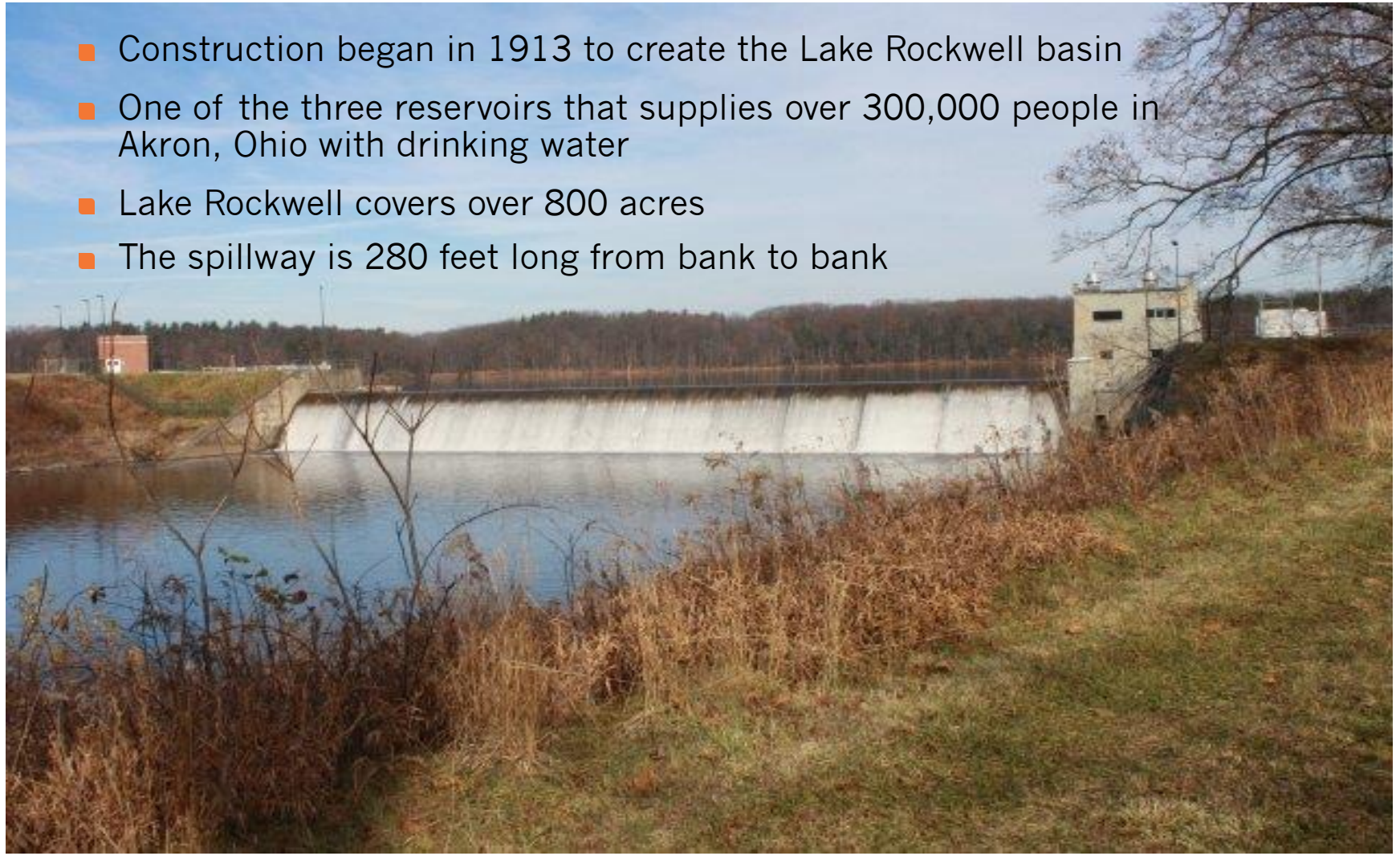
Case Study
Akron Spillway Dam

Akron, Ohio

Akron Spillway Dam: General Characteristics



Akron Dam: Structural Monitoring System Overview

Aim	To monitor the integrity and behavior of the spillway for possible failure or other possible damage and to integrate the sensing system into an already established optical network.
Location	Akron, Ohio USA
System Integrator	Chandler Monitoring Systems
End Customer	City of Akron Water Supply
Date	November 2012 to ongoing
Instrumentation	(1) Luna sm130, Optical Sensing Interrogator
Sensors	(26) Luna os3610 long gage strain sensors (3) Luna os4350 temperature sensors (6) Luna optical accelerometers (2) FBG Tech tilt meters
Software	Luna ENLIGHT and IntelliOptics
FBG Technology Benefit	Serial installation of FBG sensors allowed for quicker install compared to conventional electric strain gages. FBG sensors have reduced data drift and longer sensor lifetime compared to electric gages. The pre-existing optical network allowed for integration of FBG sensors with security cameras.

Akron Spillway Dam: System Configuration

The monitoring system instrumentation is composed of:

- Single optical interrogator (model sm130-700 dynamic interrogator)
- Long-gage strain sensors to better measure strain over the large area between buttresses
- Accelerometers, temperature sensors, and tilt meters for other crucial measurements

