Instrumentation Failure and Embankment Breach Taum Sauk, Missouri

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FERC Response to the Taum Sauk Embankment Breach

Daniel J. Mahoney, Deputy Director
Division of Dam Safety and Inspections

Immediate Response

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- Dispatched FERC Team to the Site
- Focused on Insuring Site Stabilization
- Safety Check on Lower Dam
- Initial Information Collection

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FERC Action Plan

- Require 12.10 Report – Conditions Affecting the Safety of the Project
- Formed FERC Investigation Team
- Convened an Independent Panel of Consultants
- Coordination with State Dam Safety and Resource Agencies
- Compliance with Project License
- Issue Report with Conclusions

Independent Panel of Consultants

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- Dr. Alfred J. Hendron, Jr.
- Joseph L. Ehasz
- Kermit Paul

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Independent Panel of Consultants

- Investigation Independent of FERC Team
- Numerous Information and Data Requests
- Site Visits and Interviews with Ameren and FERC Managers and Staff

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Results of Investigation

- 12.10 Report – Rizzo Report
- FERC Investigation Team Report
- IPOC Report
- Information and Conclusions Consistent

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Project Description

- 100-Foot High Concrete Faced Rock Fill Embankment
- 10-Foot High Parapet Wall
- Operation – 2-Foot of Freeboard

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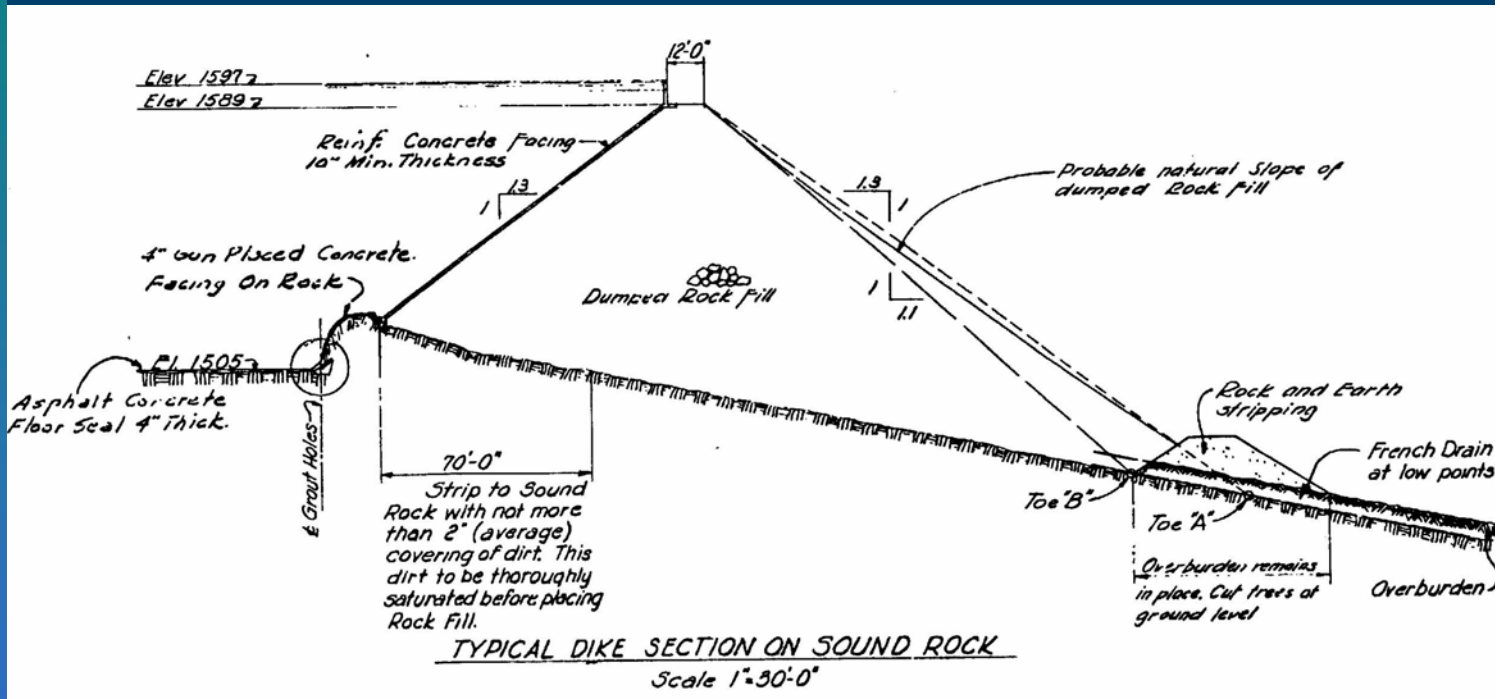

