UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
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OFFICE OF
WATER AND WATERSHEDS

July 31, 2013

Mr. Russell Link, Wildlife Program Manager
Washington Department of Fish and Wildlife
16018 Mill Creek Blvd
Mill Creek, Washington 98012

Re: Determination of Impact of the Leque Island Estuary Restoration Project on the Camano Island Sole Source Aquifer

Dear Mr. Link:

Thank you for your providing the Environmental Protection Agency (EPA) with the requested additional information to allow us to make a determination of impact of the Leque Island Restoration Project (Leque Project) on the Camano Island sole source aquifer. The purpose of this letter is to inform you of our decision.

Background

Due to location, hydrogeology, and current usage, Camano Island has experienced saltwater intrusion into portions of the underlying aquifers that are the primary sources for drinking water for area communities. Elevated chloride levels in coastal wells have already led the Juniper Beach Water District to move their pumping wells inland. Further, increased saltwater intrusion is likely as a result of predicted sea level change and other affects of climate change impacts. In response, local government and water associations have developed programs to monitor salinity at wells across the island, as well as to proactively review projects that may impact the aquifer, such as the Leque Project. During the summer of 2010, the EPA received a request from the Camano Water Systems Association to determine whether or not the Leque Project would increase saltwater intrusion into the freshwater aquifers on Camano Island.

EPA Role

The Camano Island aquifer was designated by the EPA as a sole source aquifer on April 6, 1982. The EPA defines a sole or principal source aquifer as one that supplies at least fifty percent of the drinking water for the residents that rely on it, and that has no viable alternative supply. Any proposed federally funded projects that have the potential to contaminate the aquifer are subject to the EPA's review.[i] Proposed projects that are funded entirely by state, local, or private interests are not subject to the EPA's review. Since U.S. Fish and Wildlife would provide a portion of the funding for the Leque Project, the EPA has the authority to review the project to determine if it poses a significant threat to public health by contaminating the Camano Island sole source aquifer.

Leque Project Review and Study

The EPA reviewed the Leque Project during 2010 and concluded that the information provided at the time by the Washington Department of Fish and Wildlife (WDFW) and Ducks Unlimited (DU), the federal fund grantee, was insufficient to determine if the Leque Project would create a significant impact to public health by contaminating the Camano Island sole source aquifer. The available studies at the time were regional in scale and did not provide detailed information about the local hydrogeologic conditions. In a letter sent to WDFW and DU on October 20, 2010, the EPA requested additional information on the direction of groundwater flow between Camano Island and Leque Island and suggested the following data-gathering efforts be taken:

- Two sets of monitoring wells to determine the direction of groundwater flow between Davis Slough and Camano Island;
- Data loggers in the well to collect water levels, temperature, and conductivity at a minimum;
- A tide gauge should be installed at an appropriate location;
- Data collected during a six-month period (March through September) in order to account for the high and low groundwater levels; and,
- All wells should be surveyed and tied into any other wells in the area.

DU retained the firm Pacific Groundwater Group (PGG) to do a study that responded to the EPA request in the October 20, 2010 letter. PPG conducted the study, entitled "Hydrogeologic Evaluation of Proposed Leque Island Restoration," and submitted it to EPA for review in December of 2012.

EPA Determination

EPA has completed its review of the PGG study and other available monitoring data. The EPA has determined that the Leque Project does not create a significant hazard to public health by contaminating the Camano Island sole source aquifer.

The rationale for the EPA's-determination is as follows:

1. Hydrogeologic characterization and monitoring data show groundwater flow is from Camano Island towards Leque Island.
2. Groundwater modeling after dike removal shows a slight shift of the discharge zone towards Davis Slough and the ditched monitoring site, but this is a localized effect and no change is predicted in the general groundwater flow direction even with the periodic inundation of Leque Island by saline and/or brackish water.
3. Therefore, the ditched monitoring site, which is the eastern margin of Camano Island lowland, will likely remain a discharge zone (not a recharge zone) for area groundwater even after the changes created by the Leque Project with no predicted affect on the groundwater under the Camano Island uplands nor Juniper beach.
4. Therefore, the Leque Project does not create a significant hazard to public health by contaminating the Camano Island sole source aquifer.

Hydrogeologic Characterization and Groundwater Monitoring Data

Given the site topography and stratigraphy, it is likely that groundwater flows from the west (Camano Island uplands) to the east (lowlands and Leque Island) in general; this was also predicted by the three-dimensional groundwater flow model. Further, the sampling data collected in the PPG study from the eight installed wells and the three private wells show the direction of groundwater flow is from west to east towards Leque Island. PGG monitored groundwater elevations in the eight monitoring wells and three nearby private wells between November 2011 and September 2012 to develop synoptic groundwater level maps. Three-day averages for groundwater levels for this time period show decreased water levels (head gradient) from the eastern edge of Camano Island toward the ditch-drained monitoring site and Davis Slough, and generally higher heads than in Leque Island. This supports the conclusion that the groundwater flow direction is from west to east towards Leque Island.

Groundwater Modeling and Salinity Monitoring

PGG's groundwater modeling and its projections indicate that the removal of the remaining dikes on Leque Island would not reverse the flow of groundwater under upland Camano Island towards the lowlands, except in the western part of the Leque Island, where flow towards Davis Slough is predicted by the model. PPG developed a two-dimensional groundwater model to characterize existing conditions for the area. This two-dimensional model formed the base conditions for a three-dimensional model that was used to evaluate the potential impact of post-restoration scenarios (dike removal and regular inundation by brackish and saline water) on flow conditions between Leque Island and Camano Island.

