Puget Sound Nutrient Forum

Stakeholder Responses to Nutrient Reduction Issues Questionnaire

Background

The Department of Ecology is leading a collaborative effort called the Puget Sound Nutrient Forum (Forum) intended to bring together stakeholders, regional tribes, and the public to discuss issues related to nutrient over-enrichment, its effect on water quality in Puget Sound, and potential approaches to reduce nutrient loading from humans.

At the kickoff meeting on April 25th, we asked interested participants to respond to a questionnaire designed to gather information that will be used to develop a meaningful Forum schedule that addresses the questions and issues raised by participants. We received responses from several entities that included local governments, industry, a conservation district, and nongovernmental organizations.

The tables below include the responses we received, with themes we added to each comment in order to organize the responses. We have not edited or changed the responses from the originals we received. We are not providing responses to issues and questions at this time, but will address key themes in upcoming Forum meetings.

Questionnaire Responses

1. **There is a lot of scientific information available to understand nutrient issues in Puget Sound, including: how nutrients affect the health of a waterbody, human-caused nutrient sources, computer modeling focused on Puget Sound, how the Salish Sea model can be used to look at different input scenarios, and how low dissolved oxygen or eutrophication affects Puget Sound. *What would you like to know more about?***

Theme/s	Responses
Science Involvement	Quantitative measures of phytoplankton density from species-level identification and chlorophyll-a data combined can provide the most sensitive measure of changes in the phytoplankton community. Phytoplankton blooms are ephemeral and are not always captured in monthly monitoring. This underscores the importance of working with partners like PSEMP groups and using all available data to better understand status and trends in Puget Sound. How will the PSEMP marine monitoring and modeling groups be involved in this process?
WQ Standards	Water quality standards: Many of the areas of Puget Sound that are in violation of current standards represent “stranded” inlets with low tidal exchange. Does the science support applying the same water quality

	standards for these areas as for other areas of the Sound? Are the standards reflective of the biological needs of the actual organisms that call Puget Sound home?
WQ Trends Recovery Targets	The ocean acidification link to nutrients appears to be weak. Clearly part of the concern expressed is simply based on natural nutrient cycling, uptake for productivity near the surface and breakdown and release at depth from organic matter settling. pH will vary as these processes proceed. The "cure" would be to reduce the productivity. But reducing productivity will affect the food chain too. It's really hard to understand what is needed, reasonable, optimal, or possible. Note that Ecology is identifying decreases in benthic populations in sediment monitoring. Could this be a result of reduced food supply?
WQ Standards Recovery Targets	What beneficial changes to the health of the biota will result from the small dissolved oxygen improvements that might result? Can beneficial changes for the biota actually be measured? Can we develop hypotheses and make predictions for specific beneficial changes to biota and then actually test them? Southern Puget Sound could be the test body of water, and the new Pierce County nutrient removal capability could be varied (on and off) to test the hypotheses and predictions. Notwithstanding Ecology's recent denial of the City of Everett's petition to revise the dissolved oxygen criteria, there are still significant concerns with the state's criteria. Should dissolved oxygen criteria apply everywhere in the water column? Why? In consideration of the natural dissolved oxygen patterns in Puget Sound, what purpose do the numeric criteria serve? Does it make any sense at all for the dissolved oxygen criteria to not have reasonable considerations of duration of exposure? Should there be a way to consider long term averaging periods for dissolved oxygen? EPA does. Our criteria are more than 50 years old and poorly justified. We can do better.
Recovery Target WQ Standards	Hypoxia is defined as dissolved oxygen levels below 2 to 3 mg/L that become too depleted to support many marine species (Diaz and Rosenberg, 2008). Below the oxygen level of 5 mg/L, biological stress can be induced in sensitive marine species, such as some fish (CENR, 2011). Given these thresholds, which areas and basins show the greatest impact from anthropogenic nutrient loading in the Salish Sea model? What is the spatial extent of the problem, both vertically through the water column and horizontally across each sub-basin? Where is the problem sustained over weeks to months? Thus far, model output has been grouped as pass/fail in terms of the water quality standard. Will this be better linked to more biologically meaningful impacts from nutrient reduction? For example, a drop in oxygen from 2 to 1.8 mg/L is more biologically relevant than a drop in oxygen from 6 to 5.8 mg/L.

