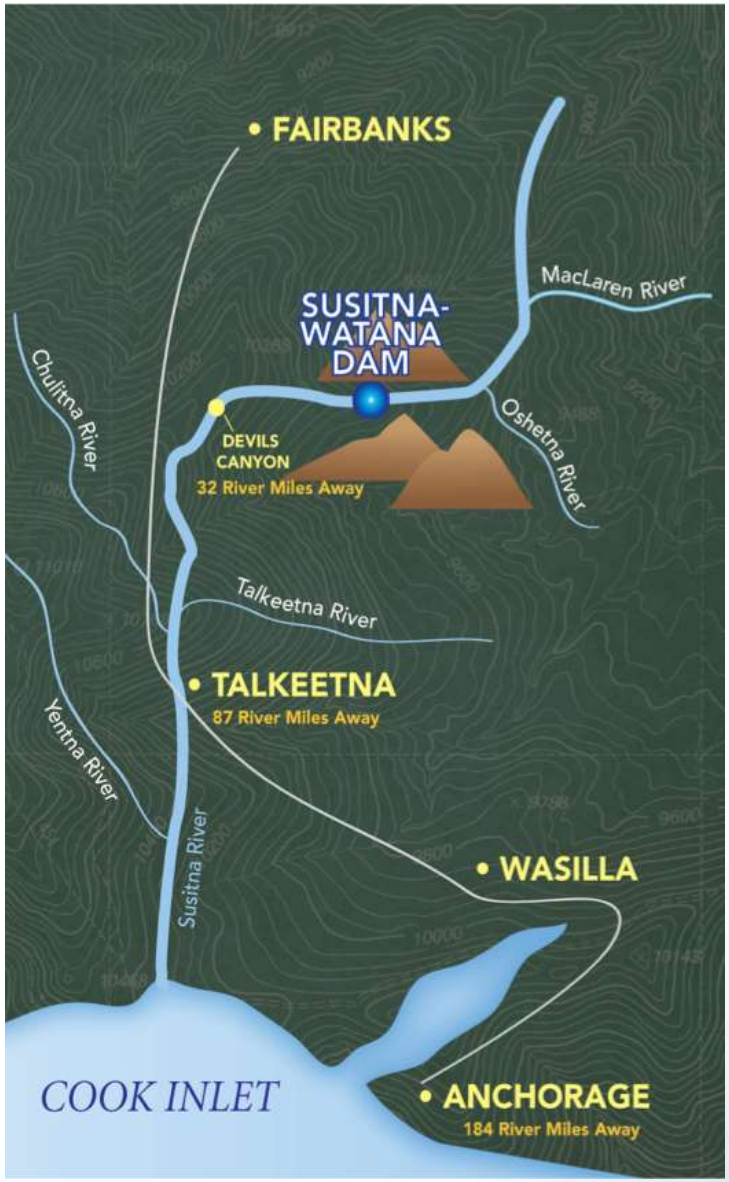
Water Quality Studies
(RSP Section 5.5, 5.6, 5.7)

Technical Work Group Meeting
2nd Quarter 2013

June 26, 2012

Prepared by: URS/Tetra Tech
Prepared for: Alaska Energy Authority



Water Quality Meeting Outline

- Q2 2013 Update
- Water Quality Studies
  - Thermistors
  - Baseline Water Quality
  - Sediment
- Focus Area Sampling
- Mercury Assessment
  - Fish
  - Feathers
  - Fur
- Q3 2013 Planned Activities

