

Chapter 4

IMPLEMENTATION

Introduction

A program of implementation to protect beneficial uses and to achieve water quality objectives is an integral component of this Basin Plan. The program of implementation is required to include, but is not limited to:

- A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private.
- A time schedule for the actions to be taken.
- A description of surveillance to be undertaken to determine compliance with objectives.
(CA Water Code § 13242)

The surveillance activities needed to determine compliance with objectives are described in Chapter 6, "Monitoring and Assessment." The remaining requirements are fulfilled by this Chapter.

This Chapter includes discussions of general control actions and related issues, a description of the Region's Nonpoint Source Program, and discussions of specific types of activities and their related water quality problems, control actions and time schedules for the actions to be taken. Control actions specific to the Lake Tahoe Basin are included in Chapter 5 of this Plan. Detailed descriptions of waterbodies with their specific water quality problems are included in the Region's Geospatial Waterbody System (GeoWBS) database.

General Control Actions and Related Issues

The Regional Board regulates the sources of water quality related problems which could result in actual, or potential, impairments of beneficial uses or degradations of water quality. The Regional Board regulates both point and nonpoint source discharge activities. A point source discharge generally originates from a single, identifiable source, while a nonpoint source discharge comes from diffuse sources. To regulate the point and nonpoint sources, control actions are required for effective water quality protection and management. Such control actions are set forth for implementation by the State Board, by other agencies with water quality or related authority, and by the Regional Board.

Control Actions under State Board Authority

The State Board has adopted several statewide or areawide water quality plans and policies which complement or may supersede portions of this Basin Plan. These plans and policies may include specific control measures. Some State Board plans and policies do not affect waters of the Lahontan Region. See Chapter 6, "Plans and Policies," for summaries of the most significant State Board plans and policies which do affect the Lahontan Region.

Control Actions to be Implemented by Other Agencies with Water Quality or Related Authority

Water quality management plans prepared under Section 208 of the Federal Water Pollution Control Act (Clean Water Act) have been completed by various public agencies. These Section 208 plans, as well as other plans adopted by federal, state, and local agencies, may affect the Regional Board's water quality management and control activities. A summary of relevant water quality management plans is included in Chapter 6, "Plans and Policies." The Regional Board can also be party to official agreements with other agencies, such as memoranda of understanding (MOUs) or management agency agreements (MAAs), which recognize and rely on the water quality authority of other agencies.

Control Actions under Regional Board Authority

Control measures implemented by the Regional Board must provide for the attainment of this Basin Plan's beneficial uses and water quality objectives (see Chapter 2, "Beneficial Uses," and Chapter 3, "Water Quality Objectives"). In addition, the control measures must be consistent with State Board and Regional Board plans, policies, agreements, prohibitions, guidance and other restrictions and requirements. The most significant Regional Board policies are described in Chapter 6, "Plans and Policies."

To prevent water quality problems, waste discharge restrictions are often used. The waste discharge restrictions can be implemented through Water Quality Certification, National Pollutant Discharge Elimination System (NPDES) permits, waste discharge requirements/permits (WDRs), discharge prohibitions, enforcement actions, special designations, and/or "Best Management Practices" (BMPs). Generally, WDRs and NPDES permits are

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used to regulate point sources of waste, with BMPs used to control nonpoint sources of waste.

Water Quality Certification.

Clean Water Act Section 401 Water Quality Certification (Water Quality Certification) gives the Regional Board extremely broad authority to review proposed activities in and/or affecting the Region's waters. The Regional Board can then recommend to the State Board that it grant, deny, or condition certification of federal permits or licenses that may result in a discharge to "waters of the United States."

National Pollutant Discharge Elimination System (NPDES).

NPDES permits are issued to regulate discharges of waste to "waters of the nation" including discharges of storm water from urban separate storm sewer systems and certain categories of industrial activity. Waters of the nation are surface waters such as rivers, lakes, bays, estuaries, oceans, etc. The permits are authorized by Section 402 of the federal Clean Water Act and Section 13370 of the California Water Code. The permit content and the issuance process are contained in the Code of Federal Regulations (40 CFR Part 122) and Chapter 9 of the California Code of Regulations. Regional Water Boards are authorized to take a variety of enforcement actions to obtain compliance with a NPDES permit. Enforcement may be only a simple order requiring the discharger to take corrective action to comply with the terms of its permit or may be an order prescribing civil monetary penalties.

NPDES permits are required to prescribe conditions of discharge which will ensure protection of beneficial uses of the receiving water as described in this Basin Plan, water quality control plans adopted by the State Water Board for inland surface waters, enclosed bays and estuaries, the ocean, and water quality control policies adopted by the State Water Board for specific types of discharges or uses of waste water.

In addition to regulating discharges of waste water to surface waters, NPDES permits also require municipal sewage treatment systems to conduct pretreatment programs if their design capacity is greater than 5 million gallons per day. Smaller municipal treatment systems may be required to conduct pretreatment programs if there are significant industrial users of their systems. The pretreatment programs must comply with the federal regulations at 40 CFR Part 403.

The U.S. Environmental Protection Agency has approved the State's program to regulate discharges

of waste water to "waters of the nation." The State, through the Regional Water Boards, issues the NPDES permits, reviews discharger self-monitoring reports, performs independent compliance checking, and takes enforcement actions as needed.

Waste Discharge Requirements (WDRs).

The California Water Code authorizes Regional Water Boards to regulate discharges to land to protect water quality. Regional Water Boards issue WDRs in accordance with Section 13263 of the California Water Code. Regional Water Boards are authorized to review WDRs periodically. Regional Water Boards issue WDRs, review self-monitoring reports submitted by the discharger, perform independent compliance checking, and take necessary enforcement action. The California Water Code authorizes the Regional Water Boards to issue enforcement actions (see below) ranging from orders requiring relatively simple corrective action to monetary penalties in order to obtain compliance with WDRs.

Waivers of WDRs.

Regional Water Boards may waive issuance of WDRs pursuant to CA Water Code § 13269 if the Regional Water Board determines that such waiver is not against the public interest. The requirement to submit a Report of Waste Discharge can also be waived. WDRs can be waived for a specific discharge or types of discharges. A waiver of WDRs is conditional and may be terminated at any time by the Regional Board. Regional Water Boards may delegate their authority to waive WDRs to the Regional Water Board Executive Officer in accordance with policies adopted by the Regional Water Board and approved by the State Water Board. The Regional Board's general policy regarding waivers is described in Chapter 6, "Plans and Policies."

Prohibitions and Exceptions to Prohibitions.

The Regional Board can prohibit specific types of discharges to certain areas (CA Water Code § 13243). These discharge prohibitions may be revised, rescinded, or adopted as necessary. Discharge prohibitions are described in the "Waste Discharge Prohibitions" section of this Chapter. For certain circumstances, the Regional Board will allow exceptions to some of these prohibitions. Prohibition exceptions are also described in the "Waste Discharge Prohibitions" section of this Chapter.

Enforcement Actions.

To facilitate remediation of water quality problems, or in instances where waste discharge restrictions or

other provisions of this Basin Plan are violated, the Regional Board can use different types of enforcement measures. These measures can include:

- A written **Notice to Comply** can be issued for minor violations during field inspections by Regional Board staff, at the discretion of the inspector. The Notice is issued to a representative of the facility being inspected, and states the nature of the alleged violation, a means to comply, and a time limit for compliance (not to exceed 30 days). The violator must sign and return the notice to the Regional Board within five working days of achieving compliance. If compliance is achieved within the stated time limits, and if the case is not subject to a fine under federal law, the violation is not subject to civil penalties. (The law establishing the authority for the Notice to Comply does not limit the Regional Board's authority for criminal enforcement or its ability to cooperate in criminal enforcement proceedings.) The Regional Board may take other enforcement actions upon failure to comply or if necessary to prevent harm to public health or the environment. A Notice to Comply cannot be used for a knowing, willful, or intentional violation, for a case where the violator benefits economically for noncompliance, for chronic violations, or a recalcitrant violator, or for violations which cannot be corrected within 30 days.
- A **Notice of Violation** or NOV is a letter formally advising a discharger in noncompliance that additional enforcement actions may be necessary if appropriate corrective actions are not taken.
- A **Time Schedule Order** or TSO (CA Water Code § 13300) is a time schedule for specific actions a discharger shall take to correct or prevent violations of requirements. A TSO is issued by the Regional Board for situations in which the Board is reasonably confident that the problem will be corrected.
- A **Cleanup and Abatement Order** or CAO (CA Water Code § 13304) is an order requiring a discharger to clean up a waste or abate its effects or, in the case of a threatened pollution or nuisance, take other necessary remedial action. A CAO can be issued by the Regional Board or by the Regional Board Executive Officer for situations when immediate action is needed on an urgent problem from regulated or

unregulated discharges which are creating or threatening to create a condition of pollution or nuisance.

- A **Cease and Desist Order** or C&D (CA Water Code § 13301) is an order requiring a discharge to comply with WDRs or prohibitions according to a time schedule, or if the violation is threatening, to take appropriate remedial or preventative action. A C&D is issued by the Regional Board when violations of requirements or prohibitions are threatened, are occurring, or have occurred and probably will continue in the future. Issuance of a C&D requires a public hearing.

Monetary liabilities or fines (**administrative civil liabilities** or ACL) may also be imposed administratively by the Regional Board. Under certain circumstances, enforcement actions are referred to the State Attorney General or District Attorney.

State Water Resources Control Board Resolution 92-49, as amended, includes statewide policies and procedures for investigation and cleanup and abatement of discharges under Water Code Section 13304. The statewide Water Quality Enforcement Policy (State Board Resolution 97-085) provides direction on types of violations which shall be brought to the attention of Regional Boards by staff, on procedures for coordination and cooperation with other agencies, and on setting amounts for Administrative Civil Liabilities. Copies of both of these policies are included in Appendix B to this Basin Plan.

Special Designations.

Some water bodies have special designations and related narrative discharge restrictions. Examples of special designations are Outstanding National Resource Water, Sole-source Aquifer, Wild and Scenic River, and Water Quality Limited Segment. Applicable special designations and discharge restrictions are described the "Resources Management and Restoration" section of this Chapter.

Compliance Schedules.

The Porter-Cologne Act (CA Water Code § 13242[b]) requires a Basin Plan's program of implementation for achieving water quality objectives to include a "time schedule for the actions to be taken." Because of the lack of ambient water quality monitoring data for most of the water bodies of the Lahontan Region (see Chapter 7), it is not possible to state whether or not these waters are in achievement of all water quality objectives, or to set compliance schedules for

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achievement. The Regional Board periodically reviews available information on attainment of objectives and support of beneficial uses as part of the Water Quality Assessment (ongoing), Section 305(b) reporting (every two years), and Triennial Review (every three years) processes. These reviews may result in Basin Plan amendments and/or the issuance of new or revised discharge permits which will include specific compliance schedules for particular dischargers or for all discharges affecting particular water bodies. The Regional Board is also required to prioritize impaired water bodies listed as "Water Quality Limited" under Section 303(d) of the Clean Water Act for the development of "Total Maximum Daily Loads" (TMDLs) of pollutants to be used in setting wasteload allocations for dischargers, in order to ensure attainment of standards. See Section 4.13 of this chapter for more information on TMDLs.

