RESPONSES TO SCIENTIFIC PEER REVIEW COMMENTS

Comments from three scientific peer reviewers on the Draft Basin Plan Amendment, staff report, and associated documents, to incorporate Draft Total Maximum Daily Loads for Selenium in Freshwater, Newport Bay Watershed, Orange County, California, were received on May 10, 2017. The peer reviewers who provided comments were:

Marjorie L. Brooks, Ph.D **[B]**
Associate Professor, Aquatic Ecology and Biogeochemistry
Department of Zoology, Southern Illinois University

Dirk Wallschläger, Ph.D **[W]**
Professor, School of the Environment
Director, Water Quality Center
Trent University, Ontario, Canada

Judson Harvey, Ph.D **[H]**
U.S. Geological Survey
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Reston, Virginia

Peer reviewers were asked to address the "Description of the Scientific Findings, Assumptions, and Conclusions" document, which is Attachment 2 to the peer review request package. That document is included in Attachment B1.1 of this response document for ease of reference.

The following table includes the comment number, which identifies the specific reviewer by the first initial of their last name, followed by the comment number. Some comments addressed more than one subject or required more than one response; those are identified by the addition of a lower case letter (e.g., a comment by Dr. Brooks that required a three-part response is identified as **B1a**, **B1b**, and **B1c**). In some cases, the comments included background information or information not directly pertinent to the review comment. In these instances, Regional Board staff condensed the comment to the portion requiring response. Copies of the peer reviewers' letters have been annotated with the corresponding comment numbers and are included in Attachment B1.2.

COMMENT NO.	COMMENT	RESPONSE
Dr. Marjorie L. Brooks, Southern Illinois University [B]		
B1a	To be scientifically defensible, future use of the biodynamic model needs to include quarterly rather than annual monitoring of whole-fish tissue and a minimum sample size of three species.	The climate in southern California is Mediterranean and essentially has only two seasons: a wet season, which is generally from October 1 to March 31, and a dry season, which usually occurs from April 1 through Sept 30. The dry season coincides with the reproduction of most fish and bird species that forage in the Newport Bay watershed and this is also the time of year when flows in the creeks are almost completely groundwater supported. As groundwater is the primary source of selenium to surface waters, the dry season also coincides with the highest selenium concentrations and lowest flows in the creeks. This is also the time of year when selenium cycling and bioaccumulation are highest. Rainfall tends to have an overall diluent effect on selenium concentrations in surface waters though there may be temporary increases in selenium inputs as a result of higher water levels in the perched aquifers that are the source of most of the selenium (selenium concentrations in rainfall runoff are very low). Fish tissue collected in early spring (May/June) and late summer/early fall (August/September) have shown little difference in selenium concentrations. Since these selenium TMDLs only apply during dry season conditions, there is no scientific reason for collecting fish tissue on a quarterly or even semi-annual basis in this watershed. Annual collection of fish tissue is the most practical and reasonable approach for the Newport Bay watershed given the limited fish habitat present in the freshwater creeks, wetlands and ponds and timing of fish reproduction during the dry season, when selenium concentrations and cycling are greatest. In addition, monitoring protocols for the watershed were established based on extensive habitat surveys and recommendations from known experts in selenium including Dr. Harry Ohlendorf, CH2M Hill and Dr. Joseph Skorupa, US Fish and Wildlife Service (USFWS). Centrarchids (primarily bluegill) are the fish species most sensitive to selenium and species of this family are those targeted for collection for assessing selenium bioaccumulation. In those areas where several different species of fish can be found (lower Peters Canyon Wash, lower San Diego Creek (Reach 1), and the IRWD wetlands), a minimum of three species of fish are collected. However, only Western mosquitofish have been found in the Santa Ana Delhi Channel

		subwatershed; only mosquito fish and a few blackhead minnows have been caught in the Big Canyon Wash subwatershed; and only mosquitofish and on one occasion, a couple of carp, have been collected from the UCI wetlands. No Centrarchids or other species of fish have been observed at these sites and often no fish or only a few fish are found in these three areas, making sample collection difficult. Therefore, at these locations it is not possible to collect three different species of fish nor are sufficient fish available for more frequent collection.
B1b	Bird egg tissue can only be collected annually. Whenever possible, sampling should include at least three bird species.	Aquatic-dependent birds are the most sensitive to selenium and the invertivorous food web the most at risk from selenium bioaccumulation in the Newport Bay watershed. In the freshwater areas, Black-necked Stilts and American Avocets are targeted for collection. However, given the paucity of bird nests, even in areas with good habitat such as the IRWD wetlands, bird eggs are collected from all nests found that contain two or more eggs and are not protected species. Species collected include Black-necked Stilts and American Avocets, plus American Coots, Black Skimmers, Forester's Terns, and Pied-billed Grebes. Forester's Tern and Black Skimmer eggs are collected from nesting islands located in Upper Newport Bay as these species have also been observed feeding in San Diego Creek and the IRWD wetlands. No nesting birds have been observed in the Santa Ana Delhi Channel Subwatershed and little suitable nesting habitat has been found. The only nesting birds found to date in the Big Canyon Wash subwatershed are two pairs of Pied-billed Grebes, which have consistently nested adjacent to the ponds on the Big Canyon Country Club Golf Course over the last 6 or 7 years. Therefore, the only location where eggs from three different bird species can be consistently found is the San Diego Creek subwatershed.
B1c	As the monitoring plan is now written, as few as one annual sample from one fish and one bird at five field sites is planned. The **assumption** that this plan is adequate is incorrect biologically and in terms of being scientifically defensible.	As discussed in the response to Comment No. B1a above, multiple fish species are only found in portions of the San Diego Creek subwatershed. The fish found in the UCI wetlands, the Santa Ana Delhi Channel subwatershed and the Big Canyon Wash subwatershed consist almost entirely of mosquitofish and it is often difficult to find sufficient fish for more than one composite sample. As discussed in the response to Comment No. B1b above, nesting birds have not been found in the Santa Ana Delhi Channel subwatershed and only Pied-billed Grebes have been found nesting in the Big Canyon Wash subwatershed. TMDL evaluation monitoring, as

		discussed in Section 8.5.3.1 in the draft staff report, identifies 2-3 assessment areas per subwatershed for a total of 8 locations (page 8-26) and acknowledges the fact that "…since not all [fish] species are expected to be available in any given year within each subwatershed area, the monitoring program must be flexible with regard to the species targeted" and the monitoring program should also consider "surrogate parameters" such as the collection of large macroinvertebrates, amphibians or reptiles, because "Field experience indicates that locations with limited habitat (e.g., Upper Peters Canyon Wash, Santa Ana-Delhi Channel, and Big Canyon Wash) may not reliably provide fish or bird eggs for collection" (page 8-27).
B2	The fundamental **assumption** that using the biodynamic model, which bases TMDL targets on past tissue concentrations in whole-fish tissue and bird egg tissue rather than total or dissolved Se water concentrations, is scientifically sound. The biodynamic model provides the highest probability of accurately assessing exposure and biological consequences because the biological availability of selenium (Se) depends on Se speciation that varies among watersheds. The **findings** that underlie the biodynamic model are sound and described in detail in the *Revised Newport Bay Biodynamic Model Runs Documentation* (Draft Staff Report Appendix O 2016) as well as peer reviewed scientific publications (Luoma and Rainbow 2005, Luoma and Presser 2009). Regulatory tissue values are based on the most current scientific knowledge available for the relationship between tissue concentrations and subsequent biological responses.	Comments noted. To clarify, the TMDL numeric tissue targets are not based on past tissue concentrations. The fish tissue target for the protection of fish of 8.1 µg Se/g dry weight (dw) is based on the US Environmental Protection Agency's (USEPA) 2014 Draft Criterion for selenium in whole body freshwater fish. The bird egg tissue target of 8 µg Se/g dw and the dietary fish tissue target of 5 µg Se/g dw for the protection of birds (which only applies if the bird egg tissue target is not being met even though the fish tissue target for the protection of fish of 8.1 µg Se/g dw is being met) were recommended by Dr. Joseph Skorupa of the USFWS, based on his extensive selenium expertise.
B3a	The implementation timeline for compliance in the proposed three-part, phased TMDL is reasonable in terms of logistical concerns and adequate time for changes in effluent inputs to be reflected in the biota within the watershed (Table 6.1) (Draft Basin Plan Amendment - New Chapter 6 2017). The structure of the TMDL Reconsideration step is vague. To be scientifically defensible, clean protocols are needed that determine when additional parameters or factors are required.	Comment noted. The TMDL reconsideration period will address new data collected since 2013 (the cutoff date for data used to develop the proposed Selenium TMDLs) including data from the Regional Monitoring Program (RMP) that is required by the proposed Selenium TMDLs. The RMP requires the following elements: TMDL Evaluation Monitoring data (water, sediment and fish and bird eggs if present) from the eight assessment areas; BMP effectiveness monitoring data, which will be used to determine whether and to what degree the BMPs implemented have resulted in successful selenium reductions without causing any adverse impacts to water quality; Offset and Trading Program Monitoring data, which also includes fish and bird egg tissue monitoring to ensure that the offset/trading program is not causing localized impacts; and

