

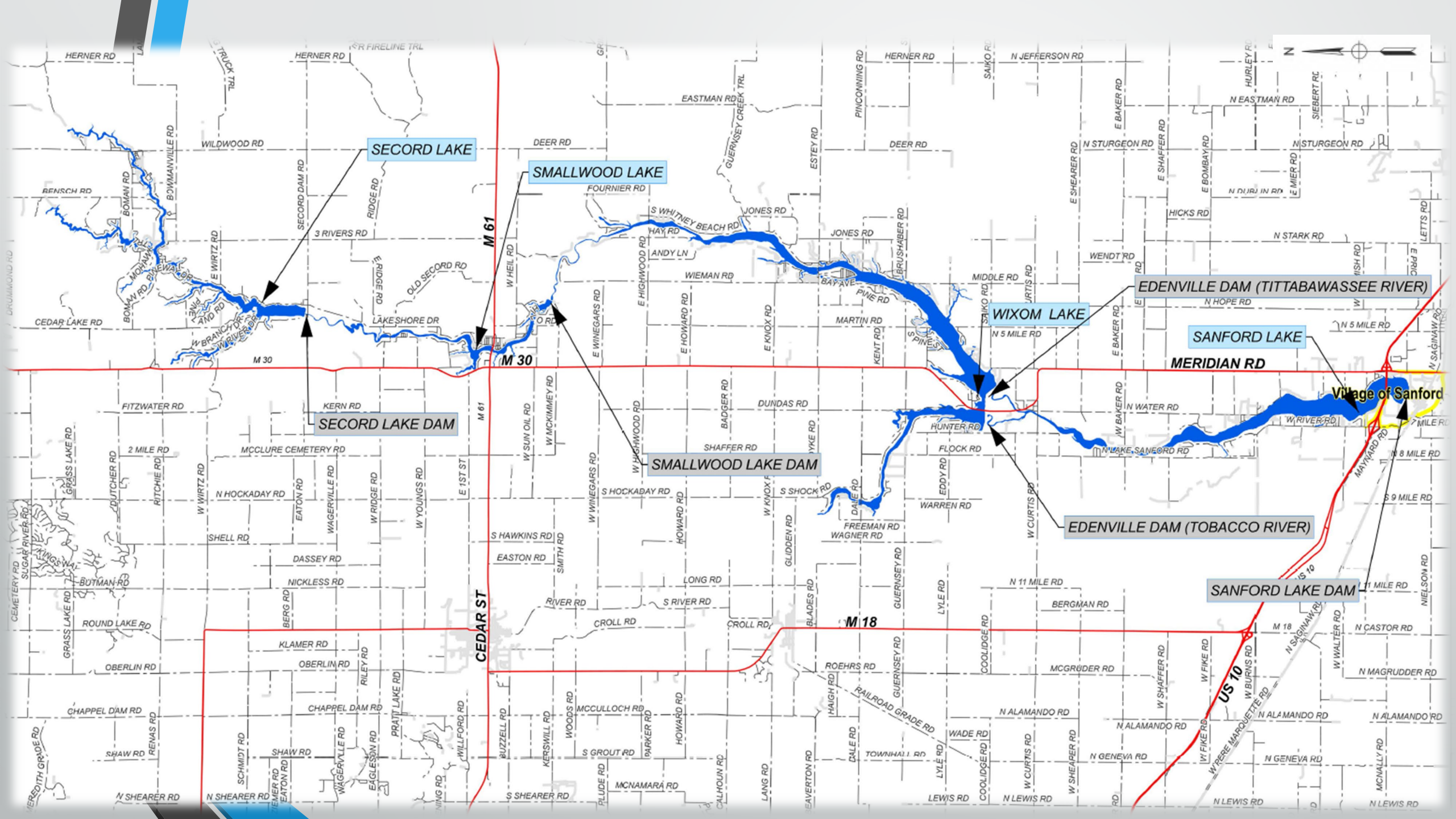


Four Lakes Dams Recovery Update Next Steps

Presenters: Brian Boals & Darrick Huff

PROJECT HISTORY

- Four Lakes
 - Midland and Gladwin Counties
 - Sanford, Wixom, Smallwood, and Secord Lakes
 - Dam impoundments created in 1924 on Tobacco and Tittabawassee Rivers
 - System spans over 45 miles



SECORD LAKE

SMALLWOOD LAKE

WIXOM LAKE

EDENVILLE DAM (TITTABAWASSEE RIVER)

