29 December 2009

Bruce Blackburn
Senior Planner
City of Bothell
18305 101st Avenue NE
Bothell, WA 98011

Re: City of Bothell Shoreline Jurisdiction

Dear Bruce:

The Watershed Company has developed the attached proposed map of shoreline jurisdiction. Under the City's current Shoreline Master Program (SMP), only the Sammamish River and North Creek are regulated as shorelines. Local governments may select from one of the following jurisdiction options specified in the Revised Code of Washington:

1. Minimum jurisdiction: shoreline waterbody, floodways, ordinary high water mark plus upland 200 feet, floodplain areas extending up to 200 feet from the floodway, and associated wetlands

2. Floodplain jurisdiction: minimum jurisdiction plus the remaining 100-year floodplain areas

3. Wetland buffers: minimum or floodplain jurisdiction plus the buffer areas of associated wetlands that would otherwise be outside of shoreline jurisdiction

Existing shoreline jurisdiction includes the shorelands extending 200 feet from the ordinary high water mark and identified associated floodways, floodplains and wetlands. This same approach to jurisdiction will continue, although various elements have been updated and refined since shoreline jurisdiction was originally established in the City. Further, the City is planning for the Municipal Urban Growth Area (MUGA) located to the west, which includes Swamp Creek, a shoreline jurisdiction stream.

The first step in updating the map of shoreline jurisdiction was to review the precise shoreline, floodway, and associated wetlands definitions found in the WAC and in Washington Department of Ecology's (Ecology) rules and guidance documents. Portions of these definitions that apply to the City of Bothell revolve around the flow thresholds for flowing waterbodies meeting shoreline criteria, the area threshold for lakes meetings

shoreline criteria, and when to consider critical areas (wetlands) as "associated" with the shoreline.

Rivers/Streams

Washington Department of Ecology's Digital Atlas was consulted to verify the upstream limits of river shoreline jurisdiction based on USGS's recent study of the 20 cubic feet per second (cfs) cut-off. As in the original SMP work, the entire extent of the Sammamish River within the City is considered a Shoreline ~~of Statewide Significance (≥ 1,000 cubic feet per second)~~, and North Creek within the City is considered a Shoreline. Recent data now indicates that portions of Swamp Creek within the City's MUGA area also exceeds the 20 cubic feet per second threshold and therefore is also considered a Shoreline. No other waterbodies were indicated as having flows sufficient to meet shoreline criteria.

Strikeouts added 1/2011. See Ecology's assessment memorandum following this letter for additional North Creek analysis.

Lakes

No lakes or other ponded features are present in the City that are 20 acres or greater.

Shorelands

Floodplains/Floodways

The mapping of floodplains and floodways uses the latest information developed by King County (for King County area) and FEMA (for Snohomish County area). All three shorelines indentified above have floodways and floodplains. As required by the Shoreline Management Act, the minimum jurisdiction includes the floodways and portions of the floodplain that extend up to 200 feet inland from the floodway edge. As well, the City continues to include the optional full extent of the 100-year floodplain, which only expands shoreline jurisdiction minimally in the area along North Creek west of I-405 and north of SR 522 and in a very small area along the Sammamish River east of I-405.

We will continue to monitor changes in floodplain/floodway mapping and will update jurisdiction maps as needed during the SMP update process.

Associated Wetlands

The City provided updated wetland mapping on December 18, 2009. All wetlands in or partially in the floodway or floodplain were identified as "potentially associated wetlands." The City's wetlands information was compiled using USFWS National Wetlands Inventory information, County mapping, and information submitted by applicants as part of project review.

As noted above, a third and relatively new jurisdiction option is for the City to include buffers of associated wetlands as shoreline jurisdiction even when those buffer areas would otherwise be outside of shoreline jurisdiction. Bothell has not historically applied shoreline

jurisdiction to biological wetland buffers outside the minimum and floodplain shoreline jurisdictional areas, instead preferring to protect those wetland buffers using its Critical Areas Regulations. The City elects to maintain protection of those buffers under its Critical Areas Regulations without adding them to shoreline jurisdiction.

Please feel free to call me if you have any questions.

