Section 9
Demonstrating Compliance

This section contains a detailed set of guidelines that describe how data collected by the recommended monitoring program may be used to assess compliance with the numeric targets included in the revised TMDLs. Multiple approaches are provided by which dischargers may use monitoring data to demonstrate compliance with the TMDL. All the available methods for demonstrating compliance apply to a single reporting period. Demonstrations of progress toward compliance with the TMDL must be submitted every 5 years by all entities with an allocation in Table 6-3. Even if an area is determined to comply in a reporting period, data collection needed to support compliance demonstrations must continue for future reporting periods. General categories of alternative compliance demonstration approaches include:

* *Approach 1 - Numeric Target*: CDFs of in-lake water quality monitoring data are equal to or better than numeric target CDFs for chlorophyll-*a*, DO, and ammonia. Section 9.1 provides more guidance and an example with hypothetical data of this compliance demonstration approach.
* *Approach 2 – Reference Condition Model*: CDFs of in-lake water quality monitoring data are equal to or better than model results for the reference scenario over the same hydrologic period for chlorophyll-*a*, DO, and ammonia. Section 9.2 provides more guidance and an example with hypothetical data of this compliance demonstration approach.
* *Approach 3 - External Load Reduction*: Allocations are developed for nutrients in external sources with an allowable concentration of nutrients, TN and TP, representative of a reference watershed. One way to demonstrate compliance involves collection of monitoring data that shows nutrients in external sources have been reduced to allocations, applicable to one or multiple jurisdictions. Section 9.3 provides more guidance and an example with hypothetical data of this compliance demonstration approach.
* *Approach 4 – In-lake Offsets*: Meet WLA/LAs by offsetting nutrient loads in excess of reference conditions over the same hydrologic period. If only one nutrient is found to meet the LA/WLA, then data needed to demonstrate compliance with in-lake numeric target CDFs must be developed for the following reporting period. Section 9.4 provides more guidance and an example with hypothetical data of this compliance demonstration approach.
* *Approach 5 – Retention*: Prevent discharge of nutrient loads from a drainage area by retaining all runoff on-site for most rainfall events. Potential extreme rainfall in excess of on-site retention capacity is estimated and serves as the basis for determining whether the overflows would exceed the WLA/LAs and in-turn require offsets with in-lake BMPs in Lake Elsinore. Section 9.5 provides more guidance and an example with hypothetical data of this compliance demonstration approach.

9.1 Approach 1 - Numeric Target

This compliance demonstration approach compares the preceding 10 years of bi-monthly sampling data against the numeric target CDF for chlorophyll-*a*, DO, and ammonia. The target CDF curve is developed based on the reference condition CAEDYM model output. Curves for each lake segment and response variable are included in Section 3 as follow:

Lake Elsinore

* Figure 3-7: Chlorophyll-*a*
* Figure 3-8: Dissolved oxygen
* Figure 3-9: Ammonia

Canyon Lake Main Lake

* Figure 3-10: Chlorophyll-*a*
* Figure 3-11: Dissolved oxygen
* Figure 3-12: Ammonia

Canyon Lake East Bay

* Figure 3-13: Chlorophyll-*a*
* Figure 3-14: Dissolved oxygen
* Figure 3-15: Ammonia

The type of monitoring data plotted as CDFs for comparison to the numeric targets differ depending upon the response variable, as follows:

* *Chlorophyll-a*: Average epilimnetic concentration from monthly satellite imagery, resulting in 120 estimates over the preceding 10 years. Separate averages are computed for Canyon Lake based on the spatial extent of the Main Lake and East Bay.
* *Dissolved oxygen*: Bi-monthly depth profiles of DO at 1-meter intervals from station LEE2 in Lake Elsinore (see Figure 2-18), CL07 in Canyon Lake Main Lake, and CL10 in Canyon Lake East Bay (see Figure 2-33) . The DO profile is converted to a fraction of the lake volume with DO > 5 mg/L, resulting in 60 estimates over the preceding 10 years. Each 1 meter DO reading represents a different volume of water for estimating the fraction of the total volume at the time a profile is collected. The volume of water at each depth interval is provided in Figure 5-2 for Lake Elsinore and Figure 5-3 for Canyon Lake Main Lake and East Bay.
* *Ammonia*: Depth integrated average ammonia concentration from bimonthly samples from station LEE2 in Lake Elsinore, CL07 in Canyon Lake Main Lake, and CL10 in Canyon Lake East Bay CDF. The set of 60 depth integrated averages are plotted as a CDF and compared with numeric target CDFs.