Cross Section from Original Design Drawings

Long Term Settlement of CFRF Dam

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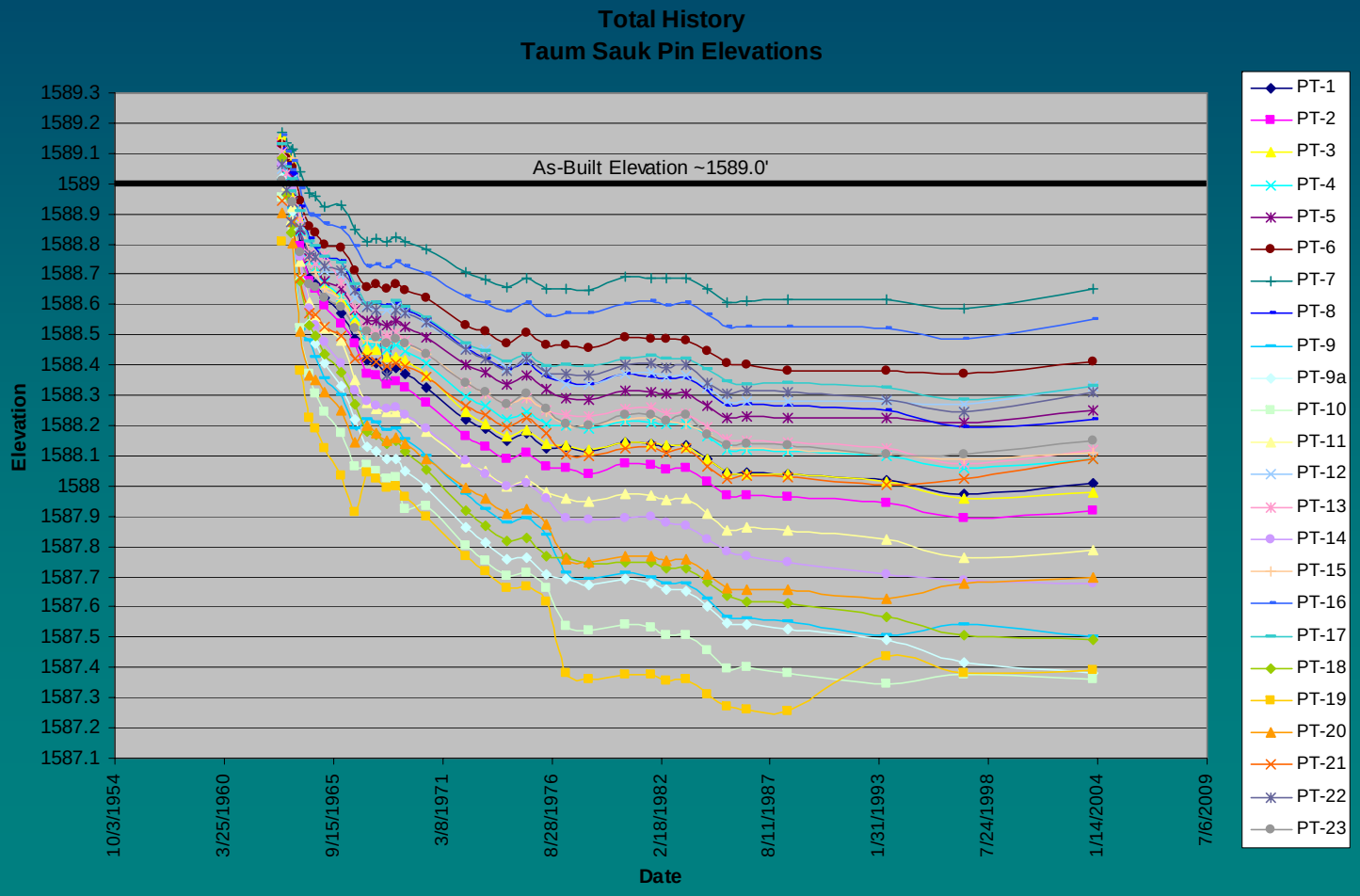

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Conclusions of IPOC Report

- Adopted by FERC
- Primary Cause of Breach
- Primary Root Causes of Breach
- Secondary Root Causes of Breach

Conclusions of IPOC Report

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Primary Cause of Breach was Overtopping of the Parapet Wall and Embankment

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Conclusions of IPOC Report

Primary Root Causes of Breach Were Those Factors Which Caused Overtopping to Occur

These were:

Conclusions of IPOC Report

Primary Root Causes of Breach Which Caused Overtopping to Occur

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- The Pressure Transducers that Monitored Reservoir Water Levels Became Unattached From Their Supports Causing Erroneous Water Level Readings

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Conclusions of IPOC Report

Primary Root Causes of Breach Which Caused Overtopping to Occur

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- The Emergency Backup Level Probes Were Set at an Elevation above the Lowest Points Along the Parapet Wall; Thus, They Failed Their Protection Role Because This Enabled Overtopping to Occur Before the Probes Could Trigger Shutdown

