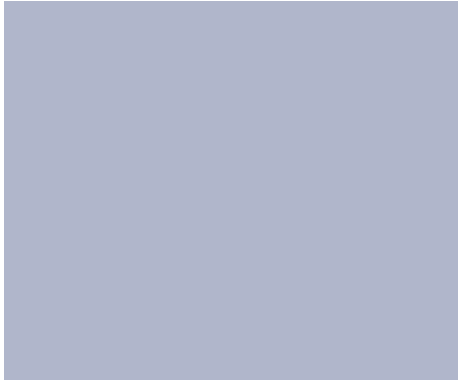




SHANNON & WILSON, INC.



Proposal for

Design and Engineering Services for the Lower Dungeness River Floodplain Restoration and Levee Realignment

DECEMBER 1, 2015
21-2-62274-001



SHANNON & WILSON, INC.

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November 30, 2015

Board of Clallam County Commissioners
 223 East 4th, Room 150
 Port Angeles, WA 98362

**RE: Bid Proposal - Design and Engineering Services for the
 Lower Dungeness River Floodplain Restoration and Levee Realignment Project**

The Shannon & Wilson (S&W) team is pleased to submit the attached proposal. We provide a well-qualified team with relevant expertise, focused on engineering and community outreach solutions, for the Lower Dungeness River Floodplain Restoration and Levee Realignment project. Our team's site-specific expertise, relevant experience on levee setback and habitat restoration projects, and relationships and experience with the project's major stakeholders, including Corps federal levee designs, offer a competitive edge in successful completion of the project on schedule.

Shannon & Wilson is proposed as the prime consultant for this team. Our contact information is provided below and followed by the list of our partner sub-consultants, their roles and contact information.

FIRM / ROLE	MAILING ADDRESS	CONTACT	EMAIL / PHONE / INTERNET
Shannon & Wilson <i>Prime / Proposer</i> - Project Manager - Lead Geotechnical Engineer	400 North 34th Street Suite 100 Seattle, WA 98103	David Cline, PE, CFM Project Manager	drc@shanwil.com (206) 632-8020 (206) 695-6885 (direct) http://www.shannonwilson.com/
Cardno ENTRIX - Lead Civil Engineer - Lead Geomorphologist - Lead Ecologist - Lead Community Outreach Specialist	801 Second Avenue Suite 700 Seattle, WA 98104	Jack Bjork, PE, D.WRE	jack.bjork@cardno.com (206) 269-0104 206-239-0277 (direct) http://www.cardno.com/en-us/Pages/Home.aspx
WEST Consultants Lead Hydraulic Engineer	12509 Bel-Red Road Suite 100 Bellevue, WA 98005	Ray Walton, PhD, PE, CFM D.WRE	rwalton@westconsultants.com (425) 646-8806 (425) 646-8806 ext. 303 http://www.westconsultants.com/
HDR - Lead Structural Engineer - Lead Transportation Engineer	500 108th Ave NE Suite 1200 Bellevue, WA 98004	Mark Olhstrom, PE	mark.olhstrom@hdrinc.com (206) 354-0279 (direct) http://www.hdrinc.com/
Johnston Land Surveying Professional Land Surveying	540 W 8th Street Port Angeles, WA 98362	Rob Johnston, PLS	rob@johnstonlandsurveying.com (360) 452-0237 http://johnstonlandsurveying.com/

Shannon & Wilson (S&W) as the prime consultant, S&W will provide project management, civil and geotechnical engineering and levee design services. Established in 1954 and based in Seattle, we are well known for innovative civil, environmental and geotechnical engineering, engineering geology, water and natural resources and permitting services. We are experts in floodplain restoration and levee realignment projects. We have experience as the prime consultant on several recent restoration projects ranging in size and construction costs from less than \$1M to \$20M. Examples of our experience as prime leading similar types of projects include the highly successful \$9M Fir Island Farm Estuary Restoration project (Washington Department of Fish and Wildlife), North Fork Skagit River Levee Setback (Skagit County Public Works), Nooksack River Levee System Wide Improvement Framework (Whatcom County), and the Fisher Slough Restoration Construction (The Nature Conservancy). Our experience on these large-scale habitat restoration projects typically involves collaboration and outreach with a number of agencies and stakeholders, complex technical studies and high-level technical reviews. Our technical expertise, project management and communications style will facilitate relationships with Clallam County, U.S. Army Corps of Engineers (Corps), Jamestown S'Klallam Tribe, and other stakeholders, grant and regulatory agencies.

Cardno is a key teaming partner and has a valuable project experience and relationships on the Dungeness River and other successful restoration projects in Clallam County. Cardno has 30 years of environmental consulting and the firm specializes in sustainable natural systems engineering, geomorphology, water and natural resource management, permitting and compliance. Their scientists and engineers have decades of experience conducting stream and watershed assessments and designing successful habitat, channel, and floodplain restoration projects. Cardno's restoration designs are based on knowledge of fluvial processes and their influence on both natural channel function and aquatic ecology supported by stable, properly functioning conditions. Their proven track record includes development of engineering design plans, permitting and construction for river and floodplain projects including levee setbacks, fish passage, culvert design, dam modification, dam removals, grade control, natural channel design, bank stabilization, sediment retention, engineered log jams, and engineered wood placements. They will provide lead civil engineering and restoration design, fluvial geomorphology, ecology and community outreach services for the project.

WEST Consultants, Inc., founded in 1988, has an excellent reputation in the field of water resources engineering and hydraulic modeling. Their experience includes hydraulics and hydrology, multidimensional modeling, analysis of hydraulic structures, sediment transport studies, streambank erosion and protection, bridge and abutment scour analyses and countermeasures, FEMA flood insurance studies, no-rise studies, CLOMR applications and levee certifications, habitat restoration, and fluvial geomorphology. West provides professional hydraulic modeling training for HEC-RAS2D. WEST will provide lead hydraulic engineering services and have valuable, previous project experience on the Lower Dungeness River Restoration project.

HDR Engineering, Inc. is a multidisciplinary firm specializing in meeting transportation and water resource needs of cities, towns, counties, associations, and other public entities. Providing services in Washington since 1974, HDR has built solid working relationships with many agencies across the state. HDR brings experience in developing alternative designs for modifying county and local roads, bridges and culverts, as well as planning and design of levee setback and other flood control projects. HDR will provide lead transportation and structural engineering services, as well as Corps federal levee design coordination services.

Johnston Land Surveying (JLS), a Port Angeles based sole proprietorship owned by Rob Johnston since 2004, will provide professional land surveying services. Mr. Johnston's experience includes base map preparation, public records research, property boundary determination, mapping, planning, rights-of-way, easements, platting, and real property descriptions. Typical projects include topographic and bathymetric surveys, ALTA/ACSM surveys, plats, short plats, and as-built surveys.

Our team is organized to provide key personnel with directly relevant expertise for the project design, and has team members who will provide positive community outreach. We tailored our team to address the scope of work and project's greatest challenges to lead to a successful project outcome. The challenges and our team's plan to address these challenges are summarized below, and described in further detail in our proposal.

High-Level Expertise and Proven Project Delivery Success – Our team provides experts with recent success in levee setback, floodplain habitat restoration, rural roadway design, permitting and construction.

Experience with the Lower Dungeness River Project – Several of our key personnel have working knowledge of the Dungeness River hydrology, hydraulics, flood modeling, Corps federal levee inspections, habitat design, and neighboring projects. This knowledge provides a head start to meet the tight project schedule.

Stakeholder Experience – Our team has worked with the project stakeholders including Clallam County, Jamestown S'Klallam Tribe, Corps of Engineers, WDFW, WSDOT, local property owners, and the North Olympic Lead Entity. Our relationships will provide for effective design team communications and outreach.

Seattle District Corps of Engineers and Federal Levee Experience – Our team members have Corps levee design, risk assessment, and habitat restoration project experience. S&W has held Seattle District Corps Geotechnical IDIQ contracts for 15 years. HDR has multiple on-call contracts for A/E, and for planning and environmental services. Our team member Mark Ohlstrom brings invaluable Corps expertise as the former Seattle District Chief of the Engineering Division. WEST Consultants holds multiple Corps hydraulics on-call services contracts and has special expertise in HEC-RAS2D modeling.

In closing, our team will provide key personnel with relevant expertise; working knowledge of the Lower Dungeness River Project; relationships and ability to effectively communicate with the County and their project stakeholders. These attributes directly address the project scope of work and its greatest challenges, and will facilitate project success.

We acknowledge receipt of Addendums 1, 2, 3, and 4 and answers to questions for Clallam County's Request for Proposal. If you have questions about this proposal or require additional information please contact me at 206-695-6885 or drc@shanwil.com.

Sincerely,
SHANNON & WILSON, INC.



David R. Cline, PE, CFM
Project Manager

ATTACHMENT 2

STATEMENT OF QUALIFICATIONS CERTIFICATION

(Proposer must use this form – All other formats will be rejected and the Proposer will be considered non-responsive, and the proposal will not be evaluated by the County)

The undersigned is authorized to execute this certification on behalf of the Proposer and certifies on the Proposer's behalf that the information presented in this Statement of Qualifications is a complete and accurate statement of facts and that the Proposer has the financial capability to perform the work which is the subject of this solicitation. The Proposer further certifies that it knows of no personal and/or organizational conflicts of interest prohibited under federal, state and local law.

The Proposer certifies that this Proposal is submitted in accordance with this solicitation and all issued addenda, and that the Proposer agrees to be bound by the same.

~~The Proposer's Small Contractors and Suppliers (SCS) utilization as set forth in the Proposal constitutes the Proposer's commitment, if awarded this contract by the County, to use certified and qualified SCSs firms as required by the Agreement.~~

The Proposer designates

David R. Cline, PE

(name)

Vice President

(title)

(206) 695-6886

(phone number)

as the person charged with carrying out and reporting the Proposer's use of SCSs to perform Work under this Contract to meet the required percentage established for this Contract.

~~The Proposer certifies that it commits that _____% of the total price of the Contract, as amended, shall be performed by Clallam County Certified SCS firms over the duration of the Contract. Clallam County will not evaluate the proposal and will not execute a contract with a Proposer who does not commit to meeting at least the minimum SCS utilization requirement for this Contract.~~

Proposer Shannon & Wilson, Inc.

Signature



Title

Vice President

Date

November 30, 2015

EXPERIENCE AND PAST PERFORMANCE OF THE PRIME CONSULTANT

Founded in Seattle in 1954, Shannon & Wilson, Inc. (S&W) has been a major provider of integrated services in civil, geotechnical, and environmental engineering; surface and groundwater resources; ecological resources; and permitting. Whether as prime consultant and engineer of record with lead responsibility for design or as a key subconsultant, S&W provides the team with a deep understanding of design, permitting, and construction contracting of habitat, floodplain, and levee setback projects. In the past five years alone, S&W has helped achieve the design, permitting, and construction of more than 5½ miles of levee setback and 750 acres of floodplain and marsh habitat restoration in King, Snohomish, Skagit, and Whatcom counties.

A singular example of S&W's ability to execute work with a high level of quality control (QC) is the successful pre-design, design, permitting, and construction of the \$9.5M Fir Island Farm Estuary Restoration project. As lead for this complex, multi-objective, and multidisciplinary estuarine dike setback effort, S&W managed all phases of feasibility study, design, permitting, and engineering during construction. We oversaw numerous subconsultants, and integrated their work, including survey, cultural resources, geomorphology, hydrodynamic modeling, and engineering (coastal, structural, geotechnical, mechanical, and electrical), into the overall project design plans. The design and permitting work delivered construction bid plans and specifications on budget and within a challenging 18-month expedited schedule. The construction phase is also on schedule and budget, and the work is considered a highly successful levee setback restoration project. At the feasibility phase, we provided a multi-objective alternatives analysis using systematic methods to quantify the comparison of existing to post-project conditions. We developed the alternatives and evaluation methods in coordination with our client and their technical advisory committee. The analysis evaluated various levee setback alignments; the benefits to fish and estuary habitat; impacts to farms and drainage, snow goose foraging, and wetlands; project costs; and sociopolitical risks. After vetting these alternatives with the owner, the technical advisory committee, project partners, and the public, S&W incorporated feedback and identified a recommended design plan.

The Fir Island design phase required technical investigations: multidimensional hydrodynamic river and estuarine modeling; river and coastal engineering design; agricultural drainage design; wetland and vegetation studies; snow goose habitat impact analyses; cultural resource and topographic surveys; structural, mechanical, and electrical design; and geotechnical explorations and analyses. The design development process was collaborative and open. Through regular outreach and design meeting updates, design development was coordinated with the local dike district, the U.S. Army Corps of Engineers (Corps), farmers, birders, hunters, and other recreational communities.

From the various technical discipline studies and designs, we published a concise design report, plans, and specifications, all of which were subject to standard internal quality control (QC) protocols and external independent technical review. Ultimately, we helped support potentially difficult decisions by clearly communicating findings on flood impacts, habitat benefits, farm impacts, project costs, risks, and constructability issues to allow comparison of existing conditions with proposed design alternatives.

Project Examples

Fir Island Farm Estuary Restoration | Skagit County, WA

Key Staff: Dave Cline, Brian Reznick, Stan Boyle	Dates: 7/2010 – 12/2016	Contract Value: \$1,396,065
Client/Owner: WDFW	Contact: Jenna Friebe, (360) 466-4345 x 250	

As prime consultant for this 5,500-foot-long levee setback and 130-acre estuarine marsh habitat restoration project, S&W is providing a feasibility study, alternatives analysis, project design, permitting, and construction phase engineering services. The work requires integration of coastal and river geomorphology, coastal engineering and hydrodynamic modeling, erosion and scour protection, groundwater studies, sea-level-rise and climate change analysis, drainage studies, geotechnical stability analyses, and seismic analyses. Collaborating with multiple stakeholders, we completed pre-design, design, and permitting within 18 months. All milestones, deadlines, and submittals were provided on schedule, while accommodating updates based on public and stakeholder outreach and feedback. The construction bid was within 1% of the engineer's cost estimate; earthwork quantities were within 1% of the engineer's estimate; minimal change orders have been executed; the project is on budget and schedule.



Fisher Slough Restoration Plan | Skagit County, WA

Key Staff: Dave Cline, Brian Reznick, Stan Boyle	Dates: 02/10-12/12	Contract Value: \$836,582
Client/Owner: The Nature Conservancy	Contact: Jenny Baker, (360) 419-7022	

S&W staff helped plan, design, and oversee construction for The Nature Conservancy's Fisher Slough Restoration Project. Dave Cline was project manager and engineer of record for the feasibility, design, permitting, and construction phases. S&W participated as an independent technical reviewer of the levee setback design, and as prime consultant for construction management. The \$7M project involved a levee setback on freshwater and tidal marsh tributaries of Fisher Slough along the South Fork Skagit River. It was designed to restore 60 acres of freshwater juvenile Chinook rearing habitat as well as to increase flood and sediment storage and improve interior drainage flood conditions. The project is an excellent example of aligning the mutual benefits of fish habitat restoration and floodplain management. With more than the usual number of project partners and technical advisers, the project required a high level of communication and coordination among drainage and dike districts; federal, state and local resource agencies; tribes, the local agricultural community; and private landowners.



Reddington Levee Setback | Auburn, WA

Key Staff: Dave Cline, Brian Reznick	Dates: 04/10 – 1/14	Contract Value: \$415,147
Client/Owner: King County	Contact: Erik Peters, (206) 477-4797	

King County constructed a levee setback and extension along the Green River to increase flood and sediment capacity, improve riparian habitat, reduce flood hazard to neighboring county residences, and control costs of flood hazard management. S&W is the geotechnical engineer of record and assisted in design and construction. The project included collection and review of surface and subsurface data, subsurface explorations, in situ soil testing, and laboratory testing. Geotechnical and hydro-geologic analyses were used to evaluate the proposed levee locations and provide design and construction recommendations. In addition to characterizing foundation soils and analyzing slope stability, seepage, liquefaction, and uplift, S&W provided geotechnical recommendations for protecting or moving existing utilities in the proposed construction zone. The firm also assessed environmental cleanup actions completed or remaining at a pesticide-contaminated property near the proposed alignment. To maximize use of onsite material, S&W provided value-added levee structural seepage core and shell design.



