CA

# 66265.97 General Water Quality Monitoring and System Requirements

**(a)**

The owner or operator shall comply with the requirements of this section for any water quality monitoring program developed to satisfy sections 66265.98 or 66265.99.

**(b)**

Groundwater Monitoring System. (1) Except as provided under subsection (e)(3) of this section, the owner or operator shall establish a groundwater monitoring system for each regulated unit. The design of the groundwater monitoring system shall be based upon the information obtained from hydrogeologic investigations of the facility area, including the identification of the uppermost aquifer and aquifers hydraulically interconnected and a determination of groundwater flow rate and direction in each such aquifer. This groundwater monitoring system shall be fully operational within 180 days of July 1, 1991. Until such groundwater monitoring system is fully operational, the owner or operator shall continue to comply with 40 CFR Part 265, Subpart F. This groundwater monitoring system shall include: (A) a sufficient number of background monitoring points (at least one) installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater that has not been affected by a release from the regulated unit; (B) for a detection monitoring

program under section 66265.98: 1. a sufficient number of monitoring points (at least three) installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the point of compliance and to allow for the detection of a release from the regulated unit; 2. a sufficient number of monitoring points installed at additional locations and depths to yield groundwater samples from the uppermost aquifer as necessary to provide the best assurance of the earliest possible detection of a release from the regulated unit; and 3. a sufficient number of monitoring points and background monitoring points installed at appropriate locations and depths to yield groundwater samples from other aquifers, low-yielding saturated zones and from zones of perched water as necessary to provide the best assurance of the earliest possible detection of a release from the regulated unit; and (C) for an evaluation monitoring program under section 66265.99: 1. a sufficient number of monitoring points (at least three) installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the point of compliance, and at other locations in the uppermost aquifer as necessary, to provide the data needed to evaluate changes in water quality due to the release from the regulated unit; and 2. a sufficient number of monitoring points and background monitoring points installed at appropriate locations and depths to yield groundwater samples from other aquifers, low-yielding saturated zones and zones of perched water as necessary to provide the data needed to evaluate changes in water quality due to the release from the regulated unit. (2) The groundwater monitoring system may include background monitoring points that are not hydraulically upgradient of the regulated unit if documentation is maintained in the facility operating record that demonstrates that sampling at

other monitoring points will provide samples that are representative of the background quality of groundwater or are more representative than those provided by the upgradient monitoring points. (3) A copy of each well report, as required by Water Code section 13751, shall be submitted to the Department within 60 days of the construction, alteration, or destruction of the well. (4) All monitoring wells shall be cased and constructed in a manner that maintains the integrity of the monitoring well bore hole and prevents the bore hole from acting as a conduit for contaminant transport. (5) The sampling interval of each monitoring well shall be appropriately screened and fitted with an appropriate filter pack to enable collection of representative groundwater samples. (6) For each monitoring well the annular space (i.e., the space between the bore hole and well casing) above and below the sampling interval shall be appropriately sealed to prevent entry of contaminants from the surface, entry of contaminants from the unsaturated zone, cross contamination of saturated zones and contamination of samples. (7) All monitoring wells shall be adequately developed to enable collection of representative groundwater samples. (8) All wells shall be adequately destroyed (decommissioned) if the wells no longer provide useful information. Decommissioning may only proceed after approval by the Department or as directed by the Department.

**(1)**

Except as provided under subsection (e)(3) of this section, the owner or operator shall establish a groundwater monitoring system for each regulated unit. The design of the groundwater monitoring system shall be based upon the information obtained from hydrogeologic investigations of the facility area, including the identification of the uppermost aquifer and aquifers hydraulically interconnected and a determination of groundwater flow rate and direction in each such aquifer. This groundwater monitoring

system shall be fully operational within 180 days of July 1, 1991. Until such groundwater monitoring system is fully operational, the owner or operator shall continue to comply with 40 CFR Part 265, Subpart F. This groundwater monitoring system shall include: (A) a sufficient number of background monitoring points (at least one) installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater that has not been affected by a release from the regulated unit; (B) for a detection monitoring program under section 66265.98: 1. a sufficient number of monitoring points (at least three) installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the point of compliance and to allow for the detection of a release from the regulated unit; 2. a sufficient number of monitoring points installed at additional locations and depths to yield groundwater samples from the uppermost aquifer as necessary to provide the best assurance of the earliest possible detection of a release from the regulated unit; and 3. a sufficient number of monitoring points and background monitoring points installed at appropriate locations and depths to yield groundwater samples from other aquifers, low-yielding saturated zones and from zones of perched water as necessary to provide the best assurance of the earliest possible detection of a release from the regulated unit; and (C) for an evaluation monitoring program under section 66265.99: 1. a sufficient number of monitoring points (at least three) installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the point of compliance, and at other locations in the uppermost aquifer as necessary, to provide the data needed to evaluate changes in water quality due to the release from the regulated unit; and 2. a sufficient number of monitoring points and background monitoring points installed at appropriate locations and depths to yield groundwater samples from other aquifers,

low-yielding saturated zones and zones of perched water as necessary to provide the data needed to evaluate changes in water quality due to the release from the regulated unit.

**(A)**

a sufficient number of background monitoring points (at least one) installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater that has not been affected by a release from the regulated unit;

**(B)**

for a detection monitoring program under section 66265.98: 1. a sufficient number of monitoring points (at least three) installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the point of compliance and to allow for the detection of a release from the regulated unit; 2. a sufficient number of monitoring points installed at additional locations and depths to yield groundwater samples from the uppermost aquifer as necessary to provide the best assurance of the earliest possible detection of a release from the regulated unit; and 3. a sufficient number of monitoring points and background monitoring points installed at appropriate locations and depths to yield groundwater samples from other aquifers, low-yielding saturated zones and from zones of perched water as necessary to provide the best assurance of the earliest possible detection of a release from the regulated unit; and

**1.**

a sufficient number of monitoring points (at least three) installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the point of compliance and to allow for the detection of a release from the regulated unit;

**2.**

a sufficient number of monitoring points installed at additional locations and depths to yield

groundwater samples from the uppermost aquifer as necessary to provide the best assurance of the earliest possible detection of a release from the regulated unit; and

**3.**

a sufficient number of monitoring points and background monitoring points installed at appropriate locations and depths to yield groundwater samples from other aquifers, low-yielding saturated zones and from zones of perched water as necessary to provide the best assurance of the earliest possible detection of a release from the regulated unit; and

**(C)**

for an evaluation monitoring program under section 66265.99: 1. a sufficient number of monitoring points (at least three) installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the point of compliance, and at other locations in the uppermost aquifer as necessary, to provide the data needed to evaluate changes in water quality due to the release from the regulated unit; and 2. a sufficient number of monitoring points and background monitoring points installed at appropriate locations and depths to yield groundwater samples from other aquifers, low-yielding saturated zones and zones of perched water as necessary to provide the data needed to evaluate changes in water quality due to the release from the regulated unit.

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a sufficient number of monitoring points (at least three) installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the point of compliance, and at other locations in the uppermost aquifer as necessary, to provide the data needed to evaluate changes in water quality due to the release from the regulated unit; and

**2.**

a sufficient number of monitoring points and background monitoring points installed at appropriate

locations and depths to yield groundwater samples from other aquifers, low-yielding saturated zones and zones of perched water as necessary to provide the data needed to evaluate changes in water quality due to the release from the regulated unit.

**(2)**

The groundwater monitoring system may include background monitoring points that are not hydraulically upgradient of the regulated unit if documentation is maintained in the facility operating record that demonstrates that sampling at other monitoring points will provide samples that are representative of the background quality of groundwater or are more representative than those provided by the upgradient monitoring points.

**(3)**

A copy of each well report, as required by Water Code section 13751, shall be submitted to the Department within 60 days of the construction, alteration, or destruction of the well.