WQ Trends Recovery Target	Local impact of nutrient enrichment on benthic communities (including shellfish, eelgrass, macroalgae and kelp) in vulnerable parts of Puget Sound under different climate conditions (high/low snowpack, high/low rainfall years, water temperature). Vulnerable sections include areas with reduced flushing such as heads of bays and inlets. More specifically, we are interested in • Potential changes in water clarity due to changes in turbidity and the composition of the pelagic food web, and their impacts on benthic communities in nearshore habitats. • Potential interactions between nutrient load and ocean acidification, and their impact on shellfish resources in different parts of the Sound. • Local impact of nutrient enrichment and low dissolved oxygen on benthic communities in deeper waters of greater Puget Sound, especially near large outfalls. Will reduced summer stream flows due to climate change exacerbate the symptoms of nutrient loading in certain embayments?
WQ Trends	For areas that are more susceptible to eutrophication and low oxygen conditions, has the problem been getting worse or staying the same over the last two decades and beyond? In terms of overall annual average trends from Ecology's marine monitoring monthly observations, chlorophyll-a is noted to have decreased over the past two decades, contrary to expected eutrophication trends. In King County's marine monitoring observations in the Central Basin, chlorophyll-a exhibits high inter-annual variability and does not show any significant trend over the past two decades. Are these trends different for other basins in Puget Sound, and how does this compare with historical data records? In the case of San Francisco Bay, which is another example of an ecosystem enriched with nutrients by both natural and anthropogenic sources, chlorophyll-a shows a significant positive trend over the past two decades, and thresholds of chlorophyll-a may be used to characterize the risk of harmful algal bloom development and low oxygen conditions (Sutula et. al, 2017).
WQ Trends	The message being communicated is that there is an excess of nutrients in Puget Sound and that reduction efforts are necessary. The assumption is that a reduction in nutrients will have a measureable benefit on dissolved oxygen concentrations through direct and/or indirect biological response(s). The scientific data presented to date have not shown that nutrients have/are caused/causing eutrophication. It is difficult to support an effort to reduce nutrients when the problem has not been convincingly communicated nor the assumption that a reduction in nutrients equates to a benefit.
WQ Trends Model Scenarios	Please provide specific results on what the science is showing regarding current and long-term trends in nutrient and chlorophyll concentrations for each Puget Sound oceanographic basin separately.

	The basins have different characteristics (e.g., flushing rates and water residence time, deep versus shallow depth, etc.) and available observational data do not show eutrophication effects Puget Sound-wide. Please provide more informatio about Ecology's approach to basin-specific actions as the inputs and cycling of nutrients across basins is not equal. If the Core or IDT groups suggest a basin-specific approach, is Ecology open to that strategy rather than a one-size-fits-all approach?
Model Performance Communication	How is Ecology planning to communicate model sensitivity and uncertainty, both in the context of model evaluation and when interpreting and applying model outcomes in the context of decision-making?
Model Performance Communication	I would like to see some group discussion of the level of comfort in the model, particularly of the elements that indicate impacts in the south sound from inputs further up north. Fundamentally one of the issues I believe we as city representatives may begin to hear about is whether or not the core concept here that activities in one area of the state need to be significantly changed to positively affect the environmental performance somewhere else. That's always going to be a bit of a hard conversation, and I've already heard rumblings that people dispute elements of this model. So I would appreciate taking that on head on and bringing the group along to a common understanding of it.
Model Results	Given the new updates and improvements to the Salish Sea model, how much was water quality predicted to improve with the current level of nitrogen removal by the Thurston County LOTT treatment plant? Can this be tied to any monitoring observations in Budd Inlet? Can we learn from the smaller spatial scale and use this to inform interpretation and assumptions of model results?
Model Performance	Quantifying model uncertainty is crucial to sound science and science-based decision-making, and optimal decisions balance model uncertainty with risk (Weller et. al, 2013). In the case of Chesapeake Bay watershed modeling efforts, a margin of safety in model assumptions is ideally made conservative enough to provide a higher probability that water quality standards would be achieved despite uncertainties (Weller et. al, 2013). How much uncertainty is in the Salish Sea model predictions of impacts from nutrient loading? Is there any margin of safety in model assumptions? How does the choice of model parameterization impact the sensitivity to anthropogenic nutrient loading? Have comparisons to other models for Puget Sound been considered, as was done for the Chesapeake Bay watershed and estuary, in order to better inform management and policy and better quantify this uncertainty or strengthen the predictions (Weller et. al, 2013)?
Model Performance	A model is a useful tool that can be used to identify problem areas and prioritize management actions, but the output is not reality due to the