CDFs of data must be equal to or better than the numeric target CDF over the full range of frequencies to demonstrate compliance. An example involving the use of this method for a hypothetical (2020-2030) set of DO profiles from site CL07 in Canyon Lake Main Lake is provided below (Figure 9-1). To demonstrate compliance with the TMDL, the CDF from field measurements should remain above the reference condition CDF.

**Figure 9-1. Hypothetical Example of Use of DO Profile Data to Evaluate Compliance with Numeric Target for DO**

9.2 Approach 2 - Reference Condition Model

This compliance demonstration approach evaluates current monitoring data against modeled water quality for a reference condition over the same hydrologic period. This approach is very similar to a comparison with the numeric target CDFs demonstrated above, with the only change involving alignment of hydrology with the preceding 10-yr period. This approach is most appropriate when the preceding 10-yr period is not representative of long-term hydrologic periods used to the develop numeric targets: 1916-2016 for Lake Elsinore and 2001-2016 for Canyon Lake Main Lake and East Bay.

CDFs of data must be equal to or better than a CDF of model results for reference conditions over the full range of frequencies to demonstrate compliance. Figure 9-2 provides an example demonstrating compliance using this method for chlorophyll-*a* in Lake Elsinore. The example is based on hypothetical (2020-2030) results from extension of the DYRESM-CAEDYM model past the numeric target setting period and a hypothetical set of monthly lake-wide chlorophyll-*a* concentrations derived from satellite imagery analysis. To demonstrate compliance with the TMDL, the CDF from satellite imagery analyses should remain below the reference condition CDF.

Figure 9-2. Hypothetical Example of Use of Chlorophyll-*a* Data to Evaluate Compliance Using the Reference Condition Model Approach

9.3 Approach 3: External Load Reduction

Allocations are developed for nutrients from external sources with an allowable concentration of nutrients, TN and TP, representative of a reference watershed. Demonstrating compliance with these allowable concentrations involves collection of monitoring data that shows nutrients in external sources have been reduced to allocations. For example, flow-weighted average TP and/or TN concentration may be used to demonstrate that allocations are being achieved if the 10-year average of flow weighted composite samples is less than 0.32 mg/L for TP and/or 0.92 mg/L for TN. This approach may be used based on data collected by required watershed monitoring program or from any additional upstream monitoring locations for individual or groups of jurisdictions. However, the following must be considered:

* When using this approach, any samples collected at a downstream monitoring station that is influenced by atypical levels of sediment from burned hillsides (e.g. TSS > 1,000 mg/L) may be excluded from the calculation of average nutrient concentrations.
* If a jurisdiction also includes drainage area in a different tributary to the downstream lakes, any excess nutrient loads from these areas must be accounted for separately (e.g. nutrient reduction credit in Salt Creek watershed cannot be transferred to the San Jacinto watershed). Monitoring at any new jurisdiction-specific locations must collect composite samples and follow requirements described in Chapter 8, Monitoring Requirements.
* If only one nutrient is found to meet the WLA/LA at the first TMDL compliance reporting period following adoption of the TMDL revision, then a demonstration using either Approach 1 or 2 must accompany use of a single nutrient control strategy in all subsequent TMDL compliance reporting periods.

Figure 9-3 provides an example demonstrating compliance using this method for phosphorus in the Salt Creek watershed. The example is based on hypothetical (2020-2030) results from continued implementation of the watershed monitoring program. To demonstrate compliance with the TMDL, the 10-yr average nutrient concentrations must be below the reference watershed nutrient concentration.

