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Agenda Item #9
REPORT #RWSC 2008 - 07

**REPORT TO REGIONAL WATER SUPPLY COMMISSION
MEETING OF WEDNESDAY, 20 FEBRUARY 2008**

SUBJECT WATER QUALITY TRENDS IN SOOKE RESERVOIR IN JANUARY 2008

SUMMARY

The water quality tests conducted for Sooke Reservoir during January 2008 continued to show good quality source water. The water quality data collected from Sooke Reservoir prior to inundation of the surrounding shoreline (pre-inundation average) with data collected during and after the flooding occurred demonstrates that the raising of the reservoir produced one positive (water temperature) and several negative impacts on source water quality (turbidity, nutrients and chlorophyll-a). However, while the percentage increases appear to be substantial, the actual changes in real numbers are relatively small. This is primarily a reflection of the high quality of water in Sooke Reservoir.

PURPOSE

This report provides information on the water quality conditions observed in Sooke Reservoir during the month of January and compares these data with those from previous years and long-term averages.

REPORT

Starting with this report, a new dark blue line identified as the 'Post-inundation Average' is shown in **Figures 2-10**. This line averages the water quality data (blue circles) collected in the period from January 2003 to December 2007 and represents the average impact on the quality of water in Sooke Reservoir during the period when inundation of the shoreline of the reservoir was first occurring and for the first two years after reaching full pool level.

Physical Parameters

Water Levels. Following the heavy rains in December, 2007, Sooke Reservoir reached its full pool level of 186.75 m on January 8, 2008 (**Figure 1**). On January 24, 2008, the water level fell just below spill and did not spill for the balance of the month.

Water Temperature. During January, the weekly average temperature of the water entering the Japan Gulch Treatment Plant was slightly colder than the pre-inundation average (**Figure 2**). By the end of January, the weekly average water temperature of the water entering the Japan Gulch Plant was 4.2°C, slightly colder than the long-term average of 5°C.

Water Clarity

Turbidity. Raising the water level in Sooke Reservoir increased the average turbidity (cloudiness) by 72%. While this percentage is substantial, in real terms, there was only a slight increase in the cloudiness of the reservoir. In the north basin of Sooke Reservoir (**Figure 3**), the turbidity increased an average of 0.18 NTU from a pre-inundation average of 0.25 NTU (black line) to a post-inundation average of 0.43 NTU (blue line).

During January 2008, the turbidity of the surface water in Sooke Reservoir declined from the high levels observed in December, 2007 but continued to remain higher than the both the pre- and post-inundation averages in both the south and north basins of the reservoir (**Figure 3**). At month end, the average turbidity was approximately 0.6 NTU.

Water Transparency. Raising the water level in Sooke Reservoir reduced the transparency of the water in the reservoir (as measured by observing a black and white disk under the water) by about 10% - not a substantial decrease. At the intake tower (**Figure 4**), water transparency declined an average of 0.76 m from a pre-inundation average of 7.38 m (black line) to a post-inundation average of 6.62 m (blue line).

In January 2008, the transparency of the water at the intake tower was similar to, albeit slightly poorer than the post-inundation average (**Figure 4**).

Bacteria

Total Coliform Bacteria. The total coliform bacteria concentration in the water entering the Japan Gulch Treatment Plant from Sooke Reservoir was similar to levels observed in past years and similar to winter conditions of low coliform counts. By the end of January, the total coliform level was about 25 colony forming units per 100 mL.

Nutrients

Phosphorus. Raising the water level in Sooke Reservoir increased the average concentration of phosphorus in the reservoir by about 60%. In the south basin (**Figure 5**), the phosphorus concentration increased an average of 2.1 µg/L (60%) from a pre-inundation average of 3.51 µg/L (black line) to a post-inundation average of 5.61 µg/L (blue line). In the north basin (**Figure 6**), the phosphorus concentration increased an average of 2.2 µg/L (62%) from 3.56 µg/L to 5.76 µg/L.