Custom Designed
Computer System

Luna Sensor Interrogator
sm130-500

Luna 3610 Long Gage Strain

Luna
Optical Accelerometers

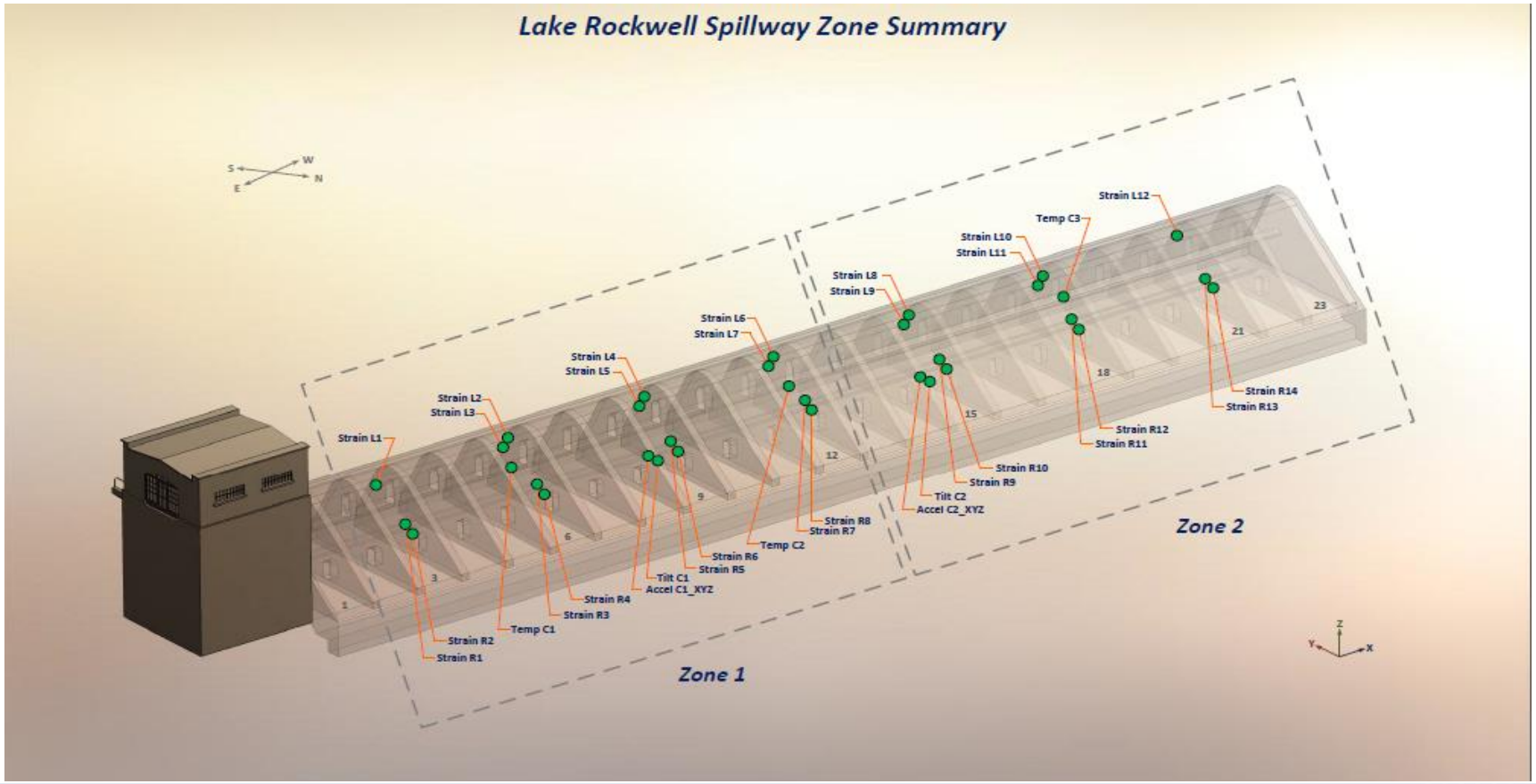
FBG Tech Tilt Meter

Luna 4350 Temp.

