MEMORANDUM

Date: May 25, 2023
To: Andrea McNamara Doyle, Office of Chehalis Basin, Washington State Department of Ecology
From: Larry Karpack, PE, Watershed Science and Engineering
cc: Guillaume Mauger, UW CIG; Heather Page, Anchor QEA
Re: Simulation and Analysis of Global Climate Model Ensemble for the Chehalis Basin

Introduction and Summary of Results

Previous hydrologic analyses for the Chehalis Basin considered future conditions, including the projected effects of climate change on streamflows (both peak flows and seasonal flow volumes), temperatures, and precipitation. Conditions were previously evaluated for mid-century and late-century time frames with projected changes estimated based on data available from two Global Climate Models (GCMs). The purpose of the current work is to expand upon the earlier climate change analysis by modeling and analyzing 11 additional global climate models. The expanded set of 12 GCMs is hereinafter referred to as an ensemble.

The two GCMs used in the previous climate change analyses were ACCESS 1.0, with emissions scenario Representative Concentration Pathway (RCP) 4.5, and GFDL-CM3, with emissions scenario RCP 8.5. RCP 4.5 is described by the Intergovernmental Panel on Climate Change (IPCC) as a moderate scenario in which emissions peak around 2040 and then decline thereafter. RCP 8.5 is the highest baseline emissions scenario in which emissions continue to rise throughout the twenty-first century.

This current work includes hydrologic modeling of the ensemble of 12 GCMs, all of which use the RCP 8.5 emissions scenario. Flow frequency and seasonal volume analyses were conducted on the simulated streamflow data to provide insight into projected future climate change. This information can aid in planning and evaluating future flood damage reduction and aquatic species restoration work in the basin.

Results across the full ensemble of models for mid-century and late-century periods show the average, median, minimum, and maximum projected increases. For example, the median projected mid-century increase in peak flows across all 12 GCMs is 10% with a minimum of -14% and a maximum of 37%. The corresponding values for late-century are a median projected increase of 25% with a minimum projected increase of 3% and a maximum projected increase of 55%.

Projected flow increases at other durations (e.g., 1-day, 3-day, and 7-day flows) were also evaluated, as was the spatial patterns of projected peak flow increases. Unlike earlier analyses, the current analysis found there were no obvious spatial patterns in the projected peak flow increases across the full ensemble of models. While it might be possible to define spatial variations in projected flow increases

for a particular GCM, it is not possible to define a single spatial pattern that captures the results of the full ensemble of models.

Finally, in addition to analyzing peak flow increases, seasonal flow volume changes were also evaluated. The median projected change across the 12 GCMs by mid-century is a slight increase in both summer season (low) flows and winter season (high) flows, while by late-century summer flows are projected to decrease by about 5% (median of 12 models) and winter flows are projected to increase by 6% (median of 12 models).

Current Study

Study area and surroundings

The Chehalis River Basin in southwestern Washington is the largest river basin entirely within the state. It has a unique ecosystem supporting numerous anadromous salmonid species, additional native fish, amphibians, and other wildlife. This basin has recently experienced major flooding and substantial degradation of aquatic species habitat.

The Chehalis Basin extends over eight counties, including large portions of Grays Harbor, Lewis, and Thurston counties, and small parts of Pacific, Cowlitz, Wahkiakum, Mason, and Jefferson counties. The Chehalis River extends approximately 125 miles from the Willapa Hills upstream of Pe Ell in Lewis County to Grays Harbor and the Pacific Ocean near Aberdeen in Grays Harbor County. The river drains an area of approximately 2,700 square miles. Figure 1 shows the Chehalis River basin including the Upper and Lower Chehalis River Water Resource Inventory Areas (WRIAs).

Land use in the Chehalis Basin consists primarily of agriculture, commercial forestry, and urban and suburban development. The Chehalis Basin Board, and others, have determined that evaluation of flood damage reduction and aquatic species restoration projects must consider both historical hydrologic conditions as well as projected future conditions.

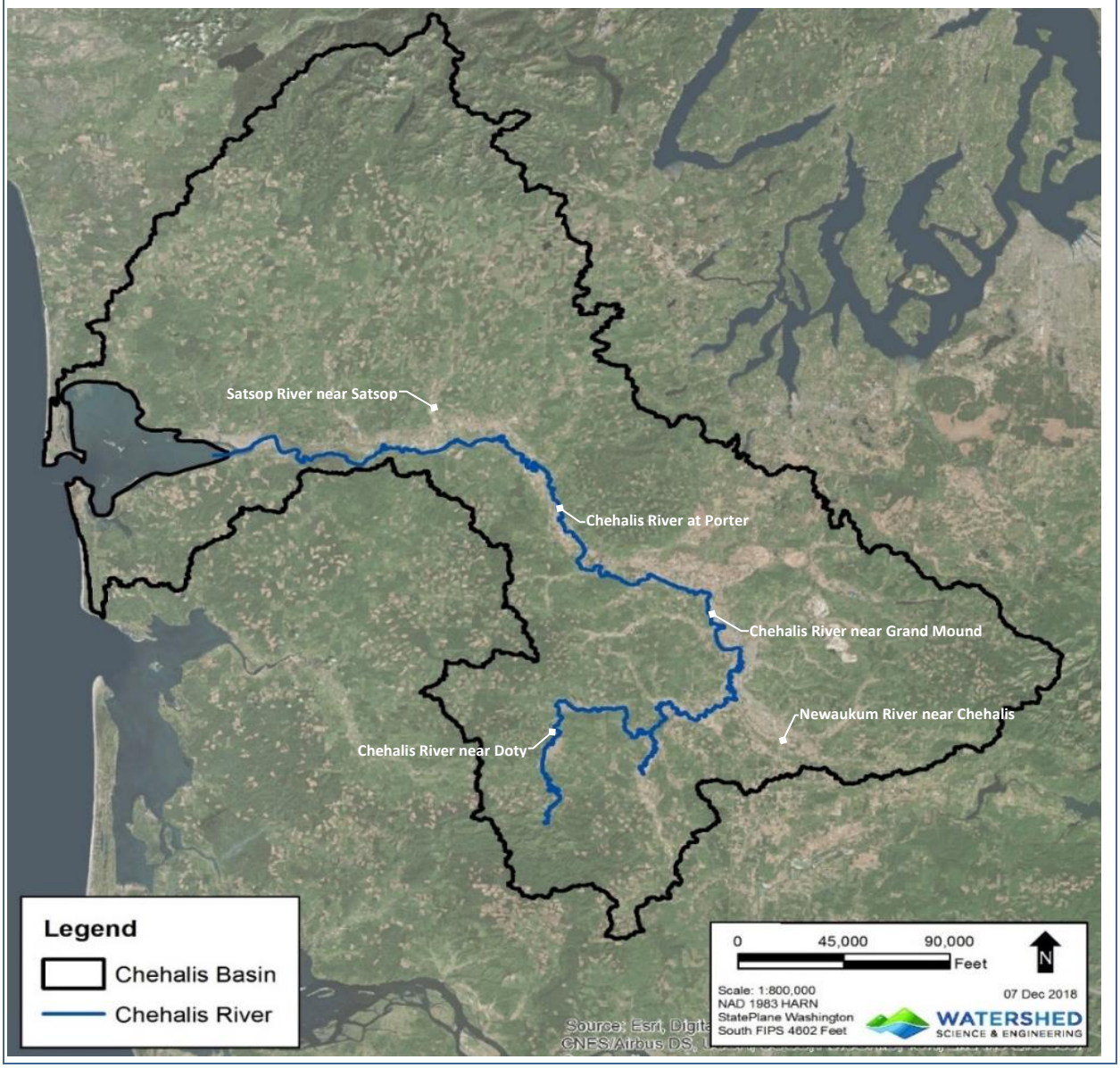
Overview

The current study uses data from 12 global climate models, one of which, the GFDL-CM3, was previously evaluated in 2019 (WSE, 2019). An additional 11 downscaled GCM meteorological data sets are available from the UW Climate Impacts Group[1]. These are:

- ACCESS 1.0 global model, RCP 8.5. Years: 1970-2099
- ACCESS 1.3 global model, RCP 8.5. Years: 1970-2099
- BCC-CSM1-1 global model, RCP 8.5. Years: 1970-2099
- CanESM2 global model, RCP 8.5. Years: 1970-2099

[1] https://cig.uw.edu/datasets/dynamically-downscaled-hydroclimate-projections-wrf-model/

Figure 1
Chehalis River Basin and Key USGS Gage Sites



- CCSM4 global model, RCP 8.5. Years: 1970-2099
- CSIRO-Mk3-6-0 global model, RCP 8.5. Years: 1970-2099
- FGOALS-g2 global model, RCP 8.5. Years: 1970-2099
- GISS-E2-H global model, RCP 8.5. Years: 1970-2099
- MIROC5 global model, RCP 8.5. Years: 1970-2099
- MRI-CGCM3 global model, RCP 8.5. Years: 1970-2099
- NorESM1-M global model, RCP 8.5. Years: 1970-2099

The current study evaluates future climate projections using each of these models, to provide context for past climate change modeling that has been done to date in the Chehalis basin and to generate data for use in future climate change modeling. This study includes two main tasks: first, an evaluation of potential bias correction techniques and selection of an appropriate method for this study; and second, hydrologic model simulations of long periods of record with each of the 12 bias-corrected GCM driving data sets and statistical analyses of simulated flows at various locations in the Chehalis basin. The results of this study includes projections of climate change impacts on flows in the Chehalis basin for mid-century and late-century. Bias correction of the meteorological data ensures that hydrologic simulations of the historical period are as accurate as possible, making the data more useful for comparisons between historical and future conditions.

Previous studies and data

In 2019, Watershed Science and Engineering (WSE) completed hydrologic modeling and analysis using the Distributed Hydrology Soil Vegetation Model[2] (DHSVM) to evaluate the effects of projected climate change on Chehalis Basin hydrology (WSE, 2019)[3]. The 2019 calibrated DHSVM hydrologic model and the data sets listed below and were used in the current study.

Data Sources

Key inputs to the hydrologic model include topographic data, soils data, land cover data, and meteorological data. For the Chehalis Basin model the following data sources, used by WSE in 2019, were also used for the current study:

- Topographic data – US Geological Survey (USGS) National Elevation Dataset 10 – and 30-meter Digital Elevation Model (DEM)[4]. Accessed April 2018.
- Soils Data – Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) (Soil Survey Staff, NRCS, United States Department of Agriculture. Web Soil Survey[5]. Accessed April 2018). For a very small portion of the basin SSURGO data were not available. In these areas, the State Soil Geographic Database (STATSGO), which is coarser than SSURGO, was used instead (obtained online using the same link as the SSURGO data). Note: SSURGO and STATSGO are based on local data and observations. They are not generated from remote sensing, unlike products such as the NLCD below.
- Land Cover Data – USGS 2011 National Land Cover Dataset[6] . Accessed April 2018.
- Meteorological Data –The meteorological data used in the 2019 study include long term historical reanalysis data covering the period 1980 – 2015. This is commonly referred to as the

[2] https://www.pnnl.gov/projects/distributed-hydrology-soil-vegetation-model
[3] https://chehalisbasinstrategy.com/wp-content/uploads/2019/04/20190228_Memo_Chehalis_Chehalis-River-Basin-Hydrologic-Modeling.pdf
[4] https://www.sciencebase.gov/catalog/item/4fcf8fd4e4b0c7fe80e81504
[5] https://websoilsurvey.nrcs.usda.gov/
[6] https://www.mrlc.gov/, originally accessed from https://catalog.data.gov/dataset/usgs-national-land-cover-dataset-nlcd-downloadable-data-collection

Pacific Northwest National Laboratory (PNNL) WRF historical data set and covers the entire Chehalis River basin.

Current Study Approach

As noted above, the current study comprised two main tasks: evaluation and selection of an appropriate bias correction technique, and long-term simulations and statistical analyses to inform climate change projections. Subtasks in the present study are listed below. Greater detail on each of these is provided in the following sections.

1. Coordinate with the University of Washington Climate Impacts Group (UW CIG) to obtain the PNNL WRF historical data set and the dynamically downscaled meteorological inputs for the 12 GCMs.
2. Run the DHSVM model for the historical period for four different bias correction techniques and evaluate the results for statistical goodness of fit at 12 USGS gages in the basin.
3. Select a bias correction technique for use in the current study.
4. Run the previously developed and calibrated DHSVM hydrologic model (WSE, 2019a) to simulate runoff throughout the Chehalis River basin for each of the downscaled GCM data sets for the 130-year period of record.
5. Output flow data from the DHSVM model for key locations in the basin, convert these outputs to cfs and import to Hydrologic Engineering Center-Data Storage System (HEC-DSS)[7].
6. Conduct flow frequency analyses on the DHSVM flow outputs at 20 locations in the basin (corresponding to the USGS long term flow gages and other locations previously used in WSE, 2019a) for three time periods (historical, mid-century, late-century) and for multiple durations (instantaneous peak, 1-day, 3-day, 7-day).
7. Compare historical, mid-century, and late-century winter (November – April) and summer (May – October) seasonal flow volumes at 12 USGS gage locations.
8. Summarize, interpret, and evaluate the results of the frequency and seasonal volume analyses to determine projected climate change scalars that reflect the spatial variations seen in the DHSVM results (median and high/low range of projections for multiple durations).
9. Report and present the results to the Ecology SEPA EIS team.
10. Act as a resource to Ecology and others considering application of the new analyses in forecasting future conditions under climate change.

[7] https://www.hec.usace.army.mil/software/hec-dss/

Selection of an Appropriate Bias Correction Technique

Meteorological Data for Climate Change Analyses

WSE coordinated with the UW CIG to obtain the latest version of the PNNL WRF historical reanalysis meteorological data set, covering the period January 1980 through December 2020[8]. These data were used in the bias correction evaluations described below. UW CIG also provided bias-corrected, dynamically downscaled, GCM data for each of the models listed above. These data have undergone extensive review and QA/QC by UW CIG and others and have been used on many other studies.

Bias Correction Evaluation and Results

Recent analyses by the UW CIG have shown that making bias adjustments to the meteorological data prior to running the DHSVM simulations can result in substantial improvements in the model's ability to match observed streamflow data. In the case of the Chehalis Basin, the DHSVM hydrologic model was previously calibrated to basin streamflow data without making bias corrections to the meteorological inputs (WSE, 2019). For the current study, four alternative bias correction techniques were investigated:

1. No correction – raw PNNL WRF data without any bias adjustment.
2. Raw WRF with PRISM subgrid – this alternative makes no change to the PNNL WRF downscaled hourly precipitation amounts, but spatially refines the 6km x 6km gridded precipitation data down to an 800 m grid based on monthly PRISM precipitation normals.
3. Delta PRISM – this alternative adjusts the WRF downscaled hourly precipitation amounts for all grid cells by a single scalar computed as the ratio of WRF monthly precipitation to PRISM monthly precipitation for low elevation (non-orographic) regions of the basin. The adjusted data were then spatially refined to the 800-meter grid in the same manner as alternative 2.
4. Delta Grid PRISM – this alternative adjusts the WRF downscaled hourly precipitation amounts for each WRF grid cell based on the ratio of WRF monthly precipitation to PRISM monthly precipitation for that particular grid cell (i.e., the downscaled precipitation is adjusted to match PRISM values for each cell). The adjusted data were then spatially refined down to the 800-meter grid based in the same manner as alternative 2.

The DHSVM model was run for the period of meteorological data (January 1980 – December 2020) using each of the four bias correction alternatives. Simulated flow outputs were saved at 12 locations in the basin, corresponding to the long term USGS gage locations:

- Chehalis River near Doty
- South Fork Chehalis River near Wildwood
- Chehalis River at Adna

[8] Note that for the 2019 modeling the PNNL WRF reanalysis data set only extended through 2015. The current study used the data set extended through December 2020.

- South Fork Newaukum River near Onalaska
- North Fork Newaukum River near Forest
- Newaukum River near Chehalis
- Skookumchuck River at Vail
- Skookumchuck River near Bucoda
- Chehalis River at Grand Mound
- Chehalis River at Porter
- Satsop River at Satsop
- Humptulips River below Hwy 101

The simulated flows were then compared to the USGS observed flow, and the following statistical measures were computed:

- Nash – Sutcliffe Efficiency: a measure of the model's goodness of fit across all flows
- Kling-Gupta Efficiency: a measure of the model's goodness of fit focused on high flows
- Annual Peak Flow Bias: a measure of the bias in peak annual flows
- Average Error: the average difference between modeled and observed flows, a measure of bias
- % Ave Error: the ratio of the average error to the mean annual flow
- Root Mean Square Error: a measure of simulation accuracy giving more weight to larger errors
- Mean Absolute Error: a measure of the model's average error, independent of sign
- Correlation: a statistical measure of the goodness of fit
- Log Correlation: a statistical measure of the goodness of fit, based on logs of the data, weighted to low flows
- Season 1 (summer) Average % Flow Error: a measure of model error in the low flow season
- Season 2 (winter) Average % Flow Error: a measure of model error in the high flow season

Table 1 summarizes the results of each of the bias correction alternatives for each of the statistical measures. The top four rows of Table 1 show the average value of the measure across all 12 gage sites. The next four rows summarize the number of locations (out of 12) that each alternative was the best performing among the four alternatives. The final four rows show the number of locations (out of 12) that each alternative was the worst performing among the four alternatives. The shading shows the best (gold) and worst (red) performing of the alternatives for each measure.

Table 1: Summary Statistics for Bias Correction Alternative Evaluation

Bias Correction Method	Nash - Sutcliffe	Kling - Gupta	Annual Peak Flow Bias	Average Error (Qm - Qo)	Average % Error	Root Mean Square Error	Mean Absolute Error	Correlation	Log Correlation	Season 1 Average % Error	Season 2 Average % Error
					Average Across all sites						
Raw WRF	0.43	0.64	7%	6	7%	1196	557	0.79	0.89	18%	4%
Raw WRF PRISM	0.66	0.73	-21%	-158	-9%	1071	508	0.83	0.92	-13%	-7%
Delta PRISM	0.35	0.53	19%	391	25%	1546	722	0.80	0.89	37%	22%
Delta Grid PRISM	0.60	0.71	-12%	133	1%	1224	590	0.82	0.89	16%	-3%
					Summary of Best Performing						
Raw WRF	1	3	2	3	3	0	0	0	0	3	3
Raw WRF PRISM	11	7	3	6	6	11	11	11	12	5	6
Delta PRISM	0	0	2	0	0	0	1	0	0	0	1
Delta Grid PRISM	1	2	4	3	3	1	0	1	0	4	3
					Summary of Worst Performing						
Raw WRF	4	3	1	2	2	4	4	4	3	1	4
Raw WRF PRISM	0	1	3	2	2	0	1	0	0	1	0
Delta PRISM	8	8	4	8	8	8	7	4	5	10	7
Delta Grid PRISM	0	0	3	0	0	0	0	2	4	0	1

Looking at the summary in Table 1, it is clear that the Raw WRF PRISM bias correction alternative generally performed the best among the four (it was statistically best, on average, for 7 of the 11 measures). Raw WRF PRISM was also the best performing alternative at more of the individual locations than any of the alternatives for 10 of the 11 measures. Finally, it was the worst performing alternative for any of the measures at only a few locations (the most being three of the locations for annual peak flow bias). On the other end of the spectrum the Delta PRISM bias correction alternative was clearly the worst performing among the four alternatives in terms of average statistical values, was very rarely the best performing alternative, and was almost always the worst performing alternatives at the individual sites. Additional detail for the statistical comparisons shown in Table 1 is provided in Appendix A.

Based on the evaluation of alternatives, WSE recommended that the climate change ensemble modeling and analysis use the Raw WRF PRISM bias correction alternative (Alternative 2). Ecology concurred with WSE's recommendation.

Analyses to Inform Climate Change Projections

Simulation of Global Climate Model Ensemble

The UW CIG prepared bias corrected dynamically downscaled meteorological inputs for 12 GCMs, as listed previously. Each data set covered the period January 1970 through December 2099 at an hourly time step. Each of these were simulated using the previously developed and calibrated DHSVM hydrologic model (WSE, 2019). Outputs from each of the DHSVM runs were saved at 20 key locations in the basin, including the 12 long term USGS gages sites used in the bias correction test and 8 other sites selected to provide reasonable spatial coverage and a range of sub-basin sizes. DHSVM model outputs were post-processed and saved in Hydrologic Engineering Center-Data Storage System (HEC-DSS)[9] database format. Flow data from the 12 GCM simulations were evaluated at the following locations:

- Chehalis River near Pe Ell (RM 108 at the proposed flood retention facility site)
- Chehalis River near Doty (RM 101.8)
- Elk Creek near Doty (RM 0.8)
- South Fork Chehalis River near Wildwood (RM 16.2)
- Bunker Creek at Ceres Hill Road (RM 0.5)
- Chehalis River near Adna (RM 86.0)
- South Fork Newaukum River near Onalaska (RM 22.8)
- North Fork Newaukum River near Forest (RM 7.7)
- Newaukum River near Chehalis (RM 4.1)
- Skookumchuck River at Vail (RM 28.8)
- Skookumchuck River near Bucoda (RM 6.4)
- Chehalis River at Grand Mound (RM 59.9)
- Black River at Highway 12 (RM 2.1)
- Chehalis River at Porter (RM 33.3)
- Satsop River at Satsop (RM 2.3)
- Wynoochee River near Grisdale (RM 51.3)
- Wynoochee River near Montesano (RM 5.9)
- Wishkah River near Nisson (RM N/A)
- Chehalis River at Mouth (RM 0.0)
- Humptulips River below Hwy 101 (RM 22.9)

[9] https://www.hec.usace.army.mil/software/hec-dss/

Model quality assessment

Prior to conducting detailed statistical analyses of the DHSVM model outputs, WSE completed several checks to ensure the models were correctly configured. Additional steps were taken to evaluate the model outputs. These QA/QC steps are summarized below:

1. Careful review of hydrologic model input data – the meteorological input data developed by CIG were subject to extensive QA/QC review by WSE, and great care was taken to correctly apply these as inputs to the DHSVM model. Model inputs from the 2019 study were reviewed again to ensure the models were configured correctly.
2. The DHSVM input data files were provided to CIG for independent technical review.
3. Model results (as summarized below) were compared to past hydrologic modeling in the Chehalis basin (WSE, 2019) and to other climate change studies using the same GCMs (Mauger, 2020[10]).
4. Model results were presented to CIG, then to Anchor QEA, and finally to Ecology for evaluation and assessment.

Statistical Analysis of Global Climate Model Outputs

Frequency analyses using the methods of Water Resources Council Bulletin 17C were conducted on the simulated flows for the 12 GCMs for at the 20 locations identified above. The data were subdivided into three 45-year periods for analysis: historical (WY 1971 – 2015), mid-century (WY 2016 – 2060), and late-century (WY 2055 – 2099). The mid- and late-century flow quantiles were compared to the historical period quantiles at each location. Comparisons were made for the 1.01-, 2-, 5-, 10-, 25-, 50-, 100-, and 500-year flood events. The projected percentage increases in peak flows by mid- and late-century were then summarized across quantiles (2- through 100-year) and locations (20 locations). Table 2 summarizes the results of the flow frequency evaluations.

Table 2 shows the average and median projected change in peak flows across all quantiles and locations for each GCM. It also shows the maximum increase at any individual location (averaged across the 2- through 100-year quantiles) and the minimum increase at any individual location. Finally, Table 2 shows the range in model results for each model in terms of the percentage increase from lowest to highest.

Results across the full ensemble of models for mid-century and late-century periods are also summarized in the last three rows in Table 2. This shows the median, minimum, and maximum change in peak flows (averaged across all quantiles) for each of the measures previously described. For example, it can be seen in Table 2 that the median projected mid-century increase in peak flows across the 12 GCMs is 10% with a minimum of -14% (model MRI-GGCM3) and a maximum of 37% (model GFDL-CM3). The corresponding values for late-century are a median projected increase of 25% with a minimum

[10] https://cig.uw.edu/wp-content/uploads/sites/2/2022/07/TechMemo_KCflood2_20201124.pdf

projected increase of 3% (model GISS-E2-H) and a maximum projected increase of 55% (model GFDL-CM3).

Table 2: Comparison of Projected Peak Flow Increases by Mid- and Late-century for GCM Ensemble

MID-CENTURY						LATE-CENTURY					
MODEL	AVERAGE	MEDIAN	MAX	MIN	RANGE	MODEL	AVERAGE	MEDIAN	MAX	MIN	RANGE
GFDL-CM3	37%	40%	57%	8%	49%	GFDL-CM3	55%	55%	90%	19%	71%
ACCESS 1.3	16%	16%	28%	6%	22%	ACCESS 1.3	43%	39%	81%	24%	56%
ACCESS 1.0	1%	1%	15%	-10%	25%	ACCESS 1.0	32%	31%	65%	11%	54%
BCC-CSM1-1	16%	16%	29%	3%	25%	BCC-CSM1-1	26%	23%	73%	7%	66%
CanESM2	6%	5%	15%	-4%	20%	CanESM2	25%	20%	51%	10%	42%
CCSM4	0%	0%	13%	-10%	23%	CCSM4	13%	10%	29%	-1%	30%
CSIRO-MK3-6-0	16%	16%	44%	-5%	49%	CSIRO-MK3-6-0	23%	19%	58%	2%	56%
FGOALS-g2	15%	15%	38%	-3%	40%	FGOALS-g2	44%	43%	82%	18%	63%
GISS-E2-H	-2%	1%	13%	-23%	37%	GISS-E2-H	3%	4%	14%	-13%	27%
MIROC5	2%	-1%	20%	-12%	32%	MIROC5	18%	16%	38%	3%	35%
MRI-GGCM3	-14%	-15%	-1%	-25%	24%	MRI-GGCM3	15%	11%	50%	-1%	50%
NorESM1-M	19%	18%	33%	8%	25%	NorESM1-M	31%	30%	68%	0%	68%
Median	10%	10%	24%	-5%	25%	**Median**	25%	22%	61%	5%	55%
Maximum	37%	40%	57%	8%	49%	**Maximum**	55%	55%	90%	24%	71%
Minimum	-14%	-15%	-1%	-25%	20%	**Minimum**	3%	4%	14%	-13%	27%

In addition to the analysis of peak flow increases, evaluations were undertaken to evaluate projected flow increases at other durations. Frequency analyses on 1-day, 3-day, and 7-day flows were evaluated in the same manner as was done for peak flows. The results of these analyses are summarized in Appendix B.

Also included in Appendix B is an evaluation of the spatial patterns of the projected peak flow increases. Spatial variations were evaluated by comparing the projected peak flow increase at each of the individual locations to the average projected peak flow increase across all stations for each GCM. Unlike earlier analyses of just the GFDL-CM3 GCM, the current analysis found there were no obvious spatial patterns in the projected peak flow increases across the full ensemble of models. A number of the GCMs showed relatively larger projected flow increases in the basins upstream of Chehalis, in particular the Newaukum River basin, and relatively smaller projected increases in the basins downstream of Montesano, but those results were neither dramatic in magnitude nor universal among the different GCMs. As such, it might be possible to define spatial variations in projected flow increases for any particular GCM, but it would not be possible to define a single spatial pattern that captures the results of the full ensemble of models.

In addition to the flow frequency analyses, the simulated flow data were analyzed to compare historical, mid-century, and late-century winter (November – April) and summer (May – October) seasonal flow

volumes. This comparison was done at the 12 USGS gage locations listed previously. Table 3 summarizes the projected changes in seasonal flows for each of the models. As seen in Table 3, the median projected change in seasonal flow volumes across the 12 GCMs by mid-century is a slight increase in both summer season and winter season flows, while by late-century the summer flows are projected to decrease by about 5% (median of 12 models) and the winter flows are projected to increase by 6% (median of 12 models).

Table 3: Summary of Seasonal Flow Volume Differences for Mid- and Late-Century periods

MODEL	MID-CENTURY VS HISTORICAL MAY-OCT	MID-CENTURY VS HISTORICAL NOV-APR	LATE-CENTURY VS HISTORICAL MAY-OCT	LATE-CENTURY VS HISTORICAL NOV-APR
GFDL-CM3	-8%	10%	-17%	10%
ACCESS1.3	5%	-4%	-5%	-4%
ACCESS1.0	25%	-2%	54%	-1%
BCC-CSM1.1	16%	5%	-3%	5%
CanESM2	-8%	3%	-12%	2%
CCSM4	-11%	5%	-10%	10%
CSIRO-MK3.6.0	3%	-1%	-2%	8%
FGOALS-g2	3%	2%	-6%	30%
GISS-E2-H	11%	0%	22%	1%
MIROC5	-5%	7%	-4%	16%
MRI-GGCM3	5%	-10%	11%	-2%
NorESM1-M	5%	14%	-9%	14%
Average	**3%**	**2%**	**1%**	**7%**
Median	**4%**	**3%**	**-5%**	**6%**

Conclusion

WSE completed hydrologic modeling and analysis to characterize potential future climate change in the Chehalis River basin for use in future analyses of basin flood damage reduction and aquatic species restoration projects. Four different bias correction approaches were evaluated, and the best performing method (Raw WRF PRISM) was selected for use in this study. An ensemble of 12 different GCMs were used to develop long term time series of streamflows throughout the basin. Flow frequency and seasonal flow volume analyses were conducted on the streamflow data to provide insight into projected future climate change. Tables 2 and 3 summarize the results of the climate change modeling and analysis for peak flows and seasonal flow volumes, respectively. Additional detailed statistical comparisons are provided in Appendix A and Appendix B.