During January, the total phosphorus concentrations continued to average about 50% higher than the pre-inundation average in the south basin (**Figure 5**) north basin (**Figure 6**). However, these concentration were slightly lower than the long-term, post-inundation average especially in the south basin (**Figure 5**). (**Note:** In the charts, the bars on each data point indicate the range of data observed from triplicate samples.)

Nitrogen. Raising the water level in Sooke Reservoir increased the concentration of nitrogen by about 30%. In the south basin (**Figure 7**), the nitrogen concentration increased an average of 21.9 µg/L (31%) from a pre-inundation average of 71.1 µg/L (black line) to a post-inundation average of 93 µg/L (blue line). In the north basin (**Figure 8**), the nitrogen concentration increased an average of 22.7 µg/L (32%) from 69.7 µg/L to 92.4 µg/L.

In January, the total nitrogen levels continued to be about 25% higher than the long-term pre-inundation average in the south basin (**Figure 7**) and north basins (**Figure 8**) of Sooke Reservoir for the majority of the period. However, the total nitrogen levels in January were slightly lower than the long-term post-inundation average in both south and north reservoirs.

Chlorophyll-a

Raising the water level in Sooke Reservoir increased the concentration of chlorophyll-a (a general measure of algal populations) in the reservoir about 80%. At the intake tower, (**Figure 9**), the chlorophyll-a concentration increased an average of 0.76 µg/L to a post-inundation average of 1.87µg/L (blue line) from a pre-inundation average of (black line) of 1.1µg/L. In the north basin of Sooke Reservoir (**Figure 10**), the chlorophyll-a concentration almost doubled - increasing an average of 0.8 µg/L (93%) from 0.86 µg/L to 1.66 µg/L.

In January, chlorophyll-a concentrations remained at low levels throughout the reservoir (**Figure 9, intake tower**) (**Figure 10, north basin**). This low level is typical of winter conditions when algal activity is low.

Algae

In January 2008, algal concentrations and activity in Sooke Reservoir remained low except for one group of tiny, fast swimming algae, the Euglenoids that doubled their numbers and can flourish in the cold months. Fortunately, the Euglenoids are of no particular concern to drinking water quality.

Zooplankton concentrations remained low to average and did not present a filter clogging problem.

Inundation Scientific Advisory Working Group

The Sooke Reservoir Inundation Scientific Advisory Working Group met on February 7, 2008. No concerns were voiced.