Sincerely,

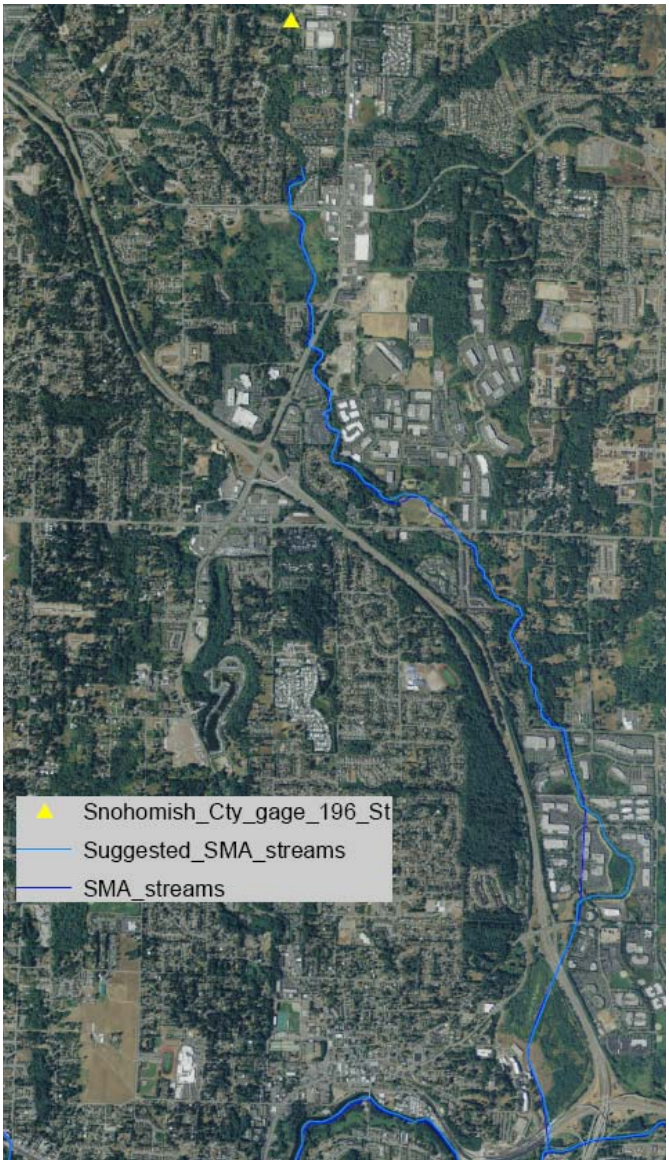
Amy Summe
Environmental Planner

Enclosures

Memo

To: Barbara Nightingale, Shoreline Planner, SEA-NWRO
From: Patricia L Olson, Senior Hydrogeologist, SEA-HQ
CC: Brian, Lynn, SEA Shoreline Program Manager, Don Bales, Shoreline Management Specialist, SEA-HQ
Date: January 12, 2011
Re: Upper SMP 20 cfs MAF point for North Creek

During our phone conference with Bothell, the city requested technical assistance on the location of SMP jurisdiction on North Creek. The city staff thought that the location maybe upstream of the SMA and suggested SMP jurisdiction point (Figure 1).



When the SMA was adopted in 1971, Ecology requested the US Geological Survey (USGS) to identify the upstream extent of SMA jurisdiction for shorelines and shorelines of statewide significance (Hardison 1971). The USGS used regional analysis to develop regression equations to calculate 20 cfs locations on ungaged streams. As more data became available, Ecology requested that the USGS update their 1971 study (Kresch 1998). The 1998 study relied on the same regions developed during the 1971 study but included more data. For North Creek, the SMA (1971) upstream point and suggested SMP (1998) point did not change. The potential upstream point is located at the northern boundary of Bothell's MUGA. Snohomish County operates and maintains a gage at this location (North Cr @ 196th).

Figure 1: Map showing North Creek SMA and suggested SMP points and location of Snohomish County gage used to determine potential upstream 20 cfs MAF location.

