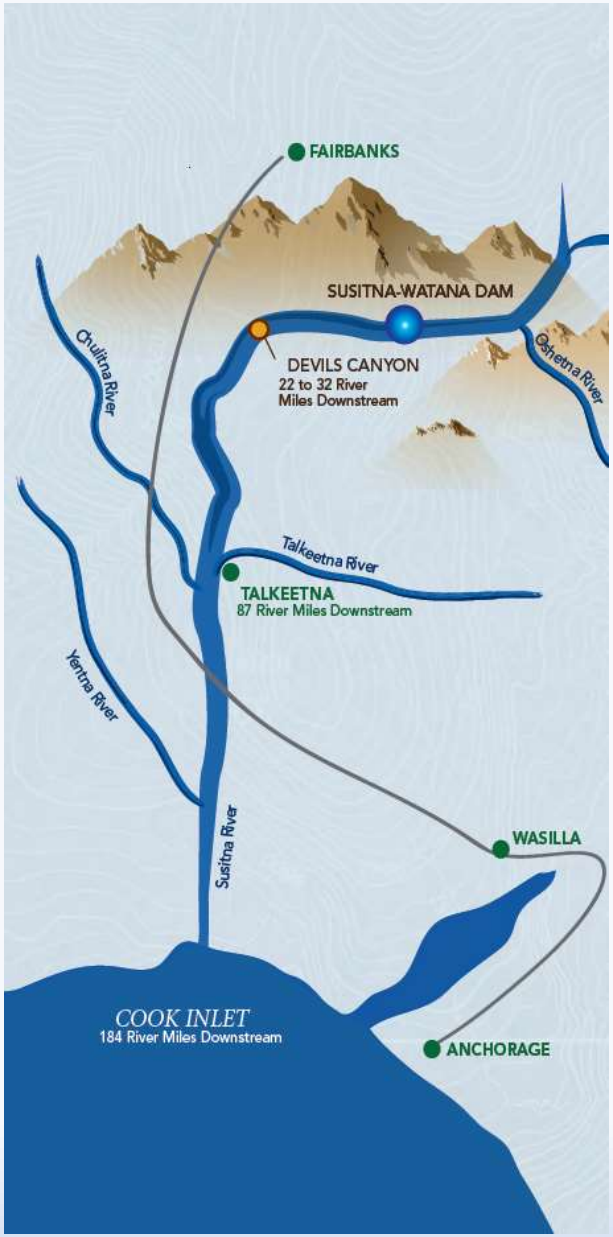


Initial Study Report Meeting

Study 16.5

Probable Maximum Flood (PMF)

October 22, 2014

Prepared by

MWH

Applied Weather Associates

Study 16.5 Objectives

- Develop a site-specific PMP to be used for the derivation of the PMF including both a temporal and spatial distribution of rainfall
- Model the runoff through the Project drainage basin to produce the PMF inflow, including snowmelt considerations for the Project reservoir
- Route the PMF inflow through the Project to obtain the PMF outflow and maximum flood elevation at the dam
- Determine the required outlet capacity to safely route the PMF through the reservoir
- Determine the freeboard allowance
- Use the Board of Consultants (BOC) for technical review during development and performance of the site-specific studies

Study 16.5 Components

- **Board of Consultants Review** (ISR Part A, Section 4.1; pg 2)
- **Data Acquisitions** (ISR Part A, Section 4.2; pg 2)
- **Historical Data Analysis** (ISR Part A, Section 4.3; pg 3)
- **Review of Previous PMF Study Report** (ISR Part A, Section 4.4; pg 4)
- **Field Visits** (ISR Part A, Section 4.5; pg 4)
- **Flood Hydrology Model Selection** (ISR Part A, Section 4.6; pg 5)
- **Flood Hydrology Model Initial Setup** (ISR Part A, Section 4.7; pg 6)
- **Flood Hydrology Model Calibration and Verification** (ISR Part A, Section 4.8; pg 6)
- **Development of the Site-Specific PMP** (ISR Part A, Section 4.9; pg 7)
- **Coincident Conditions for the PMF** (ISR Part A, Section 4.10; pg 8)
- **Development of the PMF Inflow Hydrograph** (ISR Part A, Section 4.11; pg 8)
- **Reservoir Routing of the PMF** (ISR Part A, Section 4.12; pg 9)
- **Freeboard Analysis** (ISR Part A, Section 4.13; pg 9)
- **Reporting** (ISR Part A, Section 4.14; pg 10)