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[11] http://chehalisbasinstrategy.com/strategy/
[12] https://doi.org/10.6069/67G6-H984

Acronyms

CIG – Climate Impacts Group

DHSVM – Distributed Hydrology Soil Vegetation Model

DSS – Data Storage System

EIS – Environmental Impact Statement

FCZD – Flood Control Zone District

GCM – Global Climate Model

HEC – Hydrologic Engineering Center

NRCS – Natural Resources Conservation Service

PNNL – Pacific Northwest National Laboratory

RCP – Representative Concentration Pathway

SEPA – State Environmental Policy Act

SSURGO – Soil Survey Geographic Database

STATSGO – State Soil Geographic Database

USGS – United States Geological Survey

UW – University of Washington

WSE – Watershed Science and Engineering

Appendix A

Bias Correction Method Evaluation Summary

	Bias Correction Method	Nash - Sutcliffe	Kling - Gupta	Annual Peak Flow Bias	Average Error (Qm - Qo)	Average % Error	Root Mean Square Error	Mean Absolute Error	Correlation	Log Correlation	Season 1 Average % Error	Season 2 Average % Error
Average Across all sites	*Raw WRF*	*0.43*	*0.64*	*7%*	*6*	*7%*	*1196*	*557*	*0.79*	*0.89*	*18%*	*4%*
	Raw WRF PRISM	*0.66*	*0.73*	*-21%*	*-158*	*-9%*	*1071*	*508*	*0.83*	*0.92*	*-13%*	*-7%*
	Delta PRISM	*0.35*	*0.53*	*19%*	*391*	*25%*	*1546*	*722*	*0.80*	*0.89*	*37%*	*22%*
	Delta Grid PRISM	*0.60*	*0.71*	*-12%*	*133*	*1%*	*1224*	*590*	*0.82*	*0.89*	*16%*	*-3%*
Summary of Best Performing	*Raw WRF*	*1*	*3*	*2*	*3*	*3*	*0*	*0*	*0*	*0*	*3*	*3*
	Raw WRF PRISM	*11*	*7*	*3*	*6*	*6*	*11*	*11*	*11*	*12*	*5*	*6*
	Delta PRISM	*0*	*0*	*2*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*1*
	Delta Grid PRISM	*1*	*2*	*4*	*3*	*3*	*1*	*0*	*1*	*0*	*4*	*3*
Summary of Worst Performing	*Raw WRF*	*4*	*3*	*1*	*2*	*2*	*4*	*4*	*4*	*3*	*1*	*4*
	Raw WRF PRISM	*0*	*1*	*3*	*2*	*2*	*0*	*1*	*0*	*0*	*1*	*0*
	Delta PRISM	*8*	*8*	*4*	*8*	*8*	*8*	*7*	*4*	*5*	*10*	*7*
	Delta Grid PRISM	*0*	*0*	*3*	*0*	*0*	*0*	*0*	*2*	*4*	*0*	*1*

Site	Bias Correction Method	Average Obs Flow	Nash - Sutcliffe	Kling - Gupta	Annual Peak Flow Bias	Average Error (Qm - Qo)	Average % Error	Root Mean Square Error	Mean Absolute Error	Correlation	Log Correlation	Season 1 Average % Error	Season 2 Average % Error
Chehalis at Doty	Raw WRF	593	0.65	0.74	-29%	-70	-12%	617	234	0.81	0.95	-11%	-12%
Chehalis at Doty	Raw WRF PRISM	593	0.70	0.78	-33%	-38	-6%	575	211	0.84	0.96	-14%	-4%
Chehalis at Doty	Delta PRISM	593	0.47	0.60	0%	161	27%	759	290	0.82	0.94	33%	25%
Chehalis at Doty	Delta Grid PRISM	593	0.66	0.72	-38%	-40	-7%	604	228	0.82	0.94	15%	-13%
South Fork Chehalis	Raw WRF	204	0.29	0.57	-3%	57	28%	277	124	0.71	0.83	61%	23%
South Fork Chehalis	Raw WRF PRISM	204	0.57	0.63	-41%	-9	-5%	216	87	0.76	0.88	10%	-7%
South Fork Chehalis	Delta PRISM	204	0.38	0.60	-10%	58	28%	260	119	0.73	0.82	73%	22%
South Fork Chehalis	Delta Grid PRISM	204	0.49	0.48	-50%	-34	-17%	236	93	0.72	0.83	25%	-23%
Chehalis at Adna	Raw WRF	1421	0.75	0.88		14	1%	1136	472	0.88	0.97	0%	1%
Chehalis at Adna	Raw WRF PRISM	1421	0.80	0.84		-91	-6%	1027	434	0.90	0.97	-17%	-4%
Chehalis at Adna	Delta PRISM	1421	0.54	0.56		415	29%	1544	638	0.88	0.95	35%	28%
Chehalis at Adna	Delta Grid PRISM	1421	0.77	0.84		-30	-2%	1094	483	0.88	0.95	18%	-7%
South Fork Newaukum	Raw WRF	323	0.25	0.61	18%	-56	-17%	299	167	0.67	0.79	-4%	-20%
South Fork Newaukum	Raw WRF PRISM	323	0.52	0.63	-10%	-64	-20%	240	129	0.77	0.88	-23%	-19%
South Fork Newaukum	Delta PRISM	323	0.19	0.61	44%	28	9%	310	152	0.72	0.82	24%	5%
South Fork Newaukum	Delta Grid PRISM	323	0.44	0.71	13%	-20	-6%	257	135	0.74	0.85	4%	-8%
North Fork Newaukum	Raw WRF	152	-0.12	0.34	27%	67	44%	184	92	0.71	0.81	61%	41%
North Fork Newaukum	Raw WRF PRISM	152	0.54	0.70	-29%	4	2%	118	57	0.75	0.86	5%	2%
North Fork Newaukum	Delta PRISM	152	0.00	0.42	15%	61	40%	174	89	0.70	0.78	68%	35%
North Fork Newaukum	Delta Grid PRISM	152	0.29	0.60	-5%	38	25%	147	76	0.70	0.80	53%	19%
Newaukum at Chehalis	Raw WRF	540	0.64	0.81	7%	26	5%	479	212	0.82	0.93	16%	1%
Newaukum at Chehalis	Raw WRF PRISM	540	0.71	0.76	-16%	-44	-8%	430	186	0.85	0.94	-11%	-7%
Newaukum at Chehalis	Delta PRISM	540	0.41	0.59	36%	151	28%	611	263	0.81	0.91	44%	23%
Newaukum at Chehalis	Delta Grid PRISM	540	0.61	0.76	11%	80	15%	501	225	0.83	0.92	33%	9%
Skookumchuck at Vail	Raw WRF	205	-0.23	0.30	63%	68	33%	328	136	0.72	0.87	66%	20%
Skookumchuck at Vail	Raw WRF PRISM	205	0.67	0.81	-10%	-14	-7%	169	75	0.83	0.94	-13%	-5%
Skookumchuck at Vail	Delta PRISM	205	0.25	0.50	36%	56	27%	257	107	0.79	0.91	36%	24%
Skookumchuck at Vail	Delta Grid PRISM	205	0.62	0.56	-37%	-47	-23%	184	81	0.81	0.92	-10%	-28%

Site	Bias Correction Method	Average Obs Flow	Nash - Sutcliffe	Kling - Gupta	Annual Peak Flow Bias	Average Error (Qm - Qo)	Average % Error	Root Mean Square Error	Mean Absolute Error	Correlation	Log Correlation	Season 1 Average % Error	Season 2 Average % Error
Skookumchuck at Bucoda	Raw WRF	373	0.21	0.55	17%	98	26%	432	211	0.73	0.80	29%	25%
Skookumchuck at Bucoda	Raw WRF PRISM	373	0.58	0.77	-27%	11	3%	314	161	0.79	0.83	-16%	11%
Skookumchuck at Bucoda	Delta PRISM	373	-0.05	0.35	14%	163	44%	500	243	0.73	0.80	33%	47%
Skookumchuck at Bucoda	Delta Grid PRISM	373	0.55	0.72	-35%	3	1%	328	163	0.88	0.82	-6%	3%
Chehalis at Grand Mound	Raw WRF	2829	0.70	0.80	27%	334	12%	2273	1010	0.88	0.95	15%	11%
Chehalis at Grand Mound	Raw WRF PRISM	2829	0.78	0.89	4%	24	1%	1924	875	0.89	0.95	-8%	3%
Chehalis at Grand Mound	Delta PRISM	2829	0.36	0.43	57%	1125	40%	3301	1479	0.86	0.93	46%	38%
Chehalis at Grand Mound	Delta Grid PRISM	2829	0.72	0.83	10%	304	11%	2176	1004	0.87	0.94	22%	7%
Chehalis at Porter	Raw WRF	4098	0.73	0.82	28%	405	10%	2812	1357	0.89	0.95	11%	9%
Chehalis at Porter	Raw WRF PRISM	4098	0.81	0.90	28%	-90	-2%	2380	1192	0.90	0.95	-11%	0%
Chehalis at Porter	Delta PRISM	4098	0.39	0.46	60%	1469	36%	4232	2003	0.87	0.92	40%	34%
Chehalis at Porter	Delta Grid PRISM	4098	0.69	0.78	19%	595	15%	3000	1485	0.88	0.93	20%	13%
Satsop River at Satsop	Raw WRF	7033	0.77	0.85	-25%	-244	-3%	3950	1976	0.87	0.94	9%	-7%
Satsop River at Satsop	Raw WRF PRISM	7033	0.77	0.76	-36%	-905	-13%	3908	1975	0.88	0.95	-10%	-14%
Satsop River at Satsop	Delta PRISM	7033	0.58	0.69	-8%	1402	20%	5289	2697	0.86	0.92	40%	14%
Satsop River at Satsop	Delta Grid PRISM	7033	0.64	0.78	7%	915	13%	4875	2514	0.85	0.91	32%	8%
Humptulips at Hwy 101	Raw WRF	1456	0.51	0.36	-50%	-621	-43%	1568	698	0.85	0.93	-35%	-45%
Humptulips at Hwy 101	Raw WRF PRISM	1456	0.52	0.32	-57%	-677	-46%	1552	711	0.86	0.95	-53%	-44%
Humptulips at Hwy 101	Delta PRISM	1456	0.65	0.59	-40%	-394	-27%	1317	583	0.85	0.93	-25%	-28%
Humptulips at Hwy 101	Delta Grid PRISM	1456	0.66	0.78	-24%	-167	-11%	1292	587	0.84	0.92	-10%	-12%

Site	Average Obs Flow	# Values	Nash - Sutcliffe	Kling-Gupta Efficiency	Average Error (Qm - Qo)	% Ave Error	RMSE	Mean Absolute Error	Season1 Mean Obs Flow	Season1 Mean Sim Flow	Season2 Mean Obs Flow	Season2 Mean Sim Flow	Season 1 Average % Error	Season 2 Average % Error	Correlation	Log Correlation	Annual Peak Flow Bias
Chehalis at Doty	593.04	265100	0.65	0.74	-69.64	-12%	617	234	213	190	1104	973	-11%	-12%	0.814	0.954	-0.29
South Fork Chehalis	203.82	104876	0.29	0.57	57.3	28%	277	124	90	144	247	305	61%	23%	0.714	0.826	-0.03
Chehalis at Adna	1421.1	46010	0.75	0.88	13.6	1%	1136	472	459	459	2714	2746	0%	1%	0.881	0.967	
South Fork Newaukum	323.27	109465	0.25	0.61	-56.5	-17%	299	167	198	190	369	294	-4%	-20%	0.668	0.795	0.18
North Fork Newaukum	151.71	105898	-0.12	0.34	67.1	44%	184	92	88	143	176	248	61%	41%	0.707	0.811	0.27
Newaukum at Chehalis	539.63	272182	0.64	0.81	25.69	5%	479	212	227	264	979	987	16%	1%	0.824	0.929	0.07
Skookumchuck at Vail	205.1	286661	-0.23	0.30	67.6	33%	328	136	95	158	357	429	66%	20%	0.719	0.872	0.63
Skookumchuck at Bucoda	373.2	111631	0.21	0.55	98.4	26%	432	211	199	256	600	749	29%	25%	0.726	0.796	0.17
Chehalis at Grand Mound	2828.76	288542	0.70	0.80	333.78	12%	2273	1010	1092	1257	5303	5872	15%	11%	0.875	0.947	0.27
Chehalis at Porter	4098.35	269637	0.73	0.82	405.24	10%	2812	1357	1615	1795	7586	8297	11%	9%	0.889	0.945	0.28
Satsop River at Satsop	7032.93	32324	0.77	0.85	-243.86	-3%	3950	1976	2722	2955	12412	11569	9%	-7%	0.867	0.940	-0.25
Humptulips at Hwy 101	1456.2	156632	0.51	0.36	-621.2	-43%	1568	698	674	435	2503	1372	-35%	-45%	0.846	0.929	-0.50

	Average Obs Flow	# Values	Nash - Sutcliffe	Kling-Gupta Efficiency	Average Error (Qm - Qo)	% Ave Error	RMSE	Mean Absolute Error	Season1 Mean Obs Flow	Season1 Mean Sim Flow	Season2 Mean Obs Flow	Season2 Mean Sim Flow	Season 1 Average % Error	Season 2 Average % Error	Correlation	Log Correlation	Annual Peak Flow Bias
Chehalis at Doty	593.0	265100	0.70	0.78	-38.4	-6%	575	211	213	183	1104	1056	-14%	-4%	0.836	0.956	-0.33
South Fork Chehalis	203.8	104876	0.57	0.63	-9.5	-5%	216	87	90	99	247	230	10%	-7%	0.764	0.876	-0.41
Chehalis at Adna	1421.1	46010	0.8	0.84	-90.6	-6%	1027	434	459	382	2714	2607	-17%	-4%	0.896	0.969	
South Fork Newaukum	323.3	109465	0.52	0.63	-64.3	-20%	240	129	198	153	369	298	-23%	-19%	0.768	0.877	-0.10
North Fork Newaukum	151.7	105898	0.54	0.70	3.7	2%	118	57	88	93	176	179	5%	2%	0.749	0.857	-0.29
Newaukum at Chehalis	539.6	272182	0.71	0.76	-44.0	-8%	430	186	227	203	979	906	-11%	-7%	0.853	0.939	-0.16
Skookumchuck at Vail	205.1	286661	0.67	0.81	-13.8	-7%	169	75	95	83	357	340	-13%	-5%	0.830	0.936	-0.10
Skookumchuck at Bucoda	373.2	111631	0.58	0.77	11.3	3%	314	161	199	168	600	664	-16%	11%	0.791	0.835	-0.27
Chehalis at Grand Mound	2828.8	288542	0.78	0.89	24.3	1%	1924	875	1092	1002	5303	5486	-8%	3%	0.893	0.953	0.04
Chehalis at Porter	4098.4	269637	0.81	0.90	-89.8	-2%	2380	1192	1615	1437	7586	7613	-11%	0%	0.904	0.953	0.28
Satsop River at Satsop	7032.9	32324	0.77	0.76	-905.1	-13%	3908	1975	2722	2444	12412	10722	-10%	-14%	0.877	0.949	-0.36
Humptulips at Hwy 101	1456.2	156632	0.52	0.32	-677.0	-46%	1552	711	674	314	2503	1405	-53%	-44%	0.859	0.946	-0.57

	Average Obs Flow	# Values	Nash - Sutcliffe	Kling-Gupta Efficiency	Average Error (Qm - Qo)	% Ave Error	RMSE	Mean Absolute Error	Season1 Mean Obs Flow	Season1 Mean Sim Flow	Season2 Mean Obs Flow	Season2 Mean Sim Flow	Season 1 Average % Error	Season 2 Average % Error	Correlation	Log Correlation
Chehalis at Doty	593.0	265100	0.41	0.63	114.8	19%	803	299	213	292	1104	1264	37%	14%	0.819	0.941
South Fork Chehalis	203.8	104876	-0.64	0.01	143.2	70%	422	190	90	223	247	392	148%	59%	0.734	0.816
Chehalis at Adna	1421.1	46010	0.29	0.39	544.9	38%	1920	766	459	728	2714	3623	59%	33%	0.877	0.953
South Fork Newaukum	323.3	109465	-0.38	0.38	29.7	9%	405	200	198	284	369	376	43%	2%	0.719	0.818
North Fork Newaukum	151.7	105898	-2.21	-0.45	142.9	94%	312	157	88	223	176	321	152%	82%	0.698	0.781
Newaukum at Chehalis	539.6	272182	0.06	0.35	241.7	45%	773	332	227	415	979	1292	83%	32%	0.811	0.909
Skookumchuck at Vail	205.1	286661	-2.16	-0.45	162.0	79%	526	213	95	241	357	538	152%	51%	0.787	0.905
Skookumchuck at Bucoda	373.2	111631	-1.15	-0.11	275.2	74%	714	337	199	394	600	974	98%	62%	0.725	0.797
Chehalis at Grand Mound	2828.8	288542	0.02	0.22	1522.4	54%	4077	1826	1092	1963	5303	7734	80%	46%	0.859	0.929
Chehalis at Porter	4098.4	269637	0.05	0.24	2113.2	52%	5261	2519	1615	2798	7586	10974	73%	45%	0.866	0.924
Satsop River at Satsop	7032.9	32324	0.40	0.53	2236.3	32%	6304	3248	2722	4524	12412	15167	66%	22%	0.857	0.924
Humptulips at Hwy 101	1456.2	156632	0.59	0.62	-328.8	-23%	1420	628	674	663	2503	1748	-2%	-30%	0.849	0.928

	Average Obs Flow	# Values	Nash - Sutcliffe	Kling-Gupta Efficiency	Average Error (Qm - Qo)	% Ave Error	RMSE	Mean Absolute Error	Season1 Mean Obs Flow	Season1 Mean Sim Flow	Season2 Mean Obs Flow	Season2 Mean Sim Flow	Season 1 Average % Error	Season 2 Average % Error	Correlation	Log Correlation	Annual Peak Flow Bias
Chehalis at Doty	593.0	265100	0.47	0.60	161.0	27%	759	290	213	284	1104	1384	33%	25%	0.819	0.941	0.00
South Fork Chehalis	203.8	104876	0.38	0.60	57.7	28%	260	119	90	156	247	300	73%	22%	0.734	0.816	-0.10
Chehalis at Adna	1421.1	46010	0.54	0.56	414.8	29%	1544	638	459	620	2714	3467	35%	28%	0.877	0.953	
South Fork Newaukum	323.3	109465	0.19	0.61	28.3	9%	310	152	198	245	369	389	24%	5%	0.719	0.818	0.44
North Fork Newaukum	151.7	105898	0.00	0.42	61.2	40%	174	89	88	149	176	237	68%	35%	0.698	0.781	0.15
Newaukum at Chehalis	539.6	272182	0.41	0.59	151.4	28%	611	263	227	326	979	1200	44%	23%	0.811	0.909	0.36
Skookumchuck at Vail	205.1	286661	0.25	0.50	55.9	27%	257	107	95	129	357	441	36%	24%	0.787	0.905	0.36
Skookumchuck at Bucoda	373.2	111631	-0.05	0.35	162.8	44%	500	243	199	265	600	884	33%	47%	0.725	0.797	0.14
Chehalis at Grand Mound	2828.8	288542	0.36	0.43	1125.2	40%	3301	1479	1092	1589	5303	7306	46%	38%	0.859	0.929	0.57
Chehalis at Porter	4098.4	269637	0.39	0.46	1469.3	36%	4232	2003	1615	2267	7586	10177	40%	34%	0.866	0.924	0.60
Satsop River at Satsop	7032.9	32324	0.58	0.69	1401.7	20%	5289	2697	2722	3816	12412	14176	40%	14%	0.857	0.924	-0.08
Humptulips at Hwy 101	1456.2	156632	0.65	0.59	-393.7	-27%	1317	583	674	503	2503	1811	-25%	-28%	0.849	0.928	-0.40

	Average Obs Flow	# Values	Nash - Sutcliffe	Kling-Gupta Efficiency	Average Error (Qm - Qo)	% Ave Error	RMSE	Mean Absolute Error	Season1 Mean Obs Flow	Season1 Mean Sim Flow	Season2 Mean Obs Flow	Season2 Mean Sim Flow	Season 1 Average % Error	Season 2 Average % Error	Correlation	Log Correlation
Chehalis at Doty	593.0	265100	0.61	0.69	-73.5	-12%	652	255	213	253	1104	875	19%	-21%	0.816	0.937
South Fork Chehalis	203.8	104876	0.41	0.66	19.1	9%	254	110	90	156	247	247	74%	0%	0.724	0.827
Chehalis at Adna	1421.1	46010	0.72	0.85	59.1	4%	1206	532	459	624	2714	2625	36%	-3%	0.880	0.952
South Fork Newaukum	323.3	109465	0.14	0.60	-32.2	-10%	319	172	198	232	369	312	17%	-16%	0.7448	0.847
North Fork Newaukum	151.7	105898	-1.16	-0.08	108.6	72%	255	132	88	204	176	281	131%	60%	0.703	0.803
Newaukum at Chehalis	539.6	272182	0.39	0.59	154.6	29%	621	283	227	385	979	1126	70%	15%	0.828	0.924
Skookumchuck at Vail	205.1	286661	-0.02	0.49	42.3	21%	299	136	95	178	357	343	86%	-4%	0.812	0.924
Skookumchuck at Bucoda	373.2	111631	0.18	0.54	106.4	29%	442	223	199	296	600	716	49%	19%	0.881	0.819
Chehalis at Grand Mound	2828.8	288542	0.60	0.70	625.4	22%	2611	1217	1092	1643	5303	6020	51%	14%	0.873	0.937
Chehalis at Porter	4098.4	269637	0.52	0.60	1182.7	29%	3738	1858	1615	2417	7586	9279	50%	22%	0.881	0.932
Satsop River at Satsop	7032.9	32324	0.51	0.64	1709.3	24%	5720	2977	2722	4259	12412	14312	56%	15%	0.850	0.913
Humptulips at Hwy 101	1456.2	156632	0.58	0.77	-93.9	-6%	1454	644	674	762	2503	2164	13%	-14%	0.840	0.917

	Average Obs Flow	# Values	Nash - Sutcliffe	Kling-Gupta Efficiency	Average Error (Qm - Qo)	% Ave Error	RMSE	Mean Absolute Error	Season1 Mean Obs Flow	Season1 Mean Sim Flow	Season2 Mean Obs Flow	Season2 Mean Sim Flow	Season 1 Average % Error	Season 2 Average % Error	Correlation	Log Correlation	Annual Peak Flow Bias
Chehalis at Doty	593.0	265100	0.66	0.72	-40.4	-7%	604	228	213	246	1104	963	15%	-13%	0.816	0.937	-0.38
South Fork Chehalis	203.8	104876	0.49	0.48	-34.2	-17%	236	93	90	112	247	191	25%	-23%	0.724	0.827	-0.50
Chehalis at Adna	1421.1	46010	0.77	0.84	-30.5	-2%	1094	483	459	542	2714	2527	18%	-7%	0.880	0.952	
South Fork Newaukum	323.3	109465	0.44	0.71	-19.8	-6%	257	135	198	206	369	339	4%	-8%	0.7448	0.847	0.13
North Fork Newaukum	151.7	105898	0.29	0.60	38.0	25%	147	76	88	135	176	210	53%	19%	0.703	0.803	-0.05
Newaukum at Chehalis	539.6	272182	0.61	0.76	80.2	15%	501	225	227	302	979	1064	33%	9%	0.828	0.924	0.11
Skookumchuck at Vail	205.1	286661	0.62	0.56	-46.8	-23%	184	81	95	86	357	257	-10%	-28%	0.812	0.924	-0.37
Skookumchuck at Bucoda	373.2	111631	0.55	0.72	3.4	1%	328	163	199	187	600	620	-6%	3%	0.881	0.819	-0.35
Chehalis at Grand Mound	2828.8	288542	0.72	0.83	303.6	11%	2176	1004	1092	1328	5303	5692	22%	7%	0.873	0.937	0.10
Chehalis at Porter	4098.4	269637	0.69	0.78	594.7	15%	3000	1485	1615	1933	7586	8550	20%	13%	0.881	0.932	0.19
Satsop River at Satsop	7032.9	32324	0.64	0.78	915.1	13%	4875	2514	2722	3597	12412	13355	32%	8%	0.850	0.913	0.07
Humptulips at Hwy 101	1456.2	156632	0.66	0.78	-167.0	-11%	1292	587	674	608	2503	2200	-10%	-12%	0.840	0.917	-0.24

	Raw WRF	Raw WRF PRISM	Delta PRISM	Delta Grid PRISM
	Ave & Range	Ave & Range	Ave & Range	Ave & Range
2-year	0.15 & 1.28	-0.17 & 0.94	0.25 & 1.1	-0.08 & 0.7
5-year	-0.03 & 0.91	-0.26 & 0.74	0.1 & 0.89	-0.17 & 0.66
10-year	-0.1 & 0.77	-0.29 & 0.65	0.04 & 0.79	-0.21 & 0.75
25-year	-0.16 & 0.7	-0.32 & 0.61	-0.01 & 0.86	-0.24 & 0.86
50-year	-0.19 & 0.72	-0.33 & 0.6	-0.04 & 0.96	-0.26 & 0.94
100-year	-0.22 & 0.79	-0.34 & 0.67	-0.06 & 1.06	-0.27 & 1.01
500-year	-0.26 & 0.96	-0.36 & 0.84	-0.1 & 1.26	-0.3 & 1.17
Average Error	**-11%**	**-30%**	**3%**	**-22%**
Average Abs Err	**25%**	**32%**	**27%**	**28%**
Max Error	26%	7%	46%	21%
Min Error	-49%	-55%	-38%	-63%
Range in Error	74%	62%	84%	83%

Peaks for Annual Frequency Analysis

DSN1 1140 1H FLOW /CHEHALIS RIVER/DOTY, WA/FLOW//1HOUR/USGS/

Return Period	DSN1 1140 Peak	DSN2 1308 Peak	-49%	DSN3 2578 Peak	-48%	DSN4 156 Peak	-25%	DSN5 5262 Peak	-51%
2	11587	9557	-18%	8891	-23%	13317	15%	8139	-30%
5	19664	12222	-38%	12032	-39%	17728	-10%	11261	-43%
10	25764	13901	-46%	14009	-46%	20491	-20%	13275	-48%
25	34206	15948	-53%	16404	-52%	23828	-30%	15760	-54%
50	40973	17429	-57%	18121	-56%	26216	-36%	17570	-57%
100	48113	18879	-61%	19787	-59%	28532	-41%	19348	-60%
500	66275	22197	-67%	23535	-64%	33740	-49%	23423	-65%

Peaks for Annual Frequency Analysis

DSN1 5007 1H FLOW /SOUTH FORK CHEHALIS RIVER/WILDWOOD, WA/FLOW//1HOUR/USGS/

Return Period	DSN1 5007 Peak	DSN2 2464 Peak	-32% 36%	DSN3 8067 Peak	-55% 55%	DSN4 2328 Peak	-34% 35%	DSN5 1572 Peak	-63% 63%
2	3175	3565	12%	2094	-34%	3232	2%	1791	-44%
5	5502	4576	-17%	2901	-47%	4306	-22%	2450	-55%
10	7256	5179	-29%	3413	-53%	4979	-31%	2862	-61%
25	9670	5880	-39%	4035	-58%	5792	-40%	3355	-65%
50	11590	6366	-45%	4481	-61%	6373	-45%	3705	-68%
100	13602	6824	-50%	4914	-64%	6937	-49%	4041	-70%
500	18653	7817	-58%	5886	-68%	8205	-56%	4787	-74%

Peaks for Annual Frequency Analysis

DSN1 886 1H FLOW /SOUTH FORK NEWAUKUM RIVER/ONALASKA, WA/FLOW//1HOUR/USGS/

Return Period	DSN1 886 Peak	DSN2 5525 Peak	-11% 19%	DSN3 906 Peak	-20% 20%	DSN4 5405 Peak	21% 21%	DSN5 6697 Peak	-4% 10%
2	2938	3766	28%	2704	-8%	4449	51%	3484	19%
5	4911	4937	1%	4027	-18%	6356	29%	5036	3%
10	6303	5701	-10%	4974	-21%	7650	21%	6086	-3%
25	8111	6658	-18%	6244	-23%	9313	15%	7432	-8%
50	9474	7366	-22%	7241	-24%	10571	12%	8445	-11%
100	10842	8073	-26%	8280	-24%	11842	9%	9465	-13%
500	14046	9736	-31%	10887	-22%	14890	6%	11896	-15%

Peaks for Annual Frequency Analysis

DSN1 4927 1H FLOW /NF NEWAUKUM ABV BEAR/FOREST, WA/FLOW//1HOUR/USGS/

Return Period	DSN1 4927 Peak	DSN2 2226 Peak	2% 15%	DSN3 6237 Peak	-40% 40%	DSN4 3314 Peak	-6% 16%	DSN5 5459 Peak	-23% 24%
2	1693	2367	40%	1293	-24%	2159	28%	1789	6%
5	3068	3534	15%	2012	-34%	3258	6%	2691	-12%
10	4131	4346	5%	2529	-39%	4018	-3%	3310	-20%
25	5618	5407	-4%	3221	-43%	5002	-11%	4110	-27%
50	6816	6220	-9%	3761	-45%	5750	-16%	4715	-31%
100	8081	7049	-13%	4322	-47%	6508	-19%	5327	-34%
500	11293	9062	-20%	5713	-49%	8323	-26%	6785	-40%