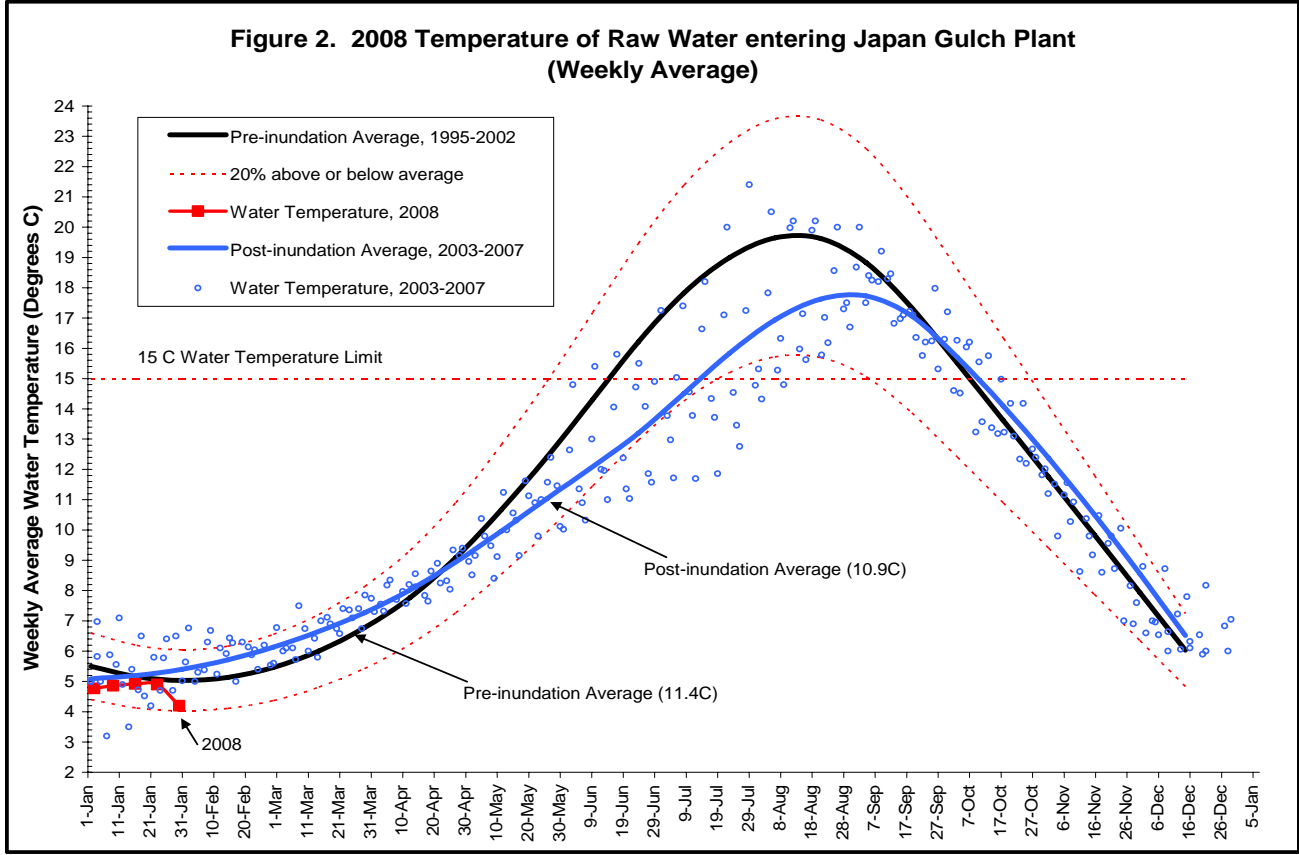
