

Blaine Harbor Area Circulation Study – August 19, 2002

This initial trial circulation study was performed by Puget Sound Restoration Fund (PSRF) with volunteer support from Tom and Kathy Cullen and Will Menzies. It was funded by Whatcom County under an ongoing contract with PSRF for focused projects to support the Community Oyster Farm project and shellfish restoration efforts in Drayton Harbor.

Methods and Materials

Wooden floats which were 1” thick and 4” x 6” in dimension, were deployed in several locations in and around the Blaine Harbor at the beginning of a flood tide on August 19, 2002. Each float was identified by a numbered small (3”x3”) nylon flag attached to a wire which went through the center of the float and was stapled to the bottom of the float. The flag was approximately 12” above the surface of the float. Flags were released at ten locations near the start of the flood tide and checked approximately every hour for the duration of the flood tide until approximately 5 pm, or sooner. Floats were deployed at the following locations in Drayton Harbor: DOH ambient stations 15 and 8 and immediately SW of the cormorant nesting site on the Blaine harbor Breakwater and inside of the Blaine Harbor at POB sites A,B,C,D,E,H, and I. Floats placed inside of the Blaine Harbor were tracked using a small dinghy and floats deployed in Drayton Harbor were tracked using the Community Oyster Farm skiff. A handheld Garmin GPS II was used to help track float movement in Drayton Harbor, but this instrument failed to attain a position fix during the study.

Conditions during the Study

Low tide was at approximately 0945, with elevation of -.8 ft.. The high tide was at 1728, with elevation of +8.5 ft. There was a significant wind from the SSW at approximately 5 to 10 MPH for the duration of the study. There was a very light chop on the surface of the water in Drayton Harbor and just inside the entrance to Blaine Harbor.

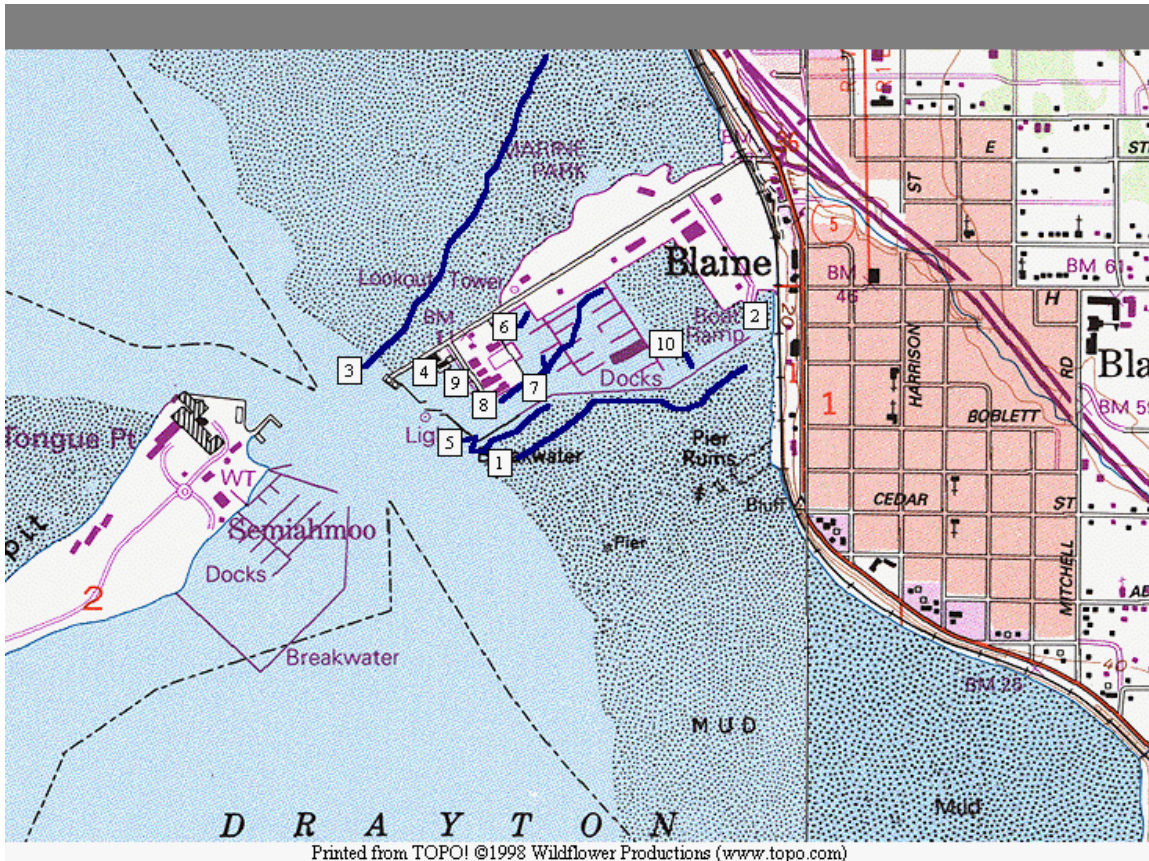
Due to the wind and chop at DOH station 15 and adjacent to the Cormorant nesting sites, red rubber buoys (8” diameter round bumpers) were also deployed next to the wooden floats. This was done to make it easier to find the original floats should they tip over, and to help track the current if the wooden floats were lost. At DOH station 15, both the wooden and buoy floats initially followed the same path (Northeasterly to the shoreline). The wooden float was not found when the red buoy was eventually retrieved from Semiahmoo Bay at 1330 hours. At the cormorant site both the wooden and the rubber buoys followed similar paths.