**Figure 9-3. Hypothetical Example of Use of Nutrient Data to Evaluate Compliance with External Loads from the Reference Watershed**

9.4 In-Lake Offsets

Allocations are developed for nutrients in external sources with an allowable concentration of nutrients, TN and TP, representative of a reference watershed. Demonstrating compliance involves first computing the excess nutrients in external sources. This amount is then used for determining the necessary offset credits from implementation of in-lake BMPs. Lastly, a project specific effectiveness analysis must be developed that computes the internal nutrient load reduction achieved with in-lake BMPs. The estimation of excess nutrients should consider the following:

* The load of nutrients in excess of reference conditions is computed from 10-year average of flow weighted composite samples, collected as described in Section 8, Monitoring Requirements.
* A safety factor of 1.2 is required to use internal load reductions within in-lake BMP(s) to offset excess external nutrient loading.
* Any samples collected at a downstream monitoring station that is influenced by atypical levels of erosion from burned hillsides (e.g. TSS > 1,000 mg/L) may be excluded from the calculation of average nutrient concentrations.
* Flow gauge data over the same 10-year period at the same monitoring station is necessary to compute the mass of excess nutrients.
* If only one nutrient is found to meet the WLA/LAs at the first TMDL compliance reporting period following adoption of the TMDL revision, then a demonstration using either Approach 1 or 2 must accompany use of a single nutrient control strategy in all subsequent TMDL compliance reporting periods.

Figure 9-4 provides an example demonstrating compliance using this method for phosphorus in the San Jacinto River watershed to Canyon Lake Main Lake. The example is based on hypothetical (2020-2030) results from continued implementation of the watershed monitoring program.



Figure 9-4. Hypothetical Example of Use of Nutrient Data to Evaluate Use of In-Lake Offsets as an Approach to Demonstrating Compliance

9.5 Retention of Extreme Rainfall Events

Another approach for demonstrating compliance with WLA/LAs involves retention of watershed runoff from all storm events up to an extreme rainfall depth (greater than 10-year return period), on-site or within a downstream control. Runoff that is retained will not contribute to downstream surface waters, which results in a net reduction in nutrient loads relative to a reference watershed. When extreme rainfall events that exceed the retention capacity occur, overflows of runoff and associated nutrient loads may cause exceedances of WLA/LAs. This compliance demonstration approach involves quantification of annualized average nutrients from potential extreme event overflows for comparison to allowable downstream loads based on a reference watershed condition (i.e., WLA/LAs). In the case of an extreme rainfall event that exceeds the retention capacity, all overflow runoff may be assumed to spill from downstream impoundments (e.g. Mystic Lake and/or Canyon Lake) and result in delivery of runoff and associated nutrient load to Lake Elsinore. Thus, any resulting load reductions associated with offsetting nutrient loads in extreme rainfall will involve internal load reduction within Lake Elsinore.

A statistical analysis of annual maximum 24-hr rainfall is used to estimate the frequency of occurrence and incremental depth above the design storm capacity (Appendix A). The depth in excess of the on-site retention capacity is then annualized for comparison with WLA/LAs, which are based on average annual runoff. The concentration of nutrients in the overflows is taken from landuse based nutrient concentrations used for the source assessment (see Table 4-7) to compute annualized overflow load for TP and TN. Depending upon the site landuse, annualized nutrient loads from extreme rainfall event overflows may be less than WLA/LAs and thereby demonstrate compliance with on-site retention, or require offsets of internal loads in Lake Elsinore with in-lake BMPs.

If annualized overflow nutrient load exceeds WLA/LAs for the site, the excess amount is then used for determining the necessary offset credits to be obtained from participation in regional in-lake BMPs in Lake Elsinore (e.g. LEAMS). A project specific effectiveness analysis must be developed that computes the internal nutrient load reduction achieved with in-lake BMPs. The use of this compliance demonstration approach should consider the following:

* Statistical rainfall analysis using the spreadsheet tool in Appendix A should be developed with site specific Atlas 14 rainfall frequency information (available at <https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html>).
* A safety factor of 1.2 is required to use internal load reductions within in-lake BMP(s) to offset excess external nutrient loading.
* If only one nutrient is found to meet the WLA/LAs, by retention or with in-lake BMP offsets, at the first TMDL compliance reporting period following adoption of the TMDL revision, then a demonstration using either Approach 1 or 2 must accompany use of a single nutrient control strategy in all subsequent TMDL compliance reporting periods.

Figure 9-5 provides an example demonstrating compliance using this method for a typical CAFO that is compliant with NPDES permit requirement to retain all runoff from up to a 25-year, 24-hour return period rainfall event.



Figure 9-5. Hypothetical Example of Use of Extreme Rainfall Event Compliance Demonstration Approach