Methods used for evaluating upstream SMP jurisdiction

A minimum of ten years data is a common requirement for determining hydrologic statistics such as mean annual flow. At least 10 years of record are needed to capture the variability in annual discharge measurements which includes dry, wet and normal periods. The North Creek gage (Snohomish County Stream Gage North Cr @ 196th Street) record extends from 4/24/2001 to present. Data are available for 4/24/ 2001 to 10/01/2010. While there is almost 10 years of data, only complete water year records (WY, 10/01-09/30) are used for this analysis reducing the number of years to 9.

The mean annual flow (MAF) is calculated from the raw streamflow data for 10/10/2001-09/30/2010. From this data, the MAF is **22.5 cfs** at the 196th Street Bridge indicating that shoreline jurisdiction may extend upstream of the 1971 SMA point and the 1998 suggested SMP point as well as Bothell's MUGA (Figure 1). Since the period of record used is 9 years instead of 10 years additional analyses were done to see if the North Creek data met the criteria:

- Data captures wet, dry and normal years without wet or dry years dominating the record.
- Flow is within the range of longer-term mean values.

Precipitation data and longer term discharge data from similar streams can provide information on whether both criteria are met. Seattle precipitation data (NOAA Station WA457458_3989) for WY 1956-2010 are used. The annual precipitation and mean annual discharge by water year indicate that annual precipitation and discharge follow a similar pattern. That is in most years, when discharge is greater or lesser than MAF for WY 2002-2010 precipitation is also greater or lesser than mean annual precipitation (WY 1956-2010) (Figure 2). Table 1 also suggests that the WY 2002-2010 were not dominated by wet or dry periods and that there are about an equal amount of wet, normal and dry years for precipitation. This data indicates that the longer term precipitation data can be used to evaluate North Creek short-term record to longer term patterns of wet, dry and normal conditions.

Table 1: Average discharge by Water Year (October-1 September 30) at the Snohomish County gage located on North Creek at the 196th Street Bridge. Seattle annual precipitation calculated by water year (WY) is compared with discharge to determine range of wet, normal, and dry years for the discharge record. The precipitation data has 55 years of record (1956-2010). The wet and dry ranks provide information to compare precipitation over time. A wet (or dry) rank of 1 would be the wettest (or driest) annual precipitation for the WY 1956-2010 period. Bolded numbers indicate wet or dry years determined as values greater than or less than 1 standard deviation from the mean.

Water Year	North Creek Annual Average Discharge (cfs)	Annual Precipitation (in)	wet rank	dry rank
2002	25.7	42.4	**11**	49
2003	16.6	30.78	52	**8**
2004	23.3	35.66	34	26
2005	20.9	31.67	47	**13**
2006	26.5	37.45	28	32
2007	25.3	41.09	**19**	41
2008	25.0	34.99	36	24
2009	15.9	29.99	53	**7**
2010	23.7	40	**22**	38