Results

The table below shows the deployment and retrieval times for each float that was placed out along with general comments about the course that each one followed. Float movement is also illustrated in the attached map.

<u>Release site</u>	<u>Float #</u>	<u>Deployment time</u>	<u>Retrieval Time</u>	<u>General Comments on Tracking</u>
DOH 15	3	1100	1330	Northeasterly course to Semiahmoo Bay and retrieved near Int’l Line at +3 ft elevation
DOH 8	1	1108	1650	Followed Blaine harbor breakwater Northeasterly to within 50 yds of back cut.
Cormorant nesting site	5	1106	1600	Followed Blaine harbor breakwater Northeasterly to first jog South of Westman’s
POB A	4	1058	1610	Stayed in corner near Star Fish for entire flood tide.
POB B	9	1056	1608	Stayed under the Blaine fuel dock and the Blaine crab buying dock for entire period.
POB C	8	1054	lost	Moved immediately NE to commercial slip on “O” dock, redeployed east of dock and lost
POB D	7	1052	1606	Moved immediately NE to commercial slip on “O” dock, redeployed east of dock, retrieved

				North of "I" float near Harbor Office
POB E	6	1048	1604	Moved eastward to corner across from Lift Station 1 near old tidal grid.
POB H	10	1050	1602	Moved SE to Blaine Harbor breakwater and fouled in rocks repeatedly.
POB I	2	1040	1600	Never left the Boat ramp area.



Other Observations

- At about 1500 hours, we observed a current flowing into Blaine Harbor via the back cut in the breakwater. Tidal elevation at that time was approximately +6 ft. There was quite a strong flood into Blaine Harbor via this route when the study was finished at 1645 hours.
- There was a barge positioned near the entrance to Blaine Harbor at the time of this study. This is being used to support the renovation of the pilings at the entrance to the marina area.
- Due to the chop and wind in Drayton Harbor, floats occasionally overturned making it difficult to locate them. For subsequent studies, I am experimenting with a small foam float, with weight suspended from the bottom and a shorter flag on top. This is designed to minimize the effect that wind may have had on float movement and to assist in tracking.
- There is a very large population of seagulls and cormorants which nest and roost all along the Blaine Harbor breakwater. A count on the evening of August 21 revealed over 500 seagulls on the breakwater and in the water north of the breakwater and 140 double crested cormorants on the South corner of the breakwater near station 8. During this circulation study, there was a constant chatter of birds along the breakwater.

Discussion

This study illustrated that at least under these conditions, it is unlikely that DOH stations 4 and 6, which represent the commercial oyster growing area in Drayton Harbor, are influenced to any significant degree by surface water quality at DOH stations 8 and 15 nor any of the sites within Blaine Harbor. None of the floats placed inside of Blaine Harbor ever left the harbor area. The float movement indicated a general movement of water in a Northeasterly direction from all starting points. The only sites that appeared to be influenced by wind were all of the sites in Drayton Harbor and POB A. It appears that the poorest circulation within the marina is near stations A,B,E, and I. It was particularly interesting that the float representing DOH station 15 moved Northeasterly into Semiahmoo Bay. This did not appear to be influenced by the presence of the barge (too far away) but might have been due to wind direction and speed.

It would be very interesting to repeat this test in the absence of wind and also to conduct it during an ebb tide. If water flows into Blaine Harbor from Drayton Harbor via the back cut on a flooding tide, it seems logical that the direction of flow would be reversed on an ebbing tide. If this is the case, water quality at DOH station 8 could very well be affected by flows from the boat ramp area inside of Blaine Harbor. Blaine Harbor and Drayton Harbor are connected by water via the back cut when the tidal elevation is approximately +6 ft.. There is an opportunity to conduct a daylight ebb tide circulation study on either September 2 or 3. The flood tide elevation on these days is high enough to evaluate this condition for at least the first hour or two of the ebb.

It would also be informative to track some deeper drogues (5-10 ft) from DOH station 15, the Tongue shoal marker, and possibly a site inside of Blaine Harbor on a flooding tide.

A series of studies like this one should be informative in gaining a better understanding of the circulation patterns under various conditions in and around Blaine Harbor. Findings should shed light on the relationship between water quality in and around Blaine Harbor and potential impacts to the oyster growing areas from this area. Clearly, the data indicates a significant difference in water quality between DOH station 8 and stations 4 and 6.