	inherent complexity of trying to adequately capture Puget Sound circulation and biogeochemical dynamics. This is particularly true in areas with complex flushing and biogeochemical cycling, such as terminal inlets where the modeling output does not match well with observational data. Utilization of the Salish Sea Model to identify areas in Puget Sound that need additional data to assess nutrient/oxygen dynamics in order to identify potential strategies is more appropriate than using the model in a regulatory context (i.e., the state narrative dissolved oxygen 0.2 mg/L standard).
Model Performance	Model validation: How do today's water quality data compare with that predicted by the model? The model was developed with data that was collected years ago. Given that, can it accurately reflect current and future conditions?
Model Performance	Why does the Salish Sea Model (SSM) show shallow areas to have problems with the dissolved oxygen criteria? Specifically, the model results show much lower DO for the bottom water than the upper 20 meters, in areas that are shallower than 20 meters (such as Padilla Bay and the head of Port Susan)? It doesn't make sense. Does the model demonstrate the day-night, photosynthesis-respiration effects in large eel grass beds, such as occur in Padilla Bay?
Model Scenarios	How does the model take into consideration of the non-human caused nutrient sources, such as, trees, wild animal wastes, runoff from different watersheds? What is the existing monitoring program on all the natural contributors? What are the indicators for healthy water quality and what are their limits?
Model Scenarios	Nutrients can be both good and bad. Nutrients are needed to support productivity and the food chain. When summer coastal conditions of winds and stratification inhibit upwelling, productivity along our Pacific coast is greatly limited and this reduction of food supply ripples through the ecosystem with direct impacts on juvenile salmonid survival and later reductions in returning adult salmon. Excess nutrients can lead to more productivity in some waters which will have some benefits and may (or may not) also be harmful. Lake Washington was cleaned up by removing excessive nutrient inputs from numerous small secondary treatment plants. Water clarity improved, the lake recovered, but it also became less productive. If the problem with nutrients is increased phytoplankton productivity, resulting in increased organic enrichment of deeper waters when the plankton die and sink, then how does that compare with the time when pulp mills and municipalities were only at primary treatment and discharged much higher levels of total suspended solids (organic particulate matter)? Run the SSM to represent that historic condition, see what it shows. By-the-way, there were much larger fish runs in those days.

Implementation/BMPS	Mitigation measures: Many other communities have dealt with water quality problems and TMDL efforts. There must be data from past efforts that illustrates which types of measures result in actual water quality improvements – best management practices with real data behind them. What are those measures?
Implementation/BMPs	AKART: What is the current definition of AKART for wastewater treatment and stormwater management and why? How is AKART applied to permitting decisions?
Implementation Funding	I'd like to know more about how to address lack of funding and resources to maintain and increase ambient water quality monitoring sites, gain landowner interest and outreach, and implementation of best management practices. In Thurston county, nutrient sources have not been addressed in the freshwater TMDLs, but remain a nonpoint source pollution problem.
Implementation	Skip the studies and the PC approach. Tell me what you need.