		Source Assessment Monitoring data. All of the monitoring data collected under the RMP and the results of any special studies will be used to refine and revise the TMDLs. The TMDL RMP will include triggers or benchmarks that will be used to determine when additional monitoring or investigations are needed. The RMP must be reviewed by USFWS and California Department of Fish and Wildlife (CDFW) staff and approved by the Executive Officer of the Regional Water Board.
B3b	As above, it is not scientifically defensible to assume that the tissue sampling frequency and tissue size are adequate to serve as the basis for future site-specific objectives (SSOs).	The SSOs will not be based on tissue sampling frequency or tissue size. They will be based on the TMDL numeric tissue targets or similar tissue concentrations that have been scientifically demonstrated to be protective of the most sensitive fish and bird species present in the Newport Bay watershed. Compliance with the SSOs (once approved by USEPA and thus in effect) and the TMDLs will be assessed based on the data that can be realistically collected from the different waterbodies in the watershed, as explained in response to comments B1a and B1b above.
B4a	I support the conclusions below if and only if sampling frequency of whole-fish tissue is increased to quarterly and sample sizes are mandated at a minimum of three species for fish and bird egg tissue.	For the reasons given in the responses to Comments No. B1a and B1b above, it is not possible under the current watershed conditions to collect three fish species or eggs from three bird species from every assessment location. Because these TMDLs apply only during dry weather, and the highest selenium concentrations and time of greatest ecological exposure for fish and birds is during their reproductive cycle, which occurs primarily during the dry season (April 1 – Sept 30), quarterly fish tissue monitoring is not reasonable or necessary for this watershed.
B4b	Also, the number of sites for tissue monitoring is not internally consistent. Appendix R lists five sites but Appendix T lists six (Draft Staff Report Appendix R 2016, Draft Staff Report Appendix T 2016).	Appendix R is the 2013 BMP Strategic Plan that was submitted by the dischargers in response to a Time Schedule Order issued by the Regional Board in 2009. The monitoring locations and assessment areas have been revised since then. Appendix T is the Economic Analysis for the TMDLs and was based on the RMP developed for the 2013 TSO BMP Strategic Plan. The 2017 Draft TMDLs include 8 assessment areas: 3 in the San Diego Creek and Big Canyon Wash Subwatersheds, and 2 in the Santa Ana-Delhi Channel subwatershed. The information on the assessment areas and minimum monitoring requirements can be found in Section 8.5.3 in the 2017 draft staff report or on pages 35-42 of the draft Basin Plan Amendment.
B5a	Although the whole-body fish concentration of 8.1 μg Se/g dw is suggested as protective of fish health, Appendix I states that the toxicity threshold for fish ranges from 4 to 6 μg Se/g dw	The toxicity threshold range for fish quoted in Appendix I of 4-6 μg Se/g dw are No Effects Concentrations (NECs). The USEPA draft criterion of 8.1 μg Se/g dw, which is the basis of

	(Draft Staff Report Appendix I 2016). This suggests that the fish tissue numeric target of 8.1 µg Se/g dw is a compromise. A brief statement about fish fecundity or other aspects that make this level acceptable would be helpful.	the TMDL primary fish tissue target, is a 10% effects concentration (EC10). While it is understood that there may still be some effects in sensitive fish species at this concentration, none of the fish in the freshwater bodies in the watershed are native nor are they federally- or state-listed species. Therefore, the numeric tissue target of 8.1 µg Se/g dw is considered to be sufficiently protective of the freshwater fish species in the Newport Bay watershed.
B5b	The assumption that monitoring whole-body Se concentration in fish rather than fish eggs is scientifically and logistically sound. The method will encourage compliance since gravid female fish are seldom collected in the Newport Bay watershed.	Comment noted.
B6	Based on various feeding studies and the references cited, the conclusion is sound that a fish tissue numeric target of 5.0 µg Se/g dw will meet the essential dietary needs of shorebirds will *(sic)* little likelihood of reproductive effects. The conclusion is based on findings that the biodynamic model takes local Kds into account to show that even endangered species are protected in the three watersheds under consideration (Draft Staff Report Appendix O 2016).	Comment noted.
B7	The assumptions underlying the proposed regulatory bird egg tissue concentration are scientifically sound for the following reasons: 1) background concentrations of <5 µg Se/g dw in bird eggs; 2) effect levels in black-necked stilt eggs range from 6-7 µg Se/g dw to 14 µg Se/g dw; 3) a range of 3-8 µg Se/g dw provides reasonable no effects concentrations; 4) EC10 values overlap with no effects concentrations in many datasets; and 5) expert opinion judges 8 µg Se/g dw egg concentrations as protective of bird species in Newport Bay watershed, including federally listed least tern and Ridgway's rail. Points 1 and 2 illustrate the knife-edge between Se essentiality and toxicity and identify that boundary to the best of our knowledge.	Comment noted.
B8	The assumption that it is sound conservation strategy to base the attainment of the bird egg target as the ultimate protective target for each watershed's TMDL is based on scientific findings and precautionary principles. As noted, in some instances managers must apply a more stringent fish tissue target if the bird egg tissue level of 8 µg Se/g dw is not met. Moreover as stated in the proposed Draft Basin Plan B8 Amendment (2017), the more stringent TMDL will also better protect fish.	Comment noted. To clarify: each subwatershed must meet both the numeric target for the protection of birds of 8.0 µg Se/g dw and the numeric target for the protection of fish of 8.1 µg Se/g dw.
B9a	The initial sentence in Conclusion 5 is based on	Comment noted.

	scientifically sound assumptions. Although water column concentrations of Se differ for lotic and lentic waterbodies and cannot be tied to selenium effects, until tissue-based criteria are adapted *(sic)*, the 5 µg Se/L water concentration is a reasonably protective numeric target.	
B9	I suggest that the timeline in the Draft Basin Plan Amendment (2017: Table 6.1, Se. 2) be placed at the beginning of the Draft Basin Plan (2017) Some of the narrative is unclear and seemingly contradicts itself mainly because a timeline for implementation for the shift from the CTR chronic criterion to the Se TMDLs is buried in narratives. For example, the text states that, "Until tissue-based objectives are approved, the CTR chronic criterion [of 5 µg Se/L] for selenium in freshwater must serve as the final numeric target for Se…for the Newport Bay watershed." In the second paragraph, the narrative states that "…at this time these selenium TMDLs do not incorporate USEPA's recommended water column elements as a TMDL numeric target. Instead the TMDLs use site-specific data and modeling to translate tissue targets into appropriate surrogate water column concentrations…"	Comment noted. Regional Board staff may consider including a copy of the timeline in the front of the document; however, the positioning of the table follows the format of the other TMDLs that have already been incorporated into the region's Basin Plan. As a matter of clarification, the issues identified are separate. In the 2000 California Toxics Rule (CTR). USEPA established enforceable selenium criteria for California. In 2016, USEPA published recommended nationwide criteria for selenium. These recommended criteria do not supplant the CTR criteria and are not enforceable. Until SSOs for selenium are approved by USEPA or USEPA revises the CTR selenium criteria (which is in progress), the final allocations for the TMDLs must be based on the currently applicable CTR criterion for selenium in freshwater (5 ug/L). The CTR does not include tissue-based criteria. The USEPA 2016 final selenium criterion replaces the National Toxics Rule selenium criteria for freshwater, but it is not directly applicable to California.
B10	The assumption of linkages from sediments into the food webs captured by the biodynamic selenium model is scientifically sound with a very high probability that accurate Se water concentrations can be estimated from tissue concentrations and vice versa because: 1) It was based on all available data for the three subwatersheds under consideration. (i.e., data on water, sediment, algae, suspended particulates, fish, and bird egg tissue); 2) Thus, we can assume that site-specific, local variance is included in species specific trophic transfer factors; and 3) The duration of sampling from 1999-2007 followed by targeted sampling from 2008 to 2014 is adequately long to have accurately captured the lag time between Se concentrations in water and tissue concentrations in fishes and birds via food webs.	Comment noted.
B11	I support the assumption that biodynamic model development is scientifically sound. During model development, managers represented site-specific conditions based on a variety of findings: 1) Using a range of watershed specific partitioning coefficients and trophic transfer factors; 2). Basing the model on either direct measures or metadata collected for Newport Bay	Comment noted.

	and the San Diego Creek watershed from 1999-2007 with targeted data from 2008 to 2014 collected within the three subwatersheds; and 3) altering model parameters after verifying that predicted values were comparable to observed tissue concentrations.	
B12a	I agree with the assumptions, findings, and conclusions in this section. Clearly, the ecology of the animals was understood and considered in model development—a factor that is often ignored. For example in applying the biodynamics model, the validity exercise indicated that fish tissue was a more reliable indicator of environmental exposure than bird tissue because of bird mobility and different feeding preferences among birds. Also, modelers recognized that because of sediment-detrital feeding by mosquito fish the model design for Big Canyon Wash should directly link fish tissue concentration using the Kd rather than the invertebrate trophic transfer factor. The discussion on water column concentrations demonstrates situations in which water concentrations are not predictive. For example, in the UCI wetlands Se levels in fish are below the tissue target. Whereas, in the Santa Ana-Delhi Channel, fish tissue Se over predicted the water column Se. Regardless of nuances in fit, or the desire to use the model to predict water column concentrations from tissue concentrations, Se levels in water must be made consistent with the conservative target of 5 µg Se/g dw in fish tissue, if the bird tissue target is not met.	Comment noted.
B12b	One concern is that language specifying the timing of monitoring is not explicit in Section 8.5.3, Assessment Area Monitoring. Basing regulation on Se tissue levels in eggs is biologically irrelevant (i.e., ineffective) if monitoring does not take place during the breeding season. Some sections state that monitoring must take place during the dry season (1 April to 30 September), other sections do not. I recommend that wording throughout for the Resolution R8-2017-0014. For example, in Section 8.5.3.1 consider changing “should” to “must” for the TMDL Evaluation Monitoring *“Bird egg collection **should** be conducted during the nesting season (generally March through August). Fish collection **should** be at the same time of year to capture the potential effects of fish as bird dietary items and for effects to spring fish reproduction (common timing for most of the target species)”*.	Comment noted and changes made accordingly in the draft staff report and Basin Plan Amendment (“should” changed to “must”).
B13a	While the guidelines for the Tiers of sampling and frequency of sample collection are included in the Appendix A of Appendix R, (See Text	The reviewer is referring to Appendix A of the 2013 BMP Strategic Plan, which includes a Regional Monitoring Program (RMP). This