**(4)**

All monitoring wells shall be cased and constructed in a manner that maintains the integrity of the monitoring well bore hole and prevents the bore hole from acting as a conduit for contaminant transport.

**(5)**

The sampling interval of each monitoring well shall be appropriately screened and fitted with an appropriate filter pack to enable collection of representative groundwater samples.

**(6)**

For each monitoring well the annular space (i.e., the space between the bore hole and well casing) above and below the sampling interval shall be appropriately sealed to prevent entry of contaminants from the surface, entry of contaminants from the

unsaturated zone, cross contamination of saturated zones and contamination of samples.

**(7)**

All monitoring wells shall be adequately developed to enable collection of representative groundwater samples.

**(8)**

All wells shall be adequately destroyed (decommissioned) if the wells no longer provide useful information. Decommissioning may only proceed after approval by the Department or as directed by the Department.

**(c)**

Surface Water Monitoring System. (1) The owner or operator shall establish a surface water monitoring system to monitor each surface water body that could be affected by a release from the regulated unit. (2) Each surface water monitoring system shall include:(A) a sufficient number of background monitoring points established at appropriate locations and depths to yield samples from each surface water body that represent the quality of the surface water that has not been affected by a release from the regulated units; (B) for a detection monitoring program under section 66265.98, a sufficient number of monitoring points established at appropriate locations and depths to yield samples from each surface water body that provide the best assurance of the earliest possible detection of a release from the regulated unit; and (C) for an evaluation monitoring program under section 66265.99, a sufficient number of monitoring points established at appropriate locations and depths to yield samples from each surface water body that provide the data necessary to evaluate changes in water quality due to the release from the regulated unit. (3) The owner or operator may modify or exclude certain chapter 15, article 6 requirements pertaining to

surface water monitoring if it is impracticable or technically inappropriate to comply with surface water monitoring requirements listed in this article. The owner or operator shall make an appropriate demonstration for alternative surface water monitoring requirements and obtain written approval from the Department before incorporating any changes into the water quality sampling and analysis plan.

**(1)**

The owner or operator shall establish a surface water monitoring system to monitor each surface water body that could be affected by a release from the regulated unit.

**(2)**

Each surface water monitoring system shall include:(A) a sufficient number of background monitoring points established at appropriate locations and depths to yield samples from each surface water body that represent the quality of the surface water that has not been affected by a release from the regulated units; (B) for a detection monitoring program under section 66265.98, a sufficient number of monitoring points established at appropriate locations and depths to yield samples from each surface water body that provide the best assurance of the earliest possible detection of a release from the regulated unit; and (C) for an evaluation monitoring program under section 66265.99, a sufficient number of monitoring points established at appropriate locations and depths to yield samples from each surface water body that provide the data necessary to evaluate changes in water quality due to the release from the regulated unit.

**(A)**

a sufficient number of background monitoring points established at appropriate locations and depths to yield samples from each surface water body that represent the quality of the surface water that has not been affected by a release from the regulated units;

**(B)**

for a detection monitoring program under section 66265.98, a sufficient number of monitoring points established at appropriate locations and depths to yield samples from each surface water body that provide the best assurance of the earliest possible detection of a release from the regulated unit; and

**(C)**

for an evaluation monitoring program under section 66265.99, a sufficient number of monitoring points established at appropriate locations and depths to yield samples from each surface water body that provide the data necessary to evaluate changes in water quality due to the release from the regulated unit.

**(3)**

The owner or operator may modify or exclude certain chapter 15, article 6 requirements pertaining to surface water monitoring if it is impracticable or technically inappropriate to comply with surface water monitoring requirements listed in this article. The owner or operator shall make an appropriate demonstration for alternative surface water monitoring requirements and obtain written approval from the Department before incorporating any changes into the water quality sampling and analysis plan.

**(d)**

Unsaturated Zone Monitoring System. (1) Except as otherwise provided in subsection (d)(5) of this section, the owner or operator shall establish an unsaturated zone monitoring system for each regulated unit. (2) The unsaturated zone monitoring system shall include:(A) a sufficient number of background monitoring points established at appropriate locations and depths to yield soil-pore liquid samples or soil-pore liquid measurements that represent the quality of soil-pore liquid that has not been affected by a release from the

regulated unit; (B) for a detection monitoring program under section 66265.98, a sufficient number of monitoring points established at appropriate locations and depths to yield soil-pore liquid samples or soil-pore liquid measurements that provide the best assurance of the earliest possible detection of a release from the regulated unit; and (C) for an evaluation monitoring program under section 66265.99, a sufficient number of monitoring points established at appropriate locations and depths to yield soil-pore liquid samples or soil-pore liquid measurements as necessary to provide the data needed to evaluate changes in water quality due to the release from the regulated unit. (3) Background monitoring points shall be installed at a background plot having soil characteristics similar to those of the soil underlying the regulated unit. (4) The owner or operator shall install liquid recovery types of unsaturated zone monitoring (e.g., the use of lysimeters) unless the owner or operator submits to the Department, and maintains in the facility operating record, evidence that such methods of unsaturated zone monitoring cannot provide useful information regarding a release from the regulated unit. The owner or operator shall install complementary or alternative (nonliquid recovery) types of unsaturated zone monitoring as necessary to adequately monitor a release from the regulated unit. (5) The owner or operator may modify or exclude certain chapter 15, article 6 requirements pertaining to unsaturated zone monitoring if it is impracticable (e.g., insufficient liquid volume for analyses) or technically inappropriate to conduct unsaturated zone monitoring at the regulated unit. The owner or operator shall make an appropriate demonstration for alternative unsaturated zone monitoring requirements and obtain written approval from the Department before incorporating any changes into the water quality sampling and analysis plan. (6) The owner or operator of a land treatment unit shall comply with the unsaturated

zone monitoring and response requirements for that unit in article 13 of this chapter, in addition to the unsaturated zone monitoring requirements of this article.

**(1)**

Except as otherwise provided in subsection (d)(5) of this section, the owner or operator shall establish an unsaturated zone monitoring system for each regulated unit.

**(2)**

The unsaturated zone monitoring system shall include:(A) a sufficient number of background monitoring points established at appropriate locations and depths to yield soil-pore liquid samples or soil-pore liquid measurements that represent the quality of soil-pore liquid that has not been affected by a release from the regulated unit; (B) for a detection monitoring program under section 66265.98, a sufficient number of monitoring points established at appropriate locations and depths to yield soil-pore liquid samples or soil-pore liquid measurements that provide the best assurance of the earliest possible detection of a release from the regulated unit; and (C) for an evaluation monitoring program under section 66265.99, a sufficient number of monitoring points established at appropriate locations and depths to yield soil-pore liquid samples or soil-pore liquid measurements as necessary to provide the data needed to evaluate changes in water quality due to the release from the regulated unit.

**(A)**

a sufficient number of background monitoring points established at appropriate locations and depths to yield soil-pore liquid samples or soil-pore liquid measurements that represent the quality of soil-pore liquid that has not been affected by a release from the regulated unit;

**(B)**

for a detection monitoring program under section 66265.98, a sufficient number of

monitoring points established at appropriate locations and depths to yield soil-pore liquid samples or soil-pore liquid measurements that provide the best assurance of the earliest possible detection of a release from the regulated unit; and

**(C)**

for an evaluation monitoring program under section 66265.99, a sufficient number of monitoring points established at appropriate locations and depths to yield soil-pore liquid samples or soil-pore liquid measurements as necessary to provide the data needed to evaluate changes in water quality due to the release from the regulated unit.

**(3)**

Background monitoring points shall be installed at a background plot having soil characteristics similar to those of the soil underlying the regulated unit.