2. What does healthy water quality in Puget Sound mean from your perspective?

Theme/s	**Responses**
Puget Sound Action Agenda	The Puget Sound Partnership has addressed this issue thoroughly. Significant Puget Sound recovery actions should be based on definitions that have been developed over time in collaboration with scientists and stakeholders from throughout the region. The following paragraphs provide additional perspectives that should not be understood to replace the common definition developed through Partnership's efforts.
Functioning ecosystem that supports aquatic life uses Basin-specific	Water quality and conditions that support the growth, survival, reproduction, and diversity of marine life in Puget Sound are an indicator of a healthy environment. As well as water quality that is safe for people to swim in and harvest fish and shellfish from. Indicators like dissolved oxygen can be an informative tool to assess water quality, and standards can provide thresholds to protect marine life. In order to make the standards biologically meaningful and impactful, it is important to consider factors like natural seasonal conditions, location, and habitat use and species adaptations. If the goal is to improve water quality for marine life and human use, then the strategy must be directly tied to this outcome to more effectively address water quality. For example, low oxygen conditions are present in the sediment record prior to the 1900's and human alterations in Hood Canal and Central Puget Sound (Brandenberger et. al, 2008). Across waters of Central Puget Sound, deep dissolved oxygen concentrations seasonally drop below the 7 mg/L standard to 4.5 – 6 mg/L in the fall every year since monitoring began in the 1930s (Collias et. al, 1974; Jaeger et. al, 2018).

	This is an essential difference from ecosystems such as Chesapeake Bay and the Gulf of Mexico, where the cause-effect relationship between coastal eutrophication and hypoxia and increased anthropogenic nutrient loadings and changing land use have been established with tools such as sediment cores (Brandenberger et. al, 2008). Puget Sound receives nutrient-rich and oxygen-deficient oceanic waters from coastal upwelling, and low oxygen conditions are also highly impacted by ventilation and stratification within the different basins. A nutrient-only view of the solution can be incomplete to manage low oxygen conditions and generally improve water quality in Puget Sound. These issues stress the importance of taking a local basin-specific approach to identify drivers and trends in water quality in order to make improvements. Prioritizing water quality and habitat issues that can have the most impact across marine species is key, such as supporting populations with high regional value such as resident orcas, salmon, and shellfish.
Functioning ecosystem	I'm not sure how to answer this. That there is a healthy ecosystem, clean water, healthy fish and other aquatic organisms. That people are able to recreate in the sound like they have for generations.
Functioning ecosystem	Maintaining viability of the last intact marine ecosystem we have.
Food web	A functioning lower trophic food web. Seasonal phytoplankton communities that consist of typical estuarine species assemblages, are not excessively large or extended in duration compared to a baseline condition, and have an expected proportion of major taxa groups (i.e. diatoms and dinoflagellates). Abundant zooplankton that are known to be important prey for higher trophic levels, such as juvenile salmonids and planktivorous seabirds, that are of high-quality nutritionally.
Food web	Pollutant loads to the water column and sediments from stormwater runoff and other point source and non-point sources that do not detrimentally affect marine biota from the bottom of the food web to the highest trophic levels due to bioaccumulation.
Human and aquatic life uses	Safe source for food, habitat, and recreation.
Human and aquatic life uses	Healthy water quality supports life and endemic ecosystems in Puget Sound, does not pose risk to public health or wildlife, and does not restrict use of the waters for recreation or harvest.
Supports aquatic life uses Broad WQ improvement	Thriving biota. Pathogens not a significant threat and reasonably managed. Legacy toxics declining. Plastic pollution declining both here and globally. New chemicals of emerging concern better understood and regulated (even banned where appropriate) to minimize effects on the biota. Shellfish toxin concerns managed by a good monitoring and closure program. Recognize that ecosystems are not static and that

	predator-prey relationships may, independent of water quality, result in significant population swings.
Supports aquatic life uses Communication Supports human uses	Healthy water quality looks like landowner being knowledgeable and aware of their impact on water quality, able to access the resources available to improve stream and wetland habitat enhancement, and funding to implement best management practices on farms to improve and protect ground and water quality. Healthy water quality means salmon numbers increasing, healthier streams, healthier shellfish protection areas to maintain those production areas and improve habitat. Healthy water quality means prevent high nitrates in the drinking water.
Supports aquatic life uses	• Healthy eelgrass and kelp beds throughout greater Puget Sound • Healthy benthic communities in both shallow and deeper waters in greater Puget Sound • Reduced occurrence of shellfish closures due to harmful algal blooms (such as Psuedo-nitzchia sp., Alexandrium sp., Dynophysis sp., …) • Low microbial contamination of recreational and commercial shellfish from human sources such as outfalls, leaky septic systems, etc.