	above and Table 2. *Summary of Monitoring Constituents*), those details are needed in the body of the Draft Staff Report. I am sensitive to the desire of the Regional Monitoring Program to be flexible, particularly in areas such as the Santa Ana-Delhi where no birds are found nesting. The text needs a table describing sampling even though it includes guidelines stating that the WLAs are tied to sampling requirements for NPDES permits, and that permits differ among locations (USEPA 2010), and that quality assurance / quality control must meet the California's Surface Water Ambient Monitoring Program (SWAMP). To avoid confusion among regulators searching for the information, I recommend including a table of QA/QC requirements and the specific benchmarks that determine whether sampling is sufficient to evaluate targets. Obviously, collection of bird eggs can only occur during the dry weather period and may be impossible if only endangered species occur, but fish can be sampled year round. The specific passages that concern me begin on page 8-25, at Section 8.5.3.1 (Draft Staff Report 2017): The frequency of sample collection must be sufficient to evaluate the WLAs and LAs (including the seasonal evaluation) and must be specified in the Regional Monitoring Program. The frequency of sample collection must be sufficient to evaluate the tissue-based numeric targets, provided sufficient samples can be collected during target sample collection times, and must be specified in the Regional Monitoring Program. At a minimum, an attempt to collect samples must be conducted annually in each assessment area. Current wording indicates that compliance could be based on only one sample per year to be increased to two if targets are not met.	version of the BMP Strategic Plan pre-dates the 2017 draft Se TMDLs Basin Plan Amendment and is out of date. It was included as an Appendix because the BMP Strategic Plan, which was developed in response to a Time Schedule Order, contains the currently applicable RMP. The TMDLs include more assessment monitoring locations than the 2013 BMP RMP (see section 8.5.3 of the draft staff report and pages 35-42 of the draft Basin Plan Amendment). The TMDL RMP must be flexible because as discussed in the response to Comments No. B1a and B1b, sufficient fish and bird eggs are not available at all assessment locations targeted in each of the three subwatersheds. Of the three subwatersheds, only the San Diego Creek subwatershed contains sufficient habitat to support the collection of multiple fish and bird species and the types and numbers of these species can vary significantly from year-to-year depending on multiple variants (e.g., precipitation, hydrology, climate fluctuation, predation, and other factors). Basin Plan Amendments require a substantial amount of staff time and resources to develop and adopt. BPAs must be approved by the Board members of the Regional Board, the State Water Resources Control Board, the California Office of Administrative Law, and USEPA. Once objectives or numeric values (e.g. QA/QC requirements or benchmarks) are incorporated into the Basin Plan, it becomes very difficult to change them. Analytical and sampling methods often change rapidly as a result of advances in science. In addition, as discussed in the responses to comments B1a and B1b, not all targeted samples can be found consistently at all locations at the number and frequency desired. Flexibility is needed in order to adapt to changes in hydrology, climate and other factors that are not always controllable. Therefore, Regional Board staff do not think that it is practical or reasonable to include specific QA/QC requirements or benchmarks that may change as the science of selenium or the environment in the watershed changes. Regarding the specific passages quoted in Section 8.5.3.1 of the 2017 draft staff report, this flexibility is necessary because of the above identified issues and the realities of the existing habitat and availability of the targeted samples at the assessment locations in each watershed as discussed in the responses to comments B1a and B1b.
B13b	As suggested, **quarterly** sample collection of fish tissue should be separated into the fall and winter	See response to Comment No. B1a.

	months (1 October to 31 March) versus the dry weather period (1 April to 30 September) because the influence of groundwater during the dry period increases Se concentrations in water. The dry period also coincides with breeding and development of offspring.	
B14	The assumption that monitoring is adequate is met for all compartments **except** tissue analyses. Guidelines for TMDL Evaluation Monitoring and BMP Effectiveness Monitoring are described (e.g. must comply with NPDES permits). As stated above, I recommend including a table describing the timing and criteria for determining whether sampling is adequate. I strongly disagree that collecting a single annual sample is an acceptable minimum for determining that TMDL criteria are met.	See response to Comment No. B13a.
B15a	If and only if future monitoring of whole-fish tissue is performed quarterly and whenever possible, bird egg tissue annually with a minimum of three fish species, then I agree with Conclusion 11, which is based on the assumption that target TMDLs within each watershed will be selenium SSOs that differ depending on whether numeric targets for the recommended fish tissue and bird egg tissue concentrations (section 4.0 in the Draft Staff Report (2017).	See responses to Comments No. B1a, B1b, and B1c. Regarding SSOs, the SSOs will be based on the proposed numeric tissue targets or similar tissue concentrations but adoption and approval of SSOs for selenium will be a separate regulatory action from adoption of the selenium TMDLs.
B15b	The numeric values for fish and bird egg tissue "are currently under development" and the TMDLs discussed herein "have been purposefully structured as Phased TMDLs to account for the regulatory flux of selenium standards at the federal, state, and local levels throughout the drafting, establishment, and implementation of these TMDLs" (Section 4.1 in Draft Staff Report (2017). In other words, depending on tissue Se concentrations during monitoring, adaptive management practices will include TMDL Reconsideration of the Kds, and TTFs in each watershed, which could alter compliance targets for water TMDLs.	Comment noted.
B15c	I strongly recommend that the thresholds for assessment criteria (e.g. lack of reduction in Se input to the watershed) and acceptable timing for compliance in the essential data that is the basis for the Se TMDL and for the SSOs (e.g. future tissue concentrations) be stated explicitly, preferably in a table format so it is easy to find.	This information (recommended table) is something that would fit better into the TMDL Regional Monitoring Program (RMP), which has not yet been developed. The TMDL requires that the RMP be submitted to the Regional Board's Executive Officer within 3 months from the effective date of the TMDLs. The TMDLs also require review and input into the RMP by USFWS and CDFW staff so consensus can be reached on how to assess selenium reductions in water, sediment and tissue concentrations and determine the effectiveness of the actions implemented in response to the selenium TMDLs. Because selenium reduction projects can impact selenium speciation and cycling, an adaptive and

		flexible approach is required to determine appropriate monitoring frequencies and thresholds for assessing attainment of the TMDLs. It is therefore not practical to include this information in the TMDL Basin Plan Amendment (BPA) since any changes to those thresholds would then require another BPA to revise that information. (See response B13a regarding the time needed to adopt BPAs.)
B15d	The fundamental idea that SSOs be established according to site-specific Kds and TTFs is based on sound scientific reasoning (Stewart et al. 2010, Draft Staff Report Appendix O 2016). My concerns are that these documents do not always explicitly state how acceptance criteria are ranked among the quantitative numeric targets. For example, the USEPA 2014 Draft Criterion stated in footnote 2 that fish tissue, "overrides any water column element when both fish tissue and water concentrations are measured" (Table 4.1 in the Draft Staff Report (2017). The same protocol is inferred on page 4-6, Section 4.1.1 in the Draft Staff Report, however, as discussed above the document states that the TMDLs are in a "regulatory flux" during the Phased establishment of this TMDL. Clear criteria for changing the target TMDLs are needed.	Comment noted. The TMDLs explicitly state (see footnote 2 to the table at the top of page 6 of the draft Basin Plan Amendment) that: "The applicable fish tissue numeric target depends upon the attainment of the bird egg target. a. <u>Where the bird egg target is attained</u>, the fish tissue target of 8.1 µg Se/g dw applies. This target serves as a protective target for fish as a separate endpoint. b. <u>Where the bird egg tissue target is not attained</u>, the fish tissue target of 5 µg Se/g dw, or a site-specific fish tissue concentration at which the bird egg target is met, applies. This target serves as a protective dietary target for aquatic-dependent shorebirds and only applies if the bird egg tissue target is not being attained at a fish tissue concentration of 8.1 µg Se/g dw." The TMDLs are not in a regulatory flux; revision of selenium criteria for California are in flux. USEPA Region IX staff are in the process of revising the CTR selenium criteria and Regional Board staff are in the process of developing SSOs for selenium in the Newport Bay watershed, which would be incorporated into the CTR once approved by USEPA. Once the CTR has been revised, or SSOs for the watershed have been approved and promulgated by USEPA, then the TMDL numeric targets may be revised. This revision is expected to take place during the TMDL reconsideration period and will require a Basin Plan Amendment.
B15e	If future bird egg concentrations exceed the proposed target of 8 µg/L, it is clear that tissue targets for fish will be set at 5 µg/L. What is not clear is the timeline by which fish tissue must meet this target, or what actions occur if the compliance timeline is not met. Finally, if the biodynamic model is used to recalculate target water concentrations, the timeline for establishing and enforcing new SSOs is unclear.	First, the SSOs will be a separate regulatory action from the TMDLs and SSOs for selenium for this watershed have not yet been developed. If and when SSOs are approved and become effective, the TMDLs will be revised accordingly. Second, the fish and bird egg tissue concentrations must be met by the attainment schedule established in the TMDLs in Section 8 of the draft staff report (Table 6.1 Se.2 in the draft proposed Basin Plan Amendment). These TMDLs are phased such that Phase I has been

