



EXPERIENCE SUMMARY

Mr. Rozeboom is an engineering hydrologist with wide experience in the assessment and management of surface water resources. During 30+ years of employment in government service and consulting practice he has conducted watershed assessment, water supply, stormwater management, river crossing, and flood protection projects in geographic settings encompassing western and northern Canada, the western United States, Hawaii, and the West Indies.

When employed by the Hawaii Water Commission from 1988 through 1992, Mr. Rozeboom established the institutional framework to implement the 1987 Hawaii Water Code. In Washington State through 2005, he was an active member of the Washington State Department of Ecology Water Resources Advisory Committee, and participated in both the Central Puget Sound Regional Water Resources Initiative and Ecology’s Water Use Measurement Technical Advisory Group. He has been retained as a technical expert in numerous regulatory proceedings and has testified before land use hearing examiners and the Washington State Pollution Control Hearings Board.

Mr. Rozeboom has a solid record of satisfied clients. His long term clients include Canadian Zinc (since 2008), and the city of Snoqualmie (since 1994). Services for the city of Snoqualmie continued until 2015 through three political administrations, several turnovers in senior city staff, and his return to Canada in 2005.

EMPLOYMENT HISTORY

Tetra Tech Canada, March 2012 to present. Water Resources Principal Specialist in the firm’s Edmonton office.

Northwest Hydraulic Consultants, November 1992 – February 2012. Senior hydrologist and project manager in the firm’s Seattle office (1992-2005) and Edmonton office (2005-2012).

Hawaii Commission on Water Resource Management, June 1988 - November 1992. Hydrologist with the State of Hawaii Commission on Water Resource Management. Implemented new programs for water rights certification and dispute resolution under the 1987 State Water Code.

Self Employed, September 1986 - May 1988. Performed engineering and management consultant services. Work included two overseas assignments for water supply development projects in St. Lucia and in Montserrat, West Indies.

University of Alberta / Alberta Environment, September 1984 - August 1986. Full-time MBA student and graduate assistant. During summer periods, conducted field research studies for Alberta Environment Hydrology Branch of carriage losses from natural channels.

EDUCATION

MBA, University of Alberta, 1986

Graduate Course Civ E 639, Ice Engineering, University of Alberta, 1980

B.Sc. in Civil Engineering, with distinction, University of Alberta, 1978

AREA OF EXPERTISE

Surface water hydrology analysis and modeling for water supply and flood hazard assessments.

Stormwater management regulations and best management practices, Washington and Alberta.

Water rights policy and administration in Alberta, Washington, and Hawaii.

Expert witness analysis and testimony on environmental impacts of development projects.

REGISTRATIONS/ AFFILIATIONS

Registered Professional Engineer, Province of Alberta

Registered Professional Engineer, Northwest Territories and Nunavut

Registered Professional Engineer, State of Washington

Member, Canadian Water Resources Association

Member, Washington State Water Resources Advisory Committee

YEARS OF EXPERIENCE

30+

CONTACT

Bill.Rozeboom@tetrattech.com

Northwest Hydraulic Consultants, January 1979 - May 1984. Project engineer with Northwest Hydraulic Consultants, Edmonton office. Managed and conducted projects involving field inspections, river surveys, scale model design and testing, hydrologic and river engineering assessments, and computer model development.

Alberta Environment Water Survey Section, Summers, 1976 – 1977. Water survey technologist with Alberta Environment Water Survey Section. Responsible for streamflow metering, lake water level surveys, equipment servicing, data reduction, and rating curve development.

PROJECT EXPERIENCE

Aboriginal Affairs and Northern Development Canada (AANDC) and Indigenous and Northern Affairs Canada (INAC) Expert Evaluations. Lead hydrologist for multidisciplinary reviews of EIAs for expansions of the Agnico Eagle Meadowbank Gold Mine, the TMAC Resources Doris North Gold Mine and TMAC's Phase 2 Hope Bay Gold Project .

Mackenzie Valley Highway Extension Hydrotechnical Assessment. Senior reviewer of hydrotechnical assessments including design flows and drainage structure recommendations for watercourse crossings encountered along the proposed 181 km section of new all-weather highway from Wrigley to Inuvik. This work was performed for the Gwich'in Development Corporation.

Roche Bay Iron Ore Project Climate and Hydrology Analysis. Senior hydrologist overseeing the analyses of local climate and streamflow data for a project site in Nunavut, extended on the basis of regional climate and streamflow records. Determined frequency statistics and trends in precipitation and runoff amounts. Developed recommendations for site-specific climate and runoff parameters to be used in the design of mine tailings and water management facilities.

Nares River Bridge Hydraulics and Fisheries Assessments. Project manager for a hydraulic analysis and fisheries assessment for the Yukon Highways and Public Works Department to support permitting for a replacement bridge for Klondike Highway 2 bridge over the Nares River at Carcross, Yukon. Project involved 2-D hydraulic modelling of the river reach, piers and embankment encroachments for existing and proposed conditions, and coordination with fisheries subconsultant to assess hydraulic impacts on fish habitat.

Canadian Zinc Prairie Creek Mine Bank Protection and Outfall. Site inspections and bank protection designs for mine flood protection berms and an access road through Nahanni National Park, Northwest Territories. Evaluated alternative wastewater outfall sites and designs, responded to regulator information requests, and collaborated in the design of fish habitat compensation works. Developed a protocol in collaboration with Water Survey of Canada for real-time estimation of Prairie Creek stream flow discharges to be used in project water management operations. Participated in project Environmental Assessment and Water License hearings.

Snoqualmie Ridge Drainage Reviews and Environmental Monitoring. As the city's on-call drainage engineer from 1994 to 2005, determined the acceptability of hydrologic analyses, drainage plans, and stormwater facility designs for the 2,000-acre mixed used development at Snoqualmie Ridge Phases 1 and 2. Coordinated sub-consultant reviews of water quality, fisheries, and wetlands issues, and oversaw the interpretation of over 10 years of multidisciplinary post-construction monitoring data. Primary author of the City's 2013 stormwater system O&M manual, developed to comply with federal NPDES permit requirements. On-call advisory services continued until project buildout in 2015.

