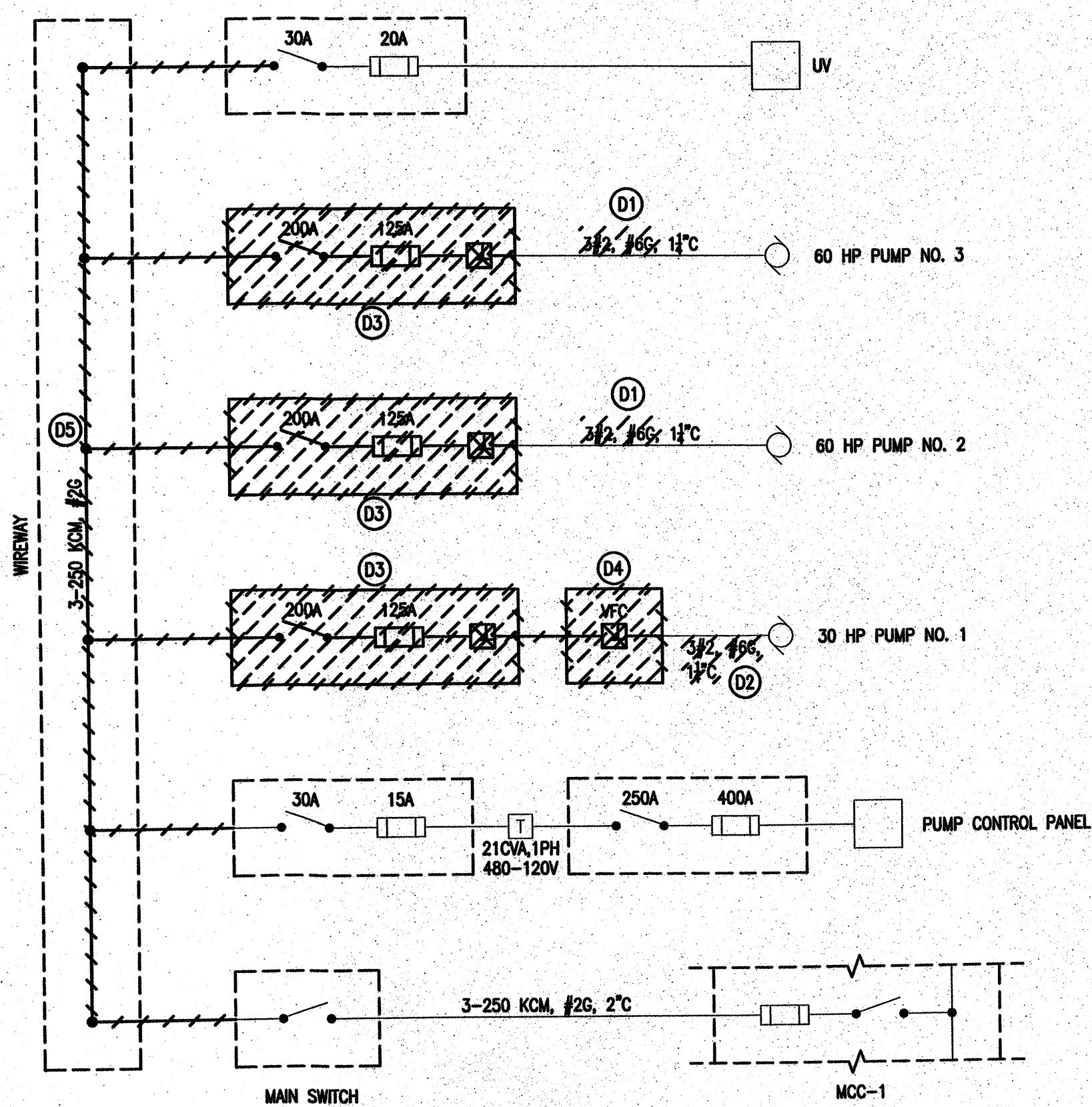


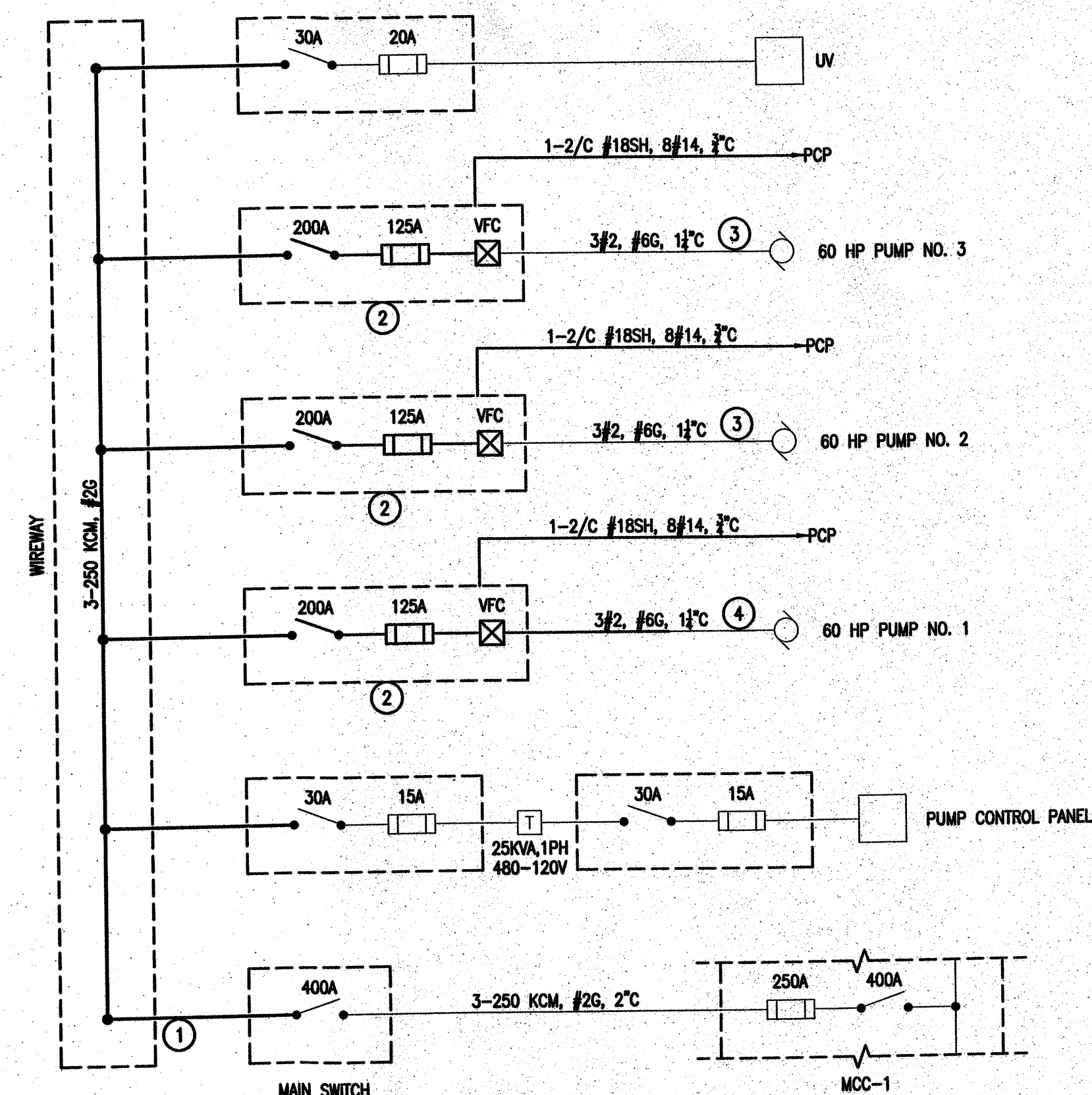


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DESIGNED BY: MURPHY, JAY 07/20/11 1:52 PM
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ELECTRICAL ONE-LINE DIAGRAM AND NOTES.dwg
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EXISTING ONE-LINE DIAGRAM - DEMOLITION