Peaks for Annual Frequency Analysis

DSN1 4195 1H FLOW /NEWAUKUM RIVER/CHEHALIS, WA/FLOW//1HOUR/USGS/

Return Period	DSN1 4195 Peak	DSN2 6549 Peak	11%	DSN3 7337 Peak	-6%	DSN4 6531 Peak	46%	DSN5 4819 Peak	21%
2	7685	7700	0%	5950	-23%	9761	27%	7892	3%
5	10671	10923	2%	8868	-17%	14272	34%	11664	9%
10	12469	13139	5%	10921	-12%	17328	39%	14243	14%
25	14552	16023	10%	13630	-6%	21237	46%	17566	21%
50	15980	18230	14%	15725	-2%	24174	51%	20077	26%
100	17314	20484	18%	17881	3%	27127	57%	22614	31%
500	20135	25978	29%	23185	15%	34133	70%	28671	42%

Peaks for Annual Frequency Analysis

DSN1 1903 1H FLOW /SKOOKUMCHUCK RIVER/VAIL, WA/FLOW//1HOUR/USGS/

Return Period	DSN1 1903 Peak	DSN2 6412 Peak	26%	DSN3 7224 Peak	-20%	DSN4 6430 Peak	19%	DSN5 4686 Peak	-45%
2	2877	5109	78%	2678	-7%	4085	42%	1903	-34%
5	4698	6662	42%	3926	-16%	5866	25%	2739	-42%
10	5993	7693	28%	4809	-20%	7115	19%	3316	-45%
25	7693	9003	17%	5983	-22%	8768	14%	4070	-47%
50	8993	9988	11%	6897	-23%	10051	12%	4649	-48%
100	10313	10982	6%	7845	-24%	11378	10%	5240	-49%
500	13473	13362	-1%	10203	-24%	14671	9%	6684	-50%

Peaks for Annual Frequency Analysis

DSN1 2217 1H FLOW /SKOOKUMCHUCK RIVER/BUCODA, WA/FLOW//1HOUR/USGS/

Return Period	DSN1 2217 Peak	DSN2 4219 Peak	-13%	DSN3 222 Peak	-40%	DSN4 2169 Peak	-9%	DSN5 2323 Peak	-48%
2	4409	5564	26%	3417	-22%	5407	23%	3082	-30%
5	7076	7173	1%	4701	-34%	7329	4%	4188	-41%
10	8996	8189	-9%	5545	-38%	8535	-5%	4890	-46%
25	11559	9429	-18%	6604	-43%	9990	-14%	5745	-50%
50	13551	10327	-24%	7390	-45%	11029	-19%	6362	-53%
100	15604	11206	-28%	8172	-48%	12034	-23%	6963	-55%
500	20645	13218	-36%	10006	-52%	14285	-31%	8325	-60%

Peaks for Annual Frequency Analysis

DSN1 4077 1H FLOW /CHEHALIS RIVER/GRAND MOUND, WA/FLOW//1HOUR/USGS/

Return Period	DSN1 4077 Peak	DSN2 1487 Peak	7%	DSN3 4415 Peak	-12%	DSN4 1431 Peak	34%	DSN5 2264 Peak	-7%
2	26679	36087	35%	29457	10%	44527	67%	31154	17%
5	41776	49482	18%	40713	-3%	61731	48%	43076	3%
10	52420	58029	11%	47889	-9%	72781	39%	50683	-3%
25	66405	68486	3%	56652	-15%	86359	30%	59977	-10%
50	77132	76048	-1%	62976	-18%	96212	25%	66687	-14%
100	88077	83434	-5%	69137	-22%	105858	20%	73228	-17%
500	114552	100215	-13%	83081	-27%	127844	12%	88040	-23%

Peaks for Annual Frequency Analysis

DSN1 3557 1H FLOW /CHEHALIS RIVER/PORTER, WA/FLOW//1HOUR/USGS/

Return Period	DSN1 3557 Peak	DSN2 6686 Peak	7%	DSN3 7111 Peak	7%	DSN4 4766 Peak	35%	DSN5 475 Peak	0%
2	30643	41736	36%	41736	36%	52133	70%	38716	26%
5	47022	55841	19%	55841	19%	70692	50%	52109	11%
10	58347	64660	11%	64660	11%	82073	41%	60484	4%
25	73003	75292	3%	75292	3%	95533	31%	70575	-3%
50	84101	82887	-1%	82887	-1%	104966	25%	77776	-8%
100	95311	90235	-5%	90235	-5%	113946	20%	84736	-11%
500	122024	106706	-13%	106706	-13%	133552	9%	100310	-18%

Peaks for Annual Frequency Analysis

DSN1 5076 1H FLOW /SATSOP RIVER/SATSOP, WA/FLOW//1HOUR/USGS/

Return Period	DSN1 5076 Peak	DSN2 5791 Peak	-27% 27%	DSN3 14741 Peak	-37% 37%	DSN4 4895 Peak	-12% 12%	DSN5 1801 Peak	3% 3%
2	29163	21817	-25%	18552	-36%	26879	-8%	31378	8%
5	40051	29260	-27%	24931	-38%	35710	-11%	41794	4%
10	46902	34019	-27%	29093	-38%	41292	-12%	48313	3%
25	55176	39868	-28%	34297	-38%	48093	-13%	56185	2%
50	61088	44123	-28%	38143	-38%	53000	-13%	61818	1%
100	66803	48300	-28%	41968	-37%	57789	-13%	67277	1%
500	79579	57882	-27%	50923	-36%	68671	-14%	79548	0%

Peaks for Annual Frequency Analysis

DSN1 3439 1H FLOW /HUMPTULIPS RIVER BELOW HWY 101/HUMPTULIPS, WA/FLOW//1HOUR/USGS/

Return Period	DSN1 3439 Peak	DSN2 8069 Peak	-48% 48%	DSN3 3876 Peak	-53% 53%	DSN4 1927 Peak	-38% 38%	DSN5 1773 Peak	-23% 23%
2	24102	11995	-50%	10210	-58%	14409	-40%	18198	-24%
5	31491	16037	-49%	13954	-56%	19213	-39%	24073	-24%
10	36108	18635	-48%	16424	-55%	22285	-38%	27764	-23%
25	41684	21841	-48%	19536	-53%	26067	-37%	32238	-23%
50	45681	24183	-47%	21851	-52%	28820	-37%	35453	-22%
100	49561	26491	-47%	24165	-51%	31527	-36%	38581	-22%
500	58317	31816	-45%	29618	-49%	37751	-35%	45654	-22%

Appendix B

Summary of GCM Ensemble - Peak Flow Changes

	Mid-Century					Late-Century				
Model	**Average**	**Median**	**Max**	**Min**	**Range**	**Average**	**Median**	**Max**	**Min**	**Range**
GFDL-CM3	37%	40%	57%	8%	49%	55%	55%	90%	19%	71%
ACCESS 1.3	16%	16%	28%	6%	22%	43%	39%	81%	24%	56%
ACCESS 1.0	1%	1%	15%	-10%	25%	32%	31%	65%	11%	54%
BCC-CSM1-1	16%	16%	29%	3%	25%	26%	23%	73%	7%	66%
CanESM2	6%	5%	15%	-4%	20%	25%	20%	51%	10%	42%
CCSM4	0%	0%	13%	-10%	23%	13%	10%	29%	-1%	30%
CSIRO-MK3-6-0	16%	16%	44%	-5%	49%	23%	19%	58%	2%	56%
FGOALS-g2	15%	15%	38%	-3%	40%	44%	43%	82%	18%	63%
GISS-E2-H	-2%	1%	13%	-23%	37%	3%	4%	14%	-13%	27%
MIROC5	2%	-1%	20%	-12%	32%	18%	16%	38%	3%	35%
MRI-GGCM3	-14%	-15%	-1%	-25%	24%	15%	11%	50%	-1%	50%
NorESM1-M	19%	18%	33%	8%	25%	31%	30%	68%	0%	68%
Median	10%	10%	24%	-5%	25%	25%	22%	61%	5%	55%
Maximum	37%	40%	57%	8%	49%	55%	55%	90%	24%	71%
Minimum	-14%	-15%	-1%	-25%	20%	3%	4%	14%	-13%	27%

Summary of GCM Ensemble - 24-Hour Flow Changes

	Mid-Century					Late-Century				
Model	**Average**	**Median**	**Max**	**Min**	**Range**	**Average**	**Median**	**Max**	**Min**	**Range**
GFDL-CM3	39%	41%	61%	7%	53%	53%	54%	83%	20%	62%
ACCESS 1.3	15%	15%	25%	5%	20%	38%	37%	70%	23%	47%
ACCESS 1.0	2%	3%	16%	-11%	26%	29%	29%	60%	7%	54%
BCC-CSM1-1	16%	16%	25%	4%	21%	22%	21%	46%	4%	42%
CanESM2	8%	7%	19%	-1%	20%	23%	19%	49%	8%	40%
CCSM4	1%	1%	11%	-9%	21%	11%	9%	27%	-2%	29%
CSIRO-MK3-6-0	11%	8%	36%	-9%	45%	18%	12%	50%	-2%	53%
FGOALS-g2	13%	12%	36%	-2%	38%	37%	37%	63%	14%	49%
GISS-E2-H	-2%	2%	13%	-22%	35%	3%	4%	13%	-10%	23%
MIROC5	0%	-3%	18%	-13%	31%	13%	13%	30%	1%	28%
MRI-GGCM3	-15%	-16%	-1%	-25%	24%	14%	13%	40%	1%	39%
NorESM1-M	18%	18%	32%	7%	25%	28%	29%	52%	7%	45%
Median	9%	8%	22%	-5%	26%	23%	20%	50%	5%	44%
Maximum	39%	41%	61%	7%	53%	53%	54%	83%	23%	62%
Minimum	-15%	-16%	-1%	-25%	20%	3%	4%	13%	-10%	23%

Summary of GCM Ensemble - 72-Hour Flow Changes

	Mid-Century					Late-Century				
Model	**Average**	**Median**	**Max**	**Min**	**Range**	**Average**	**Median**	**Max**	**Min**	**Range**
GFDL-CM3	29%	31%	48%	6%	42%	48%	50%	71%	20%	51%
ACCESS 1.3	13%	12%	26%	6%	19%	30%	28%	50%	14%	36%
ACCESS 1.0	5%	4%	22%	-11%	32%	21%	21%	39%	1%	38%
BCC-CSM1-1	21%	22%	28%	9%	19%	25%	23%	43%	12%	31%
CanESM2	5%	4%	15%	-2%	17%	15%	12%	36%	-1%	37%
CCSM4	0%	-1%	10%	-7%	17%	9%	6%	24%	0%	25%
CSIRO-MK3-6-0	-3%	-8%	20%	-17%	37%	7%	2%	37%	-7%	45%
FGOALS-g2	6%	4%	29%	-6%	35%	26%	26%	48%	6%	43%
GISS-E2-H	0%	1%	13%	-17%	30%	6%	7%	15%	-6%	21%
MIROC5	-3%	-6%	13%	-14%	27%	10%	10%	21%	2%	19%
MRI-GGCM3	-13%	-15%	0%	-23%	23%	15%	15%	34%	5%	29%
NorESM1-M	18%	18%	33%	10%	23%	23%	24%	46%	-3%	49%
Median	5%	4%	21%	-6%	25%	18%	18%	38%	1%	36%
Maximum	29%	31%	48%	10%	42%	48%	50%	71%	20%	51%
Minimum	-13%	-15%	0%	-23%	17%	6%	2%	15%	-7%	19%

Summary of GCM Ensemble - 168-Hour Flow Changes

	Mid-Century					Late-Century				
Model	**Average**	**Median**	**Max**	**Min**	**Range**	**Average**	**Median**	**Max**	**Min**	**Range**
GFDL-CM3	23%	22%	33%	14%	19%	42%	41%	61%	30%	30%
ACCESS 1.3	9%	9%	18%	2%	17%	22%	22%	34%	8%	26%
ACCESS 1.0	7%	5%	21%	-4%	25%	23%	21%	36%	12%	24%
BCC-CSM1-1	20%	20%	26%	14%	12%	23%	22%	38%	15%	23%
CanESM2	5%	3%	15%	-4%	19%	18%	17%	32%	6%	26%
CCSM4	-6%	-7%	2%	-13%	15%	2%	1%	14%	-6%	19%
CSIRO-MK3-6-0	2%	-2%	24%	-12%	36%	5%	2%	28%	-6%	34%
FGOALS-g2	6%	4%	23%	-2%	25%	27%	27%	37%	14%	23%
GISS-E2-H	3%	2%	15%	-8%	22%	7%	8%	16%	-2%	18%
MIROC5	0%	-1%	8%	-8%	16%	16%	15%	26%	10%	16%
MRI-GGCM3	-8%	-9%	5%	-16%	21%	18%	18%	32%	7%	25%
NorESM1-M	15%	16%	26%	6%	20%	10%	12%	27%	-10%	37%
Median	5%	4%	19%	-4%	19%	18%	17%	32%	8%	25%
Maximum	23%	22%	33%	14%	36%	42%	41%	61%	30%	37%
Minimum	-8%	-9%	2%	-16%	12%	2%	1%	14%	-10%	16%

Spatial Variation - Difference in Average Flow Increase Across All Quantiles for Each Model at Each Site Relative to Average Difference For All Sites for That Particular Model

Model	Pe Ell	Doty	Elk Creek	Bunker Creek	SF Chehalis	Adna	SF Newaukum	NF Newaukum	Newaukum	Skook at Vail	Skook at Bucoda	Grand Mound	Black River	Porter	Satsop River	Wyn at Grisdale	Wyn at Monte	Chehalis Mouth	Wishkah R.	Humptulips
GFDL-CM3	-2%	0%	15%	12%	-4%	6%	13%	18%	19%	15%	17%	9%	3%	3%	-14%	-22%	-25%	-10%	-24%	-29%
ACCESS 1.3	-8%	-7%	0%	2%	-1%	-4%	-1%	3%	-1%	-3%	6%	-4%	11%	-4%	5%	3%	6%	1%	-1%	-1%
ACCESS 1.0	2%	3%	-4%	2%	10%	6%	-8%	-6%	-4%	-10%	-8%	4%	13%	6%	-3%	0%	0%	4%	-7%	1%
BCC-CSM1-1	-1%	0%	-1%	12%	1%	0%	2%	0%	2%	-4%	5%	3%	7%	6%	-6%	-8%	-6%	7%	-10%	-8%
CanESM2	-6%	-7%	-6%	-6%	-3%	-2%	5%	7%	6%	-5%	0%	2%	0%	1%	6%	2%	8%	-3%	-3%	5%
CCSM4	-5%	-3%	1%	3%	-7%	-3%	-6%	1%	1%	-9%	-1%	0%	2%	-2%	5%	5%	6%	-8%	13%	6%
CSIRO-MK3-6-0	5%	3%	1%	-21%	-1%	-2%	-3%	-10%	-11%	1%	-16%	-15%	0%	-20%	17%	22%	17%	-16%	27%	21%
FGOALS-g2	6%	3%	-4%	-3%	5%	0%	22%	17%	17%	7%	3%	-1%	8%	-7%	-10%	-17%	-13%	-13%	-6%	-11%
GISS-E2-H	2%	2%	-7%	6%	15%	6%	-16%	-11%	-9%	-21%	-15%	3%	7%	5%	6%	4%	8%	5%	4%	8%
MIROC5	-5%	-6%	-3%	-9%	-14%	-10%	5%	6%	-1%	11%	-1%	-12%	-7%	-12%	10%	15%	11%	-5%	14%	11%
MRI-GGCM3	-3%	-5%	-8%	0%	1%	-5%	0%	-1%	0%	-7%	-10%	-6%	-1%	-6%	10%	6%	8%	4%	13%	11%
NorESM1-M	-2%	-2%	-9%	-4%	-4%	-3%	5%	13%	13%	0%	2%	-1%	7%	0%	-6%	-5%	-1%	-8%	3%	2%
Average	-1%	-1%	-2%	0%	0%	-1%	1%	3%	3%	-2%	-2%	-2%	4%	-3%	2%	0%	1%	-3%	2%	1%
St Dev	4%	4%	6%	9%	8%	5%	10%	10%	9%	10%	9%	7%	6%	8%	9%	12%	12%	8%	14%	13%

Model	Pe Ell	Doty	Elk Creek	Bunker Creek	SF Chehalis	Adna	SF Newaukum	NF Newaukum	Newaukum	Skook at Vail	Skook at Bucoda	Grand Mound	Black River	Porter	Satsop River	Wyn at Grisdale	Wyn at Monte	Chehalis Mouth	Wishkah R.	Humptulips
GFDL-CM3	-4%	0%	11%	12%	2%	5%	25%	25%	33%	21%	14%	5%	-10%	-1%	-17%	-30%	-24%	-9%	-23%	-35%
ACCESS 1.3	-14%	-12%	-1%	23%	-3%	-8%	-14%	-8%	-4%	-16%	-12%	-9%	11%	-12%	36%	2%	17%	0%	18%	5%
ACCESS 1.0	4%	4%	7%	20%	5%	4%	-2%	1%	5%	-2%	-10%	1%	33%	1%	-20%	-2%	-16%	-6%	-20%	-7%
BCC-CSM1-1	-5%	-3%	18%	47%	-1%	-3%	-5%	-11%	-4%	-11%	-7%	-2%	11%	2%	-11%	2%	-3%	5%	-14%	-5%
CanESM2	-10%	-13%	-13%	-4%	-6%	-11%	22%	26%	23%	8%	8%	-2%	7%	-5%	-2%	-3%	-4%	-11%	-5%	-6%
CCSM4	-5%	-4%	-2%	6%	-3%	-4%	5%	5%	12%	-10%	-13%	-4%	-6%	-8%	5%	15%	6%	-9%	5%	11%
CSIRO-MK3-6-0	-4%	-6%	-6%	-15%	-5%	-10%	-4%	-3%	-5%	-4%	-11%	-14%	-3%	-18%	19%	34%	23%	-16%	28%	21%
FGOALS-g2	7%	5%	1%	-9%	11%	2%	37%	31%	30%	11%	-1%	-7%	1%	-14%	-11%	-26%	-21%	-25%	-6%	-17%
GISS-E2-H	-4%	-3%	-7%	10%	11%	1%	-11%	-3%	1%	-15%	-9%	4%	2%	5%	2%	6%	5%	1%	-2%	7%
MIROC5	-1%	1%	14%	8%	-12%	-4%	17%	6%	5%	17%	-3%	-9%	9%	-11%	4%	-12%	-5%	-6%	-7%	-13%
MRI-GGCM3	-11%	-7%	0%	35%	4%	-3%	-7%	7%	17%	-15%	-5%	3%	25%	5%	-8%	-8%	-11%	5%	-13%	-12%
NorESM1-M	-7%	-4%	-9%	1%	5%	-2%	22%	30%	37%	8%	12%	8%	14%	6%	-19%	-30%	-17%	-18%	-17%	-20%
Average	-5%	-4%	1%	11%	1%	-3%	7%	9%	13%	-1%	-3%	-2%	8%	-4%	-2%	-4%	-4%	-7%	-5%	-6%
St Dev	6%	5%	10%	18%	7%	5%	17%	15%	15%	13%	9%	7%	13%	8%	16%	19%	15%	9%	15%	15%

GFDL-CM3 Simulations - Summary Statistics

Mid-Century (2015-2060) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	13.1%	13.2%	55.1%	-11.0%
2	29.5%	32.3%	45.5%	7.6%
5	34.7%	38.2%	52.2%	6.7%
10	37.1%	40.5%	56.4%	6.6%
25	39.3%	42.7%	60.0%	7.5%
50	40.6%	43.8%	63.1%	8.7%
100	41.7%	44.5%	66.1%	10.1%
500	43.6%	44.1%	71.6%	14.3%
Average	37.2%	40.3%	57.2%	7.9%

Late-Century (2055-2099) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	18.1%	20.4%	71.6%	-17.4%
2	39.3%	38.1%	57.6%	26.7%
5	48.2%	51.9%	67.5%	21.8%
10	53.1%	56.8%	80.9%	19.0%
25	58.6%	59.8%	97.8%	16.4%
50	62.2%	61.9%	110.5%	15.0%
100	65.6%	63.5%	123.2%	13.9%
500	72.8%	67.9%	153.3%	12.0%
Average	54.5%	55.3%	89.6%	18.8%

Peaks for Annual Frequency Analysis

DSN1 195 1H FLOW /BLACK R/AT HWY 12/FLOW//1HOUR/2.30E+61/
DSN2 8192 1H FLOW /BUNKER CK/AT CERES HILL RD/FLOW//1HOUR/23I070/
DSN3 555 1H FLOW /CHEHALIS R/AT MOUTH/FLOW//1HOUR/WSE 1/
DSN4 2350 1H FLOW /CHEHALIS R/AT PORTER/FLOW//1HOUR/12031000/
DSN5 8105 1H FLOW /CHEHALIS R/NEAR ADNA/FLOW//1HOUR/12021800/

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak
1.01	1513	362	22294	14164	8729
2	5708	1155	56307	38865	20219
5	8688	1691	75929	54215	27402
10	10693	2048	88128	64097	32125
25	13224	2499	102745	76256	38066
50	15096	2832	113121	85086	42478
100	16952	3164	123106	93734	46883
500	21241	3934	145286	113451	57255

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak							
1.01	1810	353	25237	13406	7772	19.6%	-2.6%	13.2%	-5.4%	-11.0%		
2	7557	1635	69528	50906	26745	32.4%	41.6%	23.5%	31.0%	32.3%	32.1%	
5	11904	2527	95762	75317	38886	37.0%	49.4%	26.1%	38.9%	41.9%	38.7%	
10	14906	3099	112156	90789	46611	39.4%	51.3%	27.3%	41.6%	45.1%	40.9%	40.0%
25	18771	3788	131829	109362	55950	41.9%	51.6%	28.3%	43.4%	47.0%	42.5%	
50	21675	4275	145793	122474	62598	43.6%	50.9%	28.9%	43.9%	47.4%	42.9%	
100	24588	4737	159220	134985	68991	45.0%	49.7%	29.3%	44.0%	47.2%	43.1%	
500	31436	5738	188974	162245	83113	48.0%	45.8%	30.1%	43.0%	45.2%		

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak							
						39.9%	49.1%	27.2%	40.5%	43.5%		
1.01	1949	495	27485	14699	7208	28.8%	36.6%	23.3%	3.8%	-17.4%		
2	7750	1820	73175	53293	28422	35.8%	57.6%	30.0%	37.1%	40.6%	40.2%	
5	12190	2767	104337	80155	42705	40.3%	63.6%	37.4%	47.8%	55.8%	49.0%	
10	15302	3407	125626	98074	51911	43.1%	66.3%	42.5%	53.0%	61.6%	53.3%	53.9%
25	19364	4220	153162	120577	63105	46.4%	68.9%	49.1%	58.1%	65.8%	57.7%	
50	22460	4826	174099	137152	71097	48.8%	70.4%	53.9%	61.2%	67.4%	60.3%	
100	25600	5429	195379	153527	78789	51.0%	71.6%	58.7%	63.8%	68.1%	62.6%	
500	33125	6835	246796	191223	95769	55.9%	73.7%	69.9%	68.6%	67.3%		
						44.2%	66.4%	45.3%	53.5%	59.9%		

Peaks for Annual Frequency Analysis

DSN1 6699 1H FLOW /CHEHALIS R/NEAR DOTY/FLOW//1HOUR/12020000/
DSN2 2104 1H FLOW /CHEHALIS R/NEAR GRAND MOUND/FLOW//1HOUR/12027500/
DSN3 3481 1H FLOW /CHEHALIS R/NEAR PE ELL/FLOW//1HOUR/12019310/
DSN4 3098 1H FLOW /ELK CK/NEAR DOTY/FLOW//1HOUR/12020525/
DSN5 7500 1H FLOW /HUMPTULIPS R/BELOW HWY 101/FLOW//1HOUR/12039005/

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak
1.01	3354	12040	2458	880	3914
2	9680	33877	7009	2933	11399
5	13605	47466	9788	4299	16070
10	16113	56194	11550	5194	19063
25	19177	66905	13687	6306	22724
50	21384	74660	15218	7118	25366
100	23532	82237	16701	7915	27938
500	28374	99436	20022	9732	33749

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
1.01	4268	11023	3073	1121	5494	27.3%	-8.4%	25.0%	27.4%	40.4%	
2	13205	44810	9419	4267	12493	36.4%	32.3%	34.4%	45.5%	9.6%	31.6%
5	18716	67705	13279	6454	17144	37.6%	42.6%	35.7%	50.1%	6.7%	34.5%
10	22193	82455	15697	7902	20315	37.7%	46.7%	35.9%	52.1%	6.6%	35.8%
25	26381	100363	18592	9706	24424	37.6%	50.0%	35.8%	53.9%	7.5%	37.0%
50	29359	113122	20640	11024	27561	37.3%	51.5%	35.6%	54.9%	8.7%	37.6%
100	32222	125378	22601	12317	30762	36.9%	52.5%	35.3%	55.6%	10.1%	38.1%
500	38557	152335	26913	15257	38561	35.9%	53.2%	34.4%	56.8%	14.3%	

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
						37.3%	45.9%	35.5%	52.0%	8.2%	
1.01	3568	11514	2666	947	6207	6.4%	-4.4%	8.5%	7.5%	58.6%	
2	13957	46329	9989	4375	14648	44.2%	36.8%	42.5%	49.2%	28.5%	40.2%
5	20760	71737	14608	6920	19574	52.6%	51.1%	49.2%	61.0%	21.8%	47.2%
10	25069	88966	17481	8629	22682	55.6%	58.3%	51.4%	66.1%	19.0%	50.1%
25	30232	110826	20878	10768	26458	57.6%	65.6%	52.5%	70.7%	16.4%	52.6%
50	33869	127051	23242	12333	29176	58.4%	70.2%	52.7%	73.3%	15.0%	53.9%
100	37332	143161	25474	13866	31823	58.6%	74.1%	52.5%	75.2%	13.9%	54.9%
500	44851	180485	30254	17336	37814	58.1%	81.5%	51.1%	78.1%	12.0%	
						54.5%	59.4%	50.2%	65.9%	19.1%	

Peaks for Annual Frequency Analysis

DSN1 1001 1H FLOW /NEWAUKUM R/NEAR CHEHALIS/FLOW//1HOUR/12025000/
DSN2 2569 1H FLOW /NFK NEWAUKUM R/NEAR FOREST/FLOW//1HOUR/12024400/
DSN3 2219 1H FLOW /SATSOP R/NEAR SATSOP/FLOW//1HOUR/12035000/
DSN4 6540 1H FLOW /SFK CHEHALIS R/AT HWY 6/FLOW//1HOUR/23K060/
DSN5 5617 1H FLOW /SFK NEWAUKUM R/NEAR ONALASKA/FLOW//1HOUR/12024000/

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak
1.01	2111	453	6961	3533	865
2	7051	1577	19521	8762	3167
5	10373	2350	27217	11920	4764
10	12565	2865	32116	13942	5825
25	15299	3510	38082	16426	7153
50	17303	3986	42374	18230	8127
100	19278	4456	46544	19998	9087
500	23808	5541	55933	24042	11287

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak							
1.01	2179	508	8245	3247	1009	3.3%	12.0%	18.5%	-8.1%	16.7%		
2	10011	2220	22651	10950	4481	42.0%	40.8%	16.0%	25.0%	41.5%	33.0%	
5	15783	3529	32387	15723	7037	52.2%	50.2%	19.0%	31.9%	47.7%	40.2%	
10	19647	4433	38982	18706	8755	56.4%	54.8%	21.4%	34.2%	50.3%	43.4%	43.4%
25	24471	5596	47446	22259	10911	60.0%	59.4%	24.6%	35.5%	52.5%	46.4%	
50	27990	6468	53833	24756	12493	61.8%	62.3%	27.0%	35.8%	53.7%	48.1%	
100	31431	7341	60283	27133	14047	63.0%	64.7%	29.5%	35.7%	54.6%	49.5%	
500	39199	9385	75710	32301	17582	64.6%	69.4%	35.4%	34.4%	55.8%		

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak							
						55.9%	55.4%	22.9%	33.0%	50.0%		
1.01	2539	546	8866	3101	1055	20.3%	20.5%	27.4%	-12.2%	22.0%		
2	10415	2258	26001	12288	4806	47.7%	43.2%	33.2%	40.2%	51.7%	43.2%	
5	17379	3785	36990	18267	7947	67.5%	61.1%	35.9%	53.2%	66.8%	56.9%	
10	22725	4963	44145	22030	10241	80.9%	73.3%	37.5%	58.0%	75.8%	65.1%	68.3%
25	30259	6630	53014	26514	13329	97.8%	88.9%	39.2%	61.4%	86.3%	74.7%	
50	36416	7997	59491	29655	15744	110.5%	100.6%	40.4%	62.7%	93.7%	81.6%	
100	43022	9468	65859	32632	18243	123.2%	112.4%	41.5%	63.2%	100.7%	88.2%	
500	60315	13334	80452	39048	24405	153.3%	140.6%	43.8%	62.4%	116.2%		
						87.9%	79.9%	37.9%	56.5%	79.2%		

Peaks for Annual Frequency Analysis

DSN1 2822 1H FLOW /SKOOKUMCHUCK R/NEAR BUCODA/FLOW//1HOUR/12026400/
DSN2 4981 1H FLOW /SKOOKUMCHUCK R/NEAR VAIL/FLOW//1HOUR/12025700/
DSN3 2544 1H FLOW /WISHKAH R/NEAR NISSON/FLOW//1HOUR/22D110/
DSN4 2816 1H FLOW /WYNOOCHEE R/NEAR GRISDALE/FLOW//1HOUR/12035400/
DSN5 579 1H FLOW /WYNOOCHEE R/NEAR MONTESANO/FLOW//1HOUR/12037400/