The model results predict that average annual groundwater levels beneath Leque would rise by one foot. The model evaluated the impact of a predicted one-foot groundwater level rise, and whether such a rise could cause a reversal of groundwater flow between Camano Island and the Leque lowlands. PGG's conclusion was that the dike removal and subsequent inundation would not change groundwater flow between Camano Island aquifer and Leque Island in general. Moreover, in response to stakeholder input, PGG ran supplementary model simulations and concluded that post-restoration heads beneath Leque Island would have to be 3.1 to 7.1 feet higher than predicted to cause reversal of groundwater flow.

It should be noted that even factoring in predicted climate change scenarios, the Leque Project is unlikely to be a factor in saltwater intrusion into aquifers under Camano Island. The Washington Climate Change Impacts Assessment (WACCIA) developed climate change scenarios for the impacts of climate change on Washington State. Sea levels have been predicted to rise by six inches in Puget Sound by 2050.[ii] Using this data, WACCIA predicted as sea levels increase that very near coast areas in Island County will experience a reduction in the depth of the freshwater lens floating above the seawater. This means that near shore wells that already have intrusion problems may have increased saline water. [iii] These near shore wells on Camano Island will be vulnerable to climate change impacts independent of the effects of the Leque Project. Also, as sea levels rise, the impact of the Leque Project will actually be reduced. This is due to the fact that as sea levels rise, so do groundwater levels. However, groundwater levels at Leque are limited to the land surface elevation of Leque Island, which is near mean sea level; whereas the surface level of Camano Island is higher as will be the groundwater levels. The combined affect is that as sea levels rise, the groundwater head will increase under Camano Island more than it will on Leque Island, thus ensuring that Leque Island will remain a discharge zone.

PGG's salinity measurements also showed that removal of the remaining dikes from Leque Island would have negligible impact on aquifers below Camano Island because water beneath Leque is in equilibrium with salinity in the ditches and near shore surface water. PGG sampled four monitoring wells to compare groundwater and marine water salinity. PGG monitored electrical conductivity (EC) of groundwater in monitoring wells between late November 2011 and early May 2012. Although some probes failed, resulting in an EC monitoring record shorter than the groundwater level record, estimated salinity (0.6 EC) revealed relatively high groundwater salinity at the monitoring site, decreased salinity with depth, and low EC/salinity at the sea-level aquifer beneath Camano Island uplands (Aquifer D). PGG concluded that the brackish, shallow groundwater at the monitoring site is likely to have been caused by a combination of seawater recharge during inundation events, concentration of salts due to evaporation of shallow groundwater, and deposition of salt spray. The reduced salinity at depth may be attributed to mixing (dilution) with upwelling fresh groundwater in the lowland and fresh groundwater discharge in the uplands. The hydrodynamic model predicted salinity in Leque Island during inundation will remain below 10 parts per thousand (ppt) most of the time, a value which is close to the measured salinity of approximately 11 ppt at the Leque ditch. Hence, post-restoration groundwater salinities on Leque Island are expected to show little change from current salinities.

The EPA recognizes that all modeling and its related projections have uncertainty that reflects the limitations of the available data and model calibration. The EPA believes it is highly unlikely that any reasonable modifications to model inputs or assumptions would alter the results and conclusions significantly.

Summary and Recommendations

In summary, the EPA believes that due to area hydrogeology, groundwater use, and potential climate change impacts, there is a real risk of saltwater intrusion into the aquifers underlying Camano Island, but the EPA does not find that the Leque Project increases the risk of saltwater intrusion into the Camano Island sole source aquifer. The EPA has determined that the Leque Project does not create a significant threat to public health by contaminating the Camano Island sole source aquifer. This determination permits the funding authorized by U.S. Fish and Wildlife for the Leque Island restoration project to go forward.

The EPA recommends that local government and water districts include the information in the PGG study as part of their resource management plan. This information could prove useful in making appropriate policy decisions with respect to water use. Further, the EPA recommends that at least some of the wells used in the PGG study be included into local governments' monitoring well network. We recommend in particular the Oksendahl well, which may serve as an early indicator of changes to the fresh water lens. The EPA also recommends that DU and/or WDFW continue to fund the monitoring wells during the implementation of the Leque Project and that they share that data with local stakeholders in order to demonstrate the accuracy of the PGG groundwater modeling. The EPA's determination that the Leque Project does not create a significant threat to the Camano Island sole source aquifer is not contingent on these recommendations. However, the EPA believes that implementation of these recommendations will be useful to all parties as the project goes forward.

If you have any questions, please feel free to contact me at (206) 553-1855 or Adam Baron, Project Lead for this determination at (206) 553- 6361 or baron.adam@epa.gov.

Sincerely,

Daniel D. Opalski, Director
Office of Water and Watersheds

cc: Mr. Graham Peter, Ducks Unlimited

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[i] The Sole Source Aquifer (SSA) Protection Program is authorized by Section 1424(e) of the Safe Drinking Water Act of 1974 (42 U.S.C. 300 *et. seq*), which states:

"If the Administrator determines, on his own initiative or upon petition, that an area has an aquifer which is the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health, he shall publish notice of that determination in the Federal Register. After the publication of any such notice, no commitment for federal financial assistance (through a grant, contract, loan guarantee, or otherwise) may be entered into for any project which the Administrator determines may contaminate such aquifer through a recharge zone so as to create a significant hazard to public health, but a commitment for federal assistance may, if authorized under another provision of law, be entered into to plan or design the project to assure that it will not so contaminate the aquifer."

[ii] Mote P, Petersen A, Reeder S, Shipman H, and Whitely-Binder L (2008) "Sea Level Rise in the Coastal Waters of Washington State". A report by the University of Washington Climate Impacts Group and the Washington Department of Oceanography

[iii]Huppert et al, 2009. http://cses.washington.edu/db/pdf/wacciach8coasts651.pdf