Study 16.5 Variances

- There were no variances from the RSP that would limit the accuracy, effectiveness or utility of the PMP and PMF results.
- The most significant variance from the RSP was to **increase the number of calibration and verification floods from the standard three to six floods**. As the PMF study progressed, it became clear that floods resulting from two different dominant sources (rainfall and snowmelt) must be considered. Choosing three floods of each type doubled the need for historic meteorological data development and flood calibration and verification, but ensured the accuracy of the ultimate controlling PMF hydrograph.

Study 16.5 Summary of Results in ISR

- **Review of Previous PMF Study Report**
  - Showed importance of snowmelt
  - Most historic floods were available for the 1980s study
- **Data Acquisition**
  - All major storms in the region initially considered for PMP
  - 6 historical floods for runoff model calibration and verification
  - Snowpack data
- **Historical Data Analysis**
  - Floods of record – temporal and magnitude
  - Temperature, wind speed, and dew point
  - 100-year snowpack and probable maximum snowpack
- **Field Visits**
  - September 27, 2012 study team flyover
  - May 29, 2013 with BOC and study team
  - Near coincident with June 2, 2013 sunny day maximum flood

Study 16.5 Summary of Results in ISR

- **Flood Hydrology Model Selection**
  - SSARR model from 1980s is not currently in use
  - HEC-HMS current model but does not include the recommended energy budget snowmelt method
  - HEC-1 Flood Hydrograph Package – selected - includes the energy budget snowmelt method with much previous experience available
- **Flood Hydrology Model Initial Setup**
  - Sub-basin delineation – 29 to Watana Dam; 34 total to Gold Creek
  - Areas in elevation bands; initial estimates of loss rates
- **Flood Hydrology Model Calibration and Verification**
  - Seasonal snowmelt dominated and rainfall dominated floods resulted in 6 calibration/verification floods rather than the usual 3
  - Hourly meteorological data provided by Applied Weather Associates
- **Coincident Conditions for the PMF – Alternative Cases**
  - 100-year snowpack + seasonal PMP
  - Probable maximum snowpack + 100-year rainfall
  - Probable maximum snowpack + maximum temperatures (no rain)