		designed provide time to develop a Regional Monitoring Program, determine how effective the BMPs implemented or currently under implementation are at reducing selenium concentrations in surface waters, develop selenium SSOs, go through the approval process (Regional Board, State Board, Office of Administrative Law, and USEPA – usually a two-year or longer process) and have USEPA de-promulgate the CTR and re-promulgate it with the Newport Bay watershed SSOs added. Six (6) years from the effective date of the TMDLs has been allowed for the completion of Phase I. That is followed by a two (2) year reconsideration period that allows for the revision of the TMDLs as needed as well as incorporation of approved SSOs and/or revised CTR criteria (if SSOs are not developed and approved). Phase II allows a maximum of 30 years for final attainment of the TMDLs since the majority of the selenium is non-point source and it is anticipated that it will be difficult, costly, and time consuming to determine how best to reduce this source. The schedules for both phases of the TMDLs also includes the caveat that attainment of the TMDLs must be accomplished by the required date *"…as soon as possible but no later than…"*
B15f	The future monitoring protocol for tissues must be improved for the SSOs. Based on what I have been able to glean, both fish and bird egg tissues will be collected only once per year. First, the assumption that annual monitoring of Se tissue concentrations in fish and bird eggs is adequate is not biologically sound or scientifically-defensible policy. Moreover, unlike the USEPA 2014 Draft Criterion (Table 4.1 in the Draft Staff Report (2017), which states that fish whole body concentrations can never be exceeded, the proposed TMDL is based on the geometric mean of samples. The geometric mean of fish is not adequately protective, particularly if tissues are monitored only yearly using the tiny sample sizes discussed below. In Section 4.5.2 on page 25 of Appendix A within Appendix R, contains a description of sample sizes for fish and bird egg tissues. *"<u>4.5.2. Numbers of Tissue Samples</u>. The targeted numbers of samples for fish tissue analysis should be up to three samples of composited, whole-body fish, consisting of five similar-sized, same-species fish per sample for up to three fish species (up to nine composited fish samples per site). In addition, fish eggs and ovaries from gravid females may be analyzed if USEPA adopts selenium water*	As discussed in the response to Comment No. B13a, the reviewer is referring to the Regional Monitoring Program (Appendix A) of the 2013 BMP Strategic Plan (Appendix R), which was developed in response to Time Schedule Orders (TSOs) that are still in effect. The monitoring requirements developed in response to the TSOs are not the same as the monitoring requirements included in the 2017 Se TMDLs BPA, which will supersede the requirements of the TSOs. To clarify, SSOs are not based on the fish tissue samples. The SSOs will be based on the selenium TMDL numeric tissue targets for fish and birds, or similar targets that are based on selenium concentrations that are expected to be protective of fish and birds. The tissue samples collected will be compared to these values to determine whether selenium reductions in water are having a beneficial effect and similar reduction on selenium concentrations in fish and bird egg tissue. On page 38 of the draft BPA the following is stated: "The frequency of sample collection must be sufficient to evaluate the tissue-based numeric targets, provided sufficient samples can be collected during target sample collection times, and must be specified in the Regional

	quality criteria that are based on selenium concentrations in fish eggs and ovaries. *For bird eggs, up to eight bird eggs per site for up to three species should be analyzed. Only one egg can be taken from each nest. In the case where only one egg is in the nest, no sample will be taken.* *In general, for both bird eggs and fish, the total number of tissue samples per year is expected to be less than the theoretical maximum number of samples because many of the sites are limited in biota abundance, diversity, and/or accessibility."* Thus, the SSOs for the three sub-watersheds could be based on as few as one annual sampling of one analytical sample ("up to 3 samples of composited, whole-body fish") possibly from only one fish species ("up to three fish species") could be collected annually. Similarly for bird eggs, as few as one egg from one bird species ("up to eight bird eggs per site for up to three species"). Five sample sites are proposed for Tier II, III, and IV sampling (Tier IV is tissue and algal sampling) but subject to change as needed.	Monitoring Program.[1] <u>At a minimum, an attempt to collect samples must be conducted annually in each assessment area, unless and until the Executive Officer determines that sufficient tissue data has been obtained to adequately characterize conditions and a lower sample collection frequency is warranted.</u> Bird egg collection should be conducted during the nesting season (generally March through August). Fish collection should be at the same time of year to capture the potential effects of fish as bird dietary items and for effects to fish reproduction (common timing for most of the target species)." [1] It is expected that prior to Executive Officer approval, input and recommendations from the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife will be solicited concerning the proposed monitoring, particularly biological monitoring conducted as part of Assessment Area monitoring..." As stated in the BPA, and as discussed in detail in responses to Comments No. B1a-c, there are areas within the watershed where only one species of fish or birds are present that can be sampled, or in some cases, where no fish or nesting birds are found. Even in those areas where multiple fish and bird species are found (e.g., San Diego Creek subwatershed), it is reasonable to collect those samples when fish and birds are gestating, which for most species falls between March and August, coincident with the dry season, because Se effects are tied to fish and bird reproduction. (Note: multiple attempts are made during the dry season to collect sufficient bird egg samples that meet the requirements for Se analysis and examination for deformities (i.e., eggs with embryos greater than Day 13 of development are considered to be "assessable" for abnormalities because at this stage of development and later, abnormalities can be observed by gross examination) and to collect fish if sufficient fish were not collected during the first sampling attempt.) Multiple samples collected during the dry season (late spring/early summer and late/summer early fall) have not shown a significant difference in selenium concentrations. Also, as stated in the footnotes above, both state and federal resource agencies will be asked for input into the development of the TMDL RMP. In addition, USEPA's 2016 Final Criterion for Selenium in Freshwater does not require that fish tissue concentrations "can never be exceeded". Numerous comments received during review of the 2014 draft criterion stated that this approach was not reasonable or practicable, but it was also contrary to the guidance provided by the USEPA

		in their *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*[1] (1985 Guidance Document) and the *Technical Support Document for Water Quality-based Toxics Control*[2] (1991 TSD). In the 1991 TSD, USEPA explicitly states (emphasis added): *"To predict or ascertain the attainment of criteria it is necessary to specify the allowable frequency for exceeding the criteria. This is because* ***it is statistically impossible to project that criteria will never be exceeded****. As ecological communities are naturally subjected to a series of stresses, the allowable frequency of pollutant stress may be set at a value that does not significantly increase the frequency or severity of all stress combined."* The State's *Water Quality Control Policy for Developing California's Clean Water Action Section 303(d) List*[3] (California Listing Policy), which was adopted and approved by USEPA in 2004, provides for an exceedance frequency that is based on a binomial distribution if the number of measured exceedances supports rejection of the null hypothesis as described in Appendix D of this response document. This approach acknowledges and quantifies what is considered as an acceptable or unacceptable exceedance proportion for any given toxic pollutant, including bioaccumulative contaminants such as selenium. The listing policy requirements will have to be incorporated into the TMDL RMP.
B15g	Looking at Appendix T, I see that out of many millions of dollars spent, the annual analyses for fish and bird egg tissue—the linchpin upon which the TMDL rests for the SSOs—is ~$30,000 annually excluding labor. For decisions to be scientifically defensible, increase this component of the budget to cover costs of monitoring fish tissue quarterly and bird egg tissue annually.	As discussed in responses to Comments No. B1a-c, it is not reasonable, practical, or realistic to require quarterly fish tissue monitoring in the Newport Bay watershed. Monitoring needs and costs will be reviewed and assessed during development of the TMDL RMP. In addition, monitoring locations, media, and frequency can be reviewed and revised as TMDL implementation proceeds and during the TMDL reconsideration period.
B15h	Basing draft criteria on the USEPA's criteria is an excellent approach (see p 4-5 in (Draft Staff Report 2017). The biodynamic model protects non-piscivorous birds because invertebrates	Comment noted. To clarify: The fish tissue numeric target for the protection of fish is 8.1 µg Se/g dw, not 8 µg Se/g dw. The bird egg tissue numeric target is 8 µg Se/g dw.

[1] U.S. EPA. 1985. Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses. Office of Research and Development. PB85-227049

[2] U.S. EPA. 1991. Technical Support Document for Water Quality-based Toxics Control. Office of Science and Technology, Office of Water. U.S. EPA-505-2-90-001.

[3] State Water Resources Control Board. 2004. Water Quality Control Policy

	contain less Se than fish in the same system (i.e. one lower TTF) (Draft Basin Plan Amendment - New Chapter 6 2017). Similarly, any additional tissue accumulation of piscivorous fish is implicitly considered by the fish tissue numeric target of 8 µg Se/g dw.	
B15i	More description for establishing SSOs is needed where invertebrates only are sampled. Invertebrates may not be valid surrogates because "contaminated sites have found effects on fish and birds in the absence of changes in invertebrate assemblages" inferring greater tolerance for Se (Draft Staff Report Appendix C 2016).	SSOs will not be established for invertebrates, but will be based on the fish and bird egg tissue targets or similar concentrations that are incorporated into the selenium TMDLs. These numeric tissue targets/SSOs are expected to be protective of the beneficial uses in the watershed that are most sensitive to selenium (fish and birds). Macroinvertebrates, amphibians or reptiles may be used as surrogates for helping to assess attainment of the TMDLs if sufficient fish tissue or bird eggs are not found at some monitoring locations in the watershed for comparison to the TMDL numeric tissue targets. Surrogate organisms would have to be correlated with the targeted organisms (Centrarchid fish and shorebirds) using scientifically sound methods and analyses. Any special study proposed to investigate the validity of using surrogate organisms for a numeric tissue target would require review and approval by the Regional Board's Executive Officer and consultation with federal and state resource agencies.
B15j	I applaud the inclusion of the Draft Basin Plan Amendment as a new Chapter 6, primarily because of its excellent description of the biodynamic model with a listing of Kds and Trophic Transfer Functions (TTFs) for the proposed TMDL (Draft Basin Plan Amendment - New Chapter 6 2017). The timing for TMDL implementation and compliance is clear and reasonable (Table 6.1. Se.2). However, what are the protocols for enforcing compliance if TMDLs exceed the SSOs (see p. 25 in the Draft Basin Plan Amendment)?	Site-specific objectives for selenium have not yet been developed or approved by USEPA; Regional Board staff are working on developing SSOs based on the numeric tissue targets in the TMDLs. The TMDLs will not implement the SSOs until the SSOs are approved and promulgated by USEPA. TMDLs are not self-implementing; they are plans to restore water quality standards. TMDL wasteload allocations (WLAs) are implemented through NPDES permits or waste discharge requirements (WDRs) (e.g., stormwater permit, groundwater dewatering and cleanup permits); non-point source allocations (LAs) for Se may be implemented through WDRs or conditional waivers of WDRs. Other TMDL requirements, such as those for monitoring, are typically implemented through permit requirements. The failure to implement permit requirements, including limits based on TMDL allocations, are enforceable by the Regional Board. The Board's enforcement authorities are established in the California Water Code.
B16	The assumption that relying on the biodynamic model for establishing Se TMDL is scientifically sound for the site specific constraints of the Newport Bay watershed because: 1) water Se	Comment noted.