**(4)**

The owner or operator shall install liquid recovery types of unsaturated zone monitoring (e.g., the use of lysimeters) unless the owner or operator submits to the Department, and maintains in the facility operating record, evidence that such methods of unsaturated zone monitoring cannot provide useful information regarding a release from the regulated unit. The owner or operator shall install complementary or alternative (nonliquid recovery) types of unsaturated zone monitoring as necessary to adequately monitor a release from the regulated unit.

**(5)**

The owner or operator may modify or exclude certain chapter 15, article 6 requirements pertaining to unsaturated zone monitoring if it is impracticable (e.g., insufficient liquid volume for analyses) or technically inappropriate to conduct unsaturated zone monitoring at the regulated unit. The owner or operator shall make an appropriate demonstration for alternative unsaturated zone monitoring requirements and obtain written approval from the Department before incorporating

any changes into the water quality sampling and analysis plan.

**(6)**

The owner or operator of a land treatment unit shall comply with the unsaturated zone monitoring and response requirements for that unit in article 13 of this chapter, in addition to the unsaturated zone monitoring requirements of this article.

**(e)**

General Monitoring Requirements. (1) All monitoring systems shall be designed and certified by a registered geologist or a registered civil engineer. (2) All monitoring wells and all other borings drilled to satisfy the requirements of this article shall be logged during drilling under the direct supervision of a registered geologist. These logs shall be submitted to the Department upon completion of drilling. (A) Soil shall be described in the geologic log according to the Unified Soil Classification System as presented in Geotechnical Branch Training Manuals Nos. 4, 5 and 6, published by the United States Bureau of Reclamation, January 1986, incorporated by reference in section 66260.11 of this division. (B) Rock shall be described in the geologic log in a manner appropriate for the purpose of the investigation. (C) Where possible, the depth and thickness of saturated zones shall be recorded in the geologic log. (3) If a facility contains contiguous regulated units, separate groundwater monitoring systems are not required for each such unit if the water quality monitoring program for each unit will enable the earliest possible detection and measurement of a release from that unit. (4) The water quality monitoring program shall include consistent sampling and analytical procedures that are designed to ensure that monitoring results provide a reliable indication of water quality at all monitoring points and background monitoring points. At a minimum the program shall include a detailed description of the procedures and techniques for: (A) sample collection (e.g., purging techniques,

sampling equipment and decontamination of sampling equipment); (B) sample preservation and shipment; (C) analytical procedures; and (D) chain of custody control. (5) The water quality monitoring program shall include appropriate sampling and analytical methods for groundwater, surface water and the unsaturated zone that accurately measure the concentration of each constituent of concern and the concentration or value of each monitoring parameter. (6) For each regulated unit, the owner or operator shall collect all data necessary for selecting the appropriate statistical methods pursuant to subsections (e)(7), (e)(8) and (e)(9) of this section and for establishing the background values pursuant to subsection (e)(11) of this section. At a minimum, this data shall include analytical data obtained during quarterly sampling of all background monitoring points for a period of one year, including the times of expected highest and lowest annual elevations of the groundwater surface. The Department may approve sampling at times other than the expected highest and lowest annual elevations, if appropriate, however quarterly sampling is still required for a period of at least one year. For a new regulated unit, this data shall be collected before wastes are discharged at the unit and background soil pore liquid data shall be collected from beneath the unit before the unit is constructed. (7) Based on data collected pursuant to subsection (e)(6) of this section the owner or operator shall select one of the statistical methods specified in subsection (e)(8) of this section for each constituent of concern and for each monitoring parameter. These methods shall be specified in the water quality sampling and analysis plan and shall be used in evaluating water quality monitoring data. The specifications for each statistical method shall include a detailed description of the criteria to be used for determining statistically significant evidence of any release from the regulated unit and for determining compliance with the water quality protection standard.

Each statistical test specified for a particular constituent of concern or monitoring parameter shall be conducted separately for that constituent of concern or monitoring parameter at each monitoring point. The owner or operator shall maintain sufficient documentation in the facility operating record to demonstrate that use of the selected statistical methods will be protective of human health and the environment and will comply with the performance standards outlined in subsection (e)(9) of this section. (8) The owner or operator shall specify one of the following statistical methods in the water quality sampling and analysis plan:(A) a parametric analysis of variance (ANOVA) followed in all instances by a multiple comparisons procedure to identify statistically significant evidence of a release from the regulated unit. The method shall include estimation and testing of the contrasts between each monitoring point's mean and the background mean value for each constituent of concern or monitoring parameter; (B) an analysis of variance (ANOVA) based on ranks followed in all instances by a multiple comparisons procedure to identify statistically significant evidence of a release from the regulated unit. The method shall include estimation and testing of the contrasts between each monitoring point's median and the background median values for each constituent of concern or monitoring parameter; (C) a tolerance or prediction interval procedure in which an interval for each constituent of concern or monitoring parameter is established from the distribution of the background data, and the value for each constituent of concern or monitoring parameter at each monitoring point is compared to the upper tolerance or prediction limit; (D) a control chart approach that gives control limits for each constituent of concern or monitoring parameter; or (E) another statistical test method if sufficient documentation to support selection of the method is submitted to the Department and is maintained in the facility operating record. If the statistical test method

includes a procedure to verify that there is statistically significant evidence of a release from the regulated unit, this procedure shall consist of either a single composite retest (i.e., a statistical analysis of the original data combined with newly-acquired data from the monitoring point at which evidence of a release has been indicated) or shall consist of at least two discrete retests (i.e., statistical analyses which analyze only newly-acquired data from the monitoring point at which evidence of a release has been indicated). The verification procedure shall comply with the following requirements in addition to the statistical performance standards under subsection (e)(9) of this section. 1. If the verification procedure consists of discrete retests, rejection of the null hypothesis for any one of the retests shall be considered confirmation of significant evidence of a release. 2. The number of additional samples collected and analyzed for use in the verification procedure shall be appropriate for the form of statistical test specified in the water quality sampling and analysis plan for that constituent of concern or monitoring parameter pursuant to subsection (e)(7) of this section. This number shall be greater than or equal to the number of samples specified in the water quality sampling and analysis plan for that constituent of concern or monitoring parameter pursuant to subsection (e)(12)(A) of this section. 3. If resampling at the interval identified for use in the initial statistical test pursuant to subsection (e)(12)(B) of this section would cause the entire resampling effort to take longer than 30 days, the sampling interval for use in the verification procedures shall be reduced to ensure that all samples are collected and submitted for laboratory analysis within 30 calendar days from the time that the owner or operator determines statistically significant evidence of a release pursuant to subsection 66265.98(g) or (i). Resampling may occur within a different time frame provided the owner or operator receives written approval from the Department. 4. For a

verification procedure consisting of a composite retest, the statistical verification procedure shall be based on all data obtained from the initial sampling event combined with all data obtained during the resampling event. For a verification procedure consisting of discrete retests, each shall analyze data obtained during its respective resampling event and no data shall be shared between retests. 5. For a verification procedure consisting of a composite retest, the statistical test method used in the verification procedure shall be the same as the method used in the initial statistical comparison, except that the statistical test used in the verification procedure shall be conducted at a Type 1 error level of no less than 0.05 for both the experimentwise analysis (if any) and the individual monitoring point comparisons; therefore, if a control chart approach is used to evaluate water quality monitoring data, the upper limit on an X-Bar or R-Chart must be set at no more than 1.645 standard deviations of the statistic plotted for a one-sided statistical comparison or at no more than 1.96 standard deviations of the statistic plotted for a two-sided statistical comparison. 6. For a verification procedure consisting of discrete retests, the statistical method used shall be the same as the method used in the initial statistical comparison. Notwithstanding any provision of subsection (e)(9) of this section, the critical value for the tests shall be chosen so that the Type I error rate for all individual monitoring point comparisons is the same, whether for an initial test or for a retest, and is equal-to-or-greater than either 1-0. 951/(mws))0.5 x (1/r)0.5 or 1-(.99)1/6 whichever is larger, where: m = the number of monitoring parameters; w = the number of monitoring points at the waste management units; s = the number of times that suites of monitoring data from the waste management unit are subjected to initial statistical analysis within a period of six months (i.e., s > 1); and r = the number of discrete retests that are to be conducted at a monitoring point whose initial statistical analysis for