Akron Spillway Dam: Sensor Layout

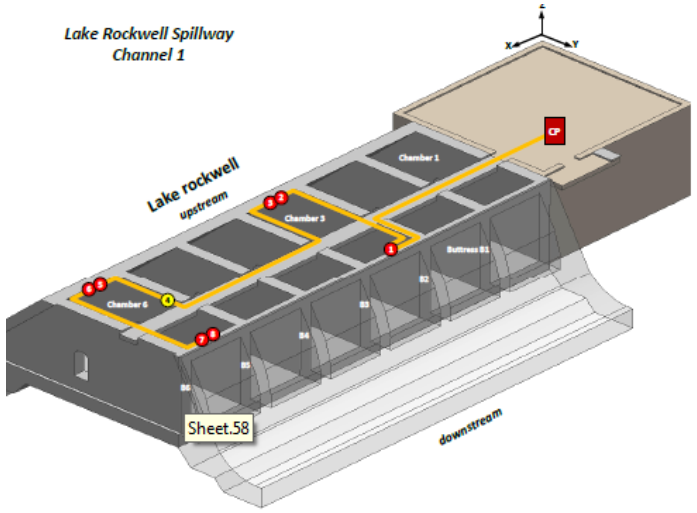
The optical monitoring system is composed of:

- Sensors put into two zones and split among the 4 channels
- 8 sensors installed in series in each channel

