Executive Briefing Paper
Weiser-Galloway Project Studies: Results and Status Report
November 4, 2013

IWRB Work Session: An update on Weiser-Galloway project activities will be provided at the Idaho Water Resource Board's (IWRB) work session on November 19, 2013. The U.S. Army Corps of Engineers (Corps) will present results of the geologic analysis at the Galloway dam and reservoir site, and will discuss progress and preliminary results of the operations analysis. Materials included in the IWRB workbooks include: the Executive Summary from the *Foundation Investigation and Evaluation, Weiser-Galloway Potential Damsite, September 2013* (final report will be provided at the IWRB meeting), a copy of Corps presentation of the final results from the geologic investigation, and a briefing memorandum on status the Weiser-Snake River Operations Study.

No action is required by the IWRB at this time.

Project Background: Water storage on Weiser River and at the Galloway site has been studied for decades -- the Corps first received a study authorization resolution for the Galloway Project from the U.S. Senate Public Works Committee in 1954; and, in the early 1970s Federal lands for the potential Galloway dam and reservoir site were classified and withdrawn for hydropower purposes by the Federal Power Commission (now the Federal Energy Regulatory Commission). In 2008, the IWRB was directed by the Idaho Legislature through House Joint Memorial 8 (HJM 8) to investigate water storage projects statewide, including the Weiser-Galloway Project. Potential project benefits include flood risk reduction, hydropower, additional water storage, pump back, irrigation, regional economic development, recreation and flow augmentation requirements for anadromous fish recovery.

Gap Analysis (March 2011): In response to HJM 8, the IWRB partnered with the Corps to publish the *Weiser-Galloway Gap Analysis, Economic Evaluation and Risk-Based Cost Analysis Project* (Gap Analysis), completed in March 2011. The Gap Analysis was a comprehensive review of earlier studies of the potential Galloway Dam and Reservoir site by the Corps from 1983-1994. It provided an analysis of gaps in information in the earlier studies and incorporated events, knowledge and information affecting Idaho and the Snake River Basin that have developed since the earlier studies were performed. Its focus was on the future water supply and management needs of Washington and Adams Counties, the City of Weiser, the State of Idaho, and the Weiser and Snake Rivers.

The gap analysis was specifically designed to inform decision makers of critical gaps to be addressed before deciding whether to move forward with comprehensive new environmental, engineering and economic feasibility studies. The analysis examined 181 gaps and identified two critical gaps that required resolution: 1) Determine the safety, suitability and integrity of geologic structures at the potential dam and reservoir site; 2) Evaluate whether basin and regional benefits would be realized by analyzing a series of system operating scenarios with new storage on the Weiser River.

On July 29, 2011, the Idaho Water Resource Board authorized expenditure of up to $2 million to analyze the forgoing gaps. Both studies are being conducted jointly between the IWRB and the Corps.

Geologic Investigation (Complete): The *Foundation Investigation and Evaluation, Weiser-Galloway Potential Damsite, September 2013* is intended to determine the suitability of the geologic structures at the potential dam and reservoir site. Clays, tuffs, and ash were found by the Corps during limited 1984 core drilling of dam site abutment structure. To rule out potential structural weakness and seepage potential for the dam and reservoir site, additional core drilling and geologic investigation was performed. Findings of the geologic investigation will be presented at the IWRB's November 19, 2013 work session. The general scope of the analysis included the following:

- Six holes and 1537.8 feet of core were drilled in the abutments of the potential dam site;
- Permeability, strength and materials testing was performed on selected core samples and possible embankment materials located near the site;

- Geologic mapping was performed, as well as investigation of foundation conditions, seepage and permeability, slope stability, seismic hazards, potential borrow areas at and around the dam reservoir site;
- Evaluation of possible dam types (e.g. embankment dam) and modifications to the structure proposed in the 1980's Corps studies (including areas of potential cost savings);
- Cost figures were updated;
- Identification of data gaps and recommendations for additional technical analysis to be pursued during a design phase.

Operational Analysis (Ongoing): The *Snake River System Operational Analysis Project* will analyze a range of scenarios that seek to optimize system operation with approximately 750,000 acre-feet of new water storage capacity on the Weiser River. The analyses will consider the needs of the Hells Canyon Complex, Snake River System, and the Weiser River Basin including Washington and Adams Counties. Coordination and validation by IPCO, BOR, BPA and NOAA is critical to the process. The analysis will schedule and shape the new storage to maximize:

- Flood risk reduction, irrigation, recreation and hydropower benefits for Weiser, and surrounding areas in Washington and Adams Counties;
- Supplemental water supply for local canal and irrigation companies;
- Economic benefits to the water storage systems on the Boise, Payette and Upper Snake Rivers through potential substitution and relief of up to 40,000, 160,000 and 200,000 acre-feet of water currently released respectively from those basins to meet anadromous fish flow augmentation requirements;
- Potential benefits to the Lower Snake for temperature reduction during the summer;
- Positive and/or negative impacts to hydropower for the Middle Snake and Hells Canyon Complex generating facilities and Lower Snake/Columbia River system;
- Integration with State water management policy including obligations set forth in the 2004 Snake River Water Rights Agreement (Nez Perce Agreement) regarding salmon flow augmentation, the 2009 Swan Falls Reaffirmation, and the Hells Canyon relicensing criteria.

During the work session presentation, the Corps will provide an overview of the work completed to date including development of the reservoir model, integration with the Snake River through the Hells Canyon Complex, and preliminary findings of the project economics. A briefing memorandum from the Corps with additional details on the study will be provided in the IWRB's workbooks and on the IWRB webpage.

Budget and Timeline (for ongoing studies)

1. Geologic Investigation:
   - $1.3 million (includes federal matching funds - Corps and IWRB partnership)
   - Drilling was completed in November 2012; results and final report will be presented in November 2013.
2. Operational Analysis:
   - $700,000 (includes federal matching funds - Corps and IWRB partnership)
   - Initiation of the operational analysis was held until preliminary results of geologic study were available.
   - Completion is anticipated by spring 2014.

Quick Project Facts (based on original 1987-89 USACE studies)

1. Located on the Weiser River, approximately 13.5 miles east of Weiser, Idaho, and its confluence with the Snake River.
2. Project consisted of a potential 300 foot high, 1,200 foot long, earth and rock-fill embankment dam, and approximately 900,000 acre-feet of water storage (a slightly smaller structure is being considered in the current studies based on the updated yield analysis).
3. Reservoir at full capacity would potentially inundate 6,918 acres of land (4,608 acres of private lands, 2,017 acres of federal lands, and 293 acres of former Northern Pacific Railroad – now the Weiser River Trail).
4. The total current project cost is estimated to be $502 million (2011). Some 78% of this cost is for contingencies per the Corps cost-risk calculation methodology. Without contingencies, the costs are estimated to be some $310 million. (Approximately $350 to $550 per acre-foot capital cost).

FOUNDATION INVESTIGATION AND EVALUATION WEISER-GALLOWAY POTENTIAL DAM SITE, WEISER, IDAHO Planning Assistance to States (PAS)

EXECUTIVE SUMMARY

Water storage on the Weiser River and at the Weiser-Galloway site has been studied for over a century. The U.S. Army Corps of Engineers (USACE) first received a study resolution for the Weiser Basin from the U.S. Senate Public Works Committee in 1954. During the early 1970s, Federal lands for the potential Weiser-Galloway Dam and Reservoir site were classified and withdrawn for hydropower purposes by the Federal Power Commission (now the Federal Energy Regulatory Commission). USACE studied the project extensively during the 1980s through the early 1990s as a multi-purpose project, but primarily for flow augmentation and flood risk reduction with incidental at-site hydropower and recreation. In 2008, the Idaho Legislature, through House Joint Memorial 8 (HJM 8), directed the Idaho Water Resource Board (IWRB) to investigate water storage projects statewide, including the Weiser-Galloway Project. Potential project benefits include flood risk reduction, hydropower, water supply, pump-back storage, irrigation, regional economic development, recreation, and the ability to meet flow augmentation requirements for anadromous fish recovery.

In response to HJM 8, IWRB partnered with USACE to publish the *Weiser-Galloway Gap Analysis, Economic Evaluation and Risk-Based Cost Analysis Project* (Gap Analysis), completed in March 2011. The Gap Analysis was a comprehensive review of earlier (1984 through 1994) studies of the proposed Weiser-Galloway Dam and Reservoir site by USACE. It provided an analysis of gaps in information in the earlier studies and incorporated events, knowledge, and information affecting Idaho and the Snake River Basin since the earlier studies were performed. The focus was on the future water supply and management needs of Washington and Adams Counties, the City of Weiser, the State of Idaho, and the Weiser and Snake Rivers.

The purpose of the Gap Analysis was to inform decision makers of critical gaps to be addressed before deciding whether to move forward with comprehensive environmental, engineering, and economic feasibility studies. The analysis examined 181 gaps and identified two critical gaps that require resolution: (1) Determine the safety, suitability, and integrity of geologic structures at the potential dam and reservoir site; and (2) Evaluate potential basin and system benefits by analyzing a series of system operating scenarios with a range of new storage options on the Weiser River.

On July 29, 2011, the IWRB authorized expenditure of up to $2 million to analyze the critical gaps. Both studies are being conducted jointly by the IWRB and USACE. This report documents the geologic investigation conducted to address the first of the two gaps discussed above.

Based upon the USACE general investigation of the Weiser River, the agency recommended the Weiser-Galloway Project (refer to site maps 1 and 2) as the

tentatively selected alternative to meet the planning objectives as described in its 1990 technical report. The physical features of the project included a 300-foot-high earth and rockfill embankment dam with a reservoir capacity of 900,000 acre-feet located on the Weiser River, approximately 13.5 miles above its confluence with the Snake River. Under current conditions, a reservoir of this size would have a water surface area of approximately 6,918 acres, inundating some 4,608 acres of private lands, 2,017 acres of Federal lands, and 293 acres of former Northern Pacific Railroad land, now the Weiser River Trail.

Additional features of the Weiser-Galloway project as proposed in the 1990 technical report included: a single-unit, 4.6-megawatt (MW) hydropower plant; camping, day-use, and reservoir access for recreation; and substantial channel protection for areas along the downstream channel above and through the City of Weiser, Idaho, for both flood risk management and to facilitate the release of water stored for flow augmentation.

General Results

Based upon the analyses completed in this investigation, it is feasible to design and construct a dam at the identified location if specific actions are taken to address the risks and site limitations outlines below.

- Dam Type
  - The site foundation and abutments were evaluated using data from nine drill holes, laboratory testing, and geologic field mapping. In general, the rock core shows the rock quality as “fair” in the abutments and “good” in the foundation based upon Rock Quality Designation measurements and the Rock Mass Rating System. These results are a preliminary indication that the foundation and abutments are suitable for a rolled earthfill or rockfill embankment dam.
  - A rolled earthfill or rockfill embankment dam is more conducive to the site given the weaker rock materials in the abutments at the dam site and the potential for differential settlement under a rigid structure, such as a roller compacted concrete or concrete dam.
- Seepage and Permeability
  - Dam Site. Permeability for the foundation was estimated using pump-in water testing in the drill holes. The data indicates the permeability is low to moderate in the foundation and abutments and propagates through fractures in the rock. While it is recommended that the foundation be grouted, the permeability results are favorable for a rolled earthfill or rockfill embankment dam.
  - Reservoir Area. In many areas, the potential reservoir basin has a clay-rich soil covering, and the underlying Weiser Basalts show low to moderate permeability indicating reservoir seepage should be minimal.

- Foundation

  - The foundation will require a grout curtain during construction. Special care will be required when the weak tuff and tuff breccias are exposed on the abutments for embankment placement. These abutment materials are prone to air-slaking and should be covered immediately after exposure to avoid drying.

  - Based upon the site foundation and abutments evaluation, the foundation (defined as below EL 2250) is adequate for the construction of an outlet works conduit either on the foundation or within a tunnel in the foundation. Construction of a larger low-level tunnel in the "good" foundation rock is recommended. This will allow for construction of a smaller ungated emergency spillway in the weaker abutment material.

- Slope Stability

  - Dam Site. Slope stability does not appear to be a significant issue at the potential dam site. However, evidence of instability at the site in the past and the change in groundwater conditions resulting from raising a reservoir should be further analyzed during design.

  - Reservoir Area. Past evidence of slope instability in the potential reservoir basin indicates slope instability along the steep west side of the potential reservoir may be an issue. While the risk of a large landslide may be low, further exploration and study should be considered to reduce uncertainty.

- Seismic Activity. There is little seismic activity in the local vicinity of the potential dam site. Active faulting is over 30 kilometers from the site. Based upon U.S. Geological Survey ground motion predictions, the site is relatively safe from strong ground motion and a well-engineered dam could be safely built and operated at the site.

- Borrow Material. Reconnaissance borrow material exploration was performed at the site. It appears that materials generally required for an earthfill or rockfill embankment are available within reasonably close proximity (within 1 mile) of the site.

- Other Considerations. Additional recommended geotechnical investigations (summarized in section 8 of this report) should be pursued during the design phase of this project to address the following issues.

  - There is a closed mercury mine at the south end of the potential reservoir, and there is evidence of possible cinnabar (mercury) mineralization in the potential reservoir basin. While the mine is outside the potential reservoir area, further analysis should be performed to minimize any potential contamination risks.

  - Lands, easements, relocations, rights-of-way, and disposal areas.

- Environmental compliance, including but not limited to the National Environmental Policy Act; Endangered Species Act, National Historical Preservation Act; and

- Tribal/cultural resource concerns.

- Costs. This report provides updated cost figures. Total estimated costs are approximately $493 million. While costs increased by approximately $58 million from the estimates in the 2011 Gap Analysis, the contingency was reduced from 78.6 to 56.31 percent. Refinements to the 2011 cost estimate include the following:

  - The 2011 and earlier estimates include a single-unit, 4.5-MW power plant. This revised estimate includes a 3-unit plant with a total capacity of 38 MW based upon recent geologic and hydraulic studies. Costs increased by approximately $41,000,000 as a result of the new plant.

  - The 2011 estimate did not include the costs for Lands and Damages estimated in the 1990 technical report. The revised cost includes Lands and Damages escalated to 2013 values. This increased the total cost by $13,900,000.

  - The new estimate reduces the contingency from 78.8 percent in 2011 to 56.3 percent because of foundation conditions and borrow material identified through the geologic investigation. Inexact spillway configurations and the power plant arrangement are still factors in the elevated contingency.

This collaborative study provides information about the geologic integrity of the Weiser-Galloway Dam site. The aforementioned summary and the contents of this report will give the IWRB, and Idaho's citizens and leaders, the qualitative and quantitative data needed to support future decisions regarding the study and implementation of this potential multipurpose water resource project.