	concentrations do not correlate will with ambient tissue concentrations in fish and bird eggs, 2) fish tissue in San Diego Creek over predicted bird egg tissue, 3) In Santa Ana-Delhi, fish tissue over-predicted water column Se concentrations, and 4) In Big Canyon Wash, bird egg tissues all exceeded 5 µg/g dw. Thus, its WLA and LA levels were established at 1 µg/L.	
B17a	One additional benefit of quarterly monitoring of whole fish tissue is capturing differences in Se bioavailability due to interannual variability in climate.	As stated in responses to Comments No. B1a-c and elsewhere in these responses, there are only essentially two seasons in the Newport Bay watershed, dry and wet, and the timing of greatest exposure for fish and birds to selenium is during reproduction, which coincides with dry season conditions from March – August (though dry season conditions can occur any time during the year, fish and bird reproduction are limited to a 6-month window that coincides with late spring through late summer/early fall). Selenium concentrations during wet season conditions are generally diluted by lower Se stormwater runoff. In addition, only one subwatershed – and not all locations within that subwatershed – contains sufficient fish or multiple species of fish that could be sampled more frequently than once a year (San Diego Creek subwatershed).
B17b	What is the status of monitoring sites? The narrative indicates that monitoring sites were chosen because they constitute suitable habitat for aquatic organisms and for aquatic-dependent birds, and yet, no birds were nesting in the Santa Ana-Delhi watershed. This brings up two issues. a. The area is highly urbanized and thus, may never provide suitable habitat. In the short term, for the purposes of this TMDL for Se, it makes sense that when bird egg tissue is not available, tissues from surrogate parameters (e.g., macroinvertebrates, reptiles, amphibians) are used. Wise use of data might be to evaluate the extent to which surrogate tissue data might correlate with fish tissue Se in the Santa Ana-Delhi Channel as well as with Se in fish and bird egg tissue collected at the other two watersheds annually and at the end of the 8-year period. b. The second issue is whether sampling locations are state or federally protected. If not, then future urban sprawl might engulf all three watersheds, making it impossible to collect even surrogate tissues for assessment.	The monitoring locations were selected because of suitable habitat for aquatic organisms and/or aquatic dependent shorebirds <u>and</u> their selenium concentrations. While the Santa Ana Delhi Channel has limited habitat for fish or nesting birds, shorebirds have been observed foraging in the channel and its tributaries. Therefore, these birds may be exposed to selenium concentrations from the food items they consume in the channel. The monitoring locations are not expected to change significantly as a result of urban sprawl, as the watershed is almost completely built out. Regarding surrogate tissue where sufficient fish or bird egg tissue samples are not available: Special studies will need to be conducted to determine how well the selected surrogate organism correlates with the targeted organism. One study has already been conducted to assess how well Se concentrations in Western Mosquitofish translate to selenium concentrations in bluegill. Mosquitofish are live bearers and pollution tolerant, making them less sensitive to selenium effects than bluegill and other Centrarchids, but mosquitofish can be found in many areas of the watershed that cannot support Centrarchid populations (e.g., Santa Ana Delhi Channel and Big Canyon Wash subwatersheds). Additional translator studies of this type will likely be necessary before an appropriate

		surrogate organism can be used when fish or shorebird eggs are not consistently found at a targeted monitoring location.
Dr. Dirk Wallschläger, Trent University [W]		
W1	I would like to point out that this [selenium TMDLs] is a very complex problem, and that, as always in such situations, one concludes that more could/should have been done, provided that more time and resources had been available. Notwithstanding my following points of criticism, I think that the SWRCB staff and their collaborators have done a respectable job of producing a scientifically-defensible report, which provides valuable guidance for managing Se in this watershed. While there are many things that were done well/right in my opinion, I will largely ignore those in the interest of time/space, and focus mostly on things that could be improved, given the availability of time and resources.	Comment noted.
W2a	Based on the provided information, the Se bioaccumulation model developed by Presser & Luoma (Appendix N) uses only total Se concentrations for calculating Kd values. The authors point out in the introduction that Se speciation in the water plays a crucial role in determining the magnitude of Kd, yet aqueous Se speciation is not explicitly incorporated into the bioaccumulation model. This approach has been used in subsequent work by Dr. Luoma, and is probably superior in predicting Se tissue concentrations. Provided that reliable Se speciation data are used (see my comments below), and provided that time and financial resources do not prevent any further refinement of the modelling exercise in this project, I would recommend expanding the model to include aqueous Se speciation information, and repeating the linkage analysis.	We agree that using Se speciation and a K_d for each form of selenium is the ideal way to model any system. However, this requires detailed speciation data, which are often not available. In this case, speciation data would be required for every selenium sample because of the variability in time and space as inferred from the variable K_ds. In addition, the model does not <u>require</u> speciation data because the K_ds themselves reflect speciation. Different K_ds were employed in different locations in the modeling with speciation inferred. The model was also validated by comparing predictions to observed water column and fish tissue concentrations in the different locations. The strong fit of prediction and observation suggests the uncertainties from not having detailed speciation data were not sufficiently large to invalidate the modeling.
W2b	I understand that aqueous Se speciation was indirectly taken into consideration by assuming certain Kd values that may be reflective of different Se speciation scenarios in the studied waters. However, I have some concerns about the quality of some of the Se speciation data reported in Appendix F, and consequently their usefulness for estimating Kd values. Generally speaking, Se speciation results should only be used if they were generated by HPLC-ICP-MS methods. The HG-based operational Se speciation approaches (based on Cutter's work) are prone to interferences that may lead to biased results for Se(VI) and "organic" Se, so those results (Meixner et al., 2004; Hibbs et al., 2008) should not be used in the modelling process.	Se speciation data were not used directly in the modeling; the data were only used to support some of the modeling concepts. The reviewer is correct that more recent advances in speciation analyses are available and preferable over older methods; however, as noted by the reviewer, the K_ds were derived from site-specific field data and are reflective of the selenium species found at the different locations modeled.

W2c	Furthermore, it is unclear from the provided description if the OCPW data were all generated by Weck (which is only explicitly mentioned in the legend of Table F.5), and whether Weck used HPLC or not, since US EPA method 200.8 is only for total/dissolved trace elements, so I also ignored those data for my considerations.	Water column samples submitted to Weck by OCPW for selenium speciation analysis were sent to their subcontractor Brooks Applied Labs. Selenate, selenite and selenocyanate were analyzed using ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS).
W2d	Also, the developed Se bioaccumulation model was only (out of the three water bodies discussed here) explicitly applied to San Diego Creek (SDC) in appendix K. I have assumed (since I didn't find any explicit evidence in the report) that it was correspondingly applied to model Se bioaccumulation in the Santa Ana-Delhi Channel (SADC) and in Big Canyon Wash (BCW).	Regional Board staff believe that the reviewer is either referring to Appendix N, Modeling of Selenium for the San Diego Creek Watershed and Newport Bay, California (Prepared by Presser and Luoma; 2009) or the conceptual model by CH2M Hill that is included in the Linkage Analysis (Section 6 of the draft staff report). Appendix K is Regional Board staffs' assessment of Se criteria for freshwater fish. The model developed for the SDC subwatershed was determined to be applicable to both the SADC and BCW subwatersheds by USGS and CH2M Hill staff, with concurrence from Regional Board staff and USFWS experts, as all three subwatersheds have similar foodwebs with the invertivorous foodweb having been identified as the most sensitive to selenium.
W2e	For the SADC, only 3 Se speciation data points exist. After eliminating the Meixner et al. (2004) data point for the reasons discussed above, only 2 data points remain. Obviously, no sensible assessment of a "representative" Se speciation pattern can be made from this, and I strongly recommend generating more Se speciation data points in the future, using the appropriate HPLC ICP- MS methods, to allow a refinement of the Kd values used for this system.	The Santa Ana-Delhi Channel is a highly modified channel that contains limited habitat but that does provide some foraging for birds (e.g., some mosquitofish, macroinvertebrates). Regional Board staff agree that more speciation data for this subwatershed is warranted. However, because this watershed is primarily lotic in nature, there are few ponded areas, and selenium concentrations in groundwater are dominated by selenate, bioaccumulation potential in this subwatershed is likely limited. Selenium concentrations in two Western mosquitofish whole body tissue composites collected in 2014 appear to confirm this: selenium concentrations measured in these two composite samples were 9.5 and 8.0 ug Se/g dw. These concentrations are much lower than the median concentrations measured in Western mosquitofish in lower SDC (16 ug Se/g dw) and in the BCW subwatershed (57 ug Se/g dw).
W2f	Using the average Kd values presented by Presser & Luoma (Appendix N, p. 1389: 317 for Se(VI), 1,760 for Se(IV) and 24,249 for SeMet), if one takes the average of the 2 results presented for organic Se in Table F.11. (p. 1043), a low fraction of organic Se of 0.36% is obtained, which results in a Kd of **421**, compared to Kd = 361 when ignoring organic Se altogether. For clarification, this value represents discrete organic Se species determined by HPLC-ICP-MS, and while it is not reported which particular	The reviewer is referring to the modeling and data that Presser & Luoma completed in 2009 for the Newport Bay watershed. That report utilized data collected from 2002-2007. The K_ds calculated and selenium data utilized (selenium speciation, algae, sediment, suspended particulates, where available) have since been updated using more recent information collected from 2008-2014 (see Dr. Samuel Luoma's report, Appendix O to the draft staff report). The assumption that all the "missing" selenium