a given constituent of concern or monitoring paramenter has indicated the presence of a release (i.e., r > 2). 7. The owner or operator shall report to the Department by certified mail the results of both the initial statistical test and the results of the verification procedure as well as all concentration data collected for use in these tests within seven days of the last laboratory analysis of the samples collected for the verification procedure. 8. The verification procedure shall only be performed for the constituent(s) which has shown statistically significant evidence of a release, and shall only be performed for that (those) monitoring point at which a release has been indicated. (9) Each statistical method chosen under subsection (e)(7) of this section shall comply with the following performance standards for each six-month period. (A) The statistical method used to evaluate water quality monitoring data shall be appropriate for the distribution of the constituent of concern or monitoring parameter to which it is applied and shall be the least likely of the appropriate methods to fail to identify a release from the regulated unit. If the distribution of a constituent of concern or monitoring parameter is inappropriate for a normal theory test, then the data shall be either transformed so that the distribution of the transformed data is appropriate for a normal theory test or a distribution-free theory test shall be used. If the distributions for the constituents of concern or monitoring parameters differ, more than one statistical method may be needed. (B) If an individual monitoring point comparison procedure is used to compare an individual monitoring point constituent concentration or monitoring parameter value with a background parameter value or with a concentration limit in the water quality protection standard or with a background monitoring parameter value, the test shall be done at a Type I error level no less than 0.01. If a multiple comparisons procedure is used, the Type I experimentwise error rate shall be no less than 0.05; however,

the Type I error of no less than 0.01 for each individual monitoring point comparison shall be maintained. This performance standard does not apply to tolerance intervals, prediction intervals or control charts. (C) If a control chart approach is used to evaluate water quality, monitoring data, the specific type of control chart and its associated statistical parameter values (e.g., the upper control limit), shall be protective of human health and the environment. Any control charting procedure must have a false-positive rate of no less than 1 percent for each monitoring point charted (e.g., upper control limits on X-bar or R-charts used only once every six months must be set at no more than 2.327 standard deviations of the statistic plotted for a one-sided statistical comparison or at no more than 2.576 standard deviations of the statistic plotted for a two-sided statistical comparison). (D) If a tolerance interval or a prediction interval is used to evaluate water quality monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain shall be protective of human health and the environment. These statistical parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentrations or values for each constituent of concern or monitoring parameter. The coverage of any tolerance interval used must be no more than 95 percent and the confidence coefficient must be no more than 95 percent for a six-month period. Prediction intervals shall be constructed with an experimentwise error rate of no less than 5 percent and an individual monitoring point error rate of no less than 1 percent. (E) The statistical method shall account for data below the practical quantification quantitation limit with one or more statistical procedures that are protective of human health and the environment. Any practical quantitation limit that is used in the statistical method shall be the lowest concentration (or value)

that can be reliably achieved within limits of precision and accuracy specified in the water quality sampling and analysis plan for routine laboratory operating conditions that are available to the facility. (F) If necessary, the statistical methods shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data. (G) Any quality control procedure that is approved by the Department for application to water quality data from downgradient monitoring points for a monitored medium shall also be applied to all newly-acquired background data from that medium. Any newly-acquired background monitoring datum that is rejected by an approved quality control procedure shall be maintained in the facility record but shall be excluded from use in statistical comparisons with downgradient water quality data. (10) Based on the data collected pursuant to subsection (e)(6) of this section and the statistical methods specified pursuant to subsection (e)(7) of this section, the owner or operator shall select and justify the use of a procedure for determining a background value for each constituent of concern and for each monitoring parameter specified in the water quality sampling and analysis plan. One of the following procedures shall be selected for groundwater, surface water and the unsaturated zone: (A) a procedure for determining the background value for each constituent or parameter that does not display appreciable natural variation; or (B) a procedure for establishing and updating the background value for a constituent or parameter to reflect changes in the background water quality if the use of contemporaneous or pooled data provides the greatest power to the statistical method for that constituent or parameter. (11) Using the procedures for determining background values proposed pursuant to subsection (e)(10) of this section, the owner or operator shall specify in the water quality sampling and analysis plan one of the following for each constituent of concern and for each

monitoring parameter: (A) the background value established by the owner or operator using the procedure selected pursuant to subsection (e)(10)(A) of this section; or (B) a detailed description of the procedure, selected pursuant to subsection (e)(10)(B) of this section, to be used by the owner or operator for establishing and updating the background value. (12) For each constituent of concern and monitoring parameter listed in the water quality sampling and analysis plan, the owner or operator shall specify in the water quality sampling and analysis plan the sampling methods to be used to establish background values and the sampling methods to be used for monitoring pursuant to this article. (A) The number and kinds of samples collected shall be appropriate for the form of statistical test employed, following generally accepted statistical principles. The sample size shall be as large as necessary to ensure with reasonable confidence that: 1. for a detection monitoring program, a release from the regulated unit will be detected; and 2. for an evaluation monitoring program, changes in water quality due to a release from the regulated unit will be recognized. (B) The sampling method (including sampling frequency and the interval of time between successive samples) shall be appropriate for the medium from which samples are taken (e.g., groundwater, surface water and soil-pore liquid). The sampling method shall include either:1. a sequence of at least four samples from each monitoring point, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained. For groundwater, this interval shall be based upon the rate of groundwater movement in the aquifer and upon the fate and transport characteristics of the potential contaminants or pollutants. The rate of groundwater movement shall be calculated by reference to the aquifer's effective porosity, hydraulic conductivity and hydraulic gradient; or 2. an alternate sampling method if sufficient

documentation is submitted to the Department and is maintained in the facility operating record to support selection of the method. (13) The groundwater portion of the monitoring program shall include an accurate determination of the groundwater surface elevation and field parameters (temperature, electrical conductivity, turbidity and pH) at each well each time groundwater is sampled. Field parameter determinations may be modified or waived, after receiving written approval by the Department, if the owner or operator can demonstrate that representative samples are obtained. Any modifications to field parameter determinations shall be specified in the water quality sampling and analysis plan. (14) The owner or operator shall graph all analytical data from each monitoring point and background monitoring point and shall submit these graphs to the Department at least annually, except graphs are not required for constituents for which no new data have been collected since the previous graph submittal. Each graph shall represent data for one constituent of concern or monitoring parameter and shall be at a scale appropriate to show trends or variations in water quality. Unless the owner or operator receives written approval from the Department to use an alternate procedure, each graph shall include data from related monitoring and background points as long as the depicted data effectively illustrates trends or variations in the data. (15) In addition to the water quality sampling conducted pursuant to the requirements of this article, the owner or operator shall measure the water level in each well and determine groundwater flow rate and direction in the uppermost aquifer and in any zones of perched water and in any additional aquifers monitored pursuant to subsection (b)(1) of this section at least quarterly, including the times of expected highest and lowest annual elevations of the water levels in the wells. The Department may approve collection of water level measurements at times other than the expected highest and lowest water

