# Upper Nisqually River Levee Retrofit
## Environmental Assessment

### Mount Rainier National Park
### Pierce County, Washington

### October 2018

Mount Rainier National Park
Superintendent
55210 238th Avenue East
Ashford, Washington 98304

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# Upper Nisqually River Levee Retrofit Environmental Assessment

## Executive Summary

The National Park Service has prepared an Environmental Assessment (EA) to analyze the potential impacts and benefits of a proposal submitted by Pierce County Planning and Public Works (Pierce County) to retrofit the upper Nisqually River levee with deflectors in Mount Rainier National Park. Pierce County maintains the levee within the park under a right-of-way (ROW) permit. The primary purpose of the proposed action would be to reduce the effects of erosional flows that have resulted in repetitive damage to the levee and to reduce the long term maintenance frequency of this nearly one-mile long flood control facility.

This EA evaluates three alternatives: Alternative A (no action), which would result in no change in the levee; Alternative B , representing the installation of rock deflectors; and Alternative C, the addition of engineered log jams near Sunshine Point, adjacent to the upstream end of the levee, located in the park.

The original levee was constructed in the 1930s to protect the historic Nisqually Entrance of the park. In 1961, the county obtained a right-of-way permit to construct and operate a levee between river mile (RM) 64.5 upstream to RM 65.4. The upper half of the levee is located within the park. The county levee was constructed to protect the historic Nisqually Entrance, the Nisqually to Paradise Road and Sunshine Point Campground within the park, and to protect the small residential community and businesses located west of the park boundary. The levee was heavily damaged during the November 2006 flood event, which temporarily closed the Nisqually to Paradise Road within the park, and destroyed the Sunshine Point Campground. Since that time, repair of the levee has occurred in 2009, 2010, 2012 and 2017. In 2017 a short segment on the Nisqually to Paradise Road was added to the county ROW, and repaired during 2017.

This Environmental Assessment (EA) has been prepared consistent with the NPS Director's Order 12 guidance for implementation of the National Environmental Policy Act, and provides the decision-making framework that 1) analyzes a reasonable range of alternatives to meet objectives of the proposal, 2) evaluates potential issues and impacts to the park's resources and values, and 3) identifies mitigation measures to lessen the degree or extent of these impacts.

If you wish to comment on this EA, you may post comments online using the National Park Service Planning, Environment and Public Comment (PEPC) website at: http://parkplanning.nps.gov/nisquallylevee or mail comments to: Superintendent, Mount Rainier National Park, 55210 238th Ave. E., Ashford, Washington, 98304. This EA will be available for public review and comment for 30 days.

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# CHAPTER I. Purpose and Need

## Introduction

The National Park Service (NPS) has prepared an Environmental Assessment (EA) to analyze the potential impacts and benefits of a proposal submitted by Pierce County Planning and Public Works Department (Pierce County) to retrofit the Upper Nisqually River Levee with deflectors. Pierce County maintains the portion of the levee within the park under a right-of-way (ROW) permit issued by the NPS. The primary purpose of the proposed action would be to reduce the effects of erosional flows that have resulted in repetitive damage to the levee, and to reduce the long term maintenance frequency of this nearly one-mile long flood control facility, approximately half of which is located within Mount Rainier National Park. Implementation of the county's proposal within the park would require a letter of authorization from the NPS, and would amend the ROW permit.

This EA evaluates three alternatives: Alternative A (no action) analyses the impacts of maintaining the levee's existing condition and typical maintenance frequency; Alternative B includes the construction of a series of 28 rock deflectors along the Pierce County flood control facility (levee) in the upper Nisqually River (13 of which would be located within the park boundary and would incorporate large wood); Alternative C analyzes the installation of seven log jams near Sunshine Point, in addition to the deflectors.

## Background

Pierce County has a right-of-way (ROW) permit with the NPS that allows maintenance and repair of the Upper Nisqually River Revetment, also referred to as "levee" in this EA. The existing levee was constructed in 1961 and extends from river mile (RM) 64.5 in unincorporated Pierce County to RM 65.4 upstream of the park boundary. The levee parallels the Nisqually River and SR 706, which becomes the Nisqually to Paradise Road within the park (Figure 1, see Attachment A). The levee protects the small community that lives immediately downstream of the Nisqually Entrance of the park, the historic Nisqually Entrance, and the historic Nisqually to Paradise Road. The Nisqually to Paradise Road provides year-round access to Longmire and the Paradise Area of Mount Rainier National Park. Annual visitation to Paradise typically exceeds about one million people, and annual visitation to the park exceeds two million (NPS 2018a).

The Nisqually River originates from the Nisqually Glacier on the south slope of Mount Rainier and flows westerly towards its terminus in South Puget Sound. Two tributaries, Kautz and Tahoma Creeks (originating from the Kautz and South Tahoma Glaciers, respectively), join the mainstem Nisqually River above the project reach. The Upper Nisqually River is a braided stream characterized by high sediment loads, a dynamic floodplain with multiple side channels, and frequent channel changes.

The NPS will examine the environmental impacts associated with the proposal to retrofit the levee in accordance with the National Environmental Policy Act (NEPA) of 1969, regulations of the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations (CFR) §1508.9),

and National Park Service (NPS) Director's Order (DO)-12: Conservation Planning, Environmental Impact Analysis, and Decision-Making.

## Purpose and Need for Action

The NPS is considering Pierce County's proposal to retrofit the existing levee and install deflectors. The current right-of-way (ROW) agreement permits the county to repair and maintain the existing levee. The deflectors are considered a retrofit that requires a letter of authorization under the current permit. The NPS introduced a second alternative in response to internal and external scoping that would install seven engineered log jams (ELJs) at Sunshine Point that would introduce large wood to the uppermost segment of the levee located within the park.

The purpose of Pierce County's proposal to install deflectors is to:

- reduce erosive flows on the levee face and toe in order to preserve the structure;
- reduce overall maintenance frequency and costs.

The NPS need is to:

- understand, characterize, and analyze the environmental impacts of the proposed action to fully inform a decision as to whether to amend the ROW permit and grant authorization to install deflectors to the levee;
- give consideration to the proposed project's potential impacts to Park resources and values;
- give consideration consistent with NPS Management Policies to the potential benefit of installing the deflectors;
- give consideration to the existing levee, alternatives to the proposed action, cumulative impacts, and future needs for Mount Rainier National Park.

## Background

The Nisqually Levee was originally constructed in 1961 with the purpose of protecting Mount Rainier National Park's historic Nisqually District, the Nisqually to Paradise Road (the park's access to Longmire and Paradise), and the Nisqually Park Subdivision from erosional flows and channel migration of the river. Since 1991, the levee experienced damage during 1991, 1992, 1993, 1995, 1996, 2003, 2004, 2005, 2006, 2009, 2010, 2012, 2015 and 2017. On November 6-7, 2006, a historic flood of record occurred at the site resulting in an estimated peak discharge in the river of 21,800 cubic feet per second (cfs) measured at the U.S. Geological Service (USGS) gauge located at National. The park was inundated with 18 inches of rainfall in a 36-hour period. The rain unleashed raging torrents of water and glacial sediment into the park's rivers and streams. Significant damages were sustained, and the park was forced to close the Nisqually to Paradise Road for six months. This event washed away 1,773 linear feet of the existing levee; removed more than five acres of upland and damaged the Sunshine Point Campground beyond repair; and destroyed 500 linear feet of the park's main entrance access road, which also cut off all power and communication utilities to the park.

Shortly after the flood, Pierce County, in partnership with the NPS and the U.S. Army Corps of Engineers (USACE), began rebuilding the levee access road and levee. The first phase of this project was completed in early 2007. Since that time repairs occurred in 2010, 2011, 2012 and 2017 after high water events damaged the levee.

The easternmost 400 ft. of the levee (revetment) was not part of the original ROW and consequently did not receive repairs other than a patch that was installed by Pierce County in partnership with the park in 2010. This easternmost segment of the levee, which protects the portion of the Nisqually to Paradise Road that was damaged in 2006 and reconstructed in 2007, continued to sustain damage including scour along the base and loss of levee toe and face rock. This damage inspired Pierce County to request a revised ROW agreement from the NPS in 2017 so that it could be repaired with funding provided by the PL84-99 program. The USACE and Pierce County repaired this new ROW segment during summer/fall of 2017 at a cost of $1.22 million. All repairs since 1991 were made as part of the PL84-99 program with the USACE, which provides 80% funding to repair of the levee, including the portion of the levee within the park (USACE 2017).

Most of the damage to the levee sustained in recent years has been caused by scour of the levee toe and loss of face rock when the thalweg of the river has been entrenched against the levee (Figure 3). While the installation of larger toe rock during the most recent repairs has resulted in a more robust levee, damage to the current "smooth" rip-rap levee face is expected to continue to occur during peak flow events as a consequence of the current and persistent river configuration.

# Issues and Impact Topics

In this EA, issues were considered, but dismissed, if they were not central to the proposal, or if environmental impacts were reduced or eliminated through project design to the degree that the project no longer had the potential to cause significant impacts. Issues and concerns retained for analysis are described in Chapter 3 of the EA, *Affected Environment and Environmental Consequences*, and are briefly described below.

## Issues Retained for Analysis

The following issues/impact topics were retained for further analysis:

*Cultural landscapes.* The proposed action alternatives (deflectors with and without log jams) have the potential to impact the National Historic Landmark District (NHLD). The NHLD is to be protected to the greatest extent possible by ensuring that any new construction within the district or within the viewshed would be compatible with the district's historic character and setting and would preserve contributing elements of the cultural environment.

*Aquatic Resources.* Construction activities would impact aquatic species and their habitat. Aquatic species would be affected due to temporary impacts on water quality and habitat

disturbance and modification. Resident fish, including native coastal cutthroat trout (*Oncorhynchus clarki*) and sculpins (Cottidae), would be impacted.

Aquatic impacts include a temporary decrease in water quality due to increased construction related turbidity from river diversion and excavation and installation of instream structures; rock fill that may modify existing rearing and spawning habitat; and diversion/dewatering and capturing/relocating fish that would impact resident fish due to stress, physical handling and relocation from preferred habitats. The impact topic of Aquatic Resources is separated into two categories: hydrology and water quality.

*Special status species and habitat.* Construction noise adjacent to suitable habitat during nesting season has the potential to impact northern spotted owls and marbled murrelets. The project action area does not contain listed fish species, but does contain coastal cutthroat trout, an NPS species of concern.

## Issues Considered but Dismissed

The following issues/impact topics were dismissed from further analysis because impacts would be limited in duration and extent. As a general rule, issues were retained for consideration and discussed in detail if:

- the environmental impacts associated with the issue are central to the proposal or of critical importance;
- a detailed analysis of environmental impacts related to the issue is necessary to make a reasoned choice between alternatives;
- the environmental impacts associated with the issue are a big point of contention among the public or other agencies; or
- there are potentially significant impacts on resources associated with the issue.

Because none of the considerations above apply to the issues or impact topics described below, they were dismissed from detailed analysis.

*Archaeological Resources.* Unknown subsurface archaeological resources could be inadvertently impacted during construction. However, archaeological resources are not likely to be impacted by the proposed action because excavation would occur in Nisqually River glacial sediments, including alluvium deposited in recent flood events, and operations would occur within the construction limits of previous levee work. In the unlikely event that archaeological resources are uncovered, Mount Rainier National Park's Inadvertent Discoveries Policy would be adhered to (see Resource Protection Measures). If archaeological resources were uncovered during construction, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented. If the resources cannot be preserved in situ, an appropriate mitigation strategy would be developed in consultation with the State Historic Preservation Officer (SHPO) and associated American Indian tribes. Any data recovery would precede and be completed before any further construction disturbance to the archaeological resources could occur. With implementation of monitoring and mitigation, adverse impacts on

archaeological resources would be avoided or minimized; therefore, archaeology was dismissed as an impact topic.

*Soundscapes.* Construction activities are expected to temporarily cause noise above existing ambient levels and may disturb the local residents downstream of the park. The Nisqually River and adjacent forested areas would act as sound buffers, reducing impacts on surrounding forest and nearby residences. Noise from construction would be limited in duration and addressed through mitigation measures. Noise as it impacts the northern spotted owl and marbled murrelets is described under "Federally listed species and habitat."

*Indian Trust Resources.* Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by Department of Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. At least six federally recognized tribes have traditional association with Mount Rainier: Muckleshoot Indian Tribe, Puyallup Tribe of Indians, Cowlitz Indian Tribe, Squaxin Island Tribe, Nisqually Indian Tribe, and the Yakama Indian Nation. The proposed action would not limit access or numbers of fish downstream and as such would not have an adverse effect to reserved treaty rights and other trust responsibilities that the NPS has to its traditionally associated tribes.

*Environmental Justice.* USDI policy requires consideration of environmental justice as a potential impact topic (USDI 1995), and Executive Order 12898 requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Ashford and other communities surrounding the park include both minority and low-income populations; however, there are no minority or low-income populations that would be disproportionately affected by the proposed action. There would be no direct or indirect adverse effects on any minority or low-income population, nor would there be any identified effects that would be specific to any minority or low-income communities. The levee and proposed retrofit is intended to protect local residences, and potentially low income households. For these reasons, the topic environmental justice was dismissed as an impact topic from detailed analysis.

# CHAPTER II. Alternatives

## Introduction

This Environmental Assessment (EA) evaluates three Alternatives for the Pierce County proposal to retrofit the levee within Mount Rainier National Park. This EA also analyzes the connected action that includes treatment of the levee downstream of the park. The No Action alternative, Alternative A, provides a basis for comparing the existing levee condition with two action alternatives: Alternative B, installation of deflectors with large wood, and Alternative C, installation of log jams in addition to the deflectors. Alternative B is Pierce County's preferred alternative, which is to install deflectors augmented with large wood along the face of the nearly one-mile long levee. Alternative C includes engineered log jams that would provide protection and function in addition to the deflectors described under Alternative B. Alternative C was added in response to internal and external scoping. Impacts associated with each alternative are described in Chapter 3, *Affected Environment and Environmental Consequences*.