	organic Se species were found in these samples, even in the worst case (= all selenomethionine with Kd = 24,249), the Kd values assumed in the SDC modelling exercise (200 or 400) appear appropriate for SADC. On the other hand, if one assumes that all of the Se in a water sample that is neither Se(IV) nor Se(VI) is organic Se (of unknown chemical identity), then one obtains an organic Se fraction of 7.48% for SADC, and a Kd value of **2,148**, which would then not fit with the values assumed for SDC. In this scenario, most of the "organic" Se would be assumed to have no discrete molecular structure (e.g., it could be associated with NOM), and therefore have no known Kd value, but may have a significant impact on Se bioaccumulation in the system. The point of all this is that it cannot be ascertained from the limited existing data if the Kd values for SDC are appropriate for describing Se bioaccumulation in SADC, and thus more data are needed to evaluate this question.	(termed organoSe in Appendix O) is selenomethionine (or equivalent in bioavailability to selenomethionine) is extremely unlikely, as the reviewer's own work shows. Selenomethionine is rapidly depleted in almost all circumstances because of the strong demand for methionine by many microorganisms. There are not sufficient selenium speciation data to develop species-specific K_d for each form of selenium as the reviewer notes. That is why field-derived K_ds were employed in the modeling. Those K_ds result in predictions for fish tissue concentrations of selenium that agree well with concentrations of Se measured in those fish. This validation is the basis for concluding that the K_d values for SDC are appropriate.
W2g	For the BCW system, there are sufficient Se speciation data for surface waters presented in Table F.13, and they are were all generated with appropriate analytical methods, therefore allowing a calculation of speciation-based Kd values, as outlined in the previous paragraph. When ignoring the presence of organic Se species, the resulting Kd is **649**. This value is higher than the estimates for SDC, and could be adjusted to produce a more realistic estimate of Kd for BCW, similar to what was suggested for the UCI wetlands (Kd = 800) in the Presser & Luoma report (Appendix N).	See response to comment W2f above.
W2h	There are some issues with the presentation of the data for organic Se in the BCW system, since there are several data points where a significant fraction (in the low % range) of organic Se is reported when all discrete organic Se species are below the detection limit. Therefore, I could only perform a worst case analysis where I assumed that any Se that is neither Se(IV) nor Se(VI) was organic Se (with the Kd for SeMet). This yields an average organic Se fraction of 11.2%, and a Kd of **3,297**. This organic Se fraction may be a little high, but for those samples where discrete organic Se species were measured, the organic Se fraction ranged from 0.9 to 10.4%, indicating that there can indeed be a significant organic Se fraction in these samples. Also, when discrete organic Se species were reported, usually methylseleninic acid, MeSe(IV), was the predominant species, and while it's Kd is unknown, it is likely to be lower than that of SeMet, which would reduce the total Kd somewhat. Still, it appears that Kd for BCW is	See response to W2f above. More recent data collected in BCW from 2008-2014 included selenium species, suspended particulates, fine sediment, algae, and fish tissue. Derivation of K_ds from these different data by Dr. Luoma, as discussed in detail in Appendix O to the staff report, yielded a best choice estimated mean K_d of 3,308 for BCW, which is similar to the reviewer's estimated K_d of 3,297 using the "worst case" average organic Se fraction from the draft staff report as estimated by the reviewer of 11.2% and assuming that all of the organic fraction was selemethionine. Dr. Luoma ran the model using the best choice mean K_d of 3,308, median K_d of 2,992 and 75th percentile K_d of 4,678, as well as several other calculated K_ds for BCW. The mean best choice estimated K_d provided the best correlation with existing selenium concentrations in fish tissue, which were used to validate the model. As the highest concentrations of selenium in fish

	probably higher than the values used to model Se bioaccumulation in SDC, and this should be reflected in some additional model simulations, because it may impact the water quality targets significantly.	and bird egg tissue measured in the freshwater drainages in the Newport Bay watershed samples have been collected from Big Canyon Wash, it is not surprising that the K_d is reflective of the higher concentrations of organic Se that are present in this watershed. Big Canyon creek is ponded extensively as it traverses the watershed and includes several small wetland areas, two ponds that serve as water hazards on the Big Canyon Country Club golf course, and a third pond located at the bottom of the watershed before the creek discharges to Upper Newport Bay.
W2i	Finally, the analysis of the Se speciation data for SDC is complicated. For my analysis, I used the data in Table F.6 and disqualified the Meixner et al. (2004), Hibbs et al. (2008), and OCPW 2012 data for the reasons outlined above. The remaining data yield Kd = **430**, when the presence of organic Se is ignored, which is in line with the 75th percentile suggested by Presser & Luoma (Appendix N). Again, since no discrete organic Se species concentrations were shown, I decided to ignore the organic Se fractions listed in Table F.6, and calculated the worst case scenarios described above, which yield 22.1% organic Se and Kd = **5,907**. I believe that this estimate of the organic Se fraction is high, although several samples show very high organic Se fractions. It is noteworthy that all of those samples are from the IRWD wetlands inlet, and were analyzed by IRWD, while the samples from the other locations within the SDC system were analyzed by ASC and showed low organic Se fractions. I would recommend a detailed re-analysis of those data sets to determine if there is really such a high organic Se fraction in the IRWD samples, because that has a significant impact on the interpretation of the Se speciation data with respect to their influence on Kd.	This would be a good suggestion if the modeling depended upon the speciation data; however, it does not. Nevertheless, improved speciation data would help to support the model results, although it is not essential to the model conclusions. The ultimate test of which of the reviewer's choices of scenarios for the K_ds is preferable is validation of the model, which compared the model predictions to independently observed selenium concentrations in fish. This validation step provided a much narrower range in K_ds (272-296) than that originally calculated by Presser and Luoma (2009) or the lower Kd calculated by the reviewer (see Table 6.3 in the draft staff report).
W2j	In summary, I suggest that the Kd values used in the modelling project may be lower than one would expect based on the apparent Se speciation, and that a careful re-examination of some of the Se speciation data might shed some light on this discrepancy. Subsequently, I would also recommend a couple of additional model simulations with higher Kd values to assess the impact of substantial organic Se fractions in SDC and BCW on the water quality targets, if those organic Se fractions prove to be real. Additionally, some more Se speciation analyses in the SADC system are required before one can even contemplate if the Kd values used by Presser & Luoma are appropriate there.	See W2i
W2k	Finally, I want to point out that sulfate	This correlation might be of general academic

	concentrations in waters influence (inversely) Kd for Se(VI), yet there is no mention of sulfate concentrations in any part of the report (as far as I can tell). I'm assuming that sulfate is high in these waters, and therefore, Kd for Se(VI) may be at the low end of the range suggested by Presser & Luoma (maybe in the 150 range?), and would therefore have the opposite effect on the water quality targets than the uncertainty of the organic Se fraction discussed above. I wonder if a simple correlation analysis of Kd values for Se(VI) reported in previous literature as a function of sulfate concentration could yield more site-specific Kd values for the studied water bodies.	interest but it would only be of minor direct value to the water bodies in the three freshwater subwatersheds that were modeled. Again, the validation exercises are the ultimate test of the best assumptions employed in the model (see response to Comment No. W2a). Those validation exercises point toward the K_ds that were used in the model runs in Appendix O.
W3a	It is pointless to ask if the range in water column Se concentrations derived from the different modelling scenarios is "appropriate", because depending on how the model is run, and what assumptions are made in each model run, you can obtain pretty much any water column concentration you like. The question of "appropriateness" is more one of risk assessment, and in that sense, the model seems to produce water quality targets for Se that can be assumed to be protective of the wildlife species in question, under the assumption that the parameters put into the model and optimized during the calibration process do hold true for prediction of future developments. However, there will never be a range of concentrations that's "appropriate"; there will just be one upper threshold value that is considered protective under the given set of biogeochemical assumptions. Also, while this is a nitpicky point, it is not the data that are being calibrated, but the model itself. That said, the general approach presented in Appendices N and O is appropriate. It is first tested how well different values for Kd, determined from the statistical spread of field data for paired water-solid samples, predict the observed tissue and egg Se concentrations, and then the "best fit" Kd value is used to inversely model the water Se concentrations required to meet certain tissue Se targets. There are a couple of problems with respect to the predictive power of some parts of the model (see in the following), but the calibration process adjusts for those to represent the existing data with as much accuracy as one would expect from a simple model for such a complex system. The big question in modelling is, as always, if the model also predicts future (= unknown) data equally well, but there is no other way of finding out than to continue this	Comments noted.

	process for future sampling events.	
W3b	There seems to be a trend of underestimating Se concentrations in sediment when mean or median Se water concentrations are used, which leads to a choice of 75th or 85th percentile Kd data during the model calibration. The same problem propagates into fish tissue concentrations accordingly. This observation suggests to me that a) Kd is generally underestimated by the approaches used for the initial modelling runs (which is in line with my comments on point 7 above), and that b) sediment may not be the optimal choice for determining and checking Kd values. I would recommend considering adding phytoplankton and suspended matter in future studies, particularly where this hasn't been done yet, to see if that yields better Kd values. This is supported by some data in the discussion of BCW Kd values in section 7 of Appendix O.	Comment noted. Regional Board staff are currently engaged in a two-year study to collect data specifically designed to refine the K_ds in all three subwatersheds. Fine organic-rich sediment, algae, suspended particulates, water (total and dissolved Se and Se species), and fish tissue are being collected (if available) at several locations in each subwatershed. .
W3c	I also note that while Se concentrations in invertebrates are usually predicted quite well, Se concentrations in bird eggs are typically overestimated significantly. This isn't my area of expertise, but it seems to suggest that the TTFs for invertebrate -> bird egg appear to be problematic.	The bird data were widely discussed among the stakeholders, Regional Board staff, the stakeholder's consultant team (e.g., CH2M Hill, Larry Walker & Associates) and with USFWS staff. The majority agreed that in a highly urbanized and fragmented area like the Newport Bay watershed, birds are most likely foraging in multiple adjacent waterbodies. As a result, they can be exposed to both high and low selenium environments, which can have a diluent effect on their dietary intake. The disparity between concentrations in bird eggs and concentrations expected from environmental conditions (as predicted by the biodynamic model) are likely to reflect the larger foraging ranges of birds as compared to fish and differences in feeding preferences among bird species, especially in the areas where the concentration of selenium in birds was much lower than predicted by the model (e.g., Big Canyon Wash). In addition, bird eggs are collected as a single egg from each nest; it is not known whether the single egg collected is representative of the other eggs in the nest as each egg is laid at a different time and the selenium concentrations may differ as a result. There is also a greater degree of uncertainty in the trophic transfer factor for bird eggs. All of these factors combined make the model runs based on the bird egg tissue numeric target much less robust than those using the fish tissue numeric targets.
W3d	The example of Kd selection for BCW illustrates a number of problems that should probably be addressed to ensure the future success of this project. It is shown (in Table 7-3, Appendix O, p. 1483) that very different Kd values can be obtained, depending on what type of "solid material" is used as the basis of comparison.	Comment noted.