The 1975 Basin Plans included recommendations that specific studies be carried out by specific dates on needs for community wastewater collection and treatment facilities in certain areas of the Lahontan Region. These plans also recommended that some communities construct specific facilities by given dates. Most of these schedules were not met. Because expected year-to-year changes in availability of and priorities for funding will ensure that long term schedules are unrealistic, this Basin Plan does not include such recommendations. Priorities are set for studies through processes such as the Regional Board's periodic revisions to its Watershed Management Initiative Chapter, and for facilities construction through the State Board Division of Clean Water Programs needs assessment process for loans and grants. Once funding is allocated, completion schedules are set through the contract process.

Some of the water quality control programs for the Lahontan Region do have specific compliance deadlines, which are discussed later in this Basin Plan. For example, the control measures for the Lake Tahoe Basin which are discussed in Chapter 5 are to be implemented over a 20-year period (through 2007) to ensure attainment of objectives. Some of the waste discharge prohibitions discussed later in this Chapter also include specific compliance dates.

The Regional Board maintains discharge permits (WDRs and NPDES permits) for point sources, each of which includes its own compliance schedule. Waste discharge permits for construction projects generally require implementation of Best Management Practices during and immediately after

construction; long-term maintenance of permanent BMPs is expected. Regional Board enforcement orders for specific problems also include compliance schedules.

Innovative Technology and Demonstration Projects.

The Regional Board occasionally receives proposals for the use of innovative technology, either as part of projects or activities which it regulates, or as a water quality mitigation measure. Examples include the use of bacteria as ice nucleating agents for snowmaking at ski areas, and bioremediation technology for cleanup of toxic substance leaks and spills in ground water. Regional Board staff will evaluate such proposals on a case-by-case basis in relation to applicable water quality standards, discharge prohibitions, effluent limitations, and the risk of adverse water quality impacts from the specific technology. (Risk assessment is discussed in the "Spills, Leaks, Complaint Investigations, and Cleanups" section of this Chapter.) Because of the high resource value and extreme sensitivity of some of the waters of the Lahontan Region, some types of demonstration projects using new technology should be carried out within other watersheds.

Interstate Issues.

The Lahontan Region includes most of California's common boundary with Nevada, and a small common boundary with Oregon. There are a number of interstate lakes, streams, and ground water basins. Section 518 of the federal Clean Water Act allows Indian tribes to apply to the USEPA to be treated as states for purposes of setting and implementing water quality standards under Sections 303 and 401 of the Act. As of 1993, no tribes within the Lahontan Region had been granted such status.

Historically, interstate water quantity issues have been of greater concern than water quality issues. (See the discussion of water quantity issues in the "Resources Management" section of this Chapter). However, the requirement for efforts by both California and Nevada to protect Lake Tahoe led to the development of the bi-state Tahoe Regional Planning Agency and a bi-state *Water Quality Management Plan for the Lake Tahoe Region* under Section 208 of the Clean Water Act (see Chapter 5). Impacts of pumping in Nevada on ground water supplies in Death Valley, and impacts of radioactivity from the Nevada Test Site on ground water quality in Death Valley, are also of concern.

In both planning and regulatory activities for interstate waters, Regional Board staff considers the applicable

water quality standards of the other state. Regional Board staff request the opportunity to review and comment on revisions of other state's water quality plans for waters shared with the Lahontan Region, and provides these states with similar opportunities to comment on Basin Plan revisions. If Regional Board Basin Plan amendments or waste discharge permits appear to create a possibility of conflict with another state's standards, Regional Board staff consults with water quality staff of the other state to attempt to resolve the conflict. Because most water quality objectives for Lahontan Region waters are based on historical water quality and nondegradation considerations, water quality permits which ensure compliance with California standards generally should be adequate to prevent violation of another state's standards.

Nonpoint Source Program.

Nonpoint sources of pollution are generally defined as sources which are diffuse and/or not subject to regulation under the federal National Pollutant Discharge Elimination System (for surface water discharges). Nonpoint sources include agriculture, grazing, silviculture, abandoned mines, construction, stormwater runoff, etc. Nonpoint sources have been identified as a major cause of water pollution in California according to the State Board's 1990 *Water Quality Assessment* report and 1988 *Nonpoint Source Problem Inventory for Surface Waters*.

The federal Clean Water Act (CWA) is the principal federal water quality protection statute. For point source discharges to surface waters, the CWA establishes a permit system. However, nonpoint sources are exempt from federal permitting requirements, as are discharges to ground water. The CWA was amended in 1987 to include a new Section 319 entitled "Nonpoint Source Management Programs." Section 319 requires states to develop Assessment Reports and Management Programs describing the states' nonpoint source problems. The State Board's November 1988 *Nonpoint Source Problem Inventory for Surface Waters* and *Nonpoint Source Management Plan* respond to this requirement.

The State Board's *Nonpoint Source Management Plan* relies on a three-tiered management approach to address nonpoint source problems. The options or tiers are presented in order of increasing stringency. In general, the least stringent option that successfully protects or restores water quality will be employed, with more stringent measures considered if timely improvements in beneficial use protection are not achieved. The three tiers are as follows:

1. **Voluntary Implementation of Best Management Practices (BMPs).** Property owners or managers may voluntarily implement BMPs. Implementation could occur for economic reasons and/or through awareness of environmental benefits. (Best Management Practices are described below).
2. **Regulatory-Based Encouragement of Best Management Practices.** Although the Porter-Cologne Act constrains Regional Boards from specifying the manner of compliance with water quality standards, there are two ways in which Regional Boards can use their regulatory authorities to encourage implementation of BMPs. First, the Regional Board may encourage BMPs by waiving adoption of waste discharge requirements on condition that dischargers comply with Best Management Practices. Alternatively, the Regional Board may enforce BMPs indirectly by entering into management agency agreements (MAAs) with other agencies which have the authority to enforce BMPs. The Regional Board will generally refrain from imposing effluent requirements on dischargers who are implementing BMPs in accordance with a waiver of waste discharge requirements, an approved MAA, or other State or Regional Board formal action.
3. **Effluent Limitations.** The Regional Board can adopt and enforce requirements on the nature of any proposed or existing waste discharge, including discharges from nonpoint sources. Although the Regional Board is precluded from specifying the manner of compliance with waste discharge limitations, in appropriate cases, limitations may be set at a level which, in practice, requires implementation of BMPs.

Not all of the categories of nonpoint source pollution follow this three-tiered approach. For example, silvicultural activities on non-federal lands are administered by the California Department of Forestry and Fire Protection (CDF). The State Board has entered into a Management Agency Agreement with CDF which allows the Regional Boards to review and inspect timber harvest plans and operations for implementation of BMPs for protection of water quality.

The Regional Board approach to addressing or regulating categories of nonpoint source pollution is discussed in various sections throughout this Chapter.

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Best Management Practices.

Property owners, managers or other dischargers may implement “Best Management Practices” (BMPs) to protect water quality. The term “Best Management Practices” used in reference to control measures for nonpoint source water pollutants is analogous to the terms “Best Available Technology/Best Control Technology” (BAT/BCT) used for control of point source pollutants. The USEPA (40 CFR § 103.2[m]) defines BMPs as follows:

“Methods, measures, or practices selected by an agency to meet its nonpoint source control needs. BMPs include, but are not limited to structural and nonstructural controls and operation and maintenance procedures. BMPs can be applied before, during and after pollution producing activities to reduce or eliminate the introduction of pollutants into receiving waters.”

USEPA regulations (40 CFR § 130.6 [b][4][i]) provide that Basin Plans:

“shall describe the regulatory and nonregulatory programs, activities, and BMPs which the agency has selected as the means to control nonpoint source pollution where necessary to protect or achieve approved water uses. Economic, institutional, and technical factors shall be considered in a continuing process of identifying control needs and evaluating and modifying the BMPs as necessary to achieve water quality goals.”

BMPs fall into two general categories:

- **Source controls** which prevent a discharge or threatened discharge. These may include measures such as recycling of used motor oil, fencing streambanks to prevent livestock entry, fertilizer management, street cleaning, revegetation and other erosion controls, and limits on total impervious surface coverage. Because the effectiveness of treatment BMPs is often uncertain, source control is generally preferable to treatment. It is also often less expensive.
- **Treatment controls** which remove pollutants from stormwater before it reaches surface or ground waters. These include infiltration facilities, oil/water separators, and constructed wetlands.

BMPs for development projects can be applied both to new project construction, and, through “retrofitting,” to existing structures, roads, parking lots, and similar

facilities. It may be possible to carry out an areawide retrofit program as part of a local government redevelopment project.

In 1988, the State Board adopted a statewide *Nonpoint Source Management Plan* which relies first upon voluntary implementation of BMPs by land management agencies and private property owners, and second upon regulatory requirements for BMP use at the discretion of the Regional Boards. The use of BMPs is now mandatory under certain types of stormwater NPDES permits (see “Stormwater” section in this Chapter) and in the Lake Tahoe Basin (see Chapter 5).

Several important points about BMPs must be emphasized at the outset:

- BMPs in California are generally certified by the State Board. Certified BMPs for the Lahontan Region include those of the U.S. Forest Service, Pacific Southwest Region (USFS 1979) and the Tahoe Regional Planning Agency (TRPA 1988, Vol. II). The State Board, together with a task force, has developed three BMP handbooks for guidance to holders of municipal, industrial, and construction NPDES stormwater permits (APWA 1993). There are a number of comprehensive BMP handbooks developed by agencies in other states which included practices which may or may not have been certified for use in the Lahontan Region. Non-certified “BMPs” may be proposed as alternative management practices, which will be evaluated by the Regional Board on a case-by-case basis.
- The use of BMPs does **not** necessarily ensure compliance with effluent limitations or with receiving water objectives. Because nonpoint source control has been a priority only since the 1970s, the long-term effectiveness of some BMPs has not yet been documented. Some source control BMPs (e.g., waste motor oil recycling) may be 100 percent effective if implemented properly. Information to date indicates that treatment control BMPs are **not** 100 percent effective, even if maintained and operated properly. Monitoring and evaluation of BMP effectiveness is an important part of nonpoint source control programs.
- The selection of individual BMPs must take into account specific site conditions (e.g., depth to ground water, quality of runoff, infiltration rates). Not all BMPs are applicable at every location.

High ground water levels may preclude the use of runoff infiltration facilities, while steep slopes may limit the use of wet ponds.

- To be effective, most BMPs must be implemented on a long-term basis. Structural BMPs (e.g., wet ponds and infiltration trenches) require periodic maintenance, and may eventually require replacement.
- The “state-of-the-art” for BMP design and implementation is expected to change over time. The State Board’s planning process will include periodic review and update of BMP certifications.

To date, the greatest attention has been given to development of BMPs for erosion and stormwater control in connection with construction projects, urban runoff, and timber harvest activities. BMPs are now being developed for control of a number of other nonpoint sources, including range livestock grazing and agricultural runoff.