SANFORD LAKE

Village of Sanford

SECORD LAKE DAM

SMALLWOOD LAKE DAM

EDENVILLE DAM (TOBACCO RIVER)

SANFORD LAKE DAM

CEDAR ST

M 18

US 10

PROJECT HISTORY

- Spicer became involved with project in Summer of 2018
- First task was to establish special assessment district (SAD)
 - Completed in May 2019 with Circuit Court Hearing
 - SAD contains 2 counties, 12 townships, and roughly 8,500 parcels
 - Hearing also confirmed Four Lakes Task Force (FLTF) as delegated authority to act on behalf of Midland and Gladwin Counties to maintain Part 307 legal summer and winter lake levels

PROJECT HISTORY

- Second Task was to assist FLTF in acquiring the dams from previous owner (May 2019 to May 2020)
 - Preparation of property transfer of ±300 bottom land parcels (over 6,000 acres)
 - Review of existing facilities
 - Miscellaneous concrete repairs
 - Gate replacement coordination
 - Creating work plans to bring dams up to design standard (approximately \$35M)
 - EGLE and FERC coordination on future construction
 - Purchase agreement was signed and ready to be executed June 2020

PROJECT HISTORY

- May 19th, 2020
 - Edenville Dam – Tittabawassee embankment failed
 - Breach wave ultimately overtopped Sanford Dam
 - 10,000 people evacuated
 - Hundreds of homes destroyed
 - Numerous bridges destroyed



Edenville Dam – Breachway looking south. Taken May 21, 2020

PROJECT HISTORY



Edenville Dam – Head cut erosion downstream of breachway.

PROJECT HISTORY

- Following May 19th, 2020
 - Sanford and Wixom Lake Drained
 - Secord and Smallwood Lake ordered by FERC to be drawn down for inspection



Sanford Dam – Looking Northeast, taken December, 2020

LAKE RECOVERY EFFORT

- June 2021
 - Damage assessment began to determine potential funding for recovery efforts
 - FEMA
 - Drone surveys and field observations to assess damage along lake system
 - NRCS
 - Soil Erosion Education Fair for landowners to report issues
 - NRCS EWP program was most beneficial for stabilization efforts



Wixom Lake – Anderson site, looking south

LAKE RECOVERY EFFORT – SHORELINE EROSION

- Shoreline Erosion Stabilization project
(\$6M)

- 15 culvert outlets
- 31 shoreline projects (approx. 3 miles)
- Spicer's role
 - Engineer of Record for shoreline stabilization designs
 - EGLE permitting
 - Survey assistance
 - Construction administration and inspection



Wixom Lake –Island Drive Site, looking west. Photo taken 4/19/2020 before construction

LAKE RECOVERY EFFORT – SHORELINE EROSION



Sanford Lake -Weeping Willow Site, looking south.
Photo taken 8/5/2020 before construction



Photo taken 5/10/2021 after construction

LAKE RECOVERY EFFORT – DAM STABILIZATION

- Dam Stabilization
 - Secord & Smallwood Dam (\$1.3M)
 - Riprap stabilization in tailrace
 - Spicer's Role
 - EGLE permitting
 - Construction Administration, inspection and material testing
 - SCADA and monitoring system design and implementation