	First, the solution presented (finding the "best choice" Kd value) is complicated, and highly site-specific. While this highlights the flexibility of the modelling process, and apparently leads to the "best fit" here, it also requires a lot of detail knowledge and experience to make that decision. Unfortunately, one has to assume that Dr. Luoma will not be available to support this effort indefinitely, so it would be good to develop a suite of internal and external experts who could perform such functions in the future, particularly if the Se bioaccumulation scenario changes significantly in one of the studied watersheds.	
W3e	Second, this example points out the importance of collecting different types of data (here: sediment, SPM and algal samples) to get a sound estimate for this crucial Kd value. It is not inconceivable that future changes to a particular watershed may lead to a shift in receptor species or their diet, which may then in turn affect which type of Kd value is the "best choice". Therefore, I would advocate for continuing to collect these different sample types in the proposed monitoring program, rather than just focusing on one type of solid sample for Kd calculations (even if that may appear warranted at the moment).	This would be a sensible suggestion in a typical watershed; the K_d should be derived from the best surrogate for consumer food per the site-specific process described in Comment No. W3d. Unfortunately, in these highly urbanized, flashy and heterogeneous watersheds, consistently finding adequate substrate for many of the ideal choices is physically and pragmatically not possible. Therefore, the decision has been made to find a substrate that is most consistently available. Fine grained bed sediments are the most consistently available substrate and are reflective of a food sources for detrital-feeding consumers and those that consume benthic invertebrates.
W3f	And third, the mathematical component of the suggested process for selecting and calculating the "best" Kd value is getting increasingly complex as one tries to refine it more and more (e.g. by adding particle size normalization to any of the presented Kd options), which makes the process more prone to errors. To illustrate that point, I believe (after checking some of the calculations) that there are several errors in Table 7.4; for example, the "sediment + SPM" value in line 7 should be 2,024, if I understood the procedure correctly (and not 1,333, as listed). So, either I didn't understand the procedure properly, or there are indeed mistakes in that table; either way, such errors could be problematic when the numbers are used subsequently. The analysis of the statistical distribution of "best choice" vs. "sediment + SPM" Kd values shows that overall, this doesn't make a significant difference, but if one looks at individual sites, Kd differences can be up to a factor of 3, which makes a huge difference for the final calculations of water quality targets.	We thank the reviewer for catching the transcribing errors in the second column of Table 7.4. The purpose of this table was to directly compare two approaches to determining K_ds derived from multiple sources. The values in this Table should have been copied from Tables 7.2 and 7.3, where the values are correct. Based upon Table 7.2 there should have only been two instances in Table 7.4 where two columns differed. Table 7.4 had no influence on the rest of the paper or the modeling. The reviewer also notes, as does the report, that in the two instances where both suspended particulate matter (SPM) and sediment data were available they differ by approximately 2X in one case and 3X in another. However, the report also notes that the means of the SPM and sediment data that characterize this subwatershed were not significantly different. The important point is that the modeling comes to the same conclusion whatever the choice of substrate because the body of data from the subwatershed was employed (for the express purpose of controlling variability) rather than modeling individual sites.
W3g	Finally, as pointed out under point 7 [comment W2f] above (and acknowledged in the SWRCB staff report), the existing data set for SADC is	Comment noted. As discussed in response to Comment No. W3b above, a special study is currently being conducted to help refine the K_ds

	very limited, and I would personally feel hesitant to derive any water quality targets for the water body from it at this time. If it is necessary to do so right now, I would at the very least recommend that many more data are generated for SADC soon after the inception of this TMDL program, and that the modelling exercise for SADC is repeated soon after those data become available to check, and adjust, if necessary, the target water concentrations for this water body.	used in the model. This includes the collection of additional data from several areas within the SADC subwatershed. Sample collection includes: fine organic sediment, water (for both total and dissolved Se and selenium speciation analyses), suspended particulates (if present in sufficient quantity), algae, and fish tissue (where present).
W4a	Overall, the proposed TMDL approach with adaptive management aspects makes a lot of sense to me. I agree with the different approaches suggested for the three subwatersheds, as they seem to be most reflective of the specific situations (for SDC and BCW) and address the lack of data for SADC appropriately at this time.	Comment noted.
W4b	My only comments arise out of ignorance of critical biological parameters. For one, an averaging period of 6 months for TMDL allocations, LAs and WLAs appears long compared to the time during which egg formation and development (apparently) occurs in the receptor species. On page 7-3 of the staff report, it is acknowledged that these processes occur on the order of weeks, and even if not all fish and bird species may develop eggs at the same time, it still seems to me that shorter averaging periods (2 or 3 months) might be more appropriate for assessing the Se exposure of embryos. This is in line with discussions I've overheard for other Se impacted watersheds. I'm hoping that the temporal resolution of RMP activities is high enough that this averaging process would only be an after- the-fact mathematical exercise, aimed at developing the best predictors for receptor tissue Se concentrations, rather than result in additional monitoring activities.	Comment noted. Fish and bird egg reproduction generally occur during a 6 month period – from March through August – hence the need for a 6-month averaging period.
W4c	Finally, I'm not sure I follow the logic of the repeated statement that "all of the results [*derived from the biodynamic model*] are deemed equally valid for predictive purposes". As far as I understand, once one has selected the appropriate endpoint for a specific subwatershed (e.g. fish tissue or bird egg), then the Se bioaccumulation model will predict the appropriate water concentration that is considered protective, based on all of the assumptions that have gone into the modeling process (including safety margins, I assume). Habitat heterogeneity along a subwatershed does not seem like a confounding factor to me in this consideration, since I assume that the critical biological species are able to migrate within a subwatershed on the spatial scale investigated	Using the lowest water column concentration across the board is not appropriate. The proposed numeric tissue targets protect both fish and birds in each subwatershed with fish being the critical link to protect fish-eating birds. The protection is inherent in the biodynamic model. The statement that refers to "all results being equally valid" refers to there being little difference in validity among the best statistical choices of K_d and that all model runs using the best choice K_ds were equally valid since the essential difference between each model run was the set of assumptions used.

	here. Therefore, it appears (to me) to be most protective to pick the lowest water concentration derived for any part of the subwatershed, and apply it to the whole subwatershed, as if the receptor biological species spent the entire critical period (of egg development) in that part of the watershed.	
W5a	Overall, the proposed monitoring program is sensible, and will probably provide much of the desired information needed in future project supervision and decision making. Generally, I question the generation and use of total Se data on top of dissolved Se data. While I understand that regulations are always based on total element concentrations, we know that there is typically not a significant particulate Se fraction in freshwaters. To support this argument, it was shown previously for this study area (Appendix O, Table 1-1, p. 1436) that there is no significant difference between total and dissolved Se concentrations. Additionally, the analytical methods typically used for total Se determination do generally not feature a complete digestion of particulate matter, and are thus a) arbitrary (i.e. strongly dependent on the methods used by specific laboratories) and b) meaningless (because they only capture an unspecified fraction of the particulate Se). The cost of the water component of the monitoring program could thus be cut in half without losing any significant information.	Board staff agree that measuring dissolved selenium concentrations may be appropriate and will explore the possibility of reducing total selenium analyses to dissolved only. This concept could then be incorporated into the Regional Monitoring Program, if approved by the Regional Board's Executive Officer.
W5b	Although Se speciation analyses are mentioned under "other considerations", I would suggest that their scientific value is not emphasized enough in the RMP design. As discussed above (for points 7 and 8), reliable Se speciation information is scarce for the studied watersheds, especially SADC. Due to its key role in determining K_d, and the apparent underestimation of bioaccumulation by median K_d values, I think the bioaccumulation model would benefit from the addition of more Se speciation information, possibly even directly into the algorithm. We know that most Se treatment processes change the relative speciation of Se significantly, so Se speciation monitoring would make a lot of sense as part of the BMP Effectiveness monitoring program, because you're ultimately not interested in reducing Se loads, but Se bioaccumulation potential, and there are demonstrated cases where a reduction in total Se accompanied by a change in Se speciation did not necessarily result in reduced Se bioaccumulation. I would personally advocate adding Se speciation monitoring to the other components of the RMP as well,	The "apparent underestimation of bioaccumulation by median K_d values" is the reviewer's interpretation, or is referring only to the bird eggs (see response to Comment No. W3c, above). For the fish data, the validation efforts show a strong fit of the model predictions from field-based K_ds as compared to selenium concentrations measured in field-collected whole body fish tissue composites. Speciation data are always valuable for checking field-based K_ds and for narrowing uncertainties in those K_ds. Inclusion of selenium speciation analyses would improve the monitoring program but it is not essential for modeling. The BMP effectiveness monitoring may need to include selenium speciation analyses on water column samples. Regional Board staff agree that BMPs or selenium treatment technologies can change Se species in the effluent or downstream of the BMP. The need for Se speciation analyses will be determined on a case-by-case basis during implementation of the TMDLs and consideration of approval of the monitoring programs to be proposed by the responsible dischargers.