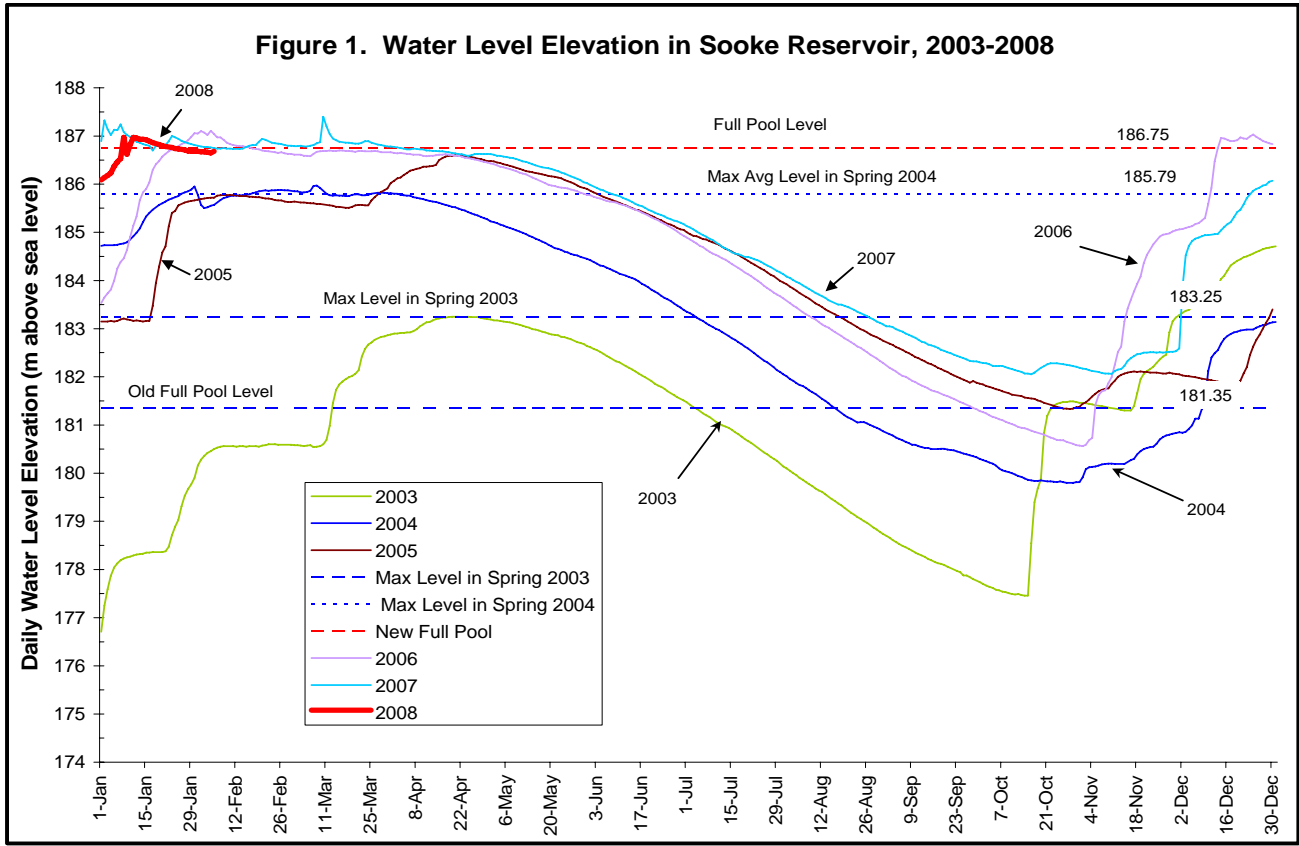
RECOMMENDATION