General information on recommended nonpoint source management practices is provided under different water quality problem categories throughout this Chapter and in Chapter 5 on the Lake Tahoe Basin. For detailed information on the design, implementation, and effectiveness of specific BMPs, the reader should consult the appropriate BMP Handbook for the project type or location.

Watershed Management Initiative.

In 1995, as part of the development of a Strategic Plan, the State and Regional Boards began implementation of a “Watershed Management Initiative” (WMI). The WMI involves coordinating most of the Regional Board’s planning, monitoring and assessment, and regulatory activities with public and private stakeholders within “priority watersheds”, and encouraging voluntary implementation of BMPs and watershed restoration projects by stakeholders. Five priority watersheds were selected within the Lahontan Region, with the expectation that priorities will be rotated to other watersheds in the future. Workplans, including proposed implementation activities and projected staff time and funding needs for a five year period, have been written for the priority watersheds as part of the Lahontan Region’s “WMI Chapter” within the statewide Strategic Plan. These watershed workplans are updated at least annually.

Specific Types of Activities and Their Related Water Quality Problems, Control Actions, and Time Schedules for the Actions to be Taken

This Plan considers specific types of problem-related activities with their water quality impacts, control actions and time schedules under the thirteen categories of:

- 4.1 Waste Discharge Prohibitions
- 4.2 Spills, Leaks, Complaint Investigations, and Cleanups
- 4.3 Stormwater Runoff, Erosion, and Sedimentation
- 4.4 Wastewater—Treatment, Disposal and Reclamation
- 4.5 Solid and Liquid Waste Disposal to Land
- 4.6 Ground Water Protection and Management
- 4.7 Mining, Industry, and Energy Production
- 4.8 Land Development
- 4.9 Resources Management and Restoration
- 4.10 Agriculture
- 4.11 Recreation
- 4.12 Military Installations
- 4.13 Total Maximum Daily Loads

General water quality impacts from each category of activities are first described, followed by details specific to the types of activities in each category.

4.1 WASTE DISCHARGE PROHIBITIONS

Waste discharge prohibitions that apply to the entire Lahontan Region are discussed first in this section. Waste discharge prohibitions that apply to parts of the Lahontan Region are listed below by hydrologic units (HUs) or hydrologic areas (HAs) from north to south. Some of the watershed-specific prohibitions are more stringent than the regionwide prohibitions.

Exemptions to regionwide, and hydrologic unit and hydrologic area prohibitions may be granted as specified in this chapter and Chapter 5 for the Lake Tahoe Hydrologic Unit. Most exemptions are based on a finding by the Regional Board, or Executive Officer if so delegated, that the discharge will not result in exceeding the water quality objectives or unreasonably affect the water for its beneficial uses. The Regional Board will base this determination on an analysis of the criteria contained in State Board Resolution 68-16, the Statement of Policy with Respect to Maintaining High Quality Waters in California.

Regionwide Prohibitions

1. The discharge of waste⁽ⁱ⁾ which causes violation of any narrative water quality objective contained in this Plan, including the Nondegradation Objective, is prohibited.
2. The discharge of waste which causes violation of any numeric water quality objective contained in this Plan is prohibited.
3. Where any numeric or narrative water quality objective contained in this Plan is already being violated, the discharge of waste which causes further degradation or pollution is prohibited.
4. The discharge of untreated sewage, garbage, or other solid wastes into surface waters of the Region is prohibited. (For the purposes of this prohibition, "untreated sewage" is that which exceeds secondary treatment standards of the Federal Water Pollution Control Act, which are

incorporated in this plan in Section 4.4 under "Surface Water Disposal of Sewage Effluent.")

5. For municipal⁽ⁱⁱ⁾ and industrial⁽ⁱⁱⁱ⁾ discharges:
 - (a.) The discharge, bypass, or diversion of raw or partially treated sewage, sludge, grease, or oils to surface waters is prohibited.
 - (b.) The discharge of wastewater except to the designated disposal site (as designated in waste discharge requirements) is prohibited.
 - (c.) The discharge of industrial process wastes^(iv) to surface waters designated for the Municipal and Domestic Supply (MUN) beneficial use is prohibited. The discharge of industrial process wastes to surface waters not designated for the MUN use may be permitted if such discharges comply with the General Discharge Limitations in Section 4.7 and if appropriate findings under state and federal anti-degradation regulations can be made.

Prohibitions 5(b) and 5(c) do not apply to industrial stormwater. For control measures applicable to industrial stormwater, see Section 4.3 of this Basin Plan, entitled "Stormwater Runoff, Erosion, and Sedimentation."

Prohibitions 5(b) and 5(c) do not apply to surface water disposal of treated ground water. For control measures applicable to surface water disposal of treated ground water, see Regional Board Order No. 6-93-104, adopted November 19, 1993 (Basin Plan Appendix B).

Definitions:

- (i) "Waste" is defined to include any waste or deleterious material including, but not limited to, waste earthen materials (such as soil, silt, sand, clay, rock, or other organic or mineral material) and any other waste as defined in the California Water Code § 13050(d).

(ii) "Municipal waste" is defined in Section 4.4

(iii) "Industry" is defined in Section 4.7

(iv) "Industrial process wastes" are wastes produced by industrial activities that result from one or more actions, operations, or treatments which modify raw material(s) and that may (1) add to or create within the effluent, waste, or receiving water a constituent or constituents not present prior to processing, or (2) alter water temperature and/or the concentration(s) of one or more naturally occurring constituents within the effluent, waste or receiving water. Certain non-stormwater discharges may occur at industrial facilities that are not considered to be industrial process wastes for the purposes of Prohibition 5(c). Examples include: fire hydrant flushing, atmospheric condensates from refrigeration and air conditioning systems, and landscape watering. The Regional Board may establish additional monitoring programs and reporting requirements for these and other non-stormwater discharges at industrial facilities.

Exemption Criteria for Restoration Projects

The Regional Board encourages restoration projects that are intended to reduce or mitigate existing sources of soil erosion, water pollution, or impairment of beneficial uses. For waste earthen materials discharged as a result of restoration projects, exemptions to the above prohibitions, and all other prohibitions contained in this Basin Plan, may be granted by the Regional Board whenever it finds that a specific project meets all of the following criteria:

1. The project will eliminate, reduce or mitigate existing sources of soil erosion, water pollution, and/or impairment of beneficial uses of water, *and*
2. There is no feasible alternative to the project that would comply with provisions of this Basin Plan, precluding the need for an exemption, *and*
3. Land disturbance will be limited to the absolute minimum necessary to correct or mitigate existing sources of soil erosion, water pollution, and/or impairment of beneficial uses of water, *and*
4. All applicable Best Management Practices and mitigation measures have been incorporated into the project to minimize soil erosion, surface runoff, and other potential adverse environmental impacts, *and*
5. The project complies with all applicable laws, regulations, plans, and policies.

Note: Additional exemption criteria apply to restoration projects proposed within the Lake Tahoe Basin (see Chapter 5 for these additional criteria).

Considerations for Water Recycling Projects

The Regional Board encourages the reuse of treated domestic wastewater, and desires to facilitate its reuse (see Section 4.4 of this Chapter). The need to develop and use recycled water is one factor the Regional Board will evaluate when considering exemption requests to waste discharge prohibitions. Other considerations, including potential impacts of nutrients in recycled water on aquatic life uses, will also apply.

Unit/Area-Specific Prohibitions

Figures depicting specific prohibition areas are located at the end of this Section. Figure 4.1-1 provides an overview of the Lahontan Region with the approximate location of all prohibition areas. Area-specific prohibitions are grouped by watersheds, which are discussed in a north to south order.

Surprise Valley, Cowhead Lake, Madeline Plains, and Duck Flat Hydrologic Units

(Figure 4.1-2)

1. The discharge of wastes from boats, marinas, or other shoreline appurtenances into the lakes or streams of the Hydrologic Unit is prohibited.
2. The discharge of untreated sewage, garbage or other solid wastes, or industrial wastes into surface waters of the Hydrologic Unit is prohibited.
3. The discharge of waste earthen materials or of any other waste as defined in Section 13050(d) of the California Water Code which would violate the water quality objectives of this Basin Plan or otherwise adversely affect the water for beneficial uses of this Basin Plan, is prohibited.

Susanville and Smoke Creek Hydrologic Units

(Figure 4.1-3)

1. The discharge of wastes from boats, marinas, or other shoreline appurtenances into the lakes or streams of the Hydrologic Unit is prohibited.
2. The discharge of untreated sewage, garbage or other solid wastes, or industrial wastes into the surface waters of the Hydrologic Unit is prohibited.
3. The discharge of waste earthen materials or of any other waste as defined in Section 13050(d) of the California Water Code which would violate the water quality objectives of this Basin Plan or otherwise adversely affect the water for beneficial uses of this Basin Plan, is prohibited.
4. The discharge of waste within the following described area (referred to as the Cady Springs Prohibition Area; see Figure 4.1-4) from leaching or percolation systems installed after August 17, 1995 is prohibited: The Cady

Springs Prohibition Area is defined as follows and is shown for information in Fig. 4.1-4:

U.S.G.S. Map (7.5 Minute Series), Susanville Quadrangle:

T.30.N. and R.11.E., Including:

Sections 1 through 18, 20 through 28, and portions of Sections 19, 29, 33, 34, 35, and 36. The boundary defining the portions of Sections 19, 29, 33, and 34 is based on the surface water divide between Piute Creek and Susan River drainages and the fault trace F₁ as described in the Cady Springs Water Quality Phase I Report (DWR 1993); the portions of those Sections within the Piute Creek drainage and north of the fault are included in the prohibition area. Areas north of the Susan River in Section 36 are included in the prohibition area. **Excluding:** Sections 30, 31 and 32.

T.29.N. and R.11.E., Including:

Areas north of the Susan River in Sections 2 and 3. **Excluding:** Section 1, and Sections 4 through 36.

Projects that satisfy the following criteria shall be exempt from the above-stated prohibition:

- a. The discharge is composed of domestic wastewater only; *and*
- b. The proposed disposal system satisfies the Regional Board's criteria for individual waste disposal systems (minimum distances, percolation rates, soil characteristics, depth to ground water, ground slope, expansion area), as prescribed in Chapter 4.4 of this Water Quality Plan; *and*
- c. One of the following:
 - i. The proposed project is residential, inside an "Existing Land Development," the net lot area is 15,000 square feet or more, and the wastewater discharge will not exceed one equivalent dwelling unit (EDU) per net lot area per day. This criterion is based on existing septic density requirements, as prescribed in Chapter 4.4 of this Water Quality Plan. The net lot area is that contained inside the boundaries set forth in the legal lot description; or

- ii. The proposed project is non-residential or of mixed occupancy, inside an "Existing Land Development," the net lot area is 15,000 square feet or more, and the wastewater discharge does not exceed one EDU per net lot area per day, as determined using Table I-3 in the Uniform Plumbing Code.

For proposed projects in "Existing Land Development" that do not satisfy the above-stated exemption criteria, an exemption to the prohibition may be granted by the Regional Board's Executive Officer after submittal by the proposed discharger of a Report of Waste Discharge which includes geologic and hydrologic evidence and an acceptable engineering design which sufficiently demonstrate that the use of the proposed leaching system will not, of itself or in conjunction with the use of other systems in the area, result in a pollution or nuisance, or other adverse effects to water quality or beneficial uses. (Guidance for preparing a Report of Waste Discharge may be obtained by contacting the office of the Regional Board.)