## Alternative A – No Action (No retrofit of levee face)

Under the No Action alternative, the operation and maintenance of the levee would continue. The NPS would expect to continue to receive, and would be required to respond to, future requests by Pierce County to maintain and repair the levee. Pierce County's ROW permit on NPS land would not be amended to include the construction or maintenance of the proposed retrofitted structures.

Pierce County maintenance operations along the existing levee structure would include repair of damage as it occurs. Between 1991 and 2017, Pierce County and the USACE spent $5.76 million ($7.09 million in present-day dollars) repairing damages (Pierce County 2018a). Repairs made by the USACE in 2012 and 2017 involved the installation of much larger rock than was used in other repair efforts undertaken in the years following the 2006 flood.

Under the No Action Alternative, future repair activities may occur more frequently than would occur under the Action Alternatives. Repair activities may or may not require diversions and in-channel work, depending on the nature and extent of the damage and the configuration of the river.

## Alternative B – Install deflectors

Under Alternative B, the NPS would grant permission to Pierce County to install a series of 13 large self-ballasting flow deflector structures along the face of the existing levee within the park (Figures 4-6). The county would also install 15 deflectors downstream of the park boundary. Construction within and downstream of the park would require one or two diversions, depending on the river's configuration at the time of construction. Work would occur during the July 16-September 30, 2019 fish window (a work period when risks to fish are minimized), and

may extend into October in consultation with the park if it becomes necessary. Work would be completed prior to the fall rainy season.

The deflectors would push the flow away from the toe of the levee and move the thalweg approximately 30 feet toward the center of the Nisqually River floodplain. Each deflector would consist of large 10- to 15-ton jetty rock excavated down approximately 15 feet in front of the levee toe to match the existing levee toe. From the toe of the existing levee the triangular deflector structure would slope upwards toward the face, at an approximate 2:1 angle, built from a combination of jetty rock and immediate facing rock. The top of each deflector would project above the 100-year water surface approximately 1-2 feet. The deflectors would disturb a total area of 21,490 square feet, and require excavation of approximately 3,396 cubic feet. The same volume would be placed above the ordinary high water mark (OHWM). The deflectors would add approximately 6,792 cubic yards (cy) of rock fill to the Nisqually River floodplain (Table 1).

The deflectors would be built along the face of the existing levee without structurally impacting the design of the existing levee, to meet USACE standards under the PL 84-99 program. Alternative B construction is proposed to begin as early as July 16, 2019. Staging may occur earlier if possible; otherwise large rock would be delivered as it is needed to minimize handling of large boulders. The county would begin construction downstream of the park and work upstream, toward the east end of the levee.

## Alternative C – Engineered Log Jams

In response to internal and external scoping, the NPS is proposing an alternative design that would install engineered log jams at Sunshine Point on the east end of the project, which is a design similar to a proposal that was originally investigated by the NPS in 2009. The proposal is also similar to an alternative dismissed by the county, which would have installed 13 log jams constructed with dolos (see page 16, under *Alternatives Considered, but Dismissed*). Under Alternative C, ELJs would augment the deflectors, and would meet NPS objectives of improving floodplain roughness and habitat complexity. The NPS proposal includes the addition of seven log jams to the deflectors. Figure 7 shows alternative configurations of log jams considered at Sunshine Point that the NPS considered in 2009.

The installation of in-channel engineered log jams was considered by Pierce County prior to the deflectors design. Pierce County eliminated the instream log jam alternative because the design did not meet the full purpose of the project, which was to reduce energy across the entire face of the levee. Pierce County's proposed log jams would have directly protected the upstream (easternmost) end of the levee at Sunshine Point, and reduced water velocity for a distance of approximately 200 feet downstream (approximately 10-20% of the length of the levee), which did not meet the purpose and need of protecting the entire length of the levee (see *Alternatives Considered but Dismissed*).

Engineered log jams (ELJs) are a constructed collection of logs engineered to act as a single unit. The mass of the structure is designed to provide the needed resistance to the expected

forces of the river (Entrix 2009). In 2008 the park hired an engineering firm that specializes in the design of engineered log structures to provide analysis for alternatives that would protect infrastructure for Longmire and Sunshine Point (Entrix 2009). The engineering and design work included additional hydrologic analysis, geomorphic assessment of the Nisqually River, hydraulic modeling, and preparation of design solutions that addressed the known environmental factors that combine to threaten park assets at the Nisqually to Paradise Road.

The ELJ design discussed under Alternative C is similar to the Carbon River ELJ project, which has a similar elevation and slope, and is glacially fed. The Carbon River project was implemented in 2011 (NPS 2010a). Seven ELJs would be constructed under Alternative C, each approximately 60 ft. by 60 ft., to an elevation approximately four to ten feet above the river bed (Figure 8). Each ELJ would need approximately 104 logs ranging in diameter from 8 to 24 inches. Seven ELJs would require a total of 728 logs. Approximately 30 cy of slash would be required for infill and topping. Alluvium from the excavation would be used for infill and topping of ELJs as needed. Each log jam would occupy an area of approximately 3,600 sq. ft., and impact a larger area of approximately 4,400 sq. ft. because of the excavation required to install the vertical pieces below scour depth. The total area impacted would be approximately 30,800 sq. ft. The total volume excavated for log jams would be 2,000 cy each and 14,000 cy total (Table 1). The ELJs may be constructed with rock ballast depending on final design.

Work would take place during the fish window in the dry or near dry, after diverting the Nisqually River. Unembedded wood from nearby gravel bars would be used to construct ELJs; additional wood as needed would be purchased locally and brought to the site. Access to the site would be from a ramp constructed over the face of the levee. A large excavator would be used to excavate holes for vertical pieces; depth of the hole would be below bottom of scour level, assumed to be 15 feet (Pierce County 2018b). Water from the excavation would be pumped onto the forest floor far enough away from the river edge to allow sediment to filter out before water returns naturally to the river. The engineered log jams would be a separate NPS project constructed during a different year, after the installation of the deflectors, when funding has been secured.

**Table 1.** Approximate disturbance areas and volume of structures.

| Project | Disturbance Area | Volume below bed (Excavation) | Volume of fill above bed |
|---|---|---|---|
| **Rock Deflectors** | 570-1,000 $ft^2$ each<br>21,490 $ft^2$ total | 104-133 cy each<br>3,396 cy total | 104-133 cy each<br>3,396 cy total |
| **ELJs** | 4,400 $ft^2$ each<br>30,800 $ft^2$ total | 2,000 cy each<br>14,000 cy total<br>(based on 15 ft scour depth) | 933 cy each<br>6,531 cy total |
| **Total ELJs + deflectors** | 52,290 $ft^2$ | 17,396 cy | 9,927 cy |

# Common to all action alternatives

## Construction timing and sequencing

One or two diversions would be constructed as early as July 16, 2019, likely within park waters. The river configuration is highly dynamic, so diversion location would not be known until after the winter storms subside in 2019, prior to the construction window. Diversion construction is anticipated to take less than one-half of a day, and fish removal and transport would take one to two days, depending on river configuration and extent of the reach to be dewatered.

Excess sediment would be placed on the existing levee to facilitate future plantings, and plantings would occur one to two years following construction.

## Resource Protection Measures and Best Management Practices

To prevent and minimize potential adverse impacts associated with the proposed installation, best management practices (BMPs) and mitigation measures would be implemented during the construction and post-construction phases of the project.

At a minimum, the project shall comply with the terms and conditions set forth in the ROW agreement (RW 9450-04-09) and 2017 amendment (NPS 2009, 2017). Conditions related to the protection of natural and cultural resources are repeated below:

- In no case shall vegetation of any kind be damaged, disturbed, or destroyed without first obtaining approval from the Superintendent. Any vegetation that must be removed shall be mitigated as specified by the Superintendent.
- Vegetable-based or an approved biodegradable hydraulic fluid will be used in heavy equipment assigned to the project. Spill control kits will be onsite during operations.
- Fallen trees, snags, and other combustible materials occurring during the operation and maintenance of the flood control structure shall be disposed of as detailed in the ROW permit, or as agreed to with the NPS.
- Invasive exotics and noxious weeds shall be controlled using an integrated management approach. All herbicides proposed for use must be approved by the Superintendent prior to use.
- Rock and/or earth material required for repair or maintenance shall be obtained only from sites mutually selected and agreed upon by the Permittee and the Park Superintendent. Rock sources will be certified as weed free, or meet park standards to minimize the potential introduction of invasive plant species to the park.
- Roads or entrance ways will be maintained only in places mutually selected and agreed upon by the Permittee and the Park Superintendent.
- Heavy equipment shall not be used in the river bed without authorization from the Park Superintendent and possession of all applicable County, State, and Federal permits.
- Before entering the right-of-way, the undercarriage of all vehicles and equipment will be cleaned of dirt, mud and other materials, which may contain seeds or other plant parts of invasive exotics and noxious weeds.
- The Permittee will halt any activities and notify the Superintendent upon discovery of

threatened or endangered species or archeological, paleontological, or historical findings. All artifacts unearthed remain the property of the park.

In addition, general and resource specific BMPs and mitigation measures for the project are listed below:

- Notify the NPS Environmental Protection Specialist (EPS) of the beginning and ending dates of the project(s). Also include notification of any unexpected problems or any modifications to project implementation. Any decisions made in the field that result in greater impacts than anticipated by the proposed action must undergo additional environmental analysis.
- The Pierce County project manager must provide advance notice to the designated resource advisor/monitor before project begins so the EPS may make arrangements to be on-site during construction in order to monitor activities related to natural and cultural resource mitigation measures.
- Ensure that this project is communicated to affected staff and visitors. Pierce County will provide project information and updates to the NPS, and the NPS will communicate information to the public. Manage the worksite to avoid exposing visitors to hazards during construction.
- Construction limits, including the staging area and parking areas, would be clearly marked prior to the beginning of work. Temporary construction fencing would only be installed where determined necessary by the NPS. As currently designed, the project would stage on the levee during construction.
- Preserve existing geodetic survey markers.
- Vegetation would not be disturbed. Temporary stockpiling of materials and equipment would be in approved staging areas.
- All tools, equipment, barricades, signs, surplus materials, and rubbish would be removed from the project work limits upon project completion.
- Equipment (for example, excavators) would not be allowed to idle longer than 15 minutes. Motor vehicles would not be allowed to idle and must be turned off when not in use.
- Construction debris would be hauled from the park to a licensed disposal location. Debris would not be disposed of in the park.
- Construction would occur during the fish window, July 16-September 30, and completed no later than October. Staging may occur outside of the park boundary prior to July 16. Staging may occur within the park in consultation with the NPS prior to July 16.
- A Hazardous Spill Plan or Spill Prevention, Control and Countermeasures Plan, whichever is determined appropriate, would be in place, stating what actions would be taken in the event of a spill, notification measures, and preventive measures to be implemented, such as the placement of refueling facilities, storage, and handling of hazardous materials. The plan would be submitted prior to the beginning of construction work as specified in the permit terms and conditions.
- All motor vehicles and equipment would have mufflers conforming to original manufacturer specifications that are in good working order and are in constant operation to prevent excessive or unusual noise.
- Sound attenuation devices (such as rubber strips or sheeting) would be installed and

maintained on all equipment.

- Use of unmuffled compression brakes would be prohibited within park boundaries.
- Use of air horns within the park would not be allowed except for safety.
- Any roadkill or wildlife collisions would be reported to the park immediately.
- Feeding or approaching wildlife would be prohibited.
- The park wildlife ecologist would be notified if bears or foxes loiter in the project area.
- A litter control program would be implemented during construction to eliminate the accumulation of trash. All food items would be stored inside vehicles, trailers, or wildlife-resistant receptacles except during actual use to prevent attracting wildlife.
- The proposed construction schedule and status of construction would be provided to the park, who would then communicate with the public via a number of outlets: the park website, regional newspapers, radio, entrance stations, visitor centers, news releases, local newspapers, media outlets, postings in local businesses, and via social media.
- The majority of material deliveries would be made and disruptive work would be done during the week, rather than on weekends or holidays. Work adjacent to the Nisqually Road (easternmost end of the project) must occur during weekdays. Construction workers and park staff would wear appropriate protective gear such as hard hats and safety vests, gloves, and goggles to protect themselves when working in the construction zone. This project would be compliant with all federal, state, and local requirements and in accordance with Occupational Safety and Health standards pertaining to employee or worker safety.
- Visitors would not be allowed in the construction zone.
- Noise-generating activities will be performed between two hours after sunrise and two hours before sunset to minimize impacts to marbled murrelets from April 1 through September 23.
- Night construction work is not allowed within the park boundary.
- Northern spotted owl surveys are ongoing, and the park may provide specific locations of owl territories. Exclusion zones would be based on the most recent information available and may change within a season as new information is gained. Currently there are no known spotted owl nest sites adjacent to the project area.
- In water work will be restricted to the fish window identified by the Washington State Department of Fish and Wildlife, which is July 16 to September 30 for the upper Nisqually River, upstream of Alder Dam.
- Instream work, including diversion of flow, and work within the ordinary high water mark will comply with the Washington State Hydraulic Code (WAC 220-070).
- Use of wood or altering the configuration of wood within the floodplain will require consultation with the NPS. Large wood situated on top of gravel bars, above the ordinary high water mark (OHWM) and not embedded may be considered for project use. Acquisition of wood on the floodplain may require river crossings, which would also need to be minimized and located in consultation with the NPS and consistent with the HPA issued by the Washington State Department of Ecology (for activities in state waters), and the Clean Water Act Section 401 and Section 404 issued by the Washington State Department of Ecology (WDOE) and the Army Corps of Engineers (USACE), respectively.
- Rock, earth materials, native seed and/or plants, and erosion control measures (such as mulch) required for repair or maintenance of the levee shall be obtained only from sites

mutually selected and agreed upon by Pierce County and the Park Superintendent. Materials shall be certified to be weed free according to North American Weed Management Association (NAWMA) standards and/or inspected by a park representative.
- All vehicles and equipment will be cleaned off prior to operating on NPS lands.
- Noxious weeds in the immediate area of mechanical operations shall be mowed to ground level prior to the start of project activities.
- All equipment and vehicles operating off of main roads shall be cleaned off prior to leaving the job site when the job site includes noxious weed populations.
- Removal of all dirt, grease, and plant parts that may carry noxious weed seeds or vegetative parts is required and may be accomplished with a pressure hose.
- A mutually agreeable water quality monitoring plan shall be developed and implemented before, during and after construction activities by Pierce County and results submitted to the NPS in the form of a report. If water quality does not meet WDOE standards at any time during project implementation, and in addition to complying with the terms of the WDOE section 401 permit, notify the NPS immediately, and determine and remedy the cause.
- The project shall implement applicable technical provisions for bank protection projects (WAC 220-110-050) and channel change/realignment (WAC 220-110-080).
- A diversion and fish removal plan shall be developed and approved by the NPS in advance of the project. The diversion plan will be consistent with (WAC 220-110-080).
- Apply excess sediment from deflector and ELJ excavation above OHWM on structures or on the levee, adjacent to structures.
- Pierce County will revegetate the levee adjacent to Sunshine Point according to the newly added ROW (2017). The NPS is seeking funding to revegetate the levee within the 2009 ROW permit boundary.

