or an integrated plan meeting the minimum requirements of 40 CFR 403.8 (f) (2) (v) A-D, one will be required to be submitted to the YCUA within 90 days of receiving an industrial user permit. If a Slug Discharge Management Plan is not required, the YCUA may mandate implementation of accidental discharge procedures in an alternate plan.

The Slug Discharge Management Plan may be part of an integrated plan provided it contains all the minimum requirements of 40 CFR 403.8(f)(2)(v) A-D. The submitted plan shall include the YCUA and the Michigan Department of Environmental Quality's (MDEQ) Pollution Emergency Alerting System (PEAS) in the notification process.

The Slug Discharge Management Plan can be developed in either of two ways:

1. Develop a Slug Discharge Management Plan Control Plan that contains at minimum all the requirements of 40 CFR 403.8 (f) (2) (v) A-D
2. Develop an integrated plan that includes at minimum all the requirements of a Slug Discharge Management Plan set forth in 40 CFR 403.8 (f) (2) (v) A-D.

H. Notification of a Change in Slug Discharge Potential: The permittee shall notify the YCUA immediately if any changes occur at the facility that affect the Slug Discharge Management Plan or spill/slug potential.

- I. Planned Changes: The permittee shall give notice to the YCUA 90 days prior to any facility expansion, production increase, or process modifications that results in new or substantially increased discharges or a change in the nature of the discharge.
- J. Anticipated Noncompliance: The permittee shall give advance notice to the YCUA of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.
- K. Duty to Provide Information: The permittee shall furnish to the YCUA, within ten (10) days any information which the YCUA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also, upon request, furnish to the YCUA within ten (10) days copies of any records required to be kept by this permit.
- L. Signatory Requirements: All applications, reports, or information submitted to the Ypsilanti Community Utilities Authority must contain the following certification statement and be signed as required in Sections 1, 2, 3, or 4 below:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

- 1. By a responsible corporate officer, if the Industrial User submitting the reports is a corporation. For the purpose of this paragraph, a responsible corporate officer means: a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or; the manager of one or more manufacturing, production, or operation facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25 million (in second quarter 1990 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
- 2. By a general partner or proprietor if the Industrial User submitting the reports is a partnership or sole proprietorship respectively.
- 3. The principal executive officer or director having responsibility for the overall operation of the discharging facility if the Industrial User submitting the reports is a Federal, State, or local governmental entity, or their agents.
- 4. By a duly authorized representative of the individual designated in paragraph 1, 2, or 3 of this section if:
 - a) the authorization is made in writing by the individual described in paragraph 1, 2, or 3;
 - b) the authorization specifies wither an individual or a position having responsibility for the overall operation of the facility from which the Industrial Discharge originates, such as the position of plant manager, operator of a well, or a well field superintendent, or a position of equivalent responsibility, or having overall responsibility for environmental matters for the company; and
 - c) The written authorization is submitted to YCUA.
- 5. If an authorization under paragraph 4 of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, or overall responsibility for the environmental matters for the company, a new authorization satisfying the requirements of paragraph 4 of this section must be submitted to YCUA prior to or together with an reports to be signed by an authorized representative.