Alberta Transportation Highway 63 Mitigation Wetlands. Designed and oversaw the hydrology component of a multi-disciplinary monitoring program to characterize the hydrologic and ecological functions of natural and constructed wetlands along the Highway 63 corridor in northern Alberta. The work has yielded results that have influenced Alberta Environment and Parks' implementation of the 2014 Alberta Wetland Policy (ongoing).

TransAlta Utilities Dam Safety Reviews. Lead hydrotechnical expert for Dam Safety Reviews conducted in 2013-2014 for three of TransAlta's thermal power generation facilities and one hydropower facility. Reviews were

performed for the Keepphills Cooling Pond, Wabamun Ash Lagoon, and Sundance Ash Lagoon all in central Alberta, and Bighorn Dam on the North Saskatchewan River.

Alberta Environment 3PC Reviews. Lead hydrotechnical expert for Alberta Environment Third Party Contractor (3PC) reviews of Environmental Impact Assessments for the Ivanhoe Tamarack SAGD Project, Coal Valley Resources' Rob Trend Mine Expansion, and the ConocoPhillips Surmont 3 SAGD project.

City of Lethbridge Stormwater Pond Water Quality Assessments. Principal investigator for a baseline study to document and evaluate water quality characteristics in each of the city's 24 stormwater ponds. Devised a program to address problems of pond odours and objectionable appearance as perceived by the public and adjacent residents.

Canadian Climate Change Compendium Review. By invitation of the Canadian Water Resources Association (CWRA), conducted a general peer review of each of the more than 350 documents in the May 2012 beta version of the CWRA compendium on Climate Change and Water Adaptation Knowledge.

Yukon Southern Lakes Hydrologic Routing Study. Managed the development and validation of a HEC-ResSim routing model of the Yukon River basin upstream from the Yukon Energy Whitehorse Rapids Generating Station, simulating daily flows and water levels in each of the basin's six major lakes. Simulations cover a 50-year period of historical record and address variable outlet conditions, complex interactions between several of the major lakes, and alternative operating strategies.

Izok Mine Environmental Assessment. Discipline lead to characterize and assess potential surface water hydrology impacts relating to a proposed metal mine beneath Izok Lake in Nunavut, and an access road from the mine site to a northern port facility.

Water Supply Outlook Forecast Review. Conducted a detailed review of current methods, models, and agency practices for forecasting seasonal flow volumes in the western U.S. and Canada. Developed updated water supply outlook forecast models for Alberta Environment for the Highwood, Oldman, and Milk River basins in southern Alberta.

Paintearth Mine Water Management. Performed hydrologic assessments to develop a water management plan for open pit mine expansion and site reclamation activity at the Paintearth Mine which supplies coal for the Battle River generating station in eastern Alberta.

Genessee Mine Extension Environmental Assessment. Assessed surface water hydrologic impacts for the extension of the open pit Genessee Mine which supplies coal for the Genessee generating station in central Alberta. Assisted in developing a water management plan to minimize impacts.

TBG Clay Pit Water Management Plan. Developed a water management plan and conceptual outfall designs for disposal of accumulated water from a clay pit north of Fort McMurray and for subsequent operation phase water management.

Parsons Creek Resources Environmental Assessment. Discipline lead to characterize and assess potential surface water hydrology impacts from a proposed limestone quarry in the floodplain of the Athabasca River north of Fort McMurray.

Suffield National Wildlife Area Infill Drilling Environmental Assessment. Discipline lead to characterize and assess potential surface water impacts relating to EnCana's proposed natural gas infill development in the Suffield National Wildlife Area in southern Alberta.

South Saskatchewan Water Management Plan Technical Review. Conducted a detailed review, on behalf of Treaty 7 First Nations, of the October 2005 draft Water Management Plan for the South Saskatchewan River Basin. Participated in meetings with First Nations representatives and co-authored a technical review report.

Vantage Point Stormwater Management Plan. Developed and applied a HSPF hydrologic model to assess impacts of a central Alberta rural residential development on downstream stormwater volumes and peak flows, and devised mitigation strategies.

Whitemud Creek Sensitive Area Assessment. Implemented a hydrologic monitoring and assessment program for a unique lake within the McTaggart Sanctuary nature preserve along Whitemud Creek in the city of Edmonton. Recommended measures to mitigate the hydrologic effects of urban development planned for the area uphill from the lake.

Great Divide SAGD Environmental Assessment. Developed, calibrated, and applied a HSPF model to identify and quantify surface water hydrology impacts related to the Great Divide SAGD oil sands development in northern Alberta.

Shepard Energy Centre Water Withdrawal Impact. Performed an assessment to determine if proposed net flow diversions from the city of Calgary Bonnybrook Wastewater Treatment Plant to the Shepard Energy Centre would be material to the Bow River and other water users.

Athabasca River Outfall Design. Oversaw development of a River-2D hydraulic model of the Athabasca River adjacent to the Beaver River Lodge north of Fort McMurray, and provided recommendations for the location and conceptual design of a new wastewater outfall.

Banff Bow River Outfall Design. Performed site inspections and hydrologic and hydraulic analyses for the Bow River at the Banff wastewater treatment plant. Prepared design details and a preliminary construction plan for an upgraded (replacement) wastewater outfall.

Hilliards Bay Marina Conceptual Design. Conducted a feasibility level design for a proposed marina on Lesser Slave Lake in north central Alberta. A design which included dredging of a channel and an armoured breakwater was developed to provide marina boat passage for the expected range in lake water levels and shoreline positions, and to withstand ice and wave action forces.