level elevations, if appropriate, however quarterly measurements are still required. The owner or operator shall use this data to determine, at least annually, whether the requirements of section 66265.97(b)(1) are satisfied. If the evaluation shows that the requirements of section 66265.97(b)(1) are not satisfied the owner or operator shall, as soon as technically feasible, modify the number, location or depth of the groundwater monitoring wells as necessary to bring the groundwater monitoring system into compliance with the requirements of this article. (16) Except as provided below, for all background monitoring points in groundwater, the owner or operator must, within 12 months of July 1, 1991, establish background concentrations or values for all constituents listed in Table 1 by sampling quarterly for one year. Results of this sampling shall be submitted to the Department within 15 days after completing each quarterly analysis. If an owner or operator has previously established background for these parameters pursuant to 40 C.F.R. Part 265 by quarterly sampling for at least one year, the owner or operator shall maintain a record of that sampling and analysis in the facility operating record and shall not repeat the sampling and analysis. Table 1 Background Water Quality Parameters ArsenicBarium CadmiumChloride ChromiumColiform Bacteria EndrinFluoride Gross AlphaGross Beta IronLead LindaneManganese MercuryMethoxychlor Nitrate (as N)pH PhenolsRadium SeleniumSilver SodiumSpecific Conductance SulfateToxaphene 2,4-D2,4,5.TP Silver Total Organic CarbonTotal Organic Halogen Turbidity (17) Water quality monitoring data collected in accordance with this article, including actual concentrations or values of all constituents and parameters, all background water quality data, all statistical evaluations, all water level elevation data and all data used to derive the groundwater flow rate and direction shall be maintained in the facility operating record throughout the active life of the facility and throughout

the postclosure care period. The owner or operator shall submit this data to the Department at least annually. This information shall be submitted no later than March 1 following each calendar year. The Department shall require more frequent reporting where necessary to protect human health or the environment.

**(1)**

All monitoring systems shall be designed and certified by a registered geologist or a registered civil engineer.

**(2)**

All monitoring wells and all other borings drilled to satisfy the requirements of this article shall be logged during drilling under the direct supervision of a registered geologist. These logs shall be submitted to the Department upon completion of drilling. (A) Soil shall be described in the geologic log according to the Unified Soil Classification System as presented in Geotechnical Branch Training Manuals Nos. 4, 5 and 6, published by the United States Bureau of Reclamation, January 1986, incorporated by reference in section 66260.11 of this division. (B) Rock shall be described in the geologic log in a manner appropriate for the purpose of the investigation. (C) Where possible, the depth and thickness of saturated zones shall be recorded in the geologic log.

**(A)**

Soil shall be described in the geologic log according to the Unified Soil Classification System as presented in Geotechnical Branch Training Manuals Nos. 4, 5 and 6, published by the United States Bureau of Reclamation, January 1986, incorporated by reference in section 66260.11 of this division.

**(B)**

Rock shall be described in the geologic log in a manner appropriate for the purpose of the investigation.

**(C)**

Where possible, the depth and thickness of saturated zones shall be recorded in the geologic log.

**(3)**

If a facility contains contiguous regulated units, separate groundwater monitoring systems are not required for each such unit if the water quality monitoring program for each unit will enable the earliest possible detection and measurement of a release from that unit.

**(4)**

The water quality monitoring program shall include consistent sampling and analytical procedures that are designed to ensure that monitoring results provide a reliable indication of water quality at all monitoring points and background monitoring points. At a minimum the program shall include a detailed description of the procedures and techniques for: (A) sample collection (e.g., purging techniques, sampling equipment and decontamination of sampling equipment); (B) sample preservation and shipment; (C) analytical procedures; and (D) chain of custody control.

**(A)**

sample collection (e.g., purging techniques, sampling equipment and decontamination of sampling equipment);

**(B)**

sample preservation and shipment;

**(C)**

analytical procedures; and

**(D)**

chain of custody control.

**(5)**

The water quality monitoring program shall include appropriate sampling and analytical methods for groundwater, surface water and the unsaturated zone that accurately measure the concentration of each constituent of concern and the concentration or value of each monitoring parameter.

**(6)**

For each regulated unit, the owner or operator shall collect all data necessary for selecting the appropriate statistical methods pursuant to subsections (e)(7), (e)(8) and (e)(9) of this section and for establishing the background values pursuant to subsection (e)(11) of this section. At a minimum, this data shall include analytical data obtained during quarterly sampling of all background monitoring points for a period of one year, including the times of expected highest and lowest annual elevations of the groundwater surface. The Department may approve sampling at times other than the expected highest and lowest annual elevations, if appropriate, however quarterly sampling is still required for a period of at least one year. For a new regulated unit, this data shall be collected before wastes are discharged at the unit and background soil pore liquid data shall be collected from beneath the unit before the unit is constructed.

**(7)**

Based on data collected pursuant to subsection (e)(6) of this section the owner or operator shall select one of the statistical methods specified in subsection (e)(8) of this section for each constituent of concern and for each monitoring parameter. These methods shall be specified in the water quality sampling and analysis plan and shall be used in evaluating water quality monitoring data. The specifications for each statistical method shall include a detailed description of the criteria to be used for determining statistically significant evidence of any release from the regulated unit and for determining compliance with the water quality protection standard. Each statistical test specified for a particular constituent of concern or monitoring parameter shall be

conducted separately for that constituent of concern or monitoring parameter at each monitoring point. The owner or operator shall maintain sufficient documentation in the facility operating record to demonstrate that use of the selected statistical methods will be protective of human health and the environment and will comply with the performance standards outlined in subsection (e)(9) of this section.

**(8)**

The owner or operator shall specify one of the following statistical methods in the water quality sampling and analysis plan:(A) a parametric analysis of variance (ANOVA) followed in all instances by a multiple comparisons procedure to identify statistically significant evidence of a release from the regulated unit. The method shall include estimation and testing of the contrasts between each monitoring point's mean and the background mean value for each constituent of concern or monitoring parameter; (B) an analysis of variance (ANOVA) based on ranks followed in all instances by a multiple comparisons procedure to identify statistically significant evidence of a release from the regulated unit. The method shall include estimation and testing of the contrasts between each monitoring point's median and the background median values for each constituent of concern or monitoring parameter; (C) a tolerance or prediction interval procedure in which an interval for each constituent of concern or monitoring parameter is established from the distribution of the background data, and the value for each constituent of concern or monitoring parameter at each monitoring point is compared to the upper tolerance or prediction limit; (D) a control chart approach that gives control limits for each constituent of concern or monitoring parameter; or (E) another statistical test method if sufficient documentation to support selection of the method is submitted to the Department and is maintained in the facility operating record. If the statistical test method includes a procedure to verify that there is statistically significant evidence of a release from the regulated unit, this procedure shall consist of

either a single composite retest (i.e., a statistical analysis of the original data combined with newly-acquired data from the monitoring point at which evidence of a release has been indicated) or shall consist of at least two discrete retests (i.e., statistical analyses which analyze only newly-acquired data from the monitoring point at which evidence of a release has been indicated). The verification procedure shall comply with the following requirements in addition to the statistical performance standards under subsection (e)(9) of this section. 1. If the verification procedure consists of discrete retests, rejection of the null hypothesis for any one of the retests shall be considered confirmation of significant evidence of a release. 2. The number of additional samples collected and analyzed for use in the verification procedure shall be appropriate for the form of statistical test specified in the water quality sampling and analysis plan for that constituent of concern or monitoring parameter pursuant to subsection (e)(7) of this section. This number shall be greater than or equal to the number of samples specified in the water quality sampling and analysis plan for that constituent of concern or monitoring parameter pursuant to subsection (e)(12)(A) of this section. 3. If resampling at the interval identified for use in the initial statistical test pursuant to subsection (e)(12)(B) of this section would cause the entire resampling effort to take longer than 30 days, the sampling interval for use in the verification procedures shall be reduced to ensure that all samples are collected and submitted for laboratory analysis within 30 calendar days from the time that the owner or operator determines statistically significant evidence of a release pursuant to subsection 66265.98(g) or (i). Resampling may occur within a different time frame provided the owner or operator receives written approval from the Department. 4. For a verification procedure consisting of a composite retest, the statistical verification procedure shall be based on all data obtained from the initial sampling event combined with all data obtained during the resampling event. For a verification procedure consisting of discrete retests,