Water Quality Studies Q2 2013

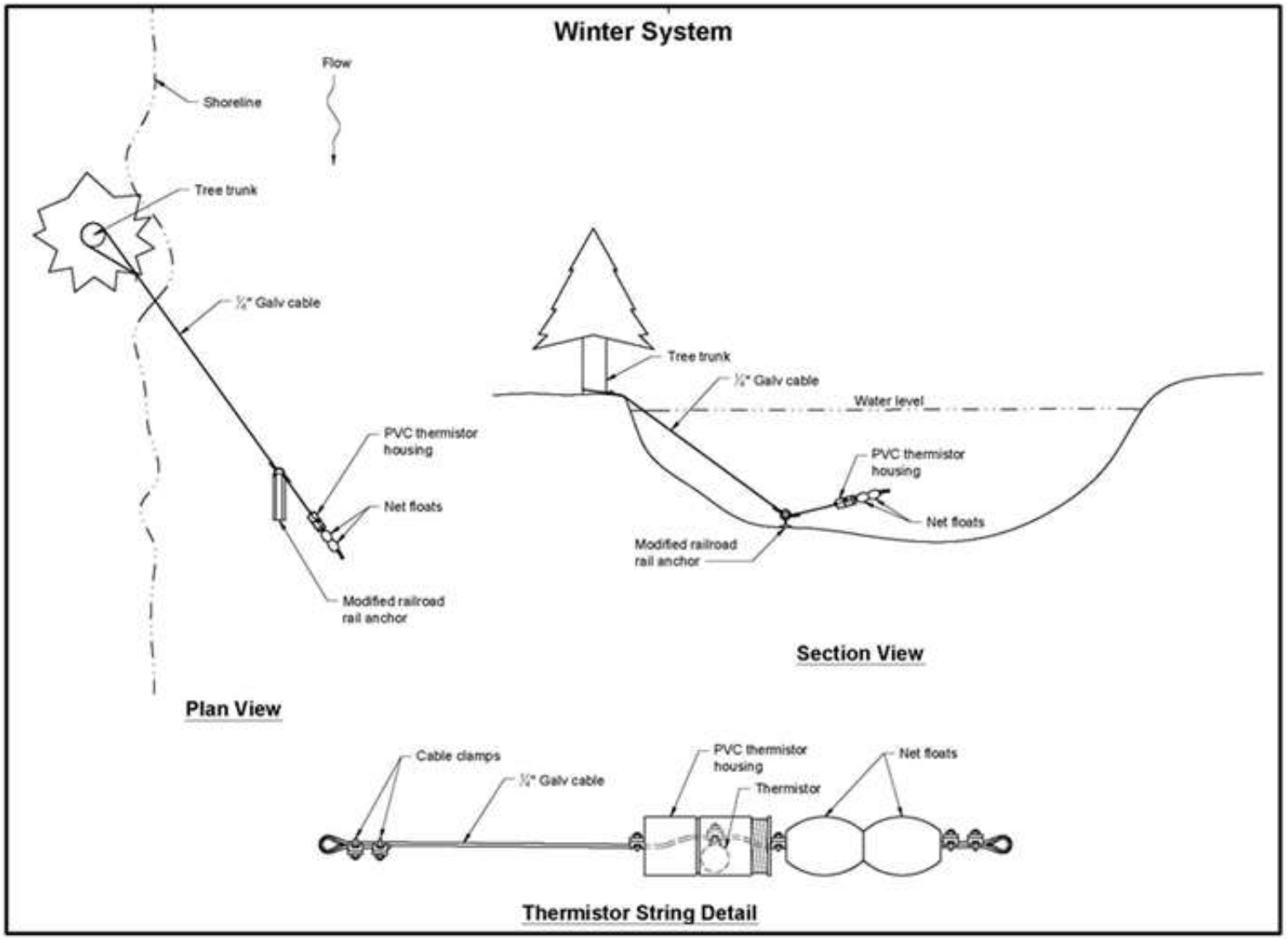
RSP Section	Title	2nd Quarter Activity
5.5	Baseline Water Quality	• Preparation for water sampling. • Temperature loggers - continuous data collection since 2012. • Met station - continuous data collection. • Re-established temperature monitoring sites. • Coordination with IFS for Focus Area sampling locations and parameters. • Completion of revised QAPP.

5.6	Water Quality Modeling	• Collecting USGS Gage Station data for use in calibrating the Hydraulic Routing Module in EFDC
		• Assembling 1980s data for evaluation for use in EFDC model calibration:
		  • Compare 1980s data with 2012/2013 data
		  • Determine comparability with current conditions
		  • Expand data record for calibration of the models

5.7	Mercury Assessment and Potential for Bioaccumulation	• Continued literature review. • Coordination with other studies for data collection (fish, feathers, fur).

Water Quality Studies

- Temperature Loggers (Thermistors)
  - Field crew currently installing/downloading thermistors.
  - 33 sites total. All have been re-installed.
  - 17 overwinter set ups in the mainstem Susitna River being recovered.
  - Currently evaluating winter installation survival.


Winter System
Flow
Shoreline
Tree trunk
½" Galv cable
PVC thermistor housing
Net floats
Modified railroad rail anchor
Plan View
Tree trunk
½" Galv cable
Water level
PVC thermistor housing
Net floats
Modified railroad rail anchor
Section View
Cable clamps
¼" Galv cable
PVC thermistor housing
Thermistor
Net floats
Thermistor String Detail

Baseline Water Quality (RSP 5.5)

- **Start sampling at end of June, 2013**
- **17 mainstem sites**

Parameters:

DO
pH
Temperature
Spec. Conductance
Turbidity
Redox
Color
Hardness
Alkalinity
Nitrate/Nitrite
Ammonia as N
Total Kjeldahl Nitrogen
Total Phosphorus
Ortho-phosphate
Chlorophyll-a
TDS
TSS
Turbidity
TOC
DOC

Fecal coliform
Petroleum hydrocarbons
Radioactivity
Aluminum
Arsenic
Barium
Cadmium
Chromium (III & IV)
Copper
Iron
Lead
Manganese
Magnesium
Mercury
Molybdenum
Nickel
Selenium
Thallium
Vanadium
Zinc

Proposed Susitna Water Quality Monitoring Sites (2013)

Susitna River Mile	Description
25.8	Susitna Station
28.0	Yentna River
29.5	Susitna above Yentna
40.6	Deshka River
55.0	Susitna
83.8	Susitna at Parks Highway East
97.2	Talkeetna River
98.5	Chulitna River
103.0	Talkeetna
120.7	Curry Fishwheel Camp
136.8	Gold Creek
138.6	Indian River
138.7	Susitna above Indian River
148.8	Susitna at Portage Creek
148.8	Portage Creek
184.5	Susitna at Watana Dam site
223.7	Susitna near Cantwell

Sediment Sampling

Parameters:

Aluminum
Arsenic
Cadmium
Copper
Iron
Lead
Mercury
Zinc
TOC
Grain size

- Start in July 2013
- Mainstem areas with finer sediment along the channel bottom
- 10 sites
- 20 samples