3. We'd like to know your issues and perspectives so they can be a part of the upcoming forum discussions. ***What are the significant issues that your organization thinks about regarding implementation controls or activities that could be used to reduce nutrients into Puget Sound?***

Theme/s	**Responses**
Science Involvement	While the model development has been robust, how can we ensure that the broader scientific community engages in the process early enough in the future (as policy decisions are discussed, and implementation actions are identified).
Science Involvement	As new science and modeling results come in, how will this be built into the policy framework? What happens if the conclusions of human nutrient impacts change?
Forum/MWQ IS process	How will the decision-making process work? What roles will the Forum and MWQI play in making decisions, or will they solely provide ideas and recommendations to Ecology? How will Ecology deal with differing opinions? Will there be a small (appointed?) board or leaders within each group to make decisions or provide the final guidance?
Model Scenarios Implementation	The implementation controls or activities need to be meaningful, affordable, and explainable to the public. Within Puget Sound, should there be different loading limits based on the location or depth of

	permitted discharges and/or varying limits depending on the time of the year? What trends are driving the timeline for control implementation?
Model Scenarios	One issue is that whatever control or strategy is selected will be applied Puget Sound-wide. There are different types and amounts of nutrient inputs into the various basins which cycle differently based upon physical and biogeochemical characteristics. A control/activity that might have a measurable decrease in one basin, will have no effect in another basin. Yet millions of taxpayer funds will be spent for no measurable benefit.
Incentives for early improvements	Cost is always a factor but not insurmountable. Ecology must stop penalizing for improving. The present regulatory framework rewards moving at glacial speed. Create incentives to change early. Can you create a pilot whereby participants can bank improvements made to be covered under future reductions? Steer clear of percentage reductions focusing instead on volume concentration and process optimization.
Implementation/BMPs	Given that the pool of money is limited, we must prioritize actions that will have the greatest impact on water quality. In addition, not all nutrient reduction treatment is equal. Some technologies may have additional benefits like removing metals and organics; however, these can be more expensive and difficult to implement. Some treatment technologies may also generate significant air pollution such as carbon dioxide, which could in turn have a negative impact on local ocean acidification. A holistic approach of these considerations would be beneficial.
Implementation Challenges	There comes a point where added requirements for nutrient removal bump up against process capability, especially for plants that already employ nutrient removal. Operational challenges like colder Spring and Fall weather and occasional slug loads of high ammonia septage can make meeting existing nitrogen limits a challenge. Further limiting nutrients could eliminate any existing “wiggle room” plant operators have to manage operational conditions that are frequently less than ideal, and increase the likelihood of permit violations.
Implementation Incentives	Water quality improvements are stymied by the lack of a state-level water quality trading/credit program. LOTT has completed projects with community partners in the past to improve local water quality, but our Board of Directors and ratepayers are hesitant to make further investments because there is no guarantee that LOTT would get credit for that effort. A credit/trading program would free up LOTT and other dischargers to take actions that would result in real water quality improvements, sooner rather than later. This type of program would also help to make sure money is spent in areas where it can do the most good.
Implementation Coordination	How could this process influence or support measures that we may have to take to address other water quality challenges, such as stormwater,