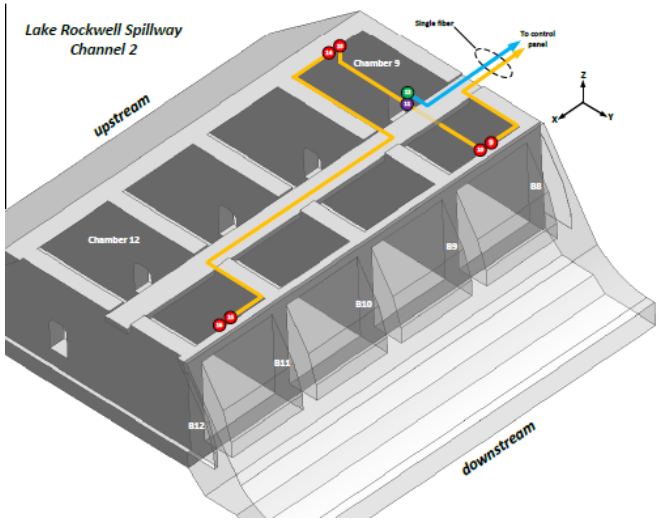


Akron Spillway Dam: Sensor Layout

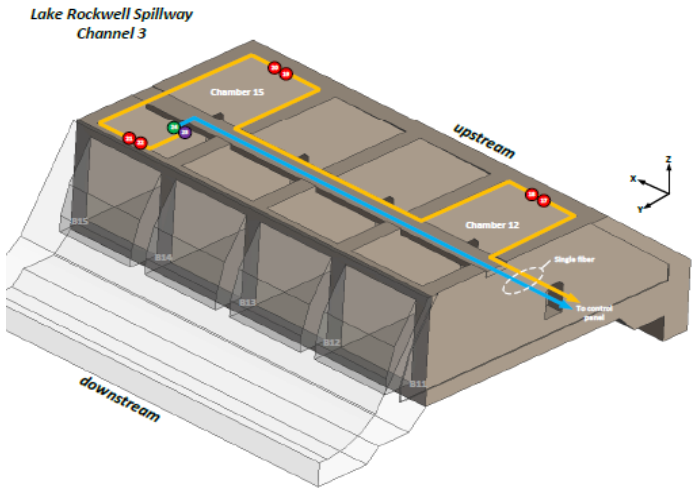
Channel 1



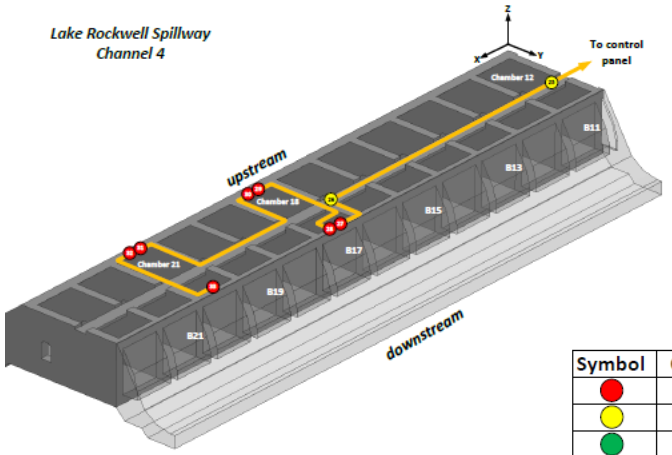
Channel 2



Channel 3



Channel 4

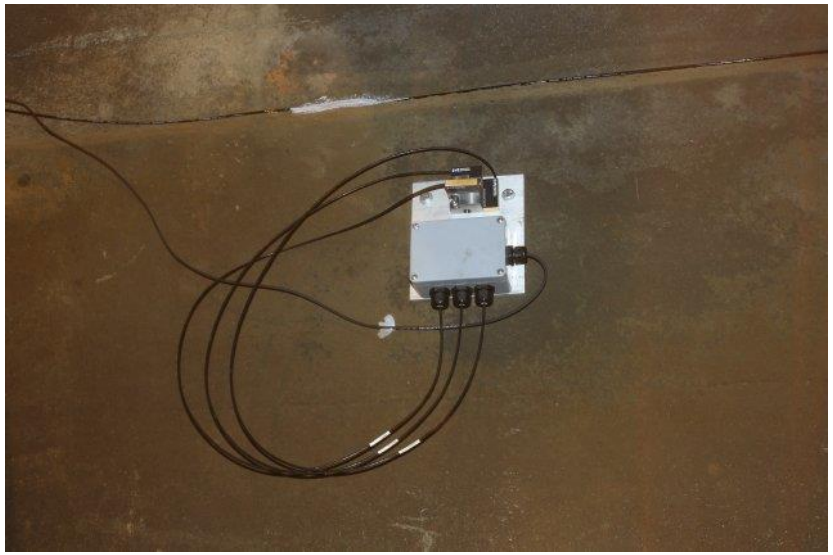


Symbol	Qty	Description
●	26	os3610 100cm strain sensor
●	3	os4350 Temperature sensor
●	2	os7103 3 axis Accelerometer
●	2	FBG-Tech single axis Tiltmeter