Smallwood Dam – During May 19th event

LAKE RECOVERY EFFORT – DAM STABILIZATION



Secord Dam – Right Training wall repair

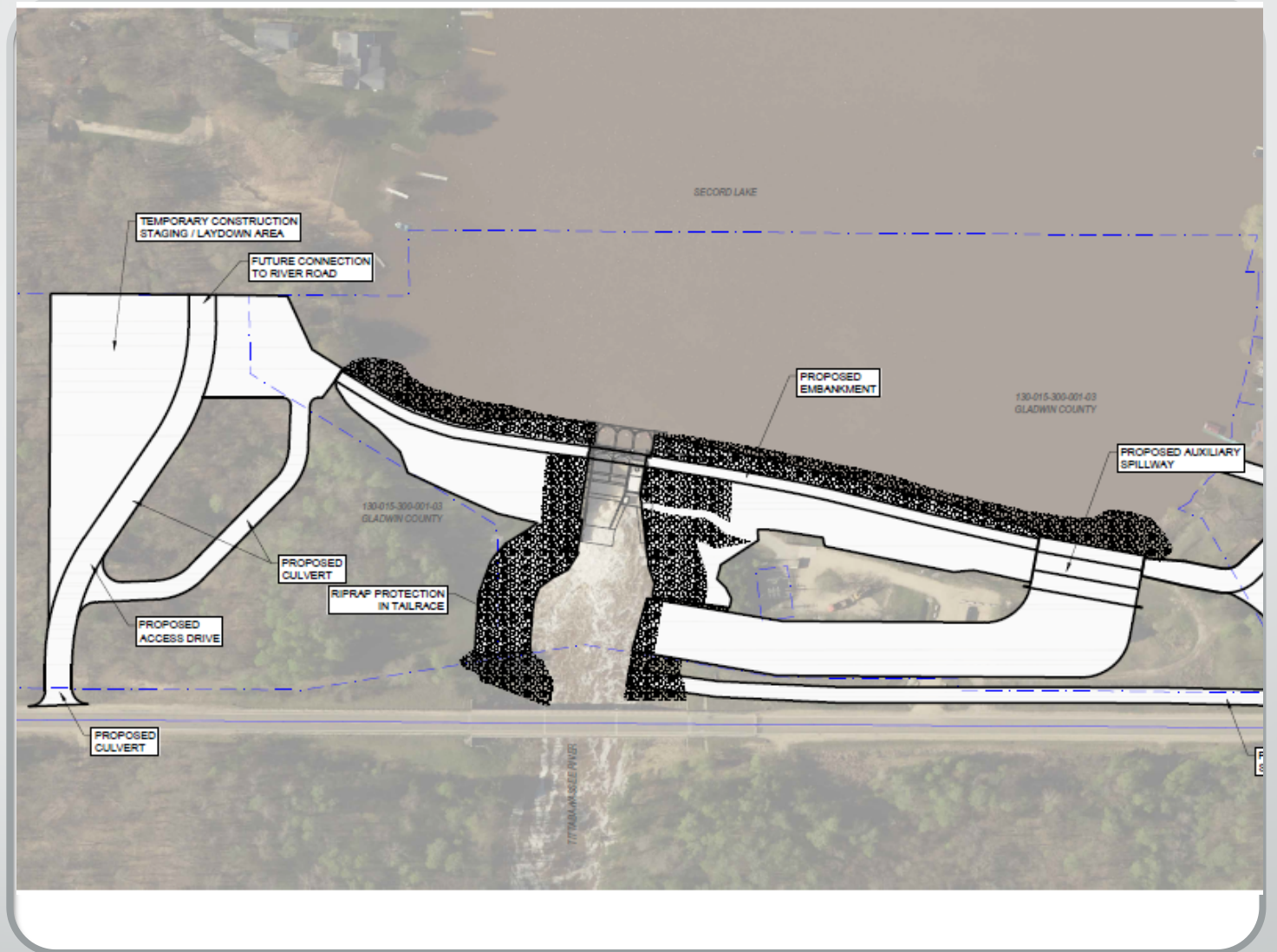


Smallwood Dam – Left embankment stabilization

Secord Dam Reconstruction Overall Site Plan

• Secord Dam Improvements:

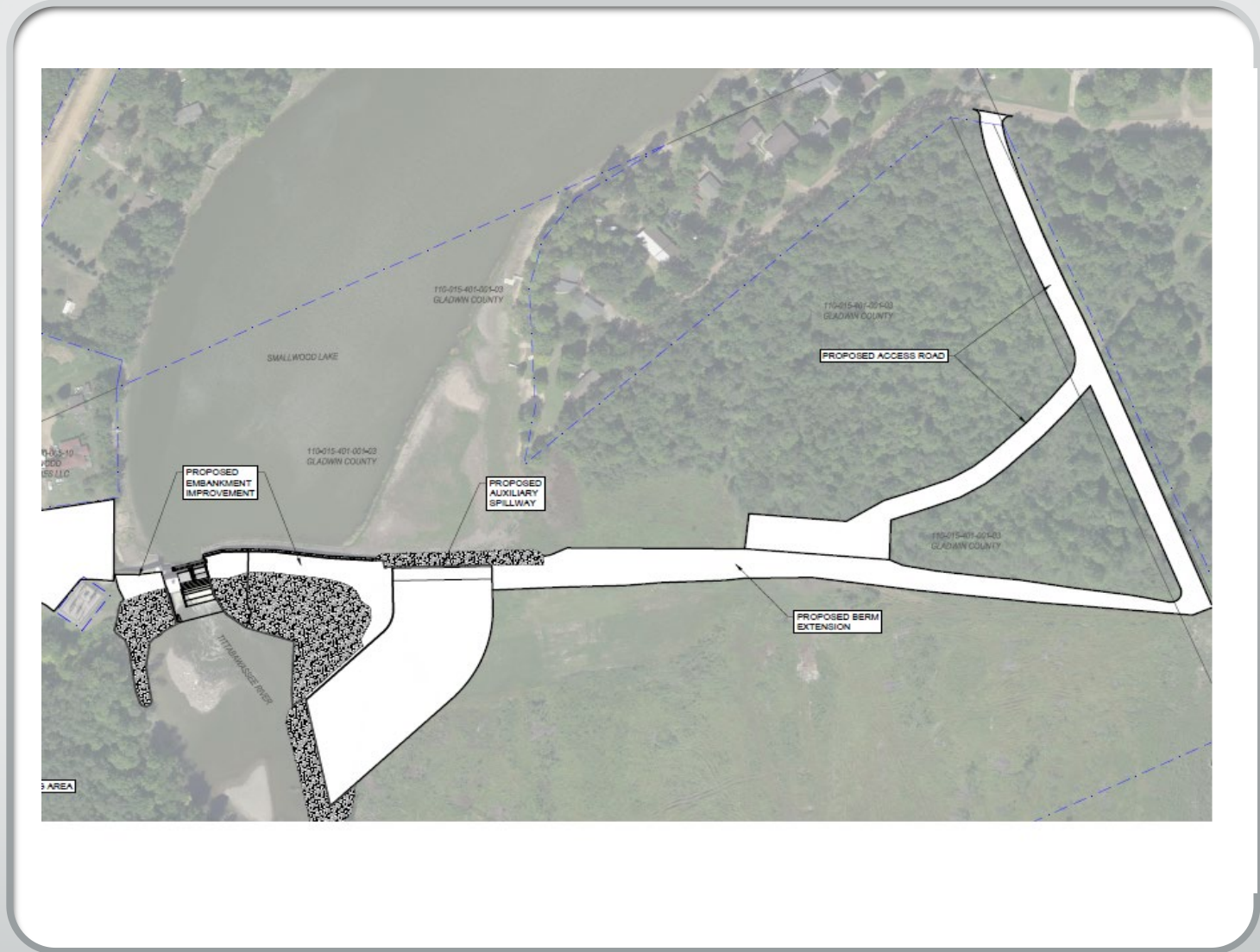
- Extend left embankment
- Improved site access
- Primary spillway upgrades (Crest Gates)
- New auxiliary spillway
- Stabilized embankments
- Beaching erosion protection upstream
- Scour protection downstream



Smallwood Dam Reconstruction Overall Site Plan

• Smallwood Dam Improvements:

- Extend Left Embankment
- Improved Site Access
- Primary spillway upgrades (Crest Gates)
- New Auxiliary Spillway
- Stabilized embankments
- Beaching erosion protection upstream
- Scour protection downstream



LAKE RECOVERY EFFORT – DAM STABILIZATION

- Dam Stabilization
 - Edenville Dam (Phase I)
 - Tobacco Spillway EGLE Emergency project (\$3M)
 - Stabilize Embankments
 - Sheet Pile Cut Off Walls
 - Completed March 2021
 - AECOM and EGLE project



Edenville Dam, Tobacco Spillway – Looking upstream during drawdown

LAKE RECOVERY EFFORT – DAM STABILIZATION

- Dam Stabilization
 - Edenville Dam (Phase I)
 - Tobacco Spillway Sister wall project (\$2.1M)
 - Re-Establish Tobacco River Flows
 - Began June 2021
 - Spicer's Role
 - Permitting
 - Construction Administration
 - Monitoring survey
 - Inspection



Edenville Dam, Tobacco Spillway – Spillway Demo take July 27th , 2021

LAKE RECOVERY EFFORT – DAM STABILIZATION

- Dam Stabilization
 - Edenville Dam (Phase II)
 - Tittabawassee Spillway (\$8M)
 - Demo Existing Tainter Gates
 - Stabilize Embankments/SSP
 - Re-Establish Tittabawassee River Through spillway
 - Construct berm across breach channel
 - Began July 2021
 - Spicer's Role
 - River restoration design
 - Permitting
 - Construction Administration
 - Monitoring and construction survey
 - Inspection