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak
1.01	1464	959	1215	2337	4505
2	4760	3484	4273	5780	11548
5	6960	5218	6163	7760	15764
10	8409	6365	7335	8993	18439
25	10218	7795	8720	10471	21699
50	11544	8841	9685	11523	24047
100	12851	9868	10596	12536	26333
500	15853	12213	12555	14791	31504

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
1.01	1449	1094	1885	2645	5088	-1.0%	14.1%	55.1%	13.2%	12.9%		
2	6463	4864	4864	6326	12430	35.8%	39.6%	13.8%	9.5%	7.6%	21.3%	
5	10292	7707	6826	8688	17197	47.9%	47.7%	10.8%	12.0%	9.1%	25.5%	
10	12929	9650	8144	10261	20387	53.7%	51.6%	11.0%	14.1%	10.6%	28.2%	29.4%
25	16305	12122	9826	12258	24450	59.6%	55.5%	12.7%	17.1%	12.7%	31.5%	
50	18828	13958	11090	13752	27501	63.1%	57.9%	14.5%	19.4%	14.4%	33.8%	
100	21344	15780	12362	15254	30573	66.1%	59.9%	16.7%	21.7%	16.1%	36.1%	
500	27204	19993	15394	18823	37895	71.6%	63.7%	22.6%	27.3%	20.3%		

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
						54.4%	52.0%	13.2%	15.6%	11.7%		
1.01	1396	964	2085	3261	5633	-4.6%	0.5%	71.6%	39.5%	25.0%		
2	6494	4846	5813	7324	14847	36.4%	39.1%	36.0%	26.7%	28.6%	33.4%	
5	10783	8298	8099	9658	20428	54.9%	59.0%	31.4%	24.4%	29.6%	39.9%	
10	13917	10890	9557	11123	23982	65.5%	71.1%	30.3%	23.7%	30.1%	44.1%	46.1%
25	18135	14451	11334	12900	28322	77.5%	85.4%	30.0%	23.2%	30.5%	49.3%	
50	21431	17283	12615	14177	31453	85.7%	95.5%	30.3%	23.0%	30.8%	53.0%	
100	24838	20251	13860	15419	34505	93.3%	105.2%	30.8%	23.0%	31.0%	56.7%	
500	33230	27707	16670	18231	41416	109.6%	126.9%	32.8%	23.3%	31.5%		
						68.9%	75.9%	31.5%	24.0%	30.1%		

ACCESS 1.3 Simulations - Summary Statistics

Mid-Century (2015-2060) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	12.9%	12.1%	38.3%	-14.7%
2	15.4%	15.2%	24.9%	7.2%
5	15.8%	15.2%	26.6%	10.8%
10	16.0%	15.2%	27.6%	9.1%
25	16.0%	15.7%	28.0%	6.0%
50	16.1%	15.7%	28.8%	3.9%
100	16.1%	16.1%	32.4%	1.9%
500	16.0%	17.0%	40.3%	-2.4%
Average	15.9%	15.5%	28.1%	6.5%

Late-Century (2055-2099) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	8.3%	5.9%	37.1%	-21.2%
2	27.9%	27.5%	52.3%	11.3%
5	36.3%	34.4%	60.0%	21.3%
10	41.1%	38.9%	69.8%	26.4%
25	46.6%	42.4%	86.8%	29.7%
50	50.4%	44.5%	100.3%	29.3%
100	54.0%	47.6%	114.5%	28.7%
500	62.1%	52.4%	150.4%	26.6%
Average	42.7%	39.2%	80.6%	24.5%

Peaks for Annual Frequency Analysis

DSN1 195 1H FLOW /BLACK R/AT HWY 12/FLOW//1HOUR/2.30E+61/
DSN2 8192 1H FLOW /BUNKER CK/AT CERES HILL RD/FLOW//1HOUR/23I070/
DSN3 555 1H FLOW /CHEHALIS R/AT MOUTH/FLOW//1HOUR/WSE 1/
DSN4 2350 1H FLOW /CHEHALIS R/AT PORTER/FLOW//1HOUR/12031000/
DSN5 8105 1H FLOW /CHEHALIS R/NEAR ADNA/FLOW//1HOUR/12021800/

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak
1.01	1971	382	25329	15313	7012
2	5149	1038	53107	36431	18381
5	7171	1483	68255	49711	25665
10	8497	1786	77556	58452	30467
25	10159	2176	88648	69449	36500
50	11386	2471	96510	77616	40969
100	12604	2769	104078	85767	45417
500	15444	3486	120941	104943	55823

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
1.01	2039	520	29240	20733	9047	3.5%	36.1%	15.4%	35.4%	29.0%	
2	6338	1297	58365	42821	22017	23.1%	24.9%	9.9%	17.5%	19.8%	19.0%
5	9078	1789	76772	56412	29515	26.6%	20.6%	12.5%	13.5%	15.0%	17.6%
10	10842	2114	89074	65348	34202	27.6%	18.3%	14.9%	11.8%	12.3%	17.0%	16.9%
25	13005	2521	104798	76612	39851	28.0%	15.9%	18.2%	10.3%	9.2%	16.3%	
50	14566	2823	116665	85006	43884	27.9%	14.3%	20.9%	9.5%	7.1%	15.9%	
100	16086	3125	128680	93417	47785	27.6%	12.8%	23.6%	8.9%	5.2%	15.6%	
500	19516	3831	157619	113349	56522	26.4%	9.9%	30.3%	8.0%	1.3%		

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
						26.8%	17.8%	16.7%	11.9%	11.4%	
1.01	2267	513	30043	16158	7504	15.0%	34.3%	18.6%	5.5%	7.0%	
2	6769	1582	67599	46540	23619	31.5%	52.3%	27.3%	27.7%	28.5%	33.5%
5	10223	2374	92098	65226	34253	42.6%	60.0%	34.9%	31.2%	33.5%	40.4%
10	12729	2935	108639	77108	41239	49.8%	64.3%	40.1%	31.9%	35.4%	44.3%	45.5%
25	16127	3680	129910	91555	49941	58.7%	69.2%	46.5%	31.8%	36.8%	48.6%	
50	18819	4259	146033	101926	56318	65.3%	72.4%	51.3%	31.3%	37.5%	51.6%	
100	21646	4857	162400	111984	62601	71.7%	75.4%	56.0%	30.6%	37.8%	54.3%	
500	28820	6336	201942	134557	77032	86.6%	81.7%	67.0%	28.2%	38.0%		
						53.3%	65.6%	42.7%	30.8%	34.9%	

Peaks for Annual Frequency Analysis

DSN1 6699 1H FLOW /CHEHALIS R/NEAR DOTY/FLOW//1HOUR/12020000/
DSN2 2104 1H FLOW /CHEHALIS R/NEAR GRAND MOUND/FLOW//1HOUR/12027500/
DSN3 3481 1H FLOW /CHEHALIS R/NEAR PE ELL/FLOW//1HOUR/12019310/
DSN4 3098 1H FLOW /ELK CK/NEAR DOTY/FLOW//1HOUR/12020525/
DSN5 7500 1H FLOW /HUMPTULIPS R/BELOW HWY 101/FLOW//1HOUR/12039005/

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak
1.01	3473	12623	2646	1030	5080
2	9017	31215	6537	2737	10674
5	12470	43378	8918	3923	13387
10	14711	51542	10455	4743	14945
25	17491	61968	12356	5812	16703
50	19527	69812	13745	6632	17887
100	21535	77722	15113	7472	18983
500	26169	96618	18266	9522	21279

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
1.01	4339	17462	3143	942	4754	24.9%	38.3%	18.8%	-8.5%	-6.4%		
2	10605	37405	7557	3122	11512	17.6%	19.8%	15.6%	14.0%	7.9%	15.0%	
5	14077	49614	9956	4591	15075	12.9%	14.4%	11.6%	17.0%	12.6%	13.7%	
10	16193	57599	11404	5563	17184	10.1%	11.8%	9.1%	17.3%	15.0%	12.6%	12.0%
25	18689	67615	13100	6779	19614	6.8%	9.1%	6.0%	16.6%	17.4%	11.2%	
50	20437	75043	14280	7672	21280	4.7%	7.5%	3.9%	15.7%	19.0%	10.1%	
100	22101	82456	15397	8554	22839	2.6%	6.1%	1.9%	14.5%	20.3%	9.1%	
500	25740	99907	17823	10585	26158	-1.6%	3.4%	-2.4%	11.2%	22.9%		

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
						9.1%	11.4%	8.0%	15.9%	15.4%		
1.01	3689	12844	2705	1085	6535	6.2%	1.7%	2.2%	5.3%	28.6%		
2	11419	40330	8174	3572	13547	26.6%	29.2%	25.1%	30.5%	26.9%	27.7%	
5	16284	58095	11482	5419	18188	30.6%	33.9%	28.8%	38.1%	35.9%	33.5%	
10	19395	69618	13551	6718	21361	31.8%	35.1%	29.6%	41.7%	42.9%	36.2%	36.6%
25	23183	83822	16026	8431	25491	32.5%	35.3%	29.7%	45.1%	52.6%	39.0%	
50	25903	94131	17775	9752	28657	32.7%	34.8%	29.3%	47.0%	60.2%	40.8%	
100	28541	104211	19450	11107	31903	32.5%	34.1%	28.7%	48.7%	68.1%	42.4%	
500	34451	127090	23132	14422	39868	31.6%	31.5%	26.6%	51.5%	87.4%		
						31.1%	33.7%	28.5%	41.8%	47.8%		

Peaks for Annual Frequency Analysis

DSN1 1001	1H FLOW	/NEWAUKUM R/NEAR CHEHALIS/FLOW//1HOUR/12025000/
DSN2 2569	1H FLOW	/NFK NEWAUKUM R/NEAR FOREST/FLOW//1HOUR/12024400/
DSN3 2219	1H FLOW	/SATSOP R/NEAR SATSOP/FLOW//1HOUR/12035000/
DSN4 6540	1H FLOW	/SFK CHEHALIS R/AT HWY 6/FLOW//1HOUR/23K060/
DSN5 5617	1H FLOW	/SFK NEWAUKUM R/NEAR ONALASKA/FLOW//1HOUR/12024000/

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak
1.01	2816	686	7208	3074	1303
2	7122	1609	17313	7966	3319
5	9879	2197	22981	10960	4555
10	11703	2588	26466	12883	5351
25	14003	3083	30612	15248	6333
50	15713	3453	33538	16966	7048
100	17421	3825	36341	18651	7752
500	21439	4707	42531	22500	9365

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
1.01	3165	747	8914	4241	1456	12.4%	8.9%	23.7%	37.9%	11.7%		
2	8218	1817	20953	9827	3698	15.4%	12.9%	21.0%	23.4%	11.4%	16.8%	
5	11421	2548	27719	12952	5139	15.6%	16.0%	20.6%	18.2%	12.8%	16.6%	
10	13522	3052	31895	14879	6094	15.5%	17.9%	20.5%	15.5%	13.9%	16.7%	16.8%
25	16150	3709	36880	17178	7300	15.3%	20.3%	20.5%	12.7%	15.3%	16.8%	
50	18089	4213	40411	18807	8198	15.1%	22.0%	20.5%	10.8%	16.3%	17.0%	
100	20015	4731	43804	20372	9096	14.9%	23.7%	20.5%	9.2%	17.3%	17.1%	
500	24500	5998	51336	23847	11212	14.3%	27.4%	20.7%	6.0%	19.7%		

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
						15.3%	18.8%	20.6%	15.0%	14.5%		
1.01	2849	621	9885	3317	1316	1.2%	-9.4%	37.1%	7.9%	1.0%		
2	8862	1899	24563	10611	3901	24.4%	18.0%	41.9%	33.2%	17.5%	27.0%	
5	13151	2820	36214	15211	5659	33.1%	28.3%	57.6%	38.8%	24.2%	36.4%	
10	16112	3462	44948	18141	6844	37.7%	33.8%	69.8%	40.8%	27.9%	42.0%	44.2%
25	19961	4303	57174	21695	8356	42.6%	39.6%	86.8%	42.3%	31.9%	48.6%	
50	22894	4949	67165	24236	9489	45.7%	43.3%	100.3%	42.8%	34.6%	53.4%	
100	25875	5610	77934	26690	10626	48.5%	46.7%	114.5%	43.1%	37.1%	58.0%	
500	33069	7220	106496	32153	13319	54.2%	53.4%	150.4%	42.9%	42.2%		
						38.7%	34.9%	78.5%	40.2%	28.9%		

Peaks for Annual Frequency Analysis

DSN1 2822 1H FLOW /SKOOKUMCHUCK R/NEAR BUCODA/FLOW//1HOUR/12026400/
DSN2 4981 1H FLOW /SKOOKUMCHUCK R/NEAR VAIL/FLOW//1HOUR/12025700/
DSN3 2544 1H FLOW /WISHKAH R/NEAR NISSON/FLOW//1HOUR/22D110/
DSN4 2816 1H FLOW /WYNOOCHEE R/NEAR GRISDALE/FLOW//1HOUR/12035400/
DSN5 579 1H FLOW /WYNOOCHEE R/NEAR MONTESANO/FLOW//1HOUR/12037400/

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak
1.01	1994	1453	1809	3296	5455
2	4656	3624	3938	5673	10396
5	6398	5011	5068	6923	13026
10	7572	5929	5748	7687	14633
25	9080	7086	6545	8600	16547
50	10221	7947	7100	9249	17903
100	11377	8808	7629	9876	19210
500	14161	10836	8781	11285	22126

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
1.01	1879	1392	1877	2812	5304	-5.8%	-4.2%	3.8%	-14.7%	-2.8%		
2	5033	3886	4422	6271	11962	8.1%	7.2%	12.3%	10.5%	15.1%	10.6%	
5	7384	5553	5786	8074	15600	15.4%	10.8%	14.2%	16.6%	19.8%	15.4%	
10	9075	6671	6605	9146	17820	19.8%	12.5%	14.9%	19.0%	21.8%	17.6%	17.8%
25	11359	8096	7560	10388	20448	25.1%	14.2%	15.5%	20.8%	23.6%	19.8%	
50	13165	9162	8222	11245	22296	28.8%	15.3%	15.8%	21.6%	24.5%	21.2%	
100	15059	10233	8848	12052	24063	32.4%	16.2%	16.0%	22.0%	25.3%	22.4%	
500	19865	12770	10201	13791	27956	40.3%	17.8%	16.2%	22.2%	26.3%		

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
						21.6%	12.7%	14.8%	18.4%	21.7%		
1.01	1572	1199	2311	3347	6190	-21.2%	-17.5%	27.7%	1.5%	13.5%		
2	5253	4034	5225	7192	13863	12.8%	11.3%	32.7%	26.8%	33.4%	23.4%	
5	7962	6081	7348	9493	19113	24.5%	21.3%	45.0%	37.1%	46.7%	34.9%	
10	9854	7492	8872	10979	22754	30.1%	26.4%	54.4%	42.8%	55.5%	41.8%	44.5%
25	12331	9320	10932	12823	27540	35.8%	31.5%	67.0%	49.1%	66.4%	50.0%	
50	14228	10707	12565	14177	31241	39.2%	34.7%	77.0%	53.3%	74.5%	55.7%	
100	16165	12110	14284	15518	35058	42.1%	37.5%	87.2%	57.1%	82.5%	61.3%	
500	20860	15471	18677	18638	44514	47.3%	42.8%	112.7%	65.2%	101.2%		
						30.8%	27.1%	60.5%	44.4%	59.8%		

ACCESS 1.0 Simulations - Summary Statistics

Mid-Century (2015-2060) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	25.0%	24.2%	43.0%	6.1%
2	5.3%	5.8%	9.5%	-3.4%
5	1.8%	3.1%	10.2%	-5.6%
10	0.6%	1.2%	11.2%	-9.0%
25	-0.2%	-0.6%	15.0%	-12.1%
50	-0.5%	-1.7%	19.4%	-14.0%
100	-0.5%	-1.9%	24.3%	-15.9%
500	0.0%	-2.4%	37.4%	-21.2%
Average	1.1%	1.0%	14.9%	-10.0%

Late-Century (2055-2099) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	31.2%	28.1%	76.3%	6.5%
2	29.0%	26.9%	45.7%	21.1%
5	30.0%	31.5%	54.2%	15.6%
10	30.8%	33.3%	60.9%	11.8%
25	32.1%	32.5%	69.5%	7.7%
50	33.1%	32.2%	76.0%	5.5%
100	34.1%	32.4%	82.4%	3.4%
500	36.8%	33.8%	97.6%	-0.9%
Average	31.5%	31.5%	64.8%	10.9%

Peaks for Annual Frequency Analysis

DSN1 195 1H FLOW /BLACK R/AT HWY 12/FLOW//1HOUR/2.30E+61/
DSN2 8192 1H FLOW /BUNKER CK/AT CERES HILL RD/FLOW//1HOUR/23I070/
DSN3 555 1H FLOW /CHEHALIS R/AT MOUTH/FLOW//1HOUR/WSE 1/
DSN4 2350 1H FLOW /CHEHALIS R/AT PORTER/FLOW//1HOUR/12031000/
DSN5 8105 1H FLOW /CHEHALIS R/NEAR ADNA/FLOW//1HOUR/12021800/

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak
1.01	1482	293	20274	13578	6242
2	5435	1151	53287	37969	19681
5	8137	1831	72314	53866	28206
10	9916	2319	84078	64381	33667
25	12124	2969	98091	77603	40328
50	13732	3473	107979	87394	45115
100	15307	3993	117445	97134	49759
500	18882	5271	138297	119875	60169

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
1.01	2116	370	28894	15686	7037	42.8%	26.3%	42.5%	15.5%	12.7%	
2	5801	1174	56999	39761	20381	6.7%	2.0%	7.0%	4.7%	3.6%	4.8%
5	8726	1843	74910	56488	29440	7.2%	0.7%	3.6%	4.9%	4.4%	4.2%
10	10907	2352	86939	68091	35558	10.0%	1.4%	3.4%	5.8%	5.6%	5.2%	7.2%
25	13939	3066	102377	83308	43377	15.0%	3.3%	4.4%	7.4%	7.6%	7.5%
50	16400	3651	114073	95032	49251	19.4%	5.1%	5.6%	8.7%	9.2%	9.6%
100	19034	4281	125949	107079	55160	24.3%	7.2%	7.2%	10.2%	10.9%	12.0%
500	25944	5944	154695	136710	69194	37.4%	12.8%	11.9%	14.0%	15.0%	

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
						13.8%	3.3%	5.2%	6.9%	6.9%	
1.01	2046	399	28865	15732	6991	38.1%	36.3%	42.4%	15.9%	12.0%	
2	7862	1514	66025	49378	24706	44.7%	31.5%	23.9%	30.0%	25.5%	31.1%
5	12545	2557	89138	71258	37002	54.2%	39.7%	23.3%	32.3%	31.2%	36.1%
10	15952	3394	104310	85506	45217	60.9%	46.4%	24.1%	32.8%	34.3%	39.7%	41.8%
25	20550	4624	123370	103125	55558	69.5%	55.8%	25.8%	32.9%	37.8%	44.3%
50	24164	5669	137513	115954	63195	76.0%	63.2%	27.4%	32.7%	40.1%	47.9%
100	27924	6826	151627	128526	70757	82.4%	70.9%	29.1%	32.3%	42.2%	51.4%
500	37305	10021	184828	157171	88234	97.6%	90.1%	33.6%	31.1%	46.6%	
						64.6%	51.2%	25.6%	32.2%	35.2%	

Peaks for Annual Frequency Analysis

DSN1 6699 1H FLOW /CHEHALIS R/NEAR DOTY/FLOW//1HOUR/12020000/
DSN2 2104 1H FLOW /CHEHALIS R/NEAR GRAND MOUND/FLOW//1HOUR/12027500/
DSN3 3481 1H FLOW /CHEHALIS R/NEAR PE ELL/FLOW//1HOUR/12019310/
DSN4 3098 1H FLOW /ELK CK/NEAR DOTY/FLOW//1HOUR/12020525/
DSN5 7500 1H FLOW /HUMPTULIPS R/BELOW HWY 101/FLOW//1HOUR/12039005/

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak
1.01	2989	11149	2329	849	4247
2	9675	32845	6913	2958	10295
5	13775	47509	9779	4458	14174
10	16335	57366	11613	5478	16752
25	19388	69911	13852	6782	20020
50	21536	79296	15465	7759	22462
100	23585	88703	17034	8738	24912
500	28055	110916	20565	11042	30720

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
1.01	3557	12666	2632	992	5499	19.0%	13.6%	13.0%	16.9%	29.5%	
2	10145	33931	7363	2857	11277	4.9%	3.3%	6.5%	-3.4%	9.5%	4.2%
5	14281	49115	10197	4238	14790	3.7%	3.4%	4.3%	-4.9%	4.3%	2.1%
10	16949	59768	11976	5223	17086	3.8%	4.2%	3.1%	-4.7%	2.0%	1.7%
25	20231	73853	14120	6539	19967	4.3%	5.6%	1.9%	-3.6%	-0.3%	1.6%
50	22613	84778	15646	7569	22105	5.0%	6.9%	1.2%	-2.4%	-1.6%	1.8%
100	24945	96060	17117	8641	24240	5.8%	8.3%	0.5%	-1.1%	-2.7%	2.1%
500	30251	124005	20388	11321	29275	7.8%	11.8%	-0.9%	2.5%	-4.7%	

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak	4.6%	5.3%	2.9%	-3.4%	1.9%		
1.01	3475	12807	2587	904	6465	16.3%	14.9%	11.0%	6.5%	52.2%		
2	12272	42994	8974	3583	12707	26.8%	30.9%	29.8%	21.1%	23.4%	26.4%	
5	18154	63325	13101	5809	17215	31.8%	33.3%	34.0%	30.3%	21.5%	30.2%	
10	21991	76742	15741	7456	20446	34.6%	33.8%	35.5%	36.1%	22.1%	32.4%	33.3%
25	26722	93484	18944	9709	24819	37.8%	33.7%	36.8%	43.2%	24.0%	35.1%	
50	30151	105759	21233	11501	28293	40.0%	33.4%	37.3%	48.2%	26.0%	37.0%	
100	33496	117850	23439	13383	31956	42.0%	32.9%	37.6%	53.2%	28.3%	38.8%	
500	41044	145590	28334	18146	41360	46.3%	31.3%	37.8%	64.3%	34.6%		
						35.5%	33.0%	35.2%	38.7%	24.2%		

Peaks for Annual Frequency Analysis

DSN1 1001 1H FLOW /NEWAUKUM R/NEAR CHEHALIS/FLOW//1HOUR/12025000/
DSN2 2569 1H FLOW /NFK NEWAUKUM R/NEAR FOREST/FLOW//1HOUR/12024400/
DSN3 2219 1H FLOW /SATSOP R/NEAR SATSOP/FLOW//1HOUR/12035000/
DSN4 6540 1H FLOW /SFK CHEHALIS R/AT HWY 6/FLOW//1HOUR/23K060/
DSN5 5617 1H FLOW /SFK NEWAUKUM R/NEAR ONALASKA/FLOW//1HOUR/12024000/

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak
1.01	1986	477	5958	2758	929
2	6821	1561	17835	8368	3158
5	10792	2391	25950	12111	4866
10	13755	2985	31431	14599	6087
25	17854	3781	38430	17732	7716
50	21156	4403	43682	20052	8986
100	24664	5050	48958	22359	10300
500	33724	6660	61455	27735	13555

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
1.01	2447	568	8517	2925	1125	23.2%	19.3%	43.0%	6.1%	21.2%		
2	7339	1607	19458	9085	3317	7.6%	2.9%	9.1%	8.6%	5.0%	6.6%	
5	10917	2343	26265	13343	4772	1.2%	-2.0%	1.2%	10.2%	-1.9%	1.7%	
10	13435	2856	30734	16229	5739	-2.3%	-4.3%	-2.2%	11.2%	-5.7%	-0.7%	-1.0%
25	16765	3527	36349	19920	6958	-6.1%	-6.7%	-5.4%	12.3%	-9.8%	-3.1%	
50	19343	4043	40517	22691	7863	-8.6%	-8.2%	-7.2%	13.2%	-12.5%	-4.7%	
100	22000	4572	44677	25477	8763	-10.8%	-9.5%	-8.7%	13.9%	-14.9%	-6.0%	
500	28549	5867	54465	32076	10866	-15.3%	-11.9%	-11.4%	15.7%	-19.8%		

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
						-3.2%	-4.6%	-2.2%	11.6%	-6.6%		
1.01	2577	603	10504	3105	1253	29.7%	26.6%	76.3%	12.6%	34.9%		
2	9935	2128	22630	10845	4303	45.7%	36.3%	26.9%	29.6%	36.2%	34.9%	
5	15362	3238	30166	16243	6479	42.4%	35.5%	16.2%	34.1%	33.2%	32.3%	
10	19089	4004	35134	19866	7965	38.8%	34.2%	11.8%	36.1%	30.9%	30.3%	29.3%
25	23877	4994	41406	24446	9872	33.7%	32.1%	7.7%	37.9%	27.9%	27.9%	
50	27473	5743	46083	27842	11305	29.9%	30.4%	5.5%	38.8%	25.8%	26.1%	
100	31081	6500	50772	31217	12745	26.0%	28.7%	3.7%	39.6%	23.7%	24.4%	
500	39579	8303	61885	39058	16154	17.4%	24.7%	0.7%	40.8%	19.2%		
						36.1%	32.9%	12.0%	36.0%	29.6%		

Peaks for Annual Frequency Analysis

DSN1 2822 1H FLOW /SKOOKUMCHUCK R/NEAR BUCODA/FLOW//1HOUR/12026400/
DSN2 4981 1H FLOW /SKOOKUMCHUCK R/NEAR VAIL/FLOW//1HOUR/12025700/
DSN3 2544 1H FLOW /WISHKAH R/NEAR NISSON/FLOW//1HOUR/22D110/
DSN4 2816 1H FLOW /WYNOOCHEE R/NEAR GRISDALE/FLOW//1HOUR/12035400/
DSN5 579 1H FLOW /WYNOOCHEE R/NEAR MONTESANO/FLOW//1HOUR/12037400/

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak
1.01	1396	947	1366	2283	4070
2	4742	3521	3796	5688	10505
5	7223	5407	5481	7693	14548
10	8960	6705	6640	8957	17186
25	11240	8375	8143	10490	20475
50	12988	9633	9290	11590	22893
100	14775	10897	10458	12658	25288
500	19114	13889	13286	15065	30842

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
1.01	1782	1271	1908	2934	5099	27.7%	34.3%	39.7%	28.5%	25.3%		
2	4786	3592	4152	6120	11408	0.9%	2.0%	9.4%	7.6%	8.6%	5.7%	
5	6862	5105	5463	7913	15059	-5.0%	-5.6%	-0.3%	2.9%	3.5%	-0.9%	
10	8291	6104	6297	9035	17364	-7.5%	-9.0%	-5.2%	0.9%	1.0%	-3.9%	-4.1%
25	10150	7358	7319	10393	20169	-9.7%	-12.1%	-10.1%	-0.9%	-1.5%	-6.9%	
50	11572	8285	8062	11369	22192	-10.9%	-14.0%	-13.2%	-1.9%	-3.1%	-8.6%	
100	13022	9206	8791	12319	24167	-11.9%	-15.5%	-15.9%	-2.7%	-4.4%	-10.1%	
500	16549	11352	10464	14471	28657	-13.4%	-18.3%	-21.2%	-3.9%	-7.1%		

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
						-7.3%	-9.0%	-5.9%	1.0%	0.7%		
1.01	1506	1072	2061	3638	6774	7.9%	13.3%	50.9%	59.3%	66.5%		
2	5798	4378	4719	7059	12774	22.3%	24.4%	24.3%	24.1%	21.6%	23.3%	
5	8906	6904	6367	9530	16818	23.3%	27.7%	16.2%	23.9%	15.6%	21.3%	
10	11017	8666	7448	11302	19618	23.0%	29.2%	12.2%	26.2%	14.1%	20.9%	21.7%
25	13702	10954	8803	13701	23303	21.9%	30.8%	8.1%	30.6%	13.8%	21.0%	
50	15701	12690	9808	15608	26159	20.9%	31.7%	5.6%	34.7%	14.3%	21.4%	
100	17692	14442	10810	17619	29112	19.7%	32.5%	3.4%	39.2%	15.1%	22.0%	
500	22330	18613	13162	22786	36469	16.8%	34.0%	-0.9%	51.2%	18.2%		
						21.8%	29.4%	11.6%	29.8%	15.8%		

BCC-CSM1-1 Simulations - Summary Statistics

Mid-Century (2015-2060) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	19.4%	18.0%	44.2%	-3.6%
2	14.1%	13.6%	20.5%	7.1%
5	14.7%	15.4%	24.2%	6.4%
10	15.4%	16.2%	27.1%	5.4%
25	16.7%	16.1%	30.8%	4.7%
50	17.8%	16.4%	33.5%	0.7%
100	18.9%	16.5%	36.2%	-3.2%
500	21.8%	17.5%	47.3%	-11.5%
Average	16.3%	15.7%	28.7%	3.5%

Late-Century (2055-2099) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	27.4%	29.4%	55.1%	0.3%
2	21.4%	22.5%	34.4%	3.9%
5	22.8%	21.3%	52.9%	8.9%
10	24.3%	22.3%	65.9%	12.0%
25	26.6%	22.8%	82.5%	8.5%
50	28.5%	24.0%	95.1%	6.4%
100	30.4%	25.3%	107.8%	4.6%
500	35.3%	29.7%	138.4%	0.1%
Average	25.7%	23.0%	73.1%	7.4%