	but also salmon protection, sediment cleanup, land protection, and other actions? How are these other concerns and initiatives being taken into account in the forum or the development of the implementation strategy?
Implementation	The "implementation strategy" appears to have several components, e.g. a "results chain" and set of recommendations. How is it actually implemented? How would it influence decisions on how dollars gets spent (e.g., does it lead directly to regulatory actions)?
Implementation Sequencing	Is there room for incremental progress in this effort, for example doing things first that address nutrients while also addressing other water quality concerns, or does the plan have to be designed to meet the water quality standard by a certain date?
Implementation Coordination	How will any controls or activities be prioritized and/or leveraged with stormwater reduction efforts? Millions of dollars have already been spent (and billions more are planned) to reduced stormwater inputs to Puget Sound. Potential controls and activities would also require a billion dollar investment with no guaranteed benefit.
Regulatory Fairness	LOTT's ratepayers have invested millions of dollars to add nutrient removal to our process at the Budd Inlet Treatment Plant (BITP). We have been the only plant on Puget Sound to provide this advanced level of treatment for decades, yet we are likely going to be required to do even more to reduce nitrogen while many other treatment plants do not have these requirements. Our Board of Directors and our ratepayers have serious concerns about equity, especially when our local TMDL has identified input from external sources (nonpoint pollution and treatment plants to the north of Budd Inlet) as contributing 20% of the loading in our area when LOTT's contribution is less than 3%.
Regulatory Fairness	We're going to be interested in fairness and equity and skin in the game from all parties that have an influence on the water quality, all of the various point and non-point sources.
Cost Regulatory Fairness	LOTT's contribution to nutrient inputs in Budd Inlet is the smallest of the four sources under review in our local TMDL, yet limiting LOTT's discharge further could cost more than addressing the other sources. Our local community's ability to shoulder the cost of needed water quality improvements has limits. It should be focused on actions that can create the greatest water quality benefits.
Cost Implementation	Costs, in consideration of other societal costs. What actions produce the best return, and what actions produce the least return. Go for those that produce the best return. This view is not specific just to the nutrient reduction goals of Ecology. Stormwater management may become very costly. Culvert replacement costs may escalate greatly. New human health criteria may result in high costs and little benefit in return. Taxpayers are reacting to tax increases for education.

Implementation	DNR understands that implementation of nutrient reduction measures is a complex issue that will affect local and regional stakeholders. Despite these challenges, nutrient reduction is critical to Puget Sound's health, especially given the projected population increases in our watersheds.
Implementation Funding	Significant issues from the conservation district perspective include the need for more landowner engagement, which we see as a higher priority than another prioritization, since several prioritizations for restoration and conservation exist at a watershed and county level, as well as at a basin level. More funding is needed to maintain these programs and to partner together for to share efforts and collaborate.
Costs/Affordability Implementation	Ecology indicated that, given the potential magnitude of costs associated with substantial nutrient removal from wastewater treatment plants, the forum (public engagement) process could include addressing the question of how to prioritize large investments in water quality - related actions - such as stormwater controls, toxics, making investments to avoid future accidents like what happened last year at West Point, etc. How does Ecology see this discussion playing out in light of regulatory requirements and other initiatives?
Cost/Affordability Implementation	LOTT staff work diligently to produce the highest quality effluent possible, routinely achieving nutrient levels well below what is required by permit. This effort, along with significant infrastructure investments, have resulted in LOTT consistently operating well below permit requirements, effectively gaining wastewater treatment capacity sufficient to meet needs until the year 2036. By requiring further reductions of nitrogen at the BITP, much of the careful planning we have done to ensure our communities have adequate capacity into the future will be undone. The community investment required to replace the lost capacity is disproportionate to the water quality improvement to be gained by reducing LOTT's discharge.
Cost and Affordability	The background information presented on the Department of Ecology's (ECY) website and materials distributed to date, places significant emphasis on nutrients discharged from municipal wastewater treatment facilities. In particular, the story map appears to dedicate the majority of the screen time to publicly owned treatment works for wastewater treatment (POTW). This suggests that Ecology is targeting wastewater treatment plants as primary means for controlling and reducing nutrient loading into Puget Sound. While there may be sound reasoning and science based justification, the costs associated with the infrastructure, processes and regulations will be massive. Upgrades and renewals of aging and undersized POTW's, under current regulations, are increasingly measured in the hundreds of millions of dollars, even for small communities. The additional costs likely to be incurred to meet pending nutrient removal requirements at POTW will be borne by rate payers and in particular homeowners.