PRIME FIRM QUALIFICATIONS MATRIX		ALTERNATIVES ANALYSIS	GEOTECH EXPLORATION, CORPS DESIGNS & SEISMIC	HABITAT RESTORATION	HYDRAULICS, MODELING, SCOUR AND EROSION	CHANNEL MIGRATION AVIATIONS, GEOMORPHOLOGY	PLANS, SPECS, BID DOCS	CORPS DESIGN STANDARDS, PL84-99, SECTION 408	FEMA NO-RISE, CLOMR, LEVEE CERTIFICATION	STAKEHOLDER OUTREACH	CONSTRUCTION ASSISTANCE
PROJECT / OWNER	CONTACT INFORMATION										
Fir Island Farm Levee Setback WDFW	Jennifer Friebe (360) 466-4345 x250	✓	✓	✓	✓		✓	✓		✓	✓
Fisher Slough Levee Setback The Nature Conservancy	Jenny Baker (360) 719-4022	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Reddington Levee Setback King Co.	Erik Peters (206) 477-4797	✓	✓	✓	✓		✓	✓			✓
Deming Levee Extension Whatcom Co.	Paula (Cooper) Harris (360) 778-6285	✓	✓	✓	✓	✓	✓	✓		✓	
Nooksack River Levee SWIF Whatcom Co.	Paula (Cooper) Harris (360) 778-6285	✓		✓	✓	✓				✓	
Smith Island Levee Setback Snohomish Co.	Bob Aldrich (425) 388-6424	✓	✓	✓	✓	✓	✓	✓		✓	✓
Port Susan Bay Levee Setback The Nature Conservancy	Jenny Baker (360) 719-4022						✓				✓
N. Fork Skagit Levee Setback Skagit County	Jeff McGowan (360) 416-1400	✓	✓	✓	✓	✓	✓	✓		✓	

FIRM'S (PRIME / SUB) EXPERIENCE PERFORMING DISCIPLINES OF WORK

Hydraulic Modeling and Scour Analysis

The S&W team includes the most-experienced users of HEC-RAS modeling software in the Pacific Northwest. Our lead hydraulic engineer, Ray Walton (WEST) teaches courses internationally in HEC-RAS and HEC-RAS2D modeling, and, with other team members, has modeled the Dungeness, Columbia, Snake, Skokomish, Elwha, Green, Snohomish, Skagit, Sumas, and many other rivers. Nationwide experts in sediment transport and erosion control, including bridge scour, channel erosion control, and levee erosion protection, our team members have developed Federal Emergency Management Agency (FEMA) flood insurance studies and flood maps for areas throughout the Pacific Northwest. Using Corps guidelines and standards, the team has completed levee certifications that meet FEMA's requirements that are fully compliant with 44 CFR 65.10. WEST analyzes erosion potential due to flood events, wind and wave action, ice loading, floating debris impact, and extended periods of inundation. Bridge scour analysis experience includes 1,500 bridges, many in the Pacific Northwest, including pier, embankment, and abutment scour with development of scour mitigation design measures.

SR 107/4 Bridge and Chehalis River Flood Authority Flood and Scour Mitigation Analysis | Greys Harbor County, WA

Key Staff: Ray Walton	Start/End Date: 10/14 – 03/15	Contract Value: \$34,514
Client/Owner: WSDOT	Contact: Julie Heilman, (509) 577-1703	

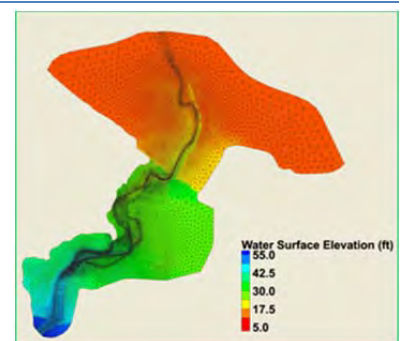
The Chehalis River has a sharp meander bend just upstream of the State Route 107 (SR-107) crossing near Montesano. River hydraulics poses a threat to the SR-107 Bridge and its south approach, although the river is relatively stable and the bridge is inspected after major flood events. WEST staff developed a SRH-2D hydrodynamic model extending from upstream of the meander bend to just upstream of the confluence of the Chehalis and Wynoochee rivers. An existing WEST-developed 1D HEC-RAS model of the Chehalis was applied to develop upstream flow and downstream stage boundary conditions and calibration for several historical events and the 100-year flood. After model calibration, several river morphological and migration configurations were simulated to evaluate a range of potential future hydraulic conditions at the SR-107 bridge. Model output was used with Federal Highway Administration HEC-18 bridge scour guidelines to estimate the scour potential at the bridge for the morphology scenarios, to calculate shear stress and stream power for bank erosion, and, using particle tracking, to assess alternative alignment-induced alterations in flow characteristics through the bridge.



2-D ADH Hydrodynamic Model of Lower Dungeness River | Sequim, WA

Key Staff: Ray Walton	Dates: 12/10 – 04/11	Contract Value: \$35,274
Client/Owner: Jamestown S'Klallam Tribe	Contact: Randy Johnson, (360) 681-4631	

WEST set up a 2D hydrodynamic model, using the Corps' Adaptive Hydraulics (ADH) program for the Dungeness River project site. The purpose was to examine the hydrodynamic changes due to levee setback along the right overbank between River miles 1 and 2, restoration of flood flows in the overbank area, and calibrate to a 2002 major flood event. Model geometry was developed from LiDAR overbank topography and sparse channel cross sections. HEC-RAS was used to develop a denser mesh of in-channel geometry points to map to the finite-element grid used by ADH. The model was run to simulate existing conditions during the two-year and 100-year floods. After adding project features to the model (levee setback, side-channel bypass, vegetation plantings, and bank-stabilizing large woody debris [LWD]), the model was rerun for the same three events. Results were used to compare hydrodynamic changes with and without the project features.



Geomorphic Response Analysis

Cardno, the team's geomorphic response lead, brings its well-tested understanding of fundamental geomorphic drivers and processes in the Pacific Northwest river systems. The team's scientists have in-depth experience analyzing sediment transport, geologic controls, slope system processes, landscape and fluvial process, uncertainty, and the effects of LWD on rivers, streams and their floodplains. They use in-house state-of-the-science approaches to characterize local and system-wide channel braiding, migration, avulsion, and other morphologic responses. At the foundation of our team's habitat restoration designs, geomorphic process-based approaches help ensure that projects are sustainable and allow channel responses that lead to long-term recovery.

Lower Dungeness River Levee Setback | Sequim, WA

Key Staff: Jack Bjork, Derek Booth	Start/End Date: 11/2010 – 9/2013	Contract Value: \$175,000
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Client/Owner: Jamestown S’Klallam Tribe	Contact: Randy Johnson, (360) 681-4631
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On a Corps Section 544 levee setback project to remove a 2,600-foot-long levee and restore 112 acres of floodplain along the Dungeness River, Cardno developed 60% plans and cost estimates for reconnecting the river to its floodplain while preventing a channel avulsion into recently planted floodplain vegetation. Engineered log jams (ELJs) were planned to foster development of the anabranching channels while providing beneficial salmonid habitat. The 60% plan for the levee setback project designs were based on geomorphologic assessments demonstrating that the river’s restored condition is an anabranching channel form. Team member WEST developed the 2D hydraulic model to investigate the influence of levee removal on flow conditions in the river and floodplain, levee design elevations, and erosion protection armoring. Working collaboratively with the Corps and other stakeholders, Cardno developed a levee alignment that provides environmental benefits and meeting the Corps’ cost-benefit criteria.



Ohop Creek Restoration Project | Eatonville, WA

Key Staff: Derek Booth, Kim Gould	Start/End Date: 3/2008 – 10/2015	Contract Value: \$644,495
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Client/Owner: South Puget Sound Salmon Enhancement Group	Contact: Lance Winecka, (360) 412-0808
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Cardno helped restore more than two miles of Ohop Creek, a channel long-impacted by agricultural practices. The designs for the reconstructed, natural, sinuous planform were based on geomorphic, hydrologic, and sediment conditions of the contributing watershed. Geomorphic designs evaluated stable and natural channel parameters, evaluated the risk of channel migration, and created in-channel habitat enhancement structures at key locations. New LWD structures now occupy the restored reach. Cardno was responsible for all stages of the analysis and design, including construction drawings and onsite construction oversight.

River Erosion Scour Protection Design

For the lower Dungeness River, cost-effective erosion protection is required for the new levee, the existing Anderson Road Bridge near the floodplain return flow channel, and to maintain the integrity of the restored forested floodplain. Team engineers have performed hundreds of bridge scour evaluations and designs, including bridges across large dynamic Northwest rivers such as the White Chuck and Suitttle rivers. The team has implemented conventional solutions, such as riprap and buried riprap toe scour trenches, and innovative solutions such as bioengineering bank stabilization, ELJs, log matrices, LWD in the floodplain, and Dolotimber structures. Traditional riprap designs were applied to high-energy sites along the Snoqualmie, Skykomish, Skagit and Nooksack rivers. Cardno has special expertise in bioengineering using ELJs and LWD to control erosion and scour, to create floodplain side-channel habitat, and to introduce floodplain roughness elements.

South Fork Nooksack Saxon Reach Restoration Project | Acme, WA

Key Staff: Jack Bjork, Derek Booth	Start/End Date: 8/2009 – 8/2012	Contract Value: \$267,713
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Client/Owner: Lummi Nation	Contact: Jill Komoto, (360) 312-2315
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On a reach of the Nooksack River with a long history of significant lateral migration and incision, Cardno led the geomorphic characterization and salmon habitat restoration designs. With county zero-rise regulations in mind, Cardno enhanced Chinook rearing and spawning habitat by increasing in-stream complexity while minimizing risk to property and infrastructure. Twelve strategically placed ELJs offer high-quality stable pool habitat, add channel complexity, increase flows onto the floodplain, and support reactivation of historical side channels. Elsewhere in the reach, a 630-linear-foot ELJ structure stabilizes the riverbank and creates additional fish habitat.



Upper Puyallup River Flood Protection Assessment/Design—Upper Neadham/Orville Road Levee | Orting, WA

Key Staff: Jack Bjork	Start/End Date: 2009 – 2012	Contract Value: \$194,056
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Client/Owner: Pierce County Public Works, Water Programs Division	Contact: Hans Hunger, (253) 798-6162
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A 2009 washout destroyed several hundred feet of levee along the upper Puyallup River upstream of Orting. Cardno developed designs to protect the downstream community, inhibit channel further expansion, and restore habitat complexity lost by historical channelization. The design was supported by HEC-RAS modeling of hydraulics and sediment transport for 3.3 river miles and a geomorphic assessment of channel migration, for pre- and post-levee system conditions, riverbed aggradation, and geological controls on river conditions. Installation of two ELJs was completed in 2009 as part of Pierce County's new setback levee; and two additional ELJs along with two mid-channel ELJs were constructed in 2011.



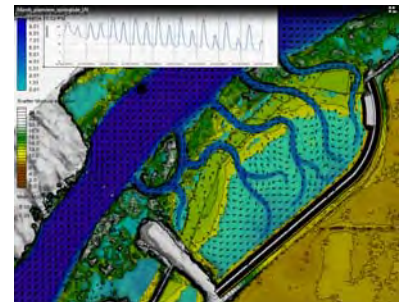
Alternatives Analysis

The alternatives analysis will be a team effort to evaluate Towne Road and levee realignment options. Our team will evaluate transportation and levee civil design engineering concepts for the road and levee alignment alternatives, and then analyze the alternatives' effects on hydraulics, floodplain geomorphology, and habitat conditions. With the County and their partners, the combined team will detail the alternatives and the evaluation metrics, (e.g., fish habitat area and functions, flood risks, construction and future maintenance costs, recreation). Additional detail is included in the project approach section of this proposal. The S&W team has completed many multi-objective alternatives analyses for road realignment, levee setbacks, and floodplain restoration. Furthermore, our team has experience presenting, listening, answering, and responding to questions and feedback at outreach meetings, including participation in the Clallam County open house regarding the alignment of Towne Road in May. After a recent session with the Whatcom County Council to summarize a geomorphologic, channel migration zone and avulsion study for a levee alternatives setback study, one of council members stated "it was the best technical presentation the Council had seen." This comment speaks to our ability to communicate technical information and inform the community and broad audiences.

North Fork Skagit River Levee Setback | Skagit County, WA

Key Staff: David Cline, Brian Reznick	Dates: 05/2014 – present	Contract Value: \$316,500
Client/Owner: Skagit County Public Works	Contact: Jeff McGowan, (360) 416-1400	

The project is a baseline study, alternatives analysis, and feasibility study for a 2,200-foot-long levee setback on the North Fork Skagit River. The baseline studies addressed river hydrology and 2D hydraulic modeling, soils, geology, geotechnical, groundwater, farm drainage, and wetland and riparian vegetation. Baseline study data were used to analyze the levee setback alternatives with and without a realigned county road on the levee. Key evaluation metrics included fish habitat benefits, flood risk reduction, costs, and impacts to adjacent farm drainage systems and crops. When findings were presented to the local dike and drainage district and farm community, the parties agreed to the preferred alternative with no road on levee due to increase cost with little benefits, and to include drainage mitigation features. The feasibility study will be complete in 2015, and the project is moving forward to final design and permit phase of study.



Nooksack River Levee System-wide Improvement Framework (SWIF) | Whatcom County, WA

Key Staff: David Cline, Brian Reznick	Dates: 01/2014 – present	Contract Value: \$199,955
Client/Owner: Whatcom County (FCZD)	Contact: Paula (Cooper) Harris, (360) 778-6285	

This project is under way to maintain levee eligibility in the Corps' PL84-99 Non-Federal Levee Rehabilitation and Inspection Program. The project involves evaluating levee deficiencies and developing risk-based action plans for levee repairs and vegetation maintenance. A geomorphologic, channel migration zone and avulsion study along middle Nooksack River between Deming and Nugent's Corner was undertaken to establish concept design alternative locations for levee setback alignments and habitat restoration areas. The setback alternatives analysis evaluated improvements in flood protection and river-related landslide hazard risks, while reconnecting and improving river, floodplain, and side-channel connectivity to benefit salmon. The potential for \$25M in savings for long-term levee repair and maintenance over a 50-year project period would be a great benefit to the local levee district. The technical studies were presented to the local community and dike district, and acceptance of the SWIF plans allows the levees to remain eligible and active in the Corps PL84-99 program.



Engineering Design

Our team is organized around three areas of engineering design expertise: river, stream, and floodplain habitat restoration (Cardno); roadways, bridges, and culverts (HDR); and levee setback (S&W). This expertise in developing plans, specifications, and cost estimates that meet Corps requirements, will result in expediting issuance of agency-approved design and construction bid documents. The team can focus on design tasks in parallel to expedite project delivery. Cardno will lead the river and floodplain restoration design, using a multidisciplinary approach for all engineering, geomorphic, and biological elements of the work.

3 Crabs Nearshore & Estuarine Restoration Project | Dungeness, WA

Key Staff: Jack Bjork, Derek Booth, Jenna Scholz	Dates: 7/2013 – present	Contract Value: \$487,083
Client/Owner: North Olympic Salmon Coalition	Contact: Kevin Long; (360) 379-8051	

Historically connected to the Dungeness River near its mouth, the 3 Crabs estuary was cut off with construction of the federal Dungeness levee in the 1960s. Development has led to further degradation. This project will set back 1,700 linear feet of Clallam County roadway and replace an undersized bridge, in addition to restoring the tidal lagoon system with LWD erosion protection, to improve vital estuarine salmonid rearing habitat. Geomorphic analysis, tidal hydrology and hydrodynamic modeling analyses, community and stakeholder facilitation, and county coordination are complete; engineering design plans, specifications, and construction cost estimates are out for the public bidding process.



Kandoll Slough Wetland Restoration | Grays River, WA

Key Staff: Jack Bjork	Dates: 12/2011 – 9/2013	Contract Value: \$327,225
Client/Owner: Columbia Land Trust	Contact: Ian Sinks, (360) 696-0131	

Collaborating with the local property owners and overseeing construction, Cardno restored 163 acres of agricultural property whose tidal connection to the Grays River had been severed by levees. With 3,200 linear feet of levee set back, native salmonids will be able to occupy the restored wetland, with its 15,000 feet of new small channels, six log habitat structures, 20 beaver dam “starters,” 23 acres of mounds created by excavated soil, and multiple estuarine zones. Hydraulic modelers, geomorphologists, geotechnical engineers, ecologists, and contractors worked together on this site with very soft soils that required special construction equipment and large amphibious excavators. The adjacent Kandoll Road and embankment were upgraded and paved, and riprap was added for scour protection. Actual construction costs were lower than the engineer estimate. The Daily Journal of Commerce recognized the work as one of the best Infrastructure Projects for 2013 in Oregon and Southwest Washington.

Professional Land Surveying

Precise and useable base maps are required for accurate design, construction quantity takeoff, measurement, and payment; for meeting regulatory flood mapping standards; and for providing property and boundary, right-of-ways and easement, and metes and bounds legal descriptions. Base map preparation will be supported by Johnston Land Surveying (JLS), a Port Angeles and Sequim area surveyor with strong experience in local survey control, record surveys, topographic and bathymetric, road, bridge, trail, river, and habitat restoration projects. JLS has capability in GPS, and robotic total station surveys in areas with poor satellite coverage. They provide error-reducing QC procedures to satisfy the most rigorous surveying requirements. The team also has access to Cardno’s low-altitude aerial photography and LIDAR mapping capabilities, which may be of interest for long term habitat monitoring, and for community outreach visual media.