Edenville Dam – September 24, 2021. Exposed Left Side Training Wall

LAKE RECOVERY EFFORT – DAM STABILIZATION



Edenville Dam – Phase II project July 14, 2021



Edenville Dam – Phase II project July 30, 2021

LAKE RECOVERY EFFORT – DAM STABILIZATION

- Dam Stabilization & Debris Removal
 - Debris removal completed Winter 2020 (\$200K)
 - Sanford Dam (\$12M)
 - Began September 2021
 - Demo Existing Tainter Gates
 - Stabilize Embankments/SSP
 - Re-Establish Tittabawassee River Through spillway
 - Construct berm across breach channel
 - Spicer's Role
 - Permitting
 - Construction Administration
 - Monitoring and construction survey
 - Inspection



Sanford Dam – Debris accumulation on Dam, taken October 2020

LAKE RECOVERY EFFORT – DEBRIS & SEDIMENT

- Debris and sediment removal (\$8.8M)
 - Estimated 87,500 cubic yards of sediment
 - Approximately 4,000 trees
 - 6,000 cubic yards of miscellaneous debris



Debris accumulation near M30 in Village of Sanford

LAKE RECOVERY EFFORT

- Project partners
 - GEI Consultants (Engineer of Record for Dam repairs)
 - NRCS (Funding Stabilization projects)
 - USDA Rural Development (Funding Dam Reconstructions)
 - Streamside/Merjent/CMU (Environmental)
 - FLTF volunteers
- Regulatory Coordination
 - EGLE
 - MDNR
 - USFW
 - MDOT

LAKE RESTORATION EFFORT

- Dam reconstruction to bring lakes back
 - Secord Dam – \$24M
 - Smallwood Dam – \$16M
 - Edenville Dam - \$150M
 - Sanford Dam - \$50M
- Projects will run through 2026 with construction planned to begin Winter of 2022
- Spicer departments involved
 - Applied Tech & I.T
 - Survey
 - Planning
 - Municipal
 - Electrical
 - Construction services
 - Water Resources

OTHER ACTIVE TASKS

- Other On-going efforts
 - Creating SAD methodology
 - Lake restoration planning and environmental coordination
 - Recreation planning
 - Data management
 - Administration & program management
 - Property management
 - Operations assistance
 - Public relations
- I.T. support
- Public GIS web map creation and maintenance
- and much more

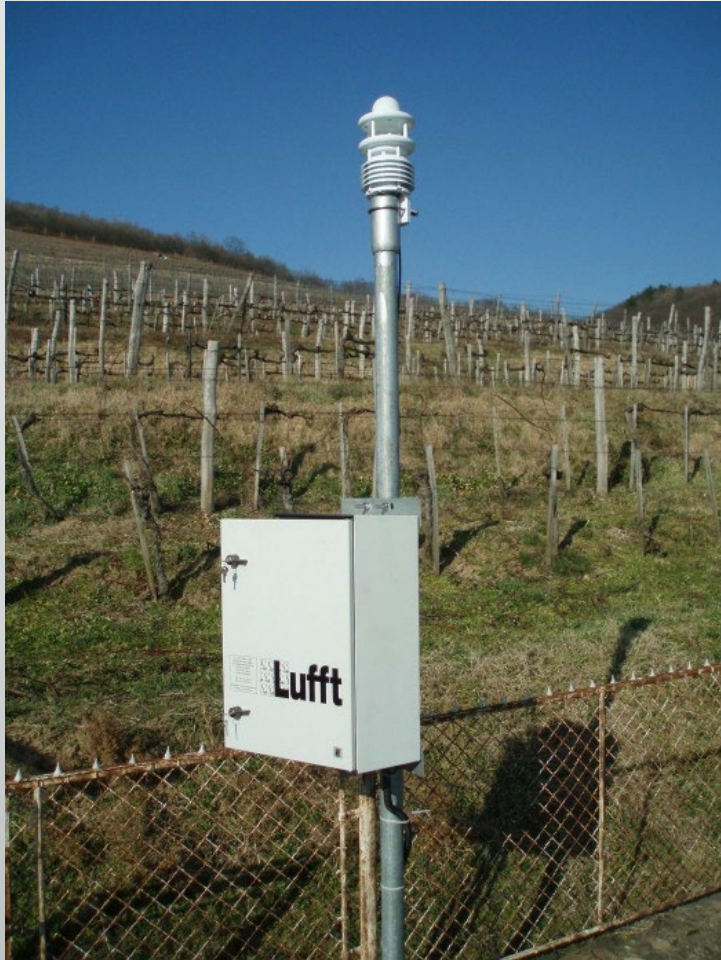
Instrumentation

Four Lakes Task Force



Four Lakes Task Force

Weather Stations



- Installed at each Dam
- Data Shared with Stakeholders
- Other locations and funding being investigated