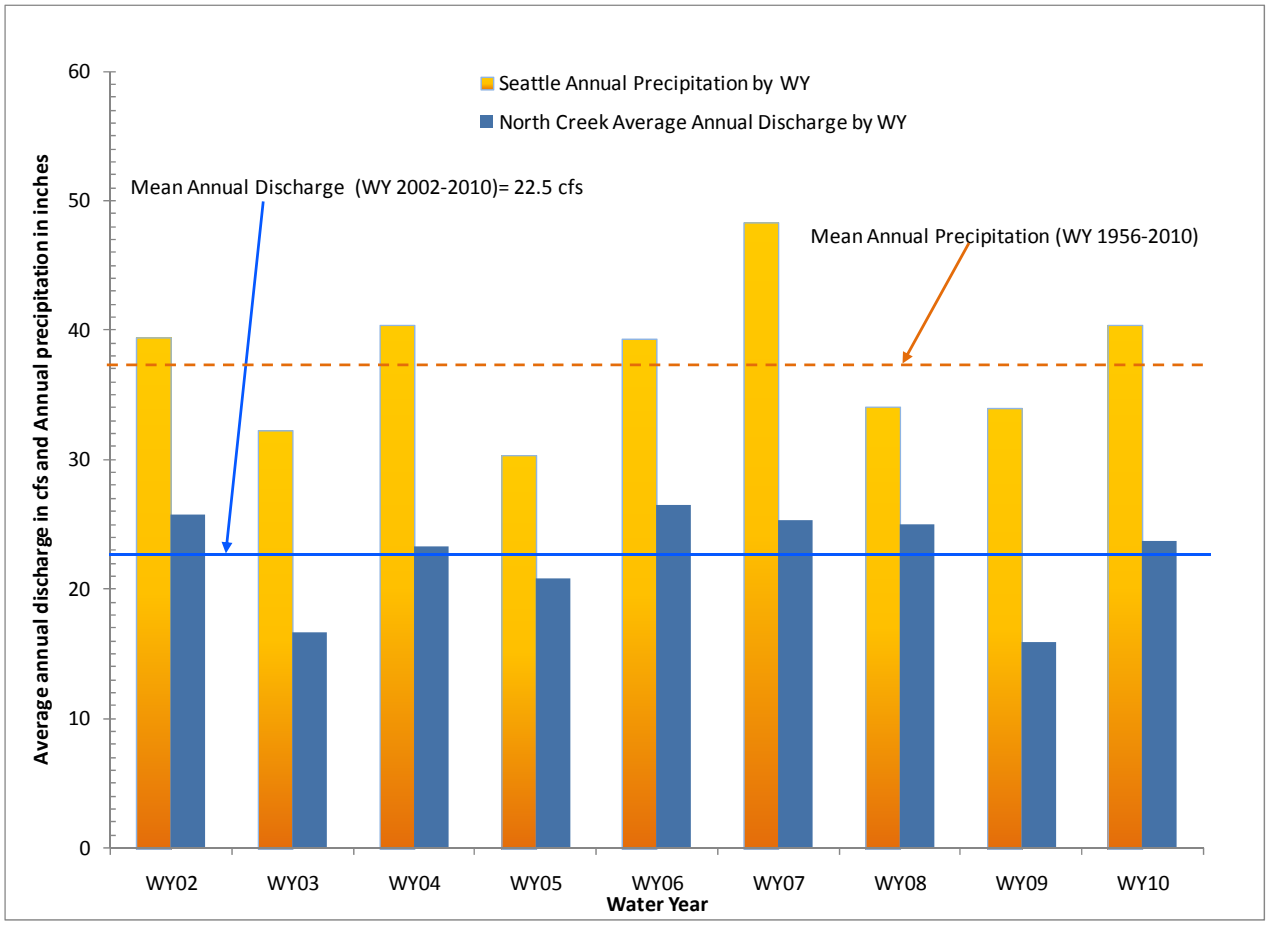


Figure 2: Graph of North Creek average annual discharge and Seattle annual precipitation (Station WA457458_3989) indicate that annual precipitation and discharge follow a similar pattern. The relationship indicates that the precipitation data will provide information on wet, dry and normal occurrences in relation to the North Creek discharge period.

There are limited long-term stream discharge data from similar watersheds. Mercer Creek gage data (# USGS 12120000 Mercer Creek near Bellevue, WA, WY 1956-2010) was chosen to evaluate wet, dry and normal flow patterns over a longer period of record. Mercer and North Creek show similar runoff response (Figure 3) indicating that Mercer Creek can be used to determine if the North Creek flow record falls within the range of mean annual discharge variability. However, the Mercer Creek data cannot be used to estimate North Creek discharge because the regression equation between the 2 has a large standard error of prediction.

The Seattle precipitation data and Mercer Creek data were normalized by subtracting the mean annual precipitation calculated for WY 1956-2010 from the yearly precipitation and subtracting the mean annual discharge (WY 1956-2010) from mean annual discharge for each WY. The normalization allows a comparison between precipitation and discharge wet, dry and normal conditions for the longer Seattle precipitation and Mercer Creek discharge record (WY 1956-2010) and the shorter record (WY 2002-2010) covered by the North Creek data. The comparison does not show any discrepancies between the longer record and the shorter record. Moreover, there are no apparent trends in the data.