- M. Operating Upsets: A permittee that experiences an upset in operations that places the permittee in a temporary state of noncompliance with the provisions of either this permit or with the Sewer Use Ordinance shall inform the YCUA within 24 hours of becoming aware of the upset at (734) 484-4600, including weekends and holidays. A written follow-up report of the upset shall be filed by the permittee with the YCUA within five days. The report shall specify:
1. Description of the upset, the cause(s) thereof and the upset's impact on the permittee's compliance status;
 2. Duration of noncompliance, including exact dates and times of noncompliance, and if not corrected, the anticipated time the non-compliance is expected to continue; and
 3. All steps taken or to be taken to reduce, eliminate and prevent reoccurrence of such an upset.
- The report must also demonstrate that the treatment facility was being operated in a prudent and workmanlike manner. A documented and verified operating upset shall be an affirmative defense to any enforcement action brought against the permittee for violations attributable to the upset event.
- N. Annual Publication: A list of all industrial users, which were subject to Significant Non-Compliance (SNC) according to Title 40 Code of Federal Regulations (CFR) Part 403.8(D)(vii)(B) during the twelve (12) previous months, shall be annually published by the Ypsilanti Community Utilities Authority in the Ann Arbor News, the Ypsilanti Press, The Canton Observer, The Detroit News or the Detroit Free Press. Accordingly, the permittee is appraised that noncompliance with this permit may lead to an enforcement action and may result in publication of its name in an appropriate newspaper in accordance with this section.
- O. Civil and Criminal Liability: Nothing in this permit shall be construed to relieve the permittee from civil and/or criminal penalties for noncompliance under sewer use ordinance or State or Federal laws or regulations.
- P. Penalties for Violations of Permit Conditions: The sewer use ordinance provides that any person who violates a permit condition may be subject to a civil penalty of \$1000 per day of such violation. Any person who willfully or negligently violates permit conditions is subject to criminal penalties of a fine of up to \$500 per day of violation, or by imprisonment for 90 days(s), or both. The permittee may also be subject to sanctions under State and/or Federal law.
- Q. Recovery of Costs Incurred: In addition to civil and criminal liability, the permittee violating any of the provisions of this permit or sewer use ordinance or causing damage to or otherwise inhibiting the Ypsilanti Community Utilities Authority wastewater disposal system shall be liable to the Ypsilanti Community Utilities Authority for any expense, loss, or damage caused by such violation or discharge. The Ypsilanti Community Utilities Authority shall bill the permittee for the costs incurred by the Ypsilanti Community Utilities Authority for any cleaning, repairing, or replacement work caused by the violation or discharge. Refusal to pay the assessed costs shall constitute a separate violation of the sewer use ordinance.

Part V – Special Conditions and/or Requirements

- A. This permit contains no special conditions / requirements.

Part VI – Standard Conditions

- A. Re-Opener Clause: This permit may be reopened and modified to incorporate any new or revised requirements contained in a National categorical pretreatment standard. This permit may also be reopened and modified to incorporate any new or revised requirements resulting from the YCUA as are necessary to ensure compliance with applicable sludge management requirements promulgated by EPA (40 CFR 503).
- B. Severability: The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.
- C. Duty to Comply: The permittee must comply with all conditions of this permit. Failure to comply with the requirements of this permit may be grounds for administrative action, or enforcement proceedings including civil or criminal penalties, injunctive relief, and summary abatements.
- D. Duty to Mitigate: The permittee shall take all reasonable steps to minimize or correct any adverse impact to the public treatment plant or the environment resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.
- E. Permit Modification and Termination: **The filing of a request by the permittee for a permit modification, revocation and re-issuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.** This permit may be modified or terminated for good causes including, but not limited to, the following:
1. To incorporate any new or revised federal, state, or local pretreatment standards or requirements.
 2. Material or substantial alterations or additions to the discharger's operation processes, or discharge volume or character which were not considered in drafting the effective permit.
 3. A change in any condition in either the industrial user or the POTW that requires either a temporary or permanent reduction or elimination of the authorized discharge.
 4. Information indicating that the permitted discharge poses a threat to the control authority's collection and treatment systems, POTW personnel or the receiving waters.
 5. Violation of any terms or conditions of the permit.
 6. Misrepresentation or failure to disclose fully all relevant facts in the permit application or in any required reporting.
 7. Revision of or a grant of variance from such categorical standards pursuant to 40 CFR 403.13.
 8. To correct typographical or other errors in the permit.
 9. To reflect transfer of the facility ownership and/or operation to a new owner/operator.
 10. Upon request of the permittee, provided such request does not create a violation of any applicable requirements, standards, laws, or rules and regulations.
 11. Falsifying self-monitoring reports.
 12. Tampering with monitoring equipment.
 13. Refusing to allow timely access to the facility premises and records.
 14. Failure to meet effluent limitations.
 15. Failure to pay fines.
 16. Failure to pay sewer charges.
 17. Failure to meet compliance schedules