Peaks for Annual Frequency Analysis

DSN1 195 1H FLOW /BLACK R/AT HWY 12/FLOW//1HOUR/2.30E+61/
DSN2 8192 1H FLOW /BUNKER CK/AT CERES HILL RD/FLOW//1HOUR/23I070/
DSN3 555 1H FLOW /CHEHALIS R/AT MOUTH/FLOW//1HOUR/WSE 1/
DSN4 2350 1H FLOW /CHEHALIS R/AT PORTER/FLOW//1HOUR/12031000/
DSN5 8105 1H FLOW /CHEHALIS R/NEAR ADNA/FLOW//1HOUR/12021800/

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak
1.01	1835	481	24278	15528	6715
2	5754	1229	56750	40057	20390
5	8324	1702	73386	53385	28392
10	10007	2013	83111	61353	33288
25	12098	2401	94214	70589	39040
50	13627	2689	101764	76946	43037
100	15131	2974	108790	82914	46813
500	18575	3639	123626	95670	54938

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
1.01	2646	563	26804	18141	8327	44.2%	17.1%	10.4%	16.8%	24.0%	
2	6632	1475	62741	45242	24114	15.3%	20.0%	10.6%	12.9%	18.3%	15.4%
5	9708	2114	85204	62340	33204	16.6%	24.2%	16.1%	16.8%	16.9%	18.1%
10	11976	2558	99960	73567	38746	19.7%	27.1%	20.3%	19.9%	16.4%	20.7%	22.6%
25	15107	3140	118501	87645	45251	24.9%	30.8%	25.8%	24.2%	15.9%	24.3%	
50	17633	3589	132257	98062	49770	29.4%	33.5%	30.0%	27.4%	15.6%	27.2%	
100	20328	4050	145978	108427	54040	34.3%	36.2%	34.2%	30.8%	15.4%	30.2%	
500	27359	5184	178234	132675	63242	47.3%	42.4%	44.2%	38.7%	15.1%		

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
						23.4%	28.6%	22.8%	22.0%	16.4%	
1.01	2451	518	33719	19028	8747	33.5%	7.7%	38.9%	22.5%	30.2%	
2	7134	1646	69494	48059	24833	24.0%	33.9%	22.5%	20.0%	21.8%	24.4%
5	10711	2603	91533	65840	34568	28.7%	52.9%	24.7%	23.3%	21.8%	30.3%
10	13306	3338	106033	77296	40710	33.0%	65.9%	27.6%	26.0%	22.3%	34.9%	38.1%
25	16824	4382	124324	91434	48130	39.1%	82.5%	32.0%	29.5%	23.3%	41.3%	
50	19614	5244	137963	101743	53427	43.9%	95.1%	35.6%	32.2%	24.1%	46.2%	
100	22545	6179	151635	111879	58543	49.0%	107.8%	39.4%	34.9%	25.1%	51.2%	
500	29994	8678	184061	135158	69950	61.5%	138.4%	48.9%	41.3%	27.3%		
						36.3%	73.0%	30.3%	27.7%	23.1%	

Peaks for Annual Frequency Analysis

DSN1 6699 1H FLOW /CHEHALIS R/NEAR DOTY/FLOW//1HOUR/12020000/
DSN2 2104 1H FLOW /CHEHALIS R/NEAR GRAND MOUND/FLOW//1HOUR/12027500/
DSN3 3481 1H FLOW /CHEHALIS R/NEAR PE ELL/FLOW//1HOUR/12019310/
DSN4 3098 1H FLOW /ELK CK/NEAR DOTY/FLOW//1HOUR/12020525/
DSN5 7500 1H FLOW /HUMPTULIPS R/BELOW HWY 101/FLOW//1HOUR/12039005/

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak
1.01	3337	12614	2407	960	4679
2	9856	34760	7038	3046	11402
5	13591	47321	9652	4340	15204
10	15854	54961	11224	5155	17548
25	18495	63926	13047	6136	20343
50	20319	70159	14299	6832	22318
100	22035	76054	15471	7501	24212
500	25702	88786	17960	8976	28403

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
1.01	3981	14992	3250	1232	5351	19.3%	18.8%	35.0%	28.4%	14.4%		
2	11685	39607	8481	3585	12551	18.6%	13.9%	20.5%	17.7%	10.1%	16.2%	
5	15946	54961	11263	5030	16552	17.3%	16.1%	16.7%	15.9%	8.9%	15.0%	
10	18472	64913	12900	5947	19005	16.5%	18.1%	14.9%	15.4%	8.3%	14.6%	14.9%
25	21367	77241	14774	7060	21918	15.5%	20.8%	13.2%	15.1%	7.7%	14.5%	
50	23335	86254	16048	7857	23971	14.8%	22.9%	12.2%	15.0%	7.4%	14.5%	
100	25160	95132	17232	8630	25936	14.2%	25.1%	11.4%	15.0%	7.1%	14.6%	
500	28983	115564	19723	10358	30274	12.8%	30.2%	9.8%	15.4%	6.6%		

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
						16.2%	19.5%	14.8%	15.7%	8.3%		
1.01	4290	15195	3220	1167	6166	28.5%	20.5%	33.8%	21.6%	31.8%		
2	12138	41143	8592	3866	13964	23.2%	18.4%	22.1%	26.9%	22.5%	22.6%	
5	16668	57192	11615	5858	18365	22.6%	20.9%	20.3%	35.0%	20.8%	23.9%	
10	19443	67512	13453	7254	21100	22.6%	22.8%	19.9%	40.7%	20.2%	25.3%	26.3%
25	22716	80201	15612	9087	24387	22.8%	25.5%	19.7%	48.1%	19.9%	27.2%	
50	25001	89413	17115	10494	26730	23.0%	27.4%	19.7%	53.6%	19.8%	28.7%	
100	27168	98433	18538	11935	28995	23.3%	29.4%	19.8%	59.1%	19.8%	30.3%	
500	31870	118998	21620	15440	34068	24.0%	34.0%	20.4%	72.0%	19.9%		
						22.9%	24.1%	20.2%	43.9%	20.5%		

Peaks for Annual Frequency Analysis

DSN1 1001 1H FLOW /NEWAUKUM R/NEAR CHEHALIS/FLOW//1HOUR/12025000/
DSN2 2569 1H FLOW /NFK NEWAUKUM R/NEAR FOREST/FLOW//1HOUR/12024400/
DSN3 2219 1H FLOW /SATSOP R/NEAR SATSOP/FLOW//1HOUR/12035000/
DSN4 6540 1H FLOW /SFK CHEHALIS R/AT HWY 6/FLOW//1HOUR/23K060/
DSN5 5617 1H FLOW /SFK NEWAUKUM R/NEAR ONALASKA/FLOW//1HOUR/12024000/

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak
1.01	2480	478	6708	2865	1162
2	7500	1572	19957	8822	3302
5	10653	2300	28296	12312	4631
10	12671	2778	33653	14445	5481
25	15136	3373	40216	16947	6522
50	16909	3808	44957	18683	7274
100	18633	4235	49577	20319	8006
500	22510	5213	60017	23832	9663

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
1.01	2805	604	8103	3859	1284	13.1%	26.5%	20.8%	34.7%	10.5%		
2	8230	1779	22882	10505	3689	9.7%	13.2%	14.7%	19.1%	11.7%	13.7%	
5	12058	2607	31762	14427	5324	13.2%	13.4%	12.3%	17.2%	15.0%	14.2%	
10	14701	3179	37342	16876	6429	16.0%	14.4%	11.0%	16.8%	17.3%	15.1%	16.1%
25	18142	3923	44063	19815	7844	19.9%	16.3%	9.6%	16.9%	20.3%	16.6%	
50	20769	4490	48849	21901	8908	22.8%	17.9%	8.7%	17.2%	22.5%	17.8%	
100	23447	5069	53460	23906	9980	25.8%	19.7%	7.8%	17.7%	24.7%	19.1%	
500	29938	6469	63711	28352	12531	33.0%	24.1%	6.2%	19.0%	29.7%		

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
						17.9%	15.8%	10.7%	17.5%	18.6%		
1.01	3109	623	10407	3839	1386	25.3%	30.4%	55.1%	34.0%	19.3%		
2	8802	1833	25743	10884	3769	17.4%	16.6%	29.0%	23.4%	14.1%	20.1%	
5	12625	2642	33973	15168	5414	18.5%	14.9%	20.1%	23.2%	16.9%	18.7%	
10	15197	3182	38883	17879	6543	19.9%	14.5%	15.5%	23.8%	19.4%	18.6%	19.4%
25	18474	3866	44574	21163	8008	22.1%	14.6%	10.8%	24.9%	22.8%	19.0%	
50	20932	4375	48493	23514	9125	23.8%	14.9%	7.9%	25.9%	25.4%	19.6%	
100	23400	4883	52175	25788	10262	25.6%	15.3%	5.2%	26.9%	28.2%	20.2%	
500	29250	6077	60060	30875	13020	29.9%	16.6%	0.1%	29.6%	34.7%		
						21.2%	15.1%	14.8%	24.7%	21.1%		

Peaks for Annual Frequency Analysis

DSN1 2822 1H FLOW /SKOOKUMCHUCK R/NEAR BUCODA/FLOW//1HOUR/12026400/
DSN2 4981 1H FLOW /SKOOKUMCHUCK R/NEAR VAIL/FLOW//1HOUR/12025700/
DSN3 2544 1H FLOW /WISHKAH R/NEAR NISSON/FLOW//1HOUR/22D110/
DSN4 2816 1H FLOW /WYNOOCHEE R/NEAR GRISDALE/FLOW//1HOUR/12035400/
DSN5 579 1H FLOW /WYNOOCHEE R/NEAR MONTESANO/FLOW//1HOUR/12037400/

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak
1.01	1698	1221	1600	2711	4632
2	4735	3575	4525	5393	11360
5	6521	5063	6339	7087	15304
10	7629	6024	7502	8218	17787
25	8953	7207	8925	9663	20797
50	9887	8066	9953	10754	22958
100	10781	8905	10956	11858	25056
500	12748	10814	13226	14518	29784

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
1.01	1795	1177	2047	3061	5177	5.7%	-3.6%	27.9%	12.9%	11.8%		
2	5070	3842	4956	6468	12815	7.1%	7.5%	9.5%	19.9%	12.8%	11.4%	
5	7409	5600	6745	8113	17070	13.6%	10.6%	6.4%	14.5%	11.5%	11.3%	
10	9042	6748	7905	9054	19667	18.5%	12.0%	5.4%	10.2%	10.6%	11.3%	11.5%
25	11191	8172	9347	10113	22734	25.0%	13.4%	4.7%	4.7%	9.3%	11.4%	
50	12849	9209	10406	10825	24883	30.0%	14.2%	4.6%	0.7%	8.4%	11.5%	
100	14553	10227	11453	11483	26930	35.0%	14.8%	4.5%	-3.2%	7.5%	11.7%	
500	18738	12545	13880	12855	31408	47.0%	16.0%	4.9%	-11.5%	5.5%		

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
						21.5%	12.1%	5.9%	7.8%	10.0%		
1.01	1717	1225	2364	3441	6406	1.1%	0.3%	47.7%	26.9%	38.3%		
2	4929	3715	5551	7247	14435	4.1%	3.9%	22.7%	34.4%	27.1%	18.4%	
5	7216	5516	7319	9352	18959	10.7%	8.9%	15.5%	32.0%	23.9%	18.2%	
10	8808	6774	8401	10654	21770	15.4%	12.4%	12.0%	29.6%	22.4%	18.4%	18.9%
25	10894	8425	9686	12216	25146	21.7%	16.9%	8.5%	26.4%	20.9%	18.9%	
50	12498	9696	10590	13329	27553	26.4%	20.2%	6.4%	23.9%	20.0%	19.4%	
100	14141	10999	11455	14405	29879	31.2%	23.5%	4.6%	21.5%	19.2%	20.0%	
500	18160	14184	13362	16817	35089	42.5%	31.2%	1.0%	15.8%	17.8%		
						18.2%	14.3%	11.6%	28.0%	22.3%		

CanESM2 Simulations - Summary Statistics

Mid-Century (2015-2060) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	28.9%	31.1%	49.5%	8.0%
2	9.3%	8.5%	19.1%	-0.2%
5	6.1%	5.2%	13.9%	-3.5%
10	5.0%	4.8%	13.0%	-3.2%
25	4.4%	5.0%	13.1%	-4.7%
50	4.3%	4.3%	15.4%	-6.5%
100	4.4%	3.9%	18.0%	-7.9%
500	5.1%	5.1%	24.2%	-13.1%
Average	5.6%	5.3%	15.4%	-4.3%

Late-Century (2055-2099) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	20.2%	21.0%	40.4%	-0.5%
2	16.0%	15.0%	28.6%	2.7%
5	19.5%	19.6%	37.8%	5.9%
10	22.5%	19.5%	44.7%	9.1%
25	26.7%	21.2%	56.4%	12.3%
50	30.1%	22.6%	65.6%	14.2%
100	33.5%	24.3%	75.2%	14.9%
500	42.0%	29.4%	99.0%	12.8%
Average	24.7%	20.4%	51.4%	9.9%

Peaks for Annual Frequency Analysis

DSN1 195 1H FLOW /BLACK R/AT HWY 12/FLOW//1HOUR/2.30E+61/
DSN2 8192 1H FLOW /BUNKER CK/AT CERES HILL RD/FLOW//1HOUR/23I070/
DSN3 555 1H FLOW /CHEHALIS R/AT MOUTH/FLOW//1HOUR/WSE 1/
DSN4 2350 1H FLOW /CHEHALIS R/AT PORTER/FLOW//1HOUR/12031000/
DSN5 8105 1H FLOW /CHEHALIS R/NEAR ADNA/FLOW//1HOUR/12021800/

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak
1.01	1745	368	22391	13896	7102
2	5143	1073	51913	36066	18022
5	7247	1523	68391	48218	24429
10	8587	1816	78536	55516	28450
25	10216	2178	90628	64005	33305
50	11386	2442	99181	69867	36776
100	12520	2701	107395	75384	40134
500	15062	3295	125605	87220	47657

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
1.01	2021	498	33467	18852	8203	15.8%	35.3%	49.5%	35.7%	15.5%	
2	5431	1099	58679	38734	18993	5.6%	2.5%	13.0%	7.4%	5.4%	6.8%
5	7593	1504	72188	50556	25327	4.8%	-1.3%	5.6%	4.8%	3.7%	3.5%
10	9006	1782	80521	58187	29345	4.9%	-1.9%	2.5%	4.8%	3.1%	2.7%
25	10766	2145	90534	67668	34250	5.4%	-1.5%	-0.1%	5.7%	2.8%	2.5%
50	12059	2424	97694	74641	37797	5.9%	-0.7%	-1.5%	6.8%	2.8%	2.7%
100	13338	2710	104644	81556	41264	6.5%	0.3%	-2.6%	8.2%	2.8%	3.1%
500	16300	3414	120356	97685	49161	8.2%	3.6%	-4.2%	12.0%	3.2%	

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
						5.5%	-0.4%	2.8%	6.3%	3.4%	
1.01	2098	477	27692	15855	7110	20.3%	29.7%	23.7%	14.1%	0.1%	
2	6104	1265	57331	38333	18577	18.7%	17.9%	10.4%	6.3%	3.1%	11.3%
5	9006	1801	75963	53878	26372	24.3%	18.2%	11.1%	11.7%	8.0%	14.6%
10	11044	2166	88354	64671	31695	28.6%	19.3%	12.5%	16.5%	11.4%	17.7%
25	13734	2637	104120	78853	38583	34.4%	21.1%	14.9%	23.2%	15.8%	21.9%
50	15815	2996	115968	89803	43823	38.9%	22.7%	16.9%	28.5%	19.2%	25.2%
100	17959	3359	127918	101080	49152	43.5%	24.4%	19.1%	34.1%	22.5%	28.7%
500	23243	4237	156529	128924	62043	54.3%	28.6%	24.6%	47.8%	30.2%	
						31.4%	20.6%	14.2%	20.1%	13.3%	

Peaks for Annual Frequency Analysis

DSN1 6699 1H FLOW /CHEHALIS R/NEAR DOTY/FLOW//1HOUR/12020000/
DSN2 2104 1H FLOW /CHEHALIS R/NEAR GRAND MOUND/FLOW//1HOUR/12027500/
DSN3 3481 1H FLOW /CHEHALIS R/NEAR PE ELL/FLOW//1HOUR/12019310/
DSN4 3098 1H FLOW /ELK CK/NEAR DOTY/FLOW//1HOUR/12020525/
DSN5 7500 1H FLOW /HUMPTULIPS R/BELOW HWY 101/FLOW//1HOUR/12039005/

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak
1.01	2920	11535	2211	878	4808
2	8397	30656	5952	2800	9659
5	11738	41241	8183	3986	12711
10	13853	47615	9586	4732	14746
25	16414	55041	11281	5628	17342
50	18245	60174	12491	6261	19297
100	20016	65007	13661	6869	21274
500	23973	75381	16276	8204	26022

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
1.01	4053	15017	3027	1267	6379	38.8%	30.2%	36.9%	44.3%	32.7%		
2	9115	32784	6560	2793	11502	8.5%	6.9%	10.2%	-0.2%	19.1%	8.9%	
5	11900	43525	8448	3846	14480	1.4%	5.5%	3.2%	-3.5%	13.9%	4.1%	
10	13607	50490	9590	4581	16393	-1.8%	6.0%	0.0%	-3.2%	11.2%	2.5%	3.1%
25	15635	59163	10935	5551	18767	-4.7%	7.5%	-3.1%	-1.4%	8.2%	1.3%	
50	17066	65550	11876	6305	20513	-6.5%	8.9%	-4.9%	0.7%	6.3%	0.9%	
100	18438	71889	12773	7085	22246	-7.9%	10.6%	-6.5%	3.1%	4.6%	0.8%	
500	21473	86679	14739	9030	26297	-10.4%	15.0%	-9.4%	10.1%	1.1%		

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak	-1.8%	7.6%	-0.2%	-0.8%	10.5%		
1.01	3671	12980	2611	1010	6443	25.7%	12.5%	18.1%	15.1%	34.0%		
2	9146	33033	6582	2876	11992	8.9%	7.8%	10.6%	2.7%	24.2%	10.8%	
5	12790	47028	9165	4221	15348	9.0%	14.0%	12.0%	5.9%	20.7%	12.3%	
10	15259	56759	10889	5164	17546	10.1%	19.2%	13.6%	9.1%	19.0%	14.2%	16.0%
25	18437	69543	13082	6410	20312	12.3%	26.3%	16.0%	13.9%	17.1%	17.1%	
50	20844	79408	14724	7375	22374	14.2%	32.0%	17.9%	17.8%	15.9%	19.6%	
100	23284	89558	16374	8368	24440	16.3%	37.8%	19.9%	21.8%	14.9%	22.1%	
500	29163	114570	20293	10820	29343	21.7%	52.0%	24.7%	31.9%	12.8%		
						11.8%	22.8%	15.0%	11.9%	18.6%		

Peaks for Annual Frequency Analysis

DSN1 1001 1H FLOW /NEWAUKUM R/NEAR CHEHALIS/FLOW//1HOUR/12025000/
DSN2 2569 1H FLOW /NFK NEWAUKUM R/NEAR FOREST/FLOW//1HOUR/12024400/
DSN3 2219 1H FLOW /SATSOP R/NEAR SATSOP/FLOW//1HOUR/12035000/
DSN4 6540 1H FLOW /SFK CHEHALIS R/AT HWY 6/FLOW//1HOUR/23K060/
DSN5 5617 1H FLOW /SFK NEWAUKUM R/NEAR ONALASKA/FLOW//1HOUR/12024000/

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak
1.01	2371	494	8470	3081	1014
2	6260	1381	17308	7315	2695
5	8572	1883	22784	9920	3673
10	10027	2188	26399	11612	4280
25	11787	2544	30974	13720	5006
50	13045	2791	34395	15271	5520
100	14263	3024	37832	16807	6012
500	16990	3525	46015	20380	7101

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
1.01	2819	608	11519	3755	1224	18.9%	23.0%	36.0%	21.9%	20.7%	
2	6888	1486	20423	7927	2938	10.0%	7.6%	18.0%	8.4%	9.0%	10.6%
5	9439	2044	25862	10391	3997	10.1%	8.5%	13.5%	4.8%	8.8%	9.1%
10	11111	2413	29448	11972	4686	10.8%	10.3%	11.5%	3.1%	9.5%	9.0%	9.8%
25	13206	2877	33989	13926	5544	12.0%	13.1%	9.7%	1.5%	10.8%	9.4%
50	14755	3222	37390	15356	6176	13.1%	15.4%	8.7%	0.6%	11.9%	9.9%
100	16296	3567	40816	16768	6802	14.3%	18.0%	7.9%	-0.2%	13.1%	10.6%
500	19900	4380	49006	20039	8259	17.1%	24.2%	6.5%	-1.7%	16.3%	

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
						11.7%	12.1%	11.6%	3.0%	10.5%	
1.01	2872	627	10236	3066	1283	21.1%	26.8%	20.8%	-0.5%	26.5%	
2	8046	1733	20854	8132	3465	28.5%	25.4%	20.5%	11.2%	28.6%	22.8%
5	11811	2565	27678	11477	5024	37.8%	36.2%	21.5%	15.7%	36.8%	29.6%
10	14472	3166	32274	13720	6118	44.3%	44.7%	22.3%	18.1%	42.9%	34.5%	37.4%
25	18009	3979	38185	16575	7564	52.8%	56.4%	23.3%	20.8%	51.1%	40.9%
50	20763	4623	42670	18715	8685	59.2%	65.6%	24.1%	22.6%	57.3%	45.7%
100	23615	5298	47229	20867	9842	65.6%	75.2%	24.8%	24.2%	63.7%	50.7%
500	30708	7014	58277	25974	12706	80.7%	99.0%	26.6%	27.4%	78.9%	
						48.0%	50.6%	22.7%	18.8%	46.7%	

Peaks for Annual Frequency Analysis

DSN1 2822 1H FLOW /SKOOKUMCHUCK R/NEAR BUCODA/FLOW//1HOUR/12026400/
DSN2 4981 1H FLOW /SKOOKUMCHUCK R/NEAR VAIL/FLOW//1HOUR/12025700/
DSN3 2544 1H FLOW /WISHKAH R/NEAR NISSON/FLOW//1HOUR/22D110/
DSN4 2816 1H FLOW /WYNOOCHEE R/NEAR GRISDALE/FLOW//1HOUR/12035400/
DSN5 579 1H FLOW /WYNOOCHEE R/NEAR MONTESANO/FLOW//1HOUR/12037400/

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak
1.01	1573	1069	1730	2439	5046
2	4087	2939	3775	4492	10019
5	5567	4035	5053	5779	12907
10	6495	4715	5898	6638	14752
25	7613	5527	6966	7735	17025
50	8412	6101	7763	8564	18687
100	9183	6650	8564	9404	20326
500	10905	7861	10464	11431	24120

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
1.01	1699	1194	2524	3221	6271	8.0%	11.7%	45.9%	32.0%	24.3%		
2	4239	2984	4461	5244	11492	3.7%	1.5%	18.2%	16.7%	14.7%	11.0%	
5	5806	4045	5489	6410	14628	4.3%	0.3%	8.6%	10.9%	13.3%	7.5%	
10	6822	4715	6119	7159	16676	5.0%	0.0%	3.8%	7.8%	13.0%	5.9%	5.9%
25	8083	5530	6873	8087	19250	6.2%	0.1%	-1.3%	4.5%	13.1%	4.5%	
50	9006	6116	7409	8770	21164	7.1%	0.3%	-4.6%	2.4%	13.3%	3.7%	
100	9917	6686	7929	9449	23080	8.0%	0.5%	-7.4%	0.5%	13.6%	3.0%	
500	12024	7974	9096	11038	27620	10.3%	1.4%	-13.1%	-3.4%	14.5%		

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak	5.7%	0.4%	2.9%	7.2%	13.5%		
1.01	1670	1169	2429	3124	6609	6.2%	9.4%	40.4%	28.1%	31.0%		
2	4493	3297	4764	5701	11971	9.9%	12.2%	26.2%	26.9%	19.5%	18.9%	
5	6680	4897	6160	7182	15389	20.0%	21.4%	21.9%	24.3%	19.2%	21.4%	
10	8290	6049	7066	8128	17690	27.6%	28.3%	19.8%	22.4%	19.9%	23.6%	25.5%
25	10505	7605	8197	9295	20653	38.0%	37.6%	17.7%	20.2%	21.3%	26.9%	
50	12287	8834	9034	10149	22905	46.1%	44.8%	16.4%	18.5%	22.6%	29.7%	
100	14180	10121	9867	10994	25198	54.4%	52.2%	15.2%	16.9%	24.0%	32.5%	
500	19090	13380	11826	12957	30779	75.1%	70.2%	13.0%	13.3%	27.6%		
						32.7%	32.7%	19.5%	21.5%	21.1%		

CCSM4 Simulations - Summary Statistics

Mid-Century (2015-2060) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	19.0%	17.8%	36.0%	8.5%
2	7.7%	7.0%	15.2%	0.6%
5	3.0%	3.1%	12.5%	-6.2%
10	0.5%	1.1%	12.0%	-9.2%
25	-2.2%	-2.0%	12.1%	-12.1%
50	-3.9%	-3.5%	12.6%	-15.5%
100	-5.5%	-5.4%	13.2%	-19.1%
500	-8.7%	-9.4%	15.1%	-26.7%
Average	-0.1%	0.0%	13.0%	-10.2%

Late-Century (2055-2099) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	25.9%	25.2%	55.2%	14.1%
2	16.7%	16.1%	25.3%	7.2%
5	14.0%	13.0%	21.5%	2.0%
10	12.8%	11.2%	25.0%	-0.7%
25	11.5%	8.9%	30.2%	-3.2%
50	10.8%	7.2%	34.3%	-4.7%
100	10.2%	5.6%	38.3%	-6.5%
500	9.1%	2.0%	47.9%	-12.9%
Average	12.7%	10.3%	29.1%	-1.0%

Peaks for Annual Frequency Analysis

DSN1 195 1H FLOW /BLACK R/AT HWY 12/FLOW//1HOUR/2.30E+61/
DSN2 8192 1H FLOW /BUNKER CK/AT CERES HILL RD/FLOW//1HOUR/23I070/
DSN3 555 1H FLOW /CHEHALIS R/AT MOUTH/FLOW//1HOUR/WSE 1/
DSN4 2350 1H FLOW /CHEHALIS R/AT PORTER/FLOW//1HOUR/12031000/
DSN5 8105 1H FLOW /CHEHALIS R/NEAR ADNA/FLOW//1HOUR/12021800/

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak
1.01	2329	545	28081	17996	9111
2	6096	1317	61456	41875	21576
5	8653	1857	84363	58145	30155
10	10398	2235	100299	69377	36104
25	12653	2734	121309	84077	43917
50	14368	3121	137601	95392	49948
100	16110	3522	154445	107018	56159
500	20320	4517	196334	135635	71495

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
1.01	2526	662	31770	21177	10381	8.5%	21.4%	13.1%	17.7%	13.9%	
2	6613	1395	65636	44527	23117	8.5%	5.9%	6.8%	6.3%	7.1%	6.9%
5	9125	1918	83603	58867	30679	5.5%	3.3%	-0.9%	1.2%	1.7%	2.2%
10	10741	2291	94481	68274	35525	3.3%	2.5%	-5.8%	-1.6%	-1.6%	-0.6%
25	12731	2793	107311	80107	41500	0.6%	2.2%	-11.5%	-4.7%	-5.5%	-3.8%
50	14178	3189	116316	88907	45859	-1.3%	2.2%	-15.5%	-6.8%	-8.2%	-5.9%
100	15597	3604	124919	97710	50153	-3.2%	2.3%	-19.1%	-8.7%	-10.7%	-7.9%
500	18842	4662	143869	118510	60055	-7.3%	3.2%	-26.7%	-12.6%	-16.0%	

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
						2.2%	3.1%	-7.7%	-2.4%	-2.9%	
1.01	3276	757	35586	23312	10397	40.6%	38.9%	26.7%	29.5%	14.1%	
2	7006	1592	71346	47673	25016	14.9%	20.9%	16.1%	13.8%	15.9%	16.3%
5	9418	2198	91963	62976	34006	8.8%	18.4%	9.0%	8.3%	12.8%	11.5%
10	11043	2633	105072	73156	39840	6.2%	17.8%	4.8%	5.4%	10.3%	8.9%
25	13132	3223	121168	86116	47094	3.8%	17.9%	-0.1%	2.4%	7.2%	6.2%
50	14716	3691	132886	95860	52423	2.4%	18.3%	-3.4%	0.5%	5.0%	4.5%
100	16325	4185	144414	105694	57697	1.3%	18.8%	-6.5%	-1.2%	2.7%	3.0%
500	20216	5452	170980	129258	69934	-0.5%	20.7%	-12.9%	-4.7%	-2.2%	
						6.2%	18.7%	3.3%	4.9%	9.0%	

Peaks for Annual Frequency Analysis

DSN1 6699 1H FLOW /CHEHALIS R/NEAR DOTY/FLOW//1HOUR/12020000/
DSN2 2104 1H FLOW /CHEHALIS R/NEAR GRAND MOUND/FLOW//1HOUR/12027500/
DSN3 3481 1H FLOW /CHEHALIS R/NEAR PE ELL/FLOW//1HOUR/12019310/
DSN4 3098 1H FLOW /ELK CK/NEAR DOTY/FLOW//1HOUR/12020525/
DSN5 7500 1H FLOW /HUMPTULIPS R/BELOW HWY 101/FLOW//1HOUR/12039005/