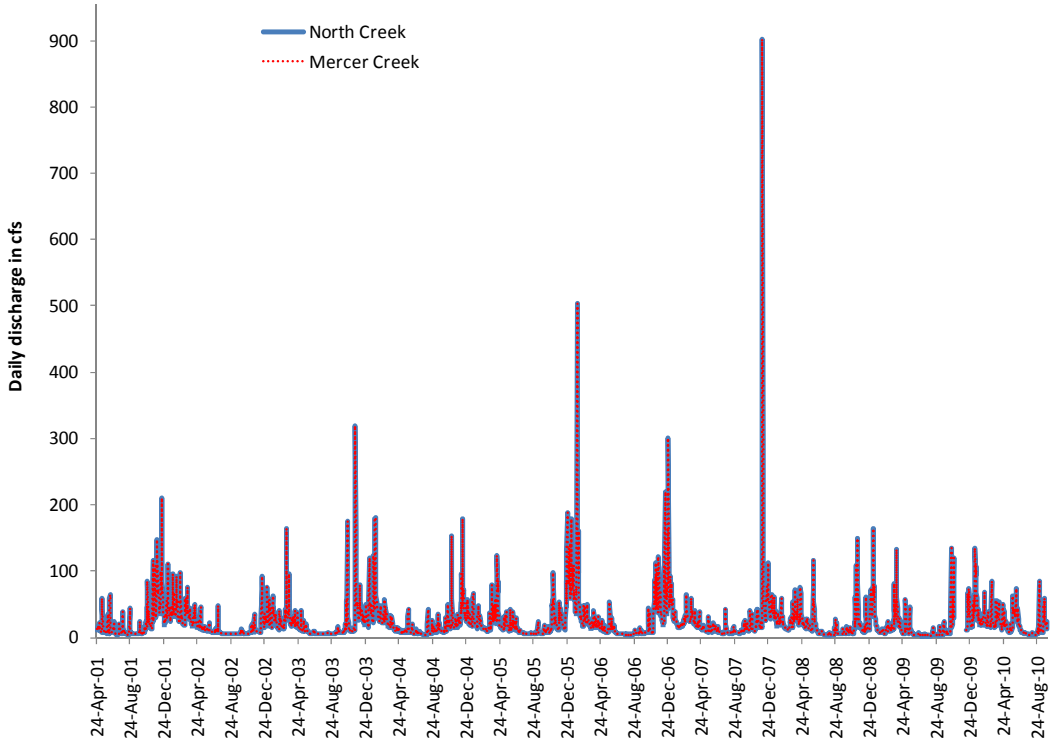


Figure 3: Daily discharge hydrographs for North Creek and Mercer Creek show that runoff response is similar for both.