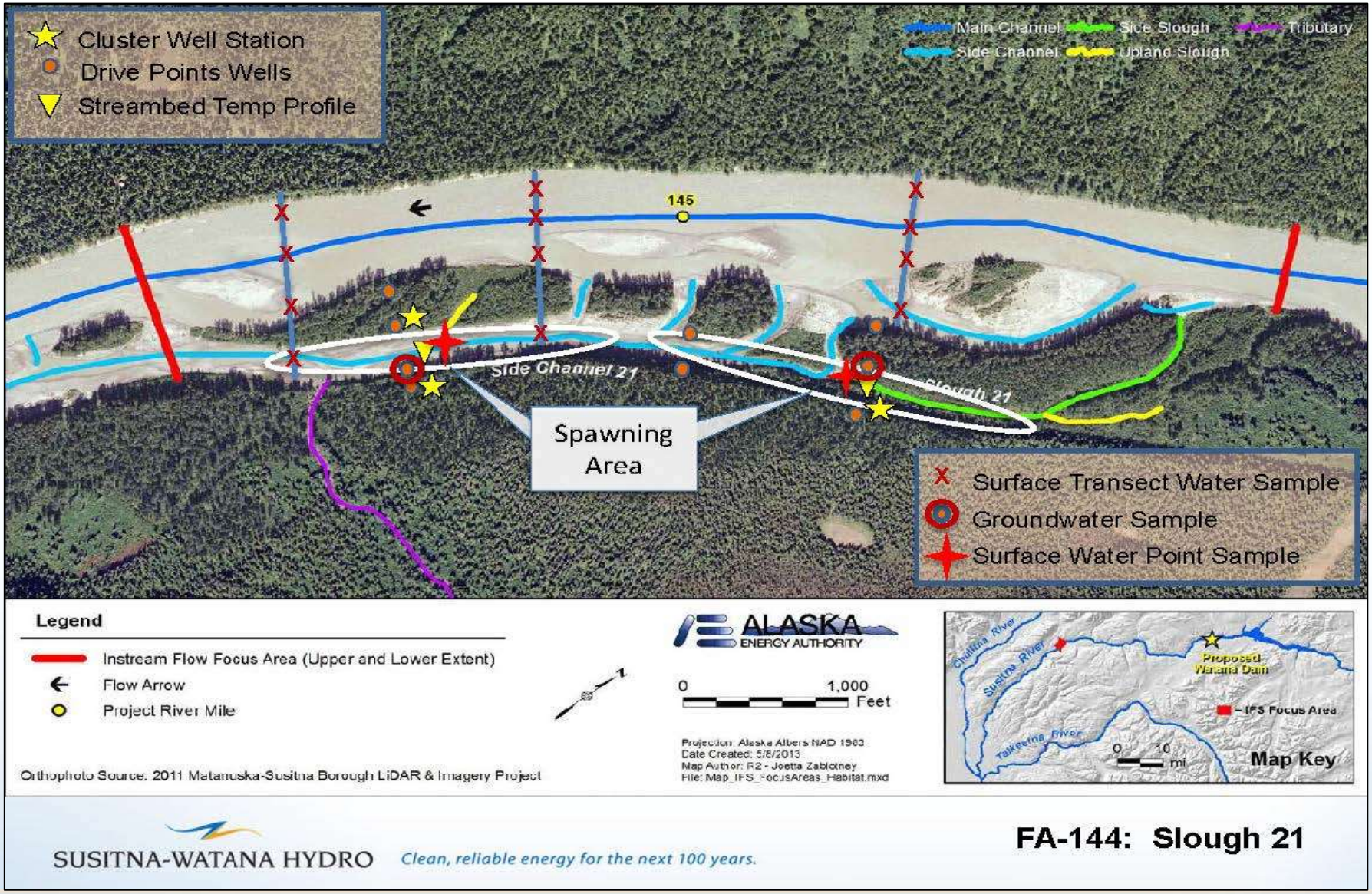
Objectives:

1. Identify presence of toxics and location;
2. Determine if toxics are bioaccumulative (Pathways Models); and
3. Use data to improve performance of the toxics module within EFDC

Focus Area WQ Sampling

- Start sampling at end of June 2013.
- 3 sample events, seven Focus Areas.
- 2-3 cross sections per Focus Area.
  - Added point samples from areas of special interest
- Groundwater samples
  - Monitoring for both water quality studies and Instream Flow Study (RSP 8.5)
  - Coordination of installation with Groundwater Study (RSP 7.5)