## Alternatives Considered but Dismissed

Pierce County considered several alternatives in an analysis prior to proposing the deflector design to the NPS (Pierce County 2018a). The NPS concurs with the county's determination that the following alternatives be considered, but dismissed for reasons specified below.

*Setback levee.* This alternative would involve setting back the existing levee northward to run parallel with State Route 706. The Nisqually River valley at this location forms a large alluvial fan. Valley widths at the project location average 3000 linear feet wide from valley wall to valley wall. To construct a setback levee would require building a levee parallel to State Route 706 for almost 6.5 miles until it could be terminated into higher ground. Within the setback area is the Nisqually Park subdivision and many other private properties that would need to be acquired to construct the new levee alignment.

Approximately 228 properties would be affected by this alternative. Entire parcels or portions of each property would need to be acquired to construct the setback levee. The cost of acquiring property and to construct a new levee alignment would be significant. There would be additional costs to remove structures, utilities, drain lines, septic systems, etc. Pierce County evaluated purchasing the Nisqually Park Subdivision in 2011 as part of updating the Rivers

Flood Hazard Management Plan and estimated the acquisition cost alone would be approximately ten million dollars. Setting back the levee is outside the scope of this project.

*In-channel engineered log jams.* This alternative was originally presented to the NPS as an option that would involve the construction of 13 engineered log jam structures in the river channel, located 200-300 feet away from the levee to split and deflect the flows and promote sediment deposition behind each log jam. Each ELJ structure would consist of multiple logs, slash, and concrete dolos to anchor the log members in place. Scour depth estimates in this reach of the Nisqually River was estimated to be 15-20 feet, and would have required the excavation of approximately 90,000 cy to construct 13 log jams. This alternative would have only treated approximately 10-20% of the revetment/levee, not meeting the purpose of the project, which is to treat the entire levee length.

The NPS proposed installation of seven logjams in the Sunshine Point area in 2009. As with Pierce County's original proposal, a stand-alone project including seven logjams would not meet the purpose and need of the project, which is to treat the entire levee length. For this reason, seven log jams are not proposed as a standalone alternative, but are proposed as a potential project that would augment the deflectors.

*Engineered log jams in place of deflectors.* This alternative would construct 28 dolo-timber engineered log jam structures along the current levee. Each ELJ structure would consist of multiple logs, slash, and concrete dolos to anchor the log members in place. The county determined that the design would need to be anchored to the levee with vertical piles to withstand repeated high flows. While this alternative would have met the purpose and need of protecting the entire length of the levee, installation of the piles into the existing levee would structurally alter the levee and disqualify it from the USACE PL84-99 levee design requirements and opportunity for cost sharing. This alternative would also have exceeded the Pierce County's budget for the project.

*Revetment Retrofit with Wood/Log Cribs Structures (entire length).* This alternative would construct a continuous wood/log crib revetment upon the existing levee face. The log/crib structures would be ballasted against movement using boulders and vertical piles. As with other proposals that would structurally alter the levee, it would be disqualified from inclusion in the USACE cost share program. Without a physical connection to the levee the wood/log crib structure would likely not withstand repeated high flows, based on Pierce County's assessment.

# CHAPTER III
# Affected Environment and Environmental Consequences

## Introduction

This chapter describes the existing environmental conditions that may be affected by the proposed action ("affected environment") and analyzes the potential environmental impacts that could occur with implementation of elements of the proposed action ("environmental consequences"). The chapter is organized by impact topics that were derived during scoping and introduced in Chapter 1. The environmental consequences for each impact topic were considered as direct or indirect, or cumulative (40 CFR 1508.7). A conclusion is provided for each impact topic, which addresses potential significance of impacts based on context, duration and intensity.

## Cultural Landscapes

### Affected Environment

The existing levee impacts the landscape views along the Nisqually to Paradise Road, where sweeping natural vistas are a fundamental resource and value of the park. The addition of rock structures has the potential to further degrade the views from the road, which are adversely affected by the existing levee.

The eastern end of the levee is located within the National Historic Landmark District (NHLD), which was designated in 1997. Most of the developed areas within the park, including most of the park's road system and the Wonderland and Northern Loop trails, are within the NHLD. The Nisqually Historic District, which was included in the NHLD in 1997, includes the Nisqually Entrance Station and several historic buildings that were built during the 1930s. A purpose of the levee is to protect the Nisqually Historic District, including the entrance station. While the existing levee was constructed during the early 1960s, remnants of a revetment constructed during the 1930s exist landward of the newer revetment and levee.

The Nisqually to Paradise Road lies within the NHLD, and includes lands 30 feet from the centerline. The NHLD intersects the levee at Sunshine Point along 300 feet of the levee at its east end. The levee to the west of Sunshine Point is visible from the Nisqually Road as drivers navigate a curve around the point as they travel west. This location is not a historic viewpoint, and is not a location where drivers should stop, or be encouraged to stop. However, the view of the unvegetated levee, rather than of a vegetated riparian area, degrades the scenic quality of the site, especially looking downstream from the east.

Pierce County typically adds sediment to portions of the levee above the ordinary high water mark (OHWM) to create a substrate that is then subsequently planted with riparian vegetation. The success of this treatment can be seen downstream of NPS lands, where Pierce County recently revegetated the segment of levee located immediately downstream of the park

boundary following the 2012 levee repairs. Pierce County is responsible for revegetating the levee adjacent to Sunshine Point (within the recently added ROW), and the NPS is responsible for and seeking funding to revegetate the levee along the 2009 ROW boundary in accordance with an agreement with Pierce County. Revegetation of the levee will improve the scenic quality at Sunshine Point as newly planted and natural vegetation becomes established over the course of a few years.

## Environmental Consequences

*Alternative A impacts (No Action).* There would be no change in the NHLD or viewshed adjacent to the road. According to the ROW permit with the NPS, Pierce County is responsible for revegetating the upper 400 foot segment of the levee that was added to the ROW in 2017. The remaining levee (approximately 1700 ft.) is currently free of vegetation, and any substrate that might support it. The levee within the park will be revegetated in accordance with agreements between the park and the County, and in accordance with CWA Section 404 permits.

*Alternative B direct, indirect and cumulative impacts*. The addition of deflectors and integrated large wood would be visible from the NHLD, as would log jams. In addition to planned vegetation establishment on the levee retrofits, deflectors with and without large wood and log jams would break up the uniform view of the existing levee and provide opportunities to improve the viewshed with logs and additional plantings.

*Alternative C direct, indirect and cumulative impacts*. The addition of log jams immediately south of the Longmire to Paradise Road would have a neutral impact relative to the deflectors, and a positive impact over the existing levee face. Tree growth would be encouraged on log jams and in areas where sediment has aggraded. With time trees would dominate views of the abandoned campground and upstream views of the Nisqually River.

There may be limited impacts to the scenic quality looking west from the Nisqually Road because of the addition of large rock along the levee and the presence of unvegetated deflectors. The aggradation of sediment that would occur along the levee face may allow for the establishment of vegetation above the OHWM. The installation of large wood on deflectors along Sunshine Point would naturalize the view and would not contribute to cumulative impacts. Wood contained within the ELJs under Alternative C would also improve the scenic quality at Sunshine Point once logs have aged.

## Conclusion

The action alternatives would not diminish the scenic quality of the Nisqually to Paradise Road or the NHLD compared to the no action alternative, and would potentially improve it. The NPS has determined that implementation of the project would have no *adverse effect* on the NHLD. A formal request for concurrence will be submitted to the SHPO with the publication of this EA, and written concurrence would be documented in the final decision, or finding of no significant impact (FONSI).

# Aquatic Resources: Hydrology

## Affected Environment

The proposed project is located along the north side of the Nisqually River in the upper river basin at an elevation approximately 2,000 feet above sea level. The Nisqually River's headwaters lie on the southern slopes of Mount Rainier on the Nisqually Glacier. The river's drainage basin at the repair site is approximately 65 square miles. The upper watershed receives 80 to 112 inches of precipitation annually. The driest months in the upper watershed are June through August, and the wettest months are November through January (NPS citation). Floods in the upper Nisqually River result from winter rainstorms, spring snowmelt, glacial melt, and mud and debris flows associated with glacial outburst flooding. The upper Nisqually River carries a heavy bedload of cobbles, gravel, and sand, and transports a substantial amount of large wood. It is a braided river with multiple, shallow channels that shift often, separated by gravel bars that are exposed except at very high flows. Gravel bars contain a matrix of large wood that has become embedded over time.

A low-flow, active channel runs along the toe of the levee at the easternmost end of the levee, even when the thalweg of the Nisqually River has shifted toward the left bank. This unnamed low flow perennial channel is fed by hillslope streams that cross the Westside and Nisqually to Paradise Roads. The Nisqually River generally traverses a broad plain in the project vicinity, but it is constrained at Sunshine Point (easternmost end, within the park) where the river meets the base of a steep hillside. The Nisqually to Paradise Road runs along the lower hillslope, immediately landward of Sunshine Point (Figure 2). Floods have damaged the levee and adjacent lands in the past.

During early November 2006, Mount Rainier National Park received almost 18 inches of rainfall in 36 hours. Rivers and streams in the park, including the Nisqually River, overtopped their channels with floods measuring the highest levels since the park's establishment in 1899. In the Nisqually River watershed, facilities at both Longmire and Sunshine Point were heavily damaged.

During the 2006 flood event, the Nisqually River eroded a large portion of the right bank and redirected the river's flow toward the Sunshine Point campground. More than five acres of the campground and a segment of the Nisqually to Paradise Road were washed away, closing access to the park. Much of the revetment protecting Sunshine Point was washed away by the 2006 flood. Surveyed cross sections showed that the 2008 active channel width was 300 feet wider than shown in the 2006 pre-erosion event survey data (Beason et al. 2015). Figure 2 shows the current active channel location relative to the 2006 bank. River and stream channels aggraded an average of about three feet during the November 2006 flood, reducing conveyance capacity and increasing flood impacts. Based on historic aggradation rates, a three-foot channel rise would typically be expected to take 20 years (Entrix 2009).

## Environmental Consequences

*Alternative A (No Action): direct, indirect and cumulative effects*. There would be no change in the configuration of the levee. The adverse impacts of the levee would continue to occur, which include continued high water velocities along the levee face. The levee face is constructed of large rock or riprap, and provides limited opportunity for vegetation establishment. Levees with smooth riprap faces adversely affect aquatic resources by reducing opportunities for vegetation establishment along shorelines, reducing habitat complexity, reducing shade, and disconnecting waterbodies from floodplains. Pools and riffles do not form along levees. Energy and flow velocity is artificially higher than natural conditions, and transferred downstream. Hydraulic modeling of the levee in its existing condition shows high water velocities along the entire face of the levee (Figure 9).

Repairs made by the USACE in 2011 and 2017 involved the installation of much larger toe rock than was installed following the 2006 flood event. Because of this, the levee is considered more robust and is expected to better withstand flood events that have a 1% probability of occurring in any given year (USGS 2018). Under the No Action Alternative, future repair activities may occur more frequently than would occur under the Action Alternatives. Repair activities may or may not require diversions or in-channel work, depending on the nature and extent of the damage.

*Alternative B: direct, indirect and cumulative effects*. This alternative is designed to reduce water velocities along the entire levee by shifting the thalweg away from the levee toe. Hydraulic modeling predicts the water velocity and shear stresses would be reduced approximately 50% during the 100-year flow simulation. Modification to the existing levee requires relatively small amounts of excavation/fill to build the toe section of each deflector. The entire project would require 3,396 cy of fill below OHWM. Table 1 displays areas and volumes of fill by alternative. The remaining, upper portion of the deflectors can be built on top of the existing levee without modifying the existing structure. The increased bank length and roughness provided by the deflectors would reduce the water velocity, reducing destructive flows adjacent to the levee and subsequent recurring damage to the levee.

Short-term hydrology impacts would result from the diversion of flow along the levee to dewater the construction area. Changes in flow would alter the distribution of sediment and wood downstream. The first peak flow events would typically destroy the diversion berm, which would be constructed of alluvium and unembedded wood. Peak flow events typically occur November through January or February. Because the Nisqually River is a highly dynamic braided channel, and because existing channels are used for diversion, impacts are not expected to persist through the first winter. If the channel persists beyond the first winter, it is likely that it would return to the right bank after a few years, depending on the valley slope. The long term impacts to hydrology would be the shift of the thalweg to toward the center of the river channel resulting from the increased bank length and roughness. This would result in a permanent change in thalweg location, and distribution of sediment and large wood. The shoreline is likely to create limited scour pools and areas of sediment deposition that are not currently present. This change in shoreline characteristics would benefit aquatic resources as discussed below.

Each deflector would be self-ballasting and designed to withstand 100-year flow events. This alternative would improve local habitat conditions to a limited extent by creating pools on the upstream end of each deflector structure, potentially providing rearing habitat and high flow refuge for cutthroat trout. The deflectors would provide limited areas of gravel sorting and deposition on the downstream end of each structure that may promote vegetation establishment and invertebrate production. The increased bank length and roughness provided by the deflectors would reduce the water velocity, reducing destructive flows adjacent to the levee and subsequent recurring damage to the levee.

