SSC Discussion and Recommendations from March 2011 SQO Meeting

Indirect Effects

The SSC commends the Science Team for the progress that has been made to date. This approach will give the State of California a state-of-the-art approach for indirect effects assessment. The framework is generally appropriate for the questions that are being addressed. Some refinements of the tools and the assessment thresholds may well be forth coming over time and the policy should have some mechanism to allow for improvements to be incorporated into the tools as science dictates. The framework is basically in place, but implementation guidance will be very important and has yet to be developed.

Overall Issues

There is an important need for the Science Team to provide study design and interpretation guidance to fully implement the proposed indirect sediment quality objective.

From the discussion and presentations, the SSC emphasized the importance for development of the Conceptual Model to establish a framework for each assessment which is applied across all Tiers. Some characteristics for this development are listed below:

- Development of a decision tree may be useful for leading to the proper Conceptual Model design and to identify the scope of the assessment.
- The model must be as comprehensive as possible.
- The Conceptual Model should identify the questions and scope (purpose) of the assessment. The purpose of the assessment should identify the program for which the assessment is being performed (e.g., TMDL, 303d listing, discharge permits, etc.).
- The Conceptual Model should define the initial boundaries of the assessment; the pertinent issues and relevance of human risk should be part of the information informing the spatial scale.
- The Conceptual Model should determine the appropriate sampling scheme to ensure representative sampling of the matrices, both sediment and fish.

Spatial extent is an issue that has come up at more than one of these meetings. It is a critical site characteristic across all tiers and has not been fully addressed. Unlike the direct effect evaluations that can be done on a station by station basis, the indirect effects assessment relies on evaluation of some area that will likely vary in size from very small project scale considerations up to regional or subregional assessments. The SSC recommends that the Science Team perform case studies of varying spatial size relative to fish forage ranges to determine whether any particular scale variations lead to conditions that are not protective or insensitive (e.g., relatively small area using species with a large foraging range). This evaluation should inform the development of implementation guidance for assessing sites, particularly those of small spatial

scale. Further, evaluation of case studies at a range of spatial scales should allow better evaluation of the potential rates for false negatives and positives in the evaluation decisions.

Because of the complications of performing indirect effects assessments, all issues that may impair these assessments may not have been covered in the short time frame that the SSC and Science Team have had to develop the framework. While most of the larger more obvious issues have been examined and discussed, the SSC suggests that if it is possible, the State of California should consider a trial period for the use of this assessment framework so that unexpected issues, which may arise, can be evaluated and addressed before a final protocol is promulgated.

It may be useful to include additional risk levels (e.g., exceedance of 10^{-4} cancer risk), to better separate the categories of consumption risk so that sites with higher levels of risk are more clearly identified.

There is likely a need for an 'inconclusive' category, which might reflect the quality of the data or the uncertainty of the assessment, which might be one guide for moving the assessment to Tier III.

Tier I

There is no substitute for appropriate and representative data as bad data leads to bad decisions. This is particularly the case where this tier is to be used to allow for meeting the SQO.
The data should be representative of current conditions. There should be clear implementation guidance regarding data quality objectives for this tier.

The SSC recommends that the Science Team develop guidance for appropriate detection limits; preferably risk based and addressing non-detect concentration data.

The SSC was sensitive to the concern that a look up table of sediment concentrations could lead to misuse as specific clean-up values and discourages this. To address this issue, the SSC suggests that the Science Team examine the potential for Tier I analysis to be used in a somewhat different manner. The Conceptual Model will identify the fish species that are most representative of human consumption for sites to be evaluated. The Tier I analysis could use the fish species that represents the highest bioaccumulation potential for Tier I as 100% of the diet. This is different from the current approach that uses an average concentration of the fish which make up the consumed species from the site. The assessment would then calculate the two risks, cancer and non-cancer, consumption risk or sediment based risks for this bioaccumulative species. This would lead to a Tier I assessment for each site but the site risk values would be different for each site based on the species of concern at the site. The Science Team indicated

that they could provide Tier I BAF values for each guild to facilitate this evaluation. This would eliminate a look up table for sediment concentrations. It is prudent for the Science Team to compare the performance of this approach with that of the original averaging of species approach to ensure that this does not become too conservative such that all sites are forced to Tier II.

The decision table for Tier I was discussed and changed such that where Seafood meets the SQO but Sediment seems to show potential for exceedance, the Seafood data are sufficient to indicate that the site meets the SQO.