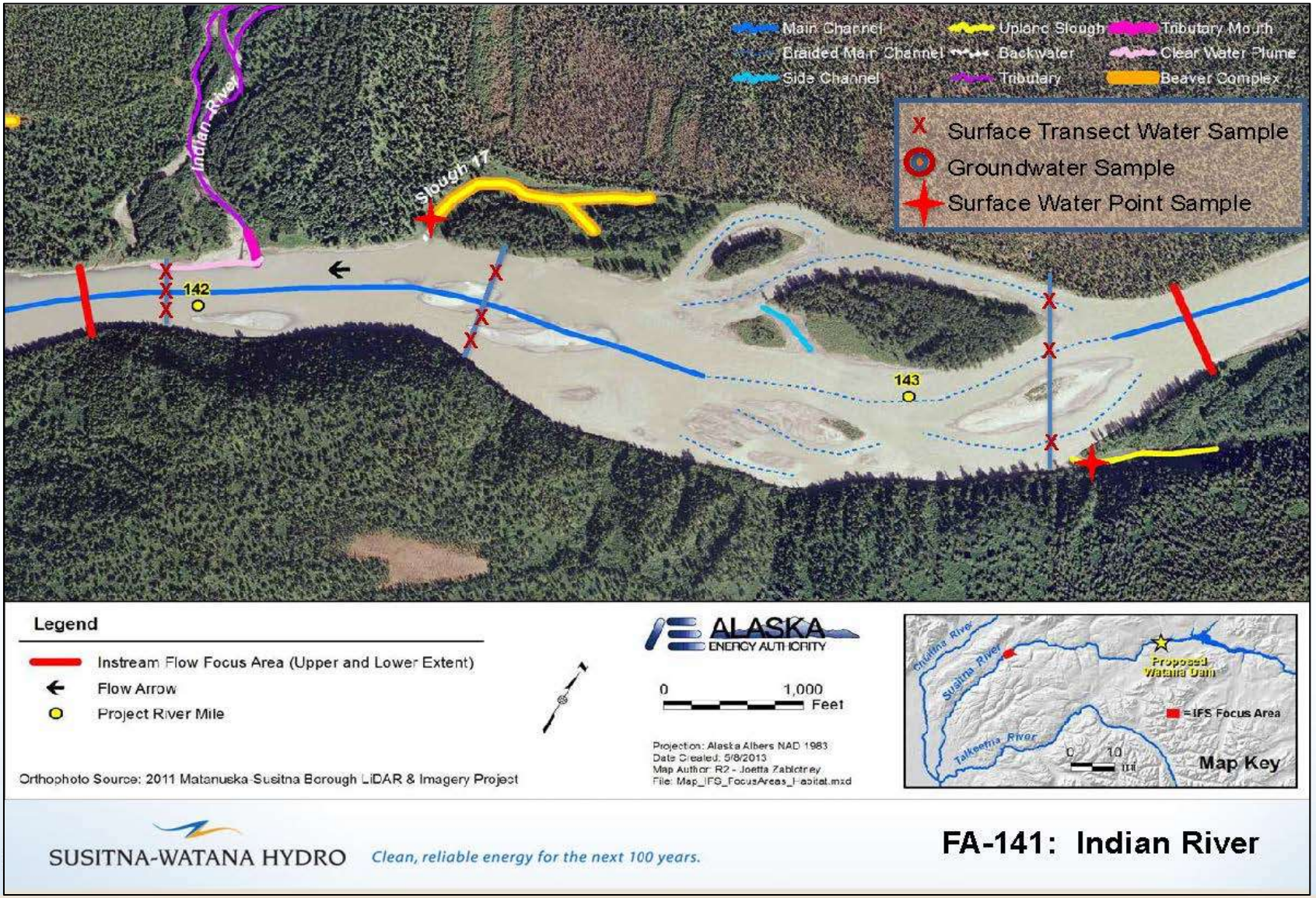
Focus Areas



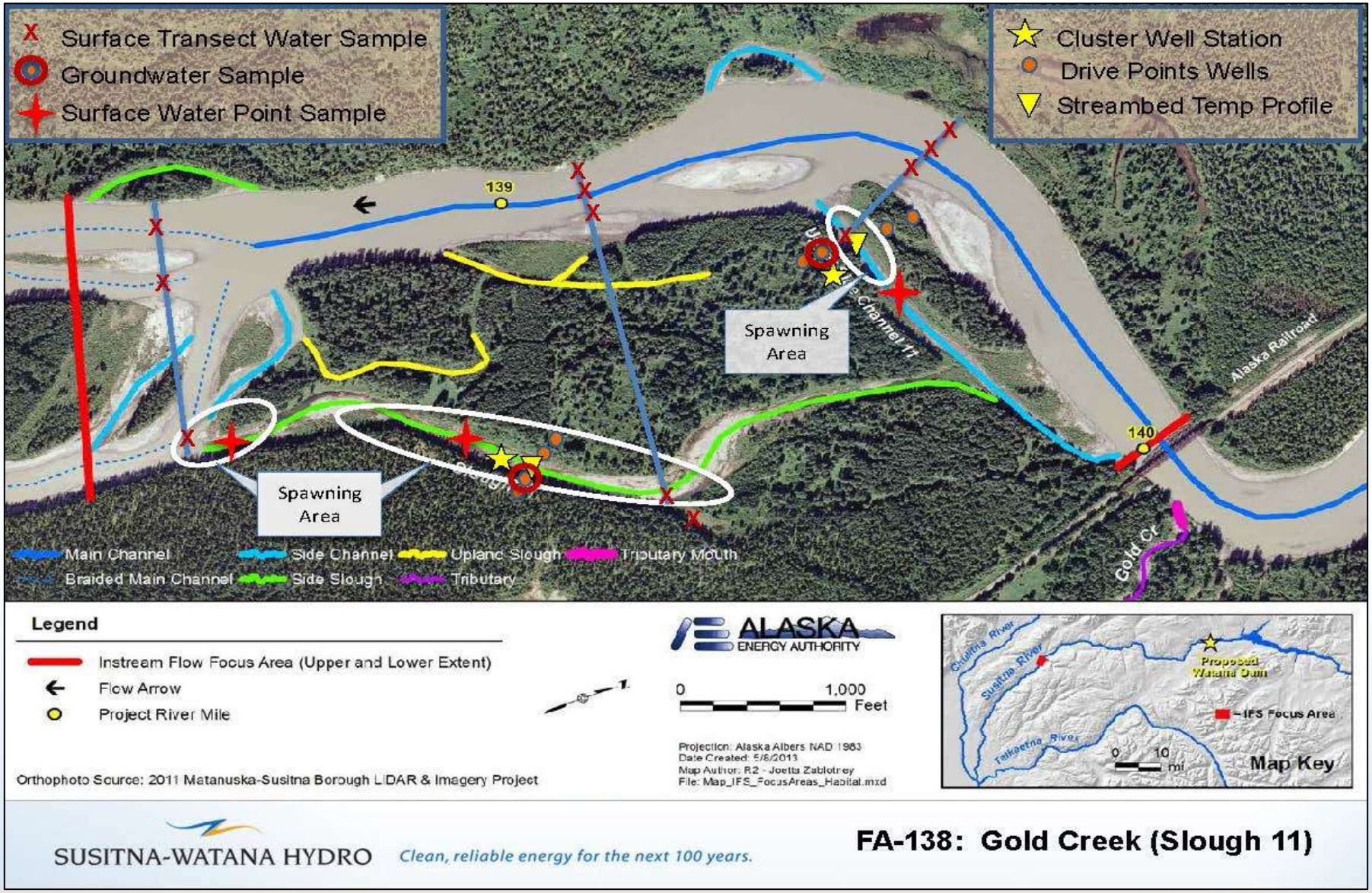
SUSITNA-WATANA HYDRO *Clean, reliable energy for the next 100 years.*