For purposes of the above-stated exemption criteria, "Existing Land Development" is defined as subdivisions or individual parcels that have legal lot descriptions approved by local agencies prior to April 21, 1995. Further, it is understood that Lassen County's standards for use of septic tank systems require, at a minimum, compliance with the Regional Board's criteria for individual waste disposal systems.

The Regional Board will not issue discharge permits for proposed leaching or percolation systems on "new lots" inside the prohibition area. For purposes of this prohibition, "new lots" are defined as lots created for development after April 21, 1995 by means of parcel splits and/or land divisions. An exemption may be granted by the Regional Board for projects on "new lots," provided the project is necessary for public health and safety, or other necessary public services which, by their inherent nature, must be located in close geographic proximity to the served public. Examples of such public services would be schools and post offices. To obtain an exemption, the proposed discharger must submit a Report of Waste Discharge which includes geologic and hydrologic evidence and an acceptable engineering design which sufficiently demonstrate that the use of the

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proposed leaching system will not, of itself or in conjunction with the use of other systems in the area, result in a pollution or nuisance, or other adverse effects to water quality or beneficial uses.

Eagle Drainage Hydrologic Area

(Figure 4.1-5)

1. New discharge of waste within the Spaulding Tract and Stones-Bengard subdivisions is prohibited after March 30, 1987. For the purposes of this prohibition, new discharge of waste is the installation of new septic systems, or expansion of existing septic systems.
2. The discharge of waste from the Spaulding Tract or Stones-Bengard subdivisions with other than a zero discharge of nutrients to any surface waters or ground waters in the Eagle Lake basin is prohibited after September 14, 1989.
3. The discharge of waste from Eagle's Nest Tract in excess of a five consecutive month period each calendar year is prohibited.
4. Use of dishwashers, washing machines, garbage disposals and detergents containing phosphates is prohibited in Eagle's Nest Tract.
5. The maximum development density for new development which discharges wastes to subsurface disposal systems shall be one single family dwelling equivalent per 20 acres. For non-residential development, and/or where pre-discharge nutrient removal is provided, single family dwelling equivalence shall be based on mean total nitrogen discharge or mean total phosphorus discharge to the subsurface disposal system(s), whichever is more restrictive. Approval by the Regional Board's Executive Officer is required for each system prior to discharge from the system. Before granting such approval, the Executive Officer must find (based on evidence presented by the proposed discharger) that soils have good phosphorus removal capability, and that the system will comply with all other applicable criteria contained in this Plan.
6. The discharge of wastes containing nutrients from the wastewater treatment facility on lands administered by the U.S. Forest Service, Lassen National Forest, to surface waters or ground waters in the Eagle Lake basin is prohibited.
7. The discharge of wastes containing nutrients from the Bald Hills Campground to surface waters or ground waters in the Eagle Lake basin is prohibited.
8. The discharge of wastes containing nutrients from any new recreational facility or use area to surface waters or ground waters in the Eagle Lake basin is prohibited, except as described below. For purposes of this prohibition any new or increased discharge of waste from any recreational facility or use area other than that discharged as of July 15, 1985 is prohibited unless the nutrient discharge equivalent is less than or equal to one single family dwelling per 20 acres.
9. The discharge of wastes containing nutrients from any subsurface disposal system on a lot with an elevation of less than 5130 feet is prohibited.
10. The discharge of wastes from boats, marinas, or other shoreline appurtenances into the lakes or streams of the Hydrologic Area is prohibited.
11. The discharge of untreated sewage, garbage or other solid wastes, or industrial wastes into the surface waters of the Hydrologic Area is prohibited.
12. The discharge of waste earthen materials or of any other waste as defined in Section 13050(d) of the California Water Code which would violate the water quality objectives of this Basin Plan or otherwise adversely affect the water for beneficial uses of this Basin Plan, is prohibited.

Little Truckee River Hydrologic Unit

(Figure 4.1-6)

1. The discharge of wastes from boats, marinas, or other shoreline appurtenances to surface waters of the Little Truckee River HU is prohibited.
2. The discharge of any waste or deleterious material to surface waters of the Little Truckee River HU is prohibited.
3. The discharge of any waste or deleterious material in the Little Truckee River HU which

For purposes of the above prohibition, "new development" is defined as any subdivision of land in any area other than the existing Spaulding Tract, Stones-Bengard and Eagle's Nest Tract subdivisions.

would cause or threaten to cause violation of any water quality objective contained in this Plan, or otherwise adversely affect or threaten to adversely affect the beneficial uses of water set forth in this Plan, is prohibited.

4. The following additional prohibitions shall apply to the Little Truckee River HU:

- (a) The discharge of treated or untreated domestic sewage, industrial waste, garbage or other solid wastes, or any other deleterious material to surface waters of the Little Truckee River HU is prohibited.
- (b) The discharge, attributable to human activities, of solid or liquid waste materials, including but not limited to soil, silt, clay, sand, or other organic or earthen material, to surface waters of the Little Truckee River HU is prohibited.
- (c) The discharge or threatened discharge, attributable to human activities, of solid or liquid waste materials including soil, silt, clay, sand, and other organic and earthen materials to lands within the 100-year floodplain of the Little Truckee River or any tributary to the Little Truckee River is prohibited.

Exemption Criteria for Little Truckee River Hydrologic Unit and Truckee River Hydrologic Unit

The Regional Board may grant exemptions to prohibition 4(c) above as it applies to the Little Truckee River HU and the Truckee River HU for the repair or replacement of existing structures, provided that the repair or replacement does not involve the loss of additional floodplain area or volume. For example, if a building or residence is damaged or destroyed by fire, flooding, etc., the pre-existing structure could be repaired or a structure of identical (or smaller) size could be re-built on the same site in the footprint of the pre-existing building. Prior to granting any such exemption, the Regional Board shall require demonstration by the proposed discharger that all applicable Best Management Practices and mitigation measures have been incorporated into the project to minimize any potential soil erosion and/or surface runoff problems.

The Regional Board may also grant exemptions to prohibition 4(c) above as it applies to the Little Truckee River HU and the Truckee River HU for the following categories of new projects:

- (1) projects solely intended to reduce or mitigate existing sources of erosion or water pollution, or to restore the functional value to previously disturbed floodplain areas
- (2) bridge abutments, approaches, or other essential transportation facilities identified in an approved county general plan
- (3) projects necessary to protect public health or safety or to provide essential public services
- (4) projects necessary for public recreation
- (5) projects that will provide outdoor public recreation within portions of the 100-year floodplain that have been substantially altered by grading and/or filling activities which occurred prior to June 26, 1975.

An exemption to prohibition 4(c) above may be allowed for a specific new project only when the Regional Board makes all of the following findings:

- The project is included in one or more of the five categories listed above
- There is no reasonable alternative to locating the project or portions of the project within the 100-year floodplain
- The project, by its very nature, must be located within the 100-year floodplain. (This finding is not required for those portions of outdoor public recreation projects to be located in areas that were substantially altered by grading and/or filling activities before June 26, 1975.) The determination of whether a project, by its very nature, must be located in a 100-year floodplain shall be based on the kind of project proposed, not the particular site proposed. Exemptions for projects such as recreational facility parking lots and visitor centers, which by their very nature do not have to be located in a 100-year floodplain, will not be allowed in areas that were not substantially altered by grading and/or filling prior to June 26, 1975.
- The project incorporates measures which will insure that any erosion and surface runoff problems caused by the project are mitigated to levels of insignificance.
- The project will not, individually or cumulatively with other projects, directly or indirectly, degrade water quality or impair beneficial uses of water.

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- The project will not reduce the flood flow attenuation capacity, the surface flow treatment capacity, or the ground water flow treatment capacity from existing conditions. This shall be ensured by restoration of previously disturbed areas within the 100-year floodplain within the project site, or by enlargement of the floodplain within or as close as practical to the project site. The restored, new or enlarged floodplain shall be of sufficient area, volume, and wetland value to more than offset the flood flow attenuation capacity, surface flow treatment capacity and ground water flow treatment capacity lost by construction of the project. This finding will not be required for: (1) essential public health or safety projects, (2) projects to provide essential public services for which the Regional Board finds such mitigation measures to be infeasible because the financial resources of the entity proposing the project are severely limited, or (3) projects for which the Regional Board finds (based on evidence presented by the proposed discharger) that the project will not reduce the flood flow attenuation capacity, the surface flow treatment capacity, or the ground water flow treatment capacity from existing conditions.

The Regional Board has delegated authority to the Executive Officer to grant exceptions to Prohibition 4(c) above as it applies to the Little Truckee River HU and the Truckee River HU, for specific discharges where the proposed project meets the conditions required for a waiver of waste discharge requirements or for approval under general waste discharge requirements or a general NPDES permit, under the following circumstances:

- (1) the project is within the following specific size limitations:
 - less than 1000 square feet of new impervious coverage, or
 - less than 2000 square feet of new ground disturbance, or
 - less than 100 cubic yards of fill or excavation; **or**
- (2) the project's primary purpose is to reduce, control, or mitigate existing sources of erosion or water pollution;
and

- (3) the project meets the exemption criteria set forth in this section of the Basin Plan.

Except in emergency situations, the Executive Officer shall notify the Board and interested members of the public of his intent to issue an exemption subject to this Resolution at least ten (10) days before the exemption is issued. A notice of the exemption will also be published seven (7) days prior to issuance to allow for public comments. All comments received and staff's response to the comments will be forwarded to the Board with the proposed exemption. Any Regional Board member may direct that an exemption not be granted by the Executive Officer and that it be scheduled for consideration by the Regional Board.

A Report of Waste Discharge shall be filed for any discharge for which approval is sought from the Executive Officer. Discharge from a project cannot commence until such time as the Regional Board Executive Officer has prepared and sent a letter to the applicant indicating that an exemption to the Basin Plan prohibitions is granted and that waste discharge requirements for the project are waived, or that General Waste Discharge Requirements are applicable. The Regional Board's action delegating authority to the Executive Officer to grant exemptions is conditional and the Executive Officer may recommend that certain exemption requests be considered by the Regional Board. Also see Appendix B for a copy of Resolution 6-90-22 describing conditions under which the Executive Officer can grant exceptions.

Definitions (applicable in the Little Truckee River prohibition above, and in the Truckee River prohibition below):

"Necessary" shall mean when the appropriate governmental agency finds that a project is needed to protect public health and safety, to provide essential services, or for public recreation.

"Public recreation" shall mean a project which can be enjoyed by an entire community or neighborhood, or a considerable number of persons. In previously altered floodplain areas (defined as floodplain areas where soils, vegetation and hydrology are found by the Regional Board to have been substantially modified by human activities which occurred prior to June 26, 1975) "public recreation" is limited to public outdoor recreation facilities/activities such as hiking trails, bike paths, and similar recreation facilities/activities which do not involve construction of buildings or similar structures.