Peace River Region Hydraulic Capacity Assessments. Performed hydrologic and hydraulic analyses for Alberta Infrastructure and Transportation to address drainage problems at six problem sites across the region. Problems were the result of varied local conditions including obstructed or un-maintained drainage paths, beaver activity, and structural failures. Developed designs and costs for improvements.

Boyle - Amisk Lake Water Supply Assessment. Developed and calibrated a continuous simulation water balance model of Amisk Lake to determine its reliability as a future source of raw water supply for the Village of Boyle. Assessed impacts of proposed municipal withdrawals on lake levels and on the frequency and duration of zero flows at the lake outlet.

Michel Creek Bank Armour Construction Inspection. Provided construction supervision and prepared as-built reports for riprap bank armoring at two Terasen Gas pipeline crossings of Michel Creek in the Crowsnest Pass area of southern B.C.

Fort St. John - Peace River Outfall. Developed a River 2D hydraulic model of the Peace River to assess river hydraulic conditions in the vicinity of proposed wastewater outfall for the City of Fort St. John. Prepared design drawings for outfall placement.

Westlock/Clyde Regional Water Supply Assessment. Conducted a hydrologic assessment of the suitability of the Pembina River near Westlock as a source of raw water supply for a regional system. The assessment included consideration of instream flow needs and active water licenses for consumptive withdrawals.

Meander River Water Supply Assessment. Conducted a hydrologic assessment of the suitability of the Hay River near Meander River as a source of community raw water supply. The assessment included consideration of instream flow needs and active water licenses for consumptive withdrawals.

Faro Mine Hydrology. Reconciled incomplete available water level and streamflow data collected by others at multiple sites along North Rose Creek in preparation for closure of a mine site near Faro, Yukon. Performed flood routing analyses at a flow-through rock drain embankment along the channel.

Green River Strategic Assessment. Managed a multi-agency assessment of reservoir regulation, land use, and water extraction impacts on tributary and main-stem streamflow in the Green River watershed in western

Washington. Analysis methods developed in this work are being applied to other basins as a means to identify reach-specific areas of water quantity impact and mitigation opportunities.

SeaTac Airport 3rd Runway Review. Reviewed technical and regulatory elements of the stormwater management plan and related documents submitted for Section 401 State Water Quality Certification for the SeaTac airport third runway project. Identified significant errors in the hydrologic modeling and analyses. Concerns were corroborated by third-party reviews and led to substantial overhauls of the stormwater plan modeling and facility designs. Provided expert testimony before the State of Washington Pollution Control Hearings Board.

Kent Third Avenue Pump Station Hydraulic Design. Managed the analyses and hydraulic design of two stormwater pump stations to augment existing gravity stormwater systems in the City of Kent. Detailed analyses were performed with a continuous-simulation hourly routing model using HSPF-derived inflows and historic Green River water levels. Evaluated various combinations of pump capacity and operating rules to efficiently achieve a target 25-year level of flood protection.

Snoqualmie Ridge II Master Drainage Plan. Retained by the City of Snoqualmie to provide detailed technical reviews of Master Drainage Plans, Environmental Impact Statements, and engineering plans prepared by Quadrant Corporation for the 730-acre Phase II Snoqualmie Ridge development. The site is the headwater area for several small streams and an extensive network of more than 60 on-site wetlands, all of which are vulnerable to site hydrologic changes. Worked closely with city and staff and environmental consultants to incorporate Low Impact Development techniques and to implement a program for post-construction monitoring.

Stillaguamish Basin Instream Flow Hydrology. Performed a hydrologic evaluation of flows in the Stillaguamish River basin, Water Resource Inventory Area 5. The work was in support of a Washington Department of Ecology proposal to promulgate an instream resources protection rule in the basin. Developed data transposition techniques in which locally available data were paired with representative long-record stations to determine site-specific streamflow statistics. Developed and provided hydrographs showing the 5, 10, 20, 50, 80, and 90 percent daily exceedance values for each of fourteen instream flow study sites.

Cedar River Section 205 Project Interior Drainage Assessment. Performed an interior drainage assessment for the levee/floodwall system constructed as a Section 205 Flood Protection Project along the lower Cedar River in the city of Renton. Identified and mapped areas at risk of interior flooding during high river conditions, based on a review of storm drain drawings and field surveys of critical overflow points.

Shared Strategy Instream Flow Assessment Pilot Project. Co-managed the study design for an instream flow pilot study in the Stillaguamish River basin with county and tribal partners. Study objective was to demonstrate a procedure using HSPF and EDT models to quantify the impacts of urbanization, land cover change, and water use on stream flow, water quality, and salmon populations.

Valterra View Estates Flow Splitter Design. Designed a flow control structure for a proposed residential development located uphill from Snohomish County Diking District No. 2. The flow control structure limits seasonal flow volumes through the diking district to pre-development levels and bypasses excess volumes to a tightline to the Snohomish River. Used HSPF hydrologic modeling to establish flow duration performance targets and to demonstrate satisfactory seasonal performance.

Mount Vernon Surface Water Management Plan Update. Managed the updating of hydrometeorological data sets for previously-developed HSPF models. Recalibrated an HSPF model of Maddox Creek to new streamflow data collected at the city urban growth boundary, using FEQ hydraulic model results to define flood storage conditions in the lower watershed. Work in progress includes detailed assessments of drainage problem areas in the Freeway Drive basin and lower Maddox Creek basin.

Dungeness River Hatchery Water Supply. Reviewed water rights certificates for the state-run fish hatchery on the Dungeness River to identify constraints which would influence the design or operation of a new intake. Performed a hydrologic assessment of published river flow data and identified flood flow and flow duration characteristics necessary for the hydraulic design of the new intake.

Green River Water Quality Assessment Storm Delineations. Developed and implemented techniques to identify discrete runoff events from continuous streamflow data in daily and hourly formats. This work was performed in support of a multi-year assessment of water quality and quantity data being collected at 13 sites in the Green-Duwamish Watershed. Developed continuous hydrograph separation techniques which produced reasonable results both for isolated storms and within prolonged complex runoff events.