FA-144: Slough 21

Focus Areas


Main Channel
Braided Main Channel
Side Channel
Upland Slough
Backwater
Tributary
Tributary Mouth
Clear Water Plume
Beaver Complex
Surface Transect Water Sample
Groundwater Sample
Surface Water Point Sample
Indian River
Slough 17
142
143
Legend
Instream Flow Focus Area (Upper and Lower Extent)
Flow Arrow
Project River Mile
Orthophoto Source: 2011 Matanuska-Susitna Borough LiDAR & Imagery Project
ALASKA ENERGY AUTHORITY
0
1,000
Feet
Projection: Alaska Albers NAD 1983
Date Created: 5/8/2013
Map Author: R2 - Joetta Zablotney
File: Map_IFS_FocusAreas_Habitat.mxd
Chulitna River
Susitna River
Talkeetna River
Proposed Watana Dam
= IFS Focus Area
0
10
mi
Map Key
SUSITNA-WATANA HYDRO
Clean, reliable energy for the next 100 years.
FA-141: Indian River

Focus Areas


Surface Transect Water Sample
Groundwater Sample
Surface Water Point Sample
Cluster Well Station
Drive Points Wells
Streambed Temp Profile
139
140
Spawning Area
Spawning Area
Slough 11
Alaska Railroad
Gold Cr
Main Channel
Braided Main Channel
Side Channel
Side Slough
Upland Slough
Tributary
Tributary Mouth
Legend
Instream Flow Focus Area (Upper and Lower Extent)
Flow Arrow
Project River Mile
ALASKA ENERGY AUTHORITY
0
1,000
Feet
Projection: Alaska Albers NAD 1983
Date Created: 5/6/2013
Map Author: R2 - Joetta Zablotney
File: Map_IFS_FocusAreas_Habitat.mxd
Orthophoto Source: 2011 Matanuska-Susitna Borough LIDAR & Imagery Project
Chulitna River
Susitna River
Talkeetna River
Proposed Watana Dam
IFS Focus Area
0
10
mi
Map Key
SUSITNA-WATANA HYDRO
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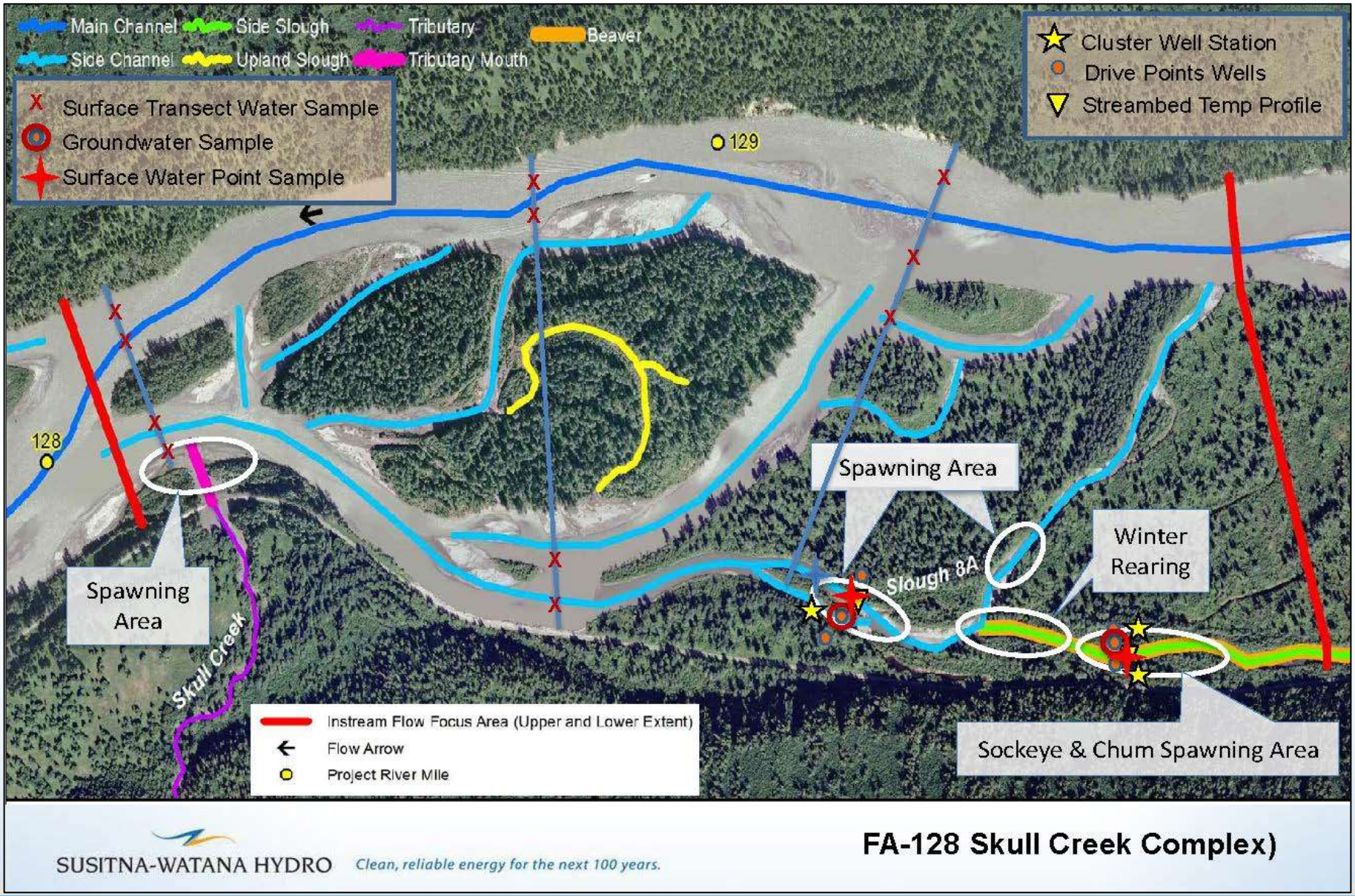
FA-138: Gold Creek (Slough 11)