	As ECY looks to build understanding of the science and reasoning behind implementation of new restrictions and regulations, a robust examination of the impacts to front line rate payers will be appreciated. Including municipalities and representative organizations (eg AWC) in the conversation on costs to implement the regulations will be beneficial. Communicating to elected policy makers the expected cost and benefits in a way that is real to a typical homeowner will be important. Robust discussions on affordability of implemention of nutrient removal efforts at all income levels will be essential. Conventional measures of affordability based on the median household income (MHI) such as those used by the US-EPA are known to disproportionately burden the higher population of lower income households when MHI is skewed by the comparatively smaller population with very high incomes. As the monthly cost of sewer service rises to pay for the cost of nutrient removal, the percentage of total household income spent on sewer utility bills will increase thereby disproportionately affecting household with income lower than the MHI. Using on the MHI income as metric of affordability ignores the statistically reality associated with income disparity that has been prevalent in the Puget Sound region for many years. Ask a random person if they think a clean and healthy Puget Sound is important and you will get a yes answer from most. Asking homeowners if they are willing to pay $150/month, or more, on a City sewer bill (in addition to $50 for NPDES stormwater O&M requirements) and the dynamics of the conversation change fairly quickly. Ask a local, elected official if they are willing to raise sewer bills with double or triple digit, percentage increases and the answer will inexorably be no.

4. Does your organization have other questions or concerns that are not included in your previous answers?

Theme/s	Responses
Forum/MWQ IS Process	It was not clear at the meeting in Tukwila what the role of the Core and IDTs will be and how the two will differ?
Science Involvement	The general schedule we heard about in past meetings, as well as at the Forum last week, indicates an anticipation by Ecology that stakeholders will be able to engage in a meaningful way for many months prior to having substantive information from the Starter Package and bounding scenarios modeling, and that the initial meetings will be on policy/regulatory issues. It would be helpful to have supporting scientific information sooner than later for stakeholders to engage on the science, and to also be more informed on the regulatory needs.

Science Involvement	Compared to the cost of implementation, the cost of science and modeling is minor. Given limited resources, it seems vitally important that the science and modeling efforts be put ahead of discussions of policy and implementation in order to have the greatest impact on Puget Sound water quality. The scientific questions of eutrophication and low oxygen conditions in Puget Sound are complex and interdisciplinary in nature. Involvement of other scientists working in the region on similar issues and the creation of an independent external science advisory panel early in the process can strengthen the scientific credibility and relevancy of the nutrient reduction project.
Science Involvement	It has been stated several times that Ecology is approaching this effort as a collaborative process, yet the Puget Sound marine waters scientific community has not been engaged. PSEMP's Marine Waters Workgroup was not sent notification directly about the July 2017 science workshop nor sent notice about the recent meeting in Tukwila. Information was sent short-notice to workgroup members via other members who received the announcement from a different pathway. Dustin did come to a workgroup meeting and gave the same presentation as the July workshop, but the workgroup has not been engaged on the science aspects of the project. In addition, the PSP's Science Panel has also not been engaged in the process.
WQ Standards Reference Conditions	Where does the DO depletion of not exceeding 0.2 mg/L come from? Does it have a scientific basis? Do we know what natural background water quality conditions look like? What are we aiming for and why?
WQ Standards	The state standards, particularly the narrative criterion, should be reassessed for biological relevance applicability as well as cohesion with other coastal states. It is important to take into account natural processes that affect oxygen dynamics to establish criteria that reflect natural conditions and protect marine life. For estuaries such as Chesapeake and San Francisco Bay, rigorous efforts were used to develop numeric dissolved oxygen criteria that were biologically relevant. A similar scientifically-based effort is necessary for Puget Sound that is based on the protection of Puget Sound's sensitive species and habitats.
Climate Change Impacts	Are there scientific estimates for how global climate conditions could change the water quality of Puget Sound (i.e. changing sea levels and/or ocean and atmospheric temperatures)?
Creative Solutions	Start thinking about what we should do rather than what you think we can.. Xeriscaping and companion planting will virtually eliminate fertilizer on suburban lawns. How do we get to zero discharge? Close the loop, utilize nature over engineering. How much nitrogen and carbon will an alder tree uptake? Harvest the alders to grow mushrooms, medicinal culinary etc. Cost effective treatment for storm water. Oyster