Mill Creek/Mullen Slough Chronic Flooding. Conducted wet weather ground and aerial surveys to document chronic flooding conditions in the lower Mill Creek (Auburn) and Mullen Slough basins in south King County. Evaluated historical hydrometric data and determined the representativeness of the observed conditions. Identified constricting reaches and point obstructions where targeted drainage improvements would provide relief from chronic flooding.

Snoqualmie River – North Bend Flood Insurance Study. Provided a technical review of Snoqualmie River HEC-RAS models and floodplain mapping developed by the Corps of Engineers for a Flood Insurance of the Snoqualmie River and its major tributaries at North Bend. The work was performed on behalf of the City of Snoqualmie, located immediately downstream and potentially affected by the map revisions. In two major cycles of review, identified technical discrepancies which resulted in unjustified flood level increases and which were successfully resolved through meetings and discussions with the Corps and with FEMA.

Seattle South Park Storm/Tide Design Events. Developed a 48 year continuous simulation sequence of urban runoff and tidally-influenced flooding of the City of Seattle South Park area which drains to the Duwamish River. Performed future-conditions hydrologic runoff computations with HSPF and wrote FORTRAN computer code to perform continuous simulation hydraulic routing of inflow, storage, and tidally-restricted outflow. Identified historic events representing 2-year through 100-year design storm/tide sequences.

Chain Lakes Dam Break Analysis. Constructed and debugged a Version 2 FLDWAV model for dam breach inundation studies of the North Dam of the Chain Lakes Reservoir, located in Southern Alberta about 100 km south of the City of Calgary. Prepared pre-processor input templates to expedite code preparation for this unstable model. Performed model debugging support on an on-call basis for the duration of the study.

South Heart Dam Break Analysis. Developed a beta-version FLDWAV model of the South Heart River below the South Heart Reservoir in north-central Alberta, updating previous DAMBRK and DWOPER models developed for the study reach by Alberta Environment. Performed dam breach and inundation modeling for a series of assumed reservoir return inflows, and assisted in the interpretation results.

Kent Third Avenue Storm System Modeling. Performed hydrologic modeling with HSPF and storm drain network modeling with EPANET of the storm drain improvements proposed for the collection system to a new pump station under design. Confirmed pipe sizes necessary to satisfy drainage requirements.

Snoqualmie River Floodway Certifications. In separate studies, performed hydraulic assessments of water level impacts which would result from proposed developments within the federally-regulated Snoqualmie River floodway through the City of Snoqualmie. Assessments were performed and appropriate mitigation measures were developed for a large multi-field municipal park, a commercial building within the City's Historic District, and various residential lot improvements. Prepared technical documentation in support of the "no-rise" certification required by FEMA and by the City's municipal code.

Mitigation Wetland Design. Performed site inspection and hydrologic modeling services for a mitigation wetland proposed for a gravel mine near Arlington in Snohomish County. Evaluated watershed conditions and basin hydrology for the proposed impact and mitigation sites, and through HSPF modeling identified the wetland depth-duration inundation characteristics which would result under alternative mitigation and basin restoration design alternatives.

Crossings at Pine Lake Drainage Review. Performed a technical review of drainage analyses, stormwater facilities, and wetland and stream impacts from the proposed residential development of a 56-acre site on the Sammamish Plateau. The site has several large wetlands and drains to two streams. Findings were expressed in letter reports and as testimony before the City of Sammamish Hearing Examiner.

Cowlitz River Flood Analysis. Reviewed the controlled flow releases from the Cowlitz River Mossyrock Dam during flood events in November 1995 for compliance with FERC license requirements. Assessed alternative reservoir operating scenarios to determine the extent to which operating practices contributed to downstream flood damages. Testified at trial in Thurston County Superior Court.

Ledger Lake Wetland Impact Assessment. Performed hydrologic modeling and data analyses to evaluate potential impacts of city of Mount Vernon stormwater discharges to the Ledger Lake wetland complex. Modified a daily water balance simulation model of the area to incorporate a proposed pump station at the lake outlet, and to assess future water level conditions for comparison with existing conditions. Interpreted the model results in the context of regulatory guidelines for allowable wetland water level fluctuations.

Snoqualmie Ridge Post-Construction Monitoring Program. Provided technical review and regulatory oversight for a multi-disciplinary post-construction monitoring program to assess impacts of the 1,300-acre Snoqualmie Ridge Mixed Use Development. The development drains to numerous wetlands and fish bearing streams and is one of the first projects in King County to implement the requirements of the 1998 King County Surface Water Design Manual. The monitoring plan was developed to assess the performance of representative stormwater facilities, to determine if impacts to wetlands and streams were within the tolerances predicted by the project EIS, and to take remedial measures as necessary.

Snoqualmie River HEC RAS Modeling. Managed the updating of an existing HEC RAS hydraulic model of the Snoqualmie River at Snoqualmie to assess impacts of proposed modifications to the dam crest at the Snoqualmie Falls Hydroelectric Project. Work included a field survey, verification of model calibration to observed summer water level data, and hydraulic analyses to identify project water level impacts affecting summer river access and recreational opportunities.

Mount Vernon Riverbend Stormwater Alternative. Determined the hydraulic effects of discharging stormwater from 230 acres of the City of Mount Vernon to low lying fields outside the City limits. The fields are located in a diked meander loop of the Skagit River, and interact with the river by seepage flows and a flap-gated culvert. Developed a daily water balance model of the area and calibrated seepage functions and soil specific yields to reproduce historic conditions. Determined design parameters for alternative pump station and culvert improvements to mitigate impacts of the proposed stormwater discharge.

Thunder Ridge Erosion Control. Provided expert advice, on behalf of a downstream landowner, on the adequacy of site erosion control measures at the 50-acre Thunder Ridge Estates Subdivision development in Snohomish County. Confirmed through a site inspection that the development erosion control did not comply with required Best Management Practices, and prepared documentation which led to a stop work order.