Truckee River Hydrologic Unit

(Figure 4.1-7 through 4.1-9)

1. The discharge of wastes from boats, marinas, or other shoreline appurtenances to surface waters of the Truckee River HU is prohibited.
2. The discharge of any waste or deleterious material to surface waters of the Truckee River HU is prohibited.
3. The discharge of any waste or deleterious material in the Truckee River HU, which would cause or threaten to cause violation of any water quality objective contained in this Plan, or otherwise adversely affect or threaten to adversely affect the beneficial uses of water set forth in this Plan, is prohibited.
4. The following additional prohibitions shall apply to the Truckee River HU:
 - (a) The discharge of treated or untreated domestic sewage, industrial waste, garbage or other solid wastes, or any other deleterious material to surface waters of the Truckee River HU is prohibited.
 - (b) The discharge, attributable to human activities, of solid or liquid waste materials, including but not limited to soil, silt, clay, sand, or other organic or earthen material, to surface waters of the Truckee River HU is prohibited.
 - (c) The discharge or threatened discharge, attributable to human activities, of solid or liquid waste materials including soil, silt, clay, sand, and other organic and earthen materials to lands within the 100-year floodplain of the Truckee River or any tributary to the Truckee River is prohibited. *(Exemptions to this prohibition may be granted by the Regional Board or its Executive Officer for certain projects. Exemption criteria and the Executive Officer's authority are described above under the discharge prohibitions for the Little Truckee River HU.)* Also see Appendix B for a copy of Order 6-90-22 describing conditions under which the Executive Officer can grant exceptions.
5. Discharge of wastewater or wastewater effluent resulting in an average total nitrogen concentration in the (undiluted) wastewater

exceeding 9 mg-N/liter entering the Truckee River or any of its tributaries above the Boca Reservoir outlet confluence is prohibited (Figure 4.1-8).

6. Further discharge from the secondary wastewater treatment facilities of Alpine Springs County Water District, Squaw Valley County Water District, Truckee Sanitary District, Placer County Service Area No. 21, Tahoe City Public Utility District, and North Tahoe Public Utility District is prohibited (Figure 4.1-9).
7. No discharge of domestic wastewater to individual facilities such as septic tank-leachfield systems shall be permitted for any subdivisions (as defined by the Subdivision Map Act, Government Code 66424) which did not discharge prior to October 16, 1980. This prohibition shall apply to all areas where underlying ground waters are tributary to the Truckee River or any of its tributaries above the confluence of the Boca Reservoir outlet and the

Truckee River (Figure 4.1-8). (Regionwide septic system density criteria apply to the portions of the Truckee River HU outside of this prohibition area.)

An exemption to this prohibition may be granted whenever the Regional Board finds (based on geologic and hydrologic evidence presented by the proposed discharger) that operation of individual domestic wastewater facilities in a particular area will not, individually or collectively, directly or indirectly, adversely affect water quality or beneficial uses. (See Figure 4.1-8A.) Also see Appendix B for a copy of Order 6-81-07 which describes a point system used by the Regional Board for evaluating requests for exemptions to this prohibition.

8. The discharge of wastes or wastewater to individual disposal facilities (such as septic tank-leachfield systems) within the Glenshire and Devonshire subdivisions is prohibited. (Figure 4.1-7)

An exemption to this prohibition may be granted for existing domestic wastewater facilities whenever the Regional Board's Executive Officer finds (based on geologic and hydrologic evidence presented by the proposed discharger) that continued operation of existing individual wastewater facilities will not, individually or collectively, directly or indirectly, adversely affect

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water quality or beneficial uses. An exemption to this prohibition may be granted for new leaching or percolation systems whenever the Regional Board's Executive Officer finds (based on geologic and hydrologic evidence presented by the proposed discharger) that leaching system disposal will not, individually or collectively, result in a pollution or nuisance, or other adverse affects to water quality or beneficial uses.

9. Exclusion of certain existing septic tank subdivisions from the site-specific waste discharge prohibitions above is not a mandate for build-out of all such subdivisions, and it is assumed that a large portion of existing lots currently approved for septic tank systems will eventually be sewered to the Tahoe-Truckee Sanitation Agency (TTSA).
10. Once sewer lines are installed in a subdivision or area, the discharge of wastes or wastewater to individual systems (such as septic tank-leachfield systems) from all new dwellings constructed or installed within 200 feet of the sewer line shall be prohibited.
11. Continued onsite discharge of septic tank effluent from structures within 200 feet of any existing sewer line connecting to TTSA, including the Truckee River Interceptor, where a septic tank-leachfield system is found to function improperly at any time, and/or where septic tank-leachfield construction is found to be in violation of the minimum criteria listed in this Plan, is prohibited.

Lake Tahoe Hydrologic Unit

This Basin Plan contains a separate chapter (Chapter 5) concerning Lake Tahoe and its watershed. Discharge prohibitions in effect for the Lake Tahoe HU are included in that chapter. Prohibitions are in effect in the Lake Tahoe HU for discharges and threatened discharges including, but not limited to, discharges or threatened discharges to lands, surface waters, ground waters, Stream Environment Zones, floodplains, and fish spawning habitats within the Lake Tahoe HU.

See Chapter 5 for discharge prohibitions and exemption criteria in effect for the Lake Tahoe HU. Also see Appendix B, Orders 6-70-48, 6-71-17, 6-74-139, and 6-90-22, which describe conditions for exemptions.

Carson River Hydrologic Units

(Figure 4.1-10)

1. The discharge of wastes from boats, marinas, or other shoreline appurtenances to surface waters of the East Fork Carson River HU or West Fork Carson River HU is prohibited.
2. The discharge of any waste or deleterious material to surface waters of the East Fork Carson River HU or West Fork Carson River HU is prohibited.
3. The discharge of any waste or deleterious material in the East Fork Carson River HU or West Fork Carson River HU, which would cause or threaten to cause violation of any water quality objective contained in this Plan, or otherwise adversely affect or threaten to adversely affect the beneficial uses of water set forth in this Plan, is prohibited.

Walker River Hydrologic Units

(Figure 4.1-11)

1. The discharge of wastes from boats, marinas, or other shoreline appurtenances to surface waters of the East Walker River HU or West Walker River HU is prohibited.
2. The discharge of any waste or deleterious material to surface waters of the East Walker River HU or West Walker HU is prohibited.
3. The discharge of any waste or deleterious material within the East Walker River HU or West Walker River HU, which would cause or threaten to cause violation of any water quality objective contained in this Plan, or otherwise adversely affect or threaten to adversely affect the beneficial uses of water set forth in this Plan, is prohibited.

Mono and Owens Hydrologic Units

(Figures 4.1-12 through 4.1-19)

1. The discharge of waste to surface water, including sewage or sewage effluent, is prohibited in the following locations:
 - (a) Mill Creek and Lee Vining Creek watersheds (Figure 4.1-12)
 - (b) Rush Creek watershed above the outlet from Grant Lake (Figure 4.1-12)

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- (c) The Owens River and its tributaries upstream of Crowley Lake above elevation 7,200 feet (Figure 4.1-13)
- (d) The Owens River and its tributaries downstream of Crowley Lake above elevation 5,000 feet (Figure 4.1-14).

An exemption to this prohibition may be granted whenever the Regional Board finds (based on geologic and hydrologic evidence presented by the proposed discharger) that the discharge of waste to surface waters will not, individually or collectively, directly or indirectly, adversely affect water quality or beneficial uses.

- 2. The discharge of waste from existing leaching or percolation systems is prohibited in the following areas:
 - (a) Rush Creek watershed above the outlet of Grant Lake (Figure 4.1-12)
 - (b) Mammoth Creek watershed above elevation 7,650 feet, including the drainage area of the community of Mammoth Lakes (Figure 4.1-15).

An exemption to this prohibition may be granted whenever the Regional Board's Executive Officer finds (based on geologic and hydrologic evidence presented by the proposed discharger) that the continued operation of septic tanks, cesspools, or other means of waste disposal in a specific area will not, individually or collectively, directly or indirectly, adversely affect water quality or beneficial uses, and that the sewerage of such area would have a damaging effect upon the environment.

- 3. The discharge of waste is prohibited within the following portions of Inyo County Service Area No. 1:
 - (a) Assessment District No. 1 (Fig. 4.1-16)
 - (b) Assessment District No. 2 (Fig. 4.1-17)
 - (c) City of Bishop (Fig. 4.1-16).

An exemption to this prohibition may be granted whenever the Regional Board's Executive Officer finds (based on geologic and hydrologic evidence presented by the proposed discharger) that the continued operation of septic tanks, cesspools, or other means of waste disposal in a specific area will not, individually or collectively, directly or indirectly, adversely affect water quality or the water for beneficial uses, and that

the sewerage of such area would have a damaging effect upon the environment.

An exemption to this prohibition may be granted whenever the Regional Board finds that a solid waste disposal site operated in accordance with an approved solid waste disposal plan will not, directly or indirectly, adversely affect water quality or beneficial uses.

- 4. The discharge of waste from new leaching and percolation systems is prohibited in the following areas (For this prohibition, new systems are any installed after May 15, 1975):
 - (a) Rush Creek watershed above the outlet from Grant Lake (Figure 4.1-12)
 - (b) Mammoth Creek watershed upstream of the confluence of Sherwin and Mammoth Creeks (Figure 4.1-18)
 - (c) The following portions of Inyo County Service Area No. 1:
 - (1) Assessment District No.1 (Figure 4.1-16)
 - (2) Assessment District No. 2 (Figure 4.1-17)
 - (3) Rocking K Subdivision (Fig. 4.1-16)
 - (4) City of Bishop (Fig. 4.1-16)
 - (d) Mammoth Creek watershed, including the drainage area of the community of Mammoth Lakes, and the Sherwin Creek watershed upstream of the confluence of Sherwin and Mammoth Creeks (Figure 4.1-15).

An exemption to this prohibition may be granted whenever the Regional Board's Executive Officer finds (based on geologic and hydrologic evidence presented by the proposed discharger) that leaching system disposal will not, directly or indirectly, individually or collectively, result in a pollution or nuisance, or other adverse affects to water quality or beneficial uses.

- 5. The discharge of waste within the following described area from new or existing leaching or percolation systems is prohibited (For this prohibition, new systems are any installed after May 15, 1975):

The area commonly known as the Hilton Creek/Crowley Lake communities included within the W/2, SW/4, Section 25, E/2, SE/4 and the

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SW/4, SE/4 and the S/2, SW/4 of Section 26, N/2, NE/4, NE/4, Section 34, N/2, NW/4 and the N/2, SE/4, NW/4 and the W/2, NE/4, Section 35, T4S, R29E, MDB&M (Figure 4.1-19).

An exemption to the prohibition against discharge of waste from new septic/leaching systems may be granted by the Regional Board's Executive Officer after presentation by the proposed discharger of geologic and hydrologic evidence and an acceptable engineering design which sufficiently demonstrate that the use of the proposed leaching system will not, of itself or in conjunction with the use of other systems in the area, result in a pollution or nuisance, or other adverse affects to water quality or beneficial uses.

An exemption to the prohibition against discharge of waste from existing septic/leaching systems may be granted by the Regional Board's Executive Officer after presentation by the discharger of geologic and hydrologic evidence that the continued use of an existing leaching disposal system will not, individually or collectively, result in a pollution or nuisance, or other adverse affects to water quality or beneficial uses.