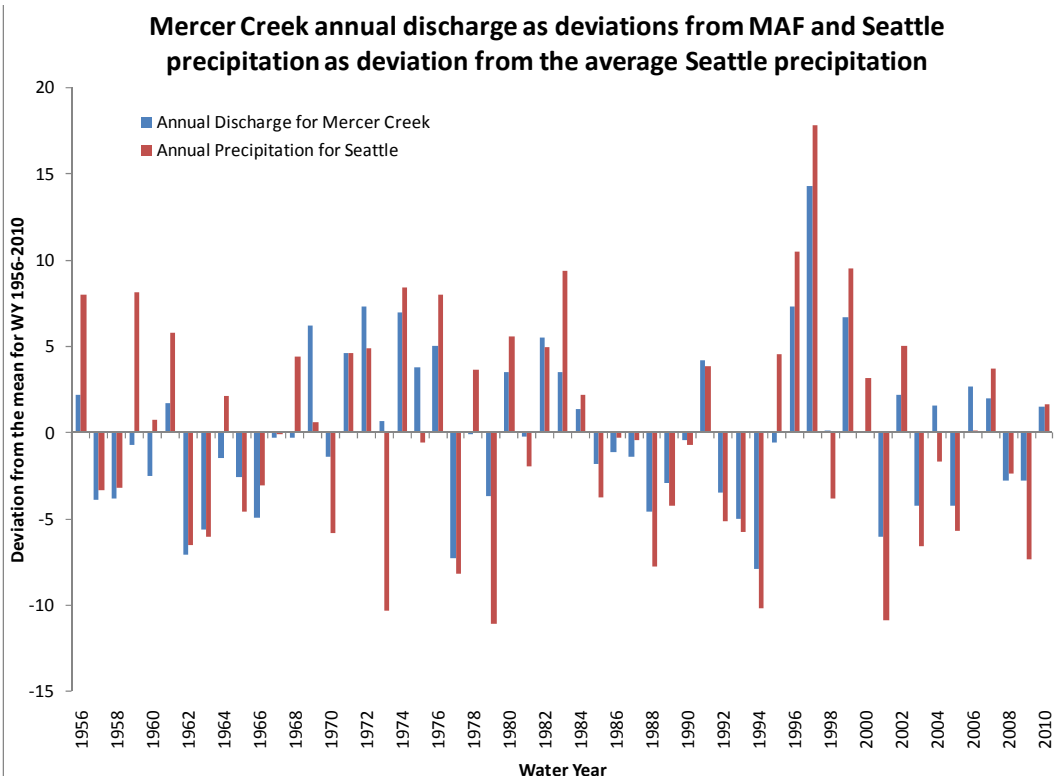


Figure 4: The precipitation and discharge data are normalized by subtracting the mean annual value for the defined water year record from the yearly mean annual values. The graph indicates that a mix of wet, dry and normal periods occurred between WY 1956 and WY 2010 with no apparent trends.

The analyses suggest that the WY 2002-2010 period is within the normal range of variability for precipitation and streamflow and is not dominated by wet or dry years. The existing record appears to meet the necessary criteria to calculate the mean annual flow for this location. A comparison between normalized data for precipitation and Mercer Creek discharge by WY 1956-2010 and WY 2002-2010 and North Creek discharge (WY 2002-2010) further indicate that the North Creek data are sufficient to calculate the MAF (Figure 4). There is one discrepancy in the pattern for WY 2008. North Creek had a very high magnitude flood (12/3/2007, 1049 cfs) that apparently skewed the mean annual discharge for that water year. However in the following water year, North Creek discharge deviation was more negative than Mercer Creek which likely offsets (sum of deviations = 0) the pervious higher mean annual flow in terms of calculating the mean annual flow for the period of record.