Flow Gauges

FLTF will have calculated flow at each dam

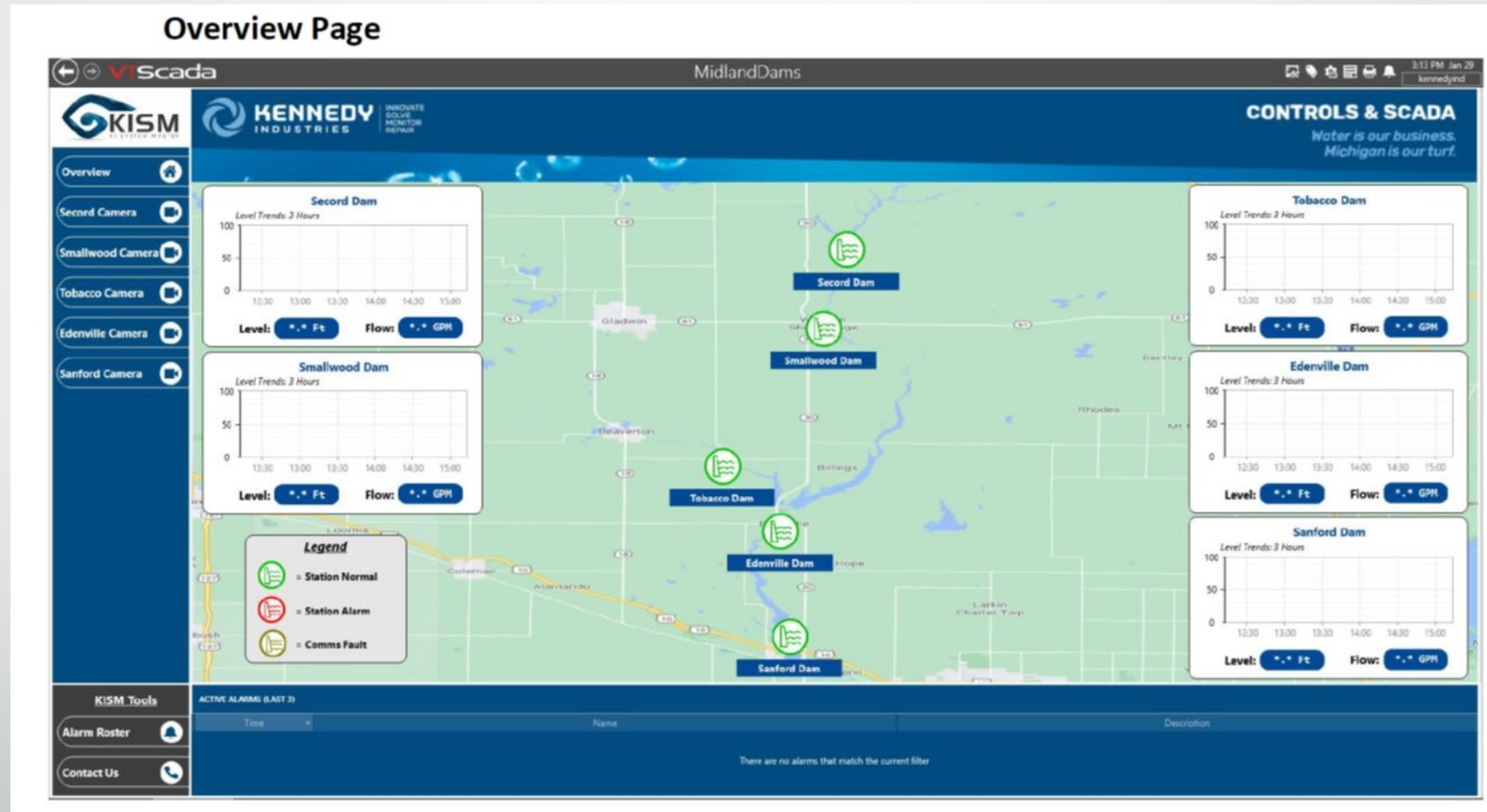
USGS staff gauges will be tied into the FLTF system as well

Secord Dam Rd.

Salt River

Chippewa River

Sanford Dam



SCADA



Alarming

Lake Levels

Flows

Power Monitoring

Dissolved Oxygen

Temperature

Site Security and Monitoring

Coordination

- Training will be provided for stakeholder access
 - ▣ County Emergency Management
 - ▣ Law Enforcement
 - ▣ Downstream Communities
- Data will be shared with NOAA and USGS
- Data will be available to the public



Questions