Amargosa Hydrologic Unit

(Figure 4.1-20)

1. The discharge of septic tank pumpings (septage) or chemical toilet wastes to other than a sewage treatment plant or certified waste hauler shall be prohibited as soon as a treatment plant for that particular regional service area has provided the capability of handling such wastes.

Searles Valley Hydrologic Area

(Figure 4.1-21)

1. The discharge of septic tank pumpings (septage) or chemical toilet wastes to other than a sewage treatment plant or certified waste hauler shall be prohibited as soon as a treatment plant for that particular regional service area has provided the capability of handling such wastes.

Antelope Hydrologic Unit

(Figure 4.1-22)

1. The discharge of waste to surface water is prohibited above elevation 3,500 feet.

An exemption to this prohibition may be granted whenever the Regional Board finds that the discharge of waste to surface waters will not, individually or collectively, directly or indirectly, adversely affect water quality or beneficial uses.

2. The discharge of septic tank pumpings (septage) or chemical toilet wastes to other than a sewage treatment plant or certified waste hauler shall be prohibited as soon as a treatment plant for the particular regional service area has provided the capability of handling such wastes.

Mojave Hydrologic Unit

(Figure 4.1-23 and 4.1-24)

1. The discharge of waste to surface water in the Mojave Hydrologic Unit that is tributary to the West Fork Mojave River or Deep Creek, above elevation 3,200 feet (approximate elevation of Mojave Forks Dam), is prohibited. This prohibition does not apply to stormwater discharges unless such discharges create a condition of pollution or nuisance. (Figure 4.1-23)

An exemption to this prohibition may be granted by the Regional Board whenever the Regional Board finds that the discharge of waste will not, individually or collectively, directly or indirectly, result in exceeding the water quality objectives or unreasonably affect the water for its beneficial uses.

2. The discharge of waste to land or water within the following areas is prohibited (Figure 4.1-23):
 - (a) The Silverwood Lake watershed
 - (b) The Deep Creek watershed above elevation 3,200 feet
 - (c) The Grass Valley Creek watershed above elevation 3,200 feet.

This prohibition does not apply to stormwater discharges unless such discharges create a condition of pollution or nuisance.

An exemption to this prohibition may be granted by the Regional Board whenever the Regional Board finds that the discharge of waste will not, individually or collectively, directly or indirectly, result in exceeding the water quality objectives or unreasonably affect the water for its beneficial uses.

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3. The discharge of waste from new leaching or percolation systems is prohibited in the following areas (Figure 4.1-23):

- (a) The Silverwood Lake watershed
- (b) Deep Creek and Grass Valley Creek watersheds above elevation 3,200 feet

For this prohibition, "new" systems are any installed after May 15, 1975.

An exemption to this prohibition may be granted whenever the Regional Board's Executive Officer finds that the operation of septic tanks, cesspools, or other means of waste disposal in a particular area will not, individually or collectively, directly or indirectly, adversely affect water quality or beneficial uses, and that the sewerage of such area would have a damaging effect upon the environment.

4. The discharge of wastes of sewage-bearing origin to surface waters in the Mojave Hydrologic Unit upstream of the Lower Narrows at Victorville is prohibited. (Figure 4.1-24)

An exemption to this prohibition may be granted by the Regional Board whenever the Regional Board finds that the discharge of waste will not, individually or collectively, directly or indirectly, result in exceeding the water quality objectives or unreasonably affect the water for its beneficial uses.

5. The discharge of waste within the following described area is prohibited (Figure 4.1-24):

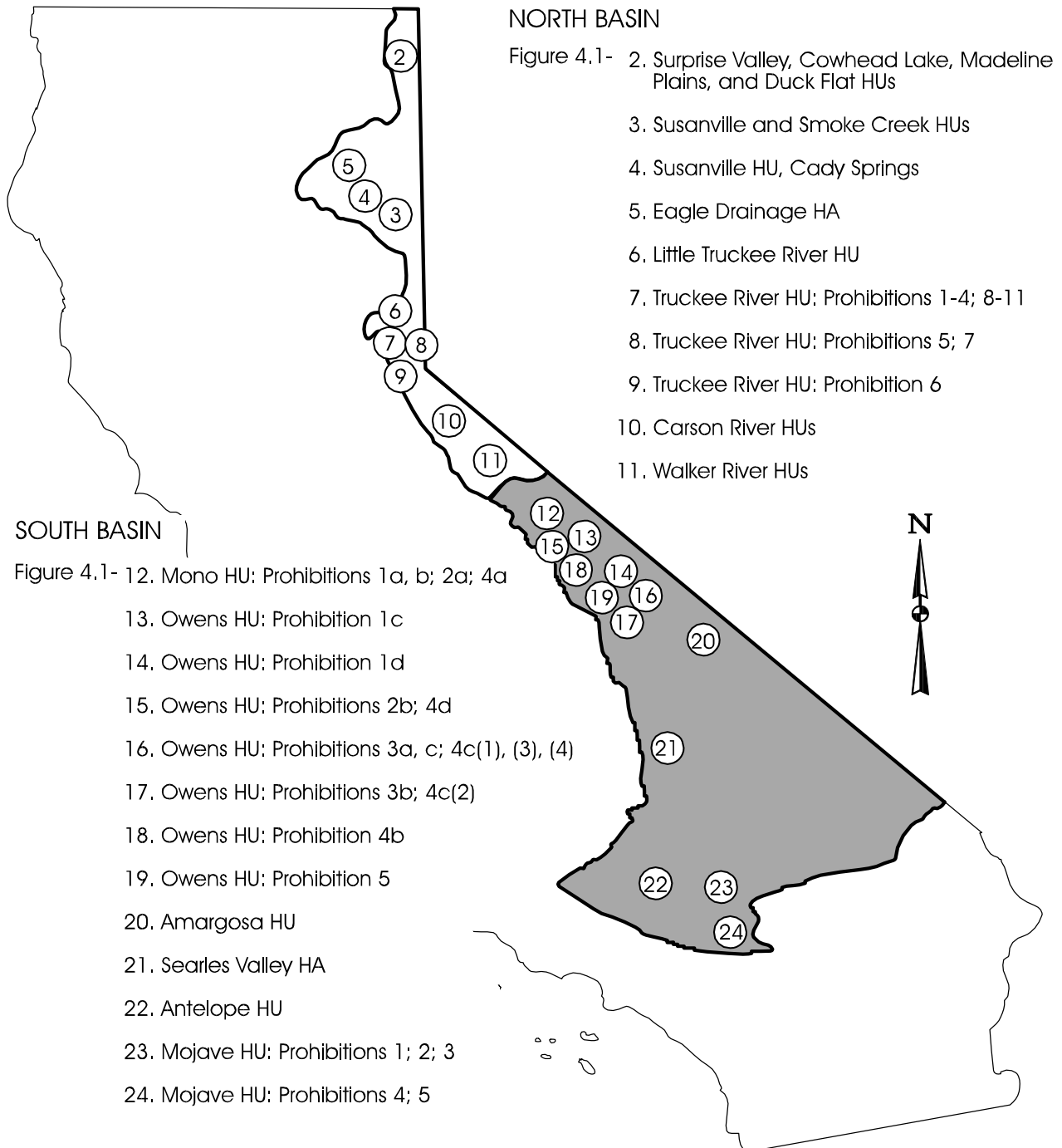
The area generally north of State Highway Number 18 commonly known as Apple Valley Desert Knolls, included within the NE/4, Sec. 12; NW/4, NW/4, Sec. 12; NE/4, NW/4, Sec. 12; N/2, SE/4, NW/4, Sec. 12; N/2, SW/4, NW/4, Sec. 12; N/2, S/2, SE/4, NW/4, Sec. 12; N/2, N/2, Sec. 11; N/2, SW/4, NW/4, Sec. 11; N/2, N/2, SE/4, NE/4, Sec. 11; N/2, NE/4, Sec. 10; SW/4, NE/4, Sec. 10; N/2, NE/4, NW/4, SE/4, Sec. 10; NW/4, NW/4, SE/4, Sec. 10; N/2, SE/4, NE/4, Sec. 10; SW/4, SE/4, NE/4, Sec. 10; E/2, Sec. 3; Sec. 2; and Sec. 1 of T5N, R4W, SBB&M and the NW/4, Sec. 7; NW/4, Sec. 6; NE/4, Sec. 6; SW/4, Sec. 6; W/2, SE/4, Sec. 6; and the W/2, E/2, SE/4, Sec. 6 of T5N, R3W, SBB&M and the S/2, Sec. 36; S/2, S/2, NW/4, Sec. 36; S/2, S/2, NE/4, Sec. 35; SE/4, Sec. 35; S/2, SW/4, Sec. 35; and the NE/4, SW/4, Sec.

35 of T6N, R4W, SBB&M and the S/2, Sec. 31 of T6N, R3W, SBB&M.

An exemption to this prohibition may be granted by the Regional Board's Executive Officer for new or existing wastewater leaching or percolation (septic) systems after presentation by the proposed discharger of geologic and hydrologic evidence that leaching system disposal will not, individually or collectively, result in a pollution or nuisance, or other adverse effects to water quality or beneficial uses.

6. The discharge of septic tank pumpings (septage) and chemical toilet wastes to other than a sewage treatment plant or a certified waste hauler shall be prohibited as soon as a treatment plant for the particular regional service area has provided the capability of handling such wastes.

**Figure 4.1-1
LAHONTAN BASIN PROHIBITION AREAS**



NOTICE:
The information contained on the figures and diagrams in this publication are intended for reference only. Consult with Regional Board staff for exact boundary lines and other information.