Large wood would be integrated into approximately half of the deflectors, most within the park and along the easternmost segment of the levee. Wood that is unembedded may be retrieved from the tops of gravel bars in the project area to minimize impacts to the Nisqually River. The availability of large wood just prior to the construction season would depend on whether previous storms transported wood into the project area. If not enough large wood with rootwads is available for construction of deflectors containing wood, logs with rootwads would need to be obtained from outside of the park. The removal of large wood from gravel bars has the potential to impact hydrology locally, but ensuring that embedded wood and wood within the wetted width is not removed would reduce the potential for impacts.

The long-term impacts of deflector installation along the levee is expected to result in a shift of the Nisqually River thalweg approximately 30 feet toward the center of the braided channel. Figure 9 displays a modeling of flow velocity for existing conditions and with deflectors installed (Pierce County 2016). The shoreline adjacent to the levee would slow (dark blue), and the highest velocity flows would shift to the south or become disrupted. Side channels on the left bank would receive more flow, with possible reactivation of some small channels further inland of the left bank.

Shifting flow toward the left bank of the Nisqually River may increase flow in side channels along forested riparian reserves, which may benefit aquatic species that rely on shaded side channel habitat. Deflectors installed under Alternative B would be constructed of large quarry rock, and would be considered fill that may affect the flood elevation in the project area. The addition of fill may slightly increase flood elevations in the immediate vicinity of the project. As currently designed, construction of deflectors may add to a potential rise in flood elevation (< 1%) because of the introduction of additional fill in the active river channel/floodway, which is considered a cumulative effect in the watershed.

Maintenance and reconstruction of the levee that occurred between 2007 and 2017 required diversions that may have impacted area hydrology. This project would add to the cumulative impacts of the earlier work, but installation of the deflectors is expected to reduce the frequency of repairs and the need to divert the river to conduct repairs in the future. Diversions are considered temporary impacts in the Nisqually River where the braided, highly dynamic channel frequently changes position in response to peak flow events.

Other known projects include a U.S.D.A. Forest Service commercial thinning project that includes restoration of riparian reserves (USFS 1994) adjacent to the Nisqually River (USFS

2014). Approximately 3400 acres were scheduled to be commercially thinned beginning as early as 2014 and spanning several years (anticipated to be ten years). Nisqually Thin units are located directly south of the levee along Big Creek. However, the thinning project is not expected to result in detectable increases in peak flows or increased sedimentation or stream temperatures in the watershed.

*Alternative C: direct, indirect and cumulative effects*. Engineered log jams (ELJ) would augment deflectors under Alternative C. Assuming a 15 ft scour depth, each ELJ would require approximately 2,444 cy of excavation and 2,000 cy of fill. Seven ELJs would add a total of 14,000 cy of fill below the riverbed, most of which would consist of large wood. ELJ volume above the riverbed would be approximately 933 cy each, with a total of 6,531 cy for seven ELJs (Table 1).

The ELJs would augment the deflectors by increasing stability in the Sunshine Point area, redirecting flow away from the Nisqually River's right bank and by creating additional protection from erosional forces. Large-wood jams create a hydraulic shadow, a low-velocity zone for some distance downstream that allows sediment to settle out and stabilize (Entrix 2009). By locating log jams along the river bank, a deposition zone is expected to form, rather than an erosion zone. The deposition zone from an ELJ would be larger in size than with the deflectors alone, and is expected to become vegetated and grow in volume over time.

Figures 10-13 display potential conditions during a 100-year peak flow event at Sunshine Point, showing current condition, with deflectors, with ELJs, and with both deflectors and ELJs, respectively. Note that when modeled (2016), the thalweg was located toward the center of the channel. The thalweg position at this location tends to shift between the right bank and the center channel. In this case, the deflectors adjacent to the Nisqually to Paradise Road appear to have no effect on slower flows, when the thalweg is positioned in the middle of the channel.

ELJs are designed to respond to expected scour adjacent to the structure through embedment of the structure and/or placing pilings. ELJs at the Sunshine Point location would be designed so that each ELJ structure can withstand the expected forces from the flow in the Nisqually River. This would require providing adequate resistance to lateral movement through either the use of piles or increasing the overall weight of the structure. To account for scour depths in the unconsolidated bed material, the piles and base layer used for resistance to lateral movement would need to be driven down or excavated to an elevation lower than the expected scour depth (Entrix 2009).

Construction of ELJs may add to a potential rise in flood elevation because of the introduction of additional fill in the active river channel/floodway. Depending on design, ELJs may require the use of large rock as ballast, similar to the design of ELJs constructed in the Carbon River constructed by the NPS in 2011 (NPS 2010a). This would add to a predicted increase in flood elevation (< 1%) from the installation of the deflectors. The utilization of large wood in ELJs would limit the impact to imported rock. The impacts of using wood from gravel bars to construct ELJs would be similar to Alternative B, except that removal would occur during a different year. While it is possible that deflector construction would deplete local large wood accumulations, available wood tends to be variable year to year because of its movement or

transport from upstream sources and delivery downstream through the project reach during storms.

### Conclusion

Implementation of Alternative B would result in short-term construction impacts to hydrology because of the need for a diversion that dewaters the work area. The diversion would persist until the first fall or winter storm event that exceeded OHW occurred. Long-term impacts to the river's hydrology would include a shift in the thalweg 30 feet toward the center of the Nisqually River's braided channel. This shift in position would slow velocities, reduce shear stress and increase sedimentation, reducing the potential for damage to the levee face and the need for levee maintenance that requires future diversions and associated impacts. Cumulative impacts include the potential to slightly increase flood elevation on the left bank and downstream.

Implementation of Alternative C would improve channel roughness and reduce velocities near Sunshine Point, increase scour and deposition along the length of each ELJ, and increase opportunities for plant growth and habitat development. Alternative C would require an additional season of instream work that would likely occur two or more years after implementation of Alternative B. ELJs constructed under Alternative C would add to the impacts of Alternative B, and may add to the potential for increasing flood elevations locally.

## Aquatic Resources: Water Quality

### Affected Environment

The Washington Department of Ecology (WDOE) has determined that the mainstem of the Nisqually River meets standards for clean water (Pierce County 2012). The Washington State Water Quality Assessment 303(d)/305(b) (WDOE 2016) does not list the Nisqually River in the project area as impaired, though a few tributaries upstream are listed with temperature concerns.

An NPS water quality monitoring site is located within the project area and is sampled as part of the North Coast and Cascades (NCCN) Water Quality monitoring protocol. (Rawhouser et al. 2012). In-situ water measurements indicate moderate turbidity during the summer months, averaging just over 110 NTU over four years of data collection (2012-2015). These results are consistent with historical NPS water quality data collected at this location and typical of a glacial river (Larson et al. 1990). Diurnal flows cause turbidity to spike daily during summer, sometimes exceeding 1000 NTU at Longmire (Beason, pers. comm.). In-situ pH measurements collected at this location have not exceeded CWA water quality criteria.

Based on continuous water temperature data collected from 2012-2015, peak summer temperatures, in July and August, reached 16°C, and winter lows occurred in December, January and February, close to 0°C. Based on available data, no exceedance of the 16°C CWA temperature criteria established for the Nisqually River has been observed at the NPS boundary sample location.

High amounts of silt deposition, channel alteration, and a low variety of velocity and depth regimes contribute to a generally poor habitat rating in the Rapid Habitat Assessment conducted for the Nisqually boundary sample reach from 2012-2015 (Archambault and Rawhouser in preparation).

Collections of stream insects taken from the Nisqually River near the project area from 2012 to 2015 indicate that this reach of the river is not fully supporting the assemblage of insect taxa that are expected to occur at this site. As a result, the Nisqually boundary sample reach is classified as being in "fair" ecological condition rather in "good" (Archambault and Rawhouser in preparation). An assessment of insect tolerances to water temperature, fine sediment, nutrient levels and metal contamination indicates that this reach of the river is nutrient poor and contains a high amount of fine sediment. These conditions are likely combining to reduce the productivity of the river in this area as well as fill in or bury the small spaces between rocks and gravel that many species of insects use for habitat.

## Environmental Consequences

*Alternative A (No Action): direct, indirect and cumulative effects*. There would be no change in the configuration of the levee, and periodic repairs and associated impacts to water quality would be expected to continue more frequently than under Alternative B or C.

*Alternative B: direct, indirect and cumulative effects.* Diverting the channel for the period of construction would reduce the potential for widespread turbidity impacts, which can increase biochemical oxygen demand and reduce dissolved oxygen levels in the water. The diversion would be left in place for fall and winter peak flow events to reconfigure the river channel(s). The river frequently shifts within the floodplain and could move again before construction. If this occurs, Pierce County would adjust the in-water construction accordingly.

The short term impacts of diversion and deflector construction would result in sediment suspension and increased turbidity adjacent to the diversion structure and downstream, along the length and downstream of the levee. If there is a need to reactivate existing dry channels as bypass channels, a pulse of elevated turbidity is expected to occur on the day of the diversion. Increased turbidity may be detected 300 feet to 1000 feet downstream of the disturbance depending on the sediment size. Diversion construction would cause a brief sediment pulse on the day it is constructed, while deflector construction would result in suspended sediment above background levels during excavation for each deflector during the two months of construction. Equipment travel on gravel bars where subsurface (hyporheic) flow is present may result in elevated turbidity and sedimentation that can degrade water quality adjacent to and downstream of the construction activity.

If turbidity exceeded State water quality standards, particulate-generating activities would be halted until standards were met, and construction methods would be changed to avoid future exceedances. Materials used to restore the levee are coarse in texture and tend not to be sediment-generating.

Best management practices, including restrictions on fueling and prevention of fluid leaks from construction equipment, would minimize discharge of pollutants into the river. Construction materials would be obtained from contaminant-free sources. Pierce County would monitor turbidity upstream and downstream of the project site during construction, per the Pierce County Water Quality Plan (2018) and WDOE permit requirements.

The levee has been repaired four times since 2006. There are cumulative effects resulting from repeated construction activities involving diversion and dewatering of the river. Alternative B would impact the Nisqually River over a nearly two-month period during the summer of 2019, while typical maintenance activities would require one month. The longer term objective of the deflectors is to reduce the impact of damaging floodwaters on the levee, thereby reducing maintenance frequency. Deflector maintenance may be needed periodically, but would not require diversion of the river. Maintenance actions are expected to decrease, or become reduced in frequency and scale once the deflectors are constructed. Because of this, flow changes and sedimentation related to maintenance and reconstruction of the levee is expected to decrease, which would benefit aquatic habitat.

*Alternative C: direct, indirect and cumulative effects. ELJs* would result in impacts similar to Alternative B, but would occur during a second year. Construction of the ELJs would only require one diversion. While excavation for ELJs is greater in volume than for the deflectors, construction would be localized and easier to constrain. As previously discussed, the ELJ installation would create benefits in the longer term by increasing channel roughness and reducing velocities near Sunshine Point, increasing scour and deposition along the length of each ELJ, and providing opportunities for plant growth and habitat development. Scour pools and deposition adjacent to ELJs would be more substantial than what is expected to develop adjacent to the deflectors, and would be more stable. Because of this, ELJs, despite the short term impact to local sedimentation and turbidity, would result in additional, and more beneficial, impacts to aquatic habitat.

## Conclusion

The short-term impacts of construction of the proposed deflectors (Alternative B) and ELJs (Alternative C) include adverse impacts to water quality. Construction would cause temporary and localized increases in turbidity, most occurring when the channel is blocked to divert water into another channel. Water quality monitoring would occur to ensure that project construction proceeds within water quality standards specified in the permit with WDOE.

Reduction in water velocity along the levee face is expected to reduce the potential for damage to the levee, and reduce maintenance needs in the long-term. Maintenance of deflectors would not typically require river diversion, so impacts to aquatic resources and water quality would be reduced in the long-term compared to the No Action alternative.

As previously discussed, ELJ placement typically results in localized increases in flow velocities, which leads to the development of scour holes, additional habitat, and the creation of vegetated islands (Entrix 2009). In time, as sediment accumulates adjacent to the ELJs, vegetation would

become established as it is currently on gravel bars adjacent to Sunshine Point. After the initial adverse impacts of construction, including localized sedimentation and turbidity, ELJs would result in additional long-term beneficial impacts to water quality.

# Special Status Species

## Affected Environment

*Federally listed species.* Several species may occur in Mount Rainier National Park; two species protected under the Endangered Species Act of 1973 (ESA) have been documented in the project vicinity. A Biological Assessment was prepared by Pierce County and the National Park Service and submitted to the U.S. Fish and Wildlife Service on June 15, 2018 requesting the initiation of formal consultation.

The marbled murrelet (*Brachyramphus marmoratus*) and the northern spotted owl (*Strix occidentalis caurina*) and their habitat have been documented in the project vicinity.

Approximately 23,000 acres of forested lands within Mount Rainier National Park is defined as suitable marbled murrelet nesting habitat. The presence of murrelets has been documented in four river corridors within the park: the Carbon, Mowich, Puyallup, and Nisqually (NPS 2017). Repeated radar surveys along the Nisqually River at the Kautz Creek and Tahoma Creek confluences detected very few (mean 4.7 per day, range 1-12) marbled murrelet targets, suggesting that this part of the Nisqually River drainage supports few marbled murrelets (ABR, Inc. 2001-2009). No active nests have been identified within the park; however, nest surveys have been few and limited to the Carbon River drainage. The forest near the east end of the levee and along the Nisqually to Paradise Road is likely suitable habitat for marbled murrelets because it is dominated by mature Douglas-fir. Critical habitat is not designated for murrelets at the proposed repair sites. Gifford Pinchot National Forest is located along the left bank of the Nisqually River near the upper and east end of the proposed project and it contains areas designated as critical habitat approximately 0.5 mile from the project site. During a May 2011 site visit, four platform trees suitable for murrelet nesting were located at the upstream end of the levee that is adjacent to Sunshine Point, and additional platform trees were noted further inland in the adjacent stand of trees. Mount Rainier National Park assumes marbled murrelet presence in the project area.