each shall analyze data obtained during its respective resampling event and no data shall be shared between retests. 5. For a verification procedure consisting of a composite retest, the statistical test method used in the verification procedure shall be the same as the method used in the initial statistical comparison, except that the statistical test used in the verification procedure shall be conducted at a Type 1 error level of no less than 0.05 for both the experimentwise analysis (if any) and the individual monitoring point comparisons; therefore, if a control chart approach is used to evaluate water quality monitoring data, the upper limit on an X-Bar or R-Chart must be set at no more than 1.645 standard deviations of the statistic plotted for a one-sided statistical comparison or at no more than 1.96 standard deviations of the statistic plotted for a two-sided statistical comparison. 6. For a verification procedure consisting of discrete retests, the statistical method used shall be the same as the method used in the initial statistical comparison. Notwithstanding any provision of subsection (e)(9) of this section, the critical value for the tests shall be chosen so that the Type I error rate for all individual monitoring point comparisons is the same, whether for an initial test or for a retest, and is equal-to-or-greater than either 1-0. 951/(mws))0.5 x (1/r)0.5 or 1-(.99)1/6 whichever is larger, where: m = the number of monitoring parameters; w = the number of monitoring points at the waste management units; s = the number of times that suites of monitoring data from the waste management unit are subjected to initial statistical analysis within a period of six months (i.e., s > 1); and r = the number of discrete retests that are to be conducted at a monitoring point whose initial statistical analysis for a given constituent of concern or monitoring paramenter has indicated the presence of a release (i.e., r > 2). 7. The owner or operator shall report to the Department by certified mail the results of both the initial statistical test and the results of the verification procedure as well as all concentration data collected for use in these tests within seven days of the last

laboratory analysis of the samples collected for the verification procedure. 8. The verification procedure shall only be performed for the constituent(s) which has shown statistically significant evidence of a release, and shall only be performed for that (those) monitoring point at which a release has been indicated.

**(A)**

a parametric analysis of variance (ANOVA) followed in all instances by a multiple comparisons procedure to identify statistically significant evidence of a release from the regulated unit. The method shall include estimation and testing of the contrasts between each monitoring point's mean and the background mean value for each constituent of concern or monitoring parameter;

**(B)**

an analysis of variance (ANOVA) based on ranks followed in all instances by a multiple comparisons procedure to identify statistically significant evidence of a release from the regulated unit. The method shall include estimation and testing of the contrasts between each monitoring point's median and the background median values for each constituent of concern or monitoring parameter;

**(C)**

a tolerance or prediction interval procedure in which an interval for each constituent of concern or monitoring parameter is established from the distribution of the background data, and the value for each constituent of concern or monitoring parameter at each monitoring point is compared to the upper tolerance or prediction limit;

**(D)**

a control chart approach that gives control limits for each constituent of concern or monitoring parameter; or

**(E)**

another statistical test method if sufficient documentation to support selection of the

method is submitted to the Department and is maintained in the facility operating record. If the statistical test method includes a procedure to verify that there is statistically significant evidence of a release from the regulated unit, this procedure shall consist of either a single composite retest (i.e., a statistical analysis of the original data combined with newly-acquired data from the monitoring point at which evidence of a release has been indicated) or shall consist of at least two discrete retests (i.e., statistical analyses which analyze only newly-acquired data from the monitoring point at which evidence of a release has been indicated). The verification procedure shall comply with the following requirements in addition to the statistical performance standards under subsection (e)(9) of this section. 1. If the verification procedure consists of discrete retests, rejection of the null hypothesis for any one of the retests shall be considered confirmation of significant evidence of a release. 2. The number of additional samples collected and analyzed for use in the verification procedure shall be appropriate for the form of statistical test specified in the water quality sampling and analysis plan for that constituent of concern or monitoring parameter pursuant to subsection (e)(7) of this section. This number shall be greater than or equal to the number of samples specified in the water quality sampling and analysis plan for that constituent of concern or monitoring parameter pursuant to subsection (e)(12)(A) of this section. 3. If resampling at the interval identified for use in the initial statistical test pursuant to subsection (e)(12)(B) of this section would cause the entire resampling effort to take longer than 30 days, the sampling interval for use in the verification procedures shall be reduced to ensure that all samples are collected and submitted for laboratory analysis within 30 calendar days from the time that the owner or operator determines statistically significant evidence of a release pursuant to subsection 66265.98(g) or (i). Resampling may occur within a different time frame provided the owner or operator receives written approval from the Department. 4. For a verification procedure consisting of a composite retest, the statistical verification procedure shall be based on all data obtained from the initial sampling

event combined with all data obtained during the resampling event. For a verification procedure consisting of discrete retests, each shall analyze data obtained during its respective resampling event and no data shall be shared between retests. 5. For a verification procedure consisting of a composite retest, the statistical test method used in the verification procedure shall be the same as the method used in the initial statistical comparison, except that the statistical test used in the verification procedure shall be conducted at a Type 1 error level of no less than 0.05 for both the experimentwise analysis (if any) and the individual monitoring point comparisons; therefore, if a control chart approach is used to evaluate water quality monitoring data, the upper limit on an X-Bar or R-Chart must be set at no more than 1.645 standard deviations of the statistic plotted for a one-sided statistical comparison or at no more than 1.96 standard deviations of the statistic plotted for a two-sided statistical comparison. 6. For a verification procedure consisting of discrete retests, the statistical method used shall be the same as the method used in the initial statistical comparison. Notwithstanding any provision of subsection (e)(9) of this section, the critical value for the tests shall be chosen so that the Type I error rate for all individual monitoring point comparisons is the same, whether for an initial test or for a retest, and is equal-to-or-greater than either 1-0. 951/(mws))0.5 x (1/r)0.5 or 1-(.99)1/6 whichever is larger, where: m = the number of monitoring parameters; w = the number of monitoring points at the waste management units; s = the number of times that suites of monitoring data from the waste management unit are subjected to initial statistical analysis within a period of six months (i.e., s > 1); and r = the number of discrete retests that are to be conducted at a monitoring point whose initial statistical analysis for a given constituent of concern or monitoring paramenter has indicated the presence of a release (i.e., r > 2). 7. The owner or operator shall report to the Department by certified mail the results of both the initial statistical test and the results of the verification procedure as well as all concentration data collected for use in these tests within seven days of the last laboratory analysis of the

samples collected for the verification procedure. 8. The verification procedure shall only be performed for the constituent(s) which has shown statistically significant evidence of a release, and shall only be performed for that (those) monitoring point at which a release has been indicated.

**1.**

If the verification procedure consists of discrete retests, rejection of the null hypothesis for any one of the retests shall be considered confirmation of significant evidence of a release.

**2.**

The number of additional samples collected and analyzed for use in the verification procedure shall be appropriate for the form of statistical test specified in the water quality sampling and analysis plan for that constituent of concern or monitoring parameter pursuant to subsection (e)(7) of this section. This number shall be greater than or equal to the number of samples specified in the water quality sampling and analysis plan for that constituent of concern or monitoring parameter pursuant to subsection (e)(12)(A) of this section.

**3.**

If resampling at the interval identified for use in the initial statistical test pursuant to subsection (e)(12)(B) of this section would cause the entire resampling effort to take longer than 30 days, the sampling interval for use in the verification procedures shall be reduced to ensure that all samples are collected and submitted for laboratory analysis within 30 calendar days from the time that the owner or operator determines statistically significant evidence of a release pursuant to subsection 66265.98(g) or (i). Resampling may occur within a different time frame provided the owner or operator receives written approval from the Department.