Dungeness River Railroad Park Trestle Replacement Project | Clallam County, WA

Key Staff: Rob Johnston	Start/End Date: 06/15 – present	Contract Value: \$17,000
Client/Owner: Jamestown S’Klallam Tribe	Contact: Randy Johnson, (360) 681-4631	

When Dungeness River flooding partially destroyed the Olympic Discovery Trail, JLS supported the bridge replacement project by providing boundary, topographic, and construction staking surveys. They occupied survey control points and established new project control. After obtaining deeds to surrounding lands, JLS preparing base maps with property boundary lines, topographic features, and 2-foot contours, and filed records of survey with the County.

Anderson Creek Restoration Project | Jefferson County, WA

Key Staff: Rob Johnston	Start/End Date: 10/15 – present	Contract Value: \$17,000
Client/Owner: WDNR, Northwest Watershed Institute	Contact: Peter Bahls of NWI, (360) 385-6786	

When WDNR and NWI acquired several residential properties along Anderson Creek, JLS provided the boundary and topographic survey of the 10-acre site. Survey work of the uplands and tidelands includes establishing survey control points, documenting property ownership lines, and defining topographic features at one-foot contour intervals. Work includes completing the required monument destruction applications (WAC 332-120), monumenting ownership lines, and filing a Record of Survey Map with Clallam County in accordance with RCW 58.09.

Transportation Design

The team's transportation lead, HDR, has significant experience designing county and local roads, bridges and culverts, levee setback and other flood control projects. For a recent levee setback and roadway reconfiguration project, HDR analyzed multiple configurations of four different alignments, developed a screening matrix, and applied the evaluation criteria to identify a preferred alternative. HDR's extensive design experience on low-volume roads includes bridges, culverts, and tie-ins to major roads. This detailed knowledge and experience will offer Clallam County a clear, concise, and high-value design that meets both federal levee design regulations, and local and federal roadway design requirements.

Russell Road Levee Setback | Kent, WA

Key Staff: Mark Ohlstrom	Start/End Date: 08/2014 – ongoing	Contract Value: \$1,026,000
Client/Owner: King County	Contact: Erik Peters, (206) 477-4797	

HDR is designing an a flood control system meeting current Corps and County levee and flood protection design standards for the Lower Russell Road levee along 1.4 miles of the Green River's east bank (S 212th Street to Veterans Drive). It will enhance both flood protection and riparian and aquatic habitat. HDR developed a full set of roadway reconfiguration alternatives for the existing Russell Road, for the S 212th Street and Veterans Drive bridges across the Green River, and for an existing pedestrian and utility crossing bridge. The alternatives evaluation also included improving the tie-in of Russell Road with Veterans Drive and S 212th Street.

192nd Street Corridor Study | Redmond, WA

Key Staff: Scott Johnson	Start/End Date: 10/2014 – 12/2014	Contract Value: \$15,000
Client/Owner: City of Redmond	Contact: Kim Dietz (425) 556-2415	

HDR developed a preferred roadway corridor alternative for the new 1.5 mile roadway in Redmond. After evaluating multiple alternatives, the preferred alternative was created through a concept development process and corresponding alternatives analysis design charrette workshop, conducted and lead by HDR with the City of Redmond's participation. The project includes four intersections and three different street design cross sections for the two-lane roadway. Design elements include multipurpose pathways and LID stormwater features.

QUALIFICATIONS OF KEY PERSONNEL

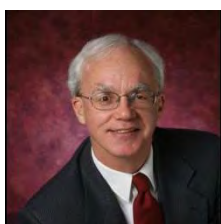


Project Manager | Dave Cline (S&W), PE-WA, CFM – With a broad background in civil design, hydraulic engineering, sediment transport, and fluvial geomorphology, and as a Certified Floodplain Manager, Dave can integrate a variety of technical components of complex projects into submittals, reports and plans that policy makers can use to make informed decisions. In the last five years alone, his comprehensive management skills have yielded nearly six miles of levee setback and 750 acres of restored (constructed) floodplain habitat in western Washington. The complexity of projects he has led is reflected by the diversity of subconsultants he manages, among them surveyors, geotechnical and structural engineers, hydrologic and hydraulic modelers, fluvial and coastal geomorphologists, transportation engineers, cultural resource experts, fisheries biologists and ecologists, field exploration firms, and public outreach specialists. Beneficiaries of his efforts include western Washington county, municipal, quasi-governmental, and private clients. He routinely informs his clients of progress and budget, and provides timely invoicing on projects over \$1M in value. A key example of his skills in action is the Fir Island Farm Estuary Restoration project. Under a challenging schedule, Dave directed a multidisciplinary team in setting back one mile of levees and restoring 130 acres of estuarine marsh. He managed technically complex scope, and was knowledgeable of each of the subconsultant roles and technical studies. He integrated the various studies, designs and permits; oversaw outreach communications; developed and executed a schedule that reflected critical design, review and funding pathways; planned contingencies; and foresaw risks. The well-designed plan and specification package included 300,000 tons of earthwork and aggregate quantities on a \$9M project. In addition, Dave can distill and communicate complex administrative and technical information at a level of detail that advances the goals of project participants.



Lead Civil Design Engineer | Jack Bjork (Cardno), PE-WA, D.WRE – Jack Bjork’s clients have benefitted from his ability to apply traditional engineering skills (concept design plans, cost estimates, permit applications, construction bid documents and construction engineering) to water resource, floodplain and large habitat restoration projects. WSDOT recognized his contributions with an award in 2013 for environmental design excellence for the habitat-friendly, bioengineering bank protection project along the Skagit River near State Route 20. The Seattle Section of the American Society of Civil Engineers conferred a similar honor, naming his Idylwood Creek Restoration Project as

Outstanding Water Resources project for 2002. Jack’s technical capabilities originate from nearly 40 years of experience on wide-ranging projects featuring levee setbacks, engineered logs jams, stream geomorphology, stream and estuary restoration, creek erosion, flood studies, bank stabilization, culvert design, bridge scour, and highway drainage. His levee setback projects required movement of hundreds of thousands of cubic yards of earth and massive engineered log jams constructed from 1,000 of pieces of large wood. Jack’s skills are enhanced by having operated with diverse stakeholders and under regulatory, budgetary, and technical requirements. This breadth and depth of experience combined with in-depth familiarity with the northern Olympic Peninsula region (e.g., previous design work on the lower Dungeness River levee setback, 3 Crabs nearshore and estuary restoration, and Kilisut Harbor restoration projects) make Jack an exceptional candidate for lead civil design engineer.



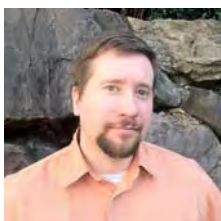
Lead Hydraulic Engineer | Ray Walton (WEST), PhD, PE-WA, D.WRE – Ray Walton brings four decades of civil design experience in water resource, habitat, and floodplain projects. A training facilitator for the Corps’ Hydrologic Engineering Center (HEC), he is a national expert in multidimensional river hydrodynamic modeling. In 2010, Ray was recognized as the outstanding Professional Engineer in the Puget Sound Region by the American Society of Civil Engineers (ASCE). Ray provided earlier design work on the lower Dungeness River levee setback alternatives and has vast hydraulics experience including FEMA flood insurance studies, river erosion and scour analysis

for hundreds of bridges, mostly in the Pacific Northwest. In western Washington alone, he managed application of ADH, SRH-2D, FLO-2D, RMA-2, and HEC-RAS models for the Dungeness, Snohomish, Chehalis, Wynoochee, Sammamish, Sumas, Columbia, Skokomish, Elwha, Green, White, and Skagit rivers. His efforts provided information for flood control, navigation, sediment transport, erosion and scour, and fluvial geomorphic responses. Results of these hydraulics studies have also been used for habitat restoration work on the Green, Satsop, Sammamish, Dungeness, Chehalis, and Snohomish rivers.



Lead Structural Engineer | Mark Ohlstrom (HDR), PE-WA – Mark’s excellent technical, project, program management and leadership skills have developed from planning, designing, constructing, operating, and managing a wide variety of water resource and infrastructure projects, including flood risk management, road and levee projects. Mark finished a public sector career as Corps of Engineers, Chief of Engineering for the Seattle District’s 200-person Division. In this role, he served as the Levee and Dam Safety Officer. He oversaw flood control projects for the Continuing Authority Program (CAP) and General Investigation (GI) at many levels of responsibility. Mark has extensive experience in cost

estimation using MCACES software, pre-flood planning and preparation, emergency response and coordination during flood events, post-flood inspection, and damage assessment. When critical dam safety deficiencies were identified at the Howard A. Hanson Dam, Mark led the corrective \$50M emergency action program. A team of multi-disciplinary specialists collaborated on this complex project. His working knowledge of Corps levee design and Corps procedures and approval protocols, including those for federal levee design approval and Section 408 permits, will benefit the Dungeness levee setback project; expediting the Corps approval will be critical to the 15 month project timeframe.

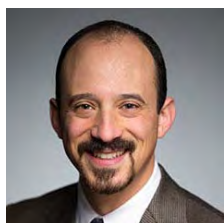


Lead Geotechnical Engineer | Brian Reznick (S&W), PE-WA – Brian Reznick’s geotechnical expertise has been demonstrated in design, seepage, and slope stability analyses for levees, flood walls, bridge foundations, bridge embankments, culverts, and headwalls. His local levee, habitat restoration, and engineered log jam experience includes the Cedar, Green, Nooksack, Snoqualmie, Skagit, and Yakima rivers. Projects were performed on behalf of the Corps, WDFW, The Nature Conservancy, King, Snohomish, Skagit and Whatcom Counties, and local dike districts. He uses GeoStudio® SEEP-W and SLOPE-W software to perform seepage and stability analyses of levee designs meeting Corps design

guidelines. Key technical analyses performed include seepage, stability, settlement and project quantity adjustments, material sourcing, project sequencing and constructability. He provides geotechnical construction observation and engineering during construction, including inspection of subgrades and evaluation of filter, fill, and other supplied aggregate materials. His technical expertise is complemented by experience developing scopes, plans, specifications, and construction contract documents for earthwork projects involving more than 100,000 cubic yards of material. Having participated in all phases of geotechnical design and construction of levee systems and floodplain habitat improvement projects, Brian offers direct benefits to the lower Dungeness River levee setback project.



Lead Fluvial Geomorphologist | Derek Booth (Cardno), PhD, PE and PG-WA – A practicing fluvial geomorphologist for more than 30 years, Derek Booth's work emphasizes field-based collection and analysis of hillslope and instream data to understand watershed processes, evaluate altered fluvial conditions and processes, and assess their responses to human disturbance. Locally, he has undertaken geomorphic assessments of the Dungeness, Sultan, Nooksack, Green, Puyallup, and Methow rivers. For the Dungeness River, he analyzed the effects of anabranching forms and multiple-channel threads on sediment supply, transport capacity, channel migration, and avulsions. He provided geomorphology expertise to restore nearshore and estuary habitat, from initial site studies through final design and construction. His geomorphic analysis of the Sultan River and characterization of large woody debris and riparian areas sources resulted in habitat-enhancing design alternatives to install large woody debris and side channel enhancement along the lowermost four miles of the river. For the Nooksack River, with an active channel migration zone, he characterized geomorphic conditions to design and integrate river and flood management action, including increases in-stream complexity for salmonid habitat. He is presently the Senior Editor of the International Scientific Journal Quaternary Research and an Affiliate Professor in the Department of Earth and Space Sciences at the University of Washington.



Lead Ecologist | Kim Gould (Cardno) – Kim Gould is an aquatic scientist and has provided services in habitat enhancement design; freshwater, estuarine, and marine habitat assessments; fish passage analysis; aquatic biology studies; water quality and NPDES permit compliance monitoring; sediment and macroinvertebrate characterization; and mitigation planning. He has overseen teams conducting culvert inventories, fish passage prioritization studies, fish distribution studies, and stream habitat surveys for hundreds of stream miles. In Clallam County, he is helping to improve fish passage at 14 stream crossings along the road to the Clallam Bay Corrections Center. He also evaluated potential effects on salmon habitat from facility improvements at the Makah National Fish Hatchery. Elsewhere in the Pacific Northwest, he helped engineers redesign and retrofit culverts to restore 3 miles of river salmonid habitat near Oregon's Sycan Marsh; participated on a multidisciplinary team to stabilize banks, restore habitat, and improve fish passage in an Oregon creek with federally listed steelhead; and oversaw construction of a 2.5-acre off-channel tidal rearing habitat enhancement project. Kim has worked with WDFW and NOAA fish passage guidelines and is skilled in expediting permitting processes through agency negotiations and use of programmatic state and federal permits.



Professional Land Surveyor | Rob Johnston (Johnston Land Surveying), PLS-WA – Rob Johnston's professional land survey experience includes base map preparation, public records research, property boundary determination, mapping, planning, rights-of-way, easements, platting, real property descriptions, and expert witness testimony. Typical projects include the preparation of Record of Surveys, Topographic Surveys, Design Base Maps, ALTA/ACSM Surveys, Plats, Short Plats, As-built Surveys, and court exhibits. He has an extensive background in all aspects of land surveying services throughout Washington and Arizona. Rob is licensed as a Professional Land Surveyor in Washington and has been surveying since 1976 for public and private sectors, many for salmon habitat restoration projects.



Transportation Engineer | Scott Johnson (HDR), PE-WA – Scott Johnson is a transportation engineer and has designed highway, roadway, and interchange improvements for infrastructure of capacities ranging from very large to very small. His experience includes an in-depth understanding of both local and state-level design standards and specifications, as well as expertise in plans, specifications, and estimates. From conceptual alternatives through final design, Scott was the transportation lead on the Lower Russell Road levee setback project in Kent, Washington. The alternatives considered for the Russell Road project are similar to those for the lower Dungeness project. In addition to analyzing roadway networks, he designed the walking and bicycle trail component of the work, including connection to a larger regional trail system. Scott acted as Deputy Project Manager for roadway improvements in Redmond and Bellevue, and evaluated alternative intersection designs and multipurpose pathway enhancements.



Community Outreach Specialist | Jenna Scholz (Cardno) – With a technical restoration background and 10 years of local experience in community engagement, Jenna Scholz is a well-respected facilitator. She leads teams of biologists, geologists, geomorphologists, engineers, economists, cultural resource specialists, and planners in community outreach efforts. Her hallmark is an ability to build consensus and diffuse tension for projects requiring both technical solutions and adaptive management strategies, and to create ownership and collaboration. Jenna's ability to manage a large, successful stakeholder engagement process includes the Pierce County Flood Hazard Management Plan. Over a 2-year period, she facilitated 18 meetings of the 27-member advisory committee, held two workshops for regional elected officials, and coordinated nine public meetings to inform the public about the planning process.

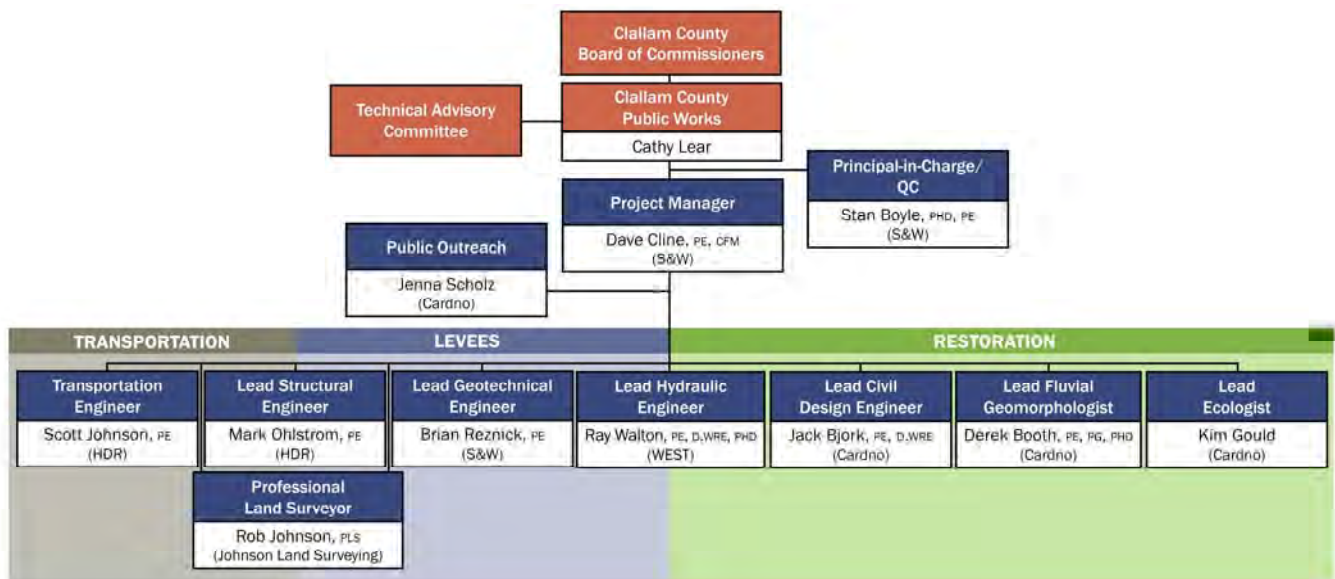
PROJECT APPROACH

This section addresses four major elements: 1) team organization and communication; 2) challenges and technical approach; 3) schedule, milestones, and task interdependencies; and 4) Project Approach Chart (attachment to the proposal). The approach demonstrates that individually and collectively, the S&W team has direct and relevant experience to the Dungeness River project, and is organized to manage and address key issues and challenges. Under this arrangement, the team will provide high-quality technical studies and submittals, perform successful community outreach and effective communications, and have complete construction bid documents ready for spring 2017 construction.