Mature forest dominated by Douglas-fir (*Pseudotsuga menziesii*) in the project vicinity is also considered suitable spotted owl habitat. The nearest known spotted owl territory is centered approximately 2.7 miles away, and the nearest recently active nesting territory is centered 3.9 miles away. Demographic surveys have been conducted annually along the roadway adjacent to the proposed project, and none have detected use of the area adjacent to the project by spotted owls. Critical habitat is not designated at the proposed repair sites; however, the NPS considers adjacent forested stands as suitable habitat. Gifford Pinchot National Forest is located along the left bank of the Nisqually River near the upper east end of the proposed project, portions of which are designated as critical habitat for the northern spotted owl. Northern spotted owls may be present in the project area.

Other listed species that may occur in Pierce County and within or near the park are highly unlikely to occur in the action area and thus would not be affected by the proposed actions. These species include Canada lynx (*Lynx canadensis*), grizzly bear (*Ursus arctos horribilis*), gray wolf (*Canis lupus*) and yellow-billed cuckoo (*Coccyzus americanus*). Yellow-billed cuckoo is a medium-sized bird that breeds in large blocks of riparian habitat, particularly woodlands with cottonwoods and willows. Deciduous forested riparian habitat is located along the Nisqually River in the project vicinity, but no riparian forest vegetation would be affected by the proposed action, and there have been no recent sightings of yellow-billed cuckoo in the project vicinity.

Bull trout (*Salvelinus confluentus*) have not been documented in the upper Nisqually River watershed (NPS 2010b; WDFW 2016). Critical habitat for Coastal-Puget Sound bull trout is not designated in the project area. In Mount Rainier National Park, bull trout are known to exist and spawn in the White, West Fork, Carbon, Mowich, and Puyallup rivers and their tributaries. Listed salmon species are not present in the Nisqually River because of downstream barriers including the Alder and LaGrande Dams and a barrier that predates the dams, which block anadromous passage.

*Species of concern.* Resident fish species in the upper Nisqually River include native coastal cutthroat trout (*Oncorhynchus clarki*) and sculpins (Cottidae spp.). Low densities of coastal cutthroat trout, typically 20-30 fish/mile, occur in the glacially turbid Nisqually River during the summer. Low fish densities and low recruitment make the populations very sensitive to additional disturbances (Samora et al. 2013).

*Essential Fish Habitat (EFH).* EFH has been designated to protect waters and substrates necessary for fish spawning, breeding, feeding, or growth to maturity (MSA § 3(10)). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable artificial barriers, and longstanding, naturally-impassable barriers. The geographic extent of freshwater EFH is specifically inclusive of all aquatic habitats within entire watersheds. For this action, the Nisqually River basin (USGS hydrologic unit number 17110015) is identified as EFH for Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), and pink salmon (*O. gorbuscha*).

## Environmental Consequences

*Alternative A (No Action): direct, indirect and cumulative effects*. The No Action Alternative would have no effect on special status species until erosion and damage occurs, and the levee needs to be maintained again. Construction impacts related to noise and harassment may have an impact during future levee repairs. Repairs can typically be conducted during late nesting seasons for the northern spotted owl and the marbled murrelet. ESA Section 7 determinations in previous consultations for repair and maintenance activities have consistently been "may affect, but not likely to adversely affect" for northern spotted owls and marbled murrelets. The frequency of future repairs is assumed to be higher than if the levee was retrofitted with deflectors or log jams.

*Alternatives B and C: direct, indirect and cumulative effects*. The primary difference between alternatives B and C is that implementation of alternative C would require construction during a second year, separated from the deflector construction by two to five years depending on availability of funding.

The NPS sent a Biological Assessment of the impacts of the proposed project to the USFWS on June 15, 2018, requesting formal consultation. The NPS evaluated potential effects to threatened and endangered species in the Biological Assessment and made the determination that the proposed action alternatives *may affect, are likely to adversely affect* (LAA) the marbled murrelet. This determination is made based upon the following reasons: 1) marbled murrelets have been documented to be present along Nisqually River, 2) suitable habitat is present in the action area, 3) construction noise and activity could disrupt marbled murrelets if they are present in the suitable habitat area adjacent to the project. No vegetation or mature trees would be removed as part of the project. Because construction activities within Mount Rainier National Park would occur during the marbled murrelet nesting season and prior to September 5, work would be restricted to daytime hours beginning two hours after sunrise, and ending no later than two hours before sunset, from April 1 through September 23.

The proposed action alternatives *may affect, are not likely to adversely affect* the northern spotted owl and its designated critical habitat. This determination is made based upon the following reasons: 1) northern spotted owls have been documented to be present along Nisqually River, 2) suitable habitat is present in the action area, 3) construction noise and activity could disturb northern spotted owls if they are present in the suitable habitat area adjacent to the proposed project, 4) no trees would be removed as part of the project, and 5) no active nests have been identified within the action area. With the exception of staging, most construction activities adjacent to suitable habitat (within the park) would occur later during the nesting season (August 1-September 30), which would lessen the potential for disturbance to northern spotted owls if they are present in the action area.

The action alternatives would have *no effect* on other federally listed species or their critical habitat. Resource protection measures, as discussed above, would be employed during construction to minimize the impact to fish and wildlife and their habitat.

*Species of concern.* Impacts to species of concern would be temporary, and limited to construction. The reduced maintenance frequency expected from implementation of Alternative B and C would be a beneficial effect to cutthroat trout, sculpin, and other aquatic species. After the initial adverse impacts of construction, including localized sedimentation and turbidity, ELJs would result in additional long-term beneficial impacts to aquatic species, including cutthroat trout, sculpin, and invertebrates because of the development of scour pools, sorted sediment deposits, and vegetated islands.

*Essential Fish Habitat.* The distribution of anadromous salmonids including Chinook salmon, coho salmon and pink salmon in the Nisqually River basin is limited to reaches and tributaries downstream of LaGrande Dam at MP 42.5. The LaGrande Hydroelectric Project was first constructed in 1910. There is considerable doubt that anadromous fish were able to migrate

much further upstream of this project due to the presence of a now submerged natural barrier in LaGrande Canyon (Kerwin 1999), which is located well below the project action area. Therefore, there would be no effect to EFH for Chinook salmon, coho salmon, or pink salmon.

### Conclusion

Implementation of Alternative B would result in reduced frequency and duration of levee maintenance repairs. Implementation would require one long construction season in the near term (2019). Deflector maintenance may be needed periodically, but would not typically require diversion of the river, and would be much smaller in scale compared to maintenance activities that have occurred since the November 2006 flood event. A decrease in maintenance frequency and duration would reduce construction related noise disturbances adjacent to marbled murrelet and northern spotted owl habitat, a longer-term beneficial effect.

The addition of ELJs to the Sunshine Point area would add one season of construction in a subsequent year, depending on availability of funding. This would result in an additional season of construction impacts in the project vicinity. ELJs would benefit aquatic species in the long term by improving habitat conditions and enabling the development of scour pools, sorted sediment deposits, and vegetated islands.

# CHAPTER IV. Consultation and Coordination

## Scoping

Public scoping was conducted June 18-July 9, 2018. Seven comment letters were received. In summary, five respondents were fully supportive of the project, citing the potential improvement in stability along the levee face, and potential reduction of maintenance. Two letters were received expressing concerns about the addition of rock deflectors without considering the installation of log jams. Because of this, a log jam alternative (Alternative C) was added to this environmental assessment. One letter was received from the National Parks Conservation Association; all other letters were from individuals.

Internal scoping was conducted by an interdisciplinary team of professionals from the park and representatives from Pierce County Planning and Public Works. Team members met three times from 2016 through 2018 to discuss the purpose and need for the project, various alternatives, potential environmental impacts, reasonably foreseeable actions that may have cumulative effects, and resource protection measures. The NPS also participated in an office and a field meeting with Pierce County representatives, representatives from the USACE, the WDOE, and the Washington State Department of Fish and Wildlife Service during the planning phase of the project.

## Agencies and Tribes Consulted

The State Historic Preservation Officer from the Washington State Department of Archeology and Historic Preservation and the following American Indian tribes were notified of the project proposal, and will be invited to comment on this EA:

Cowlitz Indian Tribe
Muckleshoot Indian Tribe
Nisqually Indian Tribe
Puyallup Tribe of Indians
Squaxin Island Tribe
Yakama Nation

The NPS anticipates that the project would have *no adverse effect* on historic properties. Consultation with the SHPO is being conducted concurrent with the publication of this EA.

## Environmental Assessment Review

This EA is subject to a 30-day public comment period. To inform the public of the availability of the EA, the NPS will notify various agencies, tribes, other interested parties on the park's mailing list, and local newspapers and online news outlets.

The EA will be available for review on the Planning, Environment and Public Comment (PEPC) website at https://parkplanning.nps.gov/nisquallylevee. The EA news release will be available at the following libraries, in addition to visitor center locations in the park: Buckley Library, Eatonville Library, Enumclaw City Library, Tacoma Public Library (Tacoma Branch), and Yakima Valley Regional Library. During the 30-day public review period, the public is encouraged to submit their comments to the NPS via the PEPC website, as described in the instructions at the beginning of this EA. Following the close of the comment period, all public comments will be reviewed and analyzed prior to the release of a decision document. The NPS will issue responses to substantive comments received during the public comment period and make an Errata available at that time.

## List of Preparers

The following persons assisted with the preparation of this EA:

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## Attachment A: Figures

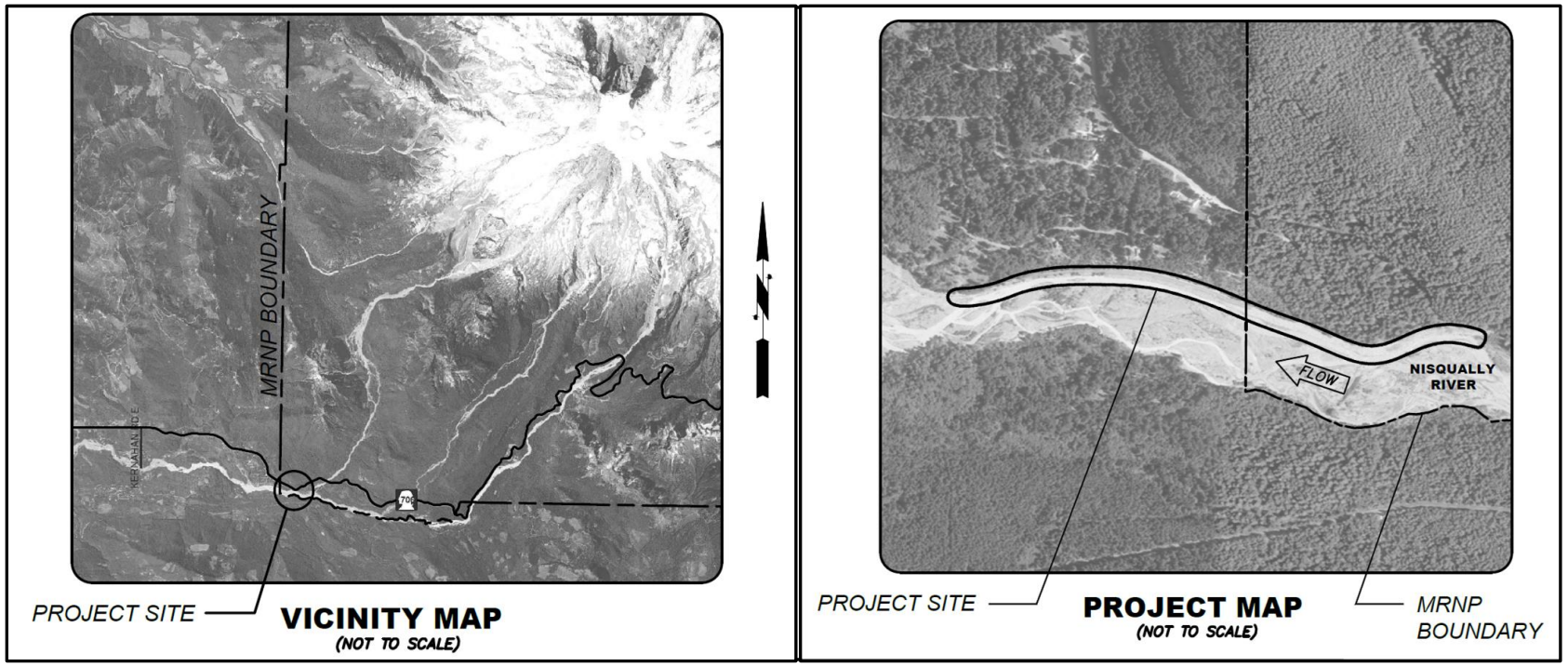


**Figure 1.** Proposed levee retrofit project vicinity and project location maps.

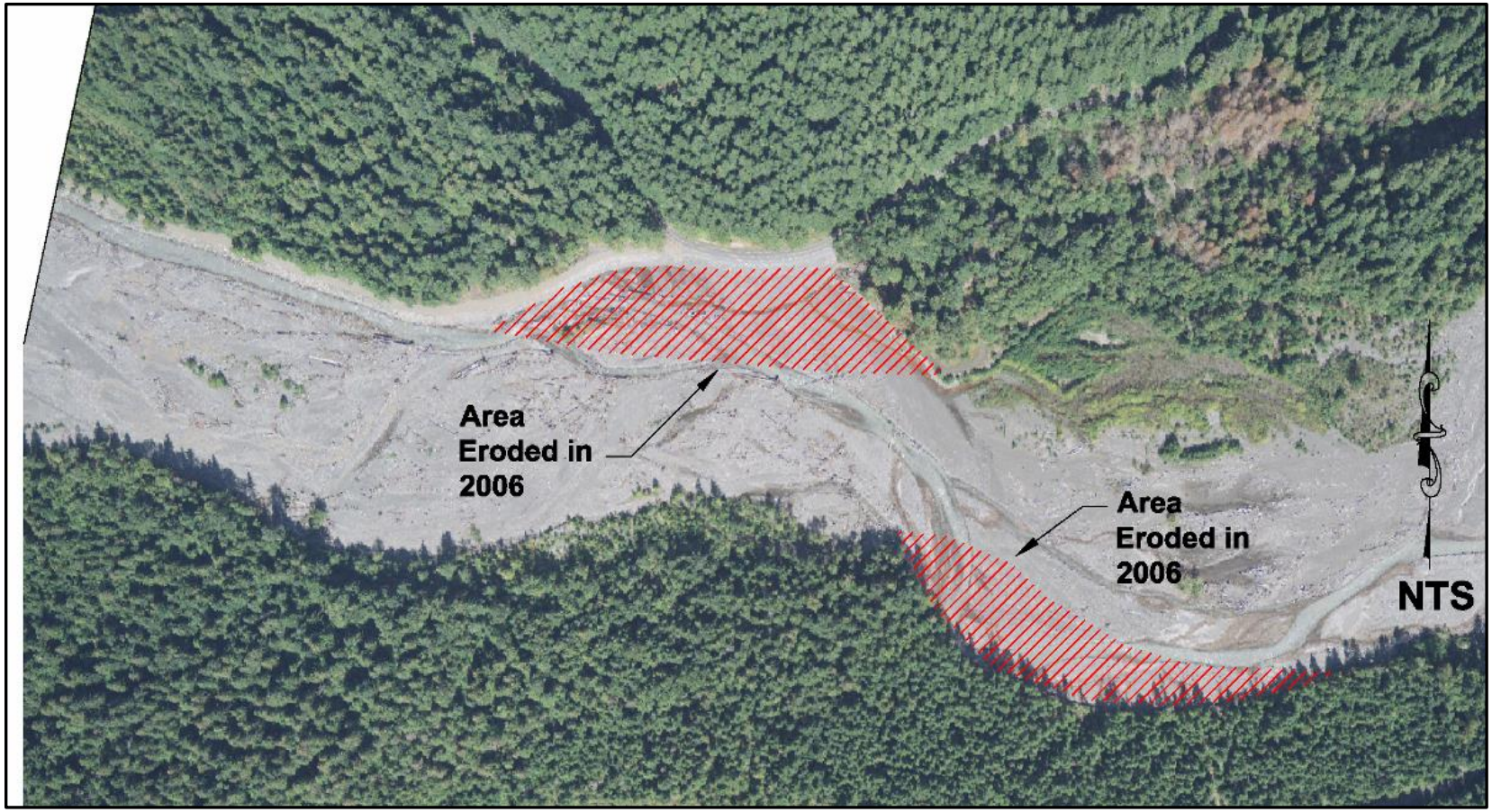


**Figure 2.** 2006 Erosion Areas at Sunshine Point and the Nisqually to Paradise Road (2007 aerial photo, from ENTRIX 2009).

**Figure 3.** Nisqually River at Sunshine Point. The revetment (levee) at this location, which protects the Nisqually to Paradise Road, was added to the county's right of way permit and repaired by the Army Corps of Engineers in 2017. At this location, scour of the levee toe and loss of face rock occurred, prompting the repair.

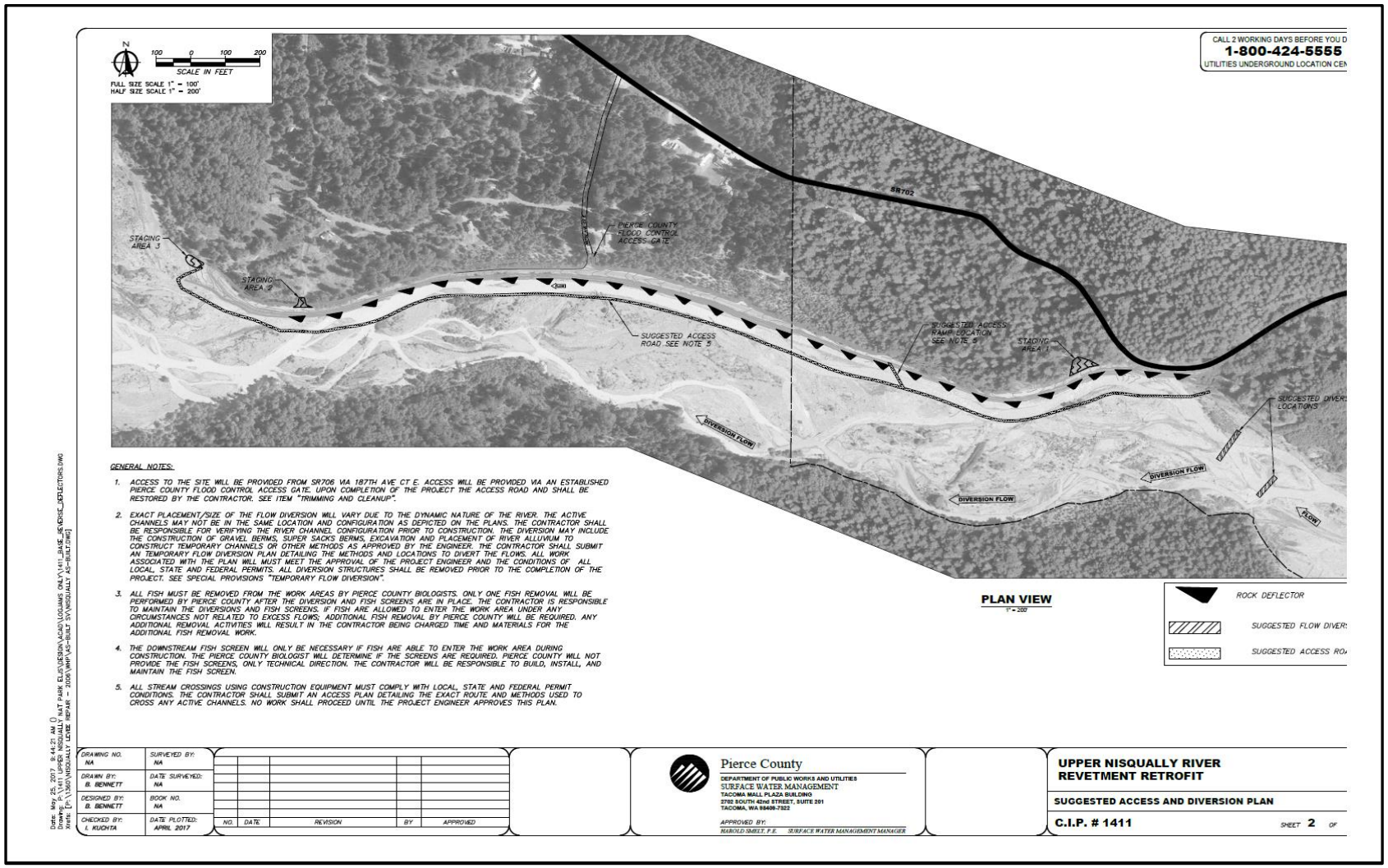


**Figure 4.** Alternative B, proposed deflectors plan view. Mount Rainier National Park is located to the east (right).

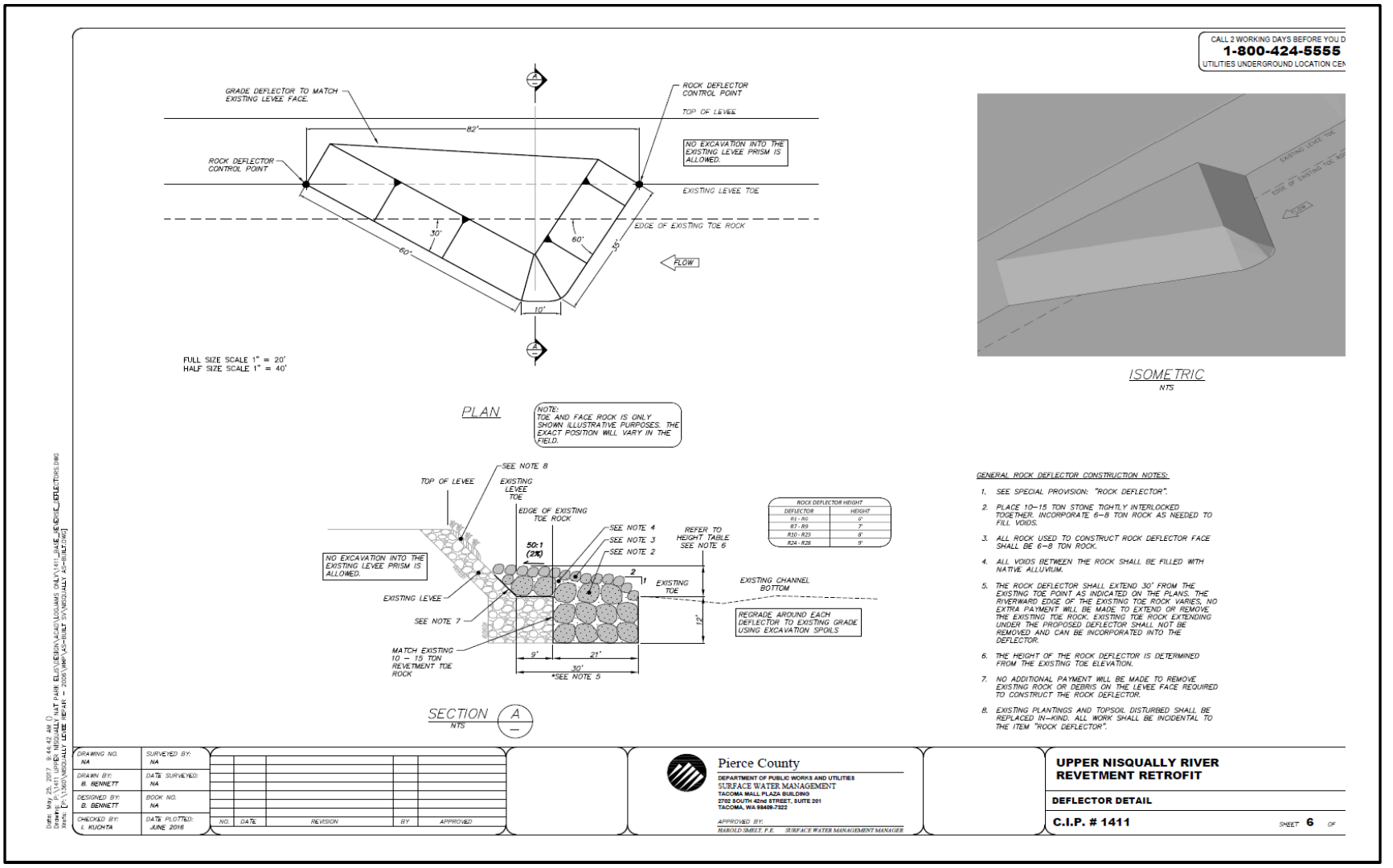


**Figure 5.** Alternative B, deflector design: plan view and cross section.

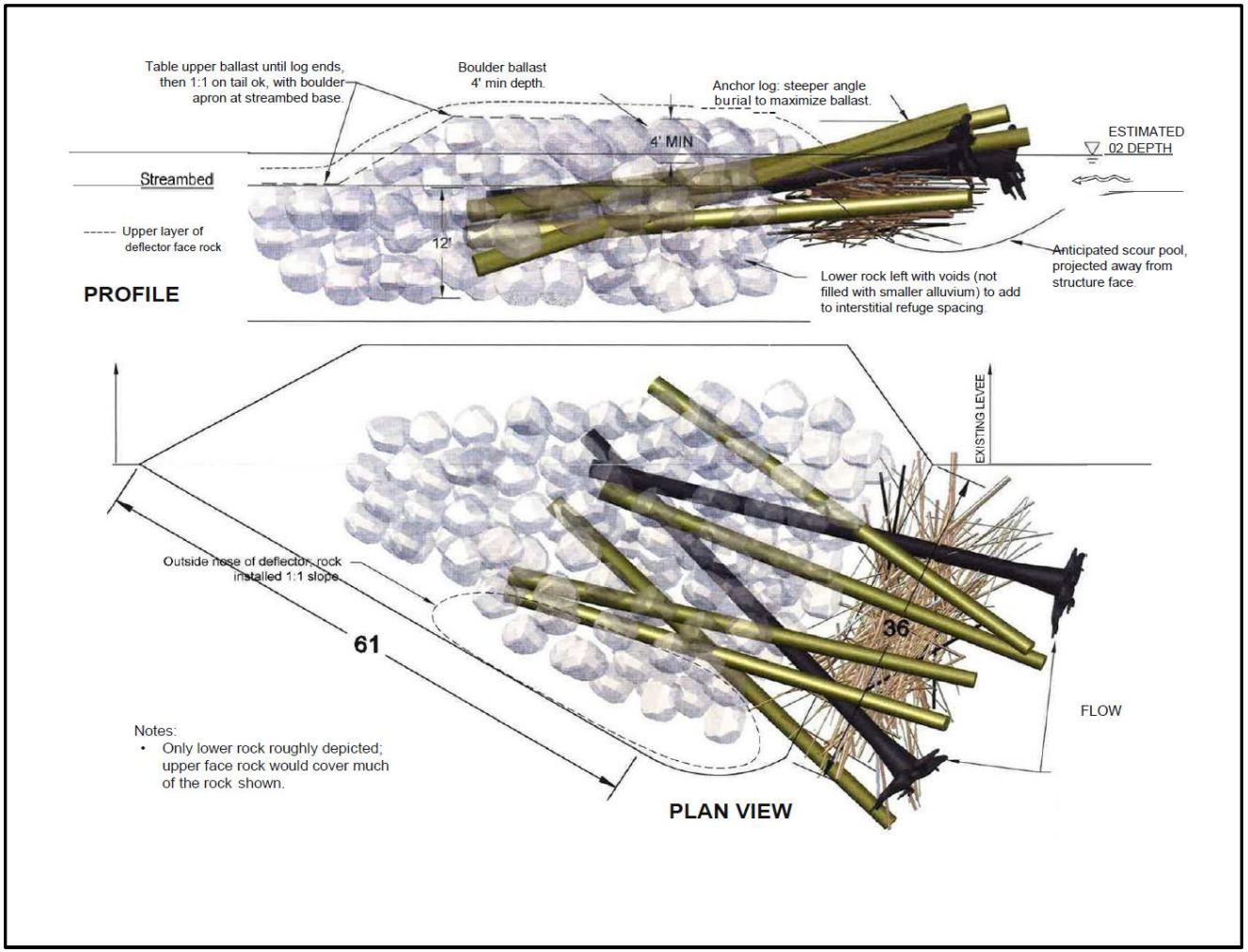


**Figure 6.** Alternative B, deflector detail. Example of wood augmentation of deflector structures at Sunshine Point, within Mount Rainier National Park.