ONELINE DIAGRAM - PROPOSED

SEQUENCE OF OPERATION

A. GENERAL: INTEGRATE THE FOLLOWING GENERAL PUMP SEQUENCE OF OPERATION INTO THE EXISTING WATER TREATMENT PLANT SCADA SYSTEM, PROGRAMMING AND MODIFICATIONS TO THE PUMP CONTROL PANEL ARE TO BE PROVIDED BY THE GENERAL CONTRACTOR AND INCLUDED IN THE BID PRICE.

B. AS PART OF THE HURON HILLS BOOSTER STATION UPGRADE, THE CONTROLS NEED TO BE RECONFIGURED TO ACHIEVE A NORMAL AND AN EMERGENCY MODE OF OPERATION.

1. UNDER NORMAL OPERATION, THE HURON HILLS BOOSTER STATION SHOULD FILL THE CENTER ROAD TANK AS QUICKLY AS POSSIBLE. THIS WOULD BE ACHIEVED BY STARTING LEAD PUMP 1 WHEN THE TANK IS AT ITS LOW LEVEL. THE CONTROL VALVE AT THE TANK WILL OPEN SLIGHTLY TO MAINTAIN SYSTEM PRESSURE. THEN AFTER A 2 TO 3 MINUTE DELAY, PUMP 2 WILL TURN ON AND THE CONTROL VALVE WILL OPEN SLIGHTLY TO MAINTAIN SYSTEM PRESSURE. AFTER A 2-TO 3-MINUTE DELAY, PUMP 3 WILL TURN ON AND THE CONTROL VALVE WILL OPEN MORE AND MAINTAIN SYSTEM PRESSURE. WHEN THE HIGH WATER LEVEL IN THE TANK IS ACHIEVED, THE PUMPS WILL TURN OFF. THE VARIABLE FREQUENCY DRIVES (VFD'S) ON THE PUMPS WILL ALLOW THEM TO RAMP UP DURING START UP AND RAMP DOWN PRIOR TO TURNING OFF. THE VFD'S WILL MINIMIZE WATER HAMMER IN THE SYSTEM AND SAVE ON OVERALL ELECTRICITY COSTS. THE TANK AND CENTER ROAD BOOSTER STATION WILL THEN PROVIDE THE PRESSURE AND FLOW DEMAND FOR THE HURON HILLS PRESSURE DISTRICT UNTIL THE LOW LEVEL IN THE TANK IS REACHED AT WHICH TIME THE HURON HILLS BOOSTER STATION WOULD BE SIGNALLED TO FILL THE TANK AGAIN. THE PRIMARY NORMAL OPERATIONAL SEQUENCE IS BASED UPON MAINTAINING THE PROPER WATER LEVELS IN THE TANK.

2. IN THE CASE OF A FIRE FLOW, AN EMERGENCY SEQUENCE OVERRIDE SHOULD ALLOW THE WATER TREATMENT PLANT TO TAKE PRIMARY CONTROL OF THE SYSTEM OPERATION. (THE TOWNSHIP MAY CONSIDER PERMITTING CITY STAFF TO TAKE ACTION IN THE EVENT OF EMERGENCY TO LESSEN RESPONSE TIME) THIS WOULD INCLUDE STAGED OPERATION OF RUNNING UP TO ALL THREE PUMPS SIMULTANEOUSLY TO MAINTAIN A SYSTEM PRESSURE SELECTED SLIGHTLY ABOVE THE NORMAL OPERATING PRESSURE. THE PRIMARY EMERGENCY OPERATIONAL SEQUENCE IS BASED UPON MAINTAINING SYSTEM PRESSURE AT SLIGHTLY HIGHER THAN NORMAL CONDITIONS SO THAT THE HURON HILLS BOOSTER STATION HAS PRIMARY CONTROL DURING THE EMERGENCY. THIS MODE WILL ALLOW THE TOWNSHIP'S CENTER ROAD BOOSTER STATION TO AUTOMATICALLY CUT BACK ON PUMPING FROM THE TANK, SINCE HURON HILLS DISTRICT PRESSURE WILL BE SATISFIED, AND ASSIST IN PEAK DEMANDS WITHOUT QUICKLY DEPLETING ALL AVAILABLE STORAGE.