**Figure 4.1-2
SURPRISE VALLEY, COWHEAD LAKE,
MADELINE PLAINS AND DUCK FLAT
HYDROLOGIC UNITS**

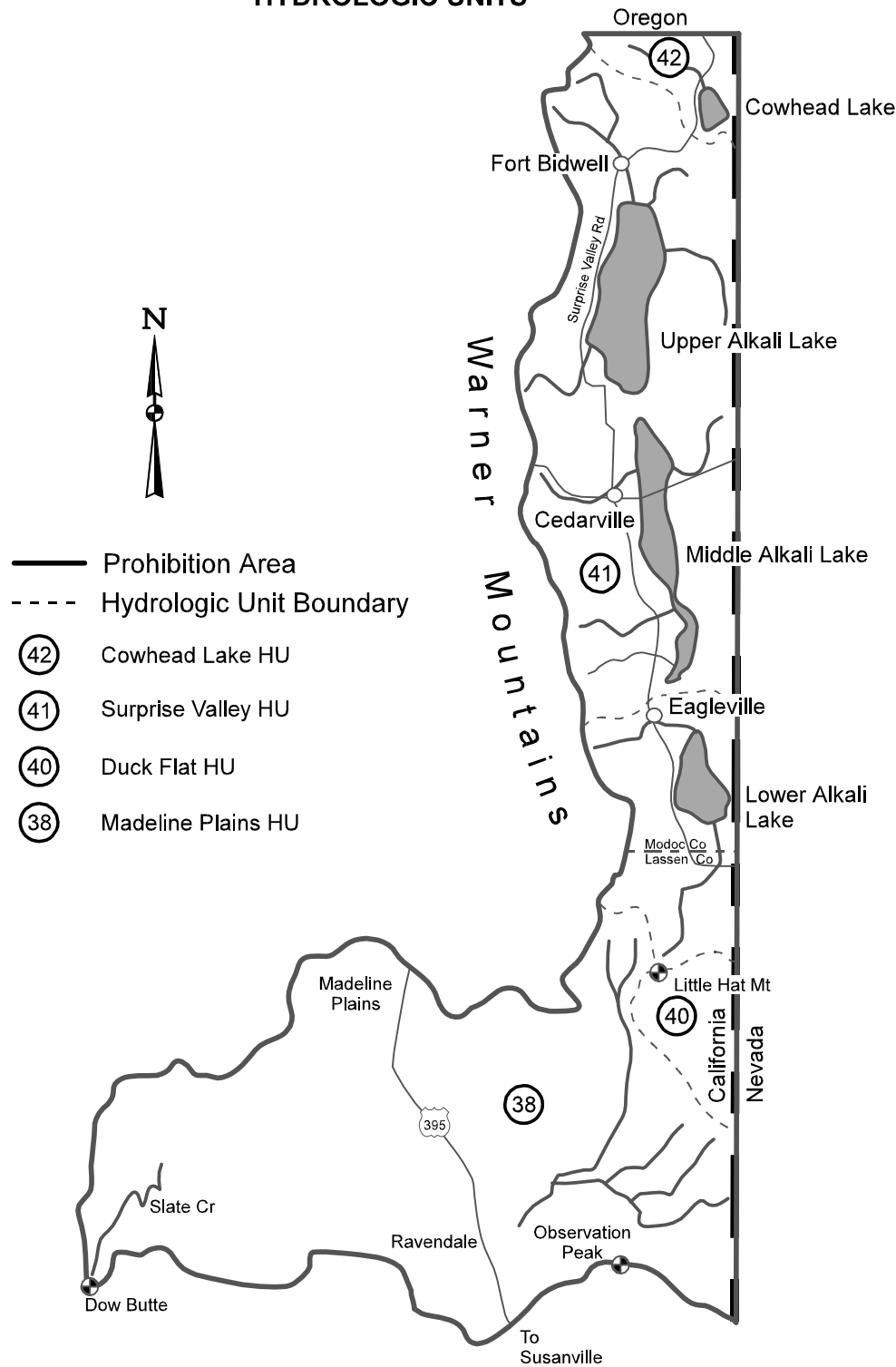


Figure 4.1-3
SUSANVILLE AND SMOKE CREEK HYDROLOGIC UNITS

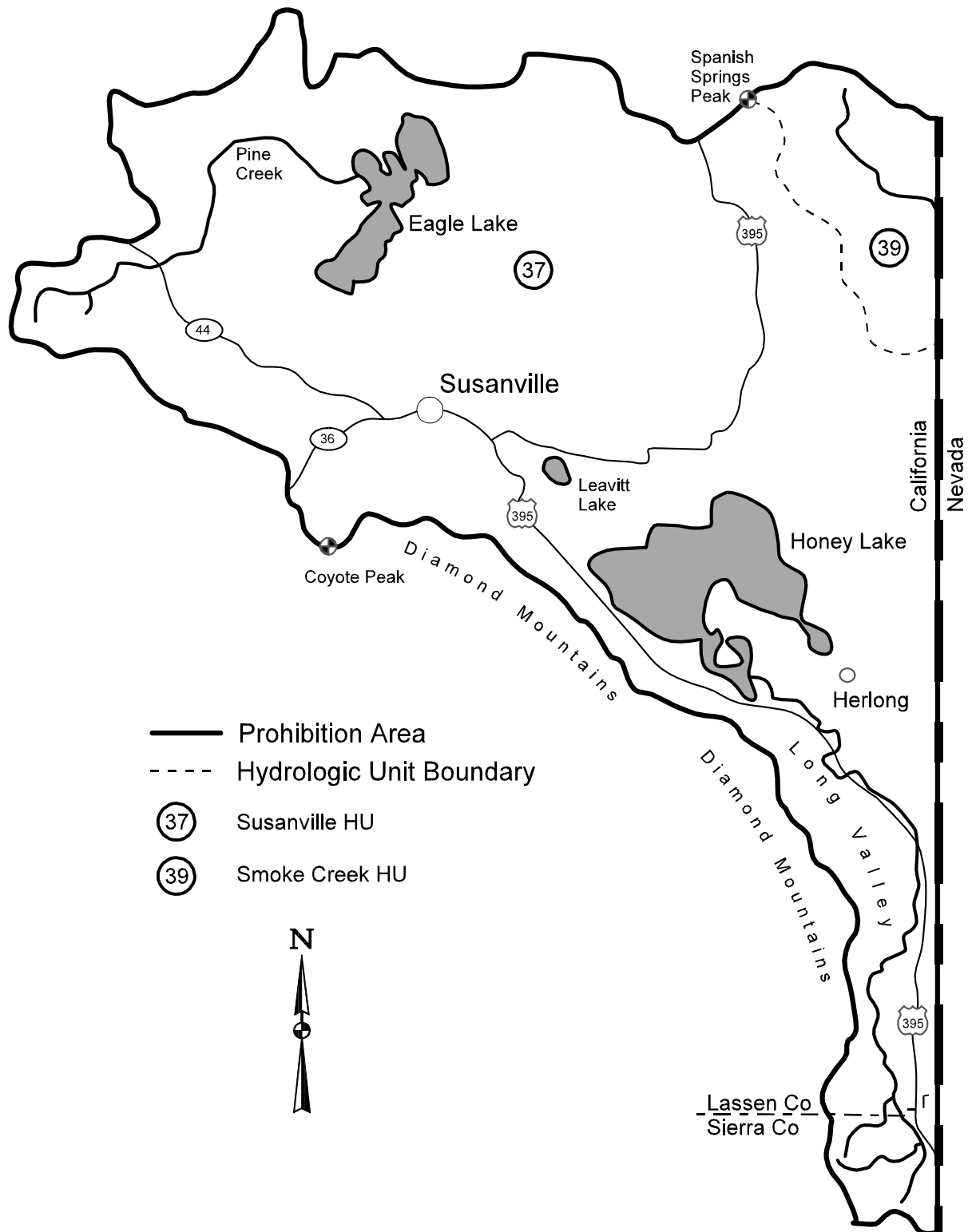
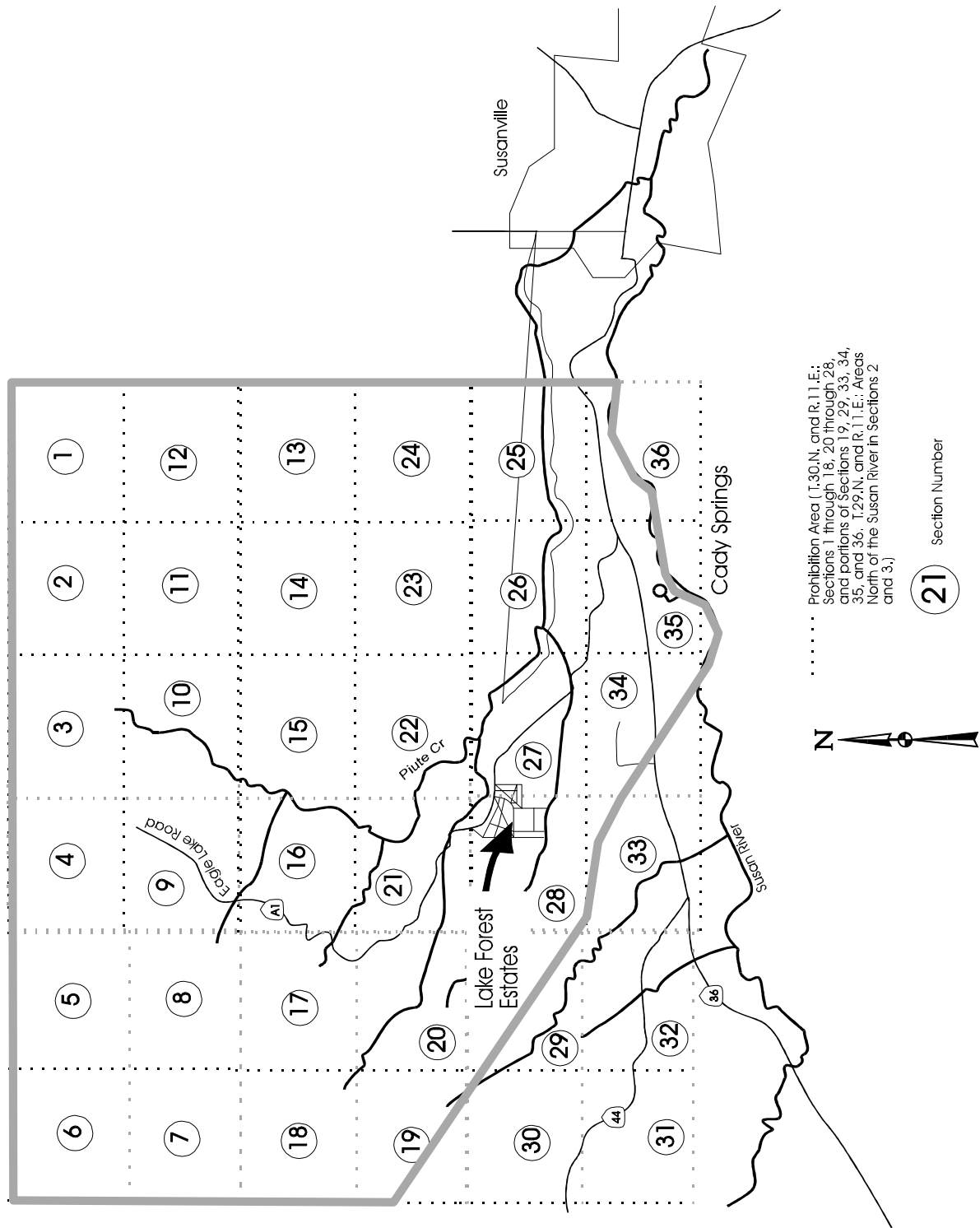