- F. Permit Appeals: The permittee may petition to appeal the terms of this permit within thirty (30) days of the notice. This petition must be in writing; failure to submit a petition for review shall be deemed to be a waiver of the appeal. In its petition, the permittee must indicate the permit provisions objected to, the reasons for this objection, and the alternative condition, if any, it seeks to be placed in the permit. The effectiveness of this permit shall not be stayed pending reconsideration by the Board. If, after considering the petition and any arguments put forth by the Director, the Board determines that reconsideration is proper, it shall remand the permit back to the Director for re-issuance. Those permit provisions being reconsidered by the Director shall be stayed pending re-issuance. A Board of Director's decision not to reconsider a final permit shall be considered final administrative action for purposes of judicial review.
- G. Property Rights: The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any violation of Federal, State, or local laws or regulations.
- H. Limitation on Permit Transfer: Permits may be reassigned or transferred to a new owner and/or operator with prior approval of the Director. The permittee must give at least thirty (30) days advance written notice to the Director that requests transfer of the permit to a new owner. **An additional written notice shall also be filed at least 30 days prior to the transfer by the new owner which contains at minimum the following elements:**
1. Cover letter that states that the new owner has no immediate intent to change the facility's operations and/or processes identifies the specific date on which the transfer is to occur, and acknowledgement of full responsibility for complying with the existing permit.
 2. Submittal of a new permit application with all informational sections completed where changes from the previous owner will occur. Informational sections that will remain the same, shall include a statement that the new owner has no immediate intent to change the facility's operations and/or processes that are applicable to the section.
- I. Duty to Reapply: If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must submit an application for a new permit at least ninety (90) days before the expiration date of this permit.
- J. Continuation of Expired Permits: An expired permit will continue to be effective and enforceable until the permit is reissued if:
1. The permittee has submitted a complete permit application at least ninety (90) days prior to the expiration date of the users existing permit.
 2. The failure to reissue the permit, prior to expiration of the previous permit, is not due to any act or failure to act on the part of the permittee.
- K. Dilution: The permittee shall not increase the use of potable or process water or, in any way, attempt to dilute an effluent as a partial or complete substitute for adequate treatment to achieve compliance with the limitations contained in this permit.

Part VII – Definitions

4-Day Average: Calculate and report 4-day averages quarterly for Cyanide, Cadmium, Chromium, Zinc, Copper, Lead, Nickel, and Total Metals per Appendix C of EPA's Pretreatment Compliance Monitoring and Enforcement Guidance (July 25, 1986).

Best Management Practices (BMP): The programs, practices, procedures or other directed efforts, initiated and implemented by Users, which can or do lead to the reduction, conservation or minimization of pollutants being introduced into the ecosystem, including but not limited to the Ypsilanti Community Utilities Authority (YCUA) publicly owned treatment system. BMPs include, but are not limited to, equipment or technology modifications, process or procedure modifications, reformulation or design of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control, and may include technical and economic considerations. BMP's may be structural or non-structural or both. In determining what BMPs will be required of an User in a particular case, the Director may consider all relevant technological, economical, practical, and institutional considerations as determined relevant and appropriate by the Director, consistent with achieving and maintaining compliance with the requirements of this Ordinance and other applicable laws and regulations.

Best Management Practices Plan (BMPP): A written document that describes how the BMPs will be accomplished.

Bypass: The intentional diversion of wastes from any portion of a treatment facility.

Daily Maximum: The maximum allowable discharge of pollutant during a calendar day. Where daily maximum limitations are expressed in units of mass, the daily discharge is the total mass discharged over the course of a concentration, the daily discharge is the arithmetic average measurement of the pollutant concentration derived from all measurements taken that day.

Chain of Custody: A legal record of each person who had possession of an environmental sample from the person who collected the sample to the person who analyzed the sample in the laboratory and to the person who witnessed the disposal of the sample.

Code of Federal Regulations (CFR): a publication of the United States government, which contains all of the finalized federal regulations. Federal environmental regulations are found in volume 40 of the CFR and General Pretreatment Regulations are found in 40 CFR Part 403.

Composite Sample: A sample that is collected over time, formed either by continuous sampling or by mixing discrete samples. The YCUA requires that composite samples be composed of discrete sample aliquots collected over a 24-hour period unless sample collection represents the entire calendar day's discharge. The YCUA will require one of the following for the collection of composite samples: **Time composite sample:** composed of discrete sample aliquots collected in one container at constant time intervals providing representative samples irrespective of stream flow. **Flow proportional composite sample:** collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increases while maintaining a constant time interval between the aliquots.