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak
1.01	4458	15620	3116	1394	4951
2	10494	36276	7495	3337	11804
5	14524	50209	10388	4695	15779
10	17271	59775	12345	5645	18275
25	20829	72238	14862	6899	21295
50	23541	81794	16769	7873	23461
100	26307	91580	18702	8881	25563
500	33032	115549	23365	11386	30298

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
1.01	5092	17564	3789	1521	5910	14.2%	12.4%	21.6%	9.1%	19.4%	
2	11175	38722	7933	3665	13052	6.5%	6.7%	5.8%	9.8%	10.6%	7.9%
5	14690	51669	10338	4946	17016	1.1%	2.9%	-0.5%	5.3%	7.8%	3.4%
10	16912	60116	11867	5763	19461	-2.1%	0.6%	-3.9%	2.1%	6.5%	0.6%
25	19620	70684	13743	6765	22384	-5.8%	-2.2%	-7.5%	-2.0%	5.1%	-2.5%
50	21577	78500	15107	7491	24459	-8.3%	-4.0%	-9.9%	-4.9%	4.3%	-4.6%
100	23490	86281	16447	8202	26458	-10.7%	-5.8%	-12.1%	-7.6%	3.5%	-6.5%
500	27849	104526	19527	9827	30915	-15.7%	-9.5%	-16.4%	-13.7%	2.0%	

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
						-3.2%	-0.3%	-4.7%	0.5%	6.3%	
1.01	5190	18468	3789	1601	5976	16.4%	18.2%	21.6%	14.9%	20.7%	
2	12201	41702	8703	3858	14042	16.3%	15.0%	16.1%	15.6%	19.0%	16.4%
5	16344	55991	11608	5319	19059	12.5%	11.5%	11.7%	13.3%	20.8%	14.0%
10	18977	65319	13459	6297	22343	9.9%	9.3%	9.0%	11.5%	22.3%	12.4%
25	22198	76990	15728	7542	26459	6.6%	6.6%	5.8%	9.3%	24.2%	10.5%
50	24529	85620	17376	8477	29505	4.2%	4.7%	3.6%	7.7%	25.8%	9.2%
100	26810	94208	18991	9418	32537	1.9%	2.9%	1.5%	6.1%	27.3%	7.9%
500	32009	114329	22688	11665	39642	-3.1%	-1.1%	-2.9%	2.4%	30.8%	
						8.6%	8.3%	8.0%	10.6%	23.2%	

Peaks for Annual Frequency Analysis

DSN1 1001 1H FLOW /NEWAUKUM R/NEAR CHEHALIS/FLOW//1HOUR/12025000/
DSN2 2569 1H FLOW /NFK NEWAUKUM R/NEAR FOREST/FLOW//1HOUR/12024400/
DSN3 2219 1H FLOW /SATSOP R/NEAR SATSOP/FLOW//1HOUR/12035000/
DSN4 6540 1H FLOW /SFK CHEHALIS R/AT HWY 6/FLOW//1HOUR/23K060/
DSN5 5617 1H FLOW /SFK NEWAUKUM R/NEAR ONALASKA/FLOW//1HOUR/12024000/

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak
1.01	2896	640	8427	3920	1237
2	7613	1672	20417	9544	3436
5	10588	2350	28590	13083	4822
10	12529	2804	34217	15408	5721
25	14949	3381	41560	18329	6834
50	16727	3814	47194	20493	7646
100	18487	4249	52966	22649	8444
500	22565	5281	67103	27706	10275

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
1.01	3417	722	10703	4436	1493	18.0%	12.9%	27.0%	13.2%	20.7%		
2	8184	1817	23498	9613	3647	7.5%	8.7%	15.1%	0.7%	6.2%	7.6%	
5	10971	2459	31176	12586	4773	3.6%	4.6%	9.0%	-3.8%	-1.0%	2.5%	
10	12728	2862	36132	14460	5436	1.6%	2.1%	5.6%	-6.2%	-5.0%	-0.4%	-1.2%
25	14860	3349	42279	16740	6195	-0.6%	-1.0%	1.7%	-8.7%	-9.3%	-3.6%	
50	16394	3697	46790	18385	6712	-2.0%	-3.1%	-0.9%	-10.3%	-12.2%	-5.7%	
100	17885	4035	51254	19991	7195	-3.3%	-5.0%	-3.2%	-11.7%	-14.8%	-7.6%	
500	21256	4792	61622	23646	8215	-5.8%	-9.3%	-8.2%	-14.7%	-20.0%		

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
						1.1%	1.1%	4.6%	-6.7%	-6.0%		
1.01	3701	804	10511	4547	1662	27.8%	25.6%	24.7%	16.0%	34.4%		
2	9053	1975	24963	11015	4018	18.9%	18.1%	22.3%	15.4%	16.9%	18.3%	
5	12773	2754	34213	14743	5599	20.6%	17.2%	19.7%	12.7%	16.1%	17.3%	
10	15362	3282	40366	17070	6679	22.6%	17.1%	18.0%	10.8%	16.7%	17.0%	17.4%
25	18768	3962	48174	19873	8078	25.5%	17.2%	15.9%	8.4%	18.2%	17.1%	
50	21401	4478	54017	21872	9145	27.9%	17.4%	14.5%	6.7%	19.6%	17.2%	
100	24115	5002	59887	23805	10232	30.4%	17.7%	13.1%	5.1%	21.2%	17.5%	
500	30825	6266	73830	28130	12875	36.6%	18.7%	10.0%	1.5%	25.3%		
						24.3%	17.5%	17.2%	9.9%	18.1%		

Peaks for Annual Frequency Analysis

DSN1 2822 1H FLOW /SKOOKUMCHUCK R/NEAR BUCODA/FLOW//1HOUR/12026400/
DSN2 4981 1H FLOW /SKOOKUMCHUCK R/NEAR VAIL/FLOW//1HOUR/12025700/
DSN3 2544 1H FLOW /WISHKAH R/NEAR NISSON/FLOW//1HOUR/22D110/
DSN4 2816 1H FLOW /WYNOOCHEE R/NEAR GRISDALE/FLOW//1HOUR/12035400/
DSN5 579 1H FLOW /WYNOOCHEE R/NEAR MONTESANO/FLOW//1HOUR/12037400/

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak
1.01	1733	1280	1645	2691	5418
2	5023	3865	4486	5905	11663
5	7203	5528	6280	7604	15680
10	8654	6609	7447	8624	18380
25	10485	7945	8896	9816	21841
50	11846	8918	9958	10646	24459
100	13202	9872	11004	11432	27113
500	16377	12049	13415	13142	33513

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak							
1.01	2249	1633	2238	3533	6130	29.8%	27.6%	36.0%	31.3%	13.1%		
2	5156	3888	5168	6410	13295	2.6%	0.6%	15.2%	8.6%	14.0%	8.2%	
5	7130	5188	7068	8005	17268	-1.0%	-6.2%	12.5%	5.3%	10.1%	4.2%	
10	8491	6000	8344	9003	19722	-1.9%	-9.2%	12.0%	4.4%	7.3%	2.5%	2.8%
25	10272	6981	9977	10218	22661	-2.0%	-12.1%	12.1%	4.1%	3.8%	1.2%	
50	11643	7682	11209	11095	24751	-1.7%	-13.9%	12.6%	4.2%	1.2%	0.5%	
100	13051	8361	12455	11953	26767	-1.1%	-15.3%	13.2%	4.6%	-1.3%	0.0%	
500	16518	9885	15447	13916	31273	0.9%	-18.0%	15.1%	5.9%	-6.7%		

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak							
						-0.9%	-9.3%	13.0%	5.2%	5.8%		
1.01	2311	1646	2554	3100	6289	33.3%	28.6%	55.2%	15.2%	16.1%		
2	5428	4143	5619	6830	14331	8.1%	7.2%	25.3%	15.7%	22.9%	15.8%	
5	7345	5719	7494	9199	19053	2.0%	3.5%	19.3%	21.0%	21.5%	13.4%	
10	8592	6752	8717	10777	22054	-0.7%	2.2%	17.1%	25.0%	20.0%	12.7%	13.1%
25	10146	8047	10247	12785	25726	-3.2%	1.3%	15.2%	30.2%	17.8%	12.3%	
50	11291	9004	11379	14293	28386	-4.7%	1.0%	14.3%	34.3%	16.1%	12.2%	
100	12426	9955	12506	15812	30991	-5.9%	0.8%	13.6%	38.3%	14.3%	12.2%	
500	15071	12177	15148	19443	36942	-8.0%	1.1%	12.9%	47.9%	10.2%		
						-0.8%	2.7%	17.5%	27.4%	18.8%		

CSIRO-Mk3-6-0 Simulations - Summary Statistics

Mid-Century (2015-2060) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	-8.2%	-8.2%	22.2%	-24.3%
2	11.0%	7.5%	23.1%	1.8%
5	15.3%	14.1%	33.6%	0.1%
10	16.9%	16.6%	41.0%	-3.6%
25	17.9%	17.7%	49.6%	-7.7%
50	18.3%	18.6%	55.5%	-10.3%
100	18.5%	19.3%	61.2%	-13.3%
500	18.2%	20.0%	73.5%	-20.8%
Average	16.3%	15.6%	44.0%	-5.5%

Late-Century (2055-2099) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	11.3%	11.5%	33.1%	-5.6%
2	25.2%	25.4%	35.2%	10.0%
5	25.5%	22.9%	48.5%	8.1%
10	24.7%	21.3%	55.8%	7.2%
25	23.2%	17.3%	63.9%	0.9%
50	21.9%	14.5%	69.2%	-4.1%
100	20.5%	12.1%	74.1%	-8.8%
500	17.5%	5.4%	86.3%	-19.3%
Average	23.5%	18.9%	57.8%	2.2%

Peaks for Annual Frequency Analysis

DSN1 195 1H FLOW /BLACK R/AT HWY 12/FLOW//1HOUR/2.30E+61/
DSN2 8192 1H FLOW /BUNKER CK/AT CERES HILL RD/FLOW//1HOUR/23I070/
DSN3 555 1H FLOW /CHEHALIS R/AT MOUTH/FLOW//1HOUR/WSE 1/
DSN4 2350 1H FLOW /CHEHALIS R/AT PORTER/FLOW//1HOUR/12031000/
DSN5 8105 1H FLOW /CHEHALIS R/NEAR ADNA/FLOW//1HOUR/12021800/

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak
1.01	2266	428	30758	18013	8258
2	6692	1451	70392	46496	24057
5	9977	2287	97465	68675	35379
10	12316	2909	116203	85087	43276
25	15437	3768	140784	107793	53645
50	17875	4460	159751	126150	61627
100	20406	5194	179278	145756	69813
500	26718	7087	227501	196994	89858

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak							
1.01	1880	523	32756	17693	7527	-17.0%	22.2%	6.5%	-1.8%	-8.8%		
2	7185	1550	73826	49418	26134	7.4%	6.8%	4.9%	6.3%	8.6%	6.8%	
5	11379	2289	100082	70100	39936	14.0%	0.1%	2.7%	2.1%	12.9%	6.4%	
10	14397	2804	117607	83782	49580	16.9%	-3.6%	1.2%	-1.5%	14.6%	5.5%	4.6%
25	18431	3480	139935	100990	62197	19.4%	-7.7%	-0.6%	-6.3%	15.9%	4.2%	
50	21575	3999	156717	113736	71850	20.7%	-10.3%	-1.9%	-9.8%	16.6%	3.0%	
100	24824	4532	173639	126417	81689	21.7%	-12.7%	-3.1%	-13.3%	17.0%	1.9%	
500	32844	5835	214097	156035	105482	22.9%	-17.7%	-5.9%	-20.8%	17.4%		

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak							
						16.7%	-4.6%	0.5%	-3.8%	14.3%		
1.01	2334	569	36005	20935	10348	3.0%	33.1%	17.1%	16.2%	25.3%		
2	8094	1871	77459	56275	29735	21.0%	29.0%	10.0%	21.0%	23.6%	20.9%	
5	12198	2696	105349	77924	42017	22.3%	17.9%	8.1%	13.5%	18.8%	16.1%	
10	14993	3221	124556	91775	49974	21.7%	10.7%	7.2%	7.9%	15.5%	12.6%	10.9%
25	18571	3857	149678	108740	59801	20.3%	2.4%	6.3%	0.9%	11.5%	8.3%	
50	21255	4311	169023	121014	66956	18.9%	-3.3%	5.8%	-4.1%	8.6%	5.2%	
100	23947	4748	188913	133000	73975	17.4%	-8.6%	5.4%	-8.8%	6.0%	2.3%	
500	30298	5719	237963	160213	90011	13.4%	-19.3%	4.6%	-18.7%	0.2%		
						20.3%	8.0%	7.1%	5.1%	14.0%		

Peaks for Annual Frequency Analysis

DSN1 6699 1H FLOW /CHEHALIS R/NEAR DOTY/FLOW//1HOUR/12020000/
DSN2 2104 1H FLOW /CHEHALIS R/NEAR GRAND MOUND/FLOW//1HOUR/12027500/
DSN3 3481 1H FLOW /CHEHALIS R/NEAR PE ELL/FLOW//1HOUR/12019310/
DSN4 3098 1H FLOW /ELK CK/NEAR DOTY/FLOW//1HOUR/12020525/
DSN5 7500 1H FLOW /HUMPTULIPS R/BELOW HWY 101/FLOW//1HOUR/12039005/

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak
1.01	4139	15522	3159	1252	7100
2	11556	39573	8142	3657	13988
5	16690	58788	11615	5484	18168
10	20211	73229	14024	6804	20903
25	24777	93472	17183	8589	24341
50	28253	110035	19616	9999	26897
100	31789	127899	22115	11477	29454
500	40336	175324	28257	15220	35504

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
1.01	3857	13938	2918	991	6174	-6.8%	-10.2%	-7.6%	-20.8%	-13.0%	
2	12945	42542	9367	3900	17095	12.0%	7.5%	15.0%	6.6%	22.2%	12.7%	
5	19588	62532	13937	6261	24147	17.4%	6.4%	20.0%	14.2%	32.9%	18.2%	
10	24207	76194	17068	7984	28791	19.8%	4.0%	21.7%	17.3%	37.7%	20.1%	19.4%
25	30227	93805	21108	10311	34611	22.0%	0.4%	22.8%	20.1%	42.2%	21.5%	
50	34822	107127	24163	12142	38907	23.3%	-2.6%	23.2%	21.4%	44.7%	22.0%	
100	39497	120597	27250	14048	43172	24.2%	-5.7%	23.2%	22.4%	46.6%	22.1%	
500	50777	152820	34624	18804	53095	25.9%	-12.8%	22.5%	23.5%	49.5%		

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak	19.8%	1.7%	21.0%	17.0%	37.7%		
1.01	5085	17385	3716	1389	7714	22.8%	12.0%	17.7%	11.0%	8.6%		
2	14470	49500	10266	4595	18053	25.2%	25.1%	26.1%	25.6%	29.1%	26.2%	
5	20340	69771	14360	6748	25021	21.9%	18.7%	23.6%	23.0%	37.7%	25.0%	
10	24116	82889	17003	8169	29801	19.3%	13.2%	21.2%	20.1%	42.6%	23.3%	21.8%
25	28755	99078	20261	9944	36022	16.1%	6.0%	17.9%	15.8%	48.0%	20.7%	
50	32116	110861	22631	11246	40787	13.7%	0.8%	15.4%	12.5%	51.6%	18.8%	
100	35401	122418	24956	12531	45663	11.4%	-4.3%	12.8%	9.2%	55.0%	16.8%	
500	42862	148811	30267	15482	57588	6.3%	-15.1%	7.1%	1.7%	62.2%		
						17.9%	9.9%	19.5%	17.7%	44.0%		

Peaks for Annual Frequency Analysis

DSN1 1001 1H FLOW /NEWAUKUM R/NEAR CHEHALIS/FLOW//1HOUR/12025000/
DSN2 2569 1H FLOW /NFK NEWAUKUM R/NEAR FOREST/FLOW//1HOUR/12024400/
DSN3 2219 1H FLOW /SATSOP R/NEAR SATSOP/FLOW//1HOUR/12035000/
DSN4 6540 1H FLOW /SFK CHEHALIS R/AT HWY 6/FLOW//1HOUR/23K060/
DSN5 5617 1H FLOW /SFK NEWAUKUM R/NEAR ONALASKA/FLOW//1HOUR/12024000/

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak
1.01	3358	738	9660	3734	1437
2	8195	1776	22887	9833	3509
5	12227	2634	31619	14410	5110
10	15338	3292	37532	17720	6294
25	19799	4233	45147	22212	7931
50	23527	5017	50923	25779	9255
100	27617	5874	56787	29533	10671
500	38784	8207	70951	39120	14378

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
1.01	2542	559	10350	3530	1096	-24.3%	-24.3%	7.1%	-5.5%	-23.7%	
2	8413	1809	28171	11222	3640	2.7%	1.8%	23.1%	14.1%	3.7%	9.1%
5	13076	2813	40867	16764	5662	6.9%	6.8%	29.2%	16.3%	10.8%	14.0%
10	16497	3558	49750	20608	7145	7.6%	8.1%	32.6%	16.3%	13.5%	15.6%	14.7%
25	21167	4583	61464	25616	9169	6.9%	8.3%	36.1%	15.3%	15.6%	16.5%
50	24885	5406	70526	29440	10781	5.8%	7.8%	38.5%	14.2%	16.5%	16.5%
100	28799	6279	79863	33335	12477	4.3%	6.9%	40.6%	12.9%	16.9%	16.3%
500	38769	8528	102906	42751	16797	0.0%	3.9%	45.0%	9.3%	16.8%	

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
						5.7%	6.6%	33.4%	14.9%	12.8%	
1.01	3334	697	11413	4529	1396	-0.7%	-5.6%	18.1%	21.3%	-2.8%	
2	10468	2203	29887	12625	4268	27.7%	24.0%	30.6%	28.4%	21.6%	26.5%
5	15429	3301	43340	17864	6277	26.2%	25.3%	37.1%	24.0%	22.8%	27.1%
10	18798	4068	52905	21315	7649	22.6%	23.6%	41.0%	20.3%	21.5%	25.8%	23.7%
25	23114	5074	65701	25640	9419	16.7%	19.9%	45.5%	15.4%	18.8%	23.3%
50	26359	5847	75733	28833	10758	12.0%	16.6%	48.7%	11.8%	16.2%	21.1%
100	29623	6638	86187	32002	12112	7.3%	13.0%	51.8%	8.4%	13.5%	18.8%
500	37367	8566	112451	39375	15350	-3.7%	4.4%	58.5%	0.7%	6.8%	
						18.8%	20.4%	42.4%	18.0%	19.1%	

Peaks for Annual Frequency Analysis

DSN1 2822 1H FLOW /SKOOKUMCHUCK R/NEAR BUCODA/FLOW//1HOUR/12026400/
DSN2 4981 1H FLOW /SKOOKUMCHUCK R/NEAR VAIL/FLOW//1HOUR/12025700/
DSN3 2544 1H FLOW /WISHKAH R/NEAR NISSON/FLOW//1HOUR/22D110/
DSN4 2816 1H FLOW /WYNOOCHEE R/NEAR GRISDALE/FLOW//1HOUR/12035400/
DSN5 579 1H FLOW /WYNOOCHEE R/NEAR MONTESANO/FLOW//1HOUR/12037400/

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak
1.01	2008	1488	2429	3488	6607
2	5022	3585	5353	6565	13544
5	7504	5227	7064	8439	17878
10	9404	6450	8152	9669	20753
25	12110	8154	9485	11222	24403
50	14356	9541	10453	12381	27141
100	16807	11032	11403	13544	29899
500	23441	14968	13579	16312	36489

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
1.01	1815	1203	2297	3538	6373	-9.6%	-19.2%	-5.4%	1.4%	-3.5%	
2	5295	3852	6478	8024	16526	5.4%	7.5%	21.0%	22.2%	22.0%	15.6%	
5	7855	5999	9439	11074	23177	4.7%	14.8%	33.6%	31.2%	29.6%	22.8%	
10	9670	7598	11495	13181	27624	2.8%	17.8%	41.0%	36.3%	33.1%	26.2%	26.6%
25	12085	9812	14189	15942	33280	-0.2%	20.3%	49.6%	42.1%	36.4%	29.6%	
50	13967	11598	16259	18069	37516	-2.7%	21.6%	55.5%	45.9%	38.2%	31.7%	
100	15917	13499	18380	20257	41770	-5.3%	22.4%	61.2%	49.6%	39.7%	33.5%	
500	20764	18428	23566	25654	51867	-11.4%	23.1%	73.5%	57.3%	42.1%		

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
						0.8%	17.4%	43.7%	37.9%	33.2%	
1.01	2115	1459	2773	3588	7170	5.3%	-1.9%	14.1%	2.9%	8.5%	
2	6052	4335	6918	8875	17701	20.5%	20.9%	29.2%	35.2%	30.7%	27.3%	
5	8872	6393	9912	12532	25036	18.2%	22.3%	40.3%	48.5%	40.0%	33.9%	
10	10842	7826	12038	15067	30141	15.3%	21.3%	47.7%	55.8%	45.2%	37.1%	37.6%
25	13432	9703	14882	18391	36860	10.9%	19.0%	56.9%	63.9%	51.0%	40.3%	
50	15430	11143	17113	20952	42054	7.5%	16.8%	63.7%	69.2%	54.9%	42.4%	
100	17483	12618	19439	23586	47407	4.0%	14.4%	70.5%	74.1%	58.6%	44.3%	
500	22523	16215	25296	30067	60638	-3.9%	8.3%	86.3%	84.3%	66.2%		
						12.7%	19.1%	51.4%	57.8%	46.8%		

FGOALS-g2 Simulations - Summary Statistics

Mid-Century (2015-2060) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	-1.0%	-2.1%	10.6%	-14.5%
2	6.3%	4.9%	15.8%	0.3%
5	10.9%	10.2%	25.0%	0.0%
10	13.9%	13.5%	33.0%	-1.7%
25	17.5%	17.1%	43.2%	-3.6%
50	20.1%	19.5%	50.7%	-4.9%
100	22.6%	21.8%	58.3%	-6.0%
500	28.5%	27.2%	76.0%	-8.5%
Average	15.2%	14.5%	37.7%	-2.6%

Late-Century (2055-2099) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	38.7%	36.0%	58.6%	19.5%
2	38.2%	38.6%	57.0%	23.4%
5	40.8%	41.4%	67.0%	20.2%
10	42.8%	43.2%	76.1%	18.6%
25	45.5%	44.6%	87.9%	17.0%
50	47.5%	44.9%	96.8%	16.0%
100	49.6%	45.1%	105.7%	15.0%
500	54.6%	47.8%	126.7%	11.8%
Average	44.1%	43.0%	81.7%	18.4%

Peaks for Annual Frequency Analysis

DSN1 195 1H FLOW /BLACK R/AT HWY 12/FLOW//1HOUR/2.30E+61/
DSN2 8192 1H FLOW /BUNKER CK/AT CERES HILL RD/FLOW//1HOUR/23I070/
DSN3 555 1H FLOW /CHEHALIS R/AT MOUTH/FLOW//1HOUR/WSE 1/
DSN4 2350 1H FLOW /CHEHALIS R/AT PORTER/FLOW//1HOUR/12031000/
DSN5 8105 1H FLOW /CHEHALIS R/NEAR ADNA/FLOW//1HOUR/12021800/

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak
1.01	1850	416	25310	15931	7031
2	4446	985	50971	32624	15988
5	5999	1334	65929	43150	21280
10	6992	1560	75493	50167	24655
25	8211	1841	87289	59115	28798
50	9095	2047	95910	65851	31807
100	9962	2251	104418	72657	34761
500	11946	2724	124119	88996	41532

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
1.01	1822	412	26192	15911	6520	-1.5%	-0.8%	3.5%	-0.1%	-7.3%		
2	4848	1032	52817	34653	16608	9.1%	4.7%	3.6%	6.2%	3.9%	5.5%	
5	6978	1450	67748	46411	23418	16.3%	8.7%	2.8%	7.6%	10.0%	9.1%	
10	8461	1737	77094	54197	28060	21.0%	11.3%	2.1%	8.0%	13.8%	11.3%	12.1%
25	10409	2107	88425	64059	34063	26.8%	14.5%	1.3%	8.4%	18.3%	13.8%	
50	11912	2390	96580	71435	38627	31.0%	16.8%	0.7%	8.5%	21.4%	15.7%	
100	13457	2678	104530	78846	43268	35.1%	19.0%	0.1%	8.5%	24.5%	17.4%	
500	17258	3378	122594	96471	54497	44.5%	24.0%	-1.2%	8.4%	31.2%		

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
						23.2%	12.5%	1.8%	7.9%	15.3%		
1.01	2693	659	32395	21407	10522	45.6%	58.6%	28.0%	34.4%	49.7%		
2	6544	1371	63671	43904	22354	47.2%	39.1%	24.9%	34.6%	39.8%	37.1%	
5	8789	1812	80470	57262	30172	46.5%	35.8%	22.1%	32.7%	41.8%	35.8%	
10	10200	2102	90759	65880	35507	45.9%	34.8%	20.2%	31.3%	44.0%	35.2%	35.4%
25	11907	2469	103023	76580	42435	45.0%	34.1%	18.0%	29.5%	47.4%	34.8%	
50	13131	2744	111720	84447	47735	44.4%	34.0%	16.5%	28.2%	50.1%	34.6%	
100	14319	3019	120099	92246	53158	43.7%	34.1%	15.0%	27.0%	52.9%	34.5%	
500	16992	3672	138809	110428	66430	42.2%	34.8%	11.8%	24.1%	59.9%		
						45.5%	35.3%	19.5%	30.6%	46.0%		

Peaks for Annual Frequency Analysis

DSN1 6699 1H FLOW /CHEHALIS R/NEAR DOTY/FLOW//1HOUR/12020000/
DSN2 2104 1H FLOW /CHEHALIS R/NEAR GRAND MOUND/FLOW//1HOUR/12027500/
DSN3 3481 1H FLOW /CHEHALIS R/NEAR PE ELL/FLOW//1HOUR/12019310/
DSN4 3098 1H FLOW /ELK CK/NEAR DOTY/FLOW//1HOUR/12020525/
DSN5 7500 1H FLOW /HUMPTULIPS R/BELOW HWY 101/FLOW//1HOUR/12039005/

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak
1.01	3296	13024	2398	1001	4865
2	7737	27417	5528	2419	9393
5	10242	36224	7262	3341	12244
10	11792	41989	8326	3959	14148
25	13646	49229	9591	4747	16581
50	14962	54606	10484	5339	18418
100	16229	59976	11339	5937	20278
500	19047	72644	13231	7363	24762

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN1 7500 Peak						
1.01	3096	12439	2213	954	5146	-6.1%	-4.5%	-7.7%	-4.6%	5.8%		
2	8039	29202	5779	2542	9702	3.9%	6.5%	4.6%	5.1%	3.3%	4.7%	
5	11396	40167	8215	3635	12643	11.3%	10.9%	13.1%	8.8%	3.3%	9.5%	
10	13689	47558	9884	4385	14635	16.1%	13.3%	18.7%	10.8%	3.4%	12.5%	13.7%
25	16657	57044	12049	5360	17210	22.1%	15.9%	25.6%	12.9%	3.8%	16.1%	
50	18916	64216	13699	6104	19174	26.4%	17.6%	30.7%	14.3%	4.1%	18.6%	
100	21214	71481	15380	6862	21180	30.7%	19.2%	35.6%	15.6%	4.4%	21.1%	
500	26775	88965	19458	8704	26080	40.6%	22.5%	47.1%	18.2%	5.3%		

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
						18.4%	13.9%	21.4%	11.2%	3.7%		
1.01	5095	17673	3637	1501	5814	54.6%	35.7%	51.6%	50.0%	19.5%		
2	10817	37518	7732	3452	11854	39.8%	36.8%	39.9%	42.7%	26.2%	37.1%	
5	14605	49616	10446	4784	15581	42.6%	37.0%	43.8%	43.2%	27.3%	38.8%	
10	17192	57515	12302	5705	18037	45.8%	37.0%	47.7%	44.1%	27.5%	40.4%	41.8%
25	20555	67411	14714	6914	21139	50.6%	36.9%	53.4%	45.7%	27.5%	42.8%	
50	23130	74743	16563	7846	23456	54.6%	36.9%	58.0%	46.9%	27.4%	44.8%	
100	25767	82055	18456	8805	25781	58.8%	36.8%	62.8%	48.3%	27.1%	46.8%	
500	32224	99251	23095	11173	31306	69.2%	36.6%	74.6%	51.7%	26.4%		
						48.7%	36.9%	50.9%	45.1%	27.2%		

Peaks for Annual Frequency Analysis

DSN1 1001 1H FLOW /NEWAUKUM R/NEAR CHEHALIS/FLOW//1HOUR/12025000/
DSN2 2569 1H FLOW /NFK NEWAUKUM R/NEAR FOREST/FLOW//1HOUR/12024400/
DSN3 2219 1H FLOW /SATSOP R/NEAR SATSOP/FLOW//1HOUR/12035000/
DSN4 6540 1H FLOW /SFK CHEHALIS R/AT HWY 6/FLOW//1HOUR/23K060/
DSN5 5617 1H FLOW /SFK NEWAUKUM R/NEAR ONALASKA/FLOW//1HOUR/12024000/