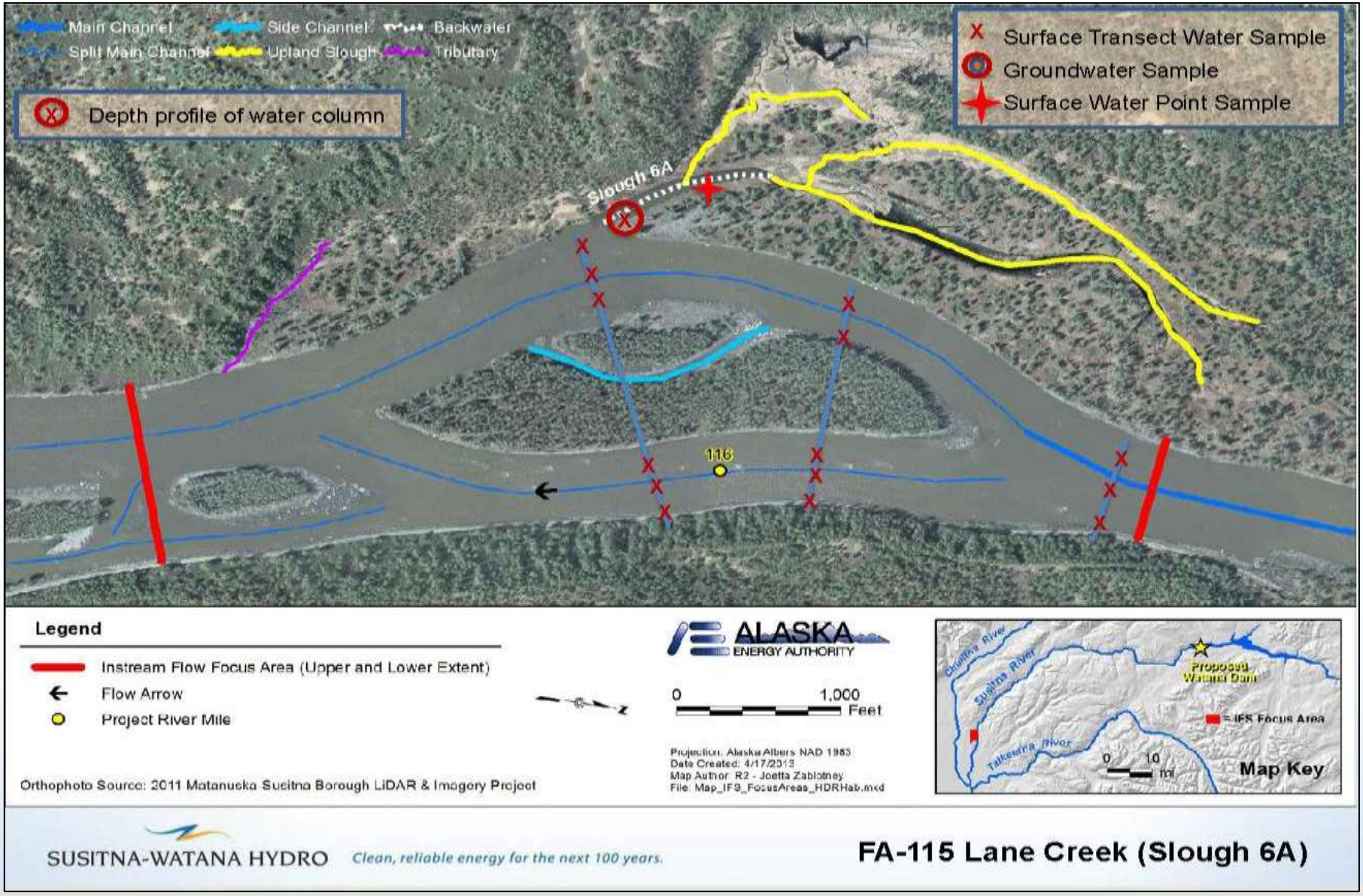
Focus Areas



SUSITNA-WATANA HYDRO *Clean, reliable energy for the next 100 years.*

FA-128 Skull Creek Complex)

