OPERATING DESCRIPTION

GENERAL

THIS DESCRIPTION APPLIES TO THE CONTROL OF THE STORMWATER PUMPING STATION. UNDER NORMAL CONDITIONS NEVADA POWER SUPPLIES ELECTRICITY TO RUN THE PUMP STATION, INCLUDING THE 35 HP MAIN STORMWATER PUMPS P-1, P-2, P-3 AND P-4. A DIESEL ENGINE DRIVEN GENERATOR PROVIDES 100% STANDBY POWER.

AN AUTOMATIC TRANSFER SWITCH IN THE MOTOR CONTROL CENTER PROVIDES DETECTION OF LOSS OF NORMAL POWER, INITIATE STARTING OF STANDBY GENERATOR AND TRANSFER THE ELECTRICAL LOADS TO THE GENERATOR WHEN ITS VOLTAGE AND FREQUENCY HAS STABILIZED. AFTER UTILITY POWER HAS BEEN RESTORED, THE LOADS WILL TRANSFER BACK TO NEVADA POWER SERVICE.

MANUAL PUMP CONTROL

H-O-A HANDSWITCHES IN EACH LOCAL PUMP CONTROL STATION (HS-1, HS-2, HS-3, AND HS-4) LOCATED IN THE PUMP ROOM PROVIDE FOR THE MANUAL STARTING AND STOPPING OF THE FOUR SUBMERSIBLE PUMPS USING "HAND" AND "OFF" MODES. THE "OFF" POSITION IS ADDITIONALLY USED AS THE DISCONNECTING MEANS WITHIN SIGHT OF THE MOTOR. PROVIDE ON/OFF STATUS INDICATING LIGHTS (QI-1A/1B, QI-2A/2B, QI-3A/3B AND QI-4A/4B) AT EACH LOCAL PUMP CONTROL STATION. DUPLICATE INDICATING LIGHTS SHALL BE LOCATED ON THE MOTOR STARTERS IN MCC.

AUTOMATIC CONTROL

IN "AUTO" MODE, PUMPS WILL BE UNDER AUTOMATIC CONTROL OF THE PROGRAMMABLE LOGIC CONTROLLER (PLC) LOCATED IN THE MOTOR CONTROL CENTER APPROXIMATELY 230 FEET AWAY. THE STARTING AND STOPPING OF THE PUMPS IS BY FLOAT SWITCHES (LSLL-1, LSL-1, LSH-1, LSH-2, LSH-3 AND LSH-4) AS DESCRIBED BELOW.

1. MINIMAL STORMWATER FLOWS ENTER THE SUMP AND ARE PUMPED OUT BY SUMP PUMP P-5. THIS PUMP IS CONTROLLED BY LIQUID LEVELS OF LSL-5 TO "OFF" AND LSH-5 TO "ON". STARTER OF THIS PUMP IS TO BE INTERLOCKED WITH STORM WATER PUMPS SO THAT PUMP P-5 WILL NOT RUN AS LONG AS ANY OF THE MAIN PUMPS P-1 THROUGH P-4 ARE RUNNING. (SEE PARAGRAPH 6) 1

2. AS STORMWATER ENTERS THE PUMP WELL, THE LIQUID LEVEL WILL RISE TO LEVEL OF LSH-1, STARTING THE LEAD PUMP. LEAD PUMP IS SELECTED BY PUMP ALTERNATOR (ALT-1) AT PLC. IF THE INFLOW RATE IS LESS THAN THE CAPACITY OF THE LEAD PUMP, THE PUMP WILL DRAW THE WELL LEVEL DOWN TO LEVEL LSLL-1 WHICH WILL STOP THE LEAD PUMP.

3. ON CONTINUING INFLOW, THE RISING LIQUID LEVEL WILL AGAIN RISE TO THE LEVEL OF LSH-1, WHICH WILL START THE NEXT PUMP IN THE ALTERNATOR SEQUENCE AS THE LEAD-PUMP.

   * IF THE PUMP CAPACITY EXCEEDS THE INFLOW RATE, THE PUMP WILL DRAW THE LEVEL DOWN TO LEVEL OF LSLL-1 WHICH WILL STOP THE PUMP.

   * IF THE INFLOW RATE EXCEEDS THE CAPACITY OF THE LEAD PUMP, THE LEVEL WILL RISE TO THE LEVEL OF LSH-2, INITIATING THE START OF THE FIRST FOLLOW PUMP. THE FIRST FOLLOW PUMP IS SELECTED BY THE PUMP ALTERNATOR. THE LEAD AND FIRST FOLLOW PUMPS WILL OPERATE UNTIL THE LEVEL DROPS TO ELEVATION LSL-1, WHICH STOPS THE FIRST FOLLOW PUMP. WHEN THE LEVEL DROPS TO LSLL-1 THE LEAD PUMP STOPS.

1 4. IF THE STORMWATER INFLOW RATE INCREASES FURTHER, THE SEQUENCE CONTINUES THROUGH LEVELS LSH-3 AND LSH-4, AT WHICH TIME ALL FOUR PUMPS WILL BE IN OPERATION. WHEN THE LEVEL IS PUMPED DOWN AND LSH-3 IS DEACTIVATED, THE FOURTH PUMP SHALL STOP. WHEN THE LEVEL IS PUMPED DOWN AND LSH-2 DEACTIVATES THE THIRD PUMP SHALL STOP. WHEN THE LEVEL IS PUMPED DOWN AND LSH-1 DEACTIVATES, THE SECOND PUMP SHALL STOP. THE LEAD PUMP SHALL RUN UNTIL LEVEL SWITCH LSLL-1 IS DEACTIVATED AND STOPS THE LEAD PUMP, LEAVING FURTHER PUMPING TO THE SUMP PUMP. THE DESCRIBED CYCLE SHALL REPEAT UPON INFLOW IN EXCESS OF SUMP PUMP CAPACITY.

