

An aerial photograph of a vast, forested mountain range in Ohio, likely the Appalachian Mountains. The terrain is rugged and covered in dense green trees, with several peaks and valleys visible. The lighting is soft, suggesting a hazy or overcast day. The text is overlaid on the upper portion of the image.

Impacts to Structures, Concrete Erosion, and Inspection

Tappan, Leesville, Piedmont and Clendening Dams - Ohio

Thomas Plummer

WOTS

July 30, 2002

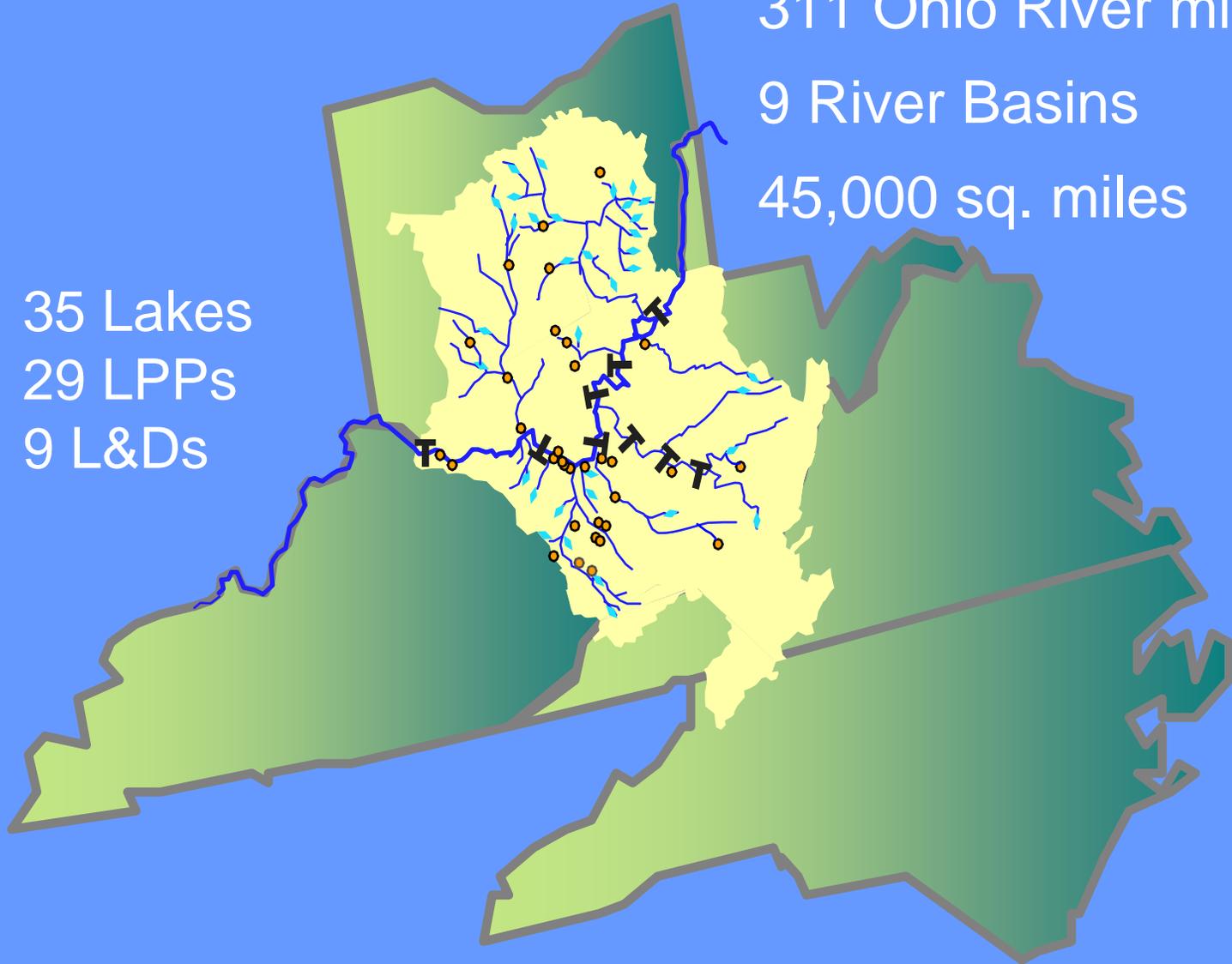


311 Ohio River miles

9 River Basins

45,000 sq. miles

- ◆ 35 Lakes
- 29 LPPs
- ⊥ 9 L&Ds





14 Original Projects

**MUSKINGUM
RIVER
BASIN**

Presentation Overview

- Basin and projects
- Structures
- Inspections / Investigations / Trials
- Monitoring