Sediment	Seafood	Final outcome
Meets SQO	Meets SQO	Meets SQO
Meets SQO[1]	No data	Meets SQO
No data	Meets SQO	Meets SQO
Potential Exceedance	No data	Proceed to Tier II
No data	Potential Exceedance	Proceed to Tier II
Meets SQO	Potential Exceedance	Proceed to Tier II
Potential Exceedance	Meets SQO[2]	Meets SQO
Potential Exceedance	Potential Exceedance	Proceed to Tier II

[1] Sediment data must be appropriate and representative
[2] Fish data must be appropriate and representative.

At this Tier, false positives are acceptable as the purpose of the tier is to determine whether the site meets the SQO or goes to Tier II. We acknowledge that this tier is designed to err on the side of false positives and that false negatives should be minimized.

Modeling Tool

There needs to be transparency for the modeling tool to define how the tool works and performs its calculations as well as exactly what assumptions are employed. This information should become part of the documentation that is incorporated into the Decision Support Tool guidance documents.

The tool should have clear color coding identifies cells with content that is critical to the calculation and should not be changed.

It would be useful for the tool to automatically produce a summary of the conditions employed to make the calculations which would be tied to the results. If this cannot be done with the current spreadsheet model, then guidance on how to establish the connection between data and output needs to be established in the Decision Support Tool guidance document.

The issue of "overestimation" was discussed in some detail. First, the best models are only considered accurate to within a factor of 2 to 5; thus, with some frequency a 500% contribution is to be expected. As the model stands, even when the percent contribution is very large, the model is informing the manager that there is potential for high contribution from the sediment. Because fish consumption risk drives the assessment, if the fish consumption is below the risk threshold then the sediment contribution over estimation is of lower concern than if the fish exceed a cancer risk or non-cancer hazard threshold. However, when the risk is high for fish consumption, the sediment over estimation issue becomes a much greater concern, particularly in terms of evaluating management objectives. This may be a second characteristic that leads to Tier III assessment. Some features that may lead to this over estimation have been identified. The first of these is the method for calculation of the percent contribution. The SSC recommends that the Science Team change the method of calculation to the following equation:

$$\frac{\sum_{i=1}^{n} Est_i}{n} \div \frac{\sum_{i=1}^{n} Obs_i}{n}$$

This calculation first determines the average estimated tissue concentration (Est), and then divides by the average concentration measured in fish from the site (Obs) to calculate the percentage sediment contribution.

Further, the SSC would like to see the potential for the model to allow direct input of information such as measured pore water and overlying water concentrations as well as benthic tissue concentrations rather than using equilibrium partitioning estimated concentrations. These values multiply up the food chain and estimation methods can lead to the overestimation. At the current time, including actual measurements of these values may be considered more Tier III additions but the science is changing rapidly and may soon allow the relatively easy use of passive sampler determinations of pore water concentration values as input data. The relative scale of the assessment compared to the fish foraging range may also lead to an overestimation because the fish would not be tied strongly to the site. Thus, if the fish consumption exceeds the risk thresholds but the overestimation seems large and cannot be addressed by one of the above values, then additional studies may be needed to examine the connection of fish to the site which would be a Tier III consideration.

The SSC suggests that the Science Team examine the utility of expressing the sediment contribution as a probability of the site exceeding the contribution threshold. This may help reduce the overestimation problem to some extent.

The SSC recommends that the Science Team should, at a minimum, perform checks to insure that the model is performing the calculations accurately (e.g., that there are no math errors in the model).

The SSC reiterates that there is a need for clear data quality objectives to insure that model calculations provide high quality information for management.

The SSC suggests that the Science Team revisit the need for five categories of sediment condition. This may change if the consideration of including additional risk levels is incorporated into the evaluation.

The SSC suggests, when funding allows, the Decision Support Tool be set-up with a user-friendly interface to improve manager usage. This may be accomplished with relatively inexpensive commercially-available Microsoft applications or by professional software programmers.

Tier III

The SSC will help the Science Team as they develop guidance to establish the criteria for the conditions and application of Tier III. For instance, as discussed above, when fish show an exceedance and the sediment contribution is very high, it would be useful to do more refinement of the model such as measuring pore water and overlying water, measuring benthic tissue concentrations and examining fish home ranges to better define the exposure and therefore the contribution to sediment working toward management decisions. Additional criteria establishing the need for Tier III will likely be developed.