Mill Creek Salem Hydrologic and Hydraulic Modeling. Developed, calibrated, and applied hydrologic and hydraulic models to assess flood control alternatives for Mill Creek at Salem, Oregon. HEC 1 and HEC HMS models were developed of the 104 square mile upper basin, calibrated to the record flood of February 1996, and applied to compute design flow hydrographs for current conditions and future scenarios with regional detention facilities. Developed and calibrated an unsteady flow branched network hydraulic model, UNET, for 15 network reaches describing Mill Creek and its tributaries which flow through the city of Salem. The UNET model was calibrated to high water mark data and very limited hydrograph data from the record flood of February 1996, and updated to incorporate flood reduction works constructed after flood event.

February 1996 Postflood Report. Managed the preparation of a postflood report for the Portland District Corps of Engineers (COE) providing comprehensive qualitative and quantitative documentation of the major storm which struck the Pacific Northwest in February 1996, causing record or near-record flooding in many basins. Archived and summarized more than 1,200 hydrometeorological data sets from USGS, NOAA, COE, and NRCS sites, developed storm isopluvial maps, determined storm intensity and flood discharge return periods, assessed flood control operations at 13 COE flood control reservoirs and 4 Section 7 flood control projects, and described COE flood fight activities.

Clarewood Development Review. Assessed drainage patterns and flood risk for properties downstream of the proposed Clarewood development in Pierce County. Provided expert testimony at a development hearing on the uncertain performance of infiltration facilities to be constructed upslope of an area with past flooding problems and the downstream flood impact risk associated with the development as proposed.

Lake Chelan Hydroelectric Project PMF Study. Developed and calibrated a HEC-1 model of the Lake Chelan basin to determine PMF rain-on-snow lake inflow and outflow hydrographs for the Lake Chelan Hydroelectric Project. The basin consists mostly of rugged mountain terrain with very steep precipitation and temperature gradients which greatly affecting local snowpack and precipitation amounts. Calibration was made to historic flood events, and PMF simulations evaluating alternative reservoir operational scenarios were made in accordance with National Weather Service and Federal Energy Regulatory Commission guidelines.

North Fork Issaquah Creek Floodplain Mapping. Updated an existing HSPF hydrologic simulation model of the North Fork basin to determine flood quantiles for current land use conditions, and developed a HEC-2 hydraulic model to determine floodplain boundaries for 1.2 miles of channel ending at the confluence with the main stem Issaquah Creek. Flood flows and floodplain boundaries in the lower portion of the study reach were determined to be influenced significantly by inter-basin flood flows originating from the main stem channel and which overtop a ridge between the basins during major floods.

Snoqualmie Ridge Golf Course Drainage Reviews. Provided technical reviews of stormwater management plans and permanent utility plans and specifications for the Snoqualmie Ridge Golf Course on the Lake Alice Plateau above Snoqualmie Falls. Reviews were made for technical accuracy and compliance with City ordinances and MDP and EIS documents. The work required analyses of numerous requests to depart from the approved MDP and standard facility designs for purposes of golf course aesthetics and to construct a large lake combining functions of water quality treatment and storage of recycled water. Results were expressed by detailed review memoranda, meetings with the City and applicant, and participation at meetings of the City Planning Commission.

Nevada Flood Insurance Hydrology Studies. Updated hydrology studies and determined design flows for FEMA floodplain mapping of three mountain streams in Washoe County near Reno and the North Las Vegas Wash Flood Control Project near North Las Vegas, Nevada. Design flows for the Washoe County streams were determined from a regional analysis to be governed by a population of relatively rare (about 50-year and higher return periods) cloudburst events accompanied by high sediment and debris loads. Existing HEC-1 models for the North Las Vegas Wash were reviewed and updated to improve estimates of 500-year flows. Methodologies used in the previous analyses had substantially underestimated 500-year flows by overlooking the loss of flow control when the 100-year design capacity of a major flood control facility is exceeded.

Washington Watershed Assessments. Conducted surface water assessments of the Deschutes, Snohomish, and Walla Walla Water Resource Inventory Areas under a statewide program of initial watershed assessments for the Washington State Department of Ecology (DOE). The purpose of this work was to characterize the "health" of the surface water resources in each watershed to facilitate decision-making by DOE on water rights applications. Examined available flow data in relation to established instream flow regulations, and conducted time-series assessments of streamflow and precipitation data to determine whether there were indications of declining minimum or average annual flows unrelated to natural climatic fluctuations.

Faro Mine Dam Break Analysis. Developed and debugged a DAMBRK model to perform dam breach simulations for a water supply reservoir at an abandoned mine in Yukon Territory.

Wenatchee Alluvial Fan Flood Hazard Review. Resolved a 20-year old dispute between the city of Wenatchee and two federal agencies over the extent of 100-year flood hazard. Evaluated methodologies and assumptions used by previous studies, and developed updated flood hydrology estimates analyses based on HEC-1 modeling, regional analysis, and a 90-year archival record of flooding from local newspaper reports. Performed hydraulic analyses with the Federal Emergency Management Agency's FAN alluvial fan model. Study results led to an 80% reduction of the regulatory flood hazard zone, relieving more than 500 property owners from the need to purchase federal flood insurance and saving more than \$200,000 per year in premiums.

Mount Vernon Regional Drainage Analyses. Used HSPF simulation models of current and future land use conditions in the City of Mount Vernon to identify drainage problems along main stem channels throughout the city. Developed designs and costs for proposed alternative solutions including pump stations, regional detention pond facilities, and culvert replacements.