3. IN ORDER TO ACHIEVE THIS, THE TANK LEVEL, SYSTEM PRESSURE, PUMP RUN STATUS, AND PRESSURE SUSTAINING VALVE POSITION AT THE CENTER ROAD FACILITY SHOULD BE COMMUNICATED DIRECTLY TO THE WATER TREATMENT PLANT TO LESSEN THE TIME DELAY FOR DATA TRANSMISSION AS DESCRIBED BELOW. THIS WILL REQUIRE THE INSTALLATION OF A SECOND TRANSMITTER AT CENTER ROAD, A SECOND RECEIVER AND TRANSMITTER AT THE WATER TREATMENT PLANT, A REPEATER STATION IS ALSO REQUIRED DUE TO THE LINE-OF-SIGHT LIMITATIONS OF RADIO TRANSMISSION. GRAND TRAVERSE COUNTY DPW UPGRADED THE EX. RADIO COMMUNICATIONS SEPARATELY FROM THIS CONTRACT.

4. THE LOWER DEMAND PERIODS REQUIRE FEEDING THE LOWER PRESSURE DISTRICT FROM THE HIGHER PRESSURE SYSTEM IN ORDER TO ACHIEVE A REASONABLE TANK TURNOVER TIME. THE TRANSMISSION MAIN FEEDING THE CENTER ROAD WATER STORAGE TANK MUST BE MAINTAINED ABOVE 35 PSI TO MEET CUSTOMER SERVICE PRESSURE NEEDS. THE BASIC APPROACH USED TO FILL THE TANK AND BACK-FEED THE LOW PRESSURE DISTRICT WILL NEED TO BE RETAINED AND THE ELECTRONIC PRESSURE SUSTAINING VALVES ARE USED TO ACHIEVE THIS. HOWEVER, TO ADDRESS THE POTENTIAL FOR EMERGENCY CONTROL STATION DIFFICULTIES, BEING ABLE TO MANUALLY OVERRIDE AUTOMATED CONTROL OPERATIONS FROM THE WATER TREATMENT PLANT ARE ADVISABLE TO OFFER MORE TIMELY RESPONSE TO THESE CONDITIONS.

C. CENTER ROAD GROUND STORAGE RESERVOIR COMMUNICATIONS MODIFICATIONS

1. THE RADIO BASED COMMUNICATIONS SYSTEM BETWEEN THE RESERVOIR AND THE BOOSTER PUMP STATION WILL BE MODIFIED TO REDUCE THE TIME DELAYS CURRENTLY EXPERIENCED IN COMMUNICATION OF DATA FROM THE RESERVOIR TO THE STATION. NO NEW RADIO EQUIPMENT WAS INSTALLED UNDER THIS CONTRACT.

2. A DEDICATED RADIO LINK UTILIZING THE SAME GE-MDS TRANSET SPREAD-SPECTRUM TRANSMITTERS AT EACH LOCATION PLUS A DEDICATED REPEATER WILL BE INSTALLED.

3. INFORMATION TO BE COMMUNICATED FROM THE RESERVOIR INCLUDES RESERVOIR LEVEL, SYSTEM PRESSURE, JOCKEY PUMP ON/OFF, DOMESTIC PUMP NO. 1 ON/OFF, DOMESTIC PUMP NO. 2 ON/OFF, FIRE PUMP ON/OFF AND PRESSURE SUSTAINING VALVE POSITION.