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak
1.01	2273	494	7433	3355	946
2	5343	1155	15864	6978	2339
5	7127	1555	21122	8895	3115
10	8250	1814	24598	10053	3589
25	9612	2134	28995	11417	4148
50	10591	2369	32282	12372	4539
100	11542	2600	35583	13283	4913
500	13693	3136	43428	15286	5728

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
1.01	2275	472	8221	2869	920	0.1%	-4.6%	10.6%	-14.5%	-2.7%		
2	6189	1319	16691	7002	2644	15.8%	14.2%	5.2%	0.3%	13.0%	9.7%	
5	8865	1928	22094	9822	3894	24.4%	23.9%	4.6%	10.4%	25.0%	17.7%	
10	10693	2355	25720	11764	4774	29.6%	29.8%	4.6%	17.0%	33.0%	22.8%	25.2%
25	13055	2920	30369	14297	5939	35.8%	36.8%	4.7%	25.2%	43.2%	29.2%	
50	14849	3357	33887	16241	6843	40.2%	41.7%	5.0%	31.3%	50.7%	33.8%	
100	16670	3808	37456	18231	7775	44.4%	46.5%	5.3%	37.2%	58.3%	38.3%	
500	21062	4922	46077	23104	10081	53.8%	57.0%	6.1%	51.1%	76.0%		

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
						31.7%	32.2%	4.9%	20.3%	37.2%		
1.01	3222	691	9435	4431	1330	41.8%	39.8%	26.9%	32.1%	40.6%		
2	8276	1813	20782	9553	3596	54.9%	57.0%	31.0%	36.9%	53.7%	46.7%	
5	11742	2591	27962	12913	5201	64.7%	66.6%	32.4%	45.2%	67.0%	55.2%	
10	14126	3130	32735	15196	6321	71.2%	72.6%	33.1%	51.2%	76.1%	60.8%	63.7%
25	17230	3833	38799	18148	7795	79.3%	79.6%	33.8%	59.0%	87.9%	67.9%	
50	19605	4374	43347	20399	8933	85.1%	84.6%	34.3%	64.9%	96.8%	73.1%	
100	22031	4927	47925	22694	10105	90.9%	89.5%	34.7%	70.8%	105.7%	78.3%	
500	27947	6280	58844	28285	12989	104.1%	100.3%	35.5%	85.0%	126.7%		
						74.3%	75.0%	33.2%	54.7%	81.2%		

Peaks for Annual Frequency Analysis

DSN1 2822 1H FLOW /SKOOKUMCHUCK R/NEAR BUCODA/FLOW//1HOUR/12026400/
DSN2 4981 1H FLOW /SKOOKUMCHUCK R/NEAR VAIL/FLOW//1HOUR/12025700/
DSN3 2544 1H FLOW /WISHKAH R/NEAR NISSON/FLOW//1HOUR/22D110/
DSN4 2816 1H FLOW /WYNOOCHEE R/NEAR GRISDALE/FLOW//1HOUR/12035400/
DSN5 579 1H FLOW /WYNOOCHEE R/NEAR MONTESANO/FLOW//1HOUR/12037400/

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak
1.01	1541	1033	1709	2161	4589
2	3576	2562	3674	4508	9161
5	4857	3498	4904	5916	12119
10	5703	4101	5717	6829	14121
25	6770	4847	6747	7967	16706
50	7565	5392	7517	8805	18674
100	8360	5929	8291	9638	20681
500	10239	7164	10131	11587	25570

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN2 2816 Peak	DSN5 579 Peak						
1.01	1484	954	1815	2350	5041	-3.8%	-7.7%	6.2%	8.8%	9.9%		
2	3873	2680	3848	4637	9708	8.3%	4.6%	4.7%	2.9%	6.0%	5.3%	
5	5528	3971	5218	5914	12566	13.8%	13.5%	6.4%	0.0%	3.7%	7.5%	
10	6672	4898	6163	6713	14448	17.0%	19.4%	7.8%	-1.7%	2.3%	9.0%	9.7%
25	8165	6146	7402	7681	16826	20.6%	26.8%	9.7%	-3.6%	0.7%	10.8%	
50	9311	7130	8357	8377	18603	23.1%	32.2%	11.2%	-4.9%	-0.4%	12.3%	
100	10485	8159	9341	9057	20388	25.4%	37.6%	12.7%	-6.0%	-1.4%	13.6%	
500	13354	10756	11774	10602	24640	30.4%	50.1%	16.2%	-8.5%	-3.6%		

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak	18.0%	22.4%	8.7%	-2.2%	1.8%		
1.01	2029	1408	2207	2886	6121	31.7%	36.3%	29.2%	33.6%	33.4%		
2	4941	3577	4848	5562	11630	38.2%	39.6%	31.9%	23.4%	27.0%	32.0%	
5	6846	5130	6613	7110	15116	40.9%	46.7%	34.9%	20.2%	24.7%	33.5%	
10	8125	6226	7824	8100	17452	42.5%	51.8%	36.8%	18.6%	23.6%	34.7%	35.5%
25	9762	7685	9400	9321	20446	44.2%	58.5%	39.3%	17.0%	22.4%	36.3%	
50	10995	8823	10610	10214	22713	45.3%	63.6%	41.1%	16.0%	21.6%	37.5%	
100	12240	10006	11850	11096	25013	46.4%	68.8%	42.9%	15.1%	20.9%	38.8%	
500	15220	12963	14892	13141	30578	48.6%	80.9%	47.0%	13.4%	19.6%		

42.9% 54.8% 37.8% 18.4% 23.4%

GISS-E2-H Simulations - Summary Statistics

Mid-Century (2015-2060) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	-10.6%	-9.6%	-0.5%	-19.5%
2	-8.1%	-7.8%	-2.5%	-15.5%
5	-5.3%	-3.4%	4.5%	-20.0%
10	-3.3%	-0.3%	10.2%	-22.5%
25	-0.8%	3.8%	17.2%	-25.5%
50	1.1%	6.3%	22.4%	-27.4%
100	2.9%	8.7%	27.5%	-29.2%
500	7.3%	14.3%	39.2%	-32.9%
Average	-2.2%	1.2%	13.2%	-23.3%

Late-Century (2055-2099) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	21.5%	28.6%	44.1%	-16.0%
2	2.6%	2.4%	9.2%	-5.2%
5	1.2%	1.4%	10.2%	-9.1%
10	1.4%	2.5%	12.4%	-12.7%
25	2.3%	3.5%	15.4%	-15.8%
50	3.3%	5.3%	17.9%	-17.4%
100	4.5%	7.4%	20.4%	-18.7%
500	7.9%	12.0%	29.8%	-20.6%
Average	2.6%	3.7%	14.3%	-13.2%

Peaks for Annual Frequency Analysis

DSN1 195 1H FLOW /BLACK R/AT HWY 12/FLOW//1HOUR/2.30E+61/
DSN2 8192 1H FLOW /BUNKER CK/AT CERES HILL RD/FLOW//1HOUR/23I070/
DSN3 555 1H FLOW /CHEHALIS R/AT MOUTH/FLOW//1HOUR/WSE 1/
DSN4 2350 1H FLOW /CHEHALIS R/AT PORTER/FLOW//1HOUR/12031000/
DSN5 8105 1H FLOW /CHEHALIS R/NEAR ADNA/FLOW//1HOUR/12021800/

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak
1.01	1601	355	23966	14960	6618
2	4805	1042	51843	35425	18612
5	7110	1539	65080	47257	25804
10	8717	1888	72550	54677	30321
25	10823	2348	80858	63651	35760
50	12442	2704	86379	70080	39631
100	14099	3069	91426	76317	43361
500	18147	3968	101811	90358	51649

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
1.01	1436	343	23685	13593	5511	-10.3%	-3.2%	-1.2%	-9.1%	-16.7%	
2	4559	1016	47956	33210	17014	-5.1%	-2.5%	-7.5%	-6.3%	-8.6%	-6.0%
5	7099	1544	62906	46249	25163	-0.2%	0.3%	-3.3%	-2.1%	-2.5%	-1.6%
10	8999	1933	72753	55090	30773	3.2%	2.4%	0.3%	0.8%	1.5%	1.6%	3.4%
25	11637	2467	85189	66481	38044	7.5%	5.1%	5.4%	4.4%	6.4%	5.8%
50	13771	2896	94474	75120	43572	10.7%	7.1%	9.4%	7.2%	9.9%	8.9%
100	16049	3350	103793	83890	49183	13.8%	9.2%	13.5%	9.9%	13.4%	12.0%
500	21980	4521	125936	105058	62687	21.1%	14.0%	23.7%	16.3%	21.4%	

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
						5.0%	3.6%	2.9%	2.3%	3.4%	
1.01	2167	482	27588	18257	8622	35.3%	35.8%	15.1%	22.0%	30.3%	
2	5065	1125	52260	37013	18842	5.4%	8.0%	0.8%	4.5%	1.2%	4.0%
5	7297	1658	65814	49370	25790	2.6%	7.7%	1.1%	4.5%	-0.1%	3.2%
10	8947	2067	74243	57807	30598	2.6%	9.5%	2.3%	5.7%	0.9%	4.2%	6.3%
25	11230	2655	84422	68778	36911	3.8%	13.0%	4.4%	8.1%	3.2%	6.5%
50	13079	3145	91727	77184	41787	5.1%	16.3%	6.2%	10.1%	5.4%	8.6%
100	15057	3682	98835	85797	46813	6.8%	20.0%	8.1%	12.4%	8.0%	11.1%
500	20247	5149	114952	106930	59254	11.6%	29.8%	12.9%	18.3%	14.7%	
						4.4%	12.4%	3.8%	7.5%	3.1%	

Peaks for Annual Frequency Analysis

DSN1 6699 1H FLOW /CHEHALIS R/NEAR DOTY/FLOW//1HOUR/12020000/
DSN2 2104 1H FLOW /CHEHALIS R/NEAR GRAND MOUND/FLOW//1HOUR/12027500/
DSN3 3481 1H FLOW /CHEHALIS R/NEAR PE ELL/FLOW//1HOUR/12019310/
DSN4 3098 1H FLOW /ELK CK/NEAR DOTY/FLOW//1HOUR/12020525/
DSN5 7500 1H FLOW /HUMPTULIPS R/BELOW HWY 101/FLOW//1HOUR/12039005/

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak
1.01	3251	12598	2426	891	4986
2	9320	30689	6632	2858	9040
5	12894	41735	9161	4192	11012
10	15106	48867	10758	5081	12164
25	17738	57693	12691	6202	13490
50	19588	64147	14074	7032	14402
100	21354	70510	15413	7857	15259
500	25219	85189	18411	9775	17106

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
1.01	2671	10708	1953	831	4162	-17.8%	-15.0%	-19.5%	-6.7%	-16.5%	
2	8372	28274	6081	2473	8669	-10.2%	-7.9%	-8.3%	-13.5%	-4.1%	-8.8%
5	12263	40270	8840	3677	11175	-4.9%	-3.5%	-3.5%	-12.3%	1.5%	-4.5%
10	14874	48478	10669	4527	12732	-1.5%	-0.8%	-0.8%	-10.9%	4.7%	-1.9%
25	18188	59111	12966	5652	14606	2.5%	2.5%	2.2%	-8.9%	8.3%	1.3%
50	20658	67207	14663	6526	15946	5.5%	4.8%	4.2%	-7.2%	10.7%	3.6%
100	23125	75447	16345	7427	17245	8.3%	7.0%	6.0%	-5.5%	13.0%	5.8%
500	28913	95396	20246	9655	20170	14.6%	12.0%	10.0%	-1.2%	17.9%	

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
						-0.1%	0.3%	0.0%	-9.7%	5.7%	
1.01	4223	14801	3119	1145	4497	29.9%	17.5%	28.6%	28.5%	-9.8%	
2	9051	31719	6531	2708	9310	-2.9%	3.4%	-1.5%	-5.2%	3.0%	-0.7%
5	12345	43268	8806	3885	11780	-4.3%	3.7%	-3.9%	-7.3%	7.0%	-1.0%
10	14630	51288	10368	4743	13247	-3.2%	5.0%	-3.6%	-6.7%	8.9%	0.1%
25	17639	61848	12407	5918	14950	-0.6%	7.2%	-2.2%	-4.6%	10.8%	2.1%
50	19969	70030	13973	6859	16128	1.9%	9.2%	-0.7%	-2.5%	12.0%	4.0%
100	22375	78483	15582	7859	17241	4.8%	11.3%	1.1%	0.0%	13.0%	6.0%
500	28354	99493	19543	10446	19649	12.4%	16.8%	6.1%	6.9%	14.9%	
						-0.7%	6.6%	-1.8%	-4.4%	9.1%	

Peaks for Annual Frequency Analysis

DSN1 1001 1H FLOW /NEWAUKUM R/NEAR CHEHALIS/FLOW//1HOUR/12025000/
DSN2 2569 1H FLOW /NFK NEWAUKUM R/NEAR FOREST/FLOW//1HOUR/12024400/
DSN3 2219 1H FLOW /SATSOP R/NEAR SATSOP/FLOW//1HOUR/12035000/
DSN4 6540 1H FLOW /SFK CHEHALIS R/AT HWY 6/FLOW//1HOUR/23K060/
DSN5 5617 1H FLOW /SFK NEWAUKUM R/NEAR ONALASKA/FLOW//1HOUR/12024000/

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak
1.01	2331	483	7446	2958	947
2	6077	1349	15844	7804	2740
5	8669	1966	19954	10626	4031
10	10458	2397	22320	12381	4935
25	12794	2963	24998	14482	6125
50	14585	3400	26806	15971	7044
100	16419	3848	28481	17401	7990
500	20900	4952	31997	20567	10313

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
1.01	2219	481	6816	2467	860	-4.8%	-0.5%	-8.5%	-16.6%	-9.2%		
2	5608	1224	14633	7474	2389	-7.7%	-9.3%	-7.6%	-4.2%	-12.8%	-8.3%	
5	7853	1729	19461	11102	3388	-9.4%	-12.0%	-2.5%	4.5%	-16.0%	-7.1%	
10	9367	2076	22634	13640	4050	-10.4%	-13.4%	1.4%	10.2%	-17.9%	-6.0%	-5.3%
25	11307	2526	26628	16976	4884	-11.6%	-14.8%	6.5%	17.2%	-20.3%	-4.6%	
50	12772	2869	29601	19545	5503	-12.4%	-15.6%	10.4%	22.4%	-21.9%	-3.4%	
100	14252	3219	32575	22181	6119	-13.2%	-16.4%	14.4%	27.5%	-23.4%	-2.2%	
500	17798	4070	39606	28632	7562	-14.8%	-17.8%	23.8%	39.2%	-26.7%		

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak	-10.8%	-13.6%	3.8%	12.9%	-18.7%		
1.01	3003	673	8332	3413	1365	28.8%	39.3%	11.9%	15.4%	44.1%		
2	6638	1453	15961	8433	2850	9.2%	7.7%	0.7%	8.1%	4.0%	5.9%	
5	9120	1991	20239	11712	3841	5.2%	1.3%	1.4%	10.2%	-4.7%	2.7%	
10	10841	2368	22928	13912	4523	3.7%	-1.2%	2.7%	12.4%	-8.4%	1.8%	2.6%
25	13103	2865	26202	16719	5413	2.4%	-3.3%	4.8%	15.4%	-11.6%	1.6%	
50	14851	3253	28568	18831	6098	1.8%	-4.3%	6.6%	17.9%	-13.4%	1.7%	
100	16655	3654	30884	20959	6801	1.4%	-5.0%	8.4%	20.4%	-14.9%	2.1%	
500	21125	4658	36179	26041	8535	1.1%	-5.9%	13.1%	26.6%	-17.2%		
						4.0%	-0.8%	4.1%	14.1%	-8.2%		

Peaks for Annual Frequency Analysis

DSN1 2822 1H FLOW /SKOOKUMCHUCK R/NEAR BUCODA/FLOW//1HOUR/12026400/
DSN2 4981 1H FLOW /SKOOKUMCHUCK R/NEAR VAIL/FLOW//1HOUR/12025700/
DSN3 2544 1H FLOW /WISHKAH R/NEAR NISSON/FLOW//1HOUR/22D110/
DSN4 2816 1H FLOW /WYNOOCHEE R/NEAR GRISDALE/FLOW//1HOUR/12035400/
DSN5 579 1H FLOW /WYNOOCHEE R/NEAR MONTESANO/FLOW//1HOUR/12037400/

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak
1.01	1532	1023	1539	2684	4981
2	4200	3152	3280	4789	9104
5	6038	4720	4164	5859	11167
10	7297	5826	4685	6501	12389
25	8929	7289	5285	7255	13811
50	10171	8422	5696	7783	14798
100	11434	9589	6082	8287	15734
500	14489	12466	6910	9398	17775

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
1.01	1379	947	1429	2183	4306	-10.0%	-7.4%	-7.2%	-18.7%	-13.6%	
2	3670	2663	2978	4523	8784	-12.6%	-15.5%	-9.2%	-5.6%	-3.5%	-9.3%
5	5123	3777	3972	5796	11356	-15.2%	-20.0%	-4.6%	-1.1%	1.7%	-7.8%
10	6074	4512	4640	6578	12985	-16.8%	-22.5%	-1.0%	1.2%	4.8%	-6.9%	-6.3%
25	7261	5433	5499	7510	14979	-18.7%	-25.5%	4.1%	3.5%	8.5%	-5.6%	
50	8134	6113	6149	8171	16427	-20.0%	-27.4%	7.9%	5.0%	11.0%	-4.7%	
100	8999	6788	6809	8808	17847	-21.3%	-29.2%	11.9%	6.3%	13.4%	-3.8%	
500	11007	8359	8404	10227	21106	-24.0%	-32.9%	21.6%	8.8%	18.7%		

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
						-17.4%	-23.3%	1.5%	1.6%	6.0%	
1.01	2080	1465	1470	2255	4886	35.8%	43.2%	-4.5%	-16.0%	-1.9%	
2	4273	3141	3267	4831	9544	1.7%	-0.3%	-0.4%	0.9%	4.8%	1.3%
5	5770	4288	4184	6202	11916	-4.4%	-9.1%	0.5%	5.9%	6.7%	-0.1%
10	6811	5086	4723	7031	13327	-6.7%	-12.7%	0.8%	8.1%	7.6%	-0.6%	-0.4%
25	8185	6137	5342	8005	14970	-8.3%	-15.8%	1.1%	10.3%	8.4%	-0.9%	
50	9251	6952	5765	8686	16111	-9.0%	-17.4%	1.2%	11.6%	8.9%	-1.0%	
100	10355	7795	6160	9336	17193	-9.4%	-18.7%	1.3%	12.7%	9.3%	-1.0%	
500	13108	9893	7003	10760	19548	-9.5%	-20.6%	1.4%	14.5%	10.0%		
						-6.0%	-12.4%	0.7%	8.2%	7.6%	

MIROC5 Simulations - Summary Statistics

Mid-Century (2015-2060) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	22.1%	20.3%	59.7%	5.4%
2	14.5%	14.2%	24.9%	7.2%
5	7.5%	6.7%	20.6%	-2.9%
10	3.2%	1.3%	16.1%	-10.2%
25	-1.8%	-5.3%	17.6%	-18.0%
50	-5.2%	-9.3%	18.6%	-23.0%
100	-8.3%	-12.4%	19.6%	-27.7%
500	-14.7%	-19.9%	21.6%	-38.3%
Average	1.6%	-0.8%	19.5%	-12.4%

Late-Century (2055-2099) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	1.2%	-5.8%	29.3%	-21.1%
2	15.9%	13.5%	34.3%	7.0%
5	18.1%	17.5%	31.6%	4.6%
10	18.5%	17.7%	34.7%	4.2%
25	18.2%	16.9%	39.1%	4.4%
50	17.8%	16.1%	42.1%	0.8%
100	17.2%	16.2%	44.9%	-3.0%
500	15.4%	12.9%	50.5%	-11.7%
Average	17.6%	16.3%	37.8%	3.0%

Peaks for Annual Frequency Analysis

DSN1 195 1H FLOW /BLACK R/AT HWY 12/FLOW//1HOUR/2.30E+61/
DSN2 8192 1H FLOW /BUNKER CK/AT CERES HILL RD/FLOW//1HOUR/23I070/
DSN3 555 1H FLOW /CHEHALIS R/AT MOUTH/FLOW//1HOUR/WSE 1/
DSN4 2350 1H FLOW /CHEHALIS R/AT PORTER/FLOW//1HOUR/12031000/
DSN5 8105 1H FLOW /CHEHALIS R/NEAR ADNA/FLOW//1HOUR/12021800/

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak
1.01	1342	287	27368	12960	6594
2	5733	1297	65107	42454	22814
5	9881	2278	93012	68750	36381
10	13189	3070	113157	89495	46616
25	18005	4232	140499	119625	60904
50	22054	5216	162246	145011	72505
100	26500	6302	185180	172998	84912
500	38568	9273	243974	249721	117286

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
1.01	2041	459	30812	16719	7913	52.1%	59.7%	12.6%	29.0%	20.0%	
2	6663	1542	69816	48460	24765	16.2%	18.8%	7.2%	14.1%	8.6%	13.0%
5	10179	2343	94535	69173	36016	3.0%	2.8%	1.6%	0.6%	-1.0%	1.4%
10	12693	2903	110946	82825	43468	-3.8%	-5.4%	-2.0%	-7.5%	-6.8%	-5.1%
25	16053	3639	131763	99924	52814	-10.8%	-14.0%	-6.2%	-16.5%	-13.3%	-12.2%
50	18676	4203	147346	112534	59709	-15.3%	-19.4%	-9.2%	-22.4%	-17.6%	-16.8%
100	21397	4780	163006	125033	66538	-19.3%	-24.2%	-12.0%	-27.7%	-21.6%	-21.0%
500	28159	6181	200256	154038	82356	-27.0%	-33.3%	-17.9%	-38.3%	-29.8%	

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
						-5.0%	-6.9%	-3.4%	-9.9%	-8.6%	
1.01	1656	331	25814	11817	5325	23.4%	15.1%	-5.7%	-8.8%	-19.2%	
2	7701	1734	72060	48272	25280	34.3%	33.7%	10.7%	13.7%	10.8%	20.6%
5	13007	2993	104831	77135	41968	31.6%	31.4%	12.7%	12.2%	15.4%	20.7%
10	16998	3938	127634	97747	54078	28.9%	28.3%	12.8%	9.2%	16.0%	19.0%
25	22503	5234	157544	125064	70265	25.0%	23.7%	12.1%	4.5%	15.4%	16.1%
50	26904	6263	180563	146164	82832	22.0%	20.1%	11.3%	0.8%	14.2%	13.7%
100	31538	7338	204177	167796	95750	19.0%	16.4%	10.3%	-3.0%	12.8%	11.1%
500	43287	10029	262044	220485	127274	12.2%	8.2%	7.4%	-11.7%	8.5%	
						26.8%	25.6%	11.6%	6.2%	14.1%	

Peaks for Annual Frequency Analysis

DSN1 6699 1H FLOW /CHEHALIS R/NEAR DOTY/FLOW//1HOUR/12020000/
DSN2 2104 1H FLOW /CHEHALIS R/NEAR GRAND MOUND/FLOW//1HOUR/12027500/
DSN3 3481 1H FLOW /CHEHALIS R/NEAR PE ELL/FLOW//1HOUR/12019310/
DSN4 3098 1H FLOW /ELK CK/NEAR DOTY/FLOW//1HOUR/12020525/
DSN5 7500 1H FLOW /HUMPTULIPS R/BELOW HWY 101/FLOW//1HOUR/12039005/

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak
1.01	3331	10788	2483	778	5438
2	11343	36786	8076	3391	13517
5	17672	59983	12402	5701	17973
10	22286	78229	15530	7461	20674
25	28545	104636	19749	9921	23846
50	33498	126801	23072	11914	26056
100	38685	151153	26541	14038	28153
500	51780	217511	35261	19525	32709

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
1.01	4020	13976	3050	1059	6116	20.7%	29.6%	22.8%	36.1%	12.5%		
2	12581	41787	9080	3888	15429	10.9%	13.6%	12.4%	14.7%	14.1%	13.2%	
5	18138	60093	12879	5991	20402	2.6%	0.2%	3.8%	5.1%	13.5%	5.1%	
10	21755	72179	15321	7452	23352	-2.4%	-7.7%	-1.3%	-0.1%	13.0%	0.3%	-1.2%
25	26224	87322	18314	9351	26752	-8.1%	-16.5%	-7.3%	-5.7%	12.2%	-5.1%	
50	29477	98490	20476	10794	29082	-12.0%	-22.3%	-11.3%	-9.4%	11.6%	-8.7%	
100	32664	109553	22584	12257	31261	-15.6%	-27.5%	-14.9%	-12.7%	11.0%	-11.9%	
500	39921	135202	27349	15757	35894	-22.9%	-37.8%	-22.4%	-19.3%	9.7%		

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak	-4.1%	-10.1%	-3.1%	-1.4%	12.6%		
1.01	2629	9479	2030	660	6933	-21.1%	-12.1%	-18.3%	-15.2%	27.5%		
2	12609	41670	9047	3988	14461	11.2%	13.3%	12.0%	17.6%	7.0%	12.2%	
5	20791	68101	14542	7257	18795	17.6%	13.5%	17.3%	27.3%	4.6%	16.1%	
10	26642	87249	18392	9820	21540	19.5%	11.5%	18.4%	31.6%	4.2%	17.1%	16.1%
25	34361	112876	23394	13451	24897	20.4%	7.9%	18.5%	35.6%	4.4%	17.3%	
50	40281	132823	27184	16413	27332	20.2%	4.7%	17.8%	37.8%	4.9%	17.1%	
100	46307	153387	31005	19575	29718	19.7%	1.5%	16.8%	39.4%	5.6%	16.6%	
500	60784	203858	40059	27736	35187	17.4%	-6.3%	13.6%	42.1%	7.6%		
						18.1%	8.7%	16.8%	31.6%	5.1%		

Peaks for Annual Frequency Analysis

DSN1 1001 1H FLOW /NEWAUKUM R/NEAR CHEHALIS/FLOW//1HOUR/12025000/
DSN2 2569 1H FLOW /NFK NEWAUKUM R/NEAR FOREST/FLOW//1HOUR/12024400/
DSN3 2219 1H FLOW /SATSOP R/NEAR SATSOP/FLOW//1HOUR/12035000/
DSN4 6540 1H FLOW /SFK CHEHALIS R/AT HWY 6/FLOW//1HOUR/23K060/
DSN5 5617 1H FLOW /SFK NEWAUKUM R/NEAR ONALASKA/FLOW//1HOUR/12024000/

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak
1.01	2063	516	8260	2774	1055
2	7708	1732	22550	10013	3450
5	12919	2825	31944	16063	5492
10	17071	3691	38206	20605	7060
25	23133	4950	46137	26911	9285
50	28255	6013	52051	32004	11120
100	33909	7186	57967	37425	13109
500	49414	10406	71910	51451	18415

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
1.01	2658	571	9532	3775	1112	28.8%	10.7%	15.4%	36.1%	5.4%	
2	9065	1963	25931	11056	3972	17.6%	13.3%	15.0%	10.4%	15.1%	14.3%
5	13995	3127	36236	15600	6135	8.3%	10.7%	13.4%	-2.9%	11.7%	8.2%
10	17528	4006	42923	18510	7659	2.7%	8.5%	12.3%	-10.2%	8.5%	4.4%
25	22254	5234	51206	22066	9666	-3.8%	5.7%	11.0%	-18.0%	4.1%	-0.2%
50	25944	6232	57260	24631	11209	-8.2%	3.7%	10.0%	-23.0%	0.8%	-3.4%
100	29769	7301	63219	27128	12789	-12.2%	1.6%	9.1%	-27.5%	-2.4%	-6.3%
500	39267	10093	76918	32759	16633	-20.5%	-3.0%	7.0%	-36.3%	-9.7%	

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
						0.7%	7.2%	11.8%	-11.9%	6.3%	
1.01	2233	507	9915	2490	993	8.2%	-1.7%	20.0%	-10.2%	-5.9%	
2	9492	2026	26246	11073	4132	23.1%	17.0%	16.4%	10.6%	19.8%	17.4%
5	16053	3448	37847	17698	7091	24.3%	22.0%	18.5%	10.2%	29.1%	20.8%
10	21140	4585	45969	22297	9454	23.8%	24.2%	20.3%	8.2%	33.9%	22.1%
25	28365	6246	56693	28226	12900	22.6%	26.2%	22.9%	4.9%	38.9%	23.1%
50	34306	7648	65002	32686	15804	21.4%	27.2%	24.9%	2.1%	42.1%	23.5%
100	40713	9194	73575	37156	19000	20.1%	27.9%	26.9%	-0.7%	44.9%	23.8%
500	57607	13423	94786	47654	27706	16.6%	29.0%	31.8%	-7.4%	50.5%	
						22.6%	24.1%	21.6%	5.9%	34.8%	

Peaks for Annual Frequency Analysis

DSN1 2822 1H FLOW /SKOOKUMCHUCK R/NEAR BUCODA/FLOW//1HOUR/12026400/
DSN2 4981 1H FLOW /SKOOKUMCHUCK R/NEAR VAIL/FLOW//1HOUR/12025700/
DSN3 2544 1H FLOW /WISHKAH R/NEAR NISSON/FLOW//1HOUR/22D110/
DSN4 2816 1H FLOW /WYNOOCHEE R/NEAR GRISDALE/FLOW//1HOUR/12035400/
DSN5 579 1H FLOW /WYNOOCHEE R/NEAR MONTESANO/FLOW//1HOUR/12037400/