Snoqualmie Ridge Parkway Plan Reviews. Reviewed Stormwater Management Plans, Erosion and Sediment Control Plans, and construction drawings for stormwater aspects of the 3.2-mile long Snoqualmie Ridge Parkway. Principal stormwater facilities include water quality/detention ponds, biofiltration swales, and a large-diameter high-flow bypass pipeline. The high-flow bypass pipeline is sized to convey excess flow from the Parkway and the adjoining Snoqualmie Ridge and Falls Crossing sites for direct discharge into the Snoqualmie River. Plans and drawings were reviewed for technical accuracy and for compliance with the King County Surface Water Design Manual, City of Snoqualmie ordinances, and project MDP and EIS documents. Coordinated subconsultant reviews of water quality and wetlands issues and facilities.

Mount Pinatubo Regional Hydrologic Analysis. Conducted a regional analysis of rainfall and streamflow data for the Mount Pinatubo region, assessed data reliability, prepared isopluvial maps of 2- through 500-year rainfall amounts for 24-hour through 5-day durations and, through HEC-1 modeling, developed flow duration and flood frequency curves for 39 potential sediment and flood control project sites on major streams affected by the 1991 eruption of Mount Pinatubo. Study results were published in COE Technical Report GL-94-16, Post Eruption Hydrology and Hydraulics of Mount Pinatubo, The Philippines.

Falls Crossing Master Drainage Plan (MDP) Review. Reviewed Draft MDP hydrologic and flood impact analyses submitted to the City of Snoqualmie for approval of a development partially located within the Snoqualmie River floodplain. Coordinated reviews of water quality and wetlands issues by subconsultants.

Cedar Hills Gaging Services and Data Processing. Responsible for operation of a six-station gaging network at the Cedar Hills landfill for a period of one year to identify and eliminate persistent data discrepancy problems. Conducted field tests and theoretical reviews which positively identified two principal problems: control elevations which had been incorrectly reported on "as-built" drawings, and inaccuracies in the technical manual used to derive theoretical rating curves for multiple-orifice outlet structures. Developed revised stage-discharge relationships which eliminated the data discrepancies, and provided training to client staff in data processing and reporting practices.

Supermall Downstream Impact Assessment. Developed current and future land use HSPF simulation models for the proposed Supermall of the Great Northwest to identify downstream impacts. Linked hourly HSPF simulation results to a finite difference unsteady flow model, FEQ, and assessed water level impacts through a complex system of wetlands, ditches and culverts to the downstream receiving channel.

Snoqualmie Ridge Master Drainage Plan (MDP) Review. Reviewed Draft MDP hydrologic analyses and conceptual facility designs submitted to the City of Snoqualmie for mixed use development approval. Reviewed hydrologic analyses for adequacy of HSPF model calibration and measures proposed to deal with uncertainty in the analyses. Reviewed conceptual facility designs for feasibility and compliance with applicable development standards. Coordinated reviews of water quality and wetlands issues by subconsultants.

Myrtle Creek Flood Study Review. Reviewed flood hydraulics and floodplain mapping studies for the Town of Myrtle Creek located at the confluence of Myrtle Creek and the South Umpqua River. The work was undertaken on behalf of the Federal Emergency Management Agency to resolve a 4-foot discrepancy in the 100-year flood elevation as reported by two other federal agencies. The discrepancy was resolved by identification of an error in one of the earlier analyses.

Snoqualmie Parkway EIS and SMP Reviews. Managed a multidisciplinary review of water quantity, water quality, and wetlands elements of Environmental Impact Statement materials and supporting documents submitted to the City of Snoqualmie for the proposed Snoqualmie Ridge Parkway. Subsequently reviewed the Stormwater Management Plans (SMP) and construction drawings for compliance with applicable standards and representations made in the environmental impact process. The work was undertaken for the City of Snoqualmie under the direction of the Director of Community Development.

Evans Creek HSPF Model Calibration. Calibrated the EPA's Hydrologic Simulation Program - Fortran (HSPF) to streamflow and wetland water level data collected at four sites in the Evans Creek West catchment of the proposed Northridge/Redmond Ridge Urban Planned Development in King County.

Cedar Hills Hydrologic Data Review. Reviewed the accuracy of rain and flow data being collected at the Cedar Hills landfill to determine downstream impacts and for future calibration of a hydrologic model. Identified erroneous records through double-mass analysis, reviewed implications of stage measurement and theoretical rating curve errors, and recommended measures for improving data accuracy.

Hawaii Water Use Inventory. Implemented Hawaii State Water Code legislation requiring registration of all wells and stream diversions statewide, declaration of water use, and monthly reporting of water use. Gave public workshops on water code requirements, developed systems, procedures, and databases to analyze and manage the contents of 7,300 declarations of water use, acted on all declarations, and coordinated field survey activities for verification of water facilities and uses.

Hawaii Database Development. Developed computer databases to track processing of Hawaii well and stream diversion works construction permits, to inventory wells, stream diversions, and water uses statewide, and to target specific groups by geographic area and/or activity for mailings of notices and informational materials.

Hawaii Water Rights and Dispute Resolution. Administered the first contested case hearing before the Hawaii Commission on Water Resource Management, including mediating discussions between opposing expert witnesses, preparing the Findings of Fact, and drafting the Commission's Decision and Order. Prepared the Findings of Fact report which led to the designation of the Island of Molokai as a Water Management Area. Prepared Departmental testimony to the Legislature on proposed amendments to the State Water Code.

Hawaii Satellite-Linked Water Resources Data Collection. Initiated and developed a pilot program for collecting real-time precipitation and other water resources data via satellite from remote areas in Hawaii.

Bank Protection Research. Conducted a comprehensive review of alternative methods of streambank protection, seeking those that would provide cost-effective alternatives to conventional riprap protection for highway bridges in Alberta. Computed present value project life costs of promising alternatives, considering allowable velocities, maintenance costs, local availability of materials, and transportation costs.

Jasper Park Lodge Water System Analysis. Conducted computer analysis of recirculating water system for Jasper Park Lodge; identified causes and recommended solutions to problems of low water pressure and fluctuating water temperatures.

Water Utility Privatization Study. Determined rate structures and impact on consumers which would result from the privatization of water and sewerage facilities for small municipalities.