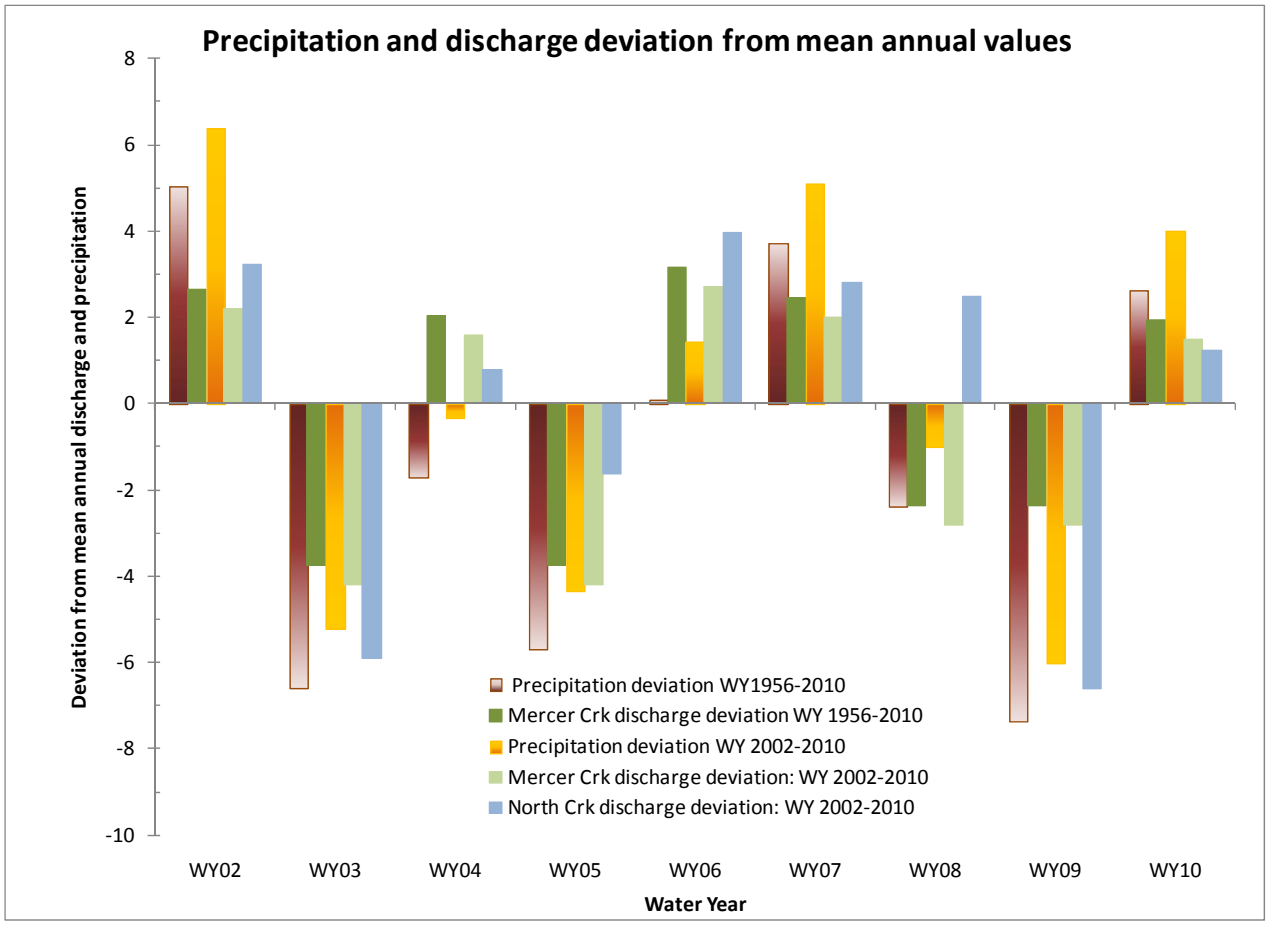


Figure 5: The precipitation and discharge data are normalized by subtracting the mean annual value for the defined water year record from the yearly mean annual values.

Summary

The data indicates that the North Creek 20 cfs MAF point is upstream of the SMP shoreline jurisdiction point and is located just upstream of the 196th Street gage. A primary goal of the comprehensive SMP update is to ensure that all the water bodies meeting the statutory thresholds (for example 20 cfs MAF on streams) are included in the SMP. Some water bodies and shoreline areas that meet the thresholds for inclusion under the Act may not be included in older SMP maps and legal descriptions. When a comprehensive SMP update is approved by Ecology, it

becomes the official delineation of SMA water bodies for that town, city or county (WAC 173-18-044). The local government decides the extent of SMP shorelands jurisdiction for three types of areas during the SMP planning process:

- River corridors. Local governments have the authority to define SMA jurisdiction along river corridors, within minimum and maximum areas defined in statute. The maximum SMA jurisdiction along rivers is the 100-year floodplain.
- Critical-area buffers. Local governments may extend the shoreline jurisdiction to include "land necessary for buffers for critical areas, as defined in Chapter *36.70A RCW*, which occur within shorelines of the state." *RCW 90.58.030(2)(f)(ii)*
- Unincorporated UGAs. Cities and towns are encouraged to plan for and predesignate shoreline environments for their unincorporated urban growth areas. However, your city or town will not have any regulatory authority in these areas until they are annexed.

If Bothell's MUGA is unincorporated and not annexed than the last bulleted item should be addressed.

There are no tributaries between the existing upstream jurisdiction point and the new proposed point. There does not appear to be channel migration in this area. Shoreline conditions appear similar to other inventoried and characterized reaches indicating that no substantial changes are needed to the I and C except forsome maps such as jurisdiction and wetlands.