	because the presented results indicate that Se speciation can change across a watershed, due to biogeochemical transformation processes, but I understand that this leads to a significant cost increase. At the very least, I would suggest adding Se speciation analyses to monitoring activities in the short- to medium-term in areas where information is lacking (especially SADC) and when and where biological populations are most at risk (i.e. before/during the breeding season) to see how that refines the understanding of the bioaccumulation process.	
W5c	Within one watershed, Se speciation might also be an interesting and relevant aspect of a trading program, if one source emits a different species of Se than another one, so that the impact of a 1-for-1 trade (in term of total Se concentrations or loads) would not be net neutral in terms of Se bioaccumulation potential.	Comment noted.
W5d	Related, it would also be a good idea to add a biological community monitoring component to the RMP. My concern would be that in a few years, as a result of change in a subwatershed, for example due to climate change or reduction in Se emissions, the structure of certain aquatic food chains might change to the point where the current Se bioaccumulation model is no longer appropriate. I'm not a biologist, so I'm not sure of the appropriate frequency and extent of such monitoring programs, but I suspect that it may be adequate to conduct such an effort every couple of years, or when the Se tissue concentrations in key receptors do not respond as predicted.	Monitoring community structure is another reasonable consideration. However, it should be recognized that the highly urbanized streams present in the Newport Bay watershed are not especially suitable for community monitoring in many areas. Earlier efforts by CH2M Hill to assess habitats in the different waterbodies met with great challenges due to the extensive hydromodification of the watershed. The TMDL employs adaptive management as a tool to address changing conditions as they occur in the watershed.
W5e	In addition to the proposed monitoring activities, I would strongly recommend to accompany the generation of more data with continued modelling efforts, in order to test and refine, if necessary, the Se bioaccumulation model and its underlying assumptions. The model is a key component in the derivation of the water quality targets for the watersheds, and (as discussed above for points 7 and 8) there are many aspects of it (such as the selection of appropriate K_d values) that are based on limited data sets and have been numerically optimized rather than being based on a sound fundamental understanding of the underlying biogeochemical processes. Therefore, it is advisable to test continuously if the water quality developments in the watersheds, e.g. after BMP implementation, fall in line with the	Comment noted. As new data are collected and/or BMPs/selenium treatment implemented, the model will be periodically re-run to determine if revised allocations are needed due to changes in selenium cycling and speciation. As discussed in response to Comment No. W2e above, a two year special study is currently underway to collect additional data (fine, organic-rich sediment, algae, suspended particulates, and water) that is expected to be used to help refine the K_ds used in the current modeling. If results of that study indicate that the model should be re-run and that the allocations based on the model results need adjustment, then the model revisions would be addressed during the TMDL reconsideration period. In addition, if information collected as part of the BMP effectiveness monitoring indicates that revision of the model parameters are necessary, those revisions would also be

	model predictions that their target values are based on.	addressed during the TMDL reconsideration.
Dr. Judson Harvey, U.S. Geological Survey [H]		
H1	The Staff Report documents that the currently available criteria has been under protective in the freshwater parts of the Newport Bay watershed, and argues effectively for the use of dominant tissue-based Se concentrations to drive the analysis, using a thoroughly peer-reviewed biodynamic model, with a provision that the fish tissue criterion should be thresholded at two levels based on whether the bird egg concentration criterion has been met, and using as a fall back criterion the water column- based criteria that matches the currently applicable CTR criterion in freshwater.	Comment noted.
H2	The data set collected between 1999 and 2007 and its targeted updates collected between 2008 and 2014 are well suited for the purpose, representing fish and bird egg tissue concentrations as well as sediment, algae, suspended particulates from the three sub-watersheds.	Comment noted.
H3	In summary, the biodynamic model results in a range of water column concentrations that can be protective of fish and wading bird consumers. This site specific application in the Newport Bay watershed has a good working data set to support the present modeling. The data set will be updated and model rerun-as new monitoring data become available.	Comment noted.
H4	The primary source of selenium is mobilization in groundwater of selenium derived from the Monterey formation and transport through the subsurface to the streams. Groundwater levels have been rising over time, and streams flow perennially now unlike in the past as a result of numerous hydrologic changes that have occurred in the basins, including water management practices involving residential and commercial spaces, and water management on municipal open spaces including reservoirs. There are currently widely varying concentrations of selenium measured in groundwater wells and surface water seeps with concentrations throughout the entire watershed varying over a factor of 40. Further isolation of source pathways and evaluation of treatment options would require considerable investment, and may not be practical given uncertain treatment options for selenium, limited space for treatment facilities in the highly urbanized watershed, and given that water quality regulations for selenium are under revision at the federal, state, and local level. Nonetheless it	The primary source of selenium in the Big Canyon Wash subwatershed is the Monterrey Formation. However, the source of selenium in the San Diego Creek and Santa Ana Delhi Channel subwatersheds is from soils formed in subsurface deposits from a large swamp (Las Cienega de las Ranas or Swamp of the Frogs) and adjacent alkali flat (see Section 3, Watershed Characteristics and Problem Statement in the draft staff report). Several studies into the sources of selenium, selenium characteristics in both groundwater and surface waters, and selenium loads have been conducted in the in the Big Canyon Wash subwatershed and the San Diego Creek and Santa Ana Delhi Channel subwatersheds (e.g., Hibbs and Lee, 2000; Meixner et al., 2004; Hibbs et al., 2008; CH2M Hill 2008, 2009d, 2009e; SARWQCB 2010). In addition, two water balance studies have been completed by Daniel B. Stephens and Associates (DBSA): one for the Big Canyon Wash subwatershed (2014) and for the Swamp of the Frogs area (2013). Both reports confirm previous findings that the selenium in

	would be of interest to better understand groundwater selenium sources, in particular whether loading is primarily from shallow or flow deep flow paths, residence times, and oxidation/reduction characteristics of water flowing along those pathways.	both areas enters surface waters from a shallow perched groundwater aquifer. Electronic copies of the above referenced reports were included in the peer review package.
H5	Seasonality was accounted for in the development of the TMDL and Allocations that considers the negative correlation between flow and selenium concentration. Wet and dry season measurements were made in the main channels and used to calibrate flow on the basis of stage measurements. These were supplemented with groundwater measurements, seep measurements, storm drain measurements, etc. Many focused studies were conducted to specifically isolate selenium sources as they relate to subsurface flow generated by golf course irrigation, reservoir storage, etc. This reviewer found the quantity and scope of the available dataset to be impressive and entirely supportive of the analysis that was undertaken. The load analysis itself concentrated on baseflow time periods, which is reasonable given that baseflow is sustained by groundwater discharge which is the source of selenium, which is independently supported by geologic analysis, concentrations measurements in potentials source waters, and hydrogeochemical source tracking. The Staff report shows conclusively that recharge of local precipitation is too small to account for measured mobilization of selenium that is occurring. The hydrogeochemical source tracking analysis identified that there are different sources of recharge to the shallow perched aquifer, apart from the very small contribution from precipitation, that become the primary pathway for mobilizing selenium. If mitigation is ever to be envisioned there could be more learned about the relative contributions from, for example, local residential and commercial irrigation operations, storm drains, reservoir leakage, etc., by expanding the footprint of the hydrogeochemical analysis.	Comment noted. Additional hydrogeochemical source tracking studies may be conducted in the future if Regional Board staff or the stakeholders determine that this type of additional information is needed to help further reduce selenium concentrations in the freshwater drainages in the Newport Bay watershed.
H6	The staff report and associated materials argue effectively for the development of SSOs in the coming years based on monitoring of biologic tissue and water column concentrations (rather than sediment concentrations, which are relevant but enormously variable). The SSOs are to be based on monitoring the biological tissue criteria are to be used to derive site-specific water column-based criteria for the sub watersheds. The SSOs are intended to	Comment noted.

	eventually replace the currently applicable CTR chronic criterion of 5 ug/L for selenium in freshwater with site specific objectives.	
H7	The frequency of Assessment Point Monitoring does not seem to be specified, except to say that is “must be sufficient to evaluate WLAs and LAs”. The difficulty of such monitoring is representing storm peaks, however the present problem involves subsurface mobilization of selenium which often may be well represented by baseflow monitoring, and thus there is less concern for this application. The degree of selenium dilution during storm peaks should be evaluated in any non-point waste load allocation analysis. No doubt such an analysis was conducted for the present problem, although this reviewer was not successful in finding the analysis in the report materials.	Assessment point monitoring frequency will be determined as part of the development of the Regional Monitoring Program (RMP). The RMP must be submitted to the Regional Board’s Executive Officer for review and approval within three (3) months of the effective date of the TMDLs. The TMDLs also require that Regional Board staff consult with staff from the resource agencies (U.S. Fish and Wildlife Service and California Department of Fish and Wildlife) before approving the RMP. The Selenium TMDLs are being proposed as dry weather TMDLs. Dry weather is when the creeks are primarily groundwater supported and when selenium concentrations are highest (see discussion under Section 7.2, Seasonal Variation and Critical Conditions of the draft staff report).
H8	All monitoring programs describe water column and flow measurements, from which one of the important outcomes is a load analysis. Substantial load analysis has been conducted, concentrating on baseflow time periods, which is reasonable given that baseflow is sustained by groundwater discharge which is the source of selenium (which is independently supported by geologic analysis, concentrations measurements in potentials source waters, and hydrogeochemical source tracking). The Staff report shows conclusively that recharge of local precipitation is too small to account for measured mobilization of selenium that is occurring. The hydrogeochemical source tracking analysis identified that there are different sources of recharge to the shallow perched aquifer, apart from the very small contribution from precipitation, that become the primary pathway for mobilizing selenium. If mitigation is ever to be envisioned there could be more learned about the relative contributions from, for example, local residential and commercial irrigation operations, storm drains, reservoir leakage, etc., by expanding the footprint of the hydrogeochemical analysis.	Comment noted.
H9	In the future the TMDL and allocations are expected to be adjusted iteratively in an adaptive management framework based on a monitoring program that will be used to update and re-run the biodynamic model. For the reasons stated in Attachment 2, the Newport Bay Watershed TMDL will not adopt site specific objectives in water for selenium,	Comment noted.

	instead the tissue concentrations known to be of concern will drive the targets, as informed by the biodynamic modeling, using a fallback water concentration criterion where necessary, and updating targets as appropriate based on the expanded data sets that become available as a result of monitoring programs. This reviewer finds the stated arguments and approaches chosen to be convincing.	

ATTACHMENT B1.1 - DESCRIPTION OF THE SCIENTIFIC FINDINGS, ASSUMPTIONS, AND CONCLUSIONS (Attachment 2 to the Peer Review Request Package)

ATTACHMENT B1.2 – PEER REVIEWER COMMENT LETTERS ANNOTATED WITH COMMENT NUMBERS TO CORRESPOND TO PEER REVIEW RESPONSE DOCUMENT