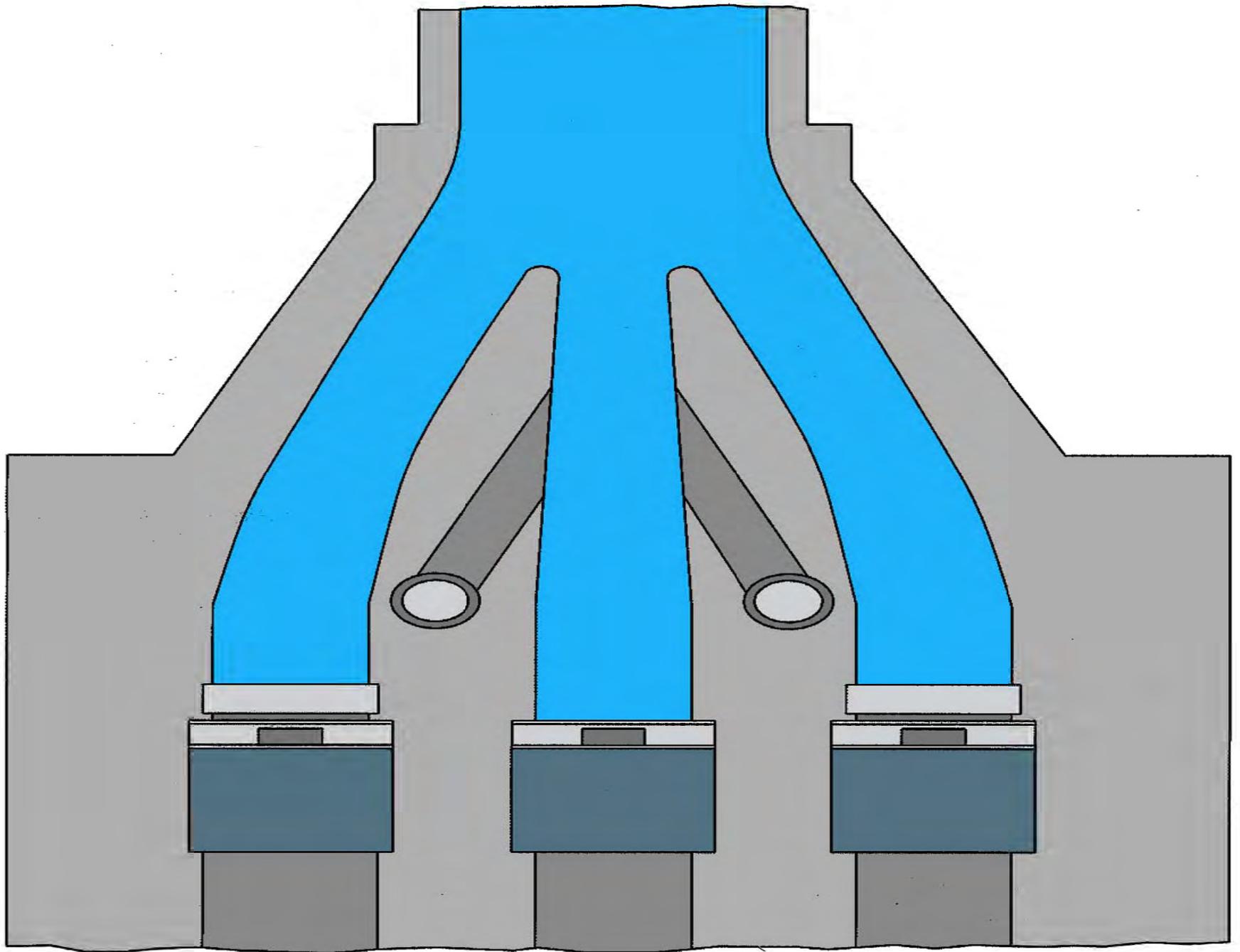
14 Muskingum River Projects

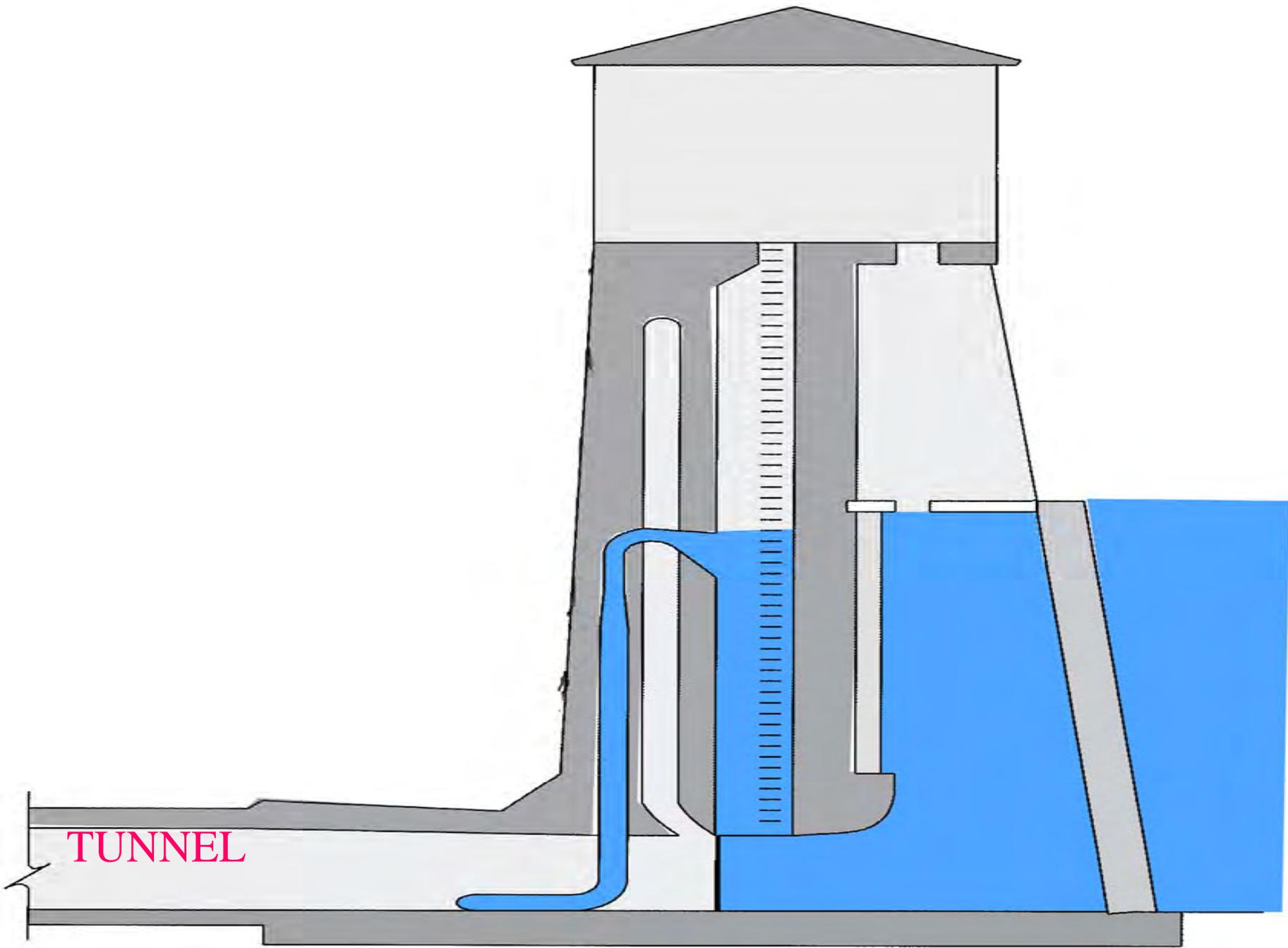
- Project construction 1935 -1937

Site soils and geology

- Winding streams – well dissected upland
- Hills rise 100 to 150 feet
- Valley fill to a depth of 100 feet (fine sand, silt and clay)
- Bed rock in area consists of sandstone and shale of the Conemaugh formation
- Area strip mining