The implementation guidance leading to Tier III should be increasingly management oriented.

Direct Effects

The SSC reaffirms that multiple lines of evidence (MLOE) are required to do successful sediment assessments. A line of evidence is not tied to a specific technique/index. The Science Team should apply the MLOE approach for all habitats within the scope of the SQOs, even those for which a validated benthic index does not currently exist. The absence of a specific index does not invalidate the need for an MLOE approach. The less confidence there is in specific lines of evidence, the more lines of evidence are needed to ensure that you are assessing the sediment characteristics correctly.

The Delta sediment quality survey was thorough and has value for the SQO and other programs. It is recognized that the Delta represents a more episodic environment for contaminant issues as well as physical and nutrient stressors; thus, it may need a different Conceptual Model to design and conduct assessments of condition. For the Delta, flux of suspended contaminants through the system may be more important than bedded sediment concentrations, requiring consideration of alternative tools for assessment.

Benthic Index

Low levels of impact and contamination are generally problematic for benthic index development since the the gradients and endpoints are not as clear as those that have been developed previously in the euhaline/polyhaline environments. However, the SSC agrees that the science team should move forward with tidal-fresh BRI and AMBI index development. To that end, conducting a workshop where experts work together to identify stations representing consensus on various states of benthic community condition is a good next step in development of these indices. The contaminant gradient as currently defined is weak when related to traditional contaminants measured (e.g., ER-L, ER-M) and toxicity since the maximum ERM-Q was only 0.4 and only three of the sampled stations showed significant amphipod toxicity. Thus, benthic condition may be driven more by nutrient, physical conditions, and contaminants with undocumented biological thresholds. However, the plot of the toxic stations does fit within the general gradient between the few good and bad stations that could be defined by experts. As the Science Team moves forward to select stations for the next stage of expert elicitation (EE), they should consider current use contaminants (i.e., emerging contaminants) in addition to the best available empirical freshwater guidelines when selecting stations to insure a gradient of contamination as part of the factors driving benthic community condition.

The SSC recommends that the work on the Delta take priority for index development but we also recommend that an index be developed for the mesohaline environment when fiscal resources becomes available.

Toxicity Tests

The SSC recommends that the Science Team identify two groups of recommended toxicity tests, with salinity tolerances that correspond to mesohaline and oligohaline/freshwater habitats, and remove the emphasis of a limited salinity range in choosing bioassays for use in the program. Bioassays should be used within their operational range and tests should not be extended to their salinity extremes to avoid additional stress on the test organisms.

The SSC recommends that toxicity testing of a sediment sample include tests with two different taxa, and that one of these tests should also include a longer duration exposure (i.e. 28 d). It is recognized that there is an increased cost of longer duration tests, thus the Science Team could consider a tiered testing design where long-term tests are conducted at a subset of stations. Clear

guidance on the conditions for selection of stations for longer tests would need to be provided in the implementation guidance if this approach is selected.

It is clear that the number of toxicity tests in the freshwater environment is limited and it would be useful to develop new toxicity tests for both additional taxa and endpoints including sublethal endpoints (when funding becomes available). For example, the freshwater bivalve *Corbicula* is being discussed in the Pacific Northwest as a possible test organism for a new toxicity protocol.

Chemistry

The SSC suggests that the Science Team use current freshwater empirical guidelines and additionally toxic unit information from the literature for current use pesticides and other emerging contaminants for the freshwater portion of the Delta since there is clearly not sufficient Delta-specific information to develop an empirical guideline. For the mesohaline portion of the Delta, the SSC suggests that the previously developed California logistic regression chemistry index be used to as the empirical guideline since mesohaline species and samples were included in the development of this guideline.

It is likely that episodic events involving non-persistent current use pesticides will dominate the Delta environment and these conditions should be considered for sampling periods and potentially the use of alternative tools as funding becomes available.

The SSC was made aware that the State of Washington is developing freshwater sediment standards and recommends that these values should be evaluated, along with other freshwater sediment quality guidelines, for potential use as empirical guidelines in the tidal freshwater portion of the Delta.

For the future, there is utility in establishing a bioavailability line of evidence (i.e., passive sampler based measurements) in addition to the current lines of evidence to help describe the contribution of contaminants to sediment condition and to assist with future efforts to improve indirect effects tools.