Montserrat, W.I., Integrated Resource Development Project. Provided specialist water resources input on a five-person multidisciplinary mission in Montserrat, W.I. for the Canadian International Development Agency. Determined design and construction specifics and costs for small dam and irrigation projects to facilitate agricultural self-sufficiency.

St. Lucia W.I. Roseau River Carriage Loss Assessment. Determined water losses which would result from using a natural channel to transmit water from a proposed water storage reservoir to downstream agricultural users.

St. Lucia W.I. Roseau Basin Water Development Program. Provided hydrologic input toward site selection for a water supply reservoir in St. Lucia, W.I. Reviewed reliability of available hydrometric data and extended streamflow records using rainfall records and computer modeling techniques. Estimated low-flow sequences to determine reservoir storage needs, and design floods for spillway sizing. Conducted training with local personnel for computer use and hydrologic techniques.

School Financial Planning Model. Refined a prototype computer model to project finances over a 5-year horizon based on scenarios of economic and demographic growth, required facilities, debt structure, salary rates, and programs of government financing.

City of Yellowknife Municipal Financial Assessment. Assessed the impact of the City's 5-year capital improvements plan on financial stability and tax rates.

Ross Creek Basin Surface Water Supply. Developed a computer simulation model which accounted for varying precipitation, evaporation, runoff and water consumption within the Ross Creek Basin in southern Alberta. The model was used to develop a 50-year sequence of natural runoff conditions and to assess alternative water supply management proposals.

Peace River Basin Surface Water Supply. Determined surface water supply characteristics from limited streamflow records based on regional correlations and frequency analyses, and computed reliable water supplies for 22 communities in northwest Alberta based on intake characteristics, current and projected water consumption, and existing reservoir facilities.

Pipeline River Crossings. Conducted field surveys and determined hydraulic design parameters of scour, bank erosion and 1.100 year high water levels at 32 river crossings of the Alaska Highway Gas Pipeline and 7 river crossings of the Alberta Deep Basin Pipeline.

Gull Lake Regulation Study. Developed and calibrated a computer simulation model to determine causes of historical declines in lake levels and assessed the effectiveness of alternative lake management scenarios on the basis of historical hydrological conditions.

Carriage Loss Investigations. Designed and coordinated a field research study to monitor carriage losses over 60 km of natural channel in Southern Alberta; analyzed field data to determine the magnitude, uniformity, and causes of losses. Reviewed and evaluated all previous studies conducted to assess carriage losses in natural channels in Alberta and Saskatchewan, and developed techniques to predict carriage losses which affect reservoir release flows into natural channels.

Isle Lake - Lac Ste. Anne Stabilization. Developed and implemented a computer simulation model to examine proposals to stabilize lake water levels.

Alaska Highway Gas Pipeline Route Hydrology. Six-month in-house assignment with the Yukon Pipeline Design Joint Venture design team. Provided hydrotechnical input on small basin hydrology and for development of drainage and erosion control criteria.

Berry Creek Channel Losses. Determined channel losses affecting reservoir release flows over 12 km of natural channel in southern Alberta.

Willow Creek Water Supply. Determined causes of winter water supply shortage at communities drawing water from Willow Creek below Chain Lakes Reservoir in southern Alberta.

Little Bow Basin Water Supply. Assessed basin water supplies as affected by internal runoff and inter-basin water diversions.

Whitford Lake Basin Management. Developed a comprehensive study program to establish an engineering data base and methodologies to evaluate drainage and flood control projects in the Whitford Lake Basin in central Alberta.

Buffalo Bay - Horse Lakes Management Program. Developed a computer simulation model to assess water levels and discharges in the Buffalo Bay - Horse Lakes complex in north-central Alberta under alternative management schemes.

Rat Creek Bridge Crossings. Conducted field surveys, determined hydraulic design parameters, and designed abutment armoring for two single-span bridge crossings in central Alberta.

McLeod River Bank Stabilization. Conducted field surveys and designed rip-rap armoring for bank stabilization at a railway bridge in central Alberta.

Channel Ice Surveys. Conducted winter ice and breakup surveys at 52 river crossings encountered along the British Columbia segment of the proposed Alaska Highway Gas Pipeline.

Red Deer River Floodplain Development. Determined open water and ice jam design flood levels and developed measures for floodplain development in Red Deer, Alberta.

St. Mary Canal Sedimentation. Conducted field bed load transport studies to assess sources and mechanisms of canal sedimentation in southern Alberta.

Dickson Dam Diversion Tunnel Model Study. Constructed and tested a 1:54 scale physical model of dual 5.5 m diameter diversion tunnels. Assessed and optimized intake and outlet flow patterns, minimized transition losses, and assessed outlet scour. Supervised construction of a 1:70 scale model of the 60 m wide, 190 m long service spillway for the dam project.

Port McNeill Harbour Breakwater Model Study. Constructed and tested a 1:100 scale physical model of the Port McNeill harbour region in British Columbia. Developed a breakwater design to shelter a proposed harbour expansion from ocean waves.

Elbow River Channel Improvement. Conducted field surveys and designed channel improvements to increase Elbow River side-channel flows in the Calgary, Alberta. The work was undertaken to demonstrate city ownership of riparian lands and to discourage encroachment by adjacent private landowners.

Harvey Creek Channelization Model Study. Constructed and tested 1:15 and 1:25 scale physical models of a steep 12 degree channel in British Columbia. Assessed the stability of 1.0 m diameter boulders under flood conditions, and flow patterns through transitions and curves in an engineered reach of channel.

Cooling Pond Circulation Model Studies. Constructed and tested physical scale models of cooling ponds formed in natural topography for three thermal generating stations in central Alberta: the Calgary Power Ltd. Keephills Thermal Plant, the Edmonton Power Genesee Power Project, and the Alberta Power Ltd. Sheerness Generating Station. Assessed alternative dike arrangements to optimize circulation patterns under conditions including thermally stratified flow and adverse wind shear.