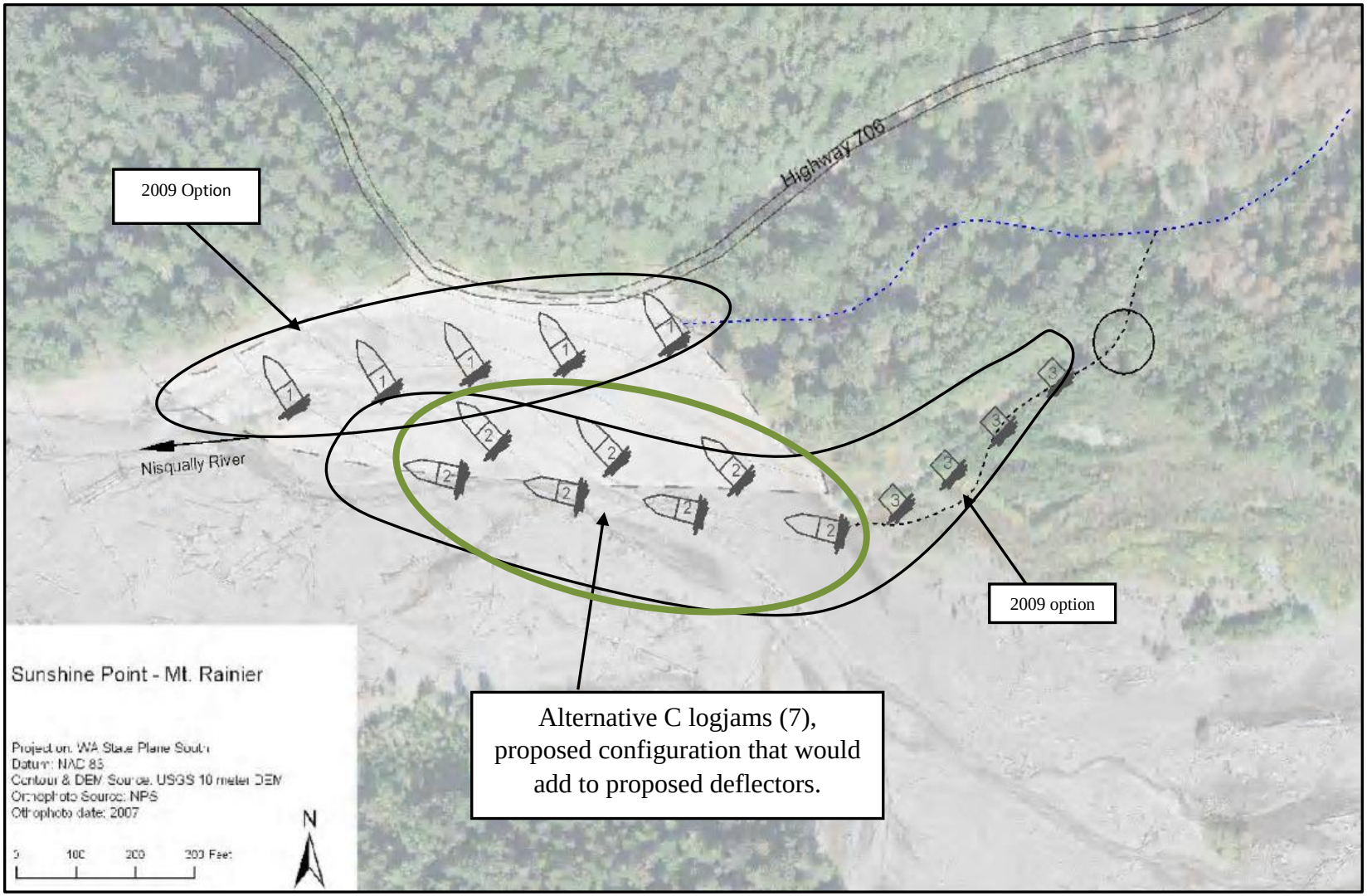


**Figure 7.** Sunshine Point Site Alternative C (showing options from 2009).

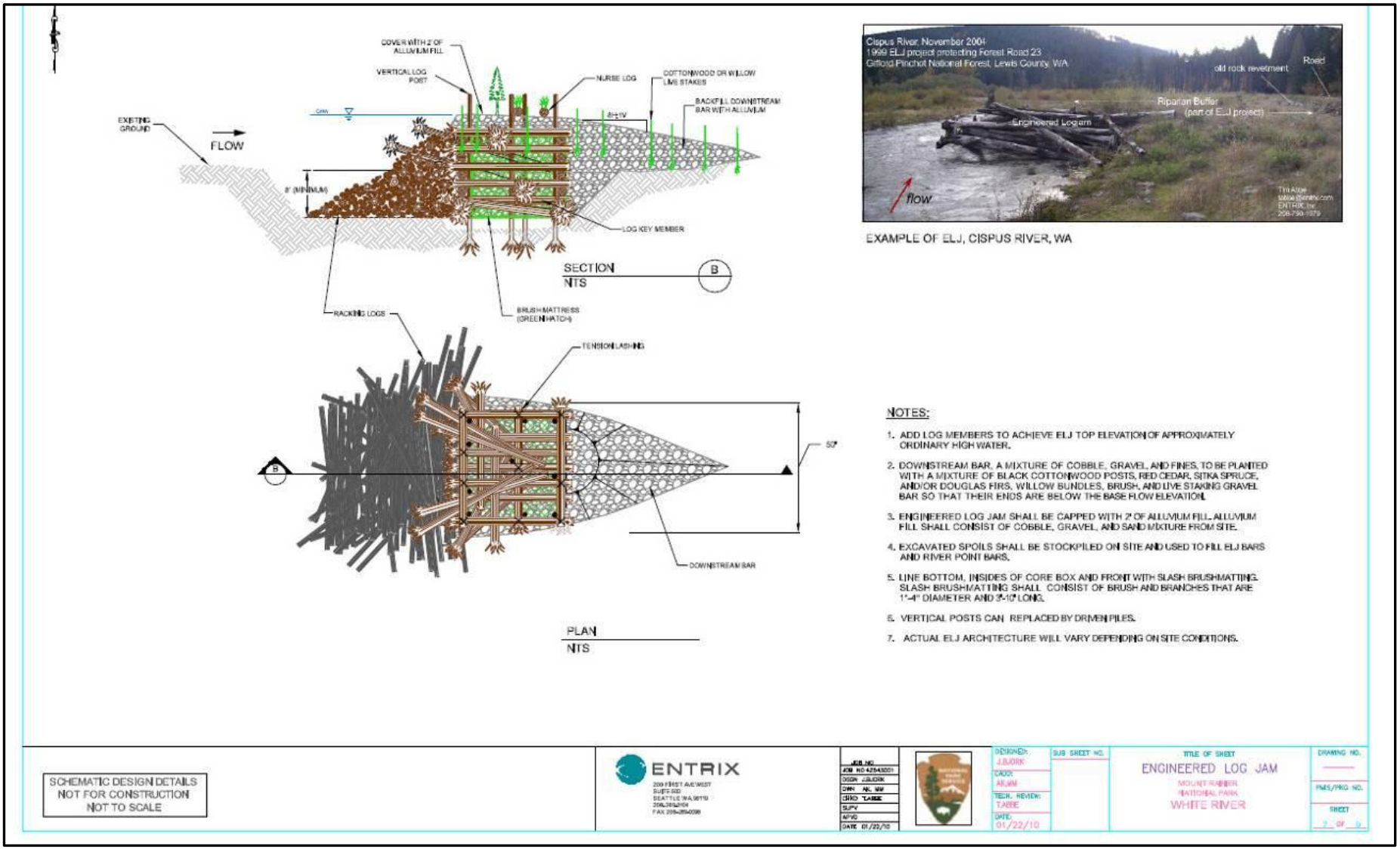


**Figure 8.** Typical design of Flow Deflection Engineered Log Jams (ELJs).

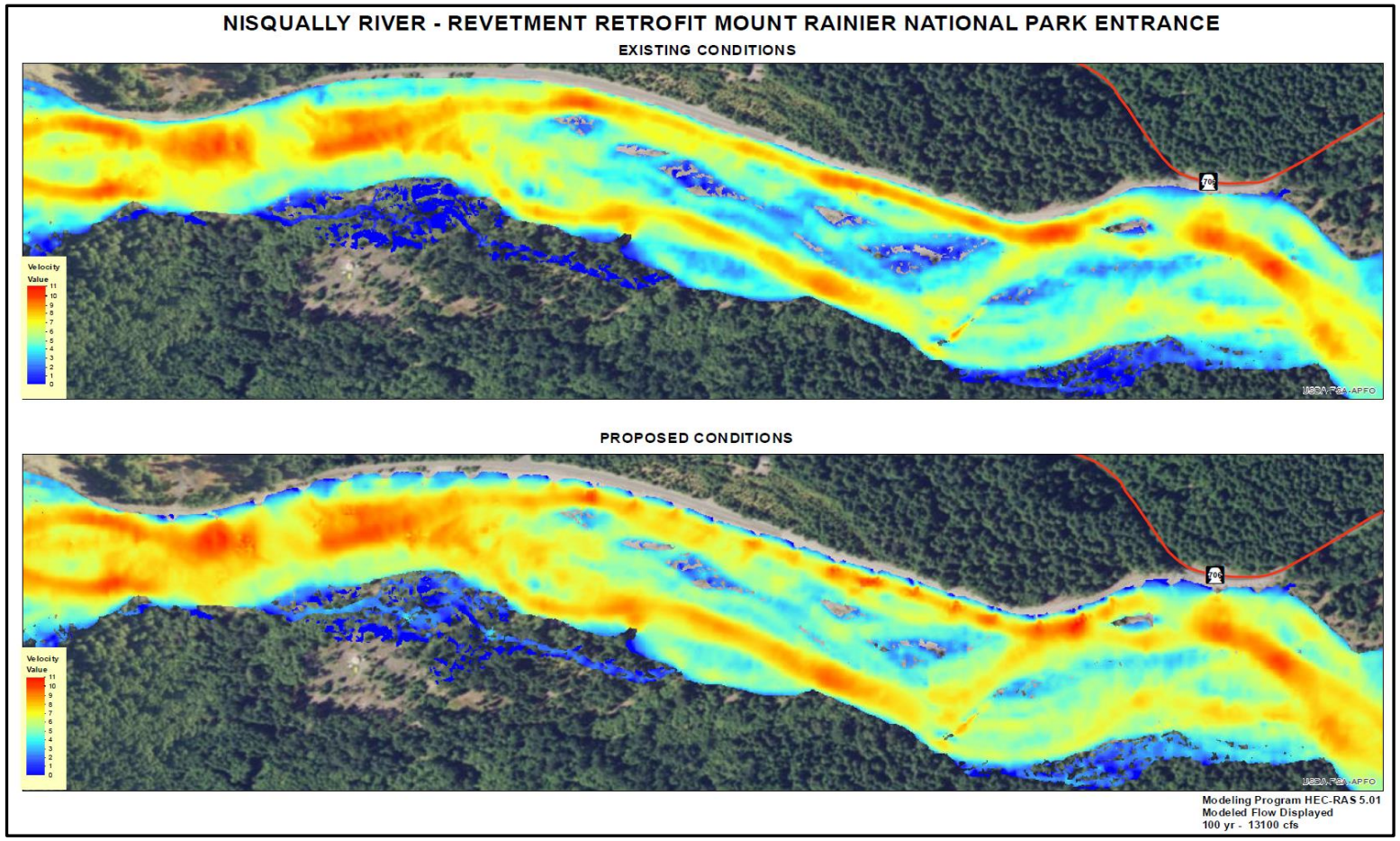


**Figure 9.** HEC-RAS modeling of the Nisqually River along the levee showing velocity of flow before and after deflector installation (Pierce County 2016). Dark red indicates the highest velocities, dark blue the slowest. Note the dark blue against the levee, between deflectors, and the increase in flow shown as light blue on the left bank. Small channels on the left bank, shown in blue, are reactivated under this scenario.

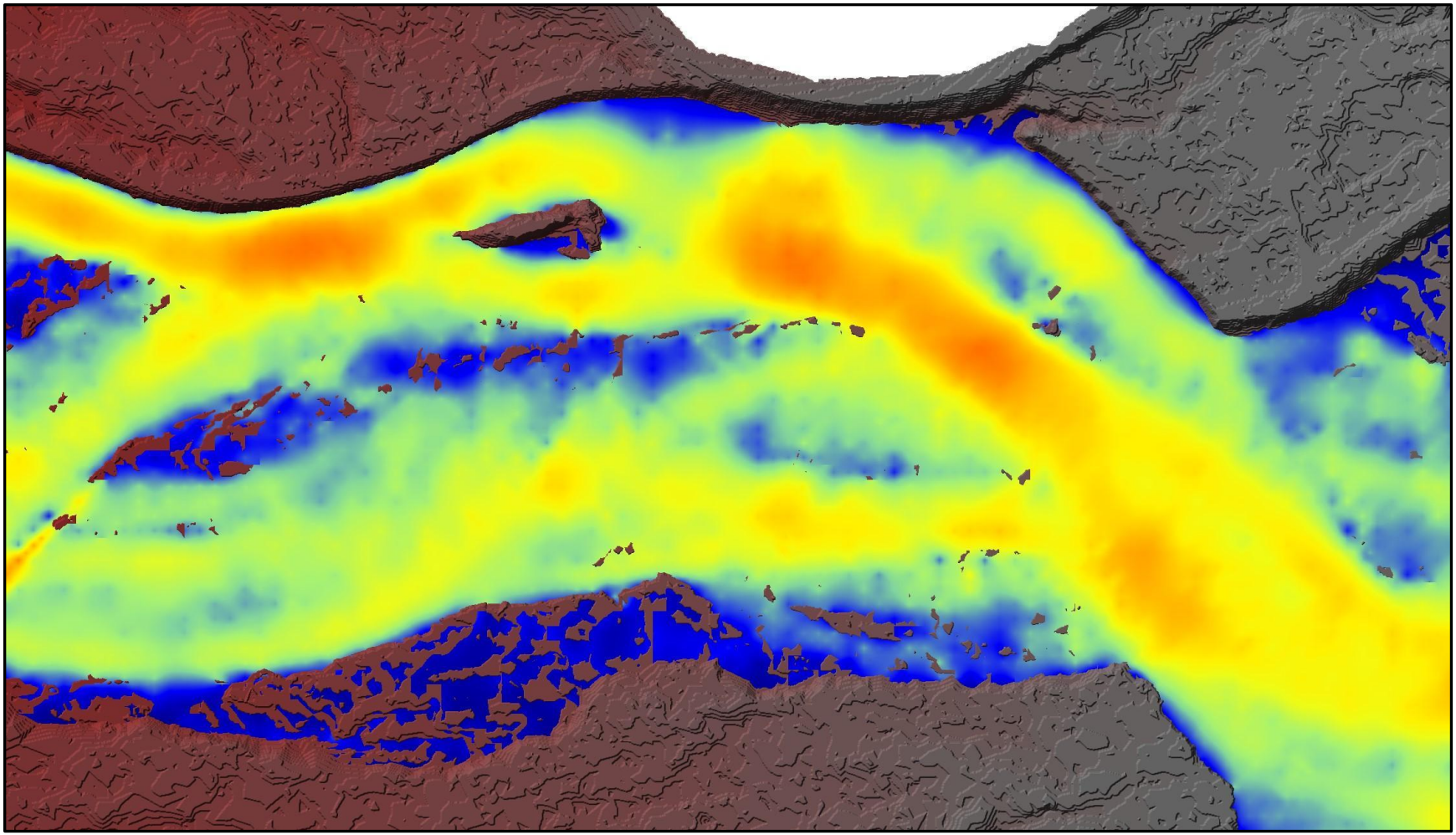

**Figure 10.** HEC-RAS showing water velocity existing condition during a 100-year event (13,100 cfs). The highest velocities are indicated in red, the slowest in dark blue.

