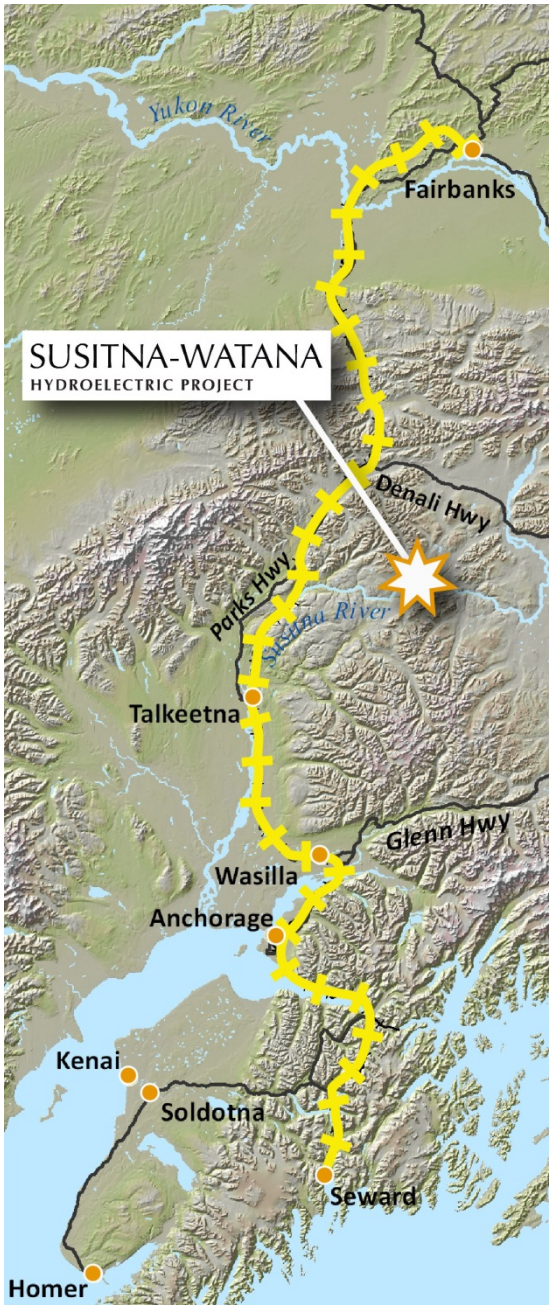

SUSITNA-WATANA
HYDROELECTRIC PROJECT

Formal ILP Proposed Study Plan Review

August 16, 2012

Prepared by MWH Americas, Inc.

ALASKA ENERGY AUTHORITY

Resource Area Proposed Studies

Section 4: Geology and Soils

- Geologic characterization of dam site, foundation conditions and construction materials;
- Regional geologic analysis - reservoir area; access roads and transmission corridors, and in stream areas downstream of dam site
- Identify adverse geologic features
- Reservoir rim stability
- Geologic and engineering analysis
- Seismic studies (see Seismic PSP, overlaps with)

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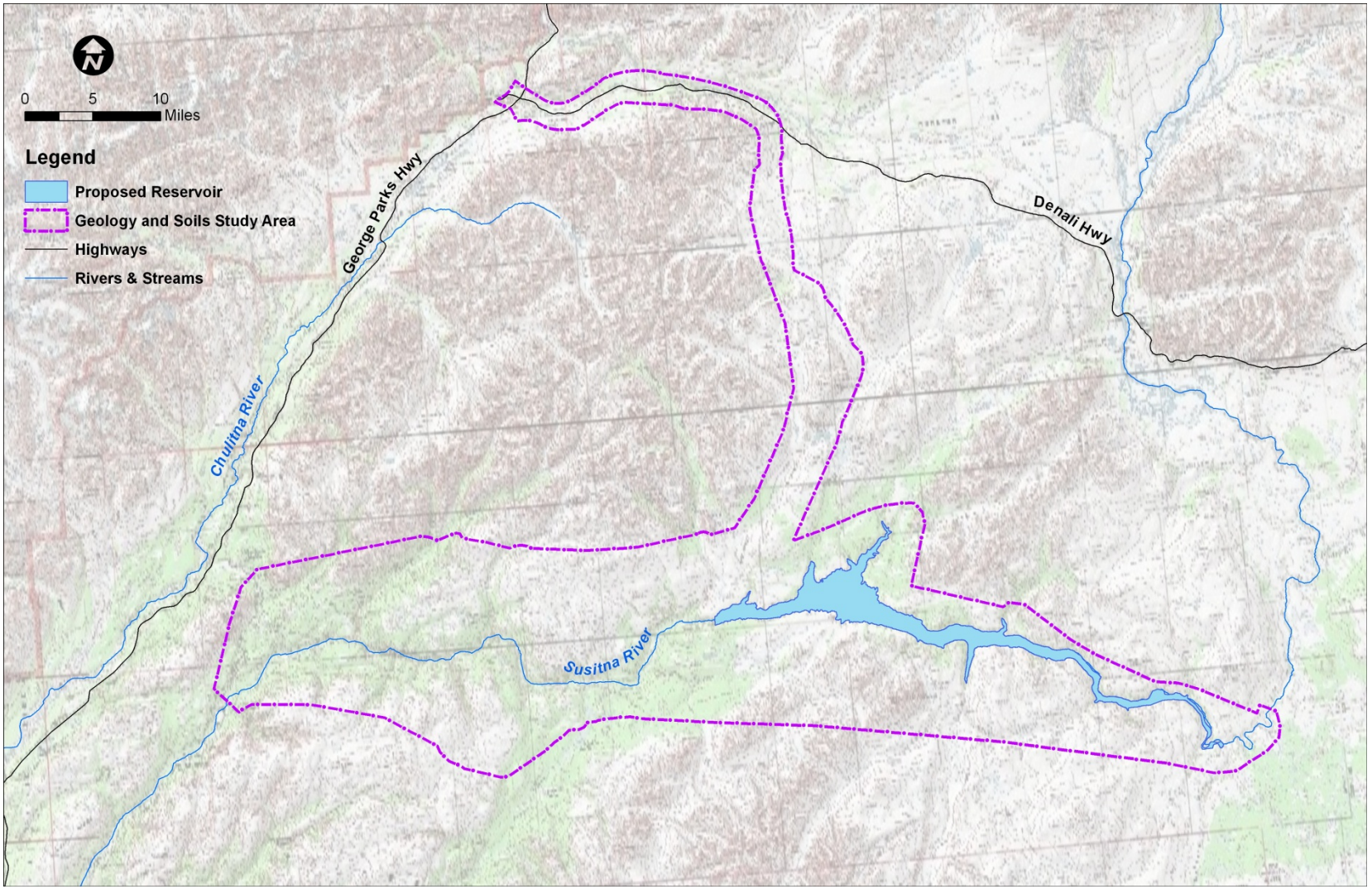
Geology and Soils
Goals and Objectives