5. SHOULD A PUMP FAIL TO START OR FAIL IN SERVICE, AND THE PUMP LEVEL REACHES THE LEVEL LSHH-1, THAT LEVEL SWITCH SHALL INITIATE THE LOCAL ALARM LAHH-1 AND INITIATE HIGH WATER LEVEL ALARM TO BE TRANSMITTED BY THE AUTO-DIALER LOCATED IN THE PLC ENCLOSURE.

1 6. A POTABLE WATER SOURCE WILL BE USED TO AGITATE THE PUMP P-5 SUMP. A SOLENOID VALVE SV-7 INTERLOCKED WITH P-5 START/STOP THROUGH OPEN/CLOSE/AUTO HANDSWITCH HS-7 WILL CONTOL AGITATION.

1 7. AUTOMATIC PIPE DRAIN OPERATION SEQUENCE: THE PURPOSE OF THIS ELECTRICALLY OPERATED VALVE IS TO DRAIN THE MAIN STORM WATER PIPE. THE PLC SHALL HAVE A "TIME DELAY ON ENERGIZING" DUAL FUNCTION SOFTWARE TIMER, WITH "ON" AND "OFF" TRIPPERS SETTABLE FROM 0 TO 999.9 HOURS (IN ONE HOUR INCREMENTS OR LESS). THE TIMER SHALL START AFTER THE LAST STORMWATER PUMP HAS STOPPED. REACHING THE "ON" TRIPPER, THE VALVE SHALL OPEN TO DRAIN THE MAIN PIPE TO SUMP. REACHING THE "OFF" TRIPPER, THE VALVE SHALL CLOSE AND THE TIMER SHALL RESET TO 0, REMAINING AT THAT STATE UNTIL ONE OR MORE OF THE STORMWATER PUMPS OPERATE AGAIN. PROVIDE ELAPSED TIME METERS (KQI-1, KQI-2, KQI-3, KQI-4) AT THE MOTOR STARTERS IN THE MCC.

PROVIDE ADDITIONAL ALARM FUNCTIONS AT THE PLC FROM SENSORS NOTED ON PLANS. THE FUNCTIONS INCLUDE FIRE DETECTION (TEMPERATURE DETECTOR IN PUMP ROOM), UTILITY POWER FAILURE (SENSED AT TRANSFER SWITCH), UN-AUTHORIZED ENTRY (SENSED AT PANEL IN PUMP ROOM) AND GASOLINE VAPOR DETECTOR (SENSOR IN PUMP ROOM). PROVIDE ONE TROUBLE AND ONE ALARM FUNCTION AT THE PLC FROM THE EMERGENCY GENERATOR CONTROL PANEL.

LEVEL SWITCHES -- FLOAT TYPE

PROVIDE SINGLE POLE MERCURY SWITCHES WHICH ACTUATE WHEN LONGITUDINAL AXIS OF FLOAT IS HORIZONTAL, AND DEACTUATE WHEN LIQUID LEVEL FALLS BELOW THE ACTUATE LEVEL. ENCLOSE SWITCH ASSEMBLY IN CHEMICAL RESISTANT CASING WITH A FIRMLY BONDED ELECTRICAL CABLE OF REQUIRED LENGTH. THE ENTIRE ASSEMBLY SHALL BE A WATERTIGHT AND IMPACT RESISTANT UNIT. PROVIDE WITH POLYPROPHYLENE BRACKET TO ATTACH SWITCH TO ONE INCH SCHEDULE 40 316 STAINLESS STEEL WALL MOUNTED PIPE SUPPORT. INSTALL SWITCHES AT INDICATED ELEVATIONS. PROVIDE SWITCHES MANUFACTURED BY HEALY-RUFF, ROTO-FLOAT OR FLYGT.

TYPE NO LS-1:

SERVICE:	PUMP STATION WET WELL PUMP CONTROL
TYPE:	TYPE P
FLOAT ELEVATION:	ADJUSTABLE
MATERIAL:	POLYPROPHYLENE
PRESSURE RATING:	ATMOSPHERIC
CABLE LENGTH:	20 FT.
CABLE TYPE:	PVC JACKETED, 600 V #18 TWISTED PAIR
ENCLOSURE:	NEMA 4
SWITCH RATING:	10 A, 120V

CONTACTS:

LSLL-1	CLOSE ON INCREASE
LSL-1	CLOSE ON INCREASE
LSH-2, 3 & 4	CLOSE ON INCREASE
LSHH-1	CLOSE ON INCREASE
TEMP (MIN/MAX)	40/80 DEG F

TYPE NO LS-5:

SERVICE:	PUMP STATION SUMP PUMP CONTROL
TYPE:	TYPE P
FLOAT ELEVATION:	ADJUSTABLE
MATERIAL:	POLYPROPHYLENE
PRESSURE RATING:	ATMOSPHERIC
CABLE LENGTH:	20 FT.
CABLE TYPE:	PVC JACKETED, 600 V #18 TWISTED PAIR
ENCLOSURE:	NEMA 4
SWITCH RATING:	10 A, 120V

CONTACTS:

LSH-5	CLOSE ON INCREASE
LSL-5	CLOSE ON INCREASE
TEMP (MIN/MAX)	40/80 DEG F

RECORD DRAWINGS

CLV DRAWING No. 107-V2011

MARK	DATE	BY	REVISION
1	10-7-94	HR	ADDENDUM NO.1

DESIGNED: HR
DRAWN: ARG
CHECKED: GWS

PROJECT ENGINEER ____ DATE ____
PROJECT MANAGER ____ DATE ____

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DEPARTMENT OF PUBLIC WORKS

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