Team Organization and Communication Structure

The organization chart below reflects the S&W team's organization based on experience of successful design, permitting, outreach, and construction of levee setback and floodplain restoration projects. Each proposed key team member has direct levee setback, floodplain restoration and roadway design experience. The organization chart shows our workflow to the County, and is organized to address the projects greatest challenges.

Team Organization Chart



S&W will be responsible for overall project management, design coordination, geotechnical engineering, and integration of all prime and subconsultant work products into final plans and specifications. Effective management and understanding of each key discipline is required to keep participants on task, to facilitate internal team communication, to integrate technical study findings into the project design plans, communicate with the County and to resolve challenges. Dave Cline's recent successes on major, multidisciplinary, levee setback and habitat restoration projects will provide invaluable leadership experience. S&W's collaborative approach to project management and communications will also generate constructive County and stakeholder input and public support.

A key benefit to the S&W team is Cardno's and WEST's history with the lower Dungeness River, specifically their in-depth familiarity with the project, well-established working relationships with the County, its partners, and other stakeholders. The Cardno, WEST and S&W team has experience working together locally on the Kilisut Bay project. These team relationships and previous project experience provide our team with a head start in meeting a substantial project schedule challenge. Cardno will be responsible for building on and completing the geomorphology studies, floodplain habitat restoration, LWD and ELJ designs, and aquatic ecology studies; they will also provide permit assistance and community outreach. WEST will be responsible for updating, calibrating, and finalizing the HEC-RAS2D model; erosion and scour analyses; and coordination with the Corps and FEMA for the no-rise conditional letter of map revision (CLOMR) application.

HDR brings quality roadway and transportation design, deep Corps experience, and federal levee design and certification expertise to the team. In addition to being responsible for roadway and culvert design, HDR will coordinate and perform technical review on design documents. HDR has a long history supporting the Corps with on-call services, and the team's HDR engineering lead (Mark Ohlstrom) served as the Corps Seattle District, Chief of the Engineering Division. The County will thus have access to proven understanding of Corps procedures, policies and people. This combination of levee, road, and Corps expertise will facilitate project completion by guiding the team through Corps design standards, approval procedures, timelines, and signing authorities.

Project success will require both internal and external communications. The internal consultant team communication approach includes a kickoff meeting; weekly check-in conference calls; monthly progress update meetings; as-needed discussion of details on scopes of service, budgets, schedules, and interdisciplinary coordination; QC reviews; and project submittals. As on his past projects, Project Manager Dave Cline will provide the team and the County with frequent email and telephone updates summarizing progress, outstanding issues, and assignments. Each member of the team will have access to a shared system of base files containing the most recent data, models, and reports, and will be notified of new updates. Comparable communications will take place for design integration and review. On technical issues, the project manager will encourage open communication among team disciplines, the County, the Corps, and project partners. His job will be to actively monitor and coordinate communications, and to anticipate and address potential issues or conflicts.

External coordination and communication are required with the Corps, County Commissioners, Jamestown S’Klallam Tribe, Dungeness River Management Team, landowners, regulatory agencies, and the general public. These communications will be managed by Dave Cline with assistance from our community outreach lead, Jenna Scholz. A series of face-to-face meetings of the design team and County with landowners is recommended to promote engagement, discuss items of interest, receive feedback, and build mutual trust. For all external communications, the S&W team will collaborate with the County to develop agendas, talking points, meeting strategies, meeting materials, posters, and venue arrangements. At the outset of the project, the S&W team will develop a communications and outreach plan, as described in the Technical Project Approach section.

Project’s Greatest Challenges to Success

The team foresees several major challenges to the project’s successful completion, as summarized below and detailed in the Technical Project Approach. The team structure and technical approach were developed specifically to address these challenges.

Project Schedule – The alternatives analysis study, design, and permitting must be completed in a 15-month period to meet the goal of advertising the construction contract in spring 2017. Typically, this process requires years. However, our direct team experience, technical approach, and community outreach plan prepare us to meet this deadline.

Direct and Applicable Site Experience – Our team will be able to meet the difficult project schedule because of its applicable experience on the Dungeness River project site; HEC-RAS2D; FEMA CLOMRs; levee setback design, that meets Corps design and FEMA levee accreditation requirements; floodplain restoration; and roadway design projects; strong community outreach and stakeholder relationships; and unmatched Corps experience. With these qualifications, the team can provide quality submittals, avoid pitfalls, address challenges, and reach project completion.

Outreach and Coordination – Our team members’ experience on the Dungeness River includes relationships with the County, Jamestown S’Klallam Tribe, WDFW, other project stakeholders and the public. This will assist in our ability to develop an effective communications and outreach plan in collaboration with the County. The Communications Plan will include strategies for County and design team outreach and coordination with key project partners, technical advisors, landowners, grant agencies, stakeholders, and the wider community. This will be critical in gaining consensus on the Towne Road alignment. An example of our success was the Pierce County Flood Hazard Management Plan where we helped the county adopt the plan via advisory committee meetings, workshops for regional elected officials, and coordinated public meetings.

Corps Federal Levee Design Approval Process – The scope of services indicates that the Corps will be involved in multiple aspects of the federal levee setback project, including cost-share, technical design review and approval, permitting, property agreements, and easements. Our team members hold on-call contracts with the Corps for civil design, hydrology and hydraulics, and geotechnical services, and have full understanding of Corps design guidelines, procedures, and approval policies. As the former Seattle District Engineering Division Chief, Mark Ohlstrom (HDR) fully understands these processes. In addition, he was the Levee Safety Officer for the Seattle District and has expert knowledge of the Corps Levee Inspection Program, PL84-99 Program, and Section 408 Permit processes.

Hydraulic Modeling and FEMA CLOMR Expertise – The Corps has requested use of the HEC-RAS1D/2D model, which is not yet publicly available in its most current release version, nor has it been widely used for FEMA no-rise and CLOMR approvals. In addition, the hydraulics study is subject to levee and floodway evaluation that will likely use the Corps’ new levee assessment and mapping procedure (LAMP). The use of the latest HEC-RAS1D/2D model, as well as the LAMP, will require an added layer of FEMA and Corps coordination and review. As a long-time Corps hydraulic on-call consultant, WEST has experience with 2D modeling of the Dungeness River and is a certified trainer for HEC-RAS1D/2D software. Their expertise and history on the project will facilitate effective scoping, studies, and submittals, thereby helping the County navigate HEC-RAS2D modeling, LAMP, and CLOMR processes with FEMA and the Corps.

Corps 404 Permitting Process– The request for proposal (RFP) indicates that the Corps will provide permitting services as part of its cost-share for the Section 544 project. Permitting is a critical path item. Typically, the Corps requires 12 months to review, complete consultations, and approve an individual Section 404 permit. Working backwards from the target spring 2017 date for construction advertisement, and allowing for the Corps review period, permit applications should be submitted in late spring 2016. Our team’s knowledge of the Corps permitting process resulted in permitting for other levee projects in a 9- to 12-month time frame. The same can be expected for the lower Dungeness River project.

Property and Landowner Agreements – The project involves developing legal easements and rights-of-way between the County, the Corps, the nearby WSDOT mitigation site, and major landowner WDFW. While each of the landowners agrees with the project, the legal agreements required for a Corps federal levee may require additional time for review and approval. Typically, landowner agreements are not negotiated and coordinated hastily, and the schedule needs to allow sufficient time for their completion. Our engineering team will expedite this task by providing draft right-of-way and easement exhibits and agreement language at the outset of design phase, and finalize agreements at the 100% design.

Technical Project Approach

This technical project approach section describes in further detail how our team will perform the tasks in the RFP scope of work and meet the challenges identified elsewhere in this proposal.

Task 1: Project Management

In addition to providing the services described in the RFP scope of work, the project management team’s primary roles are to maintain momentum of the individual and integrated elements of the project, assure timely preparation of high-quality submittals and presentations, and coordinate with the County and their stakeholders, all while managing finances, schedule, and staffing. Beyond these typical project management requirements, the Dungeness River Restoration project poses several challenges, all driven by schedule. Within a narrow 15-month window, a roadway alternatives study needs to be completed, the preferred plan needs to be identified, hydraulic modeling floodplain studies need to be completed, permits need to be submitted and approved, and the final design plans and contract specifications completed. Frequently, pre-design, design, and permitting for projects of this magnitude can take several years.

In advance of starting the technical work, we recommend the first step in meeting this schedule challenge is to develop an integrated project scope and schedule where consultant, County, and Corps roles are clearly identified, responsibilities are assigned, submittals and due dates and timelines are specified, and coordination and approval items are explicit. Review periods and approval checkpoints would be included for the County, Corps, WSDOT, WDFW, grant and lead entity agencies.

Our project manager will provide routine reports describing progress on tasks and submittals, with a narrative describing whether the project is on track, and listing issues and changes that affect schedule and budget. Changes should be anticipated. We recommend scheduling the 100% Design contract completion in early 2017 and keeping design, permit, and construction contingency funds on hand. Guided by our tested management team, our team of experts will deliver complete studies and designs, eliminating the need for rework, additional review, and delayed approval.

Task 2: Project Planning & External Coordination

The County has long-standing relationships with project partners, stakeholders, adjacent property owners, and the wider community. With community interest in the project already high, the County has formed a technical advisory committee and is engaged with the public. The scope’s required kickoff, progress, coordination, landowner, and community outreach meetings will be included in a communications and outreach plan that consistently engages all parties. This plan will function as a framework for coordination with project landowners, project partners, and other stakeholders, identifying the timing and topics of information distribution, critical decision-making points, and project milestone reporting timeframes. It is expected to reinforce project goals and objectives, clearly present technical study findings, record stakeholder input, and document the decision-making process. In addition to helping the County to develop communication strategies, agendas and talking points, the S&W team will provide other support services. We can assist with public forums, distribute emails, create high-quality visual materials such as posters, maps, power point presentations, and provide a public project website. This approach has resulted in our past success meeting planning and process goals on schedule while delivering high-quality technical products and creating long-term community support.

Task 3: Towne Road Reconfiguration Alternatives Analysis

The Towne Road reconfiguration alternatives analysis is a high priority for the project. The alternative recommended in the Corps study leaves Towne Road in the floodplain. While a cost-effective alternative, other considerations need more detailed analysis before any decision is made. Immediately after completing the integrated scope and scheduling noted in Task 1, the Towne Road alternatives analysis will be initiated. The three alternative roadway alignments surfaces will be developed and presented to the County, technical advisory committee, and the public. Feedback from the public meeting

will be incorporated into the alternatives designs and analyses. In parallel to the alternatives development, we will work with the County and the technical advisory committee to specify systematic evaluation criteria, such as road traffic use and alternative routes, private property and farm equipment access, emergency routes, floodplain connectivity, inundation areas, fish habitat functions and benefits, flood hazards, public safety, costs (construction, maintenance, and repair), and recreation walking trail access (using the levee as a trail instead of a road may yield additional community benefits). We will meet with the County and technical advisory committee to present results of the analysis, with the goal of finalizing Towne Road reconfiguration recommendations in preparation for a second public meeting. We will support the County at the public meeting and in making a final recommendation to the County Commissioners.

Task 4A: Survey & Base Map Development

Several topographic data sets for the Project Area have been completed in recent years, including the Corps and NTI 2013 ground and bathymetric surveys, 2012 LIDAR, and 2010 ground survey of the WSDOT wetland mitigation area. The Corps compiled these data into an existing project base map for the Section 544 study. An accurate base map is necessary to site key features of the project, identify construction constraints, provide accurate project quantities, and meet floodplain mapping and property boundary requirements. Our engineering team and professional land surveyor will confirm and establish survey control, complete survey data needs for the final base map, finalize flood model calibration high water surveys and assist with floodplain mapping boundaries. Additionally, our surveyor and engineering team will develop base map property boundary and easement metes and bounds legal descriptions needed for levee setback, levee removal, roadway easements, rights-of-way, and property agreements.

Task 4B and 5: Geotechnical Exploration and Laboratory Testing, and Geotechnical Engineering Design

In 2013, the Corps completed borings between 7 and 30 feet deep along Towne Road and the Meadowbrook Creek levee alignment. We will take advantage of existing Corps boring data, reports, and as-built plans to select locations for additional explorations along the setback alignment and existing levees. New soil borings will use a tracked rig along the setback levee to profile the subgrade and collect soil samples for laboratory testing. Test pits will be created within the existing levee to characterize the materials for re-use within the levee setback and Towne Road embankment. Soil samples will be tested in S&W's soil laboratory for moisture content, Atterberg limits, grain size, consolidation, compressibility, permeability, and shear strength. S&W's lab is Corps-validated and AASHTO-accredited, in accordance with ASTM International standards.

Our geotechnical engineers, who are experts with Corps design guidelines and FEMA levee certification, will design the Dungeness River setback levee consistent with agency standards. As required by the Corps, we will evaluate levee seepage and stability cases (i.e., steady state and rapid drawdown). A clay layer deposit is indicated by the shallow explorations along the setback alignment. This layer will affect embankment settlement, construction quantities, and allowable build rates. The settlement analysis will include recommendations for overbuild quantities and fill rates. Corps and FEMA methods will be used for seismic analysis of levee performance, as was the case for the team's Fir Island, Smith Island, and Reddington levee projects. Mitigation design alternatives and post-earthquake inspection and repair alternatives will be included in the analysis. The design plans will include aggregate filter design for riprap blankets, road surfacing areas, and pipeline penetrations; asphalt pavement design recommendations; levee, bridge, and embankment tie-ins; and large woody debris soil anchoring. Temporary construction impacts will be evaluated, as well as shoring and protection needs.

The constructability review will include interviews and material sampling at local quarries and pits. We will develop the levee section geometry and specifications for soil zoning design and erosion protection riprap based on the type of material available onsite and nearby and meeting Corps design requirements. We completed similar studies to develop cost-effective solutions for the Fir Island, Smith Island, and Reddington levee setback projects. The scope includes a constructability review, for which we have performed on all of our recent levee setback projects. Our constructability review will consider not just the type and quantities of material, but also the time available in which to perform the work. For the Fir Island project, a key constraint was that completing the project in a single construction season was required to meet funding grant deadlines. There was a risk for delivery and placement of levee import fill that we mitigated by including pay items for construction of temporary haul routes. Inclusion of this pay item reduced risks for both the contractor and the owner. We will apply the experience gained on these projects to the Dungeness project by including temporary haul routes, dewatering, construction staging, and sequencing in the constructability review.

Task 6: Hydrologic, Hydraulic, and Geomorphic Analysis and Design

The Corps Seattle District developed a HEC-RAS 1D/2D hydraulic model of the Dungeness River and its floodplains. Before proceeding with modeling tasks, we will review the system hydrology and the hydraulic model structure. For an experienced firm like WEST, the modeling for the study is straightforward, but still requires careful thought. Output from the model will serve three general purposes: 1) design of the road reconfiguration for alternatives analysis; 2) habitat restoration, geomorphologic analysis, and river erosion and scour design at the bridges and levees; and 3) CLOMR

application and revised flood mapping for the final alternative. The hydraulic model must simulate a range of project alternatives for the existing and proposed floodplain and floodway, and for the FEMA no-rise analysis. The alternatives analysis hydraulic modeling will be a coarse model to evaluate floodplain, habitat, and road functions with and without Towne Road. The existing conditions will be calibrated for the HEC-RAS 1D/2D model and be used for floodplain no-rise analysis and the CLOMR application for the preferred alternative and final design.

The overall geomorphic framework of the project site was developed in Cardno's 60% Design Report. Building on the study of historical channel migration ranges of pre- and post-levee condition, ranges of channel dimensions, and locations of potential avulsion risk, we will evaluate floodplain geomorphologic responses that may or may not be represented by historical pre-levee behavior. For example, sediment accumulations on the right bank are post-levee deposits and affect future channel migration and avulsion potential. We will address post-levee channel migration, avulsion, and anastomosing and braided channel conditions using the 2D model results with floodplain topography, soil, and vegetation data. The objective is to assess future migration and avulsion patterns and risks to the habitat, levee, road, and bridge infrastructure.

