


Corrective Action Report	
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CAR NO.	032	Issue Date	09/21/2022	
CONTRACTOR	KIC	Response Due Date	09/28/2022	
CONTRACTOR REPRESENTATIVE	Mark Howard			

Pump System Failure

This Corrective Action has been issued to address the event when water accumulated on I70 during a weather event on the evening of 8/7/22 causing a closure of I70 both eastbound and westbound.

- ENCR 1617 - Failed to meet the Schedule 11, A-1/A-2 Ref 18.13 requirement to have CCMS operational within 1 hour.
- ENCR 1614 – Road was blocked by floodwaters for more than two hours on 8/7/22
- ENCR 1615 – Failed to meet the Schedule 11, A-1/A-2 Ref 18.7 requirements to have pumps fully operational within 2 hours

Corrective Action Plan - Cause and Corrective Action Plan to Prevent Recurrence of Non-Conformance

Cause:

1. St. Andrews (Electrical Subcontractor) – inspected the level indication set points in the Programmable Logic Controller (PLC) and found the following:
 - a. Pump level set points on the primary level indication system were set incorrectly.
 - b. Pump level set points were previously set, tested and had performed per design, however, unintentional changes to the level set points occurred at some point during construction.

2. Browns Hill (I&C Subcontractor) – inspected the PLC along with the secondary backup level system (Hydro Ranger) on 8/9/22 and found the following:
 - a. The Hydro Ranger backup level indication system was disabled – Relay 1 on the Hydro Ranger (start command for the medium storm water pump via Hydro Ranger) was functional but the Backup Pump #2 (BP2) relay had been removed disabling Relay 1. Relays 2-6 were set to OFF. Backup level indication system was installed and tested per design; however, the backup system was unintentionally changed at some point during construction.

Corrective Actions (pending Department and WSP Review):

In our investigation of the system, we will implement the following corrective measures and enhancements to the system. Corrective measures and enhancements have been categorized as operational (an adjustment to the system) or procedural (an adjustment to a process).

Operational:

1. Corrective measure - Re-set level set points to design elevations – completed on 8/18/22 by St. Andrews.
2. Corrective measure - Re-install BP2 relay for Relay 1 and turn remaining relays to ON in Hydro Ranger.
3. Enhance system - provide an indication on Dynac at CTMC when either the Pump PLC or Motor Control Center (MCC) is NOT in AUTO.
4. Enhance system - provide a warning to CTMC operator when the PLC or MCC are in different states, for example the PLC in AUTO while the MCC is in OFF.
5. Enhance system - provide a warning to CTMC operator when the Lead Pump 1 is on.
6. Enhance system - provide an indication if the Pump Station is running off primary level indicators (i.e. L1A/B) or the backup level indicators (Hydro Ranger).
 - a. Provide a visual indication on the CTMC screen if either the Primary level indicators or the Hydro Ranger are off.
7. Enhance system - Install visual indication markers inside the pump station to show the levels at which the pump should start and the lowest roadway elevation.
8. Enhance system - provide a history to track the PLC activities.
9. Enhance system – Verification at CTMC that Hydro Ranger is active
10. Enhance system – provide door contact on PLC cabinet with alarm in Dynac.
11. Enhanced procedure - PLC screen will have a PIN or password to obtain access and to change features on lower screens.

Procedural:

12. Enhanced procedure - During a weather event, the CTMC Operator shall check to confirm pump running status is commensurate with the level indication in the pump station.
13. Enhanced procedure - If Lead Pump 1 comes on, a trained employee from KMP's Operations & Maintenance (O&M) Contractor will be dispatched to the pump station to visually confirm pump operation.
14. Enhanced procedure - Inspection protocol will be changed to include the following:
 - a. Weekly check of level set points
 - b. Weekly check of Hydro Ranger set points
 - c. Weekly inspection of the Hand/OFF/AUTO (HOA) of both the PLC and MCC
15. Enhanced procedure - Refresher training of KMP's O&M Contractor on the following:
 - a. How to check level set points in the PLC
 - b. How to check set points in the Hydro Ranger

- c. How to engage the Hydro Ranger
- d. How to "Reset" the Hydro Ranger to get the system back to the primary level indication system
- 16. Enhanced procedure – In a potential flash flood event mobilize someone from KMPs O&M Contractor to the local CDOT (Cover Top) building to be prepared.
- 17. Enhance procedure - post level set points (as shown on the PLC screen) inside the PLC panel.
- 18. Enhance procedure - Include a call tree inside the PLC Panel (with a "last updated" note on it).

Closure:

- 1. For Items 1, 2, 7, 17 & 18 an Inspection Verification Report will be provided for each
- 2. For Items 3, 4, 5, 6, 8, 9, 10 & 11 – FDC/NDC to document the necessary changes along with verification test report.
- 3. For Items 12, 13, 14, 15, & 16 – Maintenance Management Plan (MMP) update along with documentation showing implementation of MMP specific to these Items

			Date	
C70 IQC Representative	Elizabeth Barteau	<input type="checkbox"/> accept	<input type="checkbox"/> reject	Date
Comments				
Verification of Corrective Action				
C70 PQM	Gordon Peterson	<input type="checkbox"/> accept	<input type="checkbox"/> reject	Date
Comments				
	CAR Status	<input type="checkbox"/> open	<input type="checkbox"/> closed	Date