Cooling Water: Uncontaminated - Water used for cooling purposed only which has no direct contact with any raw material, intermediate, or final product and which does not contain a level of contaminants detectably higher than that of the intake water. Contaminated - Water used for cooling purposes only which may become contaminated either through the use of water treatment chemicals used for corrosion inhibitors or biocides, or by direct contact with process materials and/or wastewater.

Effluent: Wastewater or other liquid-raw, untreated, partially or completely treated-flowing from an industrial user to a reservoir, basin, treatment process or treatment plant.

Environmental Protection Agency (EPA): The U.S. Environmental Protection Agency, Administrator, or other duly authorized official.

Grab Sample: An individual sample collected in less than 15 minutes without regard for flow or time.

Instantaneous Maximum Concentration: The maximum concentration allowed in any single grab sample.

Michigan Department of Environmental Quality (MDEQ): The State of Michigan Department responsible for enforcement of federal and state laws and regulations to control pollution and the Approval Authority for YCUA and other POTW's in Michigan.

Monthly Average: The arithmetic mean of the values for effluent samples collected during a calendar month or specified thirty (30) day period (as opposed to a rolling 30-day window).

Polychlorinated Biphenyls (PCBs) Monitoring/Limitation: Any discharge at or above the level of detection shall be a specific violation of the Permit. The sampling and analytical protocol for compliance shall be in accordance with EPA Method 608 employing a detection level of 0.0002 mg/l unless a higher detection level is appropriate due to sample matrix interference.

Mercury Monitoring/ Limitation: Any discharge at or above the level of detection shall be a specific violation of the Permit. The sampling and analytical protocol for compliance shall be in accordance with EPA Method 245.1 employing a detection level of 0.0002 mg/l unless a higher detection level is appropriate due to sample matrix interference.

Process Wastewater: Any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

Resource Conservation & Recovery Act (RCRA): A federal statute enacted to define a federal role in solid waste and resource management and recovery. (PL 94-580).

Sampling Event: A sampling event is an event where YCUA IPP personnel install equipment to obtain a daily composite sample at a designated SIU discharge point for the purpose of evaluating compliance with permit or other limitations. For hauled waste, a sampling event is defined as a composite sample generated by combining a grab sample from each of the SIU's truckloads disposed at YCUA in one full day.

Sanitary Sewer: A sewer, which carries sewage and to which storm, surface and ground waters are not intentionally admitted.

Sewage Works: The municipal facilities for collecting, pumping, treating and disposing of sewage. Sewer means a pipe or conduit for carrying sewage.

Sewer Use Ordinance: A sewer use ordinance is a local ordinance adopted and enacted by a local governmental entity that establishes the terms, conditions, provisions and requirements for the discharge of pollutants into a publicly owned treatment works, as provided for in federal and state regulations. As used in this program document, the term encompasses each local ordinance serving that purpose within YCUA's service area whether or not the ordinance specifically named and identified as a "sewer use ordinance."

Significant Industrial User (SIU): means either of the following: (1) A nondomestic User subject to categorical pretreatment standards under 40 CFR S403 (1992) and 40 CFR Chapter I, subchapter N (1990); or (2) A nondomestic User that, in the opinion of YCUA or of the township, has a reasonable potential to adversely affect the POTW's operation, or for violating any pretreatment standard or requirement or that contributes a process waste stream which makes up five percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant, or that discharge an average of 25,000 gallons per day or more of process wastewater to the POTW, excluding sanitary, noncontact cooling, and boiler blow down wastewater. Any User designated as significant may petition the township to be deleted from the list of Significant Industrial Users on the grounds that it has no potential for adversely affecting the POTW's operation or violating any pretreatment standard or requirement. The Director may determine that a User that meets the criteria of Subsections (1) and (2) of this definition above is not currently a Significant Industrial User, if the Director finds that the User has no reasonable potential to adversely affect the operation of the POTW, to violate any pretreatment standard or requirement, or that a Industrial User Permit is not required to meet the purposes and objectives of this Ordinance. A determination that a User is not a Significant Industrial User (or that a permit is therefore not required) shall not be binding and may be reversed by the Director at any time based on changed circumstances, new information, or as otherwise determined necessary by the Director to meet the purposes and objectives of this Ordinance.

