Appendix B:

King County's Detailed Comments on Puget Sound Nutrient Source Reduction Project Volume 2:

Model Updates and Optimization Scenarios, Phase 2

Page	Reference Text	Comment	Recommended Action
9	p 9 abstract - The total estimated noncompliance area in 2014 is 467 km2, excluding certain areas.	It is incomplete to express noncompliance in terms of area when there are also vertical considerations and time considerations.	Recommend instead describing the percent of non-compliance modeled calculated as the sum of the number of cells not in compliance per time step divided by the total sum of the number of cell/timestep combinations.
10	"Multiple physical, chemical, and biological factors affect DO levels in Puget Sound. These include…"	The list implies a rank-ordering of their importance.	Re-order the list of factors from increasing to decreasing importance
11	"The model demonstrates the level of performance needed to determine the impact of hypothetical reductions in human loads from watersheds and wastewater treatment plants."	Framed as statement of fact rather than the judgement. Also, not clear that there was any way for the model to fail.	Re-frame as a judgement or a determination by Ecology.
14	Table ES-1 & ES-2	Analyses of the 10 Opt2 WWTP frameworks are framed as a sort of alternatives analysis. However, the anthropogenic load reductions are nearly identical among scenarios (differing by <1,000,000 kg/yr); no scenarios evaluate percent reduction, noncompliant area or days, or max magnitude of DO noncompliance for anthropogenic loads	Evaluate 3-5 additional and distinct scenarios that reflect actions to reduce anthropogenic loads to intermediate levels between 21,300,000 kg and 7,500,000 kg/yr. If the present analysis includes only 'status quo' and 10 'best-case' scenarios, this means adding scenarios that reflect approaches that characterize worst-case,

Page	Reference Text	Comment	Recommended Action
		between existing (21,300,000 kg/yr and 7,500,000 kg/yr). Accordingly, the alternatives are not substantively different, reducing the decision to a) no action or b) reducing loads to 6,570,000—7,500,000 kg/yr.	constrained, most likely, and innovative (or similar) approaches.
19	Table ES-2	Report states 80,279 days of noncompliance for existing conditions in 2014	Table caption implies that the denominator for this statistic is a single year, which must be incorrect. Clarify how one year of existing conditions could produce over 80k days of noncompliance.
23	"…this report and its appendices also contain details about recently updated model input files, reference condition scenario, updates to a newer model version at the same intermediate scale/spatial resolution as before, as well as a comprehensive model evaluation and other related and relevant results."	These model runs did not use the high spatial resolution version of the SSM (114,590 nodes and 208,452 triangular elements), which has stated improved performance for modeling biogeochemical processes. As this analysis used a volume-weighted average of all grid cells that fit into a 303(d) assessment unit, the higher resolution model would work here, with likely better results.	Add a statement regarding why they didn't use or at least assess the high-spatial resolution model. Computation time is an insufficient answer if they did not evaluate performance of the high res model.
31	Reference conditions for each of these years represent nutrient inputs from watershed and marine point sources estimated in the absence of local and regional anthropogenic influence.	It is unclear how reference conditions were calculated, and whether these values reflect naturally elevated nitrogen concentrations in Puget Lowland soils and groundwater, which can be elevated even in the absence of anthropogenic influence. Applying a uniform "natural background" across the region may result in underestimating the	Recommend clarifying whether regional variation in natural nitrogen conditions—particularly in the Puget Lowlands—was accounted for when defining reference watershed concentrations and specifying how reference conditions were determined.

Page	Reference Text	Comment	Recommended Action
		natural baseline in lowland basins and overstating the anthropogenic load. For example, Green River reference conditions were shown at <0.05 mg/L (Appendix D, pg 360). These levels are lower than the 25th percentile of reference site data used in the SAM status and trends study (0.459 mg/L; DeGasperi et al, 2018) and NAWQA reference site values (Embrey and Inkpen, 1998).	
32	"…interannual differences in watershed loads are primarily driven by flow magnitudes."	Unclear whether this is a scientific fact or simply a function of how the watershed loads are modeled	Add a statement clarifying whether this finding is an artifact of how the model works or is a scientific statement of fact.
65	The data are provided with a disclaimer that states that the data have been automatically processed and not validated, so the data are preliminary. Our SSM applications QAPP (McCarthy et al. 2018) precludes us from using unvalidated or preliminary data in a quantitative sense, but we can use it for qualitative comparisons.	Data used from King County CTD profiles listed in Appendix D are very likely the non-QC'd version, as they list of green2 site as their source instead of contacting KC directly. Technically this would preclude this data from use in a quantitative review by their own QAPP. Page 68 implies use of KC data for quantitative review.	Contact MarineWQ@kingcounty.gov for QC'd data, and change the reference to the green2 website to that email address.
66	"Predicted temperature was about one degree Celsius higher than observed at Twanoh during that period, which can result from the model overshooting vertical	At constant salinity, this degree of temperature error could account for over a 0.1 – 0.15 mg/L decrease in dissolved oxygen saturation and may result in noncompliance resulting from T error.	Check how the SSM incorporates T and S for calculating dissolved oxygen saturation, and asses what the impacts T and S error could have on DO compliance.

Page	Reference Text	Comment	Recommended Action
	mixing in mid-September and allowing warmer water and higher DO concentrations from an upper layer to mix with bottom waters sooner than when DO levels started increasing towards the end of October."		
96	At most locations and times, DeltaDO_Algal (shown in green) is negative, signifying that respiration overtakes algal DO production in the two bottom layers.	Measured chlorophyll is typically low (but not zero) at the bottom depths in CTD profiles at West Point, though algal respiration constitutes a significant fraction of overall DO consumption in the modeled results.	Add note on chl concentration at the bottom two layers for comparison to observed values. While we don't have observed algal respiration data, we can estimate accuracy based on the chl concentration at the bottom layers.
83-84 (Appendix B)	"As in other sections of the report and Appendices, "anthropogenic" refers to local and regional human loads or influence."	How are anthropogenic loads estimated from the total nitrogen (TN) watershed loads? Is any groundwater/baseflow included in the anthropogenic loads?	Recommend providing more detail on what is included in the anthropogenic loads. Knowing how these loads are defined will be important for planning interventions to reduce the load.
84 (Appendix B)	Figure B2-1	Modeling done as part of our Water Quality Benefits Evaluation Toolkit for King County watersheds estimates TN loads to be about half what is estimated by Salish Sea model.	Recommend an ensemble approach to modeling watershed estimates to better understand variability of different projections with a goal to reduce uncertainties and discrepancies in the data