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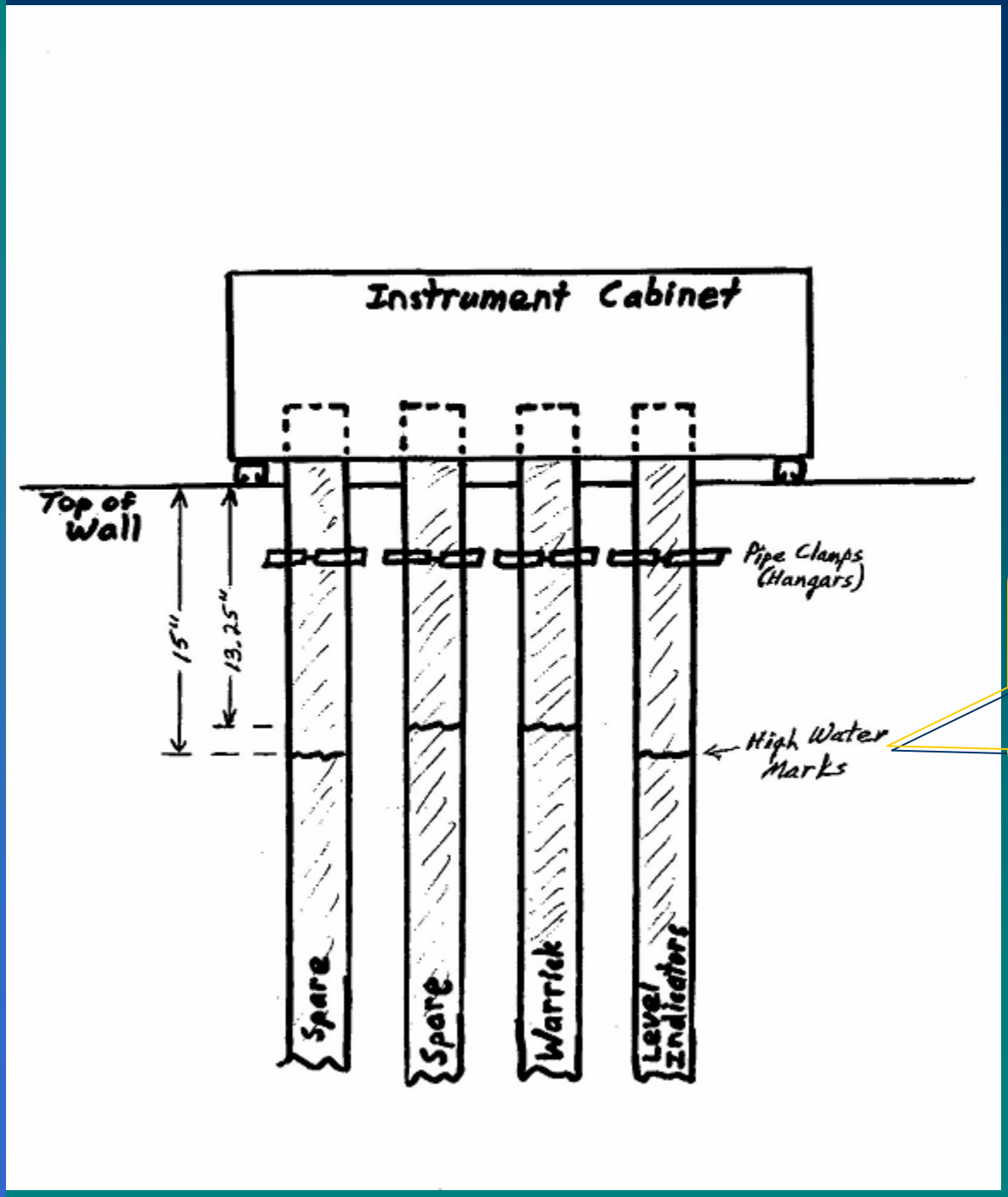

1596.90

1596.75

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Upper Ends of Protective Pipes With Instrument Cables in Enclosure on Parapet

Pressure Transducers Use Left Pipe and Conductivity Probes Use the Second Pipe From Left

Conclusions of IPOC Report

Primary Root Causes of Breach Which Caused Overtopping to Occur

- The Normal Operating High Water Levels of 1 foot Below the Top of the Parapet Wall Was Too Near the Top of the Wall to Allow for any Mistakes of Mis-Operation
- Visual Monitoring of the Upper Reservoir Water was Almost Non-Existent and There was no Systematic “Ground-Proofing” Recorded of the Relationship of the Top of the Wall and Associated Water Levels Actually Being Achieved
- There Was no Overflow Spillway to Safely Carry Accidental Over-Pumped Water Downstream and Below the Dam

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Conclusions of IPOC Report

Secondary Root Causes

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Those Factors Which Combined to Make This Embankment More Vulnerable to Failure by Overtopping:

Conclusions of IPOC Report

Secondary Root Causes

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The Marginally Stable Dumped "Dirty" Rockfill Constituted An Unforgiving Containment Structure.

It Could Not Tolerate the Additional Pore Pressures and Erosive Effects of the Overtopping Water Plunging Over the Top of the Parapet Wall onto the Narrow Dam Crest and Cascading Down the Steep 1.3:1 Slope

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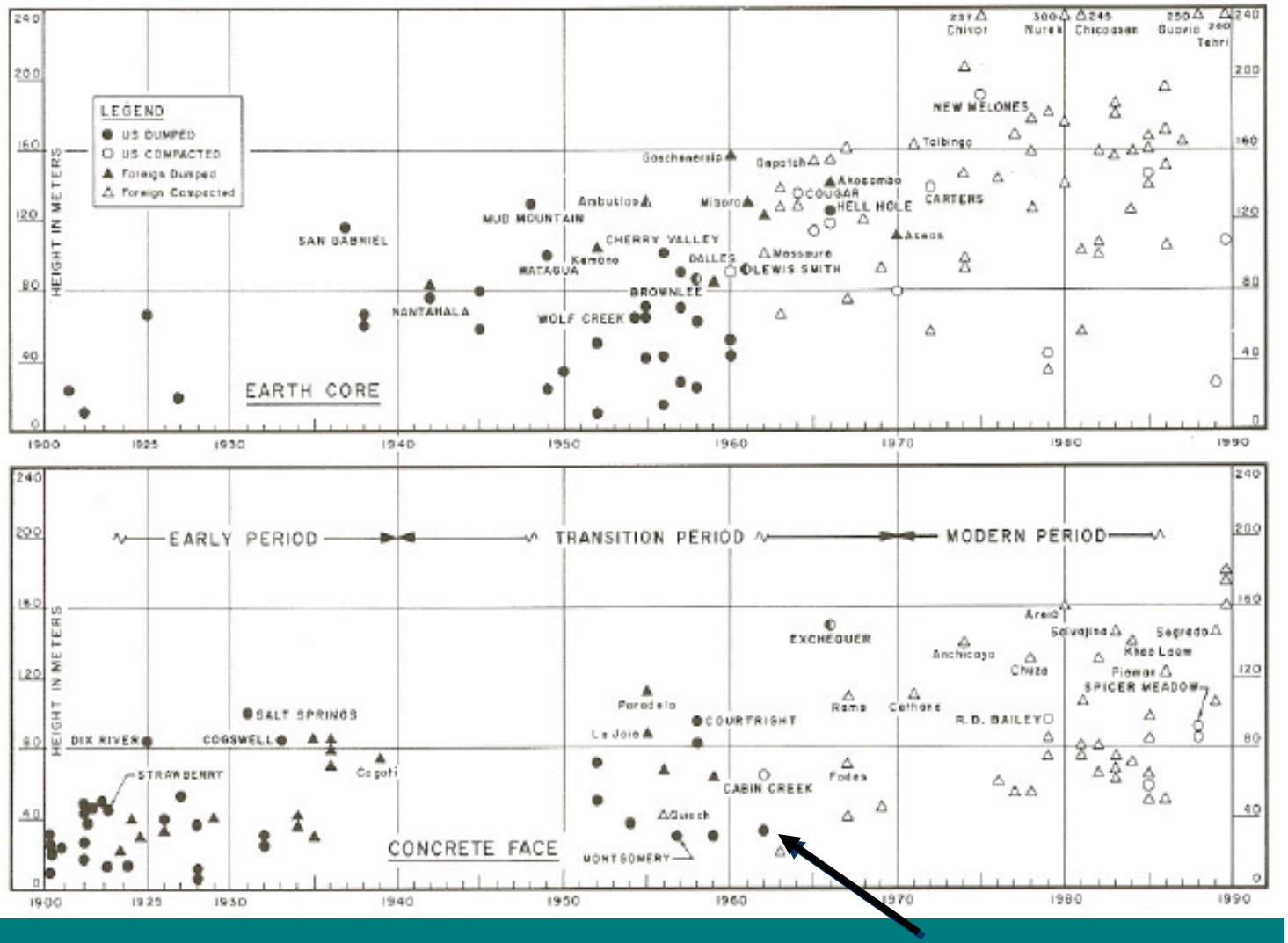

Taum Sauk U.R.

Trends in Type and Height of Rockfill Dams

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To View FERC's Incident Description, Project Description, Action Plan, Reports and Photo Gallery Visit This Link:

http://www.ferc.gov/industries/hydropower/safety/projects/taum-sauk.asp

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- Ameren's Dam Safety Program

Tom Hollenkamp