Significant Noncompliance (SNC): means any of the following: (1) chronic violations of wastewater discharge limits, defined as results of analyses in which 66% or more of all of the measurements taken for the same pollutant parameter during a 6-month period exceed, by any magnitude, a numeric Pretreatment Standard or Requirement, including instantaneous limits, as defined by 40 CFR 403.3(l); (2) technical review criteria (TRC) violations, defined as results of analyses in which 33% or more of all of the measurements taken for the same pollutant parameter taken during a 6-month period equal or exceed the product of the Pretreatment Standard or Requirement including instantaneous limits, as defined by 40 CFR 403.3(l) multiplied by the applicable technical review criteria. (Technical review criteria equals 1.4 for compatible pollutants and 1.2 for all other pollutants, except pH.); (3) any other violation of a Pretreatment Standard or Requirement as defined by 40 CFR 403.3(l), (daily maximum, longer-term average, instantaneous limits, or Narrative Standard) that the YCUA determines has caused, alone or in combination with other discharges, interference or pass-through, including endangering the health of township or YCUA personnel or the general public; (4) any discharge of a pollutant that has caused imminent endangerment to human health, welfare, or the environment or has resulted in the YCUA's exercise of its emergency authority under Rule 323.2306(a) (vi) of the Part 23 Rules under the State Act or its emergency authority under this Ordinance to halt or prevent the discharge; (5) failure to meet, within 90 days after a scheduled date, a compliance schedule milestone contained in a YCUA or other local control mechanism or enforcement order for starting construction, completing construction, or attaining final compliance; (6) failure to provide, within 30 days after the due date, a required report such as, but not limited to, a baseline monitoring report, 90 day or other compliance report, periodic self-monitoring report, or report on compliance with a compliance schedule; (7) failure to timely or accurately report noncompliance; or (8) any other violation or group of violations, which may include a violation of Best Management Practices, that YCUA determines will affect or has adversely affected the operation or implementation of the YCUA pretreatment program or operation of the POTW.

Slug, Slug Loading, Slug Discharge: means either: 1) Any discharge of pollutants at a volume or concentration that causes upset of or interference with the POTW or causes the pass-through of pollutants to receiving waters. 2) Any discharge of a pollutant(s), measured by a grab sample, at a concentration exceeding five (5) times the composite or grab sample discharge limit. 3) Any discharge of wastewater outside the pH range of 5 – 11 S.U. for either a continuous duration of greater than or equal to fifteen minutes or for a sum total of thirty minutes within one day. 4) Any discharge of a non-routine, episodic nature, including but not limited to, an accidental spill or non-customary batch discharge.

State: State of Michigan.

State Act: Public Act 451 of 1994, the Natural Resources and Environmental Protection Act (NREPA), as amended, and any administrative rules promulgated there under, as amended or revised from time to time.

Total Toxic Organics (TTO): The sum of all quantifiable values greater than 0.01 mg/l for the listed toxic organics in 40 CFR 413.02 (i)

Total Metals: Defined as the sum of the concentration of Copper, Chromium, Nickel, and Zinc. Sampling for Total Metals shall occur on the same monitoring day.

United States Environmental Protection Agency (USEPA or EPA): The principal environmental regulatory agency established by Congress to administer the nation's environmental laws.

Upset: An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee excluding such factors as operational error, improperly designed or inadequate treatment facilities, or improper operation and maintenance or lack thereof.

Part VIII – General Prohibitive Discharge Standards

The permittee shall comply with all the general prohibitive discharge standards in the sewer use ordinance. Namely, the industrial user shall not discharge to the sewer system:

- A. Any liquids, solids or gases which by reason of their nature or quantity are, or may be, sufficient either alone or by interaction with other substances to cause fire or explosion or be injurious in any other way to the sewage works or to the operation of the sewage works.
- B. Solids or viscous substances that may cause obstruction to the flow in a sewer or other interference with the operation of the wastewater treatment facilities.
- C. Any wastewater having a pH less than 5.0 or greater than 11.0; or wastewater having any other corrosive property capable of causing damage or hazard to structure, equipment, or personnel of the sewage works.
- D. Any wastewater containing toxic pollutants or of high chlorine demand in sufficient quantity, either singly or by interaction with other pollutants, to injure or interfere with any wastewater treatment process, constitute a hazard to humans or animals, create a toxic effect in the receiving waters of the sewage works, or exceed the limitation set forth in the EPA Categorical Pretreatment Standard, or any other Federal, State or County standards.
- E. Pollutants that result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause worker health and safety problems. This prohibition includes, but is not limited to, wastewaters, which contain liquids, solids, or gases that cause gases, vapors, or fumes from the discharge to exceed 10% of the immediately dangerous to life and health (IDLH) concentration. Discharges which contain more than one pollutant which may contribute to fume toxicity shall be subject to more restrictive limitations, as determined necessary by the Director. The more restrictive discharge limits shall be calculated based on the additive fume toxicity of all compounds identified or reasonably expected to be present in the discharge.
- F. Any noxious or malodorous liquids, gases, or solids which either singly or by interaction with other wastes are sufficient to create a public nuisance or hazard to life or are sufficient to prevent entry into the sewers for maintenance and repair.
- G. Any substance such as residues, sludge's, or scum that may cause the sewage works to be unsuitable for land application or reclamation and reuse or to interfere with the reclamation process.
- H. Any substance which will cause the sewage works to violate its NPDES Permit or the receiving water quality standards.

- I. Any wastewater with color or sufficient light absorbance to interfere with treatment plant process, prevent analytical determinations, or create any aesthetic effect on the treatment plant effluent, such as, but not limited to, dye wastes and vegetable tanning solutions.
- J. Daily maximum concentration or mass loading shall not be exceeded on any single calendar day. Where daily maximum limitations are expressed in terms of a concentration, the daily discharge is the arithmetical measurement of the pollutant concentration derived from all measurements taken that day. Where daily maximum limitations are expressed in units of mass, the daily discharge is the total mass discharged during the day. If a composite sample is required for a parameter, the determination whether the daily maximum limitation for that parameter has been exceeded on a single calendar day shall be based on the composite sample collected for that parameter on that calendar day. If grab samples are required for a parameter, the determination whether the daily maximum limitation for that parameter has been exceeded on a calendar day shall be based on the average of all grab samples collected for that parameter on that calendar day. If only one grab sample is collected for a parameter on a given day, the determination whether the daily maximum limitation for that parameter has been exceeded for the day shall be based on the results of that single grab sample. If the pollutant concentration in any sample is less than the applicable detection limit, that value shall be regarded as zero (0) when calculating the daily maximum concentration.
- K. Any wastewater having a temperature which will inhibit biological activity in the sewage works resulting in Interference, but in no case wastewater with a temperature at the introduction into the sewage works which exceeds 60 degrees Celsius (140F) or is lower than 0 degree Celsius (32F).
- L. Any wastewater containing any radioactive wastes or isotopes of such half-life or concentration as may exceed limits established by applicable State or Federal regulations.
- M. Any wastewater that causes a hazard to human life or creates a public nuisance.
- N. Containing organic solvent extractable substances such as fats, wax, grease, or oils of petroleum origin, whether emulsified or not, in excess of 100 mg/l or containing substances which may solidify or become viscous at temperatures between 32 degrees F and at 140 degrees F.
- O. Gasoline, benzene, naphtha, fuel oil or other flammable or explosive liquids, solids, gases or other pollutants which cause the wastewater to have a closed cup flashpoint of less than 140 degrees F, or pollutants which cause an exceedance of 10 percent of the Lower Explosive Limit (LEL) at any point within the POTW, or containing gasoline, benzene, xylene or toluene which causes the wastewater to exceed the State of Michigan Surface Water Quality Standards.
- P. Any garbage that has not been ground by household type or other suitable garbage grinders.
- Q. Any ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, paunch, manure, or any other solids or viscous substances capable of causing obstructions or other interferences with proper operation of the sewer system.
- R. Toxic or poisonous substances in sufficient quantity to injure or interfere with any wastewater treatment process, to constitute hazards to humans or animals, or to create any hazard in waters, which receive, treated effluent from the sewer system treatment plant. Toxic wastes shall include, but are not limited to wastes containing cyanide, chromium, cadmium, mercury, copper, and nickel ions.
- S. Solids of such character and quantity that special and unusual attention required for their handling.
- T. Any substance which would cause the treatment plant to be in noncompliance with sludge use, recycle or disposal criteria pursuant to guidelines or regulations developed under section 405 of the Federal Act, the Solid Waste Disposal Act, the Clean Air Act, the Toxic Substances Control Act or other regulations or criteria for sludge management and disposal as required by the State.
- U. Any medical or infectious wastes prohibited from being discharged under Federal or State law and regulations.
- V. Any pollutant, including BOD pollutants, released at a flow rate and/or pollutant concentration which would cause interference with the treatment plant.
- W. Material considered a hazardous waste under the Resource Conservation and Recovery Act (RCRA).