	mushroom will breakdown petrochemical products. Not sequester but molecularly change and still be edible.
Model Performance	The timeline presented for the various steps under the Nutrient Reduction Project does not allow for adequate time to make the effort a collaborative approach between local, tribal, and state agencies. This effort is relying heavily on the Salish Sea Model, yet the model did not undergo a substantive external peer review for the purpose it is now being used. It does not appear that the current timeframe allows for an external review process, via an IDT or other committee, and subsequent adjustments to the model. In order to move forward in this process and see the outcomes of various strategies, it is essential that stakeholders have trust in the model output.
Model Scenarios	Do we have sufficient data to define average, minimum, and maximum nutrient loading distributions from all sources? Is there enough data to reasonably determine the loading rate distribution by percentage or weighted area, from all sources, such as human caused and non-human caused, or point and non-point?
Model Scenarios	Any data coming from straight pipes, grey drains or “discharge” should not be grouped with OSS. According to WAC 246-272 A Definitions: "On-site sewage system" (OSS) means an integrated system of components, located on or nearby the property it serves, that conveys, stores, treats, and/or provides subsurface soil treatment and dispersal of sewage. It consists of a collection system, a treatment component or treatment sequence, and a soil dispersal component. An on-site sewage system also refers to a holding tank sewage system or other system that does not have a soil dispersal component. The term OSS “Failure” has been erroneously used to imply all waste (daily water use exiting the residence) is escaping, untreated. In fact, most of the effluent is treated in the tank, prior to entering the drain field. There is no measurement for the limited amount of effluent that could be on the surface or leaking. But any such leak is considered “Failure” by the following definition. According to WAC 246-272 A Definitions: "Failure" means a condition of an on-site sewage system or component that threatens the public health by inadequately treating sewage or by creating a potential for direct or indirect contact between sewage and the public. Examples of failure include: (a) Sewage on the surface of the ground; (b) Sewage backing up into a structure caused by slow soil absorption of septic tank effluent; (c) Sewage leaking from a sewage tank or collection system; (d) Cesspools or seepage pits where evidence of groundwater or surface water quality degradation exists; (e) Inadequately treated effluent contaminating groundwater or surface water; or

	(f) Noncompliance with standards stipulated on the permit. The Nitrate equation model uses a formula related to Large OSS. As provided earlier by Dave Tegeler, this is an inappropriate and unfounded formula for residential OSS.
Implementation Sequencing Costs	The timeframe for this nutrient reduction process is very long, pushing any actual improvements in water quality well out into the future (5-20 years from now). Can a water quality trading or crediting program be put together at the front end of this initial 4-5 year planning timeframe? This would allow those subject to TMDLs now and in the future to invest in improvements sooner rather than later, because they could have confidence that their efforts/investments would be "counted". Putting this system in place soon is a win-win for everyone involved, and for Puget Sound.
Implementation Certainty	As an NPDES holder I have had 3 drastically different sets of permit requirements over3- 5 year permit cycles. A treatment facility should have a 20-50 year lifecycle. No one is served if the system can't forecast the operational and regulatory requirements at least 20 years forward. Make it possible for us to plan for the long term.
Implementation/BMPs	Many other communities have dealt with water quality problems and TMDL efforts, and there have been studies and other efforts to evaluate the relative benefit of various types of mitigation measures. It seems that it should already be clear what types of measures will make an appreciable difference in improving water quality. Could Ecology establish a science-based menu of mitigation options and provide credit for those who undertake approved actions? Reinventing the wheel for each individual TMDL effort is very time-consuming and delays actual water quality improvement.