Final Results
Foundation Investigation and Evaluation
Weiser/Galloway Proposed Dam site
Weiser, ID November 2013

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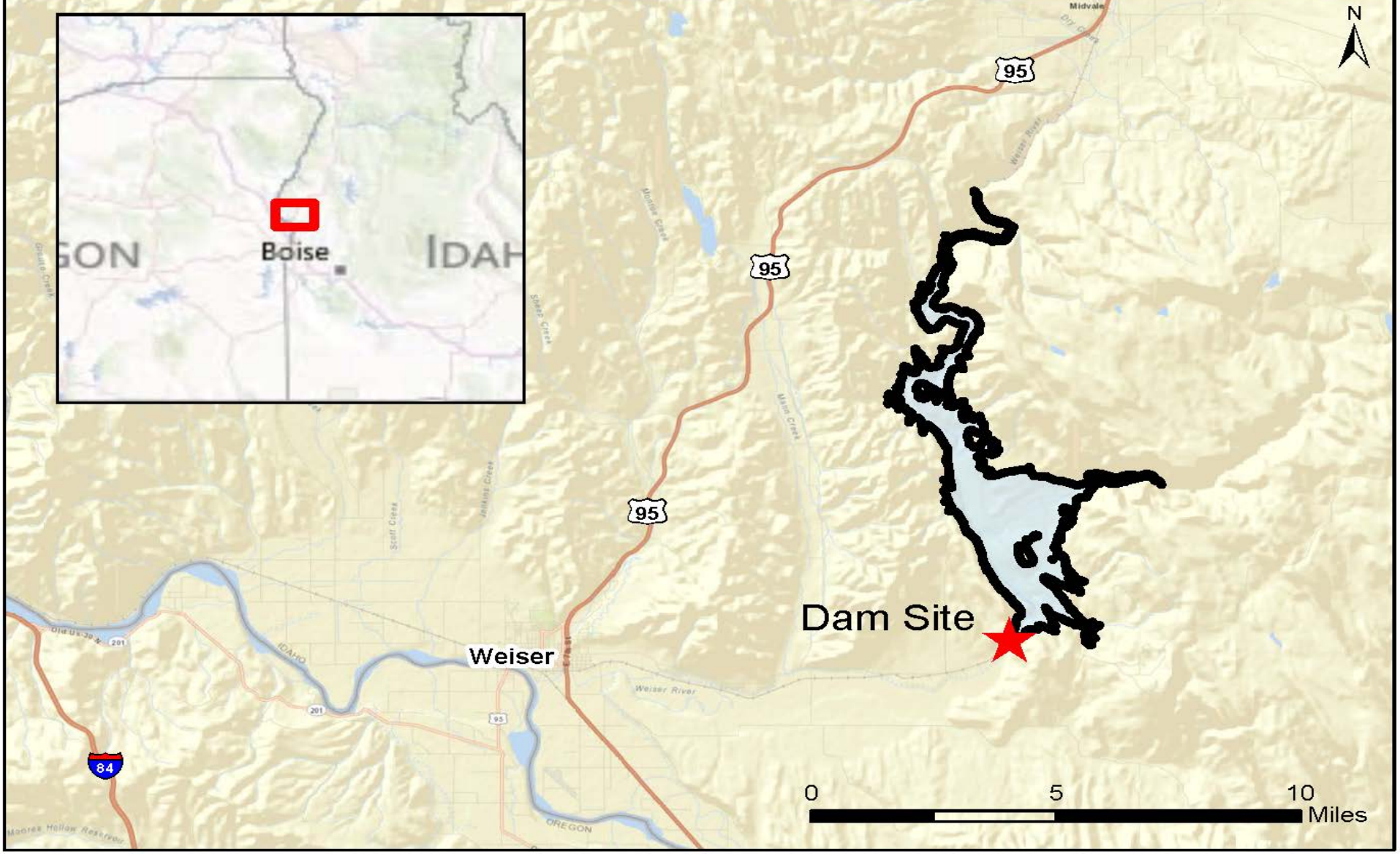
SUMMARY

- Site evaluated in 2012 – 2013, by drilling, geologic mapping, and testing.
- Foundation found suitable for a earthen embankment dam.
- Borrow materiel is close to the site.
- The lower foundation is suitable for a tunneled outlet works.
- Low seismic activity in the local vicinity.

SUMMARY CONTINUED

- While not significant there are issues with slope stability in the area.
- Foundation permeability is low to moderate and will require a grout curtain.
- Upper abutments will require special treatment during design and construction.
- The cost estimate for construction is $493-mill. with 56% contingency.



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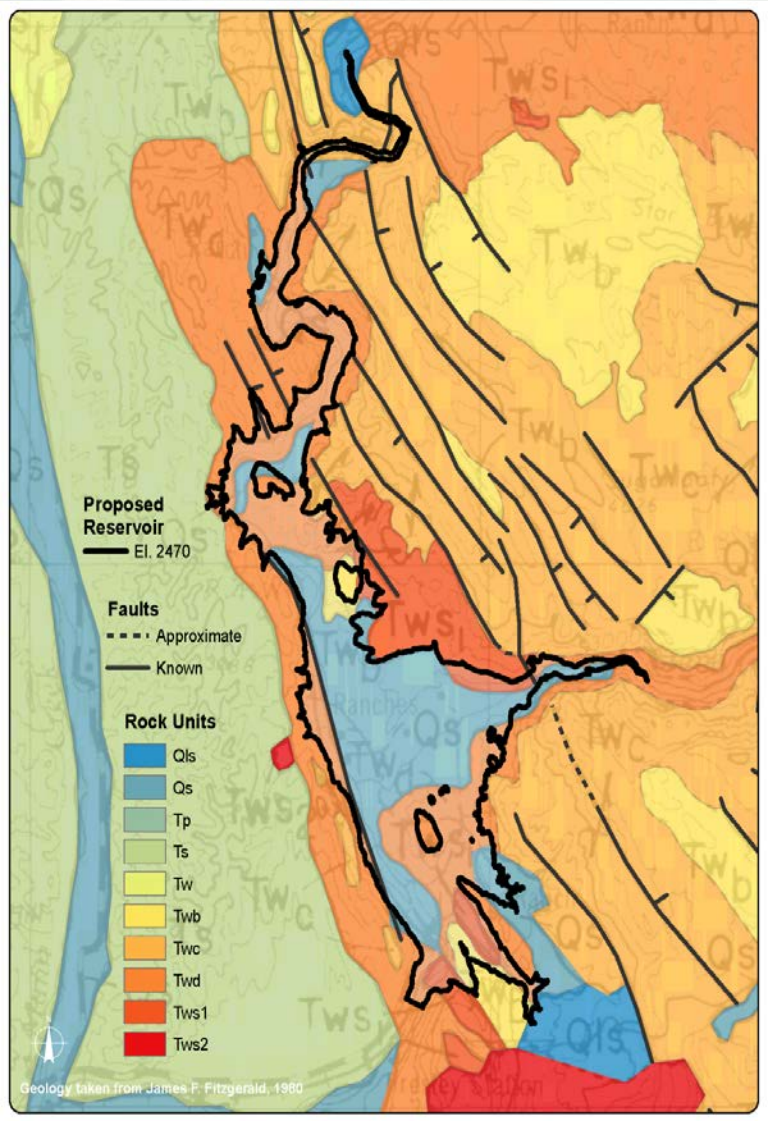
GENERAL GEOLOGY

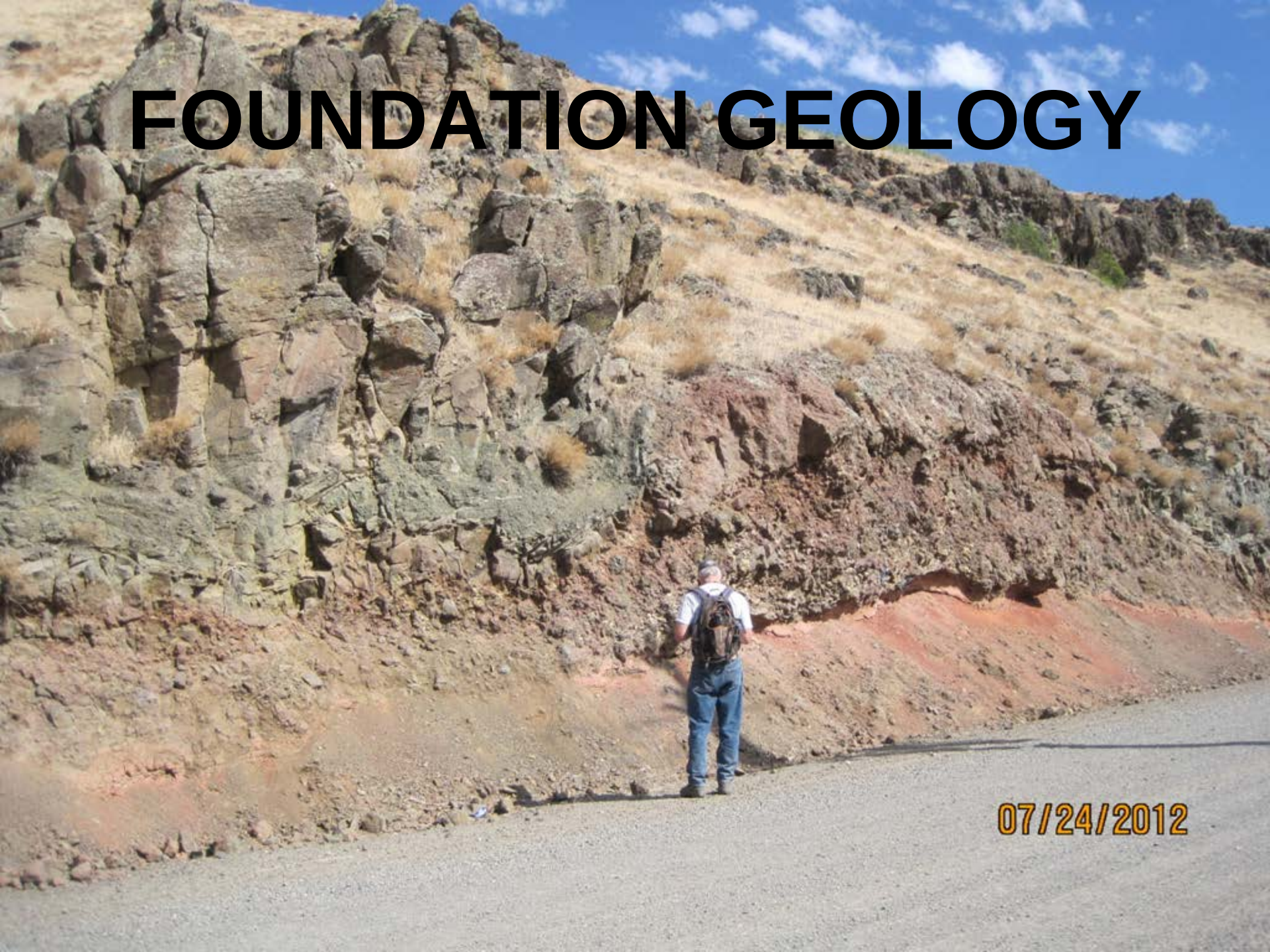


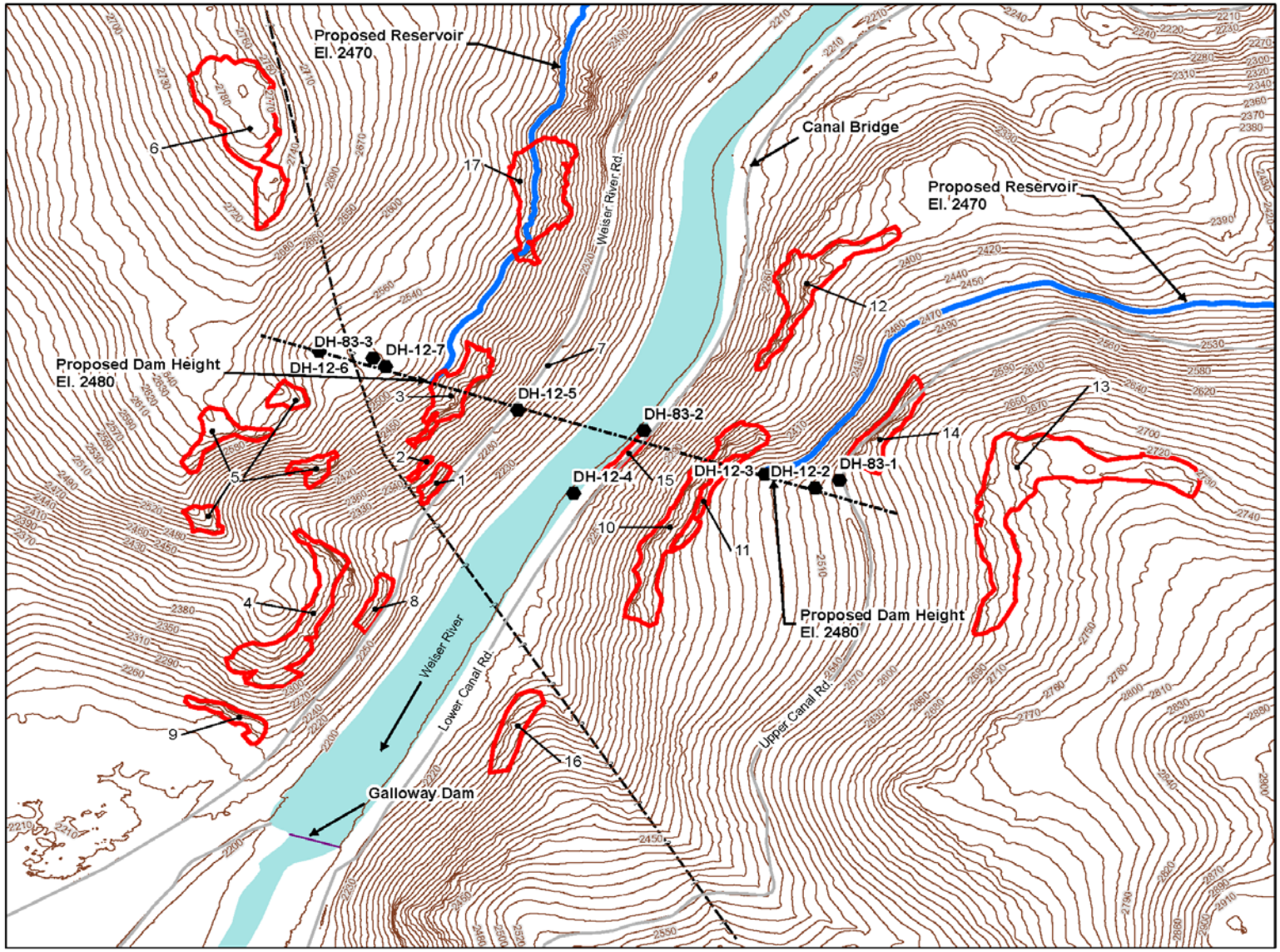
SITE INVESTIGATIONS

LABORATORY TESTING

- CORE SAMPLE TESTING
  - PHYSICAL PROPERTIES
  - UNIAXIAL COMPRESSIVE STRENGTH
- SOIL TESTING
  - GRADATIONS
  - ATTERBERG LIMITS
  - PROCTOR

FOUNDATION GEOLOGY





Weiser-Galloway Damsite

Geologic Map

US Army Corps of Engineers
Walla Walla District

Legend

- Drill Holes
- Proposed Dam Axis (Approximate)
- Road
- Rock Outcrop
- Proposed Reservoir El. 2470
- Fault

N

0 250 500 750 Feet

0 50 100 150 200 Meters

Created By: Harrison/Tucker
Map ID: GeologicMap.mxd

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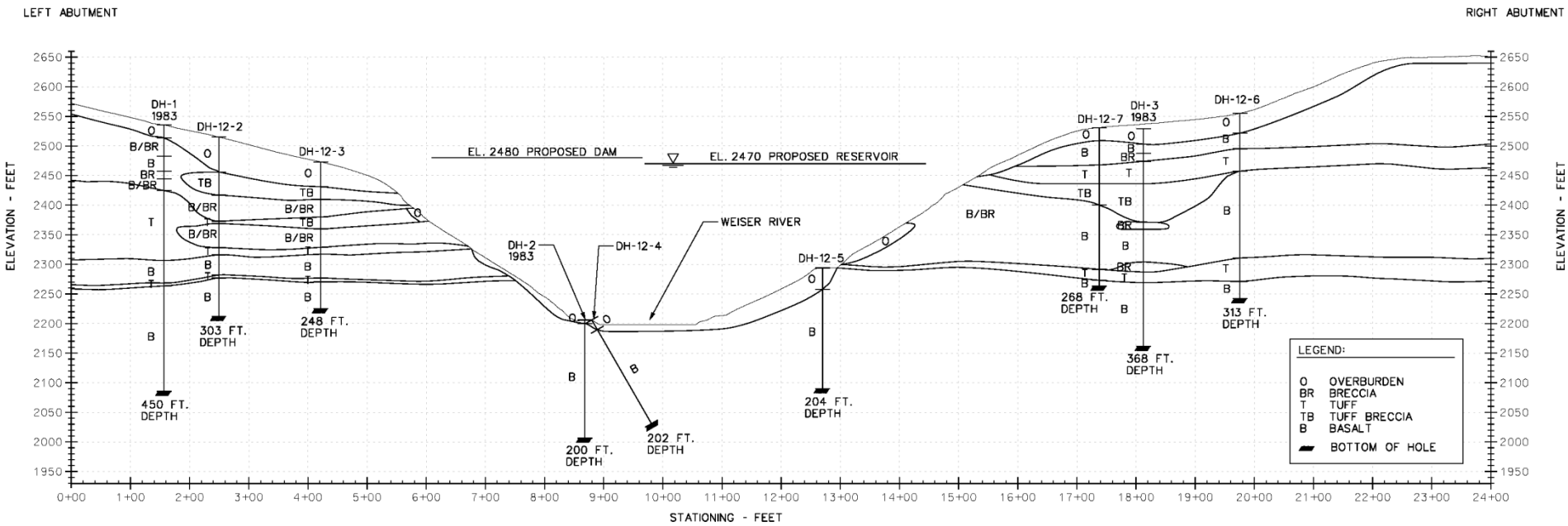
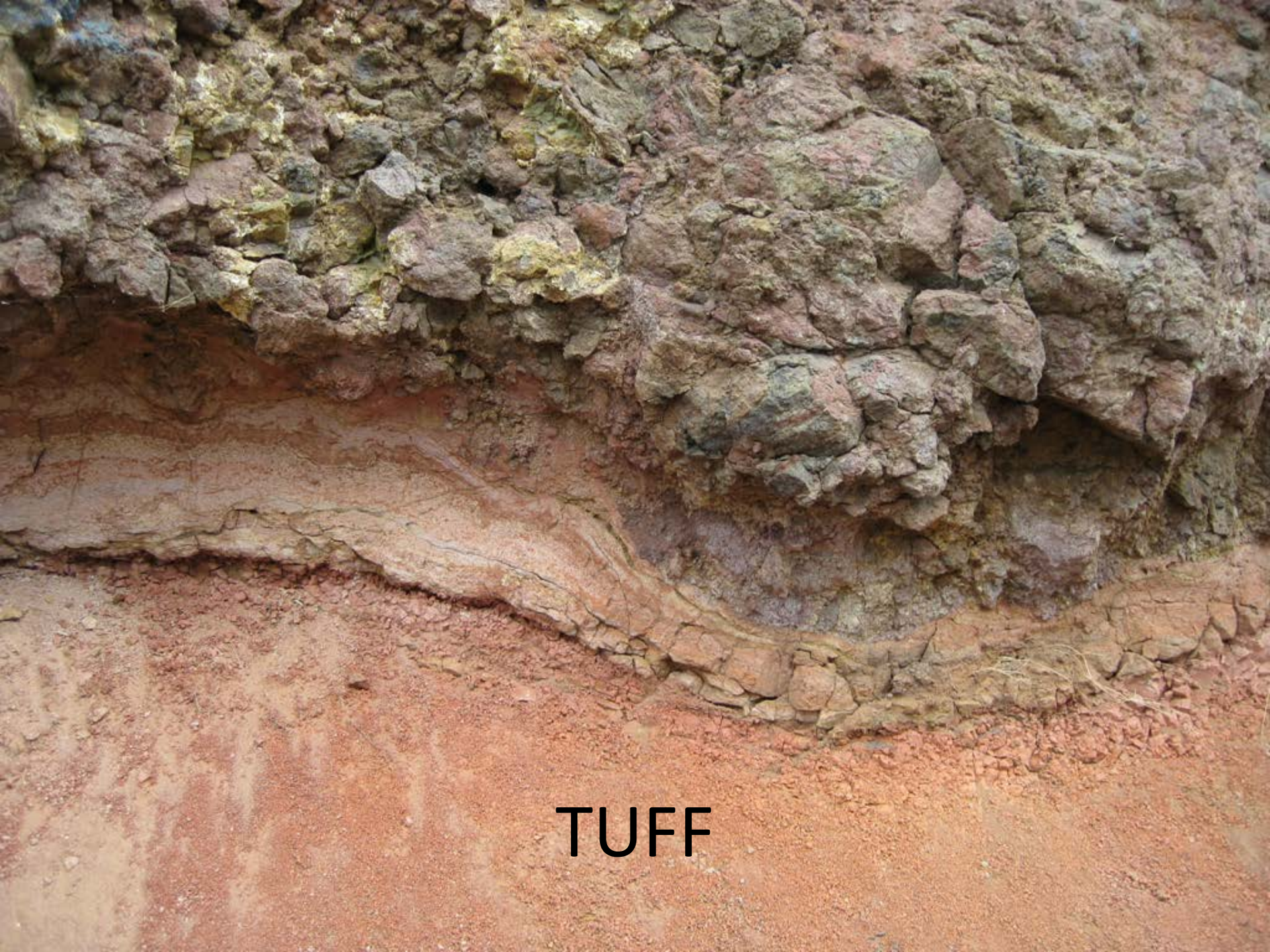
GEOLOGIC CROSS-SECTION

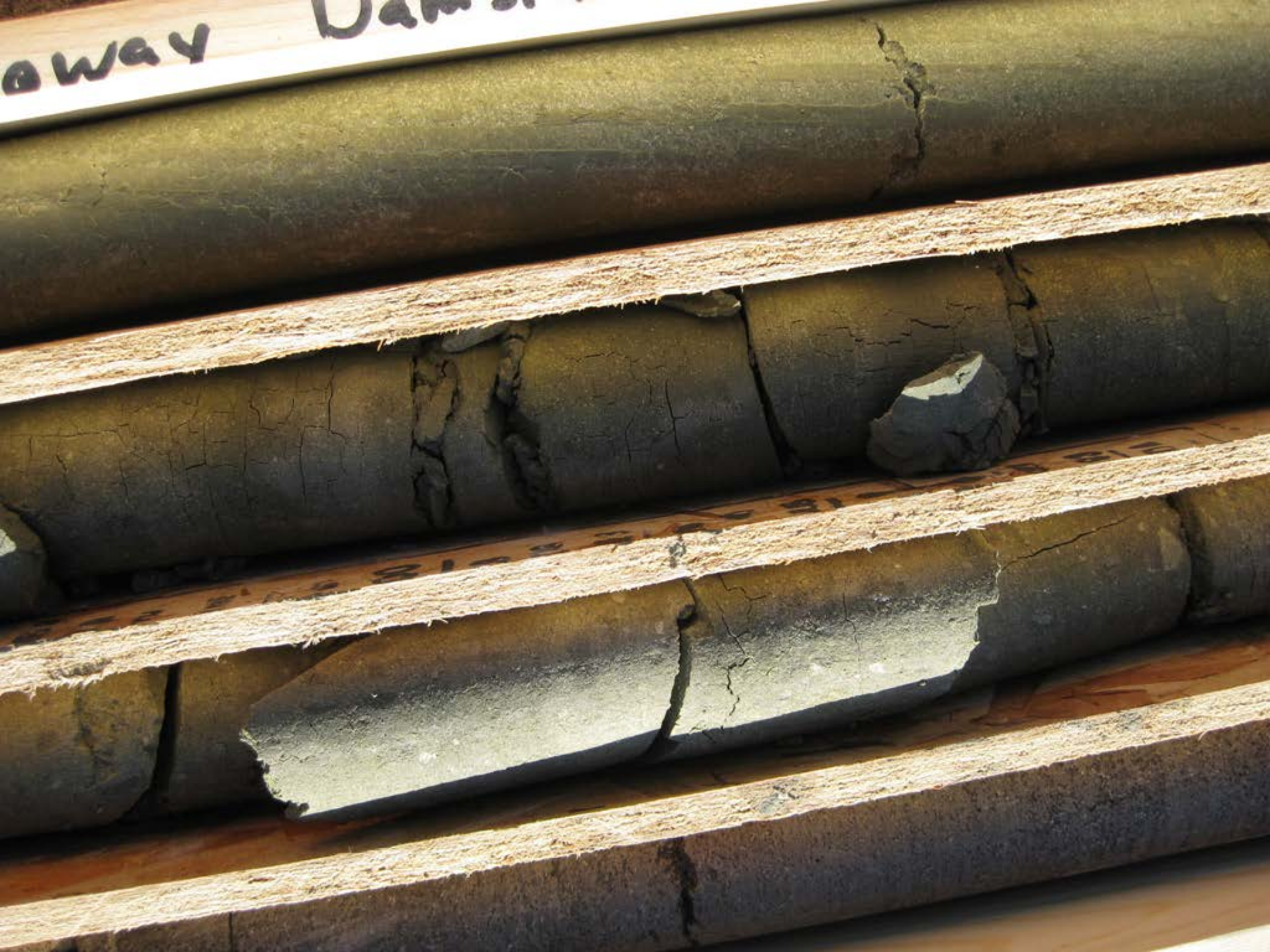


PROFILE ALONG DRILL HOLES – LOOKING DOWNSTREAM

BASALT / BASALT BRECCIA

Galloway Damsite
238°

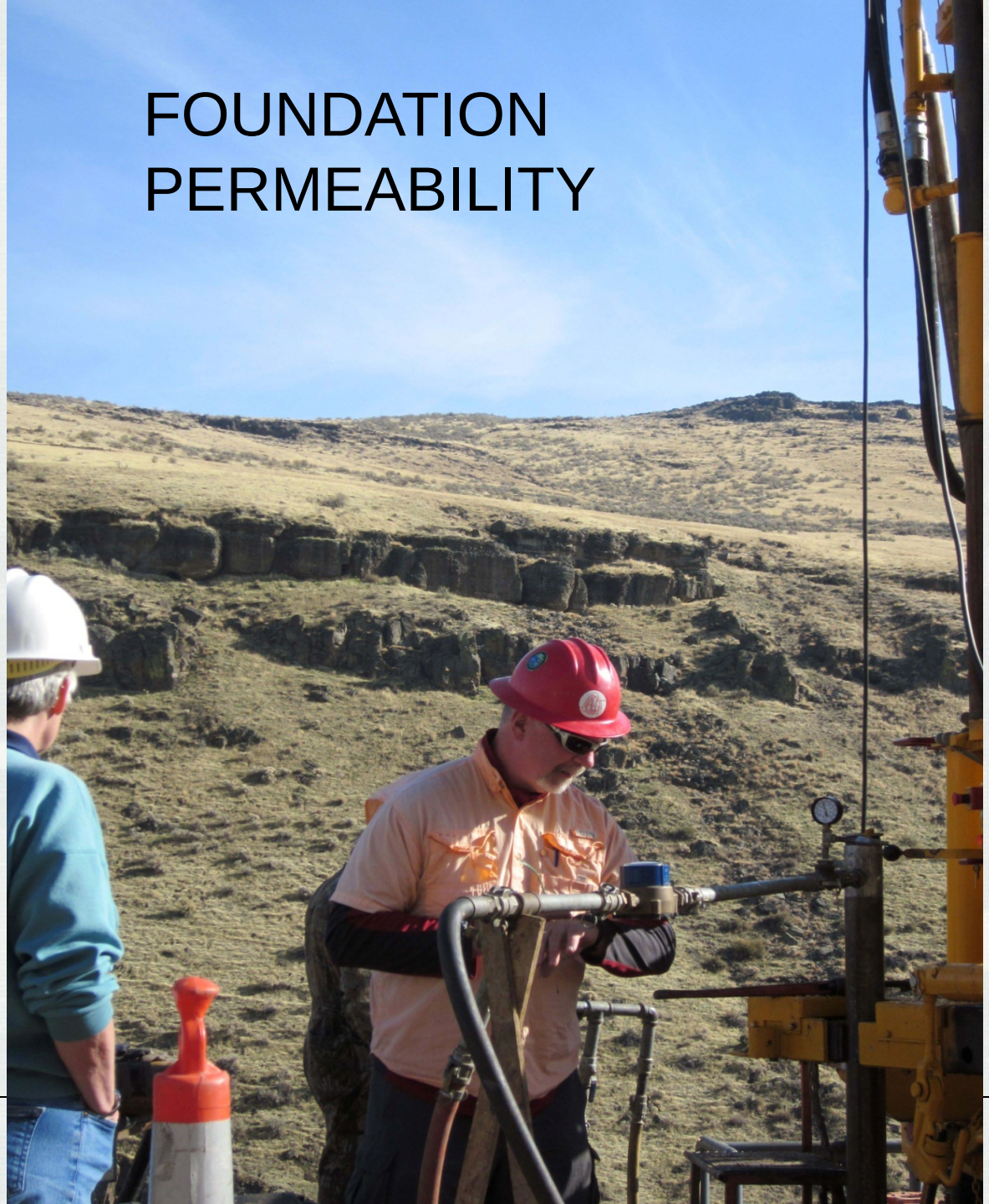

TUFF


away

TUFF BRECCIA

July 2012
Galloway Dam
DH-12-7
July 2012
Galloway Damsite
DH-12-7
Top → 107.1
Sample

FOUNDATION PERMEABILITY



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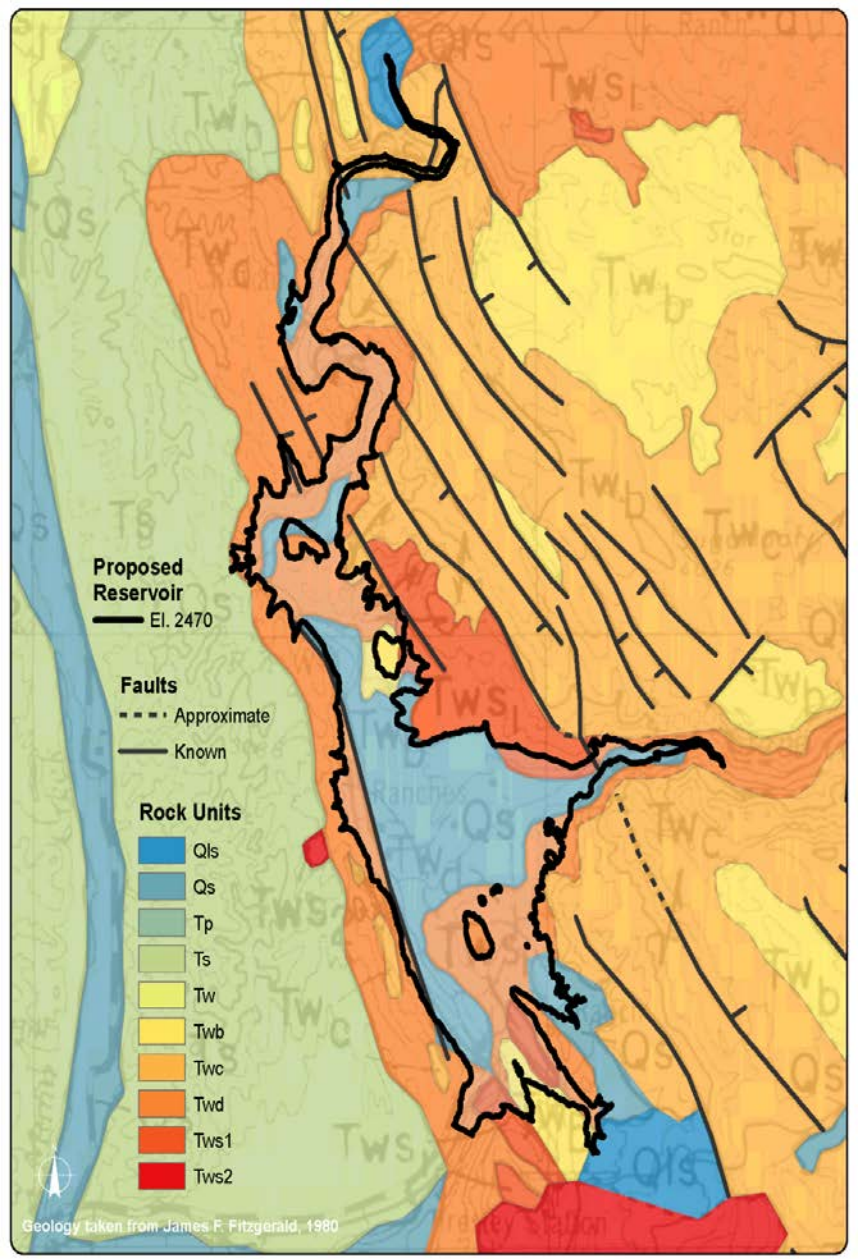
Reservoir Geology



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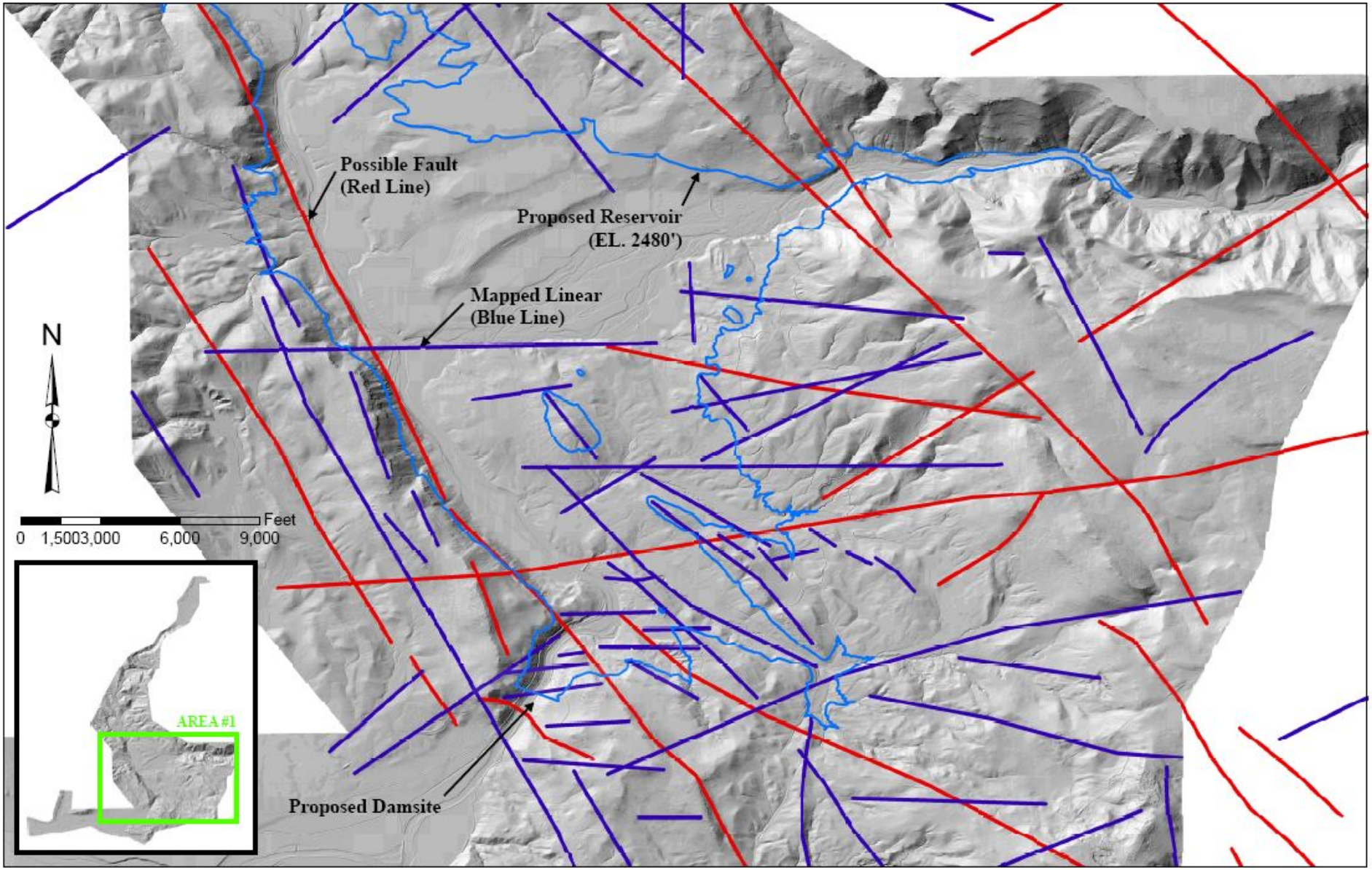
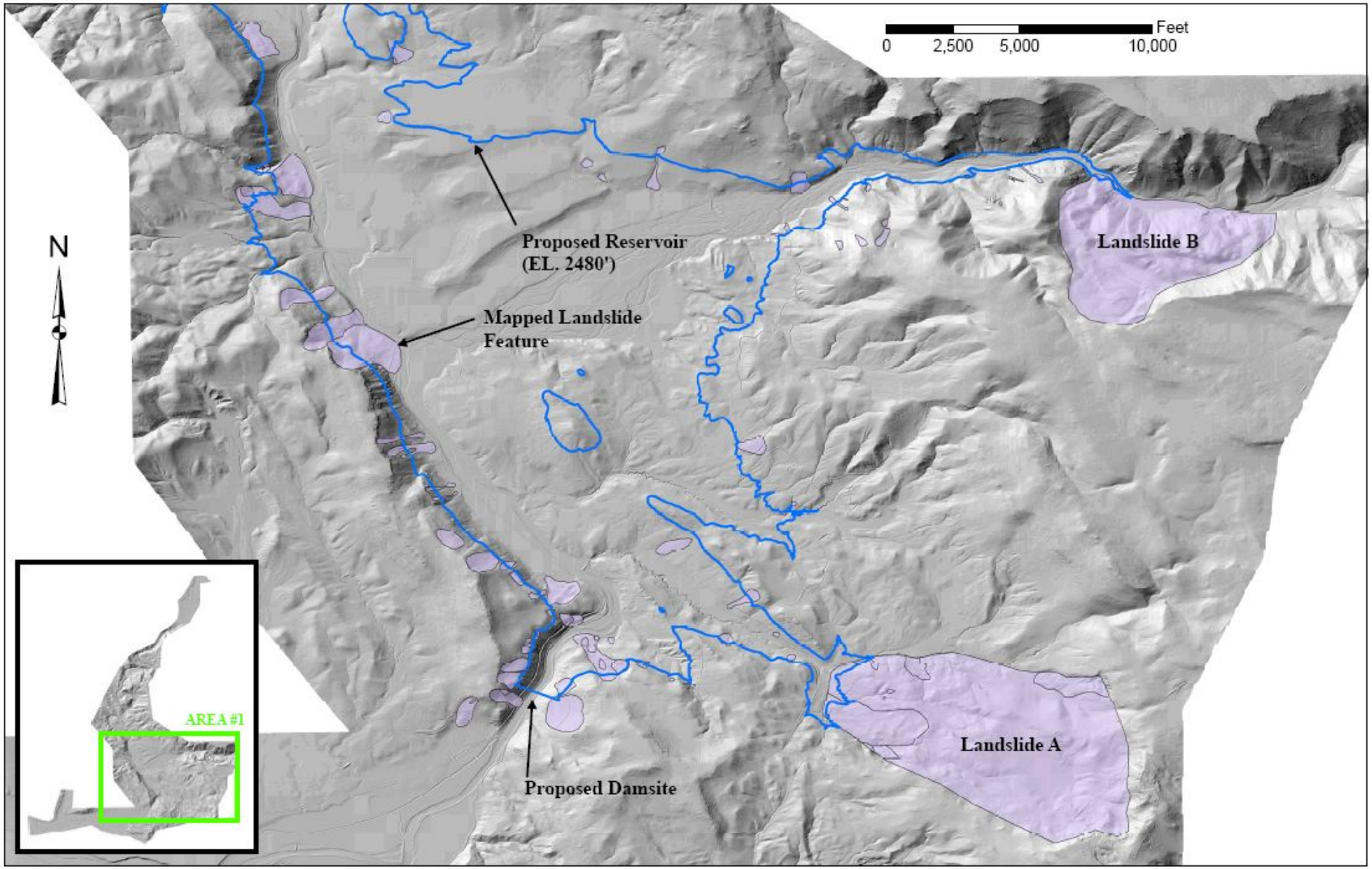
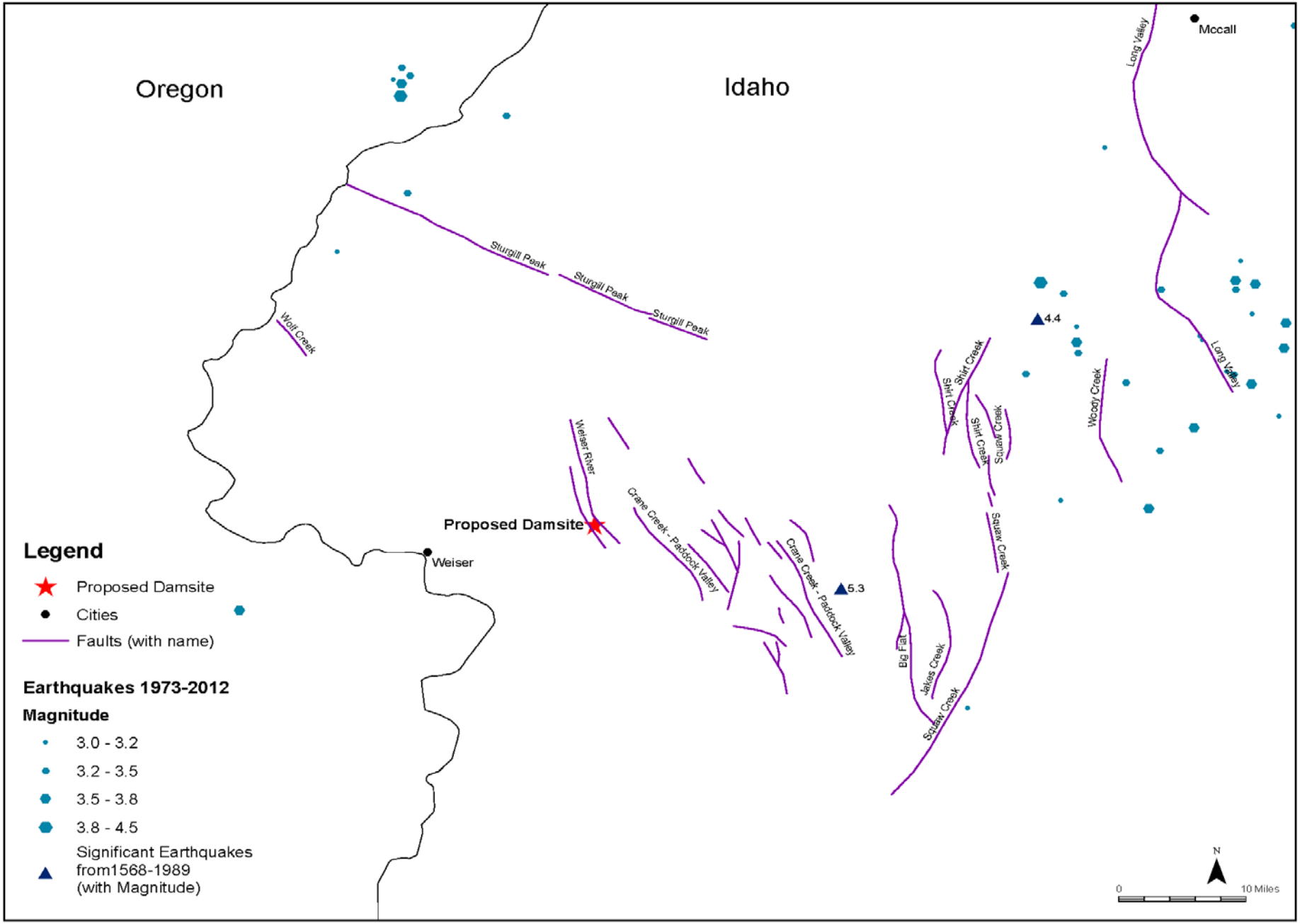

Possible Fault
(Red Line)
Proposed Reservoir
(EL. 2480')
Mapped Linear
(Blue Line)
N
Feet
0 1,5003,000 6,000 9,000
AREA #1
Proposed Damsite


Feet
0
2,500
5,000
10,000
N
Proposed Reservoir
(EL. 2480')
Mapped Landslide
Feature
Landslide B
Landslide A
Proposed Damsite
AREA #1

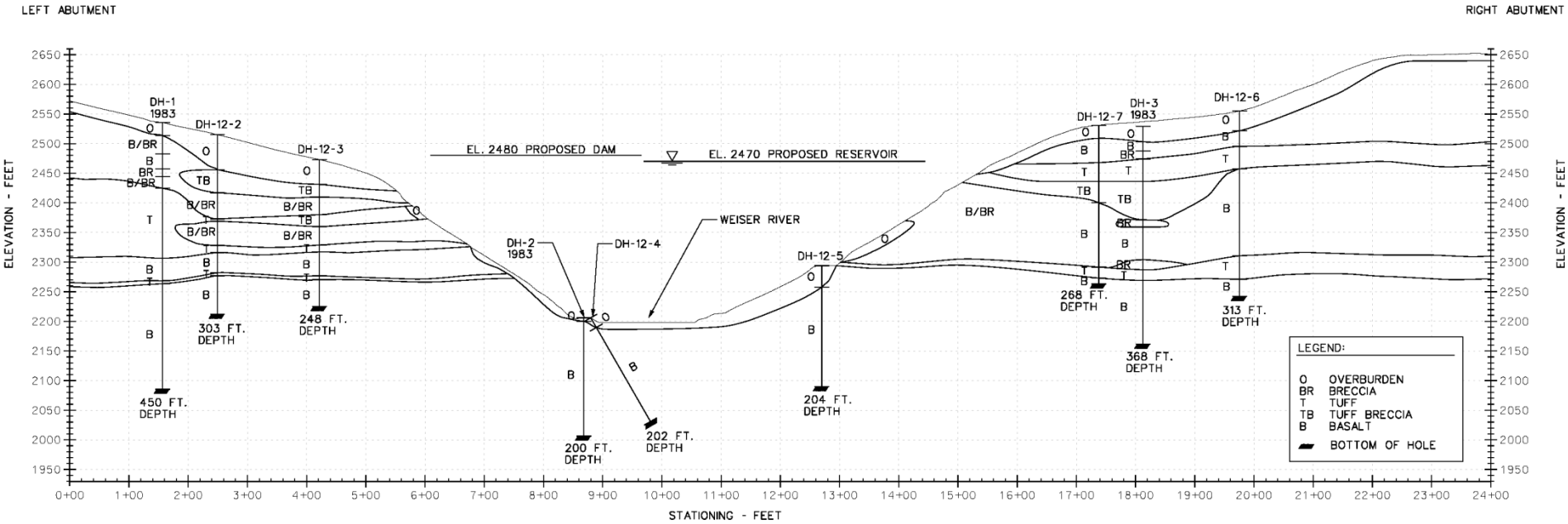
SEISMICITY


Oregon
Idaho
Mccall
Long Valley
Sturgill Peak
Sturgill Peak
Sturgill Peak
Wolf Creek
4.4
Shirt Creek
Shirt Creek
Shirt Creek
Squaw Creek
Squaw Creek
Squaw Creek
Woody Creek
Long Valley
Weiser River
Crane Creek - Paddock Valley
Crane Creek - Paddock Valley
Proposed Damsite
Weiser
5.3
Big Flat
Jakes Creek
Squaw Creek
Legend
Proposed Damsite
Cities
Faults (with name)
Earthquakes 1973-2012
Magnitude
3.0 - 3.2
3.2 - 3.5
3.5 - 3.8
3.8 - 4.5
Significant Earthquakes from1568-1989 (with Magnitude)
N
0
10 Miles

DAM DESIGN CONSIDERATIONS

- DAM TYPE
- OUTLET CONSIDERATIONS
- FOUNDATION TREATMENT
- MATERIAL SOURCES

GEOLOGIC CROSS-SECTION FOUNDATION/ABUTMENTS



PROFILE ALONG DRILL HOLES – LOOKING DOWNSTREAM

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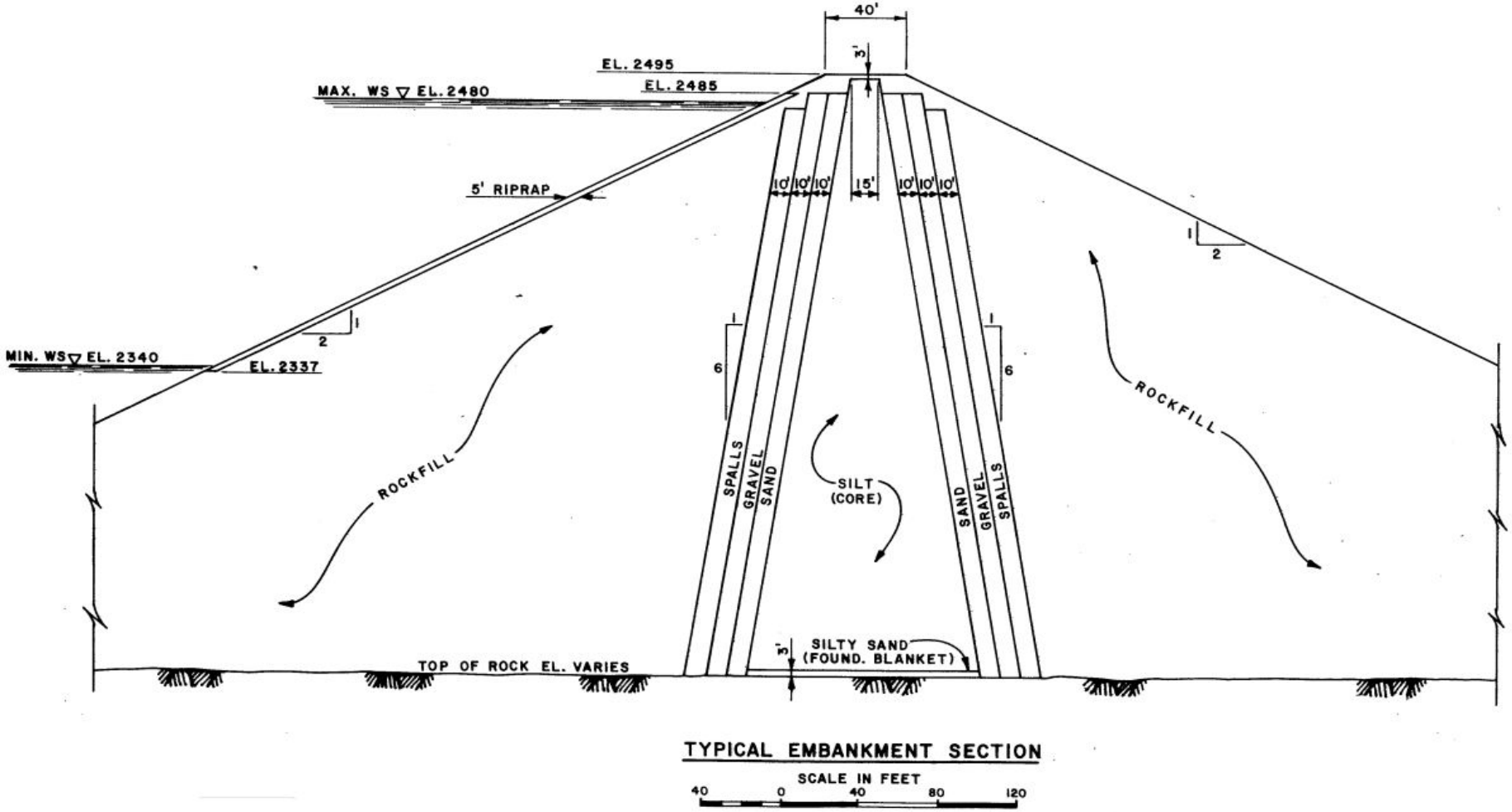
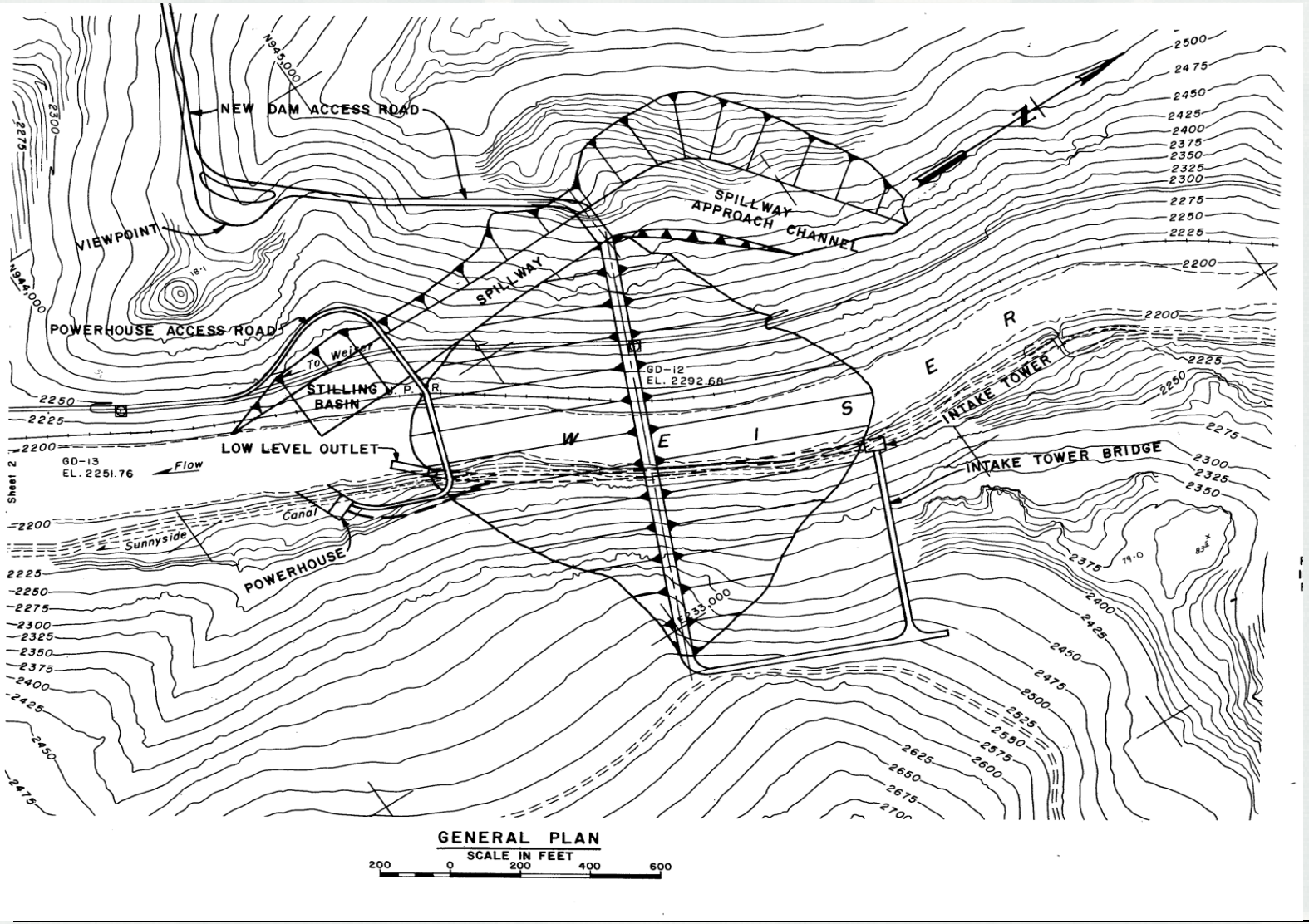
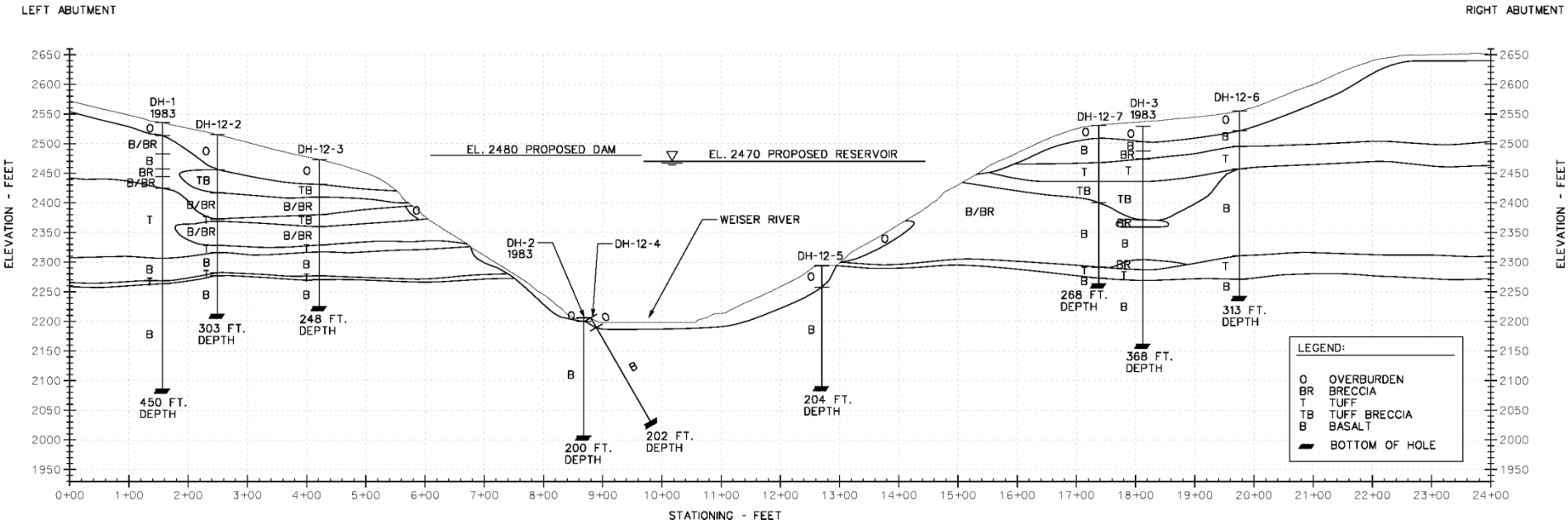
Earth Embankment



Outlet Considerations



GEOLOGIC CROSS-SECTION FOUNDATION/ABUTMENTS



PROFILE ALONG DRILL HOLES – LOOKING DOWNSTREAM

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Foundation Treatment

- Clean all foundation down to bedrock
- Excavate a keyway trench
- Construct a grout curtain
- Treat abutment materials that are prone to air slaking as soon as they are exposed

MATERIAL SOURCES

- Sand, gravel, clay, and rock are located close to the proposed dam site requiring a minimum haul distance

Foundation Investigation and Evaluation
Weiser/Galloway Proposed Dam Site

PLATE 9 - Soil Sample Location Map

US Army Corps of Engineers
Walla Walla District

Legend

- Soil Sample Locations
- Proposed Dam Footprint (Approximate)
- Proposed Dam Alignment (Approximate)

Soil Samples GAL 12-1, and GAL 12-11 not shown due to locations.

GAL 12-1 Elastic Silt
Location: 2.6 miles northwest of dam site
N44.285107, W116.805829

Gal 12-11 Silty Sand
Location: 3.6 miles west of dam site
N44.243734, W116.842861

N

0 0.25 0.5 Miles

0 0.25 0.5 Kilometers

Created By: Harrison/Tucker
Map ID: SoilSampleLocations.mxd

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COST ESTIMATE

- $493-mill. W/ 56% Contingency
- Includes a 3-unit power plant
- High contingency due to lack of design for outlet works and power plant arrangement.

CONCLUSIONS

- Foundation is suitable for earthen embankment Dam.
- Borrow material is close to the site.
- The lower foundation is suitable for a tunneled outlet works.
- Low seismic activity in local vicinity.
- Foundation permeability is low to moderate and a grout curtain is required.

CONCLUSIONS Cont.

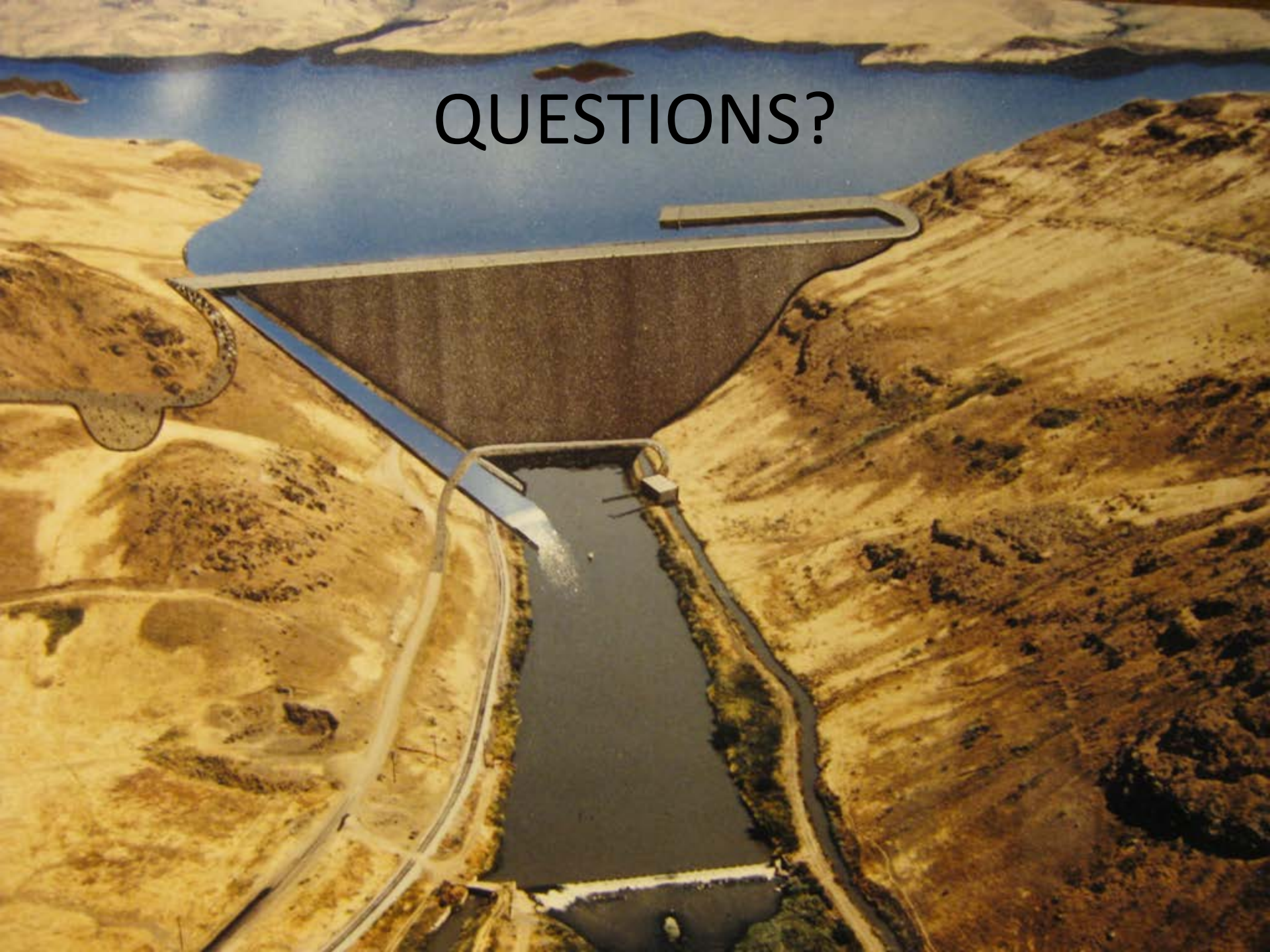
- While not significant there are issues with slope stability in the area.
- Upper abutments will require special treatment during design and construction.
- The cost estimate for construction is $493-mill. with 56% contingency.

RECOMMENDATIONS

- Develop a borrow exploration program.
- Design embankment based on site and borrow material properties.
- Determine if State or Federal permitting requires a site-specific seismic evaluation.
- Develop a drilling program to better map and evaluate abutment units.

RECOMMENDATIONS Cont.

- Mapping and trenching will be required to further evaluate slope stability.
- Install and monitor several piezometers at the site.
- Consider further studies concerning mercury concentrations in the proposed reservoir.


QUESTIONS?

Weiser River Operations Study

Idaho Water Resource Board
November 19, 2013

Jeremy Giovando, P.E.
Hydraulic Engineer
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US Army Corps of Engineers
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Presentation Overview

-Review Reservoir Analysis Goal/Tasks

-Key Assumptions & Collaboration

-Status Update

-Schedule

Council Mountain (Courtesy USFS)

Analysis Goals

1. **Quantify In-basin Benefits**: including power generation, flood risk reduction, water supply, & recreation

2. **Quantify System Benefits**: including power generation for Hells Canyon Complex and Middle Snake River; potential flow augmentation exchange with upstream basins

Analysis Framework

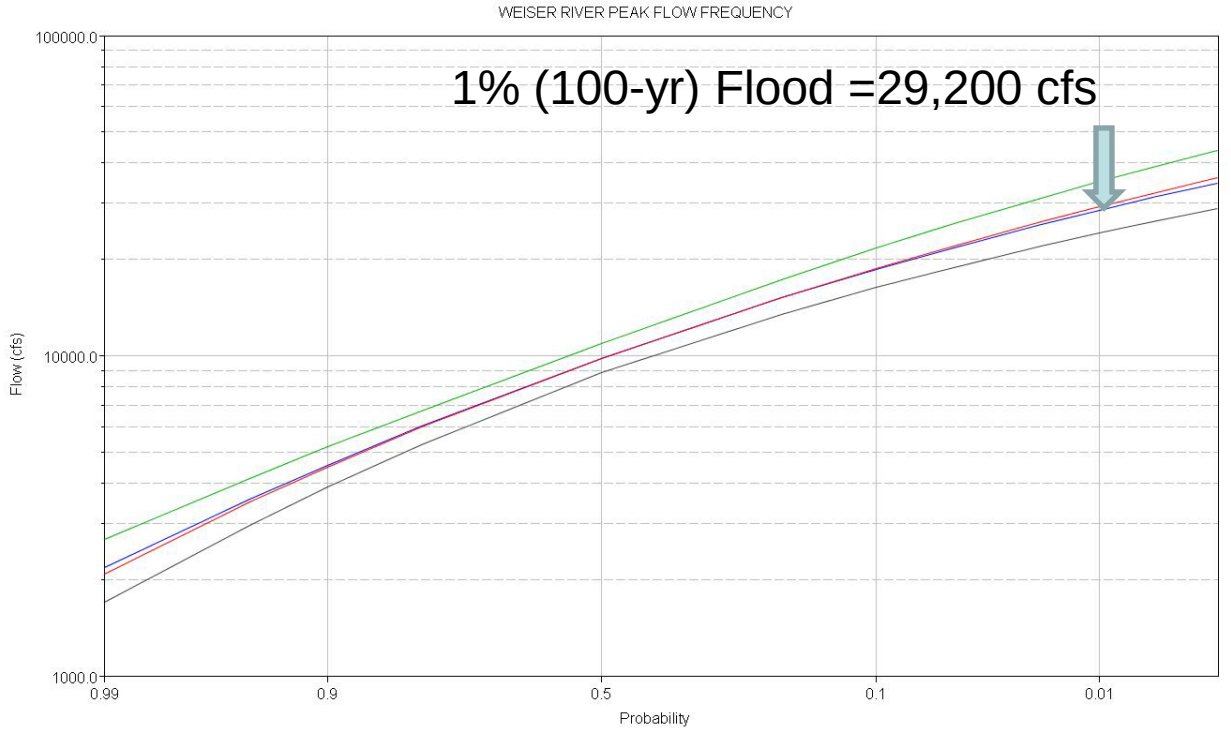
- **Key Assumptions**
  - Flow Augmentation volume and timing unchanged
  - Lower Snake River operations unchanged
  - Benefits below Hells Canyon Complex not considered
  - State Planning Model used for system analysis

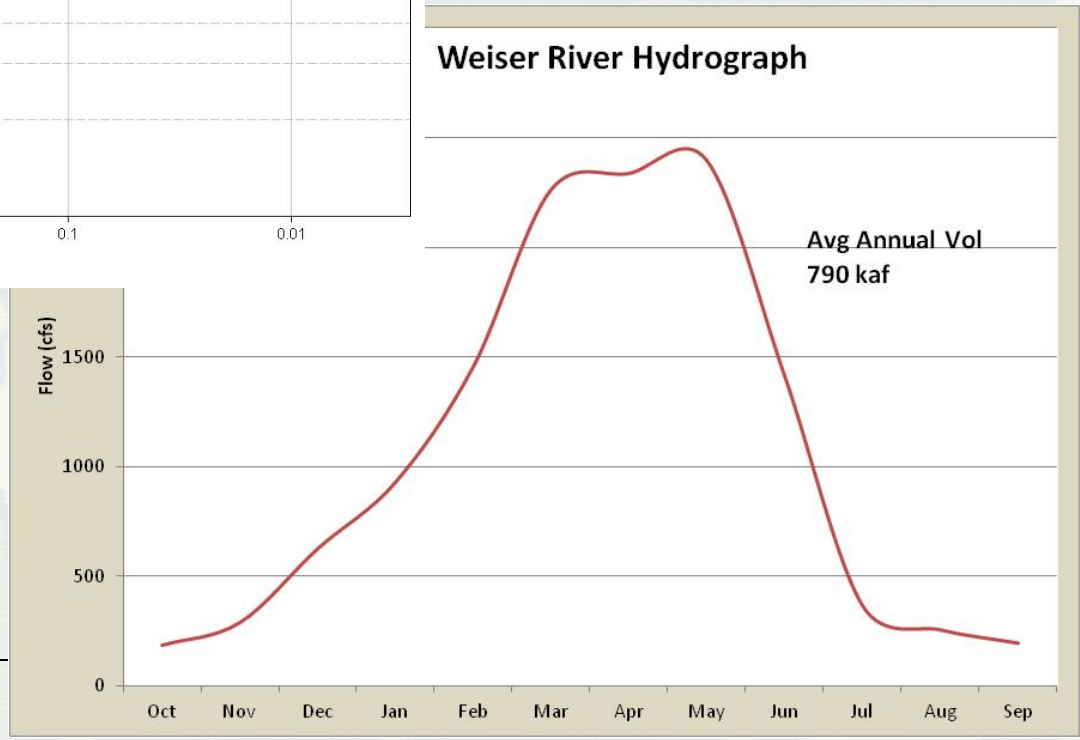
- **Collaboration**
  - State Planning Model Updates
  - Alternatives formulation
  - Metrics for System Benefits
  - Refinement of Flow Augmentation Exchange Target

Completed Tasks

- Hydrology
  - Data Extension
  - Flood Frequency
  - Flood Hydrology
  - Irrigation Depletions
  - Evaporation Depletions
  - Sediment Loading
  - Water Supply Forecast
  - Flood Risk Reduction Criteria
- Reservoir Modeling
  - Reservoir sizing
  - Hydropower Capacity
  - State Planning Model Update
  - Alternatives Formulation
  - Simulation Model Development

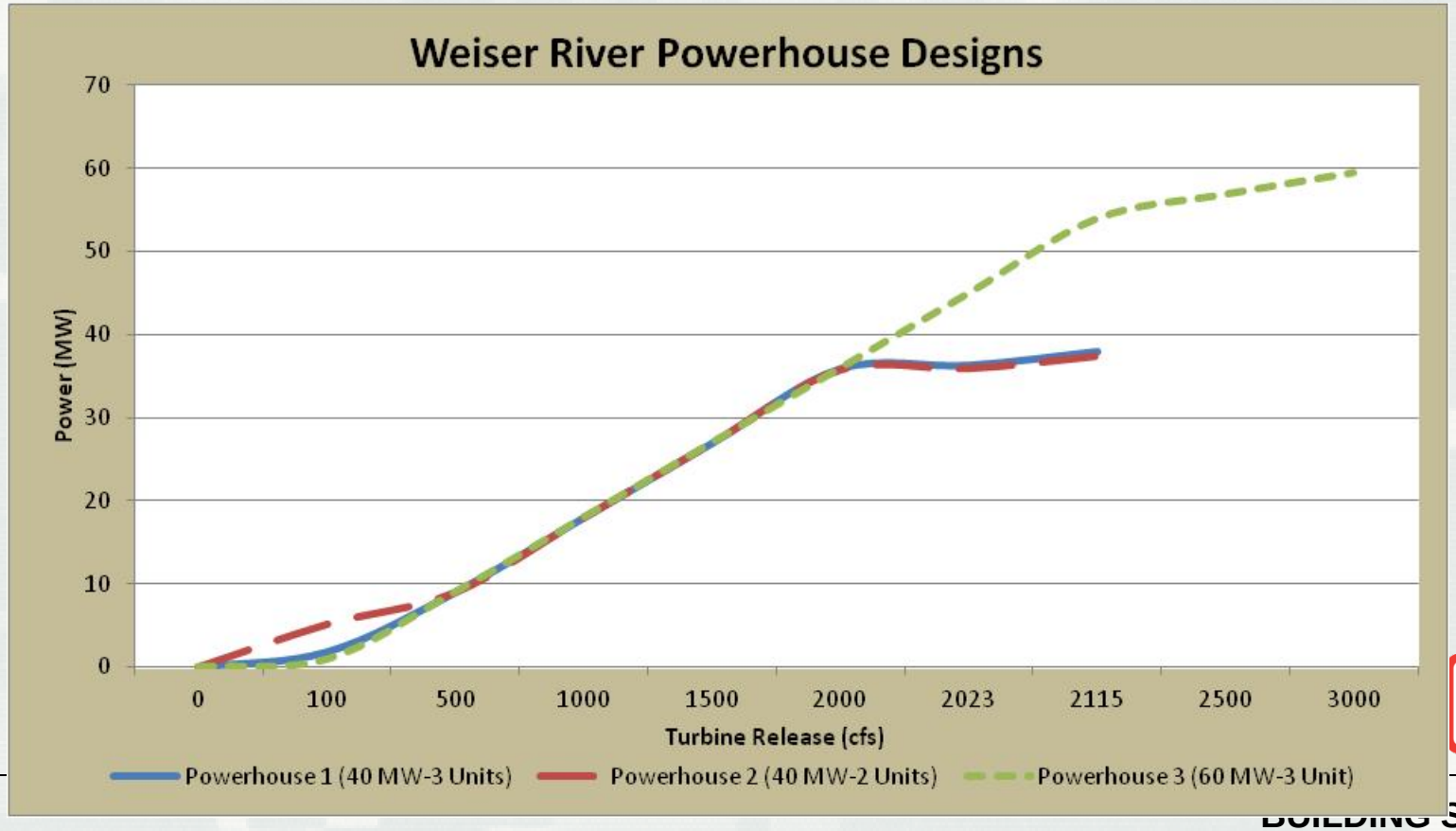
Completed Tasks-Hydrology



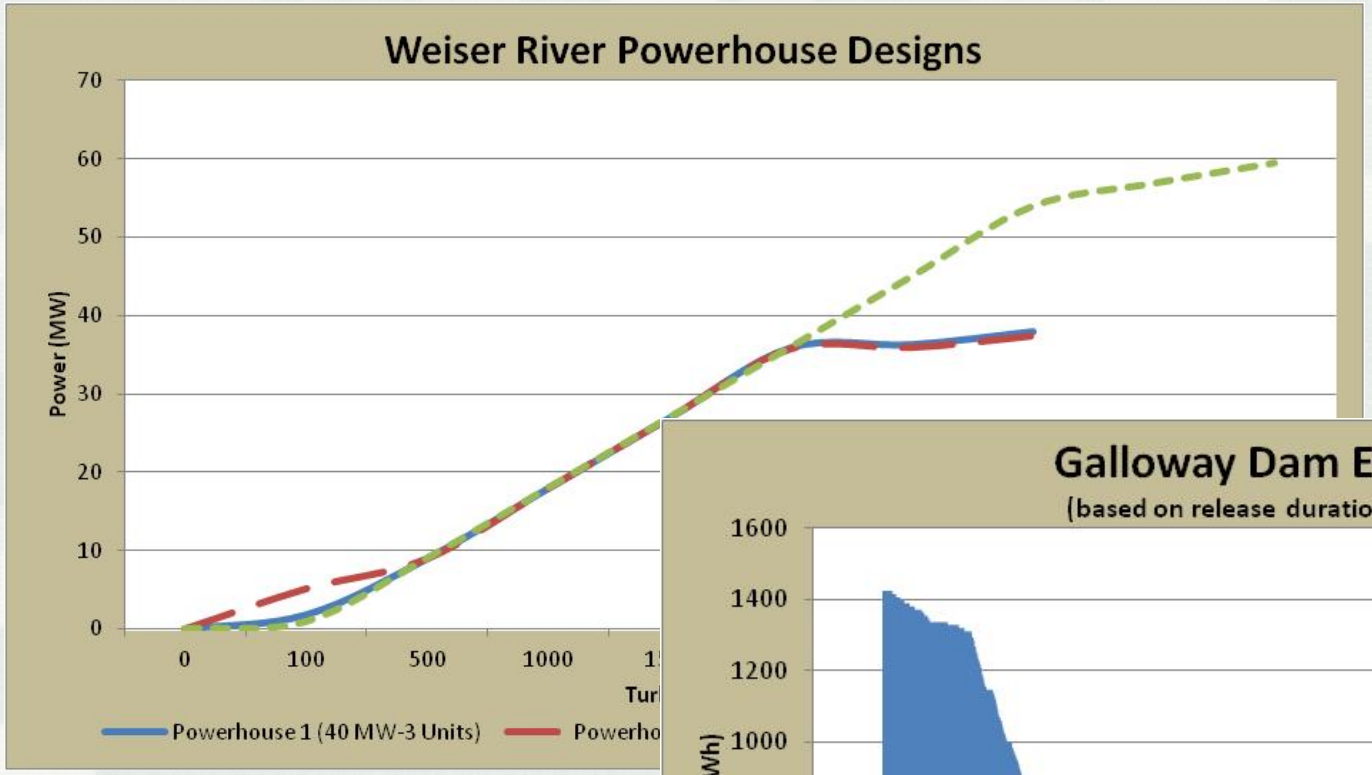


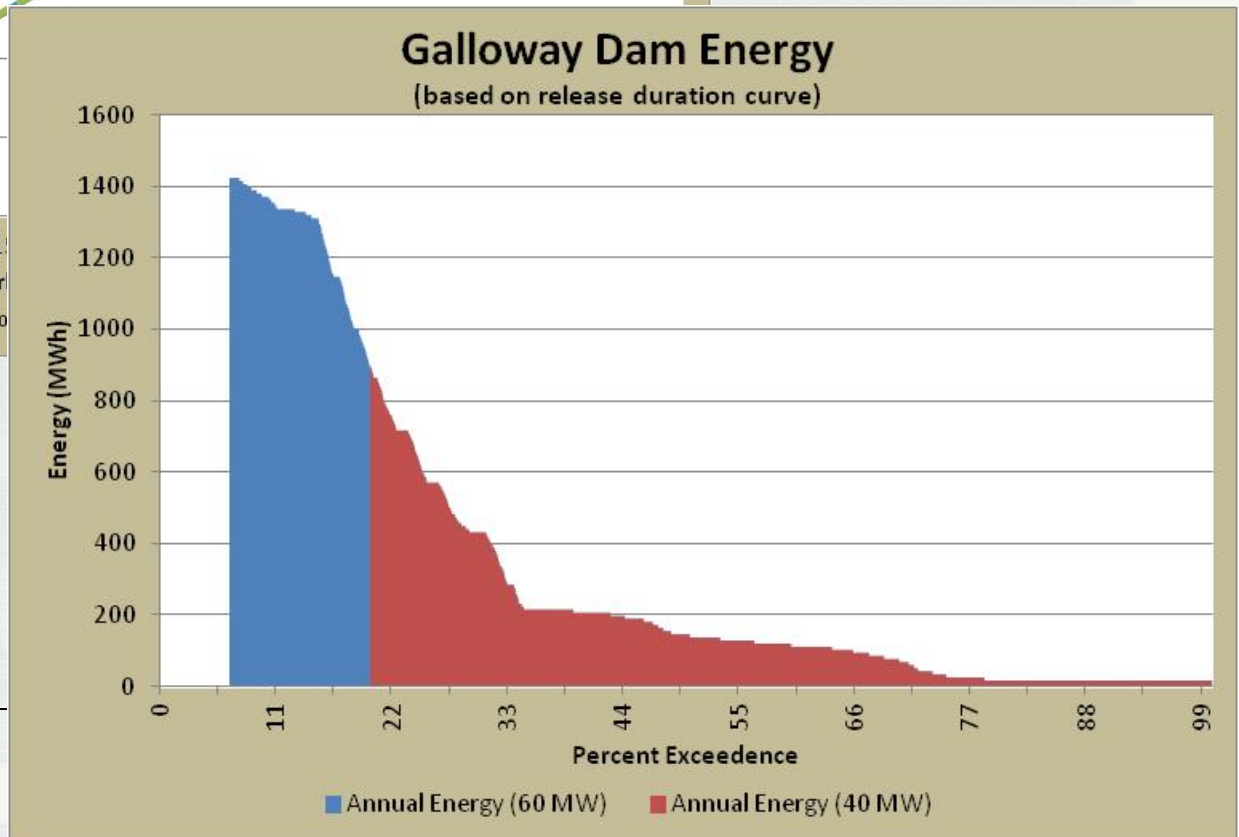
Completed Tasks-Hydropower Capacity

- Initial Designs
  - 60 MW & 40 MW powerhouse
  - Maximized release flexibility
  - Unit configuration



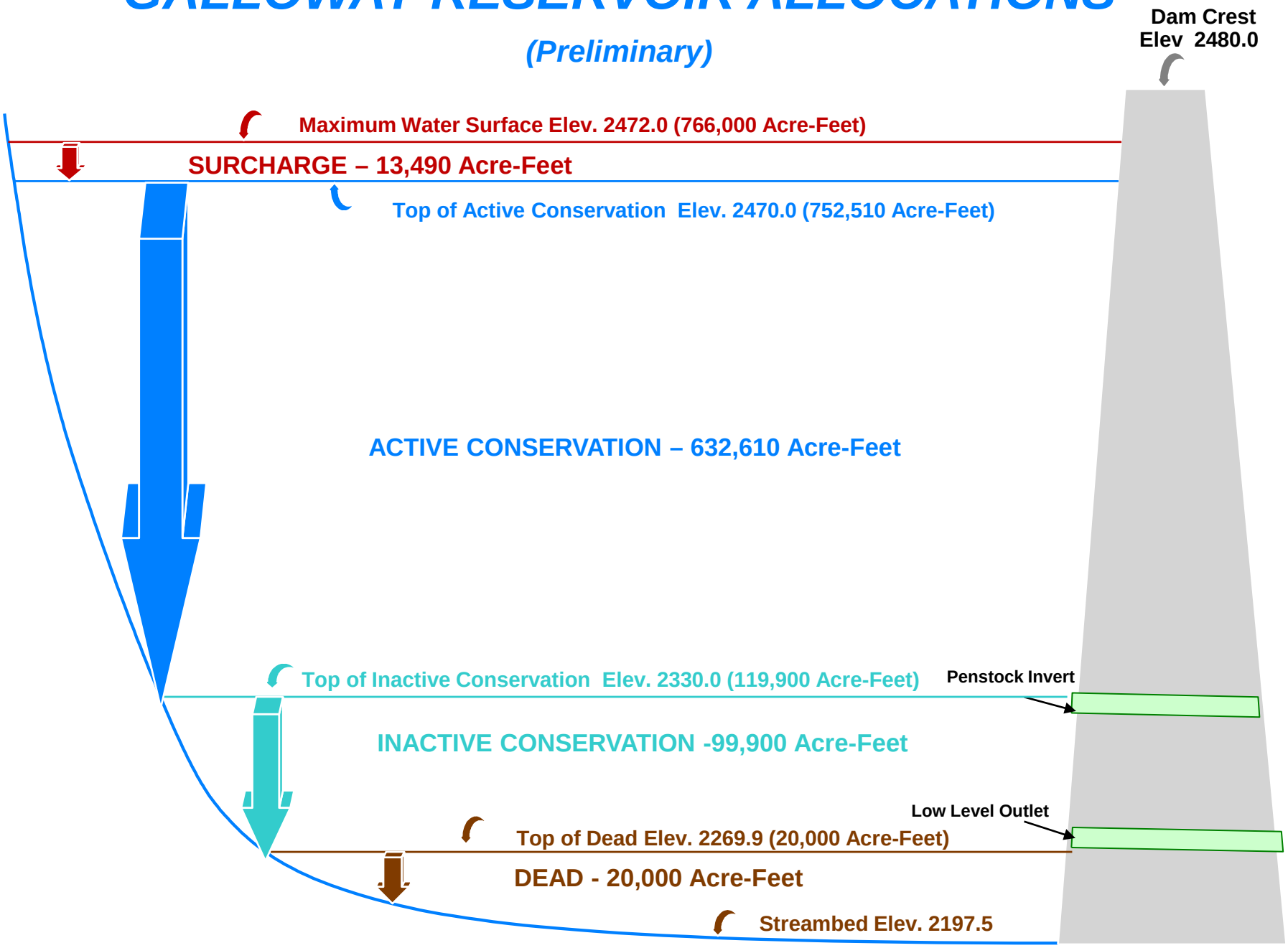
Completed Tasks-Hydropower Capacity





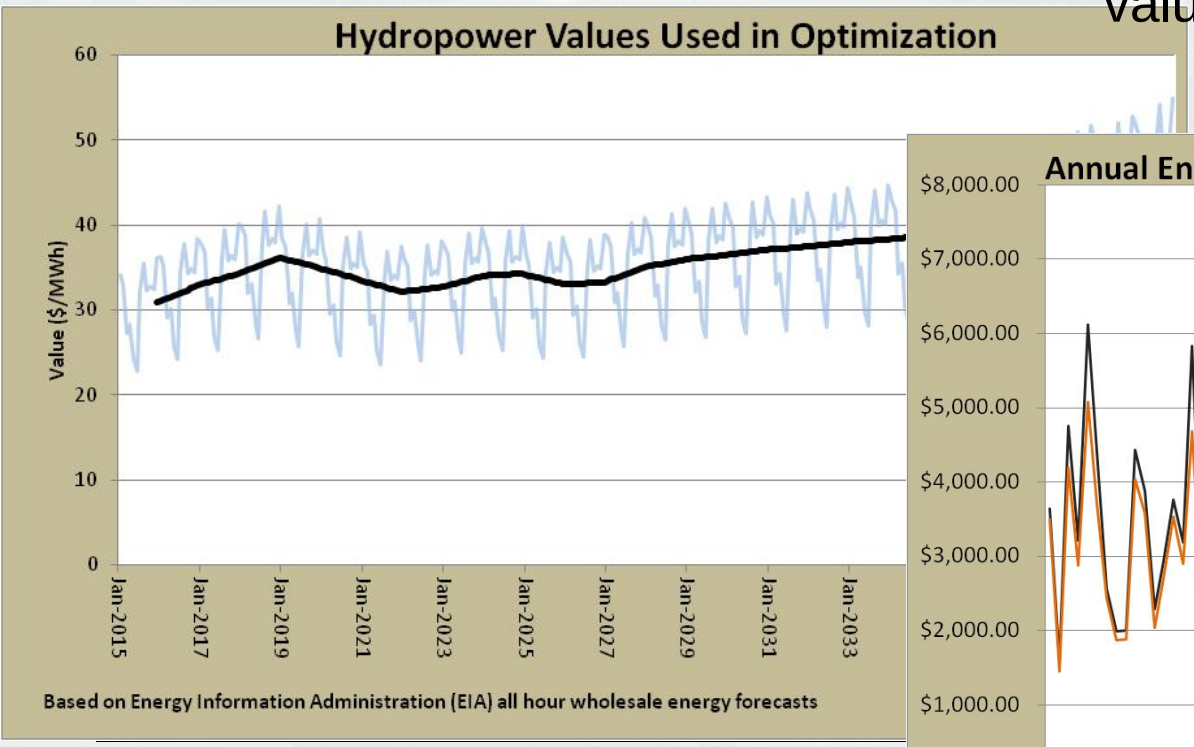
GALLOWAY RESERVOIR ALLOCATIONS

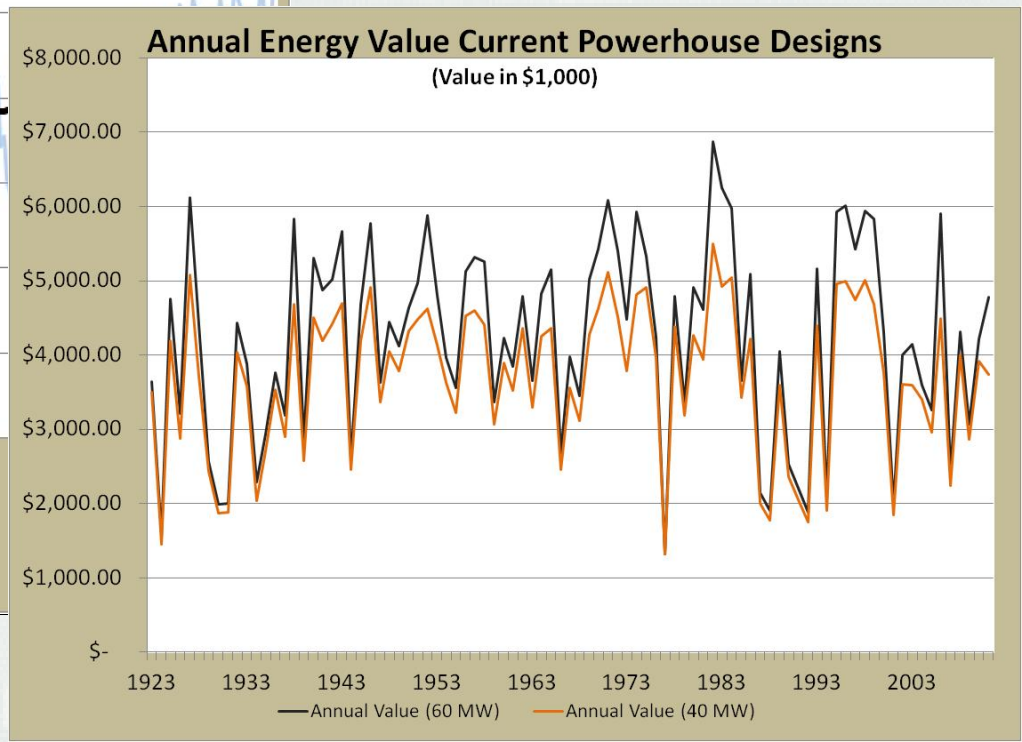
(Preliminary)



Completed Tasks-Economics

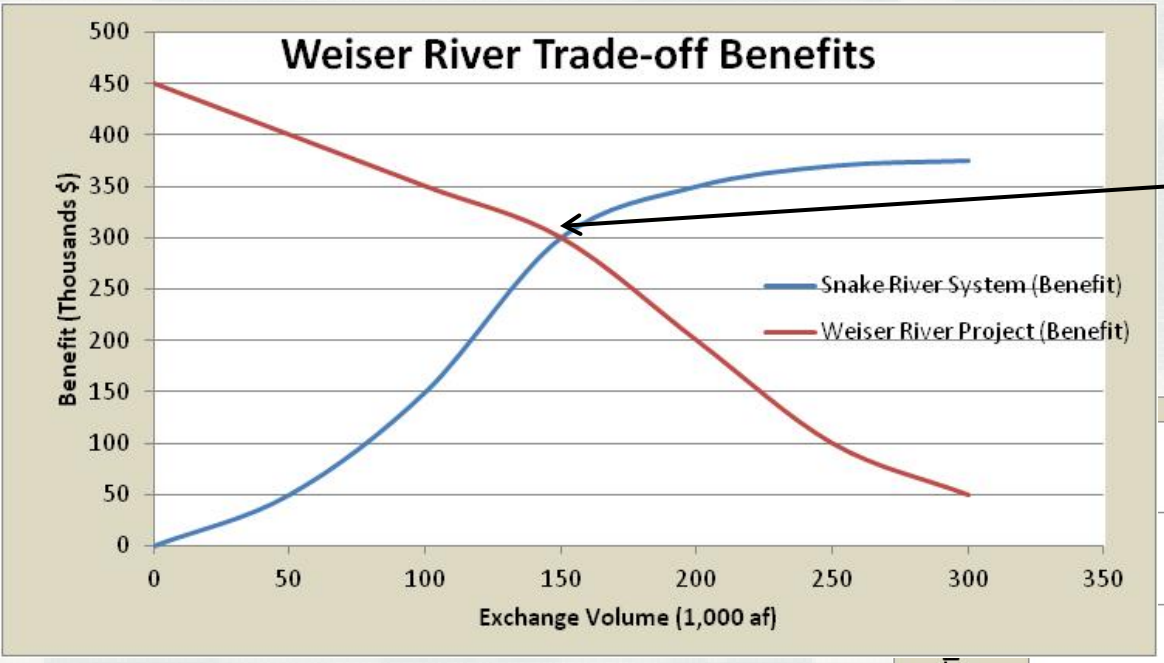
- <u>Economic Benefits Analysis</u>
  - Recreation
  - Flow Augmentation
  - Water Supply
  - Flood Risk (finalize with Hydraulics modeling completed)
- <u>Reservoir Modeling Inputs</u>
  - Projected monthly energy prices
  - Developing methods to incorporate peak/off-peak values
  - Estimation of bulk energy valuation



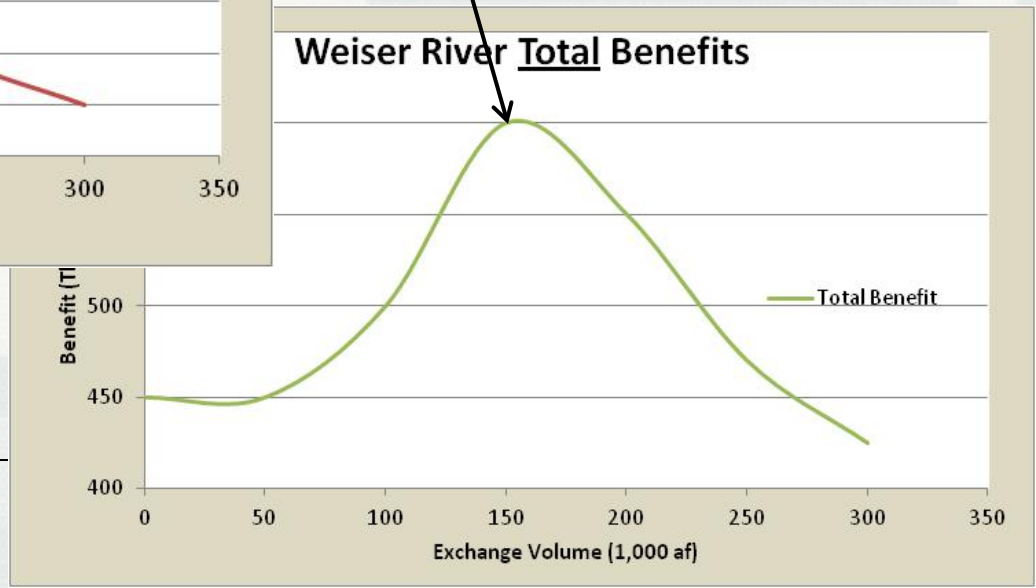


Current Tasks-Alternative Development

- Development will include input from several agencies/stakeholders
- Will help in “bracketing” the benefits of the proposed project
- Used in trade-off type analysis

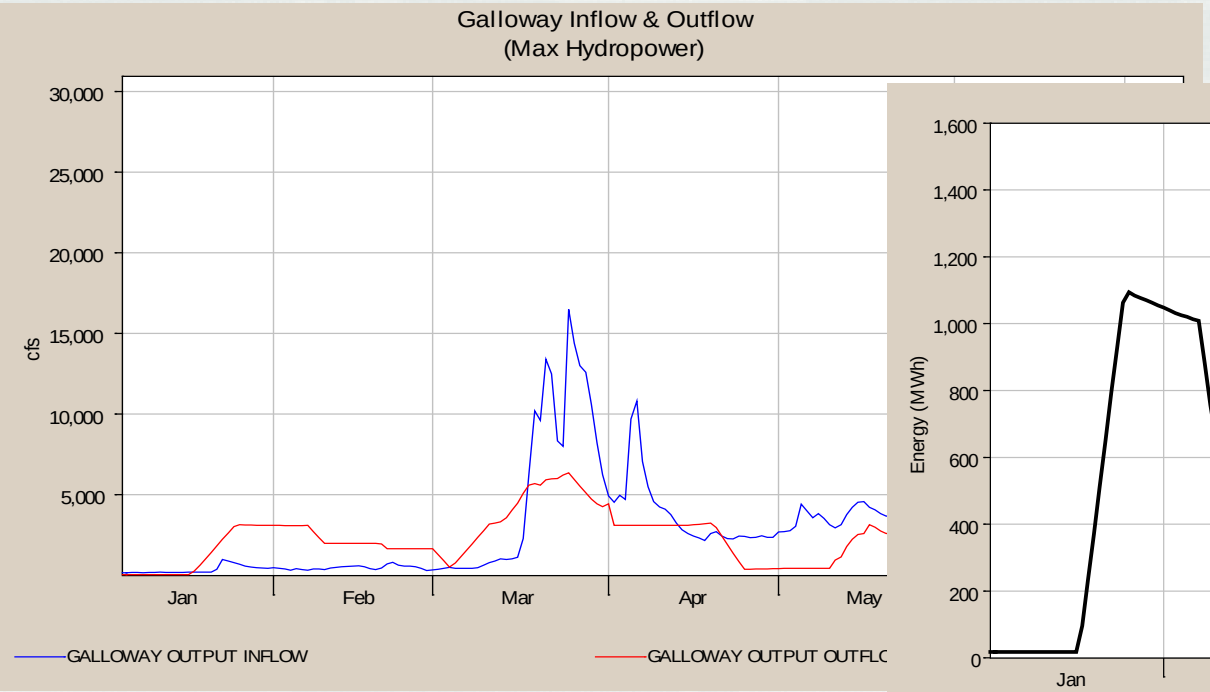


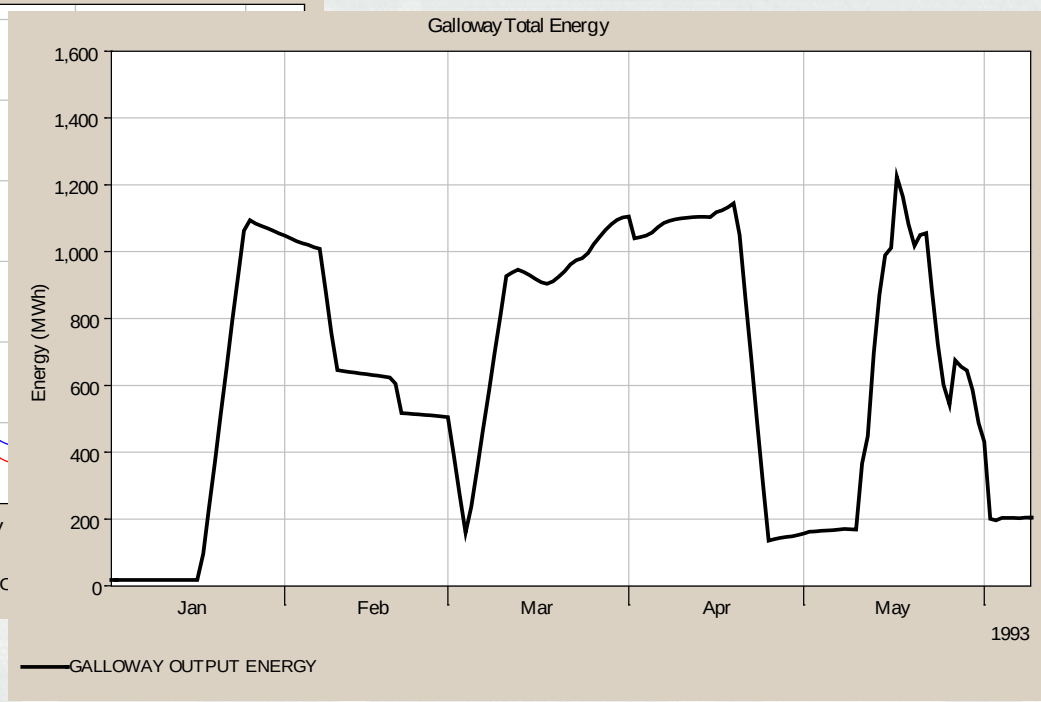
Maximum Total Benefits



Current Tasks-Modeling

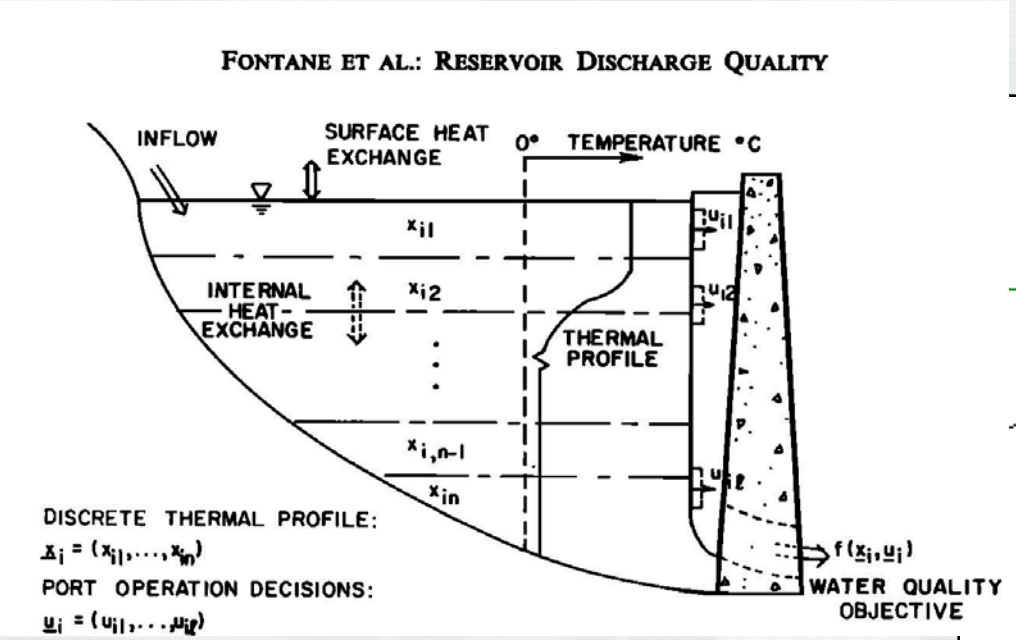
- Alternatives Coordinated with Reclamation, IPC & IDWR
- State Planning Model Updated
- Alternatives for Modeling
  - Maximize Hydropower
  - Maximize Flow Augmentation Exchange
  - Balance Hydropower & Exchange Volume

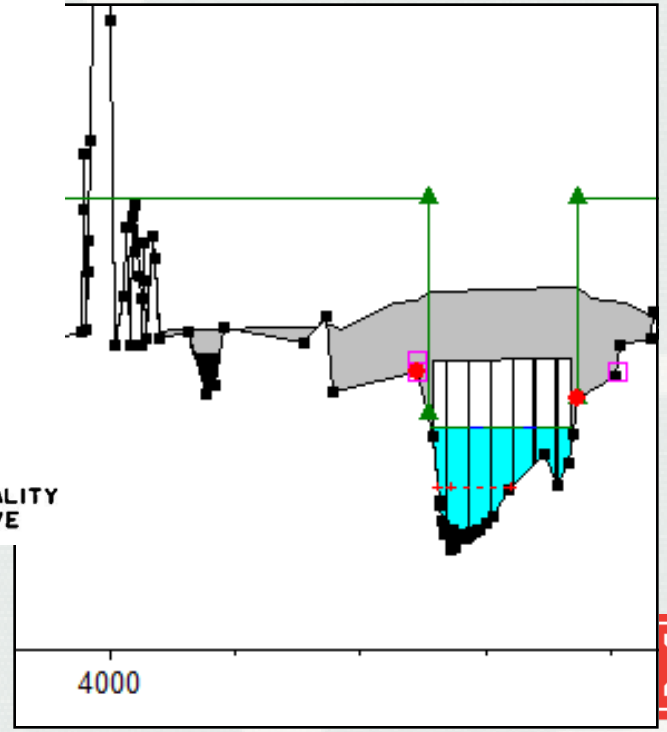




Current Tasks-Modeling

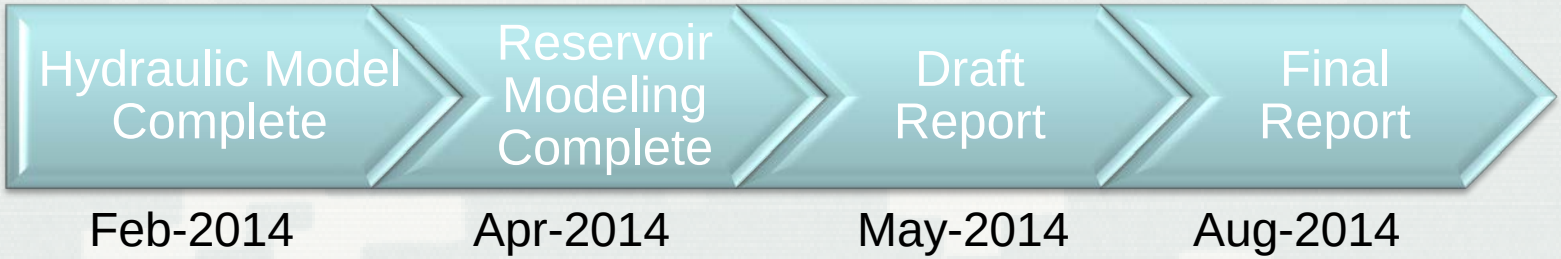
- <u>Hydraulics</u>
  - Flood Risk Reduction Benefits
  - Water Quality (temperature)





Current Tasks-Schedule

- <u>Important Milestones</u>
  - Modeling complete by April 2014
  - Documentation complete by August 2014



Weiser River near Evergreen Campground (Courtesy USFS)

Questions

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Walla Walla District

Weiser-Snake River Operations Study Update

November 2013

Summary of Activities: Several tasks were completed during FY 13 including: power plant sizing, energy value development, flood frequency analysis, streamflow extension, reservoir sizing analysis, and sediment estimation. The FY 13 completed tasks were necessary as inputs for the current modeling effort. The current work is focused on reservoir modeling for the proposed Weiser River project integrated with the Snake River reservoirs above Brownlee Reservoir. This work will produce benefits for the Weiser River project and identify potential benefits/impacts to other projects in the basin.

Completed Activities: The majority of completed tasks are related to the inputs needed for the reservoir modeling. This work includes results for both hydrologic, hydropower and economic inputs. Although the study completed by the Corps in the 1980s produced many of these same data, it was determined that completing a current analysis on this information would be beneficial since an additional +20 years of hydrologic data was available. In addition the largest flood of record occurred after the completion of the previous study. The Weiser River Basin Interim Report (1989) will still be referenced for comparison purposes. The completed hydrologic work includes:

- Probable Maximum Flood Hydrograph
- Peak Flow Frequency estimation
- Sediment analysis
- Streamflow data extension
- Runoff volume forecast development
- Reservoir sizing
- Initial reservoir yield

The powerplant design being considered is substantially larger than the previous study. The objective in this study was to determine the most reasonable maximum size for at-site hydropower given the physical limitations on dam size (determined from the Geology Investigation). The hydropower work includes:

- Design of total plant generation capacity
- Design of various unit configurations to provide maximum discharge range

The economic analysis has been iterative for the purposes of this study. Many of the economic benefits require hydrologic or reservoir information. These inputs have been provided to the economists and the report is near completion. However for the optimization modeling, economic inputs were required to determine possible future energy values. These values are the principle driver of the optimization with other constraints (i.e., minimum river flows, irrigation deliveries, etc.) still being satisfied. The completed economic work includes:

- Recreation, flow augmentation, and water supply benefits
- Flood Risk benefits (finalized after Hydraulic modeling complete)
- Projected monthly energy prices for the next 26 years
- Developing methods to incorporate peak/off-peak values
- Estimation of bulk energy valuation

On-going Activities: The current work is primarily related to the reservoir operations analysis and hydraulic modeling. The hydraulic modeling will be used to determine flood risk reduction benefits.

This analysis will also be used to determine water temperatures at the Snake-Weiser River confluence. The water temperature issue in the Lower Snake, below Hells Canyon Dam, is an important consideration. Any decreases in temperature as a result of upstream storage could potentially be a significant benefit to Idaho Power Company (IPC).

The reservoir modeling will be used to determine the majority of the project benefits. The largest potential benefits for this project are at-site hydropower, increases to Hells Canyon Complex hydropower and flow augmentation volume exchange. The reservoir modeling has several components that are being evaluated including:

- Optimization modeling for maximizing hydropower benefits
- Determining maximum flow augmentation volume that can be exchanged with other subbasins (Boise, Payette & Upper Snake)
- Quantifying impacts to the IPC's mid-Snake River projects and Hells Canyon Complex through system modeling
- Determining which subbasin will be used in the exchange
- Quantifying any additional volume from the new storage that can be used for in-basin purposes or by IPC
- Determine changes in flow regime downstream of Hells Canyon Complex

The hydraulic modeling includes the damages prevented for both the town of Weiser, ID as well as the agricultural lands adjacent to the river. Developing the hydraulic model will provide a tool to also evaluate the water temperature of the Weiser River at the confluence with the Snake River. As mentioned above the flow and temperature will then be used to evaluate any benefits for water quality further downstream. The hydraulic modeling has several tasks that are being evaluated including:

- Floodplain modeling and mapping
- Refining downstream channel capacity for reservoir management
- Water quality (temperature) modeling at the confluence
- Development of dam break model for risk analysis

Project Schedule

Tasks		Completion Date
Modeling		
1)	Optimization Model Development	11/30/13
2)	Hydraulic Modeling	12/15/13
3)	Water Quality Modeling	1/15/14
4)	Simulation Model Development	12/31/13
5)	Optimized Power Alternatives Modeling	1/31/14
6)	Dam Break Modeling	2/28/14
7)	Flow Augmentation Alternatives Modeling	3/15/14
8)	Detailed Model Documentation	5/15/14
Documentation		
9)	Initial Report Draft	4/30/14
10)	Review Comments & Coordination	7/31/14
11)	Final Report	8/31/14