TUNNEL

Inspections

- 7 Periodic Inspections – 1st 1968 & 1970 →
- Deterioration reported during 1st inspection
- Deterioration continues

Miscellaneous Paper C-77-9

- Acid Attack of Concrete Caused by Sulfur Bacteria Action (Piedmont & Clendening Dams)
- Henry T. Thornton, Jr. – 1975 to August 1977
- Concrete coring
- Compressive strength and pulse velocity measurements
- 9000 to 6000 psi
- Acid-soluble carbonates in aggregate missing

WOTS request No. 94-31

- Steve Ashby and Steven Wilhelms
- Request for assistance
- Eliminate the hydrogen sulfide from the release flows
- Coat tunnel with acid-proof coatings

Intermediate Activities

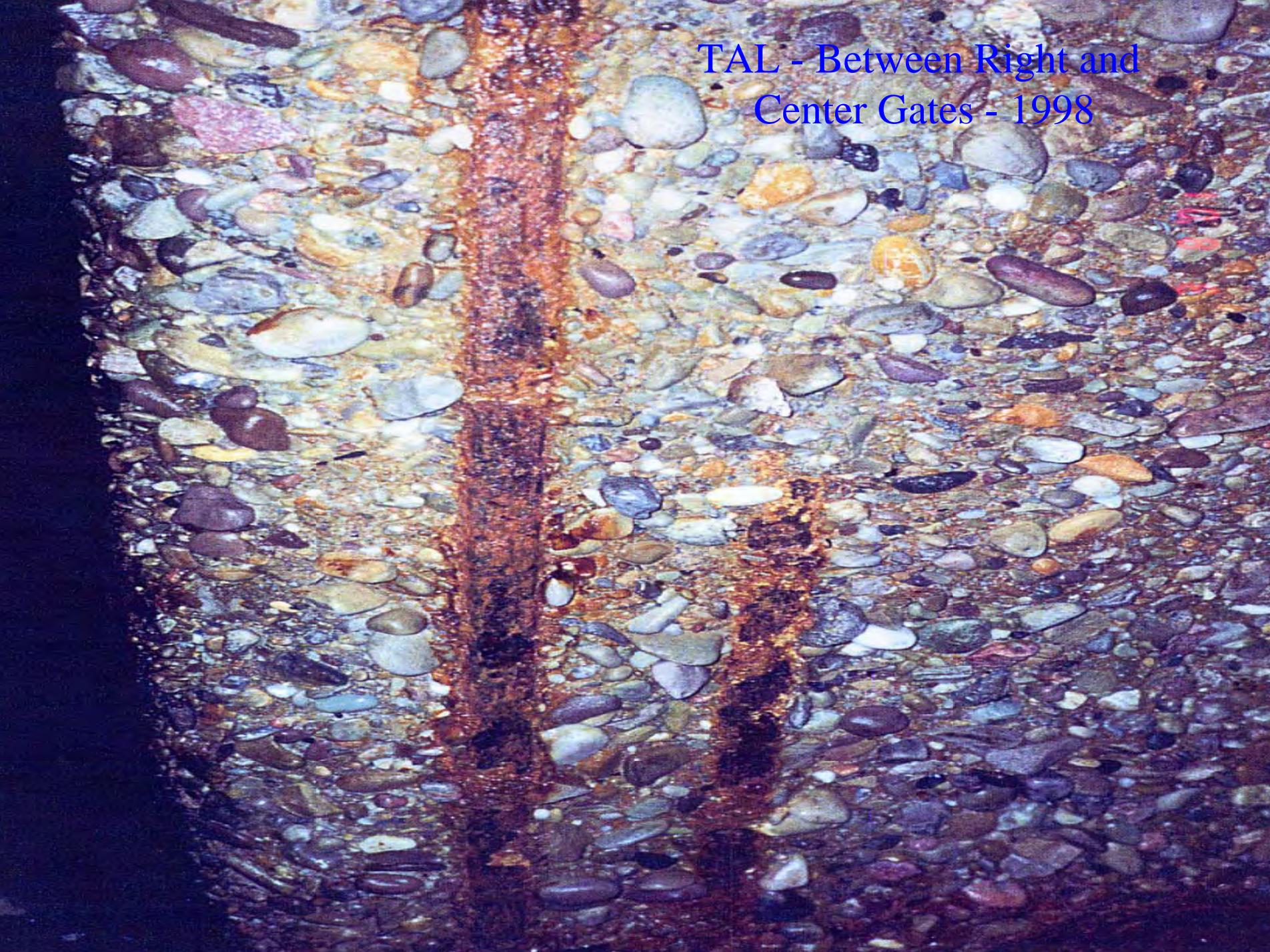
- Structural analysis
- Forced ventilation toward tunnels
- Interim washing
- Raising intake – take upper level water
- Coatings
- Seattle / WES (RC-850 and DP-36)