**4.**

For a verification procedure consisting of a composite retest, the statistical verification procedure shall be based on all data obtained from the initial sampling event combined with all data obtained during the resampling event. For a verification procedure consisting of discrete retests, each shall

analyze data obtained during its respective resampling event and no data shall be shared between retests.

**5.**

For a verification procedure consisting of a composite retest, the statistical test method used in the verification procedure shall be the same as the method used in the initial statistical comparison, except that the statistical test used in the verification procedure shall be conducted at a Type 1 error level of no less than 0.05 for both the experimentwise analysis (if any) and the individual monitoring point comparisons; therefore, if a control chart approach is used to evaluate water quality monitoring data, the upper limit on an X-Bar or R-Chart must be set at no more than 1.645 standard deviations of the statistic plotted for a one-sided statistical comparison or at no more than 1.96 standard deviations of the statistic plotted for a two-sided statistical comparison.

**6.**

For a verification procedure consisting of discrete retests, the statistical method used shall be the same as the method used in the initial statistical comparison. Notwithstanding any provision of subsection (e)(9) of this section, the critical value for the tests shall be chosen so that the Type I error rate for all individual monitoring point comparisons is the same, whether for an initial test or for a retest, and is equal-to-or-greater than either 1-0. 951/(mws))0.5 x (1/r)0.5 or 1-(.99)1/6 whichever is larger, where: m = the number of monitoring parameters; w = the number of monitoring points at the waste management units; s = the number of times that suites of monitoring data from the waste management unit are subjected to initial statistical analysis within a period of six months (i.e., s > 1); and r = the number of discrete retests that are to be conducted at a monitoring point whose initial statistical analysis for a given constituent of concern or monitoring paramenter has indicated the presence of a release (i.e., r > 2).

**7.**

The owner or operator shall report to the Department by certified mail the results of both the initial statistical test and the results of the verification procedure as well as all concentration data

collected for use in these tests within seven days of the last laboratory analysis of the samples collected for the verification procedure.

**8.**

The verification procedure shall only be performed for the constituent(s) which has shown statistically significant evidence of a release, and shall only be performed for that (those) monitoring point at which a release has been indicated.

**(9)**

Each statistical method chosen under subsection (e)(7) of this section shall comply with the following performance standards for each six-month period. (A) The statistical method used to evaluate water quality monitoring data shall be appropriate for the distribution of the constituent of concern or monitoring parameter to which it is applied and shall be the least likely of the appropriate methods to fail to identify a release from the regulated unit. If the distribution of a constituent of concern or monitoring parameter is inappropriate for a normal theory test, then the data shall be either transformed so that the distribution of the transformed data is appropriate for a normal theory test or a distribution-free theory test shall be used. If the distributions for the constituents of concern or monitoring parameters differ, more than one statistical method may be needed. (B) If an individual monitoring point comparison procedure is used to compare an individual monitoring point constituent concentration or monitoring parameter value with a background parameter value or with a concentration limit in the water quality protection standard or with a background monitoring parameter value, the test shall be done at a Type I error level no less than 0.01. If a multiple comparisons procedure is used, the Type I experimentwise error rate shall be no less than 0.05; however, the Type I error of no less than 0.01 for each individual monitoring point comparison shall be maintained. This performance standard does not apply to tolerance intervals, prediction intervals or control charts. (C) If a control chart

approach is used to evaluate water quality, monitoring data, the specific type of control chart and its associated statistical parameter values (e.g., the upper control limit), shall be protective of human health and the environment. Any control charting procedure must have a false-positive rate of no less than 1 percent for each monitoring point charted (e.g., upper control limits on X-bar or R-charts used only once every six months must be set at no more than 2.327 standard deviations of the statistic plotted for a one-sided statistical comparison or at no more than 2.576 standard deviations of the statistic plotted for a two-sided statistical comparison). (D) If a tolerance interval or a prediction interval is used to evaluate water quality monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain shall be protective of human health and the environment. These statistical parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentrations or values for each constituent of concern or monitoring parameter. The coverage of any tolerance interval used must be no more than 95 percent and the confidence coefficient must be no more than 95 percent for a six-month period. Prediction intervals shall be constructed with an experimentwise error rate of no less than 5 percent and an individual monitoring point error rate of no less than 1 percent. (E) The statistical method shall account for data below the practical quantification quantitation limit with one or more statistical procedures that are protective of human health and the environment. Any practical quantitation limit that is used in the statistical method shall be the lowest concentration (or value) that can be reliably achieved within limits of precision and accuracy specified in the water quality sampling and analysis plan for routine laboratory operating conditions that are available to the facility. (F) If necessary, the statistical methods shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data. (G) Any

quality control procedure that is approved by the Department for application to water quality data from downgradient monitoring points for a monitored medium shall also be applied to all newly-acquired background data from that medium. Any newly-acquired background monitoring datum that is rejected by an approved quality control procedure shall be maintained in the facility record but shall be excluded from use in statistical comparisons with downgradient water quality data.

**(A)**

The statistical method used to evaluate water quality monitoring data shall be appropriate for the distribution of the constituent of concern or monitoring parameter to which it is applied and shall be the least likely of the appropriate methods to fail to identify a release from the regulated unit. If the distribution of a constituent of concern or monitoring parameter is inappropriate for a normal theory test, then the data shall be either transformed so that the distribution of the transformed data is appropriate for a normal theory test or a distribution-free theory test shall be used. If the distributions for the constituents of concern or monitoring parameters differ, more than one statistical method may be needed.

**(B)**

If an individual monitoring point comparison procedure is used to compare an individual monitoring point constituent concentration or monitoring parameter value with a background parameter value or with a concentration limit in the water quality protection standard or with a background monitoring parameter value, the test shall be done at a Type I error level no less than 0.01. If a multiple comparisons procedure is used, the Type I experimentwise error rate shall be no less than 0.05; however, the Type I error of no less than 0.01 for each individual monitoring point comparison shall be maintained. This performance standard does not apply to tolerance intervals, prediction intervals or control charts.

**(C)**

If a control chart approach is used to evaluate water quality, monitoring data, the specific type of control chart and its associated statistical parameter values (e.g., the upper control limit), shall be protective of human health and the environment. Any control charting procedure must have a false-positive rate of no less than 1 percent for each monitoring point charted (e.g., upper control limits on X-bar or R-charts used only once every six months must be set at no more than 2.327 standard deviations of the statistic plotted for a one-sided statistical comparison or at no more than 2.576 standard deviations of the statistic plotted for a two-sided statistical comparison).

**(D)**

If a tolerance interval or a prediction interval is used to evaluate water quality monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain shall be protective of human health and the environment. These statistical parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentrations or values for each constituent of concern or monitoring parameter. The coverage of any tolerance interval used must be no more than 95 percent and the confidence coefficient must be no more than 95 percent for a six-month period. Prediction intervals shall be constructed with an experimentwise error rate of no less than 5 percent and an individual monitoring point error rate of no less than 1 percent.

**(E)**

The statistical method shall account for data below the practical quantification quantitation limit with one or more statistical procedures that are protective of human health and the environment. Any practical quantitation limit that is used in the statistical method shall be the lowest concentration (or value) that can be reliably achieved within limits of precision and accuracy specified in the water quality sampling and analysis plan for routine laboratory operating conditions that are available to the facility.

**(F)**

If necessary, the statistical methods shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

**(G)**

Any quality control procedure that is approved by the Department for application to water quality data from downgradient monitoring points for a monitored medium shall also be applied to all newly-acquired background data from that medium. Any newly-acquired background monitoring datum that is rejected by an approved quality control procedure shall be maintained in the facility record but shall be excluded from use in statistical comparisons with downgradient water quality data.