Figure 4.1-4
SUSANVILLE HYDROLOGIC UNIT
CADY SPRINGS



**Figure 4.1-5
EAGLE DRAINAGE HYDROLOGIC AREA**

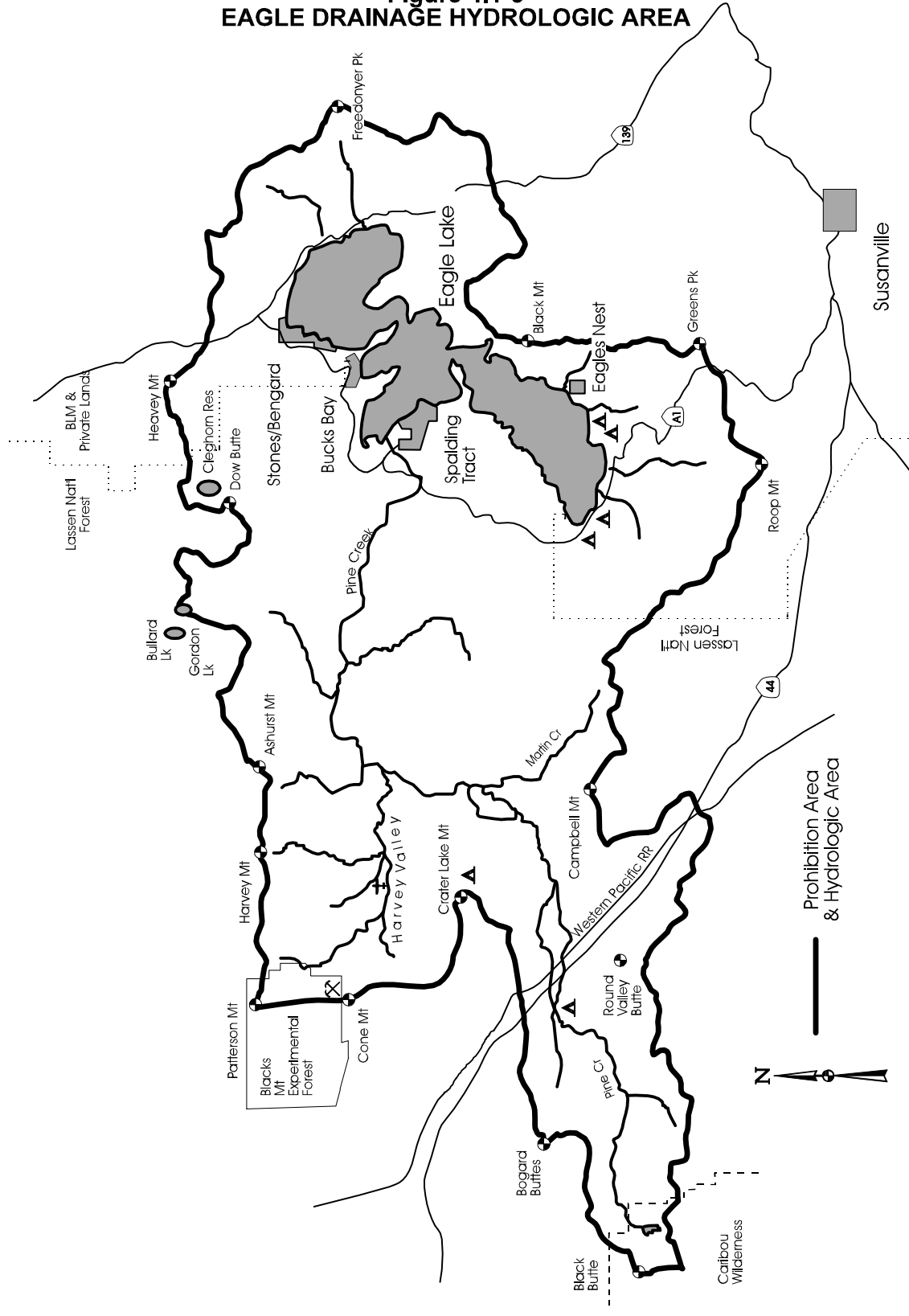
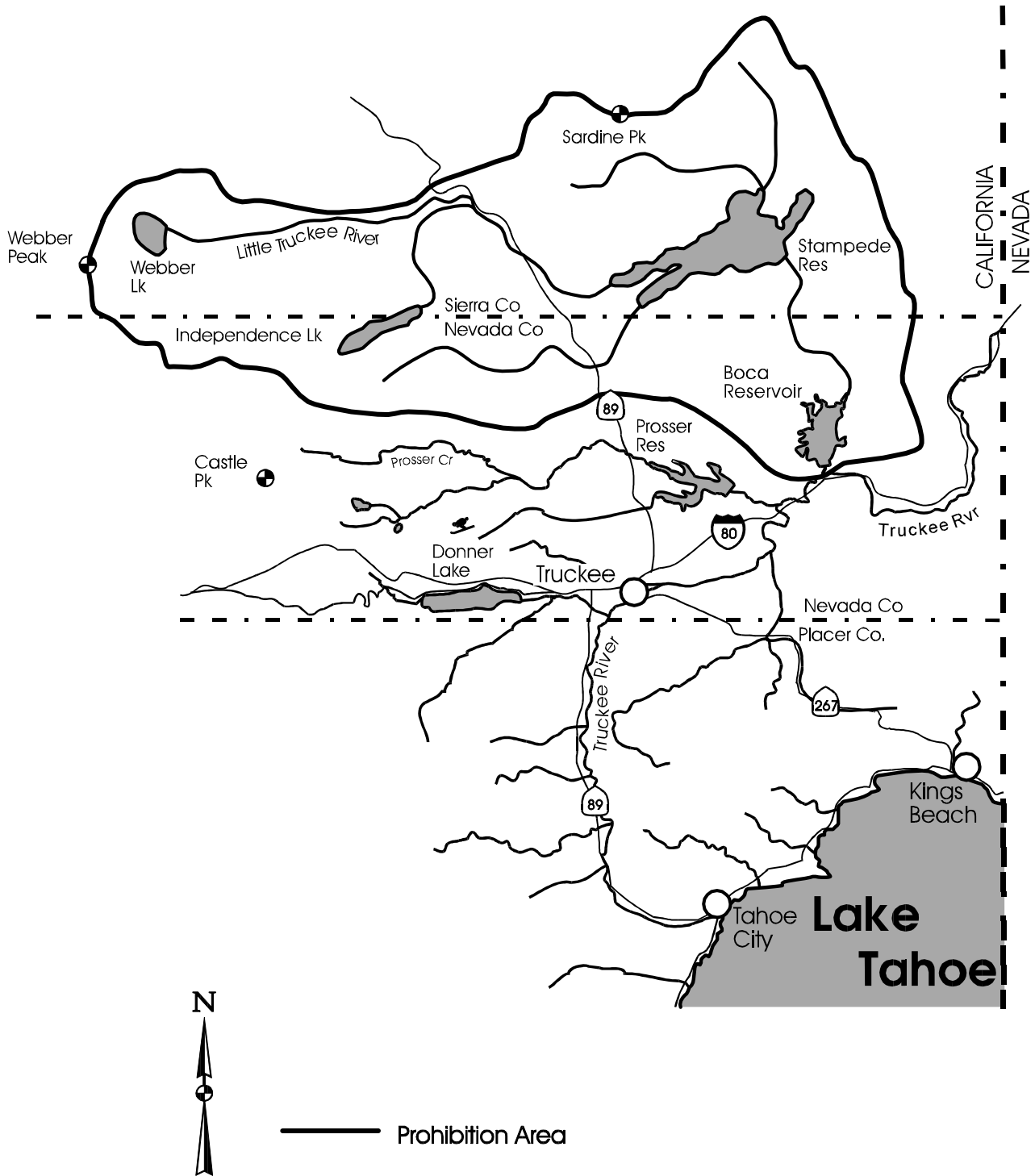


Figure 4.1-6
LITTLE TRUCKEE RIVER HYDROLOGIC UNIT



**Figure 4.1-7
TRUCKEE RIVER HYDROLOGIC UNIT
Prohibitions 1-4, 8-11**

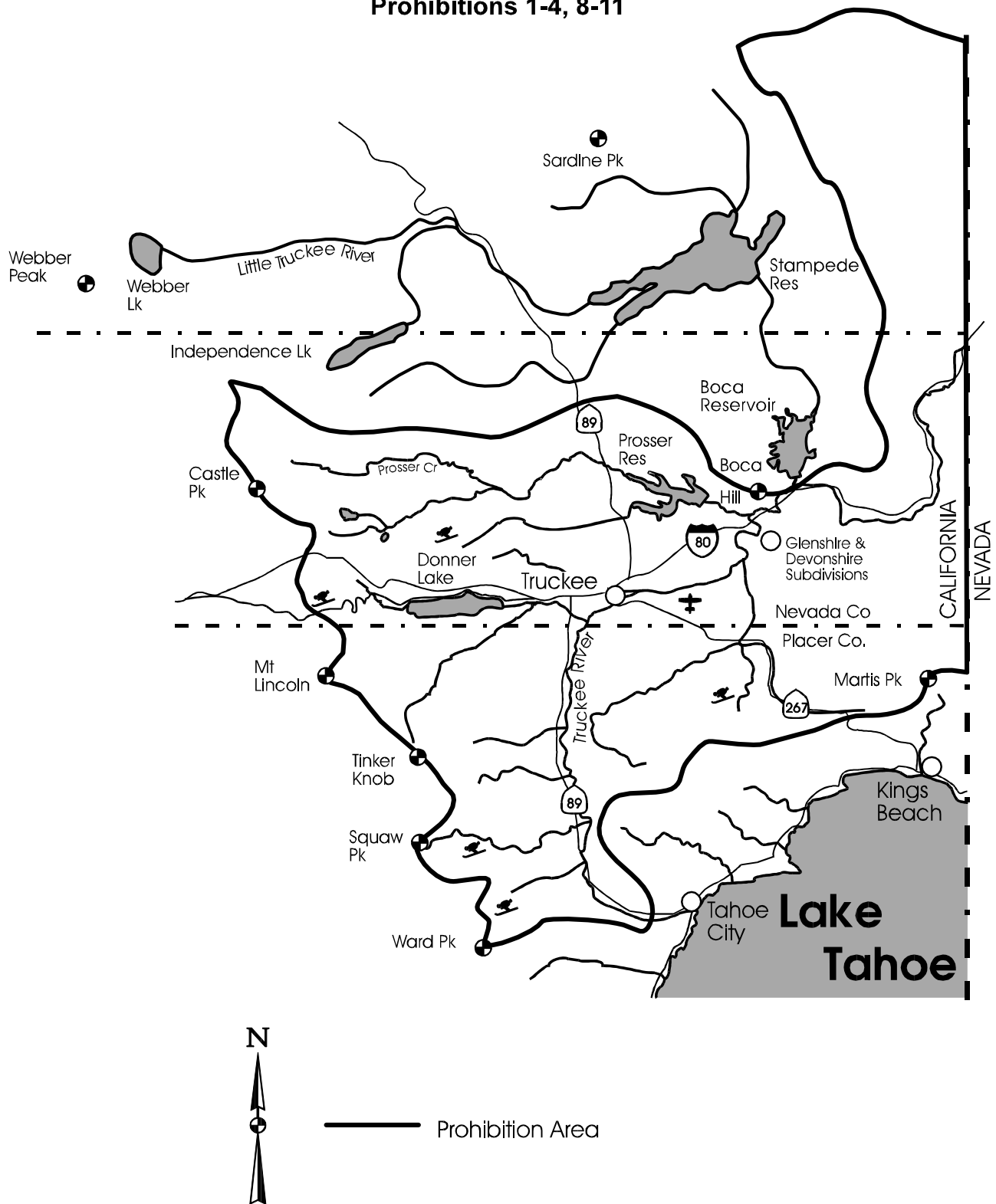


Figure 4.1-8
TRUCKEE RIVER HYDROLOGIC UNIT
Prohibitions 5 and 7