4. THE SYSTEM WILL ALSO ALLOW FOR REMOTE CONTROL OF THE TWO DOMESTIC PUMPS AT THE RESERVOIR SITE.

D. CLEAR WELL LEVEL

1. CONNECT PRESSURE TRANSDUCER 4-20MA OUTPUT TO PLC ANALOG I/O.

2. PROGRAM LOW WATER PUMP CUT-OFF AND HIGH WATER ALARM SETPOINTS BY OWNER.

3. PROVIDE NEW DIGITAL LEVEL INDICATOR IN PUMP CONTROL PANEL.

ELECTRICAL SPECIFICATIONS

A. CONDUIT AND FITTINGS.

1. CONDUIT SHALL BE GALVANIZED RIGID STEEL AND SHALL COMPLY WITH ANSI C80.1. FITTINGS AND CONDUIT BODIES USED WITH RIGID STEEL CONDUIT SHALL COMPLY WITH NEMA FB 3 AND SHALL UTILIZE THREADED CONNECTIONS. THREADED HUBS OR GASKETED DOUBLE LOCK NUTS SHALL BE USED FOR CONDUIT CONNECTIONS TO SHEET METAL ENCLOSURES.

2. FLEXIBLE CONDUIT SHALL BE LIQUDTIGHT STEEL CONSTRUCTION WITH PVC JACKET. FITTINGS USED WITH FLEXIBLE METAL CONDUIT SHALL COMPLY WITH NEMA FB 1.

B. WIRE AND CABLE: POWER AND CONTROL WIRING SHALL BE SINGLE CONDUCTOR INSULATED WIRE WITH STRANDED COPPER CONDUCTOR. INSULATION SHALL BE NFPA 70, TYPE THHN/THWN WITH A 75C, 600V RATING.

C. PULL BOXES, JUNCTION BOXES AND DEVICE BOXES SHALL BE FS/FD TYPE, CAST FERRALLOY WITH CAST, GASKETED COVERS AND INTEGRAL THREADED HUBS; WHERE LARGER BOXES ARE REQUIRED, THEY SHALL BE PROPERLY SIZED, NEMA 12, SHEET METAL CONSTRUCTION FINISHED WITH GRAY ENAMEL.

D. GROUNDING AND BONDING. GROUNDING AND BONDING CONDUCTORS SHALL BE STRANDED COPPER.

E. SUPPORTING DEVICES. SUPPORT SYSTEMS SHALL BE ADEQUATE FOR THE WEIGHT OF EQUIPMENT AND CONDUIT, INCLUDING WIRING, WHICH THEY CARRY.

F. FASTENING EQUIPMENT USED SHALL BE OF STAINLESS STEEL CONSTRUCTION. ALL CHANNEL STRUT AND SUPPORTING STEEL SHALL BE HOT DIP GALVANIZED AND FASTENING PRODUCTS SHALL BE OF STAINLESS STEEL CONSTRUCTION.

G. VARIABLE FREQUENCY CONTROLLERS:

1. VARIABLE FREQUENCY CONTROLLER (VFC) SHALL BE ALLEN BRADLEY POWERFLEX 400 SERIES OR EQUAL AS APPROVED BY THE OWNER.

2. RATING: VFC'S SHALL BE RATED FOR THE VOLTAGE AND HORSEPOWER INDICATED AND SHALL BE DESIGNED FOR VARIABLE TORQUE PUMP APPLICATIONS.

3. CONTROL INTERFACE: PROVIDE EACH VFC WITH AN OPERATOR INTERFACE KEYPAD FOR CONTROLLER PROGRAMMING, CONFIGURATION AND MONITORING. THE KEYPAD SHALL ALLOW SELECTION OF AUTOMATIC OR MANUAL OPERATION. IN MANUAL, THE PUMP SHALL BE STARTED AND STOPPED FROM THE KEYPAD AND THE PUMP SPEED SHALL BE SET AT THE KEYPAD. IN AUTOMATIC MODE, THE PUMP SHALL BE STARTED AND STOPPED VIA A REMOTE CONTACT CLOSURE AND PUMP SPEED SHALL BE CONTROLLED BY A REMOTE 4-20MADC SIGNAL.

a. PROVIDE UNPOWERED CONTACTS FOR REMOTE INDICATION OF PUMP RUNNING AND VFC FAULT.

b. PROVIDE RS485 COMMUNICATIONS INTERFACE.

c. ENCLOSURE: NEMA 12 WITH FANS AND FILTERS.

d. PROVIDE 3% INPUT LINE REACTORS MOUNTED WITHIN THE VFC ENCLOSURE.

e. DISCONNECTING MEANS: FUSIBLE SWITCH TYPE.

