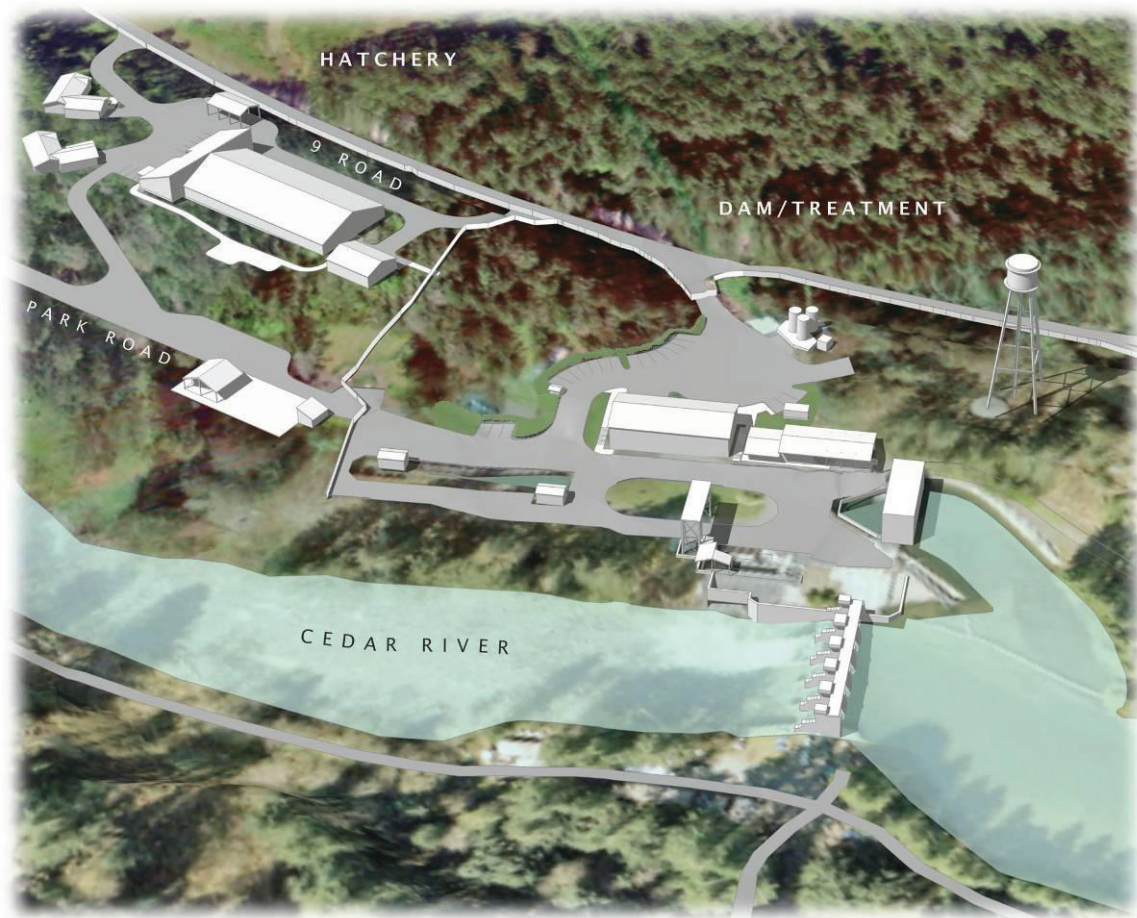


Landsburg Facility Development Project Preliminary Engineering Report

DRAFT



June 2011





**LANDSBURG FACILITY DEVELOPMENT PROJECT
PRELIMINARY ENGINEERING REPORT**

DRAFT

JUNE 2011

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Seattle Public Utilities
Landsburg Facility Development Project
Preliminary Engineering Report

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EXECUTIVE SUMMARY

BACKGROUND

In 2008, a team led by Seattle Public Utilities' (SPU's) Facilities Group in partnership with Tetra Tech completed a *Watershed and Transmission Facilities Master Plan* for SPU facilities at the Cedar Falls Watershed, Landsburg Diversion and Operations Site, Lake Youngs Reservoir and Tolt Watershed. The master plan addressed the resolution of problems at these four sites, identified risks, and presented an asset management approach to current and future facility needs.

In 2009, SPU determined that, because of its criticality, the Landsburg site should be the first to undergo preliminary engineering. Tetra Tech was selected to work with SPU staff and management to develop alternative plans based on the recommendations of the Master Plan and identify a preferred alternative, with guidance from the project's executive steering committee (consisting of executives from SPU's water line of business). This preliminary engineering report is the product of that work.

LANDSBURG SITE DESCRIPTION

The Landsburg facility is north of the Cedar River and east of Maple Valley. Principal facilities at the site are a diversion dam and initial water treatment facilities, the Cedar River Sockeye Hatchery (under construction in 2010-11), and Landsburg Park, a small pedestrian-only picnic area at the westernmost part of the site along the river. The dam diverts water from the Cedar River, and the diverted water is fluoridated and chlorinated at Landsburg before being piped for further treatment at Lake Youngs. The Operations Program has staff at the site at all times, monitoring and managing river flow and the treatment processes. The Fish Program at the site includes a fish ladder, counting and extraction facilities, and offices for fish biologists.

MASTER PLAN PROGRAM VERIFICATION

Tetra Tech conducted interviews with key staff and held workshops to assess the validity of the 2008 Master Plan program documents. Adjustments to the Master Plan space recommendations were made based on field conditions, staff input and the development of conceptual floor plans. The Master Plan budgeted 3,474 square feet of usable space. The new investigations increased that value to 4,581 square feet to account for the following:

- Increased requirements for shower/locker facilities
- Increased Fish program office space
- A weather vestibule and mud room required for energy conservation
- Space for a mechanical room and a modest lobby.

No increases were made for the Operations and Fish Programs' storage areas. Table ES-1 summarizes the changes in facility inventory recommendations between the Master Plan and the Preliminary Engineering Report.

**TABLE ES-1.
FACILITIES PROGRAM VERIFICATION AND UPDATES**

	2008 Master Plan Recommendation	2010 Preliminary Engineering Recommendation	Size (square feet)
Treatment Building	Retain or replace—consolidate	SPU will retain treatment function	1,170
Fluoride Storage	Function moves to Lake Youngs	SPU will retain fluoride at Landsburg	800
Old Analyzer Building	Retain or replace—consolidate	Remove - provide equipment enclosure	145
Compressor Building	Function moves to Lake Youngs	SPU will retain	80
Emergency Generator	Retain	Retain	
Screen House	Retain or replace	Retain (historic)	1,539
Yard Tool Shed	Remove—consolidate in new facility	Remove - consolidate in new facility	80
Stone Shelter @ Park	Retain	SPU wants to remove roof only	270
Generator Building	No recommendation	Remove - consolidate in new facility	190
Green Garage	Retain—relocate office	Relocate - move office to new facility	1,142
Green Fish Storage Bldg	Remove - consolidate in new facility	Remove - consolidate in new facility	240
Fish Trailer	Remove—consolidate in new facility	Remove - consolidate in new facility	320
Garage at Park	Remove - consolidate in new facility	Remove - consolidate in new facility	500
Old Men’s Toilet Building	Remove	Remove	48
Old Women’s Toilet Bldg	Remove	Retain and restore (historic)	48
Old Park Restrooms	Remove	Remove	160
Portable Toilet @ Park	Remove, provide in new facility	Remove, provide permanent pit toilets	270

SITE INVESTIGATIONS

Tetra Tech investigated existing conditions at the Landsburg site. Key findings from these investigations are as follows:

- **Geotechnical**—Local soils are well-draining soils with excellent bearing capacity.
- **Site Drainage/Surface Water/Flooding**—The site has good natural drainage, mostly handled through sheet flow to vegetated areas or to roadside ditches. There are a few drainage structures near the Cedar River that drain to a swale, which is inspected annually by King County. The Landsburg site is excluded from flood mapping, which begins at a point west of the Landsburg Road. Anecdotal information provided by staff indicate that flood levels have reached an elevation above the level of the site between the Treatment Building and the river. SPU has done early planning for installation of a spillway on the south side of the dam.
- **Vehicle/Pedestrian Circulation, Parking and Accessibility**—Parking is unstructured at the Landsburg gate and at the dam/treatment site, often causing blocking problems and work interruption. The unpaved drives serving chemical delivery trucks have undersized turning radii and inadequate space for maneuvering large vehicles. The change to sodium hypochlorite water treatment will increase the number of chemical deliveries to the site by a factor of six. The pedestrian circulation does not currently include ADA accessible pedestrian routes at Landsburg Park or the dam/treatment site.

- **Environmental/Wetlands**—The site contains two wetlands on the north bank of the river, one at the park and one southeast of the new Cedar River Sockeye Hatchery. Site development will likely require environmental remediation, including restoration of natural habitat, as was required for the new hatchery.
- **Solar Access**—The site is heavily shaded by tree canopies. Solar access for energy production is best in the river on the dam and on the roof of the Screen House.

UTILITIES

The following are key findings of an assessment of site utilities performed for the Preliminary Engineering Report:

- **Domestic Water**—Domestic water is non-potable river water sourced after fluoridation and chlorination. Staff must drink bottled water. The new hatchery will be served by a potable domestic water well constructed on the north side of the 9 Road.
- **Fire Water**—Water for fire suppression is pumped from the river to an existing water tower. Water from the tower is used in the treatment process but is also connected to the site's fire hydrants. The new hatchery will provide additional fire water capacity using river water, fire pump and additional hydrants.
- **Hatchery Process Water**—The hatchery will make use of two spring wells constructed on the south side of the river.
- **Sanitary Sewer**—The treatment building is served by an adjacent septic tank that pumps to a drainfield west of the green garage. Reconstructed in 2003, staff report that the 150-gallon-per-day system is failing and odors from the drainfield are common. Treatment building sink and shower gray water drains to a rock pit near the building. This system has failed. Three new septic systems, one for the hatchery and one each for the associated residences, will locate drainfields west of the hatchery complex.
- **Storm Drainage**—Storm drainage at the dam/treatment site and hatchery is largely accomplished through sheet flow to vegetation. Roof drainage is to infiltration trenches.
- **Site Power Systems**—Puget Sound Energy (PSE) provides power to the site on poles with overhead lines. The main service panel for the dam/treatment site, located in the old generator building, is 30 years old and at the end of its service life. Power is distributed underground from here to other facilities. An adjacent standby generator with diesel skid tank provides backup power. Power for the hatchery and spring wells are supplied overhead from the PSE service line. Hatchery backup power is from an additional standby generator.

FUNCTIONAL REQUIREMENTS

Chlorination System

SPU's Water Quality Group currently plans to replace the existing chlorine gas treatment system in the treatment building with a safer liquid bleach (sodium hypochlorite) treatment system. A tanker truck pumping station, spill containment system and tank facility will need to be designed and located in conjunction with any other planned improvements. The recently constructed fence enclosure of the treatment building will no longer be required.

Fluoridation System

SPU Water Quality has determined that the existing fluoridation system should remain in operation at Landsburg.

SCADA, Site Telecom and IT Systems

A fiber optic link to the Maple Valley Police Department provides connectivity to the SPU I-net system. SCADA equipment is inadequately housed in the crowded treatment building operator's room. Telecom is routed overhead on poles and in buried conduits. Telecom conduits associated with the new hatchery near the treatment building are likely in conflict with future development of the site. SCADA and IT equipment require a secure, dust-free, temperature-controlled environment. A centralized UPS system is recommended for all SCADA and IT equipment.

HATCHERY INTEGRATION

New development at the Landsburg site can be integrated with the new hatchery as follows:

- **Domestic Water System**—The hatchery domestic water well has a capacity exceeding demand by 30 gallons per minute. This is adequate to provide domestic water to the dam/treatment site. Future improvements should extend the hatchery domestic water system to serve the dam/treatment site.
- **Fire Suppression Water Service**—The hatchery fire suppression system includes a fire pump at the river, a fire service loop with hydrants and building fire sprinkler and alarm systems. The fire water system can be expanded to serve additional hydrants and facilities at the dam/treatment site. This would eliminate the need for relying on fire protection water from the water tank.
- **Power, Telecom, IT & SCADA**—The hatchery pulls power from the PSE overhead line before it reaches the generator building. It has its own diesel generators for backup power. The hatchery's IT/SCADA systems are self-contained. Telecom connects to the same SPU I-net system through Maple Valley.

SECURITY ANALYSIS

The Tetra Tech project team worked with SPU security staff to evaluate current and future security issues at the Landsburg site. Major security recommendations are as follows:

- Park and hatchery sites:
 - Install separate monitored automatic vehicle security gates for 9 Road and Park Road access at the Landsburg Road entrance.
 - Extend the fence line between the park and the hatchery site from 9 Road to the river and along 9 Road to the Landsburg Road entrance. Install a monitored automatic vehicle security gate at the Park Road entry to the hatchery site.
 - Install manual vehicle security gates at the drives from 9 Road to the hatchery site.
 - Install a monitored manual pedestrian security gate at the fence line between the hatchery site and the dam/treatment site.
- Dam/treatment site:
 - Install monitored automatic vehicle security gates at the 9 Road driveway and north at the entrance to the watershed.

- Extend perimeter fencing to isolate the site out from the river on three sides and provide a monitored pedestrian gate at the south side of the dam.
- Provide a manual gate from the 9 Road to the driveway north of the water tank.
- Provide auditable key card access hardware at operations and storage facilities as well as at the SCADA/IT server room.

The security analysis also noted that easy pedestrian access to the dam/treatment site, particularly during the evening and weekends when staff count can be one individual, places staff at risk.

LEGAL AND REGULATORY REQUIREMENTS

Tetra Tech identified current building, land use, health and environmental codes and regulations applicable to possible site development. Because of the facility's location adjacent to the Cedar River, permits associated with environmental regulations are of the most significance. Since no in-water work or disturbance to the shoreline is anticipated, permit approvals should be less challenging than for the preceding Cedar River Sockeye Hatchery and Fish Passage projects. The development will, however, disturb land within the 200-foot shoreline zone and the 165-foot Cedar River buffer, likely requiring some physical remediation and potentially a shoreline variance under the King County Shoreline Master Program. A State Environmental Policy Act (SEPA) checklist will be required. Permits and approvals will be required from King County, SPU (SEPA) and the Department of Ecology. The Washington Department of Archeological and Historic Preservation may need to provide a review if federal funds are used. A title search was conducted confirming clear ownership by the City of Seattle.

SITE DEVELOPMENT ALTERNATIVES

Tetra Tech created a series of site development alternative plans. After undergoing a series of reviews and refinements, four schemes were selected for more detailed development, pricing and performance evaluation. Two alternatives (A, A-1) consolidate staff facilities in a new two-story Operations/Fish facility adjacent to the existing treatment building. The other alternatives (B, B-1) consolidate these facilities in a single-story addition to the existing treatment building. The following characteristic benefits are common to all four alternatives:

- Removes non-functional facilities
- Provides ADA accessible facilities and routes at park and dam/treatment site
- Provides permanent ADA accessible toilet facilities at the park (vault toilets)
- Provides recommended security improvements (fencing, gates, key card and security system)
- Replaces existing failing septic system
- Provides potable domestic water and reliable fire water service
- Resolves circulation, truck maneuverability and parking issues
- Replaces antiquated electrical switch gear and service
- Renovates treatment building to provide secure SCADA/IT server room
- Restores historic women's restroom building
- Provides photovoltaic net metering green power system on the screen house
- Reduces stormwater runoff through the use of pervious paving and rain gardens

- Consolidates facilities for Operations and Fish Programs, including offices, break/meeting room, lab, lockers/showers, restrooms, copy room, mud room and support spaces.
- Consolidates program storage facilities and provides covered tractor/truck vehicle storage
- Provides high performance new facility with LEED Gold minimum certification

The four selected alternatives were compared to two base-case options: the “Status Quo Base Case,” with no improvements made to the site; and “Base Case 2,” which would implement minimal improvements only to address critical existing facility deficiencies.

EVALUATION OF ALTERNATIVES

Tetra Tech developed a methodology to rank alternatives according to their performance in four categories with weighted importance factors provided by the steering committee. Categories included health/safety/welfare, environmental, operational/business performance and social. SPU staff members evaluated each alternative within these categories, and alternatives were ranked based on the scoring from those evaluations. Tetra Tech provided financial evaluations of each alternative. Cost estimates include initial construction costs as well as 40-year operation and maintenance (O&M) costs. A summary of performance evaluation rankings and financial results is shown in Table ES-2.

Alternative	SPU Performance Ranking	Cost		
		40-Year O&M	Construction	Combined
A	3	\$3,065,930	\$4,184,000	\$7,249,930
A-1	2	\$2,956,784	\$4,309,000	\$7,265,784
B	3	\$3,204,596	\$4,280,000	\$7,484,596
B-1	1	\$3,174,107	\$4,212,000	\$7,386,107
Status Quo Base Case	5	\$1,328,083	-0-	\$1,328,083
Base Case 2	No ranking	\$2,224,687	\$1,279,000	\$3,503,687

RECOMMENDATIONS

The improvements to the Landsburg diversion facility as envisioned by the four site development alternatives can be successfully designed, permitted and constructed. While this is also true for the Base Case 2 alternative, this alternative would not meet all of the objectives of the Master Plan. The project team recommends the measures described below.

Highest Recommended Alternative

The project team’s highest recommendation is to construct Alternative A-1, but provide storage for the Fish Program in the screen house. This recommendation is illustrated in Figure ES-1. The reuse of the screen house both for storage and as a site for photovoltaic panels is a practical commitment to sustainability and historic preservation. To undertake this alternative, it should be assured that SPU will make a commitment to the dam spillway design and construction.



Figure ES-1. Recommended Alternative

Second Highest Recommended Alternative

The project team recommends Alternative B-1 if it is determined that Alternative A-1 is not suitable. The team recommends that this facility be constructed at a higher elevation than the existing Treatment Building to improve Operator views of the dam. If the treatment building's chlorine gas canister platform is not required, this area should be incorporated into the completed project as part of the Operations and Fish facility. If preferred by SPU, the treatment building addition should be constructed as a separate, stand-alone, one-story facility.

Include the Sodium Hypochlorite Work in the Landsburg Permitting/Construction

The work described in the recommended alternative should be permitted and constructed together with Water Quality's planned change in treatment technology from chlorine gas to sodium hypochlorite. Joining these projects should result in an improved facility design as well as a reduction in permit and project management costs. This approach should also require a shorter construction period, reduced disruption to work activities and lower overall construction costs.