That the Regional Water Supply Commission receive the staff report for information.

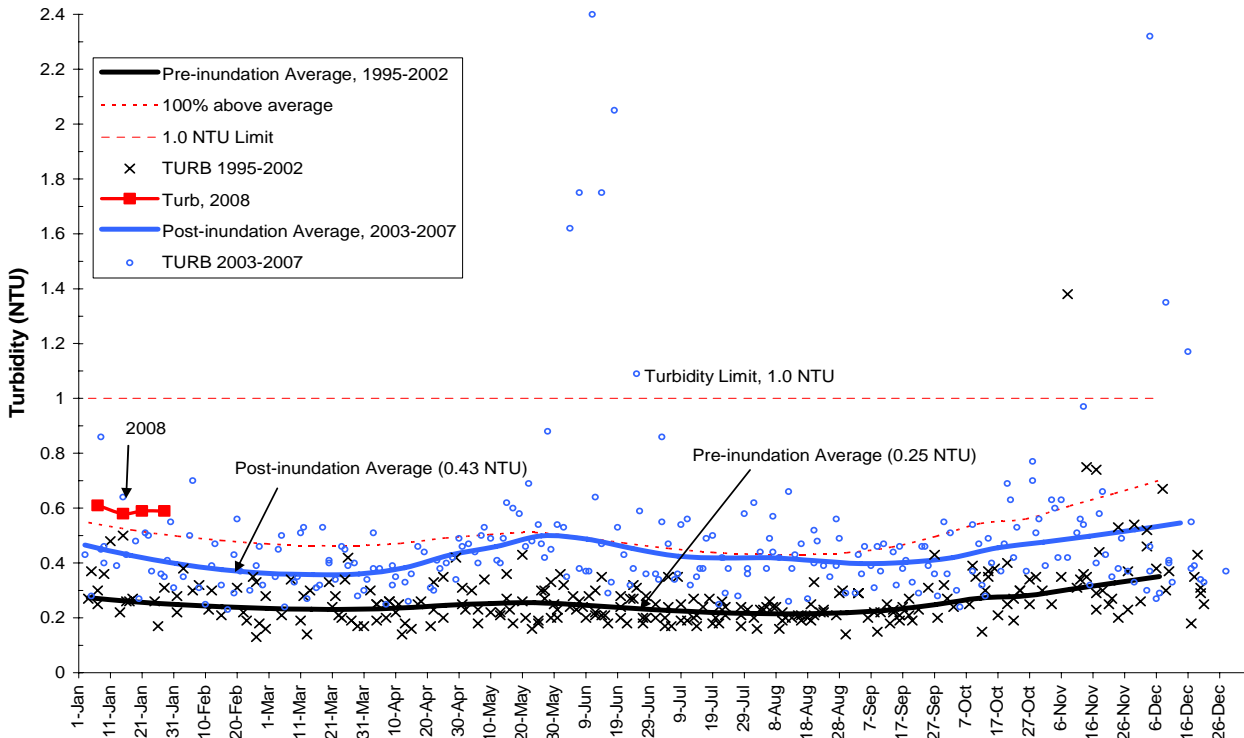
Maria Roxborough
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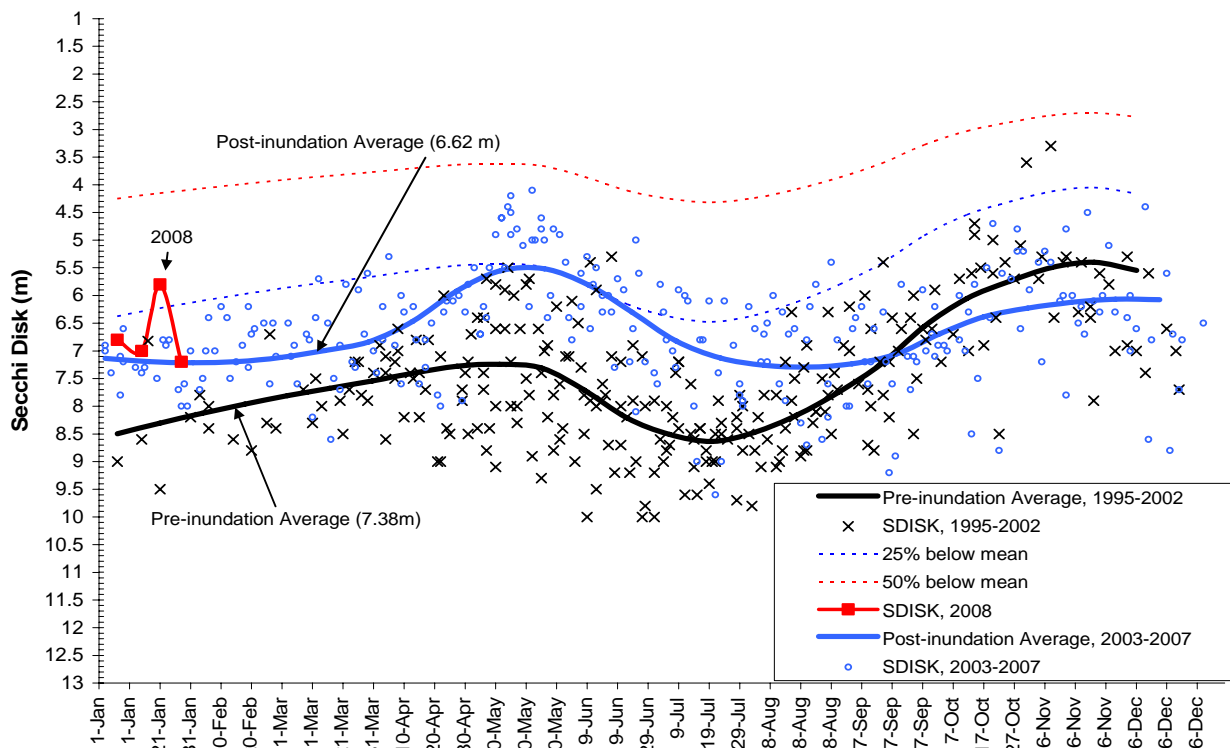
Stewart Irwin
Senior Manager, Water Quality