8. CONSTRUCTION:

a. CONSTRUCT AND INSTALL ALL MATERIAL AND COMPONENTS AT THE LOCATIONS INDICATED ON THE DRAWINGS UNLESS OTHERWISE APPROVED BY THE ENGINEER.

b. ALL CONDUIT INSTALLED SHALL BE GALVANIZED RIGID STEEL.

c. ALL WIRE AND CABLE SHALL BE CONTINUOUS IN THE SAME COLOR CODE AND TYPE TO ITS EXTREME TERMINATION POINT. THE USE OF DIFFERENT TYPE OF INSULATED WIRE TO THE SAME DEVICE OR EQUIPMENT WILL NOT BE ACCEPTED. MINIMUM POWER CONDUCTOR SIZE SHALL BE #12 AWG.

d. INSTALL SUPPORT SYSTEMS THAT ARE ADEQUATE FOR THE WEIGHT OF EQUIPMENT AND CONDUIT, INCLUDING WIRING, WHICH THEY CARRY. SUPPORT DEVICES SHALL NOT BE FASTENED TO PIPING, DUCTWORK, MECHANICAL EQUIPMENT OR CONDUIT.

e. PROVIDE WIRE MARKERS ON EACH CONDUCTOR IN PANELBOARD, PULL BOXES, OUTLETS, JUNCTION BOXES AND LOAD CONNECTION. IDENTITY WITH CIRCUIT WIRE NUMBER. WIRE MARKERS SHALL BE PREPRINTED AND NOT PIECED FROM SINGLE AND/OR DOUBLE-DIGIT TAGS. EMBOSSED TAPE WILL NOT BE PERMITTED FOR ANY APPLICATION.

9. SUBMERSIBLE PRESSURE TRANSDUCER

a. AMETEK MODEL 375 OR EQUAL AS APPROVED BY OWNER.

b. 0-14 FOOT RANGE.

c. PROVIDE 50 FEET OF CABLE.

d. PROVIDE PLASTIC COATED WEIGHT AND CABLE FOR WELL MOUNTING.

e. PROVIDE 24VDC SUPPLY.

GENERAL NOTES

- ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE LATEST ACCEPTED EDITION OF THE NATIONAL ELECTRICAL CODE (NEC) AND ALL STATE AND LOCAL CODES.
- COORDINATE THE INSTALLATION OF ALL EQUIPMENT REQUIRING ELECTRICAL CONNECTIONS WITH MECHANICAL PLANS, SPECIFICATIONS AND EQUIPMENT DRAWINGS. PROVIDE ALL NECESSARY EQUIPMENT POWER AND CONTROL CONNECTIONS WHETHER INDICATED ON THE DRAWINGS OR NOT.
- ALL LOW VOLTAGE CONDUCTORS SHALL BE STRANDED COPPER.
- INSTALL AN INSULATED, GREEN, GROUNDING CONDUCTOR IN ALL FEEDER AND BRANCH CIRCUIT RACEWAYS.
- FINAL CONNECTIONS TO ITEMS SUBJECT TO VIBRATION SHALL BE MADE WITH LIQUID TIGHT FLEXIBLE METAL CONDUIT.
- IN THE EVENT OF CONFLICTS BETWEEN THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS OR WITHIN THE DRAWINGS OR SPECIFICATIONS, THE MORE STRINGENT REQUIREMENT SHALL BE ASSUMED TO BE CORRECT. REFER UNCERTAINTIES IN REQUIREMENTS TO THE ENGINEER FOR CLARIFICATION.
- 2/C AND 3/C #18 SHIELDED SIGNAL CABLE SHALL BE BELDEN 9340 AND BELDEN 1121A RESPECTIVELY OR EQUAL.
- ALL MATERIALS AND LABOR REQUIRED TO TERMINATE CONDUCTORS/CABLES WITHIN THE EXISTING PUMP CONTROL PANEL PCP WILL BE FURNISHED BY THE GENERAL CONTRACTOR'S SYSTEM INTEGRATOR. ALL PROGRAMMING MODIFICATIONS REQUIRED WILL BE COMPLETED BY THE GENERAL CONTRACTOR'S SYSTEM INTEGRATOR.