Akron Spillway Dam: Sensor Configuration

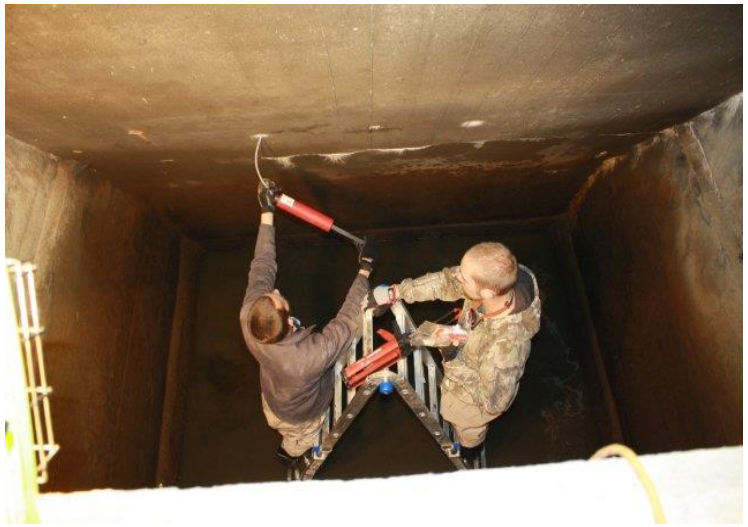
- The os3610s are mounted in pairs along the x and y axis on the centerline between buttresses as the walls between the buttresses are the mostly likely points of failure.
- The optical accelerometers are mounted on the face of the buttresses above the high water line to monitor for seismic activity and the effects of the nearby train.
- Temperature sensors, os4350, are mounted in each zone to monitor air temperature throughout the internal portion of the spillway.

1m os3610 strain gages



3-D accelerometer

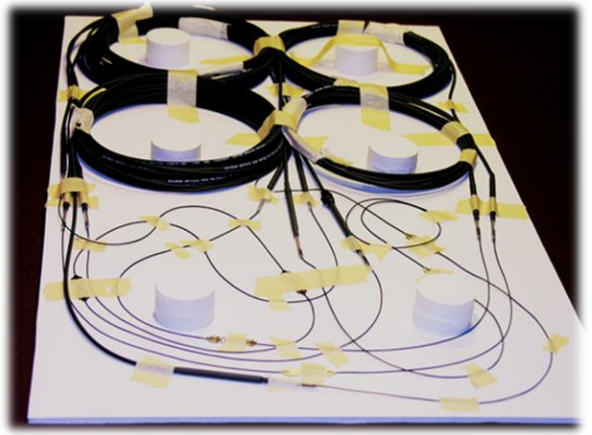
Akron Dam: Installation



- Sensors were run from the control room along the length of the spillway.
- The os3610s were installed by grouting them directly into the concrete walls of the dam.