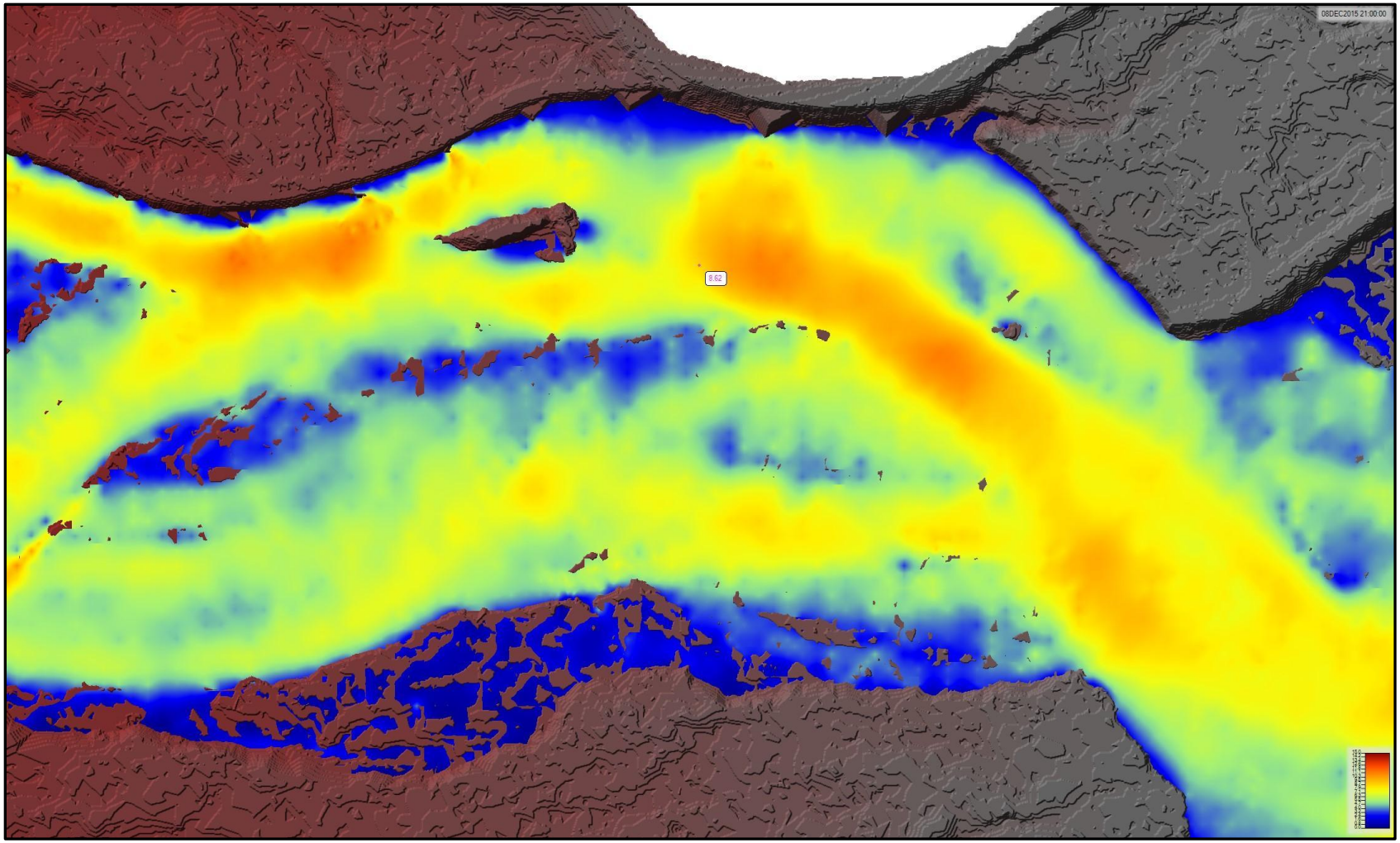


**Figure 11.** HEC-RAS showing water velocity with deflectors, during a 100-year event (13,100 cfs). The highest velocities are indicated in red, the slowest in dark blue. This was modeled based on conditions when the thalweg was located toward the center of the channel in the upper reach near Sunshine Point. The river at this location periodically shifts from the right bank to the center channel. The thalweg consistently adheres to the levee downstream of Sunshine Point.

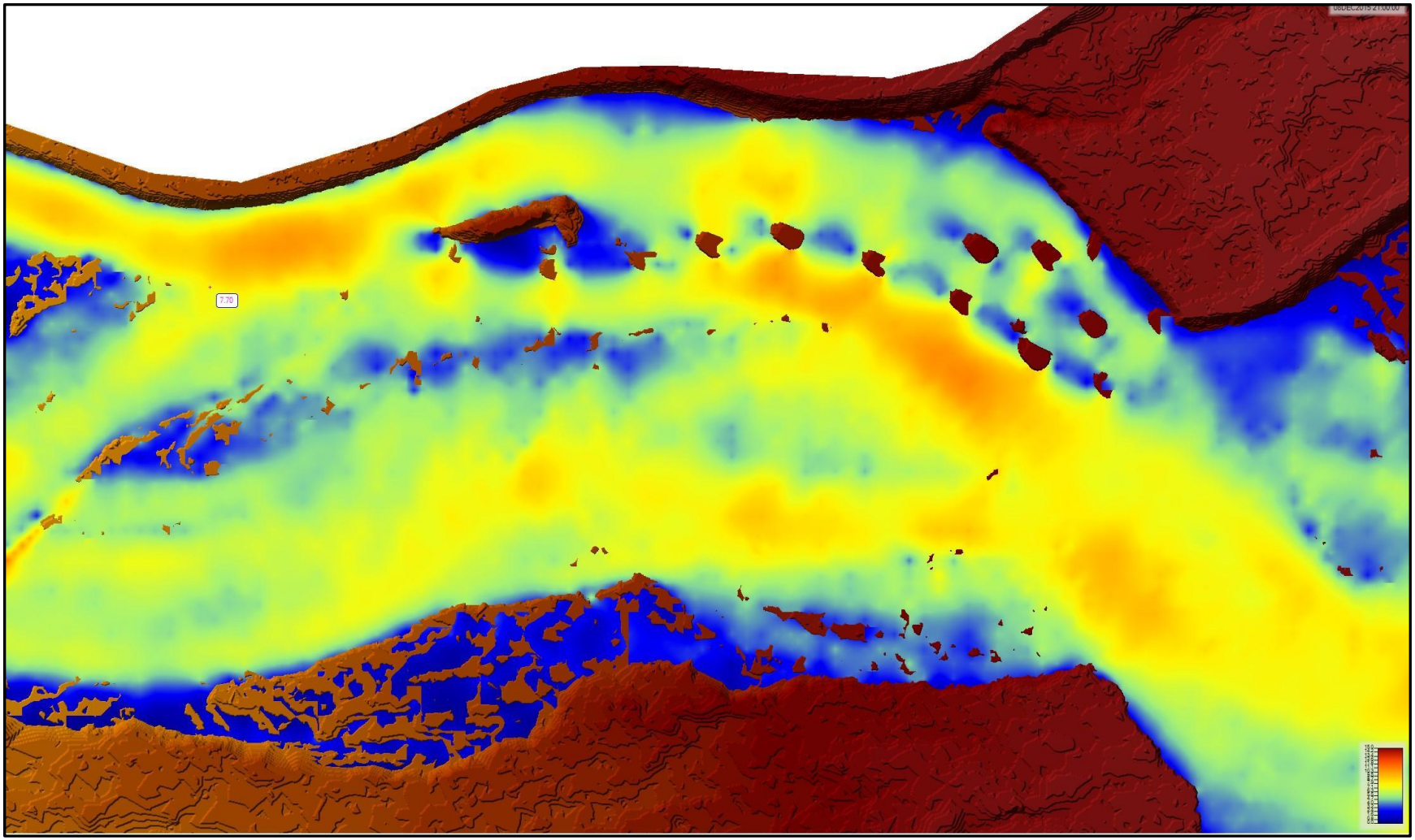

**Figure 12.** HEC-RAS showing water velocity during a 100-year event (13,100 cfs) with ELJs installed, and without deflectors. The highest velocities are indicated in red, the slowest in dark blue.

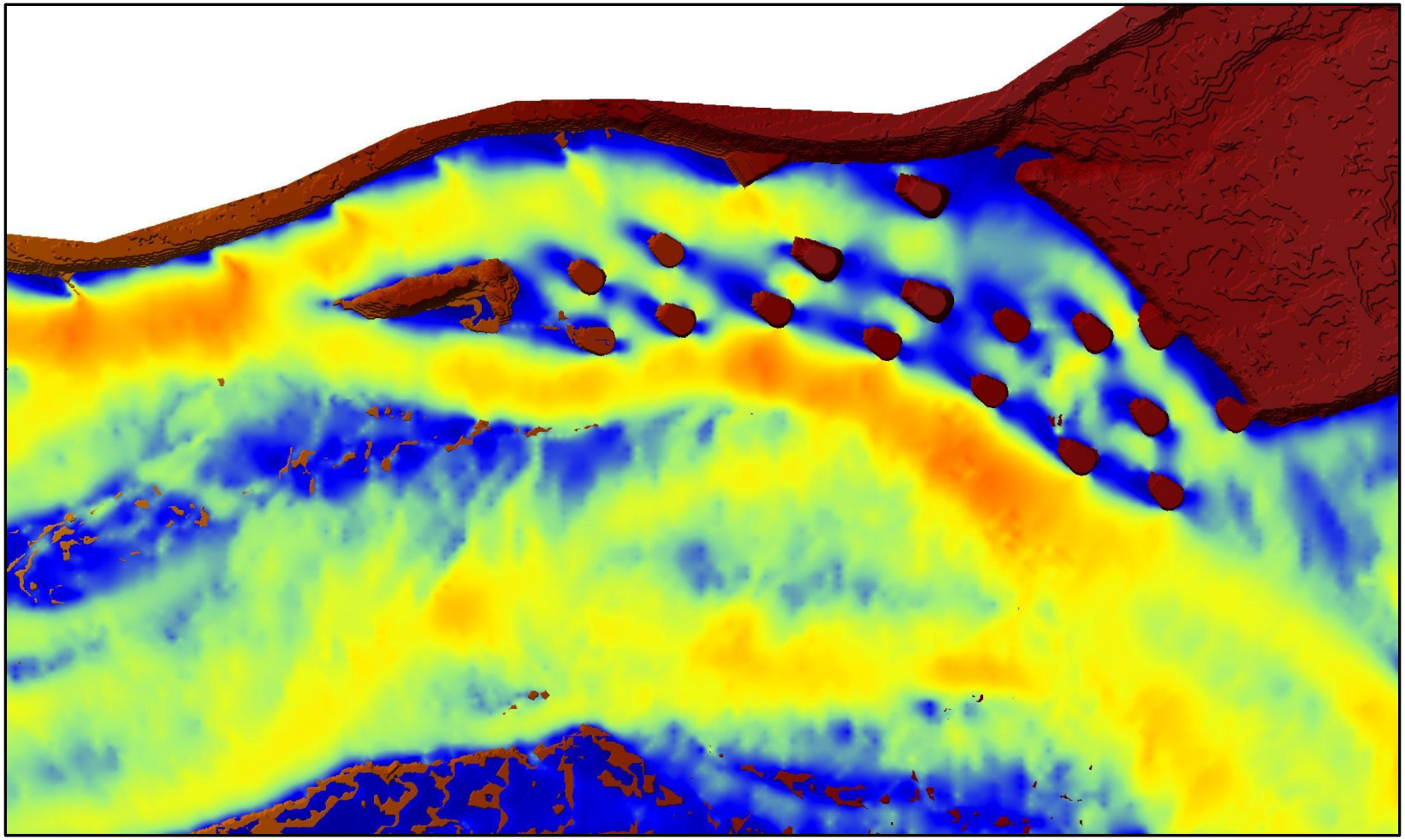

**Figure 13.** HEC-RAS showing water velocity existing condition during a 100-year event (13,100 cfs) with ELJs and deflectors installed. The highest velocities are indicated in red, the slowest in dark blue. The modeling suggests that ELJs may be more effective (slowing water velocity) with the deflectors in place.