A CLOMR is needed for the project, even with a No-Rise finding, because of changes in hydrology and topography for existing conditions. The CLOMR process requires development of a duplicate effective and existing conditions model including the existing levees in order to demonstrate no rise. The modeling tasks pose several challenges. First, the existing conditions model requires an update to the hydrology and the geometry given the longer flow record and changed river topography since the 1980 study. The approach to modeling the levees adds a second challenge. We propose to use FEMA's new Levee Analysis and Mapping Approach (LAMP) as required by 44 CFR 65.10, FEMA Levee Accreditation, but it is not yet fully tested. We will coordinate with the County to request FEMA approval of the modeling and LAMP methods. Also, since the Seattle District developed its coupled HEC-RAS 1D/2D model, new features have been added to improve the program. We will use the new high water mark data to improve the model calibration. It will be important to update to the latest modeling version, update the model cells for both simulation of project alternatives such that they are ready for inclusion of the existing floodway. Our approach to these modeling challenges is step-wise and will work in parallel with the road alternatives study, project design, and floodplain permitting.

Task 7, 8, 9: 65%, 95%, 100% Design and Intermediate Design Evaluations

To complete the 65% Design, the team will perform engineering analyses using the hydraulics, geomorphic, and geotechnical design recommendations; these recommendations will then serve as a basis of design. Having completed multiple levee setback and floodplain restoration projects as well as roadway projects, the S&W team will be able to expedite the design phase of the work using its existing libraries and templates for reports, plans, and specifications. An additional strategy to expedite the work is the creation of internal teams specifically for floodplain, habitat restoration, levee, and roadway design. A common base map and CAD standards and specification templates will be provided to the team at the project outset. Whether for a County- or Corps-led construction project, the team can produce design plans using AutoCAD or Bentley InRoads software, and can provide federal, APWA green-book, CSI, or WSDOT standard specifications with special provisions for habitat, levee, and roadway projects. Our designs will be fully integrated through a series of design team review meetings, facilitated by our project manager.

At the 65% Design phase, the RFP statement of work indicates preparation of outline specifications; we propose to accelerate the schedule by supplying draft technical specifications from our recent levee setback and habitat restoration projects. The RFP scope has the consultant provide quantity takeoff estimates to the Corps for MCACES cost estimating. Our team can efficiently deliver quantity takeoff estimates and supporting bid data. Several of our team members are familiar with MCACES and the unit price data assemblages. Our team will share recent bid tab data from completed levee setback and floodplain restoration projects to improve Corps project cost estimates. We will also provide early submittal of property exhibits, legal descriptions and landowner agreements to expedite the project's schedule.

Design review, involving the use of DrChecks, and Corps approval of the proposed design are key items for the project. We are familiar with the DrChecks review process and with Corps review procedures and signing authorities. Two pathways are possible for coordination and approval with the Corps. If the County solicits a construction contract, then the Section 408 "permit" review process will likely need to be followed. If the Corps solicits the construction contract as part of a cost-share agreement, then Corps technical review and approval will suffice. Our team will work with the County and the Corps to identify the appropriate design review and approval pathway.

Task 10. Bidder Inquiry Support

We provide our client with bid-phase services for the construction contract, including pre-solicitation language, advertisement, site visits, question and answers, contract addenda, and bid reviews. We can support either the County or the Corps in supporting bid inquiries, depending on who will be issuing the construction contract.

Task 11. Permitting Support

The permitting support task is a key challenge for the project. The RFP states that the Corps is processing all environmental permits as part of its cost-share contributions. This will require close coordination and commitment of Corps management and environmental resources to ensure timely submittal and processing of permits. Potential challenges with this process will be addressed by clearly outlining the Corps role for permitting and linking the permitting process to the project work plan and schedule with full integration of the County, Corps, and Consultant design team and permitting activities. Certain permits, beyond the Corps purview, will need scoping and coordination. Examples include County shoreline, critical areas and fill-grade permits, floodplain development permits and the associated and FEMA CLOMR. Our team has extensive permit experience for levee, habitat and road projects, which were approved in less than a 1-year time frame.

Task 12: Engineering Monitoring Plan (Optional)

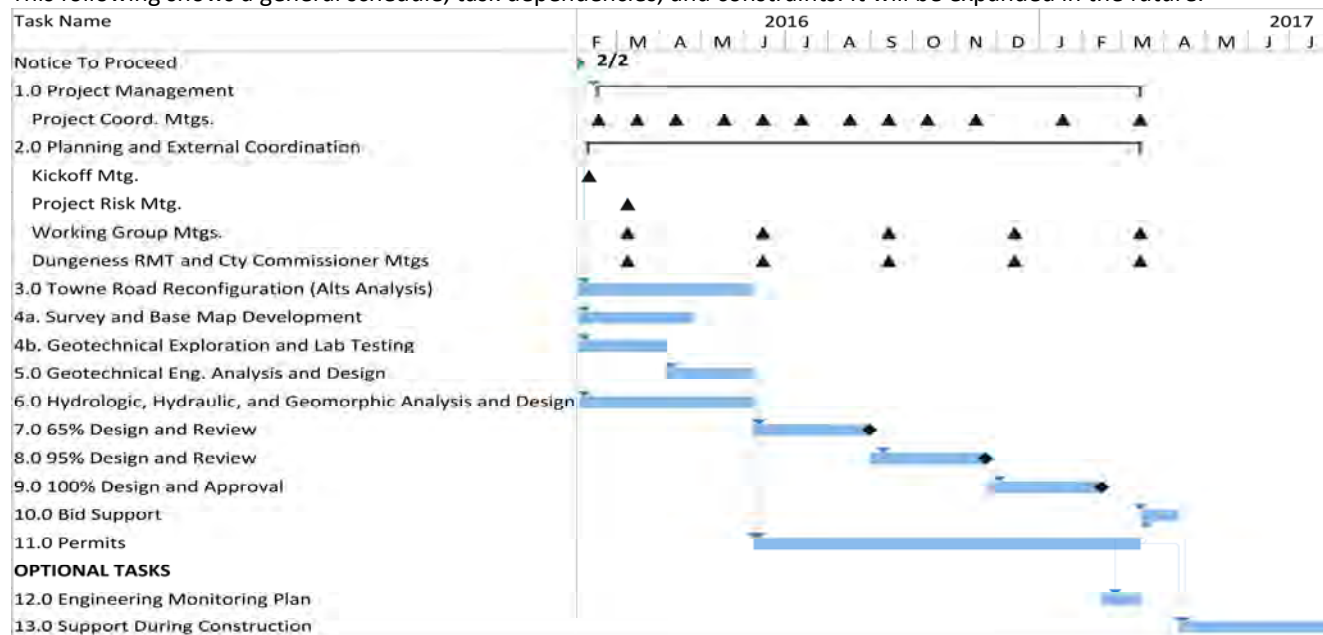
If needed, we will work with the County and Corps to provide an engineering construction compliance monitoring plan that includes a list of submittals, key specifications, and construction inspection checkpoints and closeout procedures.

Task 13: Support During Construction (Optional)

Our team can provide construction support to the construction lead agency, whether it is the County or the Corps. We have experience including submittal review, RFI responses, field observations, inspections, laboratory materials testing, pay survey quantity calculations, and change order review and negotiation. Our team is highly experienced with the construction-phase services for levee, habitat, and road projects, and can provide these services on request.

Schedule, Milestones, Task Dependencies and Constraints

This following shows a general schedule, task dependencies, and constraints. It will be expanded in the future.



APPROACH TO QUALITY ASSURANCE/QUALITY CONTROL

Our team is comprised of firms with high standards for technical excellence and quality, resulting in products that satisfy clients and protect financial interests of the client and the firms. S&W's project manager and key staff from each of the team firms are responsible for ensuring project quality. S&W's corporate QA/QC program results in high-quality deliverables and high levels of performance from our employees, subconsultants, and subcontractors. Modeled after the Department of Energy QC standards, the QC program will be tailored for the Dungeness River project. We have an internal QA/QC manual, project management manual, writing, and style guides; drafting and GIS standards; laboratory test standards; and standard operating procedures for field work, calculations, and modeling. Our work-flow process culminates with review and approval by signature authority. We do not issue work that does not meet our quality program or follow our QC procedures. Task completion and progress are tracked weekly through monitoring of financial and timesheet reports and weekly project progress meeting checks. QC checks occur throughout the work rather than only at completion. We pass QC requirements through to our subcontractors and we have the ability to gather and inspect files and progress. Our project manager will check progress weekly with all team members. If issues arise that impact the project, we will communicate with our team internally first, and then notify the County and schedule a call or meeting to address the issue.



Project Approach Chart

Design and Engineering Services for the Lower Dungeness Floodplain Restoration and Levee Realignment Project

TASK #	TASK TITLE	% of Total Effort	TEAM					Total % All Firms	KEY PERSONNEL										
			Prime	Sub1	Sub2	Sub3	Sub4		Shannon & Wilson		Cardno				WEST	HDR		Johnston	
			Shannon and Wilson	Cardno	West	HDR	Johnston		Project Manager	Lead Geotech	Lead Civil Engineer	Lead Fluvial Geomorph	Lead Ecologist	Lead Community Outreach Specialist	Lead Hydraulic Engineer	Lead Structural Engineer	Transp. Engineer	Professional Land Surveyor (Johnston)	
BASELINE SCOPE OF WORK																			
1	Project Management		8%	52%	19%	9%	19%	0%	100%	146		55				27	55		
2	Project Planning and External Coordination		18%	21%	56%	6%	12%	5%	100%	96	28	80	28	28	200	36	44	28	28
3	Towne Road Reconfiguration		9%	18%	21%	5%	56%	0%	100%	16	40	16	24	24		16	48	128	
4A	Survey and Base Map Development		11%	3%	2%	2%	3%	89%	100%	8	4	8				8	4	8	336
4B	Geotechnical Exploration and Laboratory Testing		3%	100%	0%	0%	0%	0%	100%	8	80								
5	Geotechnical Engineering Analysis and Design		5%	100%	0%	0%	0%	0%	100%	8	160								
6	Hydrologic, Hydraulic and Geomorphic Analysis and Design		16%	1%	35%	64%	0%	0%	100%	8		88	80	24		352			
7	65% Design and Intermediate Design Evaluations		18%	29%	27%	0%	41%	3%	100%	48	128	128	16	16			96	152	16
8	95% Design		7%	34%	24%	0%	39%	3%	100%	24	60	60					52	44	8
9	100% Design		4%	35%	27%	0%	35%	3%	100%	10	37	36					26	20	4
10	Bidder Inquiry Support		0.2%	33%	33%	0%	33%	0%	100%	1	1	2						2	
11	Permitting Support		0.2%	13%	88%	0%	0%	0%	100%	1		1		6					
TOTAL BASELINE EFFORT			100%							374	538	474	148	98	200	439	325	382	392
OPTIONAL SCOPE OF WORK																			
12	Engineering Monitoring Plan		NA						0%										
13	Support During Construction		NA						0%										
Firm			S&W	Cardno	WEST	HDR	Johnston	Total	1. This table estimates hourly effort for key team members contributing to the baseline scope of work only.										
Total Hours Key Personnel			912	920	439	707	392	3370	2. Total effort is summed for the baseline scope of work identified in Tasks 1-11 only.										
Each Firm's Percentage of Hour Total			27%	27%	13%	21%	12%	100%	3. Hours include time for meeting preparation, attendance and notes only.										

DAVID R. CLINE, PE, CFM | Vice President, Hydraulic Engineer

Position on Team: Project Manager

Firm	Shannon & Wilson, Inc.
Years with Firm / Industry Experience	6 years 18 years
Employment History (10 Years)	Shannon & Wilson – Vice President, Hydraulic Engineer, 2010-present, Seattle, WA Tetra Tech Inc. – Project Manager, Hydraulic Engineer, 1998-2010, Seattle, WA
Education	B.S., Civil Engineering, Water Resources Emphasis, Colorado State University, Fall 1997
Registration	P.E., Civil Engineering, Washington, 2001 Certified Floodplain Manager, 2013

David Cline is highly experienced with floodplain, river, stream, nearshore, estuarine, stream, and wetland restoration design. His background is in hydraulic engineering, sediment transport, fluvial geomorphology, and civil design. Strengths that David brings to a project include a broad knowledge of hydraulic engineering, sediment transport, fluvial/coastal geomorphology, floodplain management and habitat restoration. He is frequently involved on projects involving restoration and flood planning, feasibility study, engineering design, permitting and project construction implementation. He is an expert on levee setback and floodplain habitat restoration projects, being involved in nearly 6 miles of levee setback projects and 750 acres of habitat restoration in the last five years. He has effective communication skills and can present information ranging from the technical details of engineering and scientific investigations on flooding, sediment transport, contaminant, fish passage and estuarine tidal marsh habitats and geomorphology, to broad project management topics of scoping, tasks, scheduling, budgets, and risk management.

Washington Department of Fish and Wildlife, Fir Island Farm Estuary Restoration, Skagit County, WA (2010 – Present). David Cline is the project manager and lead engineer for the Fir Island Farm levee setback and tidal marsh restoration project. The project is a 5,500-foot-long levee setback and approximately 130-acre estuarine marsh habitat restoration project. As the prime engineering and environmental consultant, S&W is providing feasibility study, alternatives analysis, project design, permitting, and construction phase engineering services. Studies included coastal and river geomorphology, coastal engineering and hydrodynamic modeling, erosion and scour protection, groundwater studies, sea-level-rise and climate change analysis, drainage studies, and geotechnical stability and seismic analyses. The project design involves a 5,300-foot-long setback levee, a 2,000 foot long drainage storage pond, a 9,000 gpm pump station, five tidegates and the 130 acre marsh and tidal channel restoration design. Most of the levee setback construction completed in 2015, with breaching of the existing levee planned in 2016. The project construction cost is \$9.5M; the construction bid was within 1% of the engineer's cost estimate, and project soil earthwork quantities were with 1% of the engineer estimate. The project had minimal change orders, and is within budget and on schedule.

Skagit County, North Fork Skagit River, Levee Setback Feasibility Study, Skagit County, WA (2014 – Present). David Cline is the project manager and lead engineer for the baseline study, alternatives analysis and feasibility study on the North Fork Skagit River. The project involves a 2,200 foot long levee setback on the North Fork Skagit River. Baseline studies of river hydrology and hydraulics, soils, groundwater, and farm drainage conditions, wetland and riparian vegetation were performed. A set of two alternatives including a levee setback and levee setback with roadway were analyzed using key metrics such as habitat benefits, flood protection, cost, risks to farm drainage and crops. The feasibility study was complete in 2015 and awaiting funding for final design and permit phase of study.

Snohomish County, Smith Island Estuary Restoration, Snohomish County, WA (2013 – Present). David is a key member of the Smith Island restoration team. The project involves a 6,000-foot-long riverine tidal levee setback on the Snohomish River. David is the project manager for S&W who is performing all geotechnical engineering for the levee design, as well as groundwater, surface water technical studies to support interior drainage designs, and erosion protection design of the setback levee system. In addition, David is providing risk management,

construction sequencing and constructability review information for the project. Project design and construction bidding were complete in 2015, and construction is ongoing.

The Nature Conservancy, Fisher Slough Restoration, Skagit County, WA (2007 – 2012). David managed the Fisher Slough Restoration Project involving feasibility study, engineering design, permitting and construction of a 60 acre freshwater tidal marsh restoration project on the S. Fork Skagit River. The complex project involves a detailed site assessment and hydrodynamic modeling to support design of a 4,000-foot levee setback structure for an additional 50 acres of flood storage, floodgate (Self Regulating Tidegate) structural modifications, several thousand feet of channel realignment, floodplain reconnection and reconstruction, habitat feature installation and marsh and riparian plantings. The project was awarded a \$5.2M grant in 2010 and construction was substantially complete in 2011. David was the lead presenter on a number of project partner and stakeholder meetings.

The Nature Conservancy, Port Susan Bay, Snohomish County, WA (2012). David participated on the Construction Administration team and provided a range of services to the client including technical construction plan and contract review, construction bid review, earthwork, dewatering, soils management and weather monitoring construction observation and oversight services during construction.

Whatcom County Flood Control District, Nooksack River Levee System Wide Improvement Framework (SWIF), Whatcom County, WA. (2014 – Present). David is providing river engineer and levee expert assistance to Whatcom County and their stakeholders in evaluating levee deficiencies and repair plans in order to keep project levees active and eligible in the U.S. Army Corps of Engineers PL84-99 Non-Federal Levee Rehabilitation and Inspection Program. The project involves a geomorphologic study of the Nooksack River channel migration and avulsion areas in the Deming and Nugent's corner area of the middle Nooksack River, and developing levee setback and habitat restoration alternatives. The study also involved developing a levee vegetation management plan for the Nooksack River levees. The SWIF work involves technical studies culminating in presentations and outreach to the local community to develop a pathway forward for the SWIF.