- Geology and soils evaluation to define the existing geologic-al conditions in the project area and to develop design criteria to confirm that the proposed project structures would be safe and adequate to fulfill their stated functions
  - Identify existing soils and geologic features at the proposed site.
  - Determine the potential effects of project construction, operation, and maintenance activities on the geology and soils resources in the project area.
  - Develop measures to avoid, minimize, or mitigate potential adverse effects to, or resulting from, geologic and soil resources in the project area.
  - Identify mineral resources
  - Acquire geology and soils data for use in design development

Geology and Soils Study Area



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Geology and Soils
Methods

- Summarize geology and soils data from 1970's / 1980's studies.
- Conduct field investigation programs – geologic mapping, utilize imagery datasets (e.g., LiDAR), subsurface investigation and testing, laboratory testing, instrumentation, etc.
- Evaluate the mineral resource potential in reservoir area
- Geologic characterization, engineering and analysis
  - Identify significant geologic features, rock structure, weathering/alteration zones, permafrost areas, etc.
  - Delineate and characterize construction material sources
  - Optimization of project arrangement and facilities

Geology and Soils
Methods (Continued)

- Geologic characterization, engineering and analysis (cont)
  - Develop design criteria; engineering analysis, modeling (e.g., seepage) and design (e.g., foundation, cut slopes, tunnel)
  - Reservoir slope stability evaluation
  - Seismic hazard assessment
  - Develop ground motion parameters and seismic design criteria
  - Evaluate potential for Reservoir Triggered Seismicity
- Installation of long-term earthquake monitoring system

Geology and Soils
Expected Results

- Expected First year evaluations include:
  - Initiate evaluation of geology and soil resources, including mineral resources, in the dam site and reservoir areas
  - Initiate subsurface investigation program to evaluate geologic and foundation conditions at the dam site and construction material source(s) to include geologic mapping, drilling, in situ and laboratory testing. Install geo instrumentation.
  - Regional geologic analysis of surficial geology, reservoir rim stability assessment
  - Initiate seismic hazard and reservoir triggered seismicity assessment
  - Establish long term earthquake monitoring system, four stations
  - Establish preliminary design criteria, designs, optimize arrangement

Geology and Soils
Expected Results (Continued)

- Expected second and third year findings include:
  - Continue evaluation of geology and soil resources, including mineral resources, in the dam site, reservoir and road/transmission corridors
  - Continue subsurface investigation program to evaluate geologic and foundation conditions at the dam site and construction material source(s) to include geologic mapping, drilling, in situ and laboratory testing, and instrumentation.
  - Complete seismic hazard assessment
  - Earthquake monitoring
  - Engineering analysis – establish design criteria, numerical modeling, development of designs (e.g., foundation, tunnel, slope)
  - Determine impacts, mitigation measures on geology and soil resources

Geology and Soils

Relationship to Other Studies

- Data and results from geology and soils studies will be used to coordinate with other study disciplines where necessary. It is anticipated that there are relationships with the following studies:
  - PSP Section 5.7 Groundwater related aquatic habitat study
  - PSP Section 5.8 Geomorphology;
  - PSP Section 5.9 Fluvial geomorphology modeling below Watana dam;
  - PSP Section 11. 5 Cultural Resources Study
  - PSP Section 11.6 Paleontological Resources Study
  - PSP Section 14.6 Site Specific Seismic Hazard Evaluation Study
- Indicate how results will be used for impact analysis