KEYNOTES

- FURNISH AND INSTALL NEW CONDUCTORS IN EXISTING WIREWAY. TAP AS REQUIRED TO SUPPLY POWER TO NEW VARIABLE FREQUENCY CONTROLLERS AND EXISTING FUSIBLE SWITCHES.
- FURNISH AND INSTALL NEW VARIABLE FREQUENCY MOTOR CONTROLLERS (VFC) AT LOCATION OF ORIGINAL MOTOR STARTERS. FURNISH AND INSTALL NEW TAP CONDUCTORS FROM WIREWAY ABOVE AND NEW MOTOR CIRCUIT CONDUCTORS TO MOTOR. FURNISH AND INSTALL NEW CONTROL CONDUIT AND CONDUCTORS TO EXISTING PCP.
- INSTALL NEW MOTOR CIRCUIT CONDUCTORS FROM NEW VFC TO EXISTING MOTOR. EXISTING UNDERFLOOR CONDUIT AND JUNCTION BOX SHALL BE REUSED.
- FURNISH AND INSTALL NEW CONDUIT AND CONDUCTORS FROM NEW VFC TO PUMP MOTOR. ROUTE CONDUIT OVERHEAD SUCH THAT IT DOESN'T INTERFERE WITH THE HATCH ABOVE THE PUMP AND ALLOWS FOR PUMP REMOVAL WITHOUT REMOVING THE CONDUIT.

DEMOLITION KEYNOTES

- REMOVE EXISTING MOTOR CIRCUIT CONDUCTORS FROM MOTOR STARTER TO PUMP MOTOR. CONDUIT IS ROUTED WITHIN THE CONCRETE FLOOR SLAB AND WILL BE REUSED FOR NEW MOTOR CIRCUIT CONDUCTORS.
- REMOVE EXISTING MOTOR CIRCUIT CONDUCTORS FROM MOTOR STARTER TO PUMP MOTOR. CONDUIT IS ROUTED WITHIN THE CONCRETE FLOOR SLAB AND WILL BE ABANDONED IN PLACE.
- DISCONNECT AND REMOVE EXISTING PUMP MOTOR STARTERS. NEW VARIABLE FREQUENCY CONTROLLERS WILL BE INSTALLED AT THE SAME LOCATION. DISCONNECT AND REMOVE EXISTING CONTROL CONDUCTORS BETWEEN MOTOR STARTER AND CONTROL PANEL PCP.
- DISCONNECT AND REMOVE EXISTING PUMP NO. 1 VARIABLE FREQUENCY CONTROLLER AND ASSOCIATED CONDUIT AND CONDUCTORS.
- DISCONNECT AND REMOVE POWER CONDUCTORS FROM LOAD SIDE OF MAIN SWITCH THROUGH WIREWAY. WIREWAY SHALL REMAIN FOR REUSE.

TRAVERSE CITY
HURON HILLS BOOSTER PUMP STATION
IMPROVEMENTS
GRAND TRAVERSE COUNTY, MICHIGAN

ELECTRICAL ONE-LINE
DIAGRAM AND NOTES

REVISIONS

ASPECT 1/1/11
A-T-K

SCALE: AS SHOWN

PROJ. #: 10.026

DATE: MAY 2011

SHEET

3 OF 6

ISSUED FOR BIDS

3 OF 6