Whatcom County Flood Control District, Deming Levee Extension, Whatcom County, WA (2010 – Present). The Deming Levee project is an engineering and environmental design and permitting project that is extending the Deming Levee 1,000 ft to tie in and prevent overtopping of a substandard structure. David is the S&W project manager overseeing services including fluvial geomorphologic assessment of channel migration zones, scour and erosion protection design, geotechnical and hydrogeologic investigations, wetlands and stream mitigation conceptual design plans and environmental permitting. S&W also coordinated with the County on developing project alternatives and selection of a preferred alignment and scour protection alternative. Our staff developed preliminary design layouts and cost estimates, as well as screening and selection criteria for the preferred alignment. David also coordinated with BNSF railroad whose track is protected by the levee. They will be affected by the future extension tie-in and railroad crossing.

City of Edmonds, Willow Creek Fish Passage and Edmonds Marsh Restoration, Edmonds, WA (2012 – Present). David was the project manager and engineer of record for a feasibility study evaluating the fish habitat benefits, tidal marsh response, and flood storage responses for daylighting Willow Creek for fish habitat restoration at Edmonds Marsh. The feasibility study project involves Puget Sound shoreline restoration, park planning and coordination, a BNSF Railway and Sound Transit crossing erosion protection and scour design, daylighting of a 1,000 foot long channel, addressing contaminated soils and groundwater remediation, and reconnecting salt-water tidal flows to the historical marsh. The feasibility study is nearing completion and moving to design and permit phases contingent upon grant funding.

South Puget Sound Salmon Enhancement Group, Titlow Park Shoreline Restoration, Tacoma, WA (2014 – present). David is the project manager for a feasibility study evaluating the replacement of a BNSF railroad bridge and restoration of the Titlow Park shoreline and lagoon areas. Titlow Park is an icon in the Metro-Parks Tacoma system. Currently the BNSF railway has an undersized culvert that disconnects the Puget Sound from the interior pocket lagoon (estuary). The restoration project will replace the culvert with a new bridge, remove an abandoned home along the shoreline and restore coastal bluff/beach processes, and enhance the interior park areas. The feasibility study design includes design coordination with BNSF capital projects coordinator and engineering offices to meet BNSF railway engineering and maintenance requirements.

JACK C. BJORK, P.E., D.WRE. | Senior Consultant

Position on Team: Lead Civil Design Engineer

Firm	Cardno, Inc.
Years with Firm / Industry Experience	6 Years 39 Years
Employment History (10 Years)	Cardno, Inc. – Senior Consultant/Engineer, 2009–present, Seattle, WA R.W. Beck, Inc. – Senior Consultant/ Engineer, 1990–2009, Seattle, WA
Education	M.S., Civil Engineering, University of California, Berkeley, 1976 B.S., Geology, Oregon State University, 1972 B.S., General Science, Oregon State University, 1972
Registration	P.E., Civil Engineering, Washington, 1984 P.E., Civil Engineering, Oregon, 2013

Mr. Bjork has 39 years of experience specializing in water resource projects. His skills include feasibility studies, field evaluation, planning, modeling, plans and specifications for design, cost estimating, agency coordination, permit acquisition, and construction management and expert witness review. Mr. Bjork has managed multiple projects with diverse stakeholder, regulatory, budgetary, and technical requirements. His water resource projects have involved levee setbacks, engineered logs jams, stream geomorphology, stream and estuary restoration, creek erosion, flood studies, bank stabilization, culvert and canal design, bridge scour and highway drainage.

Mr. Bjork was the project manager for the Idylwood Creek Restoration Project, which won the Outstanding Water Resources project for 2002 from the Seattle Section of the American Society of Civil Engineers. Mr. Bjork has been an instructor in Northwest Environmental Technology Center's course on the design of Engineered Log Jams (ELJs) and was elected to the American Academy of Water Resources Engineers (D.WRE.) in 2008. Jack also received the WSDOT 2013 award for excellence in environmental design for innovative, habitat-friendly bank protection for SR 20 on the Skagit River and provided construction engineering on site.

Jamestown S'Klallam Tribe, Lower Dungeness River Levee Setback, Clallam County, WA (2010 – 2013). Project Manager. Mr. Bjork managed a levee setback design project to reconnect 4,800 feet of the Lower Dungeness River channel with approximately 112 acres of floodplain on WDFW, WSDOT and Clallam County properties. Several conceptual level alternatives were developed with the understanding that the natural channel pattern of the Dungeness River is an anabranching form that utilizes multiple channel threads as a system adjustment to maximize flow efficiency and sediment transport, thus maintaining a balance between sediment supply and transport capacity in conditions where a single thread channel may experience aggradation. He also evaluated options for Towne Road. Working with Clallam County, Corps of Engineers and stakeholders, a 60% design was completed.

Columbia Land Trust, Kandoll Slough, Southwest WA (2010 – 2014). Project Manager. The Columbia Land Trust acquired the diked, 163-acre Kandoll Farm property along the tidally-influenced Grays River in southwest Washington. Mr. Bjork managed the geomorphic and habitat assessment, concept development, design and construction for a project that would create a new drainage network within the property to redirect tidal exchange directly to the Grays River through a new slough network. About 15,000 feet of new channels along with 3,200-linear feet of levee removal, 6 log habitat structures and 20 beaver dam "starters" will be created. Because the site had been graded for agriculture, excavated soil will be used to form 23 acres of mounds to create several estuarine zones. The Kandoll Road and embankment was also rock lined for erosion protection and was partially rebuilt. The bids were less than the engineer's estimate. The project won an award as one of the best Infrastructure Projects in 2013 in Oregon and Southwest Washington by the Daily Journal of Commerce.

Nisqually National Wildlife Refuge, Engineered Log Jam Design for Levee Protection, WA (2009). Project Manager. The Nisqually National Wildlife Refuge completed a very large estuary restoration project in the Nisqually River Delta. Levees that had been placed for farming since the late 1900s have been reconfigured to return 283 acres to tidal influence. At a location along the river the new levee was vulnerable to migration of the Nisqually River after the existing levee was removed. Cardno completed a Channel Migration Assessment for this reach and then Mr. Bjork managed the design and construction of a 30' by 60' ELJ for flow deflection and habitat creation. The ELJ required 60' long piles for stabilization because of the deep tidal scour in the river. The structure will protect infrastructure while supporting the ecological and geomorphic function of the river.

City of Puyallup, Linden Golf Course Levee Setback Design, Puyallup, WA (2011 – 2012). Project Engineer. Mr. Bjork directed the technical work of a feasibility study and preliminary design of a levee setback at the confluence of the White and Puyallup Rivers. The study identified a recommended alternative that maximizes habitat benefits to ESA listed species and their critical habitat within the constraints of the project area which included the alignment of the Riverwalk Trail, impacts to flooding on the adjacent golf course, and the presence of capped landfill materials within the project limits. Hydraulic modeling and zero-rise analyses were conducted to determine the extent of new habitat creation, flood reduction, and in stream changes associated with the design.

King County, Green River Levee Improvements, King County, WA (1995). Project Manager. Working with Shannon and Wilson, Mr. Bjork managed the design of 2,000 linear feet of improvements to the Green River Levee that protects the City of Tukwila, Washington. The principal problem was high uplift soil pressures on the landward side of the levee. The improvements included placement of a berm on the landward side of the levee and installation of a 30 inch diameter relief wells and an associated station with two 20-hp pumps. In the middle of the design process, a significant flood occurred, requiring the emergency placement of the berm by construction crews.

North Olympic Salmon Coalition, 3 Crabs Nearshore and Estuarine Restoration Project, Clallam County, WA (2013 – present). Project Manager. Mr. Bjork is responsible for overseeing the execution of initial site studies through final design and construction for this nearshore and estuary restoration project located near the mouth of Meadowbrook Creek and the Dungeness River. In addition to restoration of the tidal lagoon system to improve threatened salmonid habitat, this project will set back an existing Clallam County roadway and utilities and replace an outdated county road bridge. Work on this project includes coastal and fluvial geomorphic analysis, tidal hydrology analysis, a site topographic survey, hydraulic modeling, and engineering design plans, specifications, and construction cost estimates. The site includes property owned by WDFW, Clallam County and Dungeness Farms. Project planning and design involved a close working relationship with them as well as local residents.

Pierce County Public Works, Neadham Road Setback Levee Protection Project, Pierce County, WA (2009 – 2012). Project Manager. Mr. Bjork managed the design and provided construction engineering for the installation of ELJs as part of the solution to levee washouts that threaten local residences and infrastructure on the Upper Puyallup River upstream of Orting. A washout in the winter of 2009 destroyed several hundred feet of levee along the river's right (east) bank. Additional erosion and channel migration is anticipated so an emergency setback levee was constructed in 2009 to treat the immediate risks posed by the washout. The project included 2 ELJs to form a riverward habitat and erosion protection along the new setback levee. The project goal was to develop solutions that inhibit further expansion of channel migration zone in the project reach that would threaten infrastructure.

Lummi Nation, South Fork Nooksack River Saxon Reach Restoration, Acme, WA (2009 – 2012). Project Manager. Mr. Bjork lead the geomorphic characterization and restoration design for salmonid habitat improvement within the reach, while considering local landowner and flood control district concerns and County zero-rise regulations. The design integrated ongoing river and flood management on this reach which has history of significant lateral migration and incision over the past 80 years. The goal was to enhance Chinook salmon rearing and spawning habitat by increasing in-stream complexity, while minimizing risk to property and infrastructure. To achieve these goals, the restoration design includes re-introduction of stable, functional large wood into the river system through construction of 12 strategically placed engineered logjams (ELJs). These structures provide high quality, stable pool habitat and increased channel complexity, as well as increasing flows onto the floodplain and re-activation of historic side channels. This side channel habitat will provide critical high flow and low temperature refugia for rearing salmonids. Another structure was built the Bank Roughening Complex, a 630 LF fish-friendly bank protection technique was constructed for stabilizing the bank and creating fish habitat.

RAY WALTON, Ph.D., P.E., D.WRE | Senior Hydraulic Engineer

Position on Team: Lead Hydraulic Engineer

Firm	WEST Consultants, Inc.
Years with Firm / Industry Experience	21 Years 40 Years
Employment History (10 Years)	WEST Consultants, Inc. – Senior Hydraulic Engineer, 1994–present, Bellevue, WA
Education	Ph.D., Hydraulics, University of Florida, 1978 M.S., Engineering Hydrology, University of Newcastle-Upon-Tyne, U.K. , 1972 B.Sc., Mathematics, University College, London, U.K. , 1971
Registration	P.E., Civil Engineering, Washington, 1990 P.E., Civil Engineering, Oregon, 1996 P.E., Civil Engineering, Virginia, 1982 P.E., Civil Engineering, Texas, 2015

Dr. Walton is a Lead Hydraulic Engineer with WEST Consultants, Inc. He has about 40 years of experience directing water resources studies throughout the U.S. and abroad. He is a nationally-recognized expert in multi-dimensional modeling of surfacewater, groundwater and water quality systems. In 2010, he was recognized as the outstanding Professional Engineer in the Puget Sound Region.

Dr. Walton's recent experience includes directing FEMA flood insurance studies throughout the Pacific Northwest, scour evaluations of hundreds of bridges for WSDOT, ODOT, ITD, and CalTrans (including 1D and 2D hydraulic analyses), flood studies for the Columbia River Treaty reviews, and hydraulic model studies of numerous rivers throughout the northwest, including the Dungeness, Snohomish, Chehalis, Wynoochee, Sammamish, Sumas, Chelan, Columbia, Skokomish, Elwha, Green, White, Snake, and Henry's Fork Rivers.

Dr. Walton has worked on more than 50 multi-dimensional hydraulic model studies throughout the world, including many in the Pacific Northwest. Recent examples include the SR 107 crossing of the Chehalis River, bridge hydraulics and scour in Humboldt Bay (CA), and Gold Beach (OR). He has applied the Corps 2D model AdH to evaluate flood control measures proposed for the Dungeness River in Washington, and to Pool 2 on the Upper Mississippi River to investigate navigation changes and sediment transport. Other modeling studies include the application of the 2-D/3-D model, EFDC, to Kilisut Harbor in Puget Sound and the Lower Willamette River; FLO-2D to evaluate flooding in Snoqualmie; the 2-D models, RMA-2 or FESWMS, to the Stehekin, Sauk, Columbia, Skagit, and Cispus Rivers. He worked on restoration studies on the Green, Satsop, Sammamish, Dungeness, Chehalis and Snohomish Rivers.

Jamestown S'Klallam Tribe, AdH Hydrodynamic Model of the Lower Dungeness River, Clallam County, WA (2010 – 2011). Working with Jamestown S'Klallam Tribe, Dr. Walton managed the application of the Corps' hydrodynamic model, AdH, to the lower Dungeness River to evaluate levee setback alternatives. The study included simulating a major flood in 2002, and the 2-year and 100-year floods, comparing existing conditions and with-project conditions.

Corps of Engineers, RAS2D and AdH Model Comparison, East St. Louis, MO (2012 – 2015). The study's goal was to compare the results of four 2D models that simulated a levee breach in Metro East St. Louis. The models included HEC-RAS2D, AdH, TuFlow and FLO-2D. Dr. Walton managed the application of HEC-RAS2D and AdH to this site.

Corps of Engineers, Seattle District, and Chehalis River Basin Flood Authority, Chehalis River Hydraulic Model Development, Lewis, Thurston and Grays Harbor Counties, WA (2011 – 2014). Dr. Walton managed the development of an unsteady flow model of the Chehalis River from Pe El to Montesano, including the Wynoochee River and other major tributaries. Evaluated the effects of climate change and a proposed levee to protect Chehalis and Centralia.

Corps of Engineers, St. Paul District, Minnesota, AdH Hydrodynamic Model of Pool 2 on Upper Mississippi River (2010 – 2011). Dr. Walton managed the applications of the Corps' model, AdH, to Pool 2 on the Upper Mississippi River to evaluate the hydrodynamic and sediment impacts of a proposed re-alignment of the navigation channel for barge traffic to cut off a major bend.

HEC-RAS2D Short Course, Nationwide (Ongoing). HEC-RAS2D Short Course. Taught for ASCE, NORFMA and private groups. Dr. Walton reviewed the overall development of a short course to teach the 2D application of HEC-RAS. Courses were held throughout the U.S. Dr. Walton demonstrates extensive knowledge of HEC-RAS2D.

WSDOT and the Chehalis River Basin Flood Authority, SR 107 Bridge Flood and Scour Mitigation Analysis, Grays Harbor County, WA (2014 – 2015). Dr. Walton managed the application of the USBR model, SRH-2D, to this site on the lower Chehalis River to evaluate the potential impacts to the SR 107 bridge due to sheet pile protection at the Marys River Lumber site just upstream (another study managed by Dr. Walton). Evaluated existing conditions, a potential upstream avulsion, and a possible bypass channel that would direct the flow at a better alignment to the bridge. Used the model results to evaluate the scour potential and abutment protection of the bridge.

Snohomish County, Smith Island Restoration, Snohomish County, WA (2011). Working with another consultant, Dr. Walton managed the application of an unsteady HEC-RAS model of the Snohomish River to evaluate the change in hydraulic conditions by breaching the existing Smith Island levees in the lower Snohomish River, and constructing a setback levee to protect critical infrastructure. The study included modeling existing conditions, levee breaching and setback, and the potential breaching of another nearby levee system that would greatly influence hydrodynamic conditions.

The Nature Conservancy and Snohomish County, Snohomish River Climate Change Study, Snohomish County, WA (2013 – 2014). Dr. Walton managed the extension of an existing HEC-RAS model of the Snohomish River (also managed by Dr. Walton) to the entire system. Simulated a major flood in January 2009, and mapped the results of numerous flood alternatives representing levels of potential climate change (sea level rise and changes in streamflow).

City of Sumner, Pierce County, White River Master Plan Evaluation, Pierce County, WA (Ongoing). Dr. Walton managed the development and application of an HEC-RAS model of the White River from just upstream of the King County line to the Puyallup River. The study evaluated the backwater rise impacts due to proposed King County levees to protect the town of Pacific, three bridge replacements, and various development scenarios in Sumner. The study also evaluated various mitigation alternatives, including levee setback, a high-flow bypass, and overbank excavation, to develop zero net rise. Various bank protection measures were evaluated.