Focus Areas


Main Channel
Side Channel
Backwater
Split Main Channel
Upland Slough
Tributary
Depth profile of water column
Surface Transect Water Sample
Groundwater Sample
Surface Water Point Sample
Slough 6A
116
Legend
Instream Flow Focus Area (Upper and Lower Extent)
Flow Arrow
Project River Mile
ALASKA ENERGY AUTHORITY
0
1,000
Feet
Projection: Alaska Albers NAD 1983
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Orthophoto Source: 2011 Matanuska Susitna Borough LiDAR & Imagery Project
Chulitna River
Susitna River
Talkeetna River
Proposed Watana Dam
IFS Focus Area
0
10
mi
Map Key
SUSITNA-WATANA HYDRO
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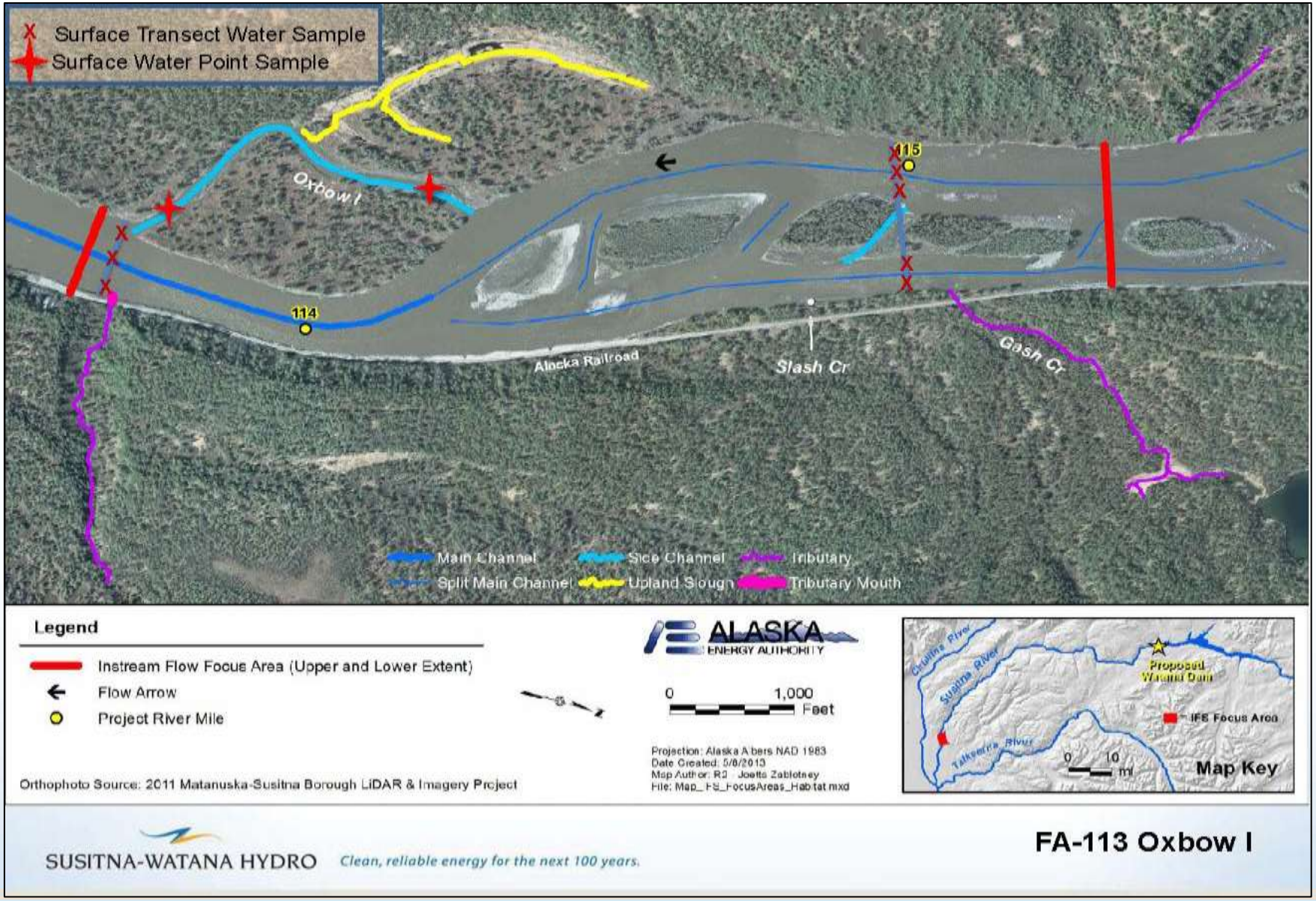
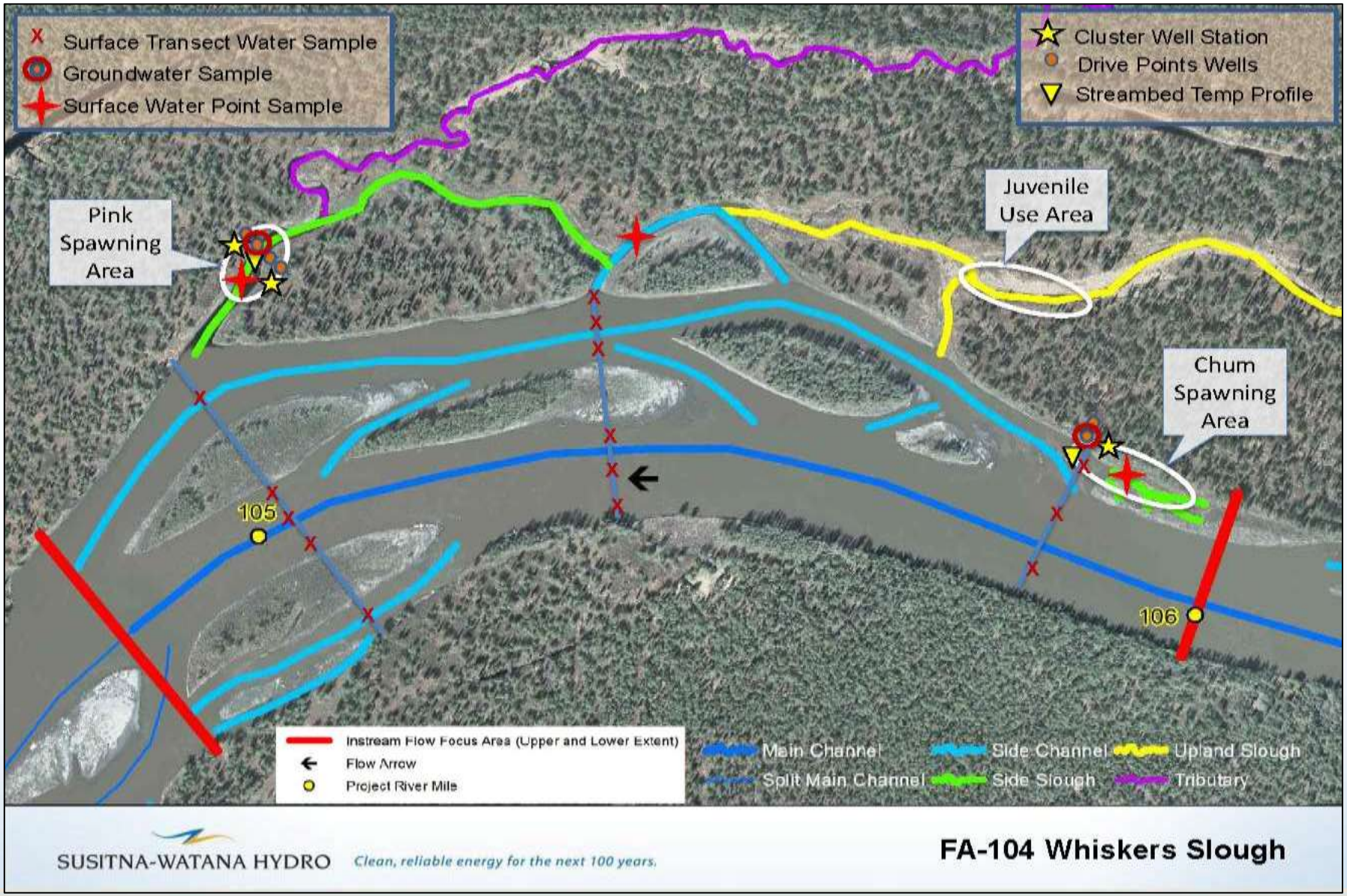
FA-115 Lane Creek (Slough 6A)