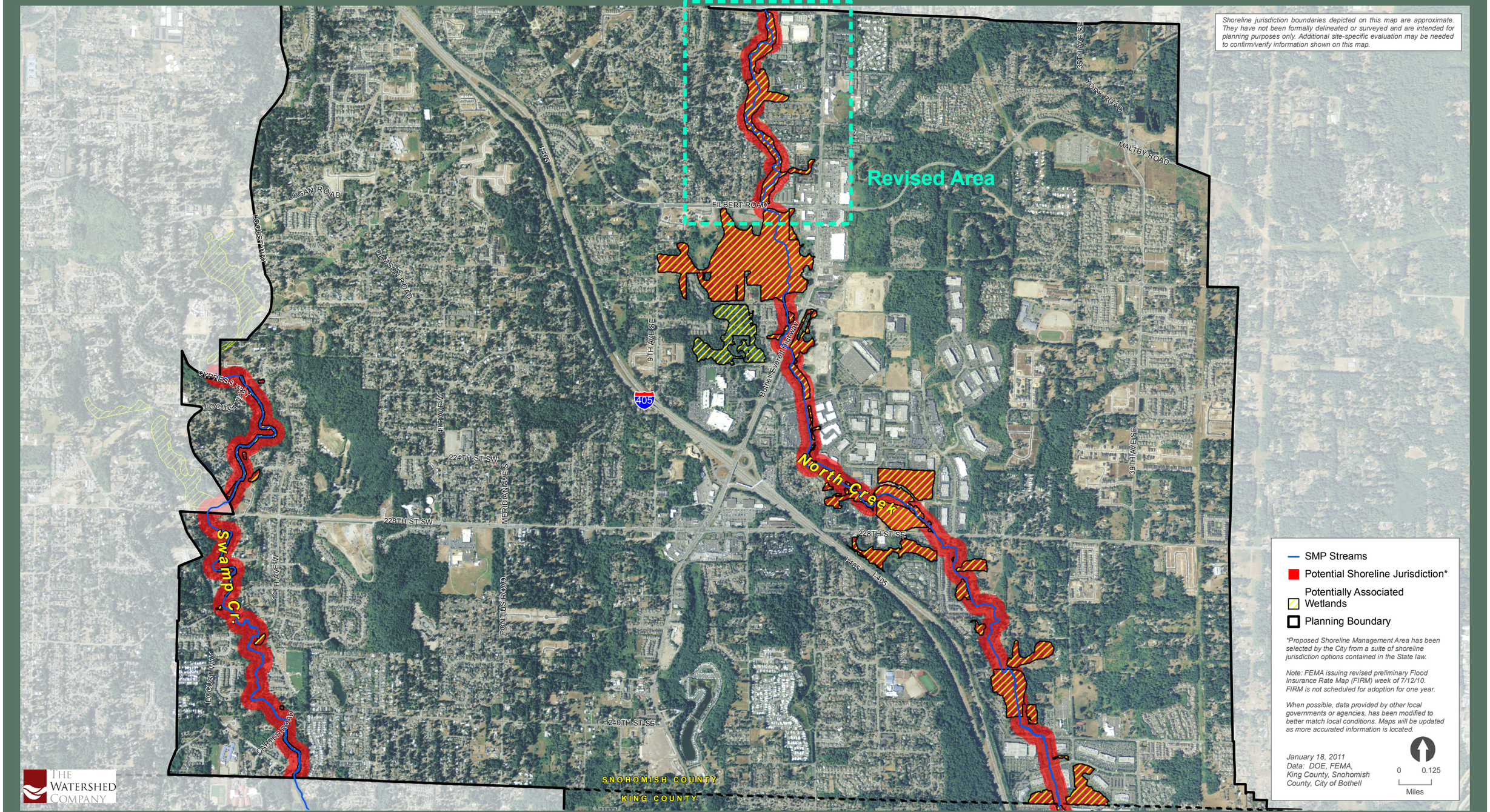
References

Hardison, Clayton H., 1971, Prediction error of regression estimates of streamflow characteristics at ungaged sites, U.S. Geological Survey Professional Paper 750-C, pp. C228-C236.

Kresch, David L. 1998, Determination of Upstream Boundaries on Western Washington Streams and Rivers Under the Requirements of the Shoreline Management Act of 1971.USGS Water-Resources Investigations Report 96-4208, 57 pp.

Menne, M.J., C.N. Williams, Jr., and R.S. Vose, Long-term daily and monthly climate records from stations across the contiguous United States, NOAA, US Historical Climatology Network, Seattle station WA457458_3989 http://cdiac.ornl.gov/cgi-bin/broker?_PROGRAM=prog.climsite_monthly.sas&_SERVICE=default&id=457458), accessed 12/29/2010.

Snohomish County, stream monitoring stations, http://198.238.192.103/spw_swhydro/hydrology-find-site.asp, accessed 12/29/2010.

Final North Creek Shoreline Jurisdiction Consistent with Ecology 2011 Analysis

City of Bothell Shoreline Master Program