MARK A. OHLSTROM, P.E. | Civil Engineer

Position on Team: Lead Structural Engineer

Firm	HDR
Years with Firm / Industry Experience	2 Years 36 Years
Employment History (10 Years)	HDR – Federal Program Lead, 2013-present, Bellevue, WA U.S. Army Corps of Engineers, Seattle District, 1978-2013, Seattle, WA
Education	M.B.A., Industrial Management, Gonzaga University, Spokane, WA, 1985 B.S., Civil Engineering, Gonzaga University, Spokane, WA, 1980
Registration	P.E., Civil Engineering, WA, 1984

Mark has 36 years of experience planning, designing, constructing, operating, and managing a wide variety of water resource projects including flood risk management projects. Mark possesses excellent technical, project, and programmatic management and leadership skills. Prior to joining HDR, Mark served as the Chief of the approximately 200-person Engineering Division for the U.S. Army Corps of Engineers Seattle District. In his role, Mark served as the Levee and Dam Safety Officer for the Seattle District. He has worked on planning studies formulating flood control projects for the Continuing Authority Program and General Investigation studies in roles as an engineer, a planner, a Program Manager, a Branch Chief, and as a Division Chief. Mark also has extensive experience serving in various capacities on flood teams performing pre-flood planning and preparation activities, emergency response and coordination during flood events, and post-flood inspection and damage assessment. Mark has lead diverse teams for complex projects including the \$50M emergency action program at Howard A. Hanson Dam to correct critical dam safety deficiencies. Mark is very knowledgeable of USACE policies and processes and is an expert in dealing with the Section 408 review and approval process.

King County, Lower Russell Road Levee Setback Design, King County, WA (2014 – Ongoing). Mark is HDR's Project Manager for this project which is along the right bank of the Green River in the City of Kent. The project area is approximately 1.4 river miles in length. Mark is leading a large multi-discipline team on this complex and diverse project whose primary goal is to replace the existing flood containment system of levee and revetments with a new set-back flood protection system designed to current engineering standards, improve riparian and aquatic habitat, and increase the current 100-year level of protection to an approximately 500- year level of protection. Project involves utility, road, and park relocation work as well.

HDR, Federal Quality Manager, Washington (2013 – Present). Since November 2013, Mark has served as the Federal Program Lead for HDR in Washington. Mark has performed quality management reviews for varied HDR projects in support of Federal Agencies and is the lead for technical, policy and guidance reviews for flood protection projects in Washington State. Mark is the recognized lead for HDR on projects requiring a Section 408 review and approval from USACE.

U.S. Army Corps of Engineers (USACE), Seattle District, Dam and Levee Safety Assurance Programs (2004 – 2013). Mark served as the District's Dam and Levee Safety Officer and oversaw the annual development of the Seattle District's Dam and Levee Safety Programs, covering 3 hydropower dams; 2 flood control dams; 1 navigation lock and dam; and 249 levee systems. Many of these structures are more than 50 years old with the oldest structure approaching 100 years old. Risk assessments and periodic inspections have been conducted for the aging infrastructure to monitor their condition and to ensure optimal use of limited federal funds. Mark convened and chaired quarterly meetings of the District's Dam and Levee Safety Committees to evaluate project problems and concerns and prioritize workload.

USACE, Seattle District, Howard A. Hanson Dam Safety Emergency Action Project, Green River, WA (2009 – 2012). Shortly after a pool of record at the dam in January 2009, a depression was noticed on the upstream face of the right abutment. Mark immediately initiated the Emergency Action Plan, notifying the appropriate officials of the situation and began to expediently, but safely, lower the remaining flood pool behind the dam. Mark quickly

assembled a team of experts from across USACE and the collective dam safety community of practice to study the problem and design a fix. The interim actions included installing an extensive grout curtain; installing new vertical and horizontal drains connecting to an existing drainage tunnel; installing new drains and a redundant pumping system to drain additional water from a critical area where the abutment transitions with the dam core; and installing additional instrumentation and piezometers to allow extensive monitoring of the dam and the abutment. The results of these measures changed the classification of this facility from a DSAC I to a DSAC IV in a three year period and at a cost of about \$50M versus the preliminary cost estimates of \$500M to more than \$1B when the problem was first identified.

USACE, Seattle District, Cedar River Flood Damage Reduction Project, USACE and City of Renton, Renton, WA (2012 – 2013). The flood risk management structures on the left and right bank of the Cedar River near its mouth are both Federal Projects. Recent inspections of the structures on both banks revealed significant deficiencies as measured against the current USACE levee safety standards. The biggest deficiency was excessive vegetation. Due to the sensitive nature of this reach of the river on account of ESA issues, Mark led efforts to perform an engineering analysis of the deficiencies on both banks to see if there was technical evidence supporting the preparation of a variance request. The results indicated that the deficiencies on the left bank needed to be corrected but that there was technical evidence supporting a variance request for a significant number of the deficiencies, particularly the excessive vegetation on the right bank. As a result of the process followed, tribal interests and the environmental resource agencies concurred with the removal of the vegetation on the left bank and a variance request to permit vegetation to remain in excess of the current standards is in process.

USACE, Seattle District, Horseshoe Bend Levee Safety Regional Solutions Team Project, USACE and King County, Kent, WA (2013 – 2013). As the Levee Safety Officer, Mark led an effort to implement an innovative approach to address critical deficiencies on a portion of the Federal Levee at Horseshoe Bend along the Green River in Kent, WA. HQ, USACE agreed to provide funding to the Seattle District to assemble a multi-agency Regional Solutions Team to brainstorm and to evaluate alternatives for correcting the identified deficiencies. The goal was to develop an implementable solution that all agencies and stakeholders can buy in to in a timely and cost effective manner versus the current process of a sequential approach, which often involved multiple iterations of proposed solutions before a final agreement and buy-off could be reached.

BRIAN S. REZNICK, P.E. | Senior Principal Geotechnical Engineer

Position on Team: Lead Geotechnical Engineer

Firm	Shannon & Wilson, Inc.
Years with Firm / Industry Experience	13 Years 13 Years
Employment History (10 Years)	Shannon & Wilson, Inc. – Geotechnical Engineer and Project Manager, 2002-present, Seattle, WA
Education	M.S., Civil Engineering, Oregon State University, 2002 B.S., Civil Engineering, Oregon State University, 2000
Registration	P.E., Civil Engineering, Washington, 2006

Brian Reznick is an experienced geotechnical and civil engineer with specialized expertise in levee and transportation design and construction. During his career, Brian has worked on multiple levee and transportation projects in the U.S. and abroad. His local levee experience includes projects on the Cedar, Green, Nooksack, Snoqualmie, Skagit, and Yakima Rivers for the USACE, WDFW, The Nature Conservancy, and various counties and dike districts. His technical expertise encompasses design of levees, floodwalls, bridge foundations, roadway pavements, culverts, headwalls, engineered log jams, and seepage filters. Early in his career, Brian spent time in the field observing levee construction, deep and shallow foundation installation, roadway subgrade preparation, ground improvement techniques, and mass soil excavation. Today, Brian's responsibilities include preparing project scopes and budgets; developing subsurface exploration, in situ testing, and laboratory testing programs; performing feasibility, design, and risk analyses; preparing reports; and developing project plans and specifications.

King County, Reddington Setback Levee, Auburn, WA (2010 – 2014). King County constructed a setback levee between river miles 28.2 and 29.5 on the Green River to increase flood and sediment capacity, improve ecological habitat, and reduce the flood hazard to neighboring county residences. Brian managed the geotechnical engineering for the project and coordinated efforts with King County and the design team. Phase 1 of the project was a feasibility study between river miles 27.5 and 29.5. Geotechnical and hydrogeologic analyses were performed to identify a proposed levee alignment and provide geotechnical design. The levee design of the levee utilized a low-permeability core with higher permeability shell to reuse on site material while meeting the USACE guidelines for stability and seepage. Filter design was provided to retain the native soil underneath the riprap barbs and revetments. Pavement design was provided for the road replacement along Lilac Street and the levee crest. A temporary haul road design was developed for construction of the levee. Brian assisted in developing project plans and specifications, and provided earthwork quantity change values for estimating soil re-use quantities. Brian also provided bid and construction support for the project, responding to contractor inquiries, requests for information, and performing site visits to observe construction activities.

Washington Department of Fish and Wildlife, Fir Island Farm Setback Dike, Skagit County, WA (2010 – Present). WDFW is restoring approximately 127 acres of tidal marshland and the tidal process to a Snow Goose Reserve on Fir Island. The project involves removing approximately 3,600 feet of existing coastal dike, constructing 5,850 feet of setback dike, dredging and expanding historical tidal channels, excavating marsh pilot channels, constructing a storage pond and pump station, and replacing and installing five new tide gates. Brian is the geotechnical lead for the project, overseeing the geotechnical aspects of design and providing construction support. Project design included recommending dike material for construction, evaluating dike seepage and exit hydraulic gradients behind the dike, analyzing dike stability, and estimating dike settlement during and after construction. Dike seepage and stability is based on USACE and NRCS design guidelines, and the various tidal sequences, wave action, and storm surges anticipated at the site. Filter material and filter diaphragms were designed beneath the riprap and along the tide gate pipes to mitigate soil movement. Temporary haul road design was included for accessing the site and constructing the dike. Brian oversaw development of the project geotechnical reports and participated with independent technical reviews for the project. Brian also worked on developing project plans and specifications for constructing the dike, tide gates, pump station, filters, and temporary haul roads. The project is currently under construction.

Snohomish County, Smith Island Restoration Setback Dike, Everett, WA (2013 – Present). Snohomish County is restoring 400 acres of estuary wetlands and tidal channels on the Snohomish River delta at Union Slough. The project involves removing 4,400 feet of existing dike, constructing 5,660 feet of setback dike, filling existing drainage channels, constructing starter channels, excavating a storage pond, installing a pump station and tide gate pipes, and installing timber piles and wood complexes. Shannon & Wilson was tasked with designing the dike and producing plans and specifications for construction. Brian managed the geotechnical design for the dike and helped prepare a multi-discipline report. Geotechnical analyses for the dike included recommending dike material, evaluating dike seepage and exit hydraulic gradients, analyzing dike stability, and estimating dike settlement on soft ground. To meet USACE guidelines a horizontal drainage layer was installed along the landward side of the dike to control seepage. Temporary haul road design was provided for accessing the site and constructing the dike. Brian prepared a report identifying potential dike import source pits within a 50 mile radius that could supply the 150,000 cubic yards needed to construct the dike. Brian also worked on developing project plans and specifications for constructing the setback dike, breaching the existing dike, and installing the tide gates, pump station, filters, and timber piles. The project is currently under construction.

U.S. Army Corps of Engineers, Seattle District, Skagit River Levee General Investigation, Skagit County, WA (2010 – 2011). The project was a study of flood risks for levees along the lower 30 miles of the Skagit River. Brian was the Geotechnical Project Manager for the study and coordinated efforts with the Corps, Skagit County, and the surrounding Dike Districts. The project included reviewing existing Corps site, levee, and subsurface information along the river, and summarizing the findings in a report. Future study recommendations were presented based on the available information. Brian presented the findings to the Corps and coordinated efforts to perform subsurface explorations and soil sampling along specific levee sections where seepage had been identified.

U.S. Army Corps of Engineers, Seattle District, Skagit River Levee Risk & Reliability Analysis, Skagit County, WA (2010). The Corps retained Shannon & Wilson's services to evaluate potentially high risk levee sections along the lower 30 miles of the Skagit River. Brian was the Project Manager. Eight levee locations were analyzed by developing surface and subsurface profiles, identifying potential levee failure modes, identifying critical input variables for each failure mode, and evaluating the appropriate river stages for analysis. The probability of failure using the Taylor Series Method and the Monte Carlo Method were assessed and the reliability of the levee at those eight locations evaluated. The river stage where the conditional probability of failure would be zero was determined and the reliability results graphed for each location as a fragility curve.

Whatcom County, Nooksack River Levee System Wide Improvement Framework (SWIF), Whatcom County, WA (2014 – Present). Whatcom County and their stakeholders are evaluating levee deficiencies and repair plans to keep project levees active and eligible in the U.S. Army Corps of Engineers PL84-99 Non-Federal Levee Rehabilitation and Inspection Program. Brian is providing geotechnical engineering expertise, evaluating levee stability and seepage where adjacent landowners have constructed retaining walls into the levee footprint.

Whatcom County, Deming Levee Extension, Deming, WA (2010 – Present). Whatcom County is extending the existing levee 1,000 feet upstream on the Nooksack River to improve flood protection and interior drainage. Several alternatives were proposed and the risks and benefits assessed for each. An alignment was recommended that provides the lowest risk for impinging flows and excessive scour, while limiting wetland impacts and maintaining the existing upstream levee and rock revetment structure. Brian performed a reconnaissance, provided geologic characterization, and developed geotechnical design and construction recommendations that included seepage, liquefaction, settlement, tie-in at the existing BNSF railroad embankment, and the re-use of on-site soils for construction.

Yakima County, East-West Corridor, Yakima County, WA (2011 – 2015). Yakima County is proposing to construct a new transportation corridor to improve traffic flow between Terrace Heights, an unincorporated area of Yakima County, and the City of Yakima. A levee is planned for flood control adjacent to the roadway between the Yakima River and the Roza Canal. Shannon & Wilson provided preliminary seepage flow rates, exit hydraulic gradient evaluation, and stability analyses for the levee based on USACE guidelines. As Project Manager, Brian oversaw the field work, reviewed the calculations and engineering report, and coordinated Shannon & Wilson's efforts with the design team and the County.

DEREK B. BOOTH, PhD, PG, PE | Senior Consultant

Position on Team: Lead Fluvial Geomorphologist

Firm	Cardno, Inc.
Years with Firm / Industry Experience	3 Years 30+ Years
Employment History (10 Years)	Cardno, Inc. – Senior Consultant/Senior Project Scientist, 2012–present, Seattle, WA Stillwater Sciences – Senior Geologist, 2006–2011, Seattle, WA University of California, Santa Barbara, Adjunct Professor, 2011–present, Santa Barbara, CA University of Washington, Affiliate Professor, 2006–present, Seattle, WA University of Washington, Research Professor, 1995–2006, Seattle, WA
Education	Ph.D., Geological Sciences, University of Washington, 1984 M.S., Geology, Stanford University, 1980 B.A., Geology, UC Berkeley, 1978 B.A., English Literature, Hampshire College, 1974
Registration	P.E., Civil Engineering, Washington, 2000 Professional Geologist, Washington, 2001 Professional Geologist, California, 2007

Derek B. Booth has integrated academic research, teaching, and private practice experience throughout his 30+ year career in geomorphology, hydrology, and watershed management, first with the U.S. Geological Survey and the Basin Planning Program for King County, as a full-time University of Washington research professor in the departments of geology and civil engineering, and now with Cardno. His publications include over 40 peer-reviewed articles, 26 USGS-published geologic maps in Washington State, and more than a dozen book chapters. His work emphasizes field-based collection and analysis of hillslope and instream data in order to understand watershed processes, evaluation of altered fluvial conditions and processes, and assessment of their likely (or actual) responses to human disturbance. He is presently the Senior Editor of the international scientific journal *Quaternary Research* and an Affiliate Professor in the Departments of Earth & Space Sciences and Civil & Environmental Engineering at the University of Washington.

Jamestown S’Klallam Tribe, Lower Dungeness River Levee Setback, Clallam County, WA (2010 – 2013). Dr. Booth was the lead geomorphologist on a levee setback design project to reconnect 4,800 feet of the Lower Dungeness River channel with 112 acres of floodplain on WDFW, WSDOT and Clallam County properties. Several conceptual-level alternatives were developed with the understanding that the natural channel pattern of the Dungeness River in the project reach is an anabranching form that utilizes multiple channel threads as a system adjustment to maximize flow efficiency and sediment transport, thus maintaining a balance between sediment supply and transport capacity in conditions where a single thread channel may experience aggradation. Dr. Booth assisted with alternatives selection and evaluated the potential for avulsion of the selected alternative.

Cascade Columbia Fisheries Enhancement Group, Methow River, Twisp-to-Carlton Reach Assessment, Twisp, WA (2014 – 2015). Dr. Booth was the lead geomorphologist for this project, whose purpose was to document and assess reach-scale features and processes for the purpose of identifying and prioritizing suitable habitat recovery actions that address known ecological concerns within this 13-mile reach. Technical elements include the identification of floodplain surfaces that are regularly or infrequently activated, and those that are inactive by virtue of either elevation or blocking human infrastructure. Recognition of the critical habitat-forming processes, using airphotos, LiDAR topographic analysis, and field reconnaissance, provides the basis for identifying prospective project sites and determining effective project types, primarily floodplain reconnection and structures promoting instream diversity that will address limiting factors for salmonids and be self-sustaining within the process dynamics of the river corridor.

Matilija Dam Removal Assessment, Matilija Creek, CA (2014 – ongoing). Dr. Booth is the geomorphology and hydrology lead and subcontract manager on a 15-month project to fully analyze and recommend alternatives for the removal of Matilija Dam on a major tributary of the Ventura River in southern California, a coastal steelhead-bearing stream that has been completely blocked for anadromous fish passage for more than 50 years. His tasks are to analyze the hydrologic regime to identify opportunities and pitfalls for natural transport of the ~8M yd³ of sediment presently stored behind the dam, to predict the likely future sediment yield of the watershed in a dam-free future, and to evaluate potential downstream effects of dam removal on channel geomorphology and a public water-supply intake.