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak
1.01	1361	1044	2083	2917	5364
2	4815	3520	5143	6939	13424
5	8156	5736	6924	9076	18302
10	10912	7484	8040	10349	21426
25	15063	10021	9387	11825	25264
50	18675	12156	10350	12843	28051
100	22760	14506	11282	13800	30782
500	34419	20935	13373	15855	37025

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
1.01	1656	1101	2210	3123	5866	21.7%	5.4%	6.1%	7.1%	9.4%		
2	5809	4396	5875	7791	15457	20.7%	24.9%	14.2%	12.3%	15.2%	17.4%	
5	9008	6918	8007	10408	20961	10.4%	20.6%	15.6%	14.7%	14.5%	15.2%	
10	11295	8685	9332	12010	24354	3.5%	16.0%	16.1%	16.0%	13.7%	13.1%	11.7%
25	14343	10990	10915	13904	28385	-4.8%	9.7%	16.3%	17.6%	12.4%	10.2%	
50	16715	12746	12036	15234	31222	-10.5%	4.9%	16.3%	18.6%	11.3%	8.1%	
100	19167	14527	13111	16502	33933	-15.8%	0.1%	16.2%	19.6%	10.2%	6.1%	
500	25223	18790	15488	19280	39886	-26.7%	-10.2%	15.8%	21.6%	7.7%		

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
						0.6%	12.7%	15.8%	16.5%	12.9%		
1.01	1259	883	2401	3771	6747	-7.5%	-15.5%	15.3%	29.3%	25.8%		
2	5627	4200	5646	7588	14911	16.9%	19.3%	9.8%	9.4%	11.1%	13.3%	
5	9641	7454	7603	9639	20257	18.2%	29.9%	9.8%	6.2%	10.7%	15.0%	
10	12768	10081	8862	10893	23879	17.0%	34.7%	10.2%	5.3%	11.4%	15.7%	15.7%
25	17220	13934	10416	12385	28551	14.3%	39.1%	11.0%	4.7%	13.0%	16.4%	
50	20887	17191	11551	13440	32104	11.8%	41.4%	11.6%	4.6%	14.4%	16.8%	
100	24845	20778	12669	14455	35720	9.2%	43.2%	12.3%	4.7%	16.0%	17.1%	
500	35286	30547	15246	16713	44491	2.5%	45.9%	14.0%	5.4%	20.2%		
						14.6%	34.6%	10.8%	5.8%	12.8%		

MRI-CGCM3 Simulations - Summary Statistics

Mid-Century (2015-2060) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	-10.4%	-7.9%	11.3%	-30.1%
2	-14.2%	-14.1%	-5.7%	-23.9%
5	-14.6%	-16.7%	-5.2%	-22.5%
10	-14.6%	-15.7%	-2.8%	-23.4%
25	-14.3%	-14.3%	0.3%	-25.0%
50	-14.1%	-14.3%	2.8%	-26.2%
100	-13.7%	-14.5%	5.2%	-27.3%
500	-12.8%	-15.8%	11.1%	-29.9%
Average	-14.3%	-14.9%	-0.9%	-24.7%

Late-Century (2055-2099) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	-7.4%	-8.3%	15.4%	-26.5%
2	2.2%	1.8%	10.7%	-5.1%
5	8.7%	6.0%	29.3%	-2.1%
10	12.8%	9.1%	42.1%	-0.7%
25	17.8%	13.3%	58.8%	0.6%
50	21.4%	16.1%	71.6%	1.4%
100	24.9%	18.9%	84.6%	2.1%
500	32.9%	25.0%	116.7%	3.2%
Average	14.6%	10.9%	49.5%	-0.6%

Peaks for Annual Frequency Analysis

DSN1 195 1H FLOW /BLACK R/AT HWY 12/FLOW//1HOUR/2.30E+61/
DSN2 8192 1H FLOW /BUNKER CK/AT CERES HILL RD/FLOW//1HOUR/23I070/
DSN3 555 1H FLOW /CHEHALIS R/AT MOUTH/FLOW//1HOUR/WSE 1/
DSN4 2350 1H FLOW /CHEHALIS R/AT PORTER/FLOW//1HOUR/12031000/
DSN5 8105 1H FLOW /CHEHALIS R/NEAR ADNA/FLOW//1HOUR/12021800/

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak
1.01	1956	407	27531	15814	7014
2	5039	1067	53266	38313	19529
5	7178	1499	68253	52494	27594
10	8659	1787	77856	61826	32895
25	10597	2154	89731	73558	39525
50	12087	2428	98432	82262	44413
100	13615	2703	107040	90944	49257
500	17361	3354	127052	111337	60503

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
1.01	1851	391	22619	14221	6441	-5.4%	-3.8%	-17.8%	-10.1%	-8.2%		
2	4374	886	48059	32707	16708	-13.2%	-16.9%	-9.8%	-14.6%	-14.4%	-13.8%	
5	6099	1248	61836	43306	22869	-15.0%	-16.7%	-9.4%	-17.5%	-17.1%	-15.2%	
10	7292	1509	70251	49941	26778	-15.8%	-15.6%	-9.8%	-19.2%	-18.6%	-15.8%	-15.8%
25	8854	1863	80240	57960	31538	-16.4%	-13.5%	-10.6%	-21.2%	-20.2%	-16.4%	
50	10056	2143	87289	63704	34966	-16.8%	-11.7%	-11.3%	-22.6%	-21.3%	-16.7%	
100	11292	2439	94051	69277	38302	-17.1%	-9.8%	-12.1%	-23.8%	-22.2%	-17.0%	
500	14335	3197	109033	81831	45840	-17.4%	-4.7%	-14.2%	-26.5%	-24.2%		

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak						
						-15.7%	-14.0%	-10.5%	-19.8%	-19.0%		
1.01	1493	348	25385	13210	6779	-23.7%	-14.5%	-7.8%	-16.5%	-3.4%		
2	5581	1181	56546	39560	19882	10.7%	10.7%	6.2%	3.3%	1.8%	6.5%	
5	9118	1938	77573	59012	29427	27.0%	29.3%	13.7%	12.4%	6.6%	17.8%	
10	11824	2540	92051	72790	36149	36.5%	42.1%	18.2%	17.7%	9.9%	24.9%	28.1%
25	15637	3420	110974	91101	45042	47.6%	58.8%	23.7%	23.9%	14.0%	33.6%	
50	18756	4166	125530	105348	51935	55.2%	71.6%	27.5%	28.1%	16.9%	39.9%	
100	22110	4991	140481	120083	59044	62.4%	84.6%	31.2%	32.0%	19.9%	46.0%	
500	30927	7267	177282	156624	76600	78.1%	116.7%	39.5%	40.7%	26.6%		
						39.9%	49.5%	20.1%	19.6%	11.5%		

Peaks for Annual Frequency Analysis

DSN1 6699 1H FLOW /CHEHALIS R/NEAR DOTY/FLOW//1HOUR/12020000/
DSN2 2104 1H FLOW /CHEHALIS R/NEAR GRAND MOUND/FLOW//1HOUR/12027500/
DSN3 3481 1H FLOW /CHEHALIS R/NEAR PE ELL/FLOW//1HOUR/12019310/
DSN4 3098 1H FLOW /ELK CK/NEAR DOTY/FLOW//1HOUR/12020525/
DSN5 7500 1H FLOW /HUMPTULIPS R/BELOW HWY 101/FLOW//1HOUR/12039005/

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak
1.01	3374	12344	2405	1075	4525
2	9528	33004	6913	2913	10044
5	13491	46144	9777	4128	13221
10	16089	54748	11635	4940	15222
25	19333	65493	13933	5973	17653
50	21719	73406	15609	6745	19404
100	24078	81244	17254	7519	21112
500	29540	99440	21018	9352	24988

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
1.01	3120	11442	2223	957	4778	-7.5%	-7.3%	-7.6%	-11.0%	5.6%		
2	8250	27698	5967	2381	9349	-13.4%	-16.1%	-13.7%	-18.3%	-6.9%	-13.7%	
5	11207	37470	8231	3274	12363	-16.9%	-18.8%	-15.8%	-20.7%	-6.5%	-15.7%	
10	13033	43724	9669	3859	14423	-19.0%	-20.1%	-16.9%	-21.9%	-5.2%	-16.6%	-16.6%
25	15207	51410	11418	4591	17108	-21.3%	-21.5%	-18.1%	-23.1%	-3.1%	-17.4%	
50	16739	56996	12676	5131	19168	-22.9%	-22.4%	-18.8%	-23.9%	-1.2%	-17.8%	
100	18205	62476	13899	5667	21283	-24.4%	-23.1%	-19.4%	-24.6%	0.8%	-18.2%	
500	21430	75025	16656	6918	26486	-27.5%	-24.6%	-20.8%	-26.0%	6.0%		

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak	-19.7%	-20.3%	-17.1%	-22.1%	-3.7%		
1.01	3432	10702	2464	981	5196	1.7%	-13.3%	2.5%	-8.7%	14.8%		
2	9462	33817	6732	2891	10152	-0.7%	2.5%	-2.6%	-0.8%	1.1%	-0.1%	
5	13882	51016	9747	4405	13305	2.9%	10.6%	-0.3%	6.7%	0.6%	4.1%	
10	17025	63189	11846	5527	15421	5.8%	15.4%	1.8%	11.9%	1.3%	7.2%	9.1%
25	21223	79333	14603	7075	18136	9.8%	21.1%	4.8%	18.5%	2.7%	11.4%	
50	24509	91859	16726	8322	20192	12.8%	25.1%	7.2%	23.4%	4.1%	14.5%	
100	27925	104781	18907	9650	22280	16.0%	29.0%	9.6%	28.3%	5.5%	17.7%	
500	36477	136670	24262	13092	27332	23.5%	37.4%	15.4%	40.0%	9.4%		
						7.8%	17.3%	3.4%	14.7%	2.6%		

Peaks for Annual Frequency Analysis

DSN1 1001 1H FLOW /NEWAUKUM R/NEAR CHEHALIS/FLOW//1HOUR/12025000/
DSN2 2569 1H FLOW /NFK NEWAUKUM R/NEAR FOREST/FLOW//1HOUR/12024400/
DSN3 2219 1H FLOW /SATSOP R/NEAR SATSOP/FLOW//1HOUR/12035000/
DSN4 6540 1H FLOW /SFK CHEHALIS R/AT HWY 6/FLOW//1HOUR/23K060/
DSN5 5617 1H FLOW /SFK NEWAUKUM R/NEAR ONALASKA/FLOW//1HOUR/12024000/

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak
1.01	2534	550	7824	2861	1127
2	6765	1483	17742	8074	3123
5	9398	2103	23649	11566	4428
10	11100	2520	27434	13911	5292
25	13202	3052	32098	16897	6381
50	14736	3450	35499	19135	7189
100	16243	3852	38847	21380	7995
500	19700	4805	46556	26697	9880

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
1.01	1843	414	7306	2527	787	-27.3%	-24.7%	-6.6%	-11.7%	-30.1%		
2	5412	1193	15843	7291	2436	-20.0%	-19.6%	-10.7%	-9.7%	-22.0%	-16.4%	
5	7829	1742	21677	10259	3637	-16.7%	-17.2%	-8.3%	-11.3%	-17.9%	-14.3%	
10	9456	2122	25727	12162	4477	-14.8%	-15.8%	-6.2%	-12.6%	-15.4%	-13.0%	-12.4%
25	11530	2617	31060	14490	5581	-12.7%	-14.3%	-3.2%	-14.2%	-12.5%	-11.4%	
50	13084	2995	35190	16172	6432	-11.2%	-13.2%	-0.9%	-15.5%	-10.5%	-10.3%	
100	14643	3381	39457	17810	7304	-9.9%	-12.2%	1.6%	-16.7%	-8.6%	-9.2%	
500	18331	4320	50052	21513	9436	-7.0%	-10.1%	7.5%	-19.4%	-4.5%		

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak	-14.2%	-15.4%	-4.6%	-13.3%	-14.5%		
1.01	1862	410	8431	2670	830	-26.5%	-25.5%	7.8%	-6.7%	-26.3%		
2	7249	1574	18068	8574	3076	7.1%	6.1%	1.8%	6.2%	-1.5%	4.0%	
5	11410	2447	24528	13050	4662	21.4%	16.3%	3.7%	12.8%	5.3%	11.9%	
10	14352	3052	28968	16250	5728	29.3%	21.1%	5.6%	16.8%	8.2%	16.2%	17.3%
25	18224	3837	34769	20526	7073	38.0%	25.7%	8.3%	21.5%	10.8%	20.9%	
50	21198	4432	39229	23868	8067	43.9%	28.4%	10.5%	24.7%	12.2%	24.0%	
100	24236	5033	43811	27334	9053	49.2%	30.7%	12.8%	27.8%	13.2%	26.7%	
500	31593	6463	55094	35959	11333	60.4%	34.5%	18.3%	34.7%	14.7%		
						31.5%	21.4%	7.1%	18.3%	8.1%		

Peaks for Annual Frequency Analysis

DSN1 2822 1H FLOW /SKOOKUMCHUCK R/NEAR BUCODA/FLOW//1HOUR/12026400/
DSN2 4981 1H FLOW /SKOOKUMCHUCK R/NEAR VAIL/FLOW//1HOUR/12025700/
DSN3 2544 1H FLOW /WISHKAH R/NEAR NISSON/FLOW//1HOUR/22D110/
DSN4 2816 1H FLOW /WYNOOCHEE R/NEAR GRISDALE/FLOW//1HOUR/12035400/
DSN5 579 1H FLOW /WYNOOCHEE R/NEAR MONTESANO/FLOW//1HOUR/12037400/

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak
1.01	1593	1085	1755	2281	4713
2	4572	3411	3764	5197	10270
5	6615	5042	4920	6873	13556
10	8005	6155	5649	7926	15660
25	9792	7587	6538	9201	18255
50	11142	8667	7181	10117	20149
100	12507	9757	7810	11007	22015
500	15774	12354	9243	13019	26323

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
1.01	1269	799	1633	2540	5097	-20.3%	-26.3%	-6.9%	11.3%	8.1%		
2	3648	2597	3459	4899	9502	-20.2%	-23.9%	-8.1%	-5.7%	-7.5%	-13.1%	
5	5157	3909	4666	6315	12429	-22.0%	-22.5%	-5.2%	-8.1%	-8.3%	-13.2%	
10	6136	4824	5490	7238	14442	-23.4%	-21.6%	-2.8%	-8.7%	-7.8%	-12.9%	-12.2%
25	7344	6021	6560	8394	17075	-25.0%	-20.6%	0.3%	-8.8%	-6.5%	-12.1%	
50	8225	6939	7380	9251	19105	-26.2%	-19.9%	2.8%	-8.6%	-5.2%	-11.4%	
100	9089	7875	8218	10107	21197	-27.3%	-19.3%	5.2%	-8.2%	-3.7%	-10.7%	
500	11065	10147	10271	12126	26376	-29.9%	-17.9%	11.1%	-6.9%	0.2%		

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak	-24.0%	-21.3%	-1.3%	-8.0%	-6.5%		
1.01	1262	917	1824	2608	5441	-20.8%	-15.5%	3.9%	14.3%	15.4%		
2	4452	3238	3670	5292	10378	-2.6%	-5.1%	-2.5%	1.8%	1.1%	-1.5%	
5	6914	4938	4856	7078	13682	4.5%	-2.1%	-1.3%	3.0%	0.9%	1.0%	
10	8675	6113	5655	8303	15960	8.4%	-0.7%	0.1%	4.8%	1.9%	2.9%	4.0%
25	11025	7636	6683	9903	18948	12.6%	0.6%	2.2%	7.6%	3.8%	5.4%	
50	12854	8791	7463	11134	21257	15.4%	1.4%	3.9%	10.1%	5.5%	7.3%	
100	14744	9960	8257	12399	23638	17.9%	2.1%	5.7%	12.6%	7.4%	9.1%	
500	19416	12752	10183	15517	29547	23.1%	3.2%	10.2%	19.2%	12.2%		
						9.3%	-0.6%	1.4%	6.7%	3.4%		

NorESM1-M Simulations - Summary Statistics

Mid-Century (2015-2060) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	2.8%	0.9%	15.6%	-9.9%
2	16.0%	15.9%	25.6%	9.7%
5	18.5%	18.2%	27.5%	11.3%
10	19.3%	18.5%	30.7%	11.3%
25	19.8%	18.8%	35.1%	8.4%
50	19.9%	18.5%	38.9%	5.7%
100	19.9%	18.1%	42.9%	2.9%
500	19.5%	16.8%	52.1%	-3.5%
Average	18.9%	18.0%	33.4%	8.2%

Late-Century (2055-2099) vs Historical (1971-2015)

Return Period	Change in Peak Flow			
	Average	Median	Maximum	Minimum
1.01	-4.0%	-3.8%	12.3%	-22.2%
2	25.8%	27.6%	45.1%	3.1%
5	30.9%	32.5%	58.9%	3.1%
10	32.1%	33.1%	66.4%	1.9%
25	32.3%	31.7%	74.4%	-0.2%
50	31.9%	29.8%	79.5%	-1.9%
100	31.1%	27.4%	84.1%	-3.8%
500	28.5%	21.6%	93.0%	-8.4%
Average	30.7%	30.3%	68.1%	0.4%

Peaks for Annual Frequency Analysis

DSN1 195 1H FLOW /BLACK R/AT HWY 12/FLOW//1HOUR/2.30E+61/
DSN2 8192 1H FLOW /BUNKER CK/AT CERES HILL RD/FLOW//1HOUR/23I070/
DSN3 555 1H FLOW /CHEHALIS R/AT MOUTH/FLOW//1HOUR/WSE 1/
DSN4 2350 1H FLOW /CHEHALIS R/AT PORTER/FLOW//1HOUR/12031000/
DSN5 8105 1H FLOW /CHEHALIS R/NEAR ADNA/FLOW//1HOUR/12021800/

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak
1.01	2312	562	29254	18561	8952
2	6692	1471	73971	48725	23718
5	9710	2167	103322	68841	34308
10	11767	2678	123019	82421	41765
25	14417	3379	148157	99818	51655
50	16421	3941	167053	112935	59350
100	18449	4538	186090	126178	67315
500	23307	6081	231491	157851	87127

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak							
1.01	2411	555	32171	19736	8796	4.3%	-1.3%	10.0%	6.3%	-1.7%		
2	8407	1788	82181	55872	27572	25.6%	21.6%	11.1%	14.7%	16.3%	17.8%	
5	12383	2610	114975	80709	40360	27.5%	20.4%	11.3%	17.2%	17.6%	18.8%	
10	14966	3152	136952	97651	48935	27.2%	17.7%	11.3%	18.5%	17.2%	18.4%	17.2%
25	18143	3828	164957	119503	59803	25.8%	13.3%	11.3%	19.7%	15.8%	17.2%	
50	20441	4325	185977	136061	67896	24.5%	9.7%	11.3%	20.5%	14.4%	16.1%	
100	22677	4814	207129	152835	75973	22.9%	6.1%	11.3%	21.1%	12.9%	14.9%	
500	27714	5940	257469	193131	94903	18.9%	-2.3%	11.2%	22.4%	8.9%		

Return Period	DSN1 195 Peak	DSN2 8192 Peak	DSN3 555 Peak	DSN4 2350 Peak	DSN5 8105 Peak							
						25.6%	14.8%	11.3%	18.6%	15.7%		
1.01	2205	438	26941	16264	8981	-4.6%	-22.2%	-7.9%	-12.4%	0.3%		
2	9088	1820	82510	59757	31105	35.8%	23.8%	11.5%	22.6%	31.1%	25.0%	
5	13980	2875	117787	91157	45580	44.0%	32.7%	14.0%	32.4%	32.9%	31.2%	
10	17227	3609	140487	112565	54916	46.4%	34.8%	14.2%	36.6%	31.5%	32.7%	30.9%
25	21271	4560	168303	139938	66329	47.5%	35.0%	13.6%	40.2%	28.4%	32.9%	
50	24220	5278	188394	160432	74536	47.5%	33.9%	12.8%	42.1%	25.6%	32.4%	
100	27105	6001	207963	180943	82492	46.9%	32.3%	11.8%	43.4%	22.5%	31.4%	
500	33636	7715	252140	229116	100287	44.3%	26.9%	8.9%	45.1%	15.1%		
						44.7%	32.1%	13.0%	36.2%	28.7%		

Peaks for Annual Frequency Analysis

DSN1 6699 1H FLOW /CHEHALIS R/NEAR DOTY/FLOW//1HOUR/12020000/
DSN2 2104 1H FLOW /CHEHALIS R/NEAR GRAND MOUND/FLOW//1HOUR/12027500/
DSN3 3481 1H FLOW /CHEHALIS R/NEAR PE ELL/FLOW//1HOUR/12019310/
DSN4 3098 1H FLOW /ELK CK/NEAR DOTY/FLOW//1HOUR/12020525/
DSN5 7500 1H FLOW /HUMPTULIPS R/BELOW HWY 101/FLOW//1HOUR/12039005/

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak
1.01	4638	15868	3298	1277	6071
2	11335	41433	8015	3720	13997
5	16004	59110	11236	5567	18645
10	19259	71306	13456	6899	21593
25	23548	87220	16354	8696	25193
50	26869	99420	18578	10114	27797
100	30296	111904	20858	11598	30342
500	38781	142394	26445	15347	36140

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
1.01	4358	16465	3266	1279	5469	-6.0%	3.8%	-1.0%	0.2%	-9.9%		
2	13124	48029	9408	4295	15736	15.8%	15.9%	17.4%	15.5%	12.4%	15.4%	
5	18966	69746	13359	6348	22061	18.5%	18.0%	18.9%	14.0%	18.3%	17.5%	
10	22848	84523	15942	7712	26086	18.6%	18.5%	18.5%	11.8%	20.8%	17.6%	16.5%
25	27740	103524	19157	9424	30986	17.8%	18.7%	17.1%	8.4%	23.0%	17.0%	
50	31364	117877	21514	10685	34506	16.7%	18.6%	15.8%	5.7%	24.1%	16.2%	
100	34969	132377	23838	11933	37922	15.4%	18.3%	14.3%	2.9%	25.0%	15.2%	
500	43375	167043	29195	14814	45596	11.8%	17.3%	10.4%	-3.5%	26.2%		

Return Period	DSN1 6699 Peak	DSN2 2104 Peak	DSN3 3481 Peak	DSN4 3098 Peak	DSN5 7500 Peak						
						17.1%	18.0%	17.0%	9.7%	20.6%		
1.01	4652	14287	3478	1282	5792	0.3%	-10.0%	5.5%	0.4%	-4.6%		
2	14889	53081	10571	4725	15057	31.4%	28.1%	31.9%	27.0%	7.6%	25.2%	
5	21108	81026	14644	7062	20528	31.9%	37.1%	30.3%	26.9%	10.1%	27.2%	
10	24975	100023	17104	8592	23965	29.7%	40.3%	27.1%	24.5%	11.0%	26.5%	24.4%
25	29573	124243	19965	10482	28115	25.6%	42.4%	22.1%	20.5%	11.6%	24.5%	
50	32799	142327	21934	11852	31081	22.1%	43.2%	18.1%	17.2%	11.8%	22.5%	
100	35870	160383	23778	13189	33949	18.4%	43.3%	14.0%	13.7%	11.9%	20.3%	
500	42548	202628	27699	16205	40368	9.7%	42.3%	4.7%	5.6%	11.7%		
						26.5%	39.1%	23.9%	21.6%	10.7%		

Peaks for Annual Frequency Analysis

DSN1 1001 1H FLOW /NEWAUKUM R/NEAR CHEHALIS/FLOW//1HOUR/12025000/
DSN2 2569 1H FLOW /NFK NEWAUKUM R/NEAR FOREST/FLOW//1HOUR/12024400/
DSN3 2219 1H FLOW /SATSOP R/NEAR SATSOP/FLOW//1HOUR/12035000/
DSN4 6540 1H FLOW /SFK CHEHALIS R/AT HWY 6/FLOW//1HOUR/23K060/
DSN5 5617 1H FLOW /SFK NEWAUKUM R/NEAR ONALASKA/FLOW//1HOUR/12024000/

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak
1.01	3199	677	9923	3977	1531
2	8864	1944	25145	10101	3869
5	12400	2765	34736	14124	5352
10	14682	3304	41019	16825	6328
25	17492	3977	48878	20272	7553
50	19534	4472	54680	22864	8461
100	21536	4962	60441	25474	9365
500	26105	6096	73873	31700	11480

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
1.01	3700	778	9696	4042	1754	15.6%	14.9%	-2.3%	1.6%	14.6%	
2	10603	2365	27579	11640	4614	19.6%	21.6%	9.7%	15.2%	19.2%	17.1%
5	15562	3514	38920	16430	6526	25.5%	27.1%	12.0%	16.3%	21.9%	20.6%
10	19033	4317	46281	19523	7818	29.6%	30.7%	12.8%	16.0%	23.5%	22.5%	23.2%
25	23605	5372	55389	23332	9476	34.9%	35.1%	13.3%	15.1%	25.5%	24.8%
50	27135	6184	62034	26099	10728	38.9%	38.3%	13.4%	14.1%	26.8%	26.3%
100	30766	7016	68564	28807	11992	42.9%	41.4%	13.4%	13.1%	28.1%	27.8%
500	39696	9051	83522	34973	15019	52.1%	48.5%	13.1%	10.3%	30.8%	

Return Period	DSN1 1001 Peak	DSN2 2569 Peak	DSN3 2219 Peak	DSN4 6540 Peak	DSN5 5617 Peak						
						31.9%	32.4%	12.5%	15.0%	24.2%	
1.01	3357	725	8742	3344	1720	4.9%	7.2%	-11.9%	-15.9%	12.3%	
2	12786	2821	27818	12665	5486	44.3%	45.1%	10.6%	25.4%	41.8%	33.4%
5	19698	4308	39297	19018	8009	58.9%	55.8%	13.1%	34.6%	49.6%	42.4%
10	24435	5302	46396	23171	9681	66.4%	60.5%	13.1%	37.7%	53.0%	46.1%	45.7%
25	30512	6549	54800	28291	11776	74.4%	64.7%	12.1%	39.6%	55.9%	49.3%
50	35071	7467	60677	31995	13320	79.5%	67.0%	11.0%	39.9%	57.4%	51.0%
100	39641	8371	66251	35600	14848	84.1%	68.7%	9.6%	39.8%	58.6%	52.1%
500	50395	10445	78319	43704	18382	93.0%	71.3%	6.0%	37.9%	60.1%	
						67.9%	60.3%	11.6%	36.2%	52.7%	

Peaks for Annual Frequency Analysis

DSN1 2822 1H FLOW /SKOOKUMCHUCK R/NEAR BUCODA/FLOW//1HOUR/12026400/
DSN2 4981 1H FLOW /SKOOKUMCHUCK R/NEAR VAIL/FLOW//1HOUR/12025700/
DSN3 2544 1H FLOW /WISHKAH R/NEAR NISSON/FLOW//1HOUR/22D110/
DSN4 2816 1H FLOW /WYNOOCHEE R/NEAR GRISDALE/FLOW//1HOUR/12035400/
DSN5 579 1H FLOW /WYNOOCHEE R/NEAR MONTESANO/FLOW//1HOUR/12037400/

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak
1.01	2001	1558	2173	3459	6106
2	5719	4216	5368	6938	14514
5	8367	6021	7296	9196	19418
10	10211	7250	8531	10726	22509
25	12630	8834	10047	12704	26259
50	14491	10034	11149	14212	28956
100	16400	11251	12229	15750	31578
500	21071	14176	14700	19502	37507

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
1.01	2273	1739	2037	3184	5846	13.6%	11.6%	-6.3%	-8.0%	-4.3%		
2	6669	5022	5920	7632	16188	16.6%	19.1%	10.3%	10.0%	11.5%	13.5%	
5	9925	7206	8543	10436	22533	18.6%	19.7%	17.1%	13.5%	16.0%	17.0%	
10	12242	8665	10308	12283	26581	19.9%	19.5%	20.8%	14.5%	18.1%	18.6%	18.6%
25	15333	10511	12557	14608	31523	21.4%	19.0%	25.0%	15.0%	20.0%	20.1%	
50	17748	11886	14243	16334	35086	22.5%	18.5%	27.7%	14.9%	21.2%	21.0%	
100	20255	13259	15934	18058	38555	23.5%	17.9%	30.3%	14.6%	22.1%	21.7%	
500	26507	16485	19937	22113	46390	25.8%	16.3%	35.6%	13.4%	23.7%		

Return Period	DSN1 2822 Peak	DSN2 4981 Peak	DSN3 2544 Peak	DSN4 2816 Peak	DSN5 579 Peak						
						20.4%	18.9%	21.9%	13.8%	18.2%		
1.01	1998	1615	2109	3082	5399	-0.2%	3.7%	-3.0%	-10.9%	-11.6%		
2	7838	5748	6063	7152	15683	37.1%	36.4%	12.9%	3.1%	8.0%	19.5%	
5	11982	8456	8364	9480	21850	43.2%	40.4%	14.6%	3.1%	12.5%	22.8%	
10	14749	10198	9778	10933	25706	44.4%	40.7%	14.6%	1.9%	14.2%	23.2%	21.7%
25	18218	12319	11449	12685	30328	44.2%	39.5%	13.9%	-0.2%	15.5%	22.6%	
50	20766	13839	12617	13937	33601	43.3%	37.9%	13.2%	-1.9%	16.0%	21.7%	
100	23274	15308	13726	15150	36741	41.9%	36.1%	12.2%	-3.8%	16.3%	20.6%	
500	29012	18576	16136	17873	43670	37.7%	31.0%	9.8%	-8.4%	16.4%		
						42.4%	38.5%	13.6%	0.4%	13.8%		