Focus Areas


Surface Transect Water Sample
Surface Water Point Sample
Oxbow I
114
115
Alaska Railroad
Slash Cr
Gash Cr
Main Channel
Side Channel
Tributary
Split Main Channel
Upland Slough
Tributary Mouth
Legend
Instream Flow Focus Area (Upper and Lower Extent)
Flow Arrow
Project River Mile
ALASKA ENERGY AUTHORITY
0
1,000
Feet
Projection: Alaska Albers NAD 1983
Date Created: 5/8/2013
Map Author: RD Joetta Zablotney
File: Map_FS_FocusAreas_Habitat.mxd
Orthophoto Source: 2011 Matanuska-Susitna Borough LiDAR & Imagery Project
Chulitna River
Susitna River
Talkeetna River
Proposed Watana Dam
IFS Focus Area
0
10
mi
Map Key
SUSITNA-WATANA HYDRO
Clean, reliable energy for the next 100 years.
FA-113 Oxbow I

Focus Areas


Surface Transect Water Sample
Groundwater Sample
Surface Water Point Sample
Cluster Well Station
Drive Points Wells
Streambed Temp Profile
Pink Spawning Area
Juvenile Use Area
Chum Spawning Area
105
106
Instream Flow Focus Area (Upper and Lower Extent)
Flow Arrow
Project River Mile
Main Channel
Side Channel
Upland Slough
Split Main Channel
Side Slough
Tributary
SUSITNA-WATANA HYDRO
Clean, reliable energy for the next 100 years.
FA-104 Whiskers Slough

Mercury Assessment Study (RSP 5.7)

Fish Sampling

- Start collecting fish samples in July.
- Dolly Varden, Arctic grayling, stickleback, longnose sucker, whitefish species, lake trout, burbot, and resident rainbow trout
- 7 to 10 samples per species
- Collected in inundation zone

Fur/Feathers Sampling (methylmercury)

- Feather sampling summer 2013.
  - Low numbers, opportunistic
  - Occur only in areas where we have access
- Fur sampling
  - No evidence of river otters in impoundment area.
  - Limited mink availability – may utilize dedicated trapper to collect samples this winter.

Water Quality Studies Q3 2013 Planned Activities

RSP Section	Title	3nd Quarter Planned Activity
5.5	Baseline Water Quality	• Continued Temp. and Met station data collection. • Baseline Water quality sampling & Focus area sampling • Sediment sampling

5.6	Water Quality Modeling	• Use LIDAR and bathymetric data to construct shape of the basin for the reservoir model
		• Define channel boundaries and generate grid for riverine model
		• Special Technical Workgroup Session discussing Mercury model details:
		  ◦ Identify reaction coefficients and parameters for construction of the model
		  ◦ Record variation over acceptable ranges to predict potential for and range of methylmercury formation

5.7	Mercury Assessment and Potential for Bioaccumulation	• Continued literature review. • Fish and feather sampling • Soil and vegetation