PES – Core patch near middle wall of sluices



3 1 '01

TAL - Between Right and
Center Gates - 1998





3 8 10 1



100
8
3





3 7 01

TAL - Bricks in Ceiling near Transition



1085

Profometer Rebar Locator

- Manufacturer test block
- Reinforced concrete slab and measured depths
- Bar diameter input – 1 bar diameter test
- Profometer – Measure depth of concrete cover
- Accuracy (0.08 to 0.10 inch from measured)
- Influence of intersecting steel
- Location and documentation
- Verify steel location

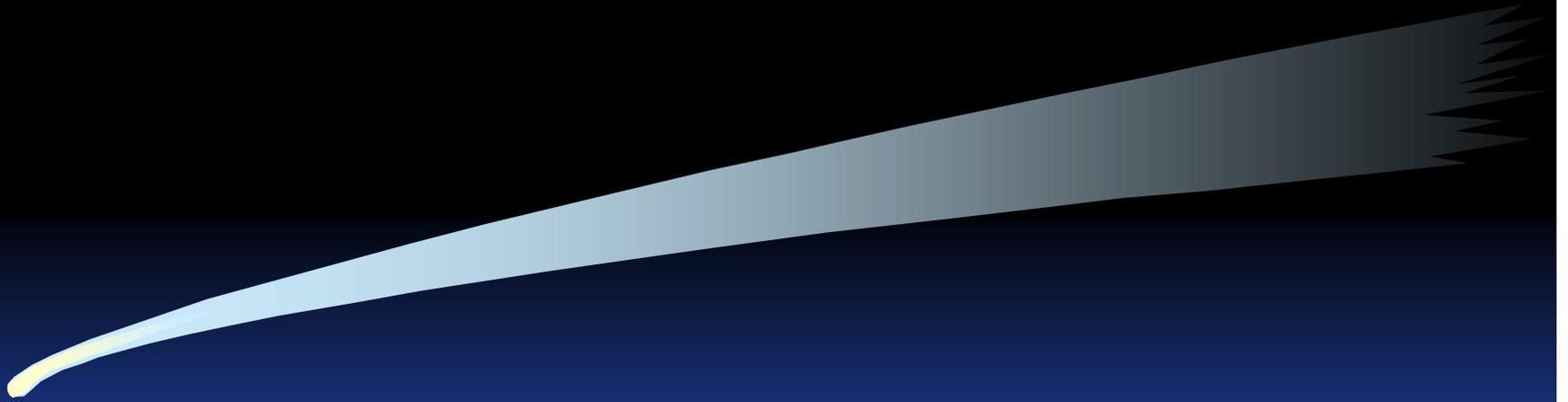
Rebar Locator

- Corvib (Profometer)
- 800-297-3208
- www.corvib.com/profometer/

Deterioration Summary

- Observed $\frac{1}{4}$ inch 1968 and 1970
- Estimated total loss $2 \frac{1}{4}$ inches of concrete
- 1998 – 2001 (general $\frac{1}{4}$ to $\frac{1}{2}$ inch) – 2002
?

Available
Funding



Assessments →
Remedial
Measures

Our Team



An aerial photograph of a mountainous region. A dirt road winds through a valley, leading towards a small settlement with several buildings. The surrounding hills are covered in dense green forest. The sky is overcast with grey clouds.

Questions