**(10)**

Based on the data collected pursuant to subsection (e)(6) of this section and the statistical methods specified pursuant to subsection (e)(7) of this section, the owner or operator shall select and justify the use of a procedure for determining a background value for each constituent of concern and for each monitoring parameter specified in the water quality sampling and analysis plan. One of the following procedures shall be selected for groundwater, surface water and the unsaturated zone: (A) a procedure for determining the background value for each constituent or parameter that does not display appreciable natural variation; or (B) a procedure for establishing and updating the background value for a constituent or parameter to reflect changes in the background water quality if the use of contemporaneous or pooled data provides the greatest power to the statistical method for that constituent or parameter.

**(A)**

a procedure for determining the background value for each constituent or parameter that does not display appreciable natural variation; or

**(B)**

a procedure for establishing and updating the background value for a constituent or parameter to reflect changes in the background water quality if the use of contemporaneous or pooled data provides the greatest power to the statistical method for that constituent or parameter.

**(11)**

Using the procedures for determining background values proposed pursuant to subsection (e)(10) of this section, the owner or operator shall specify in the water quality sampling and analysis plan one of the following for each constituent of concern and for each monitoring parameter: (A) the background value established by the owner or operator using the procedure selected pursuant to subsection (e)(10)(A) of this section; or (B) a detailed description of the procedure, selected pursuant to subsection (e)(10)(B) of this section, to be used by the owner or operator for establishing and updating the background value.

**(A)**

the background value established by the owner or operator using the procedure selected pursuant to subsection (e)(10)(A) of this section; or

**(B)**

a detailed description of the procedure, selected pursuant to subsection (e)(10)(B) of this section, to be used by the owner or operator for establishing and updating the background value.

**(12)**

For each constituent of concern and monitoring parameter listed in the water quality sampling and analysis plan, the owner or operator shall specify in the water quality sampling and analysis plan the sampling methods to be used to establish background values and the sampling methods to be used for monitoring pursuant to this article. (A) The number and kinds of samples collected shall be appropriate for the form of

statistical test employed, following generally accepted statistical principles. The sample size shall be as large as necessary to ensure with reasonable confidence that: 1. for a detection monitoring program, a release from the regulated unit will be detected; and 2. for an evaluation monitoring program, changes in water quality due to a release from the regulated unit will be recognized. (B) The sampling method (including sampling frequency and the interval of time between successive samples) shall be appropriate for the medium from which samples are taken (e.g., groundwater, surface water and soil-pore liquid). The sampling method shall include either:1. a sequence of at least four samples from each monitoring point, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained. For groundwater, this interval shall be based upon the rate of groundwater movement in the aquifer and upon the fate and transport characteristics of the potential contaminants or pollutants. The rate of groundwater movement shall be calculated by reference to the aquifer's effective porosity, hydraulic conductivity and hydraulic gradient; or 2. an alternate sampling method if sufficient documentation is submitted to the Department and is maintained in the facility operating record to support selection of the method.

**(A)**

The number and kinds of samples collected shall be appropriate for the form of statistical test employed, following generally accepted statistical principles. The sample size shall be as large as necessary to ensure with reasonable confidence that: 1. for a detection monitoring program, a release from the regulated unit will be detected; and 2. for an evaluation monitoring program, changes in water quality due to a release from the regulated unit will be recognized.

**1.**

for a detection monitoring program, a release from the regulated unit will be detected; and

**2.**

for an evaluation monitoring program, changes in water quality due to a release from the regulated unit will be recognized.

**(B)**

The sampling method (including sampling frequency and the interval of time between successive samples) shall be appropriate for the medium from which samples are taken (e.g., groundwater, surface water and soil-pore liquid). The sampling method shall include either:1. a sequence of at least four samples from each monitoring point, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained. For groundwater, this interval shall be based upon the rate of groundwater movement in the aquifer and upon the fate and transport characteristics of the potential contaminants or pollutants. The rate of groundwater movement shall be calculated by reference to the aquifer's effective porosity, hydraulic conductivity and hydraulic gradient; or 2. an alternate sampling method if sufficient documentation is submitted to the Department and is maintained in the facility operating record to support selection of the method.

**1.**

a sequence of at least four samples from each monitoring point, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained. For groundwater, this interval shall be based upon the rate of groundwater movement in the aquifer and upon the fate and transport characteristics of the potential contaminants or pollutants. The rate of groundwater movement shall be calculated by reference to the aquifer's effective porosity, hydraulic conductivity and hydraulic gradient; or

**2.**

an alternate sampling method if sufficient documentation is submitted to the Department and is maintained in the facility operating record to support selection of the method.

**(13)**

The groundwater portion of the monitoring program shall include an accurate determination of the groundwater surface elevation and field parameters (temperature, electrical conductivity, turbidity and pH) at each well each time groundwater is sampled. Field parameter determinations may be modified or waived, after receiving written approval by the Department, if the owner or operator can demonstrate that representative samples are obtained. Any modifications to field parameter determinations shall be specified in the water quality sampling and analysis plan.

**(14)**

The owner or operator shall graph all analytical data from each monitoring point and background monitoring point and shall submit these graphs to the Department at least annually, except graphs are not required for constituents for which no new data have been collected since the previous graph submittal. Each graph shall represent data for one constituent of concern or monitoring parameter and shall be at a scale appropriate to show trends or variations in water quality. Unless the owner or operator receives written approval from the Department to use an alternate procedure, each graph shall include data from related monitoring and background points as long as the depicted data effectively illustrates trends or variations in the data.

**(15)**

In addition to the water quality sampling conducted pursuant to the requirements of this article, the owner or operator shall measure the water level in each well and determine groundwater flow rate and direction in the uppermost aquifer and in any zones of perched water and in any additional aquifers monitored pursuant to subsection (b)(1) of this section at least quarterly, including the times of expected highest and lowest annual elevations of the water levels in the wells. The Department may approve collection of water level measurements at times other than the expected highest and lowest water level elevations, if appropriate, however quarterly

measurements are still required. The owner or operator shall use this data to determine, at least annually, whether the requirements of section 66265.97(b)(1) are satisfied. If the evaluation shows that the requirements of section 66265.97(b)(1) are not satisfied the owner or operator shall, as soon as technically feasible, modify the number, location or depth of the groundwater monitoring wells as necessary to bring the groundwater monitoring system into compliance with the requirements of this article.

**(16)**

Except as provided below, for all background monitoring points in groundwater, the owner or operator must, within 12 months of July 1, 1991, establish background concentrations or values for all constituents listed in Table 1 by sampling quarterly for one year. Results of this sampling shall be submitted to the Department within 15 days after completing each quarterly analysis. If an owner or operator has previously established background for these parameters pursuant to 40 C.F.R. Part 265 by quarterly sampling for at least one year, the owner or operator shall maintain a record of that sampling and analysis in the facility operating record and shall not repeat the sampling and analysis. Table 1 Background Water Quality Parameters ArsenicBarium CadmiumChloride ChromiumColiform Bacteria EndrinFluoride Gross AlphaGross Beta IronLead LindaneManganese MercuryMethoxychlor Nitrate (as N)pH PhenolsRadium SeleniumSilver SodiumSpecific Conductance SulfateToxaphene 2,4-D2,4,5.TP Silver Total Organic CarbonTotal Organic Halogen Turbidity

**(17)**

Water quality monitoring data collected in accordance with this article, including actual concentrations or values of all constituents and parameters, all background water quality data, all statistical evaluations, all water level elevation data and all data used to derive the groundwater flow rate and direction shall be maintained in the facility

operating record throughout the active life of the facility and throughout the postclosure care period. The owner or operator shall submit this data to the Department at least annually. This information shall be submitted no later than March 1 following each calendar year. The Department shall require more frequent reporting where necessary to protect human health or the environment.