Sundance Helper Cooling System Model Study. Developed 1:12 scale model of a 20 m long sump bay with a 2.1 m diameter, 100,000 GPM pump intake. designed baffles to produce smooth intake flows, and determined intake energy losses.

Field Surveys. Conducted hydrometric surveys over two summers of more than 100 rivers and lakes throughout the Province of Alberta. Responsibilities included surveying of seasonal lake level elevations, streamflow gauging by wading and bridge crane methods, sampling of suspended sediment at bridge and cableway sites, hydrographic soundings and mapping of lake bottom contours, field servicing and repair of strip-chart water level recorders, and assisting in the construction and installation of housings and equipment for stream gauge stations.

PUBLICATIONS

"Use of a Scale Model to Improve Pond Circulation," Proceedings of the Specialty Conference on Computer and Physical Modeling in Hydraulic Engineering; Chicago, Illinois; August, 1980.

"Carriage Losses in Natural Channels in Southern Alberta," with S.J. Figliuzzi. Proceedings of The 1986 Canadian Hydrology Symposium on Drought: The Impending Crisis?; Regina, Saskatchewan, June 1986.

"U.S. Television Programs in the International Market: Unfair Pricing?" with C. Hoskins and R.K. Mirus. Journal of Communication, (Spring 1989) Vol. 39, No. 2, pp. 55-75.

| Skills | Project Experience |
|--|--|
| <p>Area of Expertise</p> <ul style="list-style-type: none"> • Project management • Client development • Team building • Budgeting • Change management <hr/> <p>Education</p> <ul style="list-style-type: none"> • Bachelor of Science (B.Sc.), University of Northern British Columbia, 1996 <hr/> <p>Training</p> <ul style="list-style-type: none"> • Corporate Strategy Development, Sean Durfy (former CEO Westjet), 2012 - 2013 • Executive Mentoring, Philippe Favreau (former COO Creo), 2011 – 2012 <hr/> <p>Board Positions</p> <ul style="list-style-type: none"> • BC Trucking Association, 2011–2014 • Caterpillar Class 8 Truck Development Steering Committee, 2011–2013 | <ul style="list-style-type: none"> • Chief Operating Officer, Maple Leaf Loading Ltd., Prince George, BC – Responsible for oversight of all daily activities for 300 person corporate team that generated annual operating revenues of \$70 million with a net margin of 11%. Developed and implemented key safety initiatives for the company. (2009 - 2014) <ul style="list-style-type: none"> – Developed and implemented key safety initiatives including Certified ROPS Canopy, CSA Certified Braking System, CSA Certified Supplemental Steering and Seatbelt Interlocks; – Lead the selection and implementation of all operating equipment; – Lead the ratification of the corporate maintenance program to ensure alignment with federal and provincial safety regulations, manufactures requirements and corporate objectives; – Assembled an operational and corporate team of 300 people; – Created a culture of dedication, performance and hard work that reduced operational turnover from 50% to 20% over two years; – Received the “Northern BC Business and Technology Implementer of the Year 2011”; – Created annual budgeting and forecasting models used to establish “Management Business Objectives” for each team and division; – Implemented performance monitoring, continuous improvement, operational efficiency programs across the organization including maintenance; – Built the operations support team which included Safety, Human Resources, Accounting and Business Development; – Lead internal auditing of safety, maintenance and Implemented paperless truck and driver logs; – Led the selection and implementation of a real-time industry-specific accounting and reporting system; – Prepared significant presentations for Board meetings and Annual General Meetings to comply with public entity reporting requirements. • General Manager, Maple Leaf Loading Ltd., Prince George, BC – Grew the organization from inception to an employee base of 150 people and \$30 million in annual revenues. Developed and maintained strong customer relationships. Selected and developed the management team responsible for the original growth. Developed corporate objectives and tracked progress against objectives. Expanded operations from one discipline into several, including transportation and logistics, construction and consulting. Diversified into other market sectors (construction industry / wood fibre industry.) (2004 – 2009) |



- **Project Manager**, Allnorth Consultants Limited, Prince George, BC – Built and maintained the mining division of Allnorth to 40% of corporate revenue. Single largest revenue generating project manager: \$4.2 million in 2004. As a Corporate Leadership Team member assisted in the strategic planning for the organization. Selected engineers to mentor junior project managers across the company. Key projects during this period include:
 - EB Mine, Environmental Assessment Team (2007);
 - EB Mine, Feasibility Study Team (2007);
 - Herman Mine, Environmental Assessment Team (2006);
 - Wolverine Mine, Construction Management Team (2005 - 2006);
 - Brule Mine, Environmental Assessment Team (2005);
 - Brule Mine, Feasibility Study Team (2004 – 2005);
 - Willow Creek Mine, Construction Management Team (2004);
 - Red Chris Mine, Access Development Team (2001 – 2005).

As a member of the construction teams, responsible for tendering, construction management and commissioning of facilities. As a member of the environmental assessment teams, responsible for completing work on all infrastructures including power, road and rail. Specific tasks included formulating the capital and operating costs as well as comprehensive risk assessment and mitigation strategies.

- **Forestry Manager**, Allnorth Consultants Limited, Prince George, BC – Established and expanded the Forestry Consulting division of Allnorth to a staff of 35 professionals. Completed all field related proposals for services with private sector and government entities. Selected and hired all department staff. Established safety and professional protocols to ensure quality execution.

Biography

Don Watt has more than 21 years of experience in the resource sector which includes a wide variety of forestry and mining projects. Don provides ethical, value-based leadership on projects he is involved in ensuring that client needs are met on time and within budget. He has significant operating experience developing markets and overcoming operating challenges. Don has an extensive history with Allnorth as Forestry Manager and Project Manager. During the time period of 2004 through 2014, he was also key in the development of Maple Leaf Loading Ltd., a resource logistics service provider.