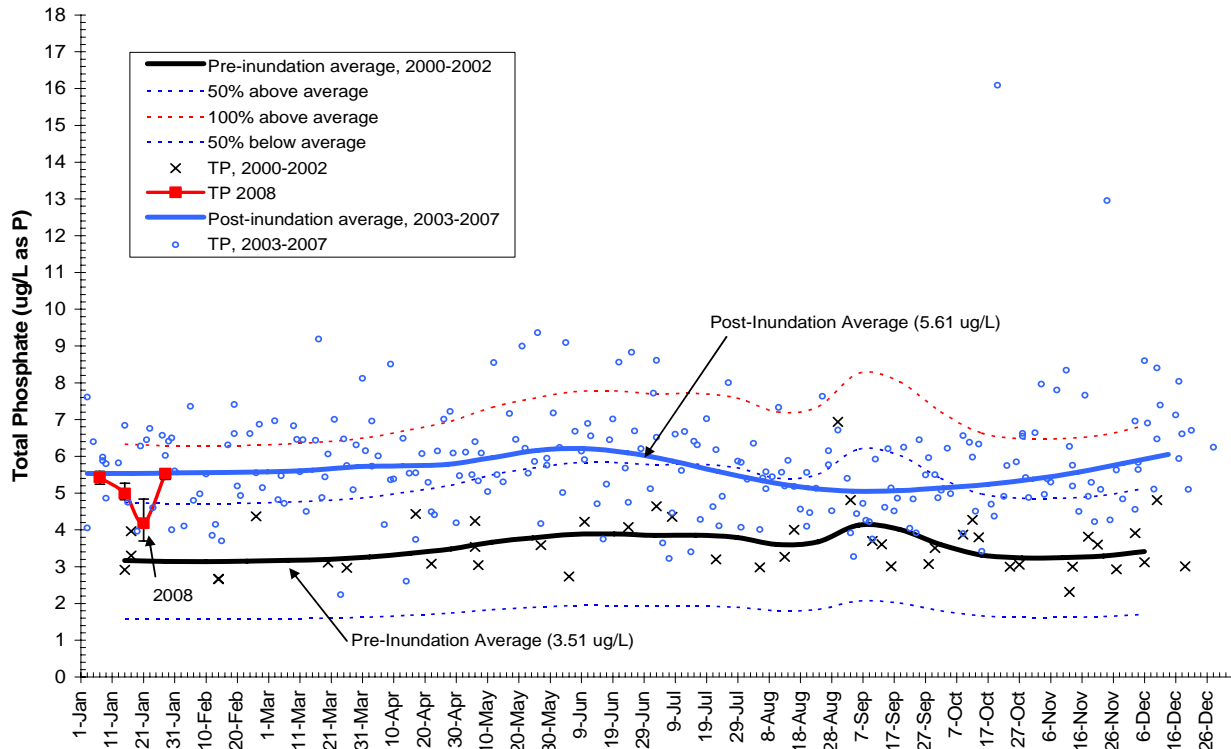
**Figure 3. 2008 Turbidity in Sooke Reservoir
 North Basin, 1m depth (SOL-04-01)**



**Figure 4. 2008 Water Transparency in Sooke Reservoir
 Intake tower, (SOL-00-01)**



**Figure 5. 2008 Total Phosphorus for Sooke Reservoir
 South basin, 1 m depth (SOL-01-01)**



**Figure 6. 2008 Total Phosphorus for Sooke Reservoir
 North basin, 1m depth (SOL-04-01)**