- X. Any commercial or industrial waste that may cause pass through of pollutants or interference with the wastewater treatment plant operations or that violates Federal, State, or local restrictions.
- Y. Trucked and hauled wastes, except at discharge points designated by YCUA.
- Z. Pollutants causing toxic gases, vapors, and fumes.
- AA. Any leachate from a hazardous waste landfill.
- BB. Any landfill leachate unless permitted and authorized under a written contract, within YCUA's sole discretion, between YCUA and the User.
- CC. Any pollutant discharge which constitutes a slug.

Part VIII – Operation and Maintenance of Pollution Controls

- A. Proper Operation and Maintenance: The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control and related appurtenances which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes but is not limited to: effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process control, including appropriate quality assurance procedures. This provision requires the operation of back up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this permit.
- B. Duty to Halt or Reduce Activity: Upon reduction of efficiency of operation, or loss or failure of all or part of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control its production or discharges or both until operation on the treatment facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
- C. Bypass of Treatment Facilities: By pass is prohibited unless it is unavoidable to prevent loss of life, personal injury, or severe property damage or no feasible alternatives exist. The permittee may allow bypass to occur which does not cause effluent limitations to be exceeded, but only if it is also for essential maintenance to assure efficient operation.

Notification of Anticipated Bypass: If the permittee knows in advance of the need for a bypass, it shall submit prior written notice, at least ten days before the date of the bypass, to the YCUA and submit a written notice to the YCUA within 5 days. This report shall specify:

1. A description of the bypass, and its cause, including its duration;
 2. Whether the by pass has been corrected; and
 3. The steps being taken or to be taken to reduce, eliminate, and prevent a re-occurrence of the bypass.
- D. Removed Substances: Solids, sludge's, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in accordance with section 405 of the Clean Water Act and Subtitles C and D of the Resource Conservation and Recovery Act and all laws and regulations of the State of Michigan.

Part IX – Monitoring and Records

- A. Representative Sampling: Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points and with the method specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water or substance. All equipment used for sampling and analysis must be routinely calibrated, inspected and maintained to ensure their accuracy. Monitoring points shall not be changed without notification to and the approval of the Ypsilanti Community Utilities Authority.
- B. Flow Measurements: If flow measurement is required by this permit, the appropriate flow measurement devices and methods consistent with approved scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated, and maintained to ensure that the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than 10 percent from true discharge rates throughout the range of expected discharge volumes. If a required flow measurement device requires maintenance or service that will inhibit the collection of flow proportional composite samples, the permittee shall provide notice to the YCUA that includes a brief explanation on the service required and the expected time period that the device will be out of service. The permittee shall collect time proportional composite samples in lieu of flow proportional composite samples unless otherwise directed by the YCUA.
- C. Analytical Methods to Demonstrate Continued Compliance: All sampling and analysis required by this permit shall be performed in accordance with the techniques prescribed in 40 CFR Part 136 and amendments thereto, otherwise approved by EPA, or as specified in this permit.
- D. Additional Monitoring by the Permittee: If the permittee monitors any pollutant more frequently than required by this permit using test procedures identified in PART IV(C), the results of this monitoring shall be included in the permittee's self-monitoring reports.
- E. Inspection and Entry: The permittee shall allow the Ypsilanti Community Utilities Authority, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:
1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
 2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
 3. Inspect at reasonable times any facilities, equipment, including monitoring and control equipment, practices, or operations regulated or required under this permit;
 4. Sample or monitor, for the purposes of assuring permit compliance, any substances or parameters at any location;
 5. Inspect any production, manufacturing, fabricating, or storage area where pollutants, regulated under the permit, could originate, be stored, or be discharged to the sewer system.

- F. **Retention of Records:** The permittee shall retain records of all monitoring information, including, all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of this sample, measurement, report or application. This period may be extended by request of the Ypsilanti Community Utilities Authority at any time. All records that pertain to matters that are the subject of special orders or any other enforcement or litigation activities brought by the Ypsilanti Community Utilities Authority shall be retained and preserved by the permittee until all enforcement activities have concluded and all periods of limitation with respect to any and all appeals have expired.
- G. **Record Contents:** Records of sampling and analyses shall include:
1. The date, exact place, time, and methods of sampling or measurements, and sample preservation techniques or procedures;
 2. Who performed the sampling or measurements;
 3. The date (s) analyses were performed;
 4. Who performed the analyses;
 5. The analytical techniques or methods used; and
 6. The results of such analyses.
- H. **Falsifying Information:** Knowingly making any false statement on any report or other document required by this permit or knowingly rendering any monitoring device or method inaccurate, is a crime and may result in the imposition of criminal sanctions and/or civil penalties.

Part X – Prohibited Concentrations

- A. No permittee shall discharge wastewater such that the concentration of pollutants in one grab sample exceeds the following limits:

Fats, Oil, and Grease: 100 mg/l

pH, standard units: ≥ 5.0 and ≤ 11.0 S.U.

Total Cyanides: 1.0 mg/l

Total Phenolic Compounds: 1.0 mg/l ⁽¹⁾

- B. No permittee shall discharge wastewater such that the concentration of pollutants contained in a representative composite sample is at or above the following surcharge threshold, except as otherwise permitted in writing by the Director and on payment of a surcharge fee, and no person shall discharge wastewater such that the concentration of pollutants contained in a representative composite sample exceeds the following upper limits, with respect to the following compatible pollutants:

<u>Pollutant</u>	<u>Surcharge Threshold</u>	<u>Upper Limits</u>
5-day BOD (Biochemical Oxygen Demand)	300 mg/l	1000 mg/l
Total SS (Suspended Solids)	350 mg/l	2500 mg/l
COD (Chemical Oxygen Demand)	600 mg/l	2000 mg/l
Total Phosphorus	15 mg/l	75 mg/l
Ammonia-Nitrogen	30 mg/l	700 mg/l

- C. No permittee shall discharge wastewater such that the concentration of pollutants contained in a representative composite sample exceeds the following limits with respect to the following inorganic or organic pollutants:

<u>Inorganics</u>	<u>Limits</u>
Arsenic	1.0 mg/l
Beryllium	0.002 mg/l
Cadmium	0.50 mg/l
Chromium (Total)	4.0 mg/l
Copper	3.0 mg/l
Lead	0.3 mg/l
Mercury	Nondetectable ⁽²⁾
Nickel	3.0 mg/l
Silver	0.15 mg/l
Zinc	3.0 mg/l

Organics

Polychlorinated Biphenyls	Nondetectable ⁽³⁾
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- 1) The total phenols limit is based on the discharge of any or all of the following phenolic compounds: 2-Chlorophenol, 4-Chlorophenol, 2,4-Dichlorophenol, 2,4-Dimethylphenol, 2,4-Dinitrophenol, 2-Methylphenol, 3-Methylphenol, 4-Methylphenol, 2-Nitrophenol, 4-Nitrophenol, and Phenol. Discharge of other phenolic compounds is prohibited except as specifically authorized by the Director.
- 2) Nondetectable per U.S. EPA Method 245.1. The local discharge limitation for mercury is established at the level of detection in accordance with the following: There shall be no detectable amounts of mercury discharged to a township or YCUA sanitary sewer. Mercury sampling procedures, preservation and handling, and analytical protocol for compliance monitoring shall be in accordance with EPA Method 245.1. The level of detection, developed in accordance with the procedure specified in 40 CFR 136, shall not exceed 0.2 ug/L for Mercury, unless higher levels are appropriate due to matrix interference.
- 3) Nondetectable per U.S. EPA Method 608. The local discharge limitation for Polychlorinated Biphenyls is established at the level of detection in accordance with the following: There shall be no detectable amounts of Polychlorinated Biphenyls discharged to a township or YCUA sanitary sewer. Polychlorinated Biphenyls sampling procedures, preservation and handling, and analytical protocol for compliance monitoring shall be in accordance with EPA Method 608. The level of detection, developed in accordance with the procedure specified in 40 CFR 136, shall not exceed 0.2 ug/L for Polychlorinated Biphenyls, unless higher levels are appropriate due to matrix interference.