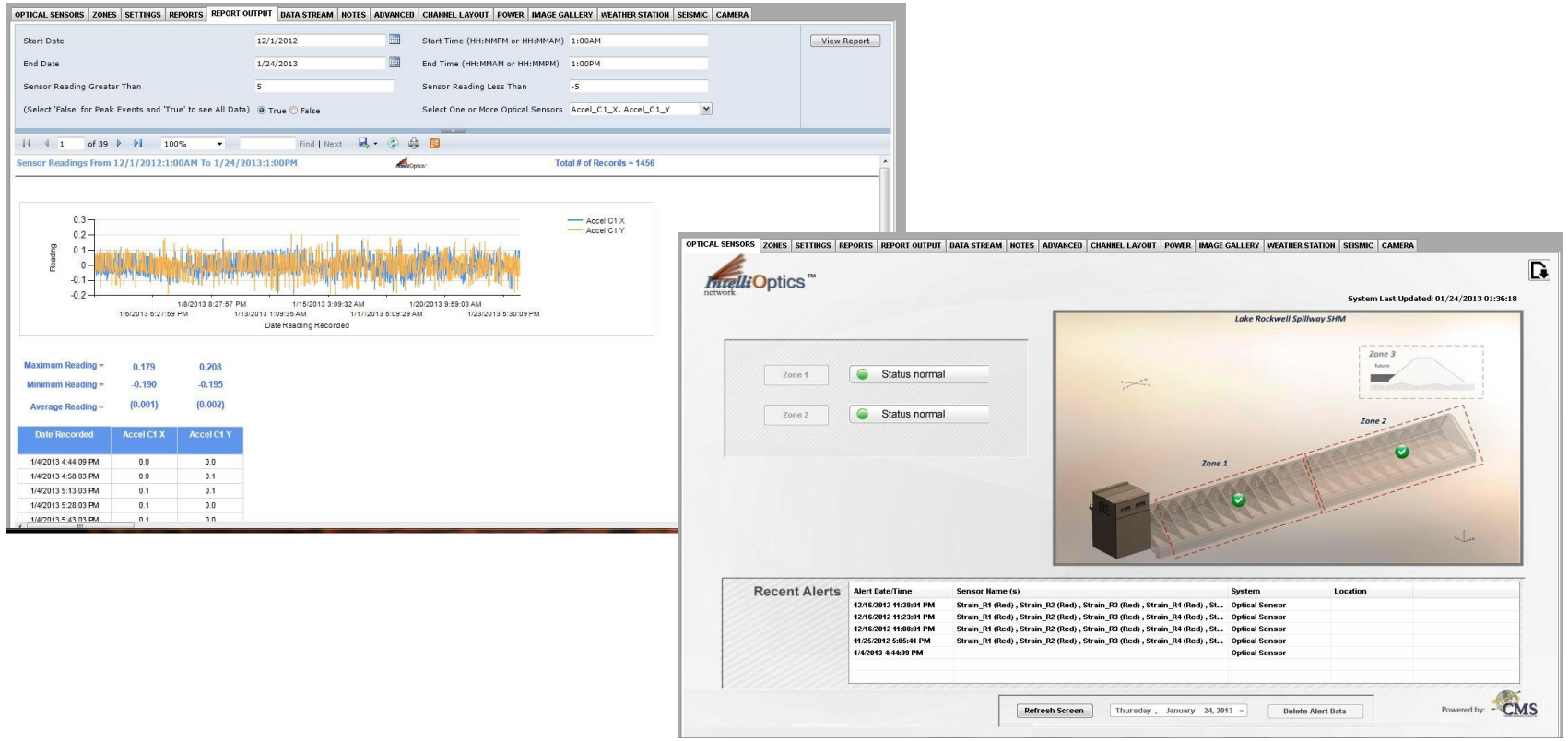
Chandler Monitoring Systems (CMS)

Services	CMS
Installation	CMS installation staff provides end-to-end installation of the SHM (structural health monitoring) systems. The CMS installation staff is insured, certified in safety procedures and trained and experienced in the latest technologies.
Monitoring	CMS provides complete monitoring services including analysis of data and regular customer reports. Included in the monitoring system are defined thresholds for alarms and alerts. CMS provides the customer with complete training on the system description, operation, and maintenance.
Software	CMS provided the customer with the IntelliOptics™ Software package. This is a customized graphical user interface software application package which provides the customer with a single monitoring interface for all of the system components. The IntelliOptics™ system monitors, gathers data, and provide alerts and analysis when various sensing systems approach or exceed established limits.



Akron Spillway Dam: Software

- The IntelliOptics software system gives a total overview of the system and the outputs for each sensor.
- It allows for the user to make notes, check the layout of the sensors, view the cameras set up for security, and much more.
- A key benefit to the system is that it can also be checked remotely and send alerts if something fails.



Akron Spillway Dam: Future Plans

- There are three planned stages for installation of the fiber optic system.
- Stage one is complete and data collection has begun to help determine necessary monitoring for later stages.

Akron Spillway Dam: Acknowledgements

- This work received federal funding and was organized by the City of Akron Water Supply.

- The Authors Wish To Thank:
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Luna Innovations

Tel : 404-325-0005

www.lunainc.com