Muckleshoot Tribe, Spawning Gravel Quality, Green River, King County, WA (2012). As Project Manager and Lead Scientist, Dr. Booth led a field-based assessment of spawning gravel quality in the Middle Green River, which evaluated the degree of fine-sediment intrusion along a 32-mile reach that has been long-recognized for its critical spawning habitat for several species of salmonids. This goal was achieved by a five-week field campaign of sampling the subsurface sediment at more than 50 locations of past salmon spawning throughout this reach to determine the grain-size distribution of the channel-bed sediment. A variety of additional sites were evaluated in other parts of the Green River system and in the adjacent Cedar River to provide a broader context for the results, and to assess the potential biases associated with the range of sample-collection and analytical techniques employed by this and prior studies of the river. Field data were integrated with the known distribution of spawning habitat and the scientific literature on fine-sediment impacts to evaluate the severity of potential or actual consequences on salmonid production.

Snohomish County PUD, Sultan River Physical Processes Studies and Licensing Implementation, Snohomish County, WA (2008 – 2014). Dr. Booth was Project Manager and Lead Scientist on a multi-phase, field-based assessment of impaired habitat conditions, and subsequent design, implementation, and monitoring of restoration projects on the Sultan River below Culmback Dam in the Cascade foothills. The work included comparisons of sediment input, routing, and deposition under pre- and post-dam scenarios using digital landslide mapping, field studies, literature review and GIS analysis. Results included historical channel planform analysis using a time series of aerial photographs and maps; determination of channel migration, terrace formation and side-channel dynamics; bedload transport capacity using sediment transport modeling and field data; and Large Woody Debris characterization using field inventory data, stream power index, and comparison to normalized volumes across western Washington rivers. Dr. Booth managed the follow-up phase that developed design alternatives for projects to install large woody debris and enhance side channels along the lowermost four miles of the Sultan River, and oversaw the evaluation of those structures' performance following a five-year flood event.

North Olympic Salmon Coalition, 3 Crabs Nearshore and Estuarine Restoration Project, Clallam County, WA (2013 – present). Lead Geomorphologist. Dr. Booth is the lead geomorphologist for this nearshore and estuary restoration project located near the mouth of Meadowbrook Creek and the Dungeness River. The geomorphic analysis included a reconstruction of the recent geomorphic history of the lower Dungeness River from historical maps, airphotos, and prior reports; integration of this recent history with the known late-glacial landscape changes that affected this area; and validation of this reconstruction through observation of on-site borings and test pits. This information was used to develop specific principles to guide the restoration, including the optimal planform and alignment of Meadowbrook Creek, design and placement of reconstructed lagoons, and choice of restoration analog sites.

South Puget Sound Salmon Enhancement Group, Pierce County, WA (2013 – 2015). Senior Geomorphologist. The preferred design developed included constructing a geomorphically appropriate channel, restoring low-profile woody debris, increasing floodplain and cool groundwater seep connectivity, and restoring native vegetation on the creek's floodplain. For Phase III, Dr. Booth conducted additional field studies on the channel geometry for the final design that incorporated and updated the 60% design completed by Cardno in 2011. Dr. Booth advised on the geomorphic design elements including the determination of stable natural channel parameters, evaluation of the risk of channel migration, and creation of in-channel habitat enhancement structures at key locations. His recommendations were incorporated into the final design.

KIM GOULD | Senior Ecologist

Position on Team: Lead Ecologist

Firm	Cardno, Inc.
Years with Firm / Industry Experience	2 Years 17 Years
Employment History (10 Years)	Cardno, Inc. – Senior Consultant/Senior Project Scientist, 2013–present, Portland, OR Pike Energy Solutions – Regional Manager of System Planning and Siting, 2011–2013, Portland, OR SWCA Environmental Consultants, 2004–2011, Portland, OR - Natural Resources Program Director, Aquatic Science Team Lead, 2009–2011 - Aquatic Ecologist, Program Manager, 2006–2009 - Project Manager, Aquatic Biologist 2004–2009
Education	B.S., Fisheries Science, Oregon State University, 1997

Kim Gould is an aquatic scientist with more than 17 years of experience in environmental and natural resource management consulting. Applying experience gained in over 300 projects, Kim helps clients reduce risk and avoid project delays through strategic multidisciplinary planning, siting, design, assessment, and permitting processes.

Kim’s technical background is in aquatic habitat and salmonid ecology. Applications have included a variety of landscape and site-level assessments of human impacts to sensitive species in ESA, NRDA, CWA, MSA, NEPA, and local planning contexts. He has provided freshwater, floodplain, estuarine, and marine habitat assessment; salmonid fish passage; aquatic biology studies; water quality and NPDES permit compliance monitoring; sediment and macroinvertebrate characterization; mitigation, and habitat design services. He has overseen teams conducting culvert inventories, fish passage prioritization studies, fish distribution studies, and stream habitat surveys for hundreds of stream miles. Kim has worked with WDFW and NOAA fish passage guidelines, and is skilled in expediting permitting processes through agency negotiations and use of programmatic state and federal permits.

Washington State Department of Corrections, Eagle Crest Way Fish Passage Improvements, Clallam County, WA (2015 – 2016). Senior Aquatic Ecologist for evaluating fish presence and passage needs at 14 road stream crossings of the road accessing the Clallam Bay Corrections Center. Scope of work includes fish habitat evaluation, culvert replacement/retrofit design, USACE and WDFW permitting support, and construction oversight.

U.S. Fish and Wildlife Service, Essential Fish Habitat Assessment, Clallam County, WA (2004 – 2005). As Aquatic Ecologist, Kim evaluated potential effects to salmon habitat from facility improvements at the Makah National Fish Hatchery.

South Puget Sound Salmon Enhancement Group, Ohop Creek Restoration Project, Phase II, Statewide, WA (2014 – 2015). Senior Scientist for fish passage, fish salvage, and construction sequence planning for 1.4 miles of stream channel and floodplain restoration.

Port of Vancouver, Columbia River Compensatory Habitat Mitigation Planning, Vancouver, WA (2014). As Senior Scientist, Kim assessed aquatic habitat mitigation and banking options for impact to ESA-listed fish species from a planned marine terminal development.

Pacific Power, Access Road Culvert Replacement Permitting, Cowlitz County, WA (2015). As Senior Aquatic Ecologist, Kim provided assistance with agency negotiation, design assistance, and permit compliance for a culvert maintenance and replacement project.

Lewis County, Stream Habitat and Fish Passage Data Collection, Lewis County, WA (2001). As the Lead Biologist and Project Manager, Kim conducted surveys of stream crossings at dozens of county roads in Western Washington for culvert replacement prioritization using WDFW protocols.

The Nature Conservancy, Lower Williamson River Habitat Restoration Design, OR (2014). As Senior Project Scientist, Kim wrote the biological goals, functions, and benefits section of the 60% Basis of Design report. The Cottonwoods project was designed to provide off-channel marsh and floodplain habitat for ESA-listed fish in the Lower Williamson River by selectively breaching levees near the confluence with Klamath Lake.

The Nature Conservancy, Sycan Marsh Habitat Restoration Design, OR (2015). As Senior Project Scientist, Kim collaborated with project engineers to restore three miles of river habitat for salmonids and other native fish. The project included fish passage analysis of five culverts, alternatives analysis, and design of replacements and retrofits.

Metro, Rock Creek/Orenco Woods Habitat Restoration and Fish Passage Barrier Removal, OR (2014 – 2015). As Project Manager, Kim managed the design and permitting of stream and floodplain restoration in collaboration with multiple stakeholders. Cardno's project team included biologists, engineers, hydraulic modelers, and geomorphologists. The project involved bank stabilization, habitat restoration, and fish passage improvements in a creek with ESA-listed steelhead. Cardno designed a large wood structure for grade and width control where an irrigation diversion dam was removed. The project scope included federal and state permitting and construction oversight, including floodplain no-rise certification, Clean Water Act applications, access road layout, fish passage standards, and erosion and sediment control plans. In addition to managing the project and the engineering team, Kim led the preparation of an alternatives analysis, project biological benefits memoranda, permit application documents, and used Nationwide Permits and programmatic biological opinions to expedite the permitting process.

PacifiCorp, Spring Channel Fish Passage Improvements, ID (2015). As Senior Scientist, Kim provided biological design requirements for the preparation of designs to create 400 feet of new stream channel to provide fish passage, spawning, rearing, and refuge improvements for Bonneville cutthroat trout.

Tidal Marsh Habitat Enhancement, OR (1999 – 2011). As Project Manager and Lead Author, Kim designed, permitted, and oversaw construction of a 2.5-acre off-channel tidal rearing habitat enhancement project near the mouth of the Sandy River. He also wrote a Biological Assessment that covered 12 species of ESA-listed salmonids.

Sundial Bank Stabilization, OR (2010). As Project Manager and Permitting Lead, Kim collaborated with engineers to design and permit the stabilization and reconstruction of several hundred feet of failed Columbia River bank per SLOPES criteria. He also oversaw construction of stabilized banks that included native vegetation and large wood installations near the mouth of the Sandy River.

Willamette River Design Notebook, OR (2001). As Biologist, Kim compiled biological parameters and participated in a design charrette for the development of an award-winning design manual for riverfront landowners. The design notebook provided bank stabilization alternatives and designs that offered improved habitat functions for ESA-listed salmon.

Highway 1 Bridge Replacement Studies, CA (2010 – 2011). As Aquatic Biology Lead Kim led a team of scientists in a functional habitat analysis of historic, present, and potential habitat conditions for comparison of project design and mitigation alternatives and decision-making support for two state highway bridge replacement projects. The project sites contained multiple ESA-listed aquatic and terrestrial species, including steelhead and coho salmon. He co-led an 8-hour multi-disciplinary workshop for stakeholder input to consider project alternatives in preparation for NEPA, CEQA, and ESA permitting.

SCOTT JOHNSON, PE | Transportation Project Manager

Position on Team: Transportation Engineer

Firm	HDR
Years with Firm / Industry Experience	10 Years 10 Years
Employment History (10 Years)	HDR – Transportation Project Manager, 2006-present, Bellevue, WA
Education	B.S., Civil Engineering, University of Washington, 2006
Registration	P.E., Civil Engineering, Washington, 2010

Scott Johnson has extensive experience designing highway, roadway, and interchange projects. Scott's unique roadway experience includes working on large WSDOT projects during his time at the I-405 GEC office and the SR 520 GEC office, and many municipal projects of varying sizes in the Cities of Bellevue, Redmond, Kirkland, Kent, and Marysville. Scott is a great communicator and facilitator that is able to balance the technical side of projects while still being able to break things down to explain the nuances of a project at a public meeting.

Scott is an expert in the PS&E delivery process. He has worked on these types of projects for municipalities in many different capacities, including as engineering designer, discipline lead, deputy project manager, and project manager. As a byproduct of this experience, Scott is extremely familiar with local agency design standards and specifications, as well as WSDOT Design Manuals and the Local Agency Guidelines (LAG).

Scott has a wide array of experience on low volume roadways and trails, including work on levee transportation systems, access roadway design in mountainous terrain, local street intersection design, and multi-purpose pathway design.

King County, Lower Russell Road Levee Setback Project, Kent, WA (2014 – 2015). Scott serves as transportation lead, providing design from conceptual alternatives analysis through final design. This project looked at the roadway network design alternatives including the road in front of the levee, behind the levee, on top of the levee, and combinations of those alternatives. Scott was involved with the screening process and advancing the preferred alternative. Scott is also developing the non-motorized design, which includes both paved and gravel trails along the river, as well as connections to the Green River regional trail system.

City of Redmond, 192nd Street Corridor Study, Redmond, WA (2014 – 2015). This project developed a preferred alternative for the new 1.5 mile roadway corridor in eastern Redmond. The preferred alternative was created through a concept development process and corresponding charrette workshop conducted by HDR with City of Redmond participation. Scott served as Project Manager.

City of Bellevue, 124th Avenue NE Roadway Improvements, Bellevue, WA (2011 – Present). Scott is the Deputy Project Manager for this project, which widens an existing roadway from three to five lanes from NE Spring Boulevard to Northup Way. The project intersection design and multipurpose pathway improvement experience will be utilized on the Dungeness River levee transportation improvements to design. Scott utilized the alternatives analysis process to select a preferred alternative for the corridor, which was carried through design. The project includes federal funding.

City of Bellevue, WA, 124th Avenue Wilburton Streetscape Enhancement Project, Bellevue, WA (2013 – 2015). Scott served as Project Manager for this project, which implemented new streetscape enhancements along 124th Avenue NE within the Wilburton Neighborhood from Main Street to NE 8th. The improvements included intersection design, a multipurpose pathway, landscaped medians, sidewalk enhancements, and frontage improvements.

City of Bellevue, NE 15th/16th Street Multimodal Corridor, Bellevue, WA (2010 – Present). Scott currently serves as the Deputy Project Manager this new, multi-modal roadway corridor through the Bel-Red area. Scott developed the preliminary corridor alternative roadway design and cost estimates. An integrated design approach is being used minimize cost and schedule for all the project stakeholders. A 30-person design charrette workshop was conducted on the project and involved all project stakeholders. The charrette and alternatives analysis successfully produced a preferred alternative that is being carried through final design. The project is a key element in the city's larger transportation network, and involves the design and implementation of six new intersections.

City of Kirkland, Forbes Creek Bridge Seismic Retrofit, Kirkland, WA (2014 – 2015). As Roadway Lead, Scott provided design support for construction access to the underside of the bridge, which is adjacent and within a wetland. He provided traffic control design and detour coordination to complete the construction. Scott also provided design services during construction.

Bonneville Power Administration, Big Eddy to Knight 500 kV Transmission Line, Goldendale, WA (2010 – 2013). This project spans 28 miles of alignment and 30+ miles of access roads along the Columbia River Gorge. HDR designed access roads and fish passable culverts for a new 500kV transmission line from The Dalles, OR, to a location north and west of Goldendale, WA. HDR provided final plans, specifications, and estimates for the preferred alignment. Scott was the Task Lead for the East Alignment Access Road Design team to develop the design plans for the Big Eddy - Knight Transmission Line Project.

ROB JOHNSTON, PLS | Principal Surveyor

Position on Team: Professional Land Surveyor

Firm	Johnston Land Surveying (JLS)
Years with Firm / Industry Experience	11 Years 39 Years
Employment History (10 Years)	Johnston Land Surveying – Principal/Owner, 2004–present, Port Angeles, WA
Education	High School Graduate, 1976
Registration	Professional Land Surveyor, Washington, 2001

Rob Johnston's primary work experience includes base map preparation, public records research, property boundary determination, mapping, planning, rights-of-way, easements, platting, real property descriptions, and expert witness testimony. Typical projects include the preparation of Record of Surveys, Topographic Surveys, Design Base Maps, ALTA/ACSM Surveys, Plats, Short Plats, As-built Surveys, and court exhibits. He has an extensive background in all aspects of land surveying services throughout Washington and Arizona. Licensed as a Professional Land Surveyor in Washington, he has been surveying since 1976, serving both the public and private sectors.

Jamestown S'Klallam Tribe, Dungeness River RR Park Trestle Replacement Project (2015 – Present). In early 2015, a portion of the Olympic Discovery Trail was destroyed by flood waters from the Dungeness River. JLS was a contracted as a subconsultant to provide the boundary, topography and construction staking to replace the 800-foot of creosote bents supporting the ODT with a pre-manufactured, steel truss bridge. Survey points were established as control for the life of project. Rob developed the base map which included ownership lines and topographic features (two-foot contours). Surrounding deeds were obtained to determine property lines. Rob was responsible for calculating and staking horizontal and vertical positions for steel pilings, concrete supports, bearing plate anchor bolts on four bridge supports. He also provided staking to create side channel drainage beneath the bridge.

Washington Department of Natural Resources / Northwest Watershed Institute, Anderson Creek Restoration Project (2015 – Present). Anderson Creek flows into the west side of Dabob Bay in Jefferson County. Several residential properties along the creek were acquired by the DNR and NWI. JLS was contracted to provide the boundary and topography of the 10-acre site. Rob is developing the base map, which includes ownership lines and topographic features (one-foot contours) of the uplands and tidelands. The intent is to remove all manmade improvements and return to site to its natural state. Survey points were established as control for the project. Extensive mapping of the creek is needed to determine the required topographic detail for a one-foot contour map. Surrounding deeds were obtained to determine property lines. An inventory of existing survey monuments will be gathered and a monument destruction application (WAC 332-120) will be completed, if applicable. The ownership lines will be monumented and a Record of Survey Map will be filed with the County in accordance with RCW 58.09, the Survey Recording Act. Rob calculated boundary lines for the three properties involved in the restoration.