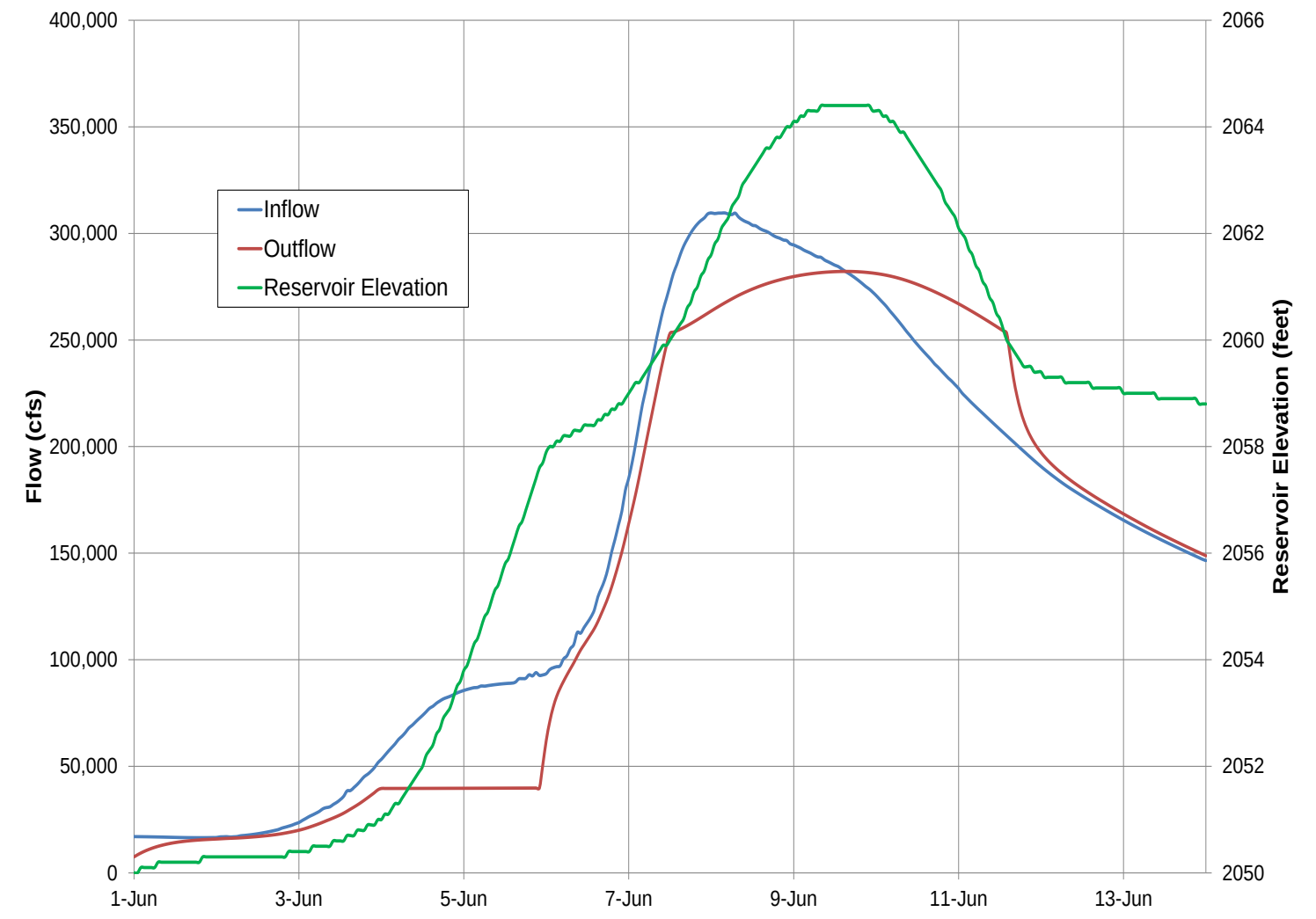
Study 16.5 Summary of Results in ISR

- **Development of the Site-Specific PMP**
  - Existing Weather Bureau (NWS) PMP guidance documents were inadequate – maximum 400 square miles and 24-hour duration
  - Storm search – long list; all major storms analyzed to determine if further analysis was warranted
  - Storm search – short list; 9 storms fully analyzed to determine PMP
  - Maximization, transposition, and orographic analysis
  - August 1967 Fairbanks storm was critical
  - All data prepared on an hourly time increment
  - All-season (maximum) PMP would occur in July or August
  - Alternative temporal sequences were developed
  - Basin average values: 1.78 in. for 6 hours; 4.40 inches for 24 hours; 7.19 inches for 72 hours; 10.00 inches for 216 hours (9 days)
  - Concurrent meteorological data (temperature, wind speed, dew point) for snowmelt for each hour in the time sequence
  - Adjustment factors for data from the maximum month to the months of April through October

Study 16.5 Summary of Results in ISR

- **Development of the PMF Inflow Hydrograph**
  - Cases - PMP temporal, PMF seasonal, PMF sensitivity
  - 310,000 cfs peak inflow
- **Reservoir Routing of the PMF**
  - Peak reservoir elevation – 2,064.5 ft
  - Peak outflow – 282,000 cfs
- **Freeboard Analysis**
  - Normal freeboard: required = 9.6 ft; provided = 18.5 ft
  - Minimum freeboard: required = 3.5 ft; provided = 4.0 ft
- **Board of Consultants meeting and review comments – April 2-4, 2014**
  - PMP and PMF were substantially complete
  - Concurrence with primary study methods and results
  - Sun-on-Snow PMF
- **Reporting**
  - Final Draft Report - May 2014 – 390 pages
  - Included as Study 16.5 ISR, Part C, 2 of 2

Study 16.5 Summary of Results in ISR



Current Status and Steps to Complete Study 16.5

The PMF Study is complete subject to inclusion of any additional responses to potential comments from the BOC and others, which would be addressed in the USR

Licensing Participants Proposed Modifications to Study 16.5?

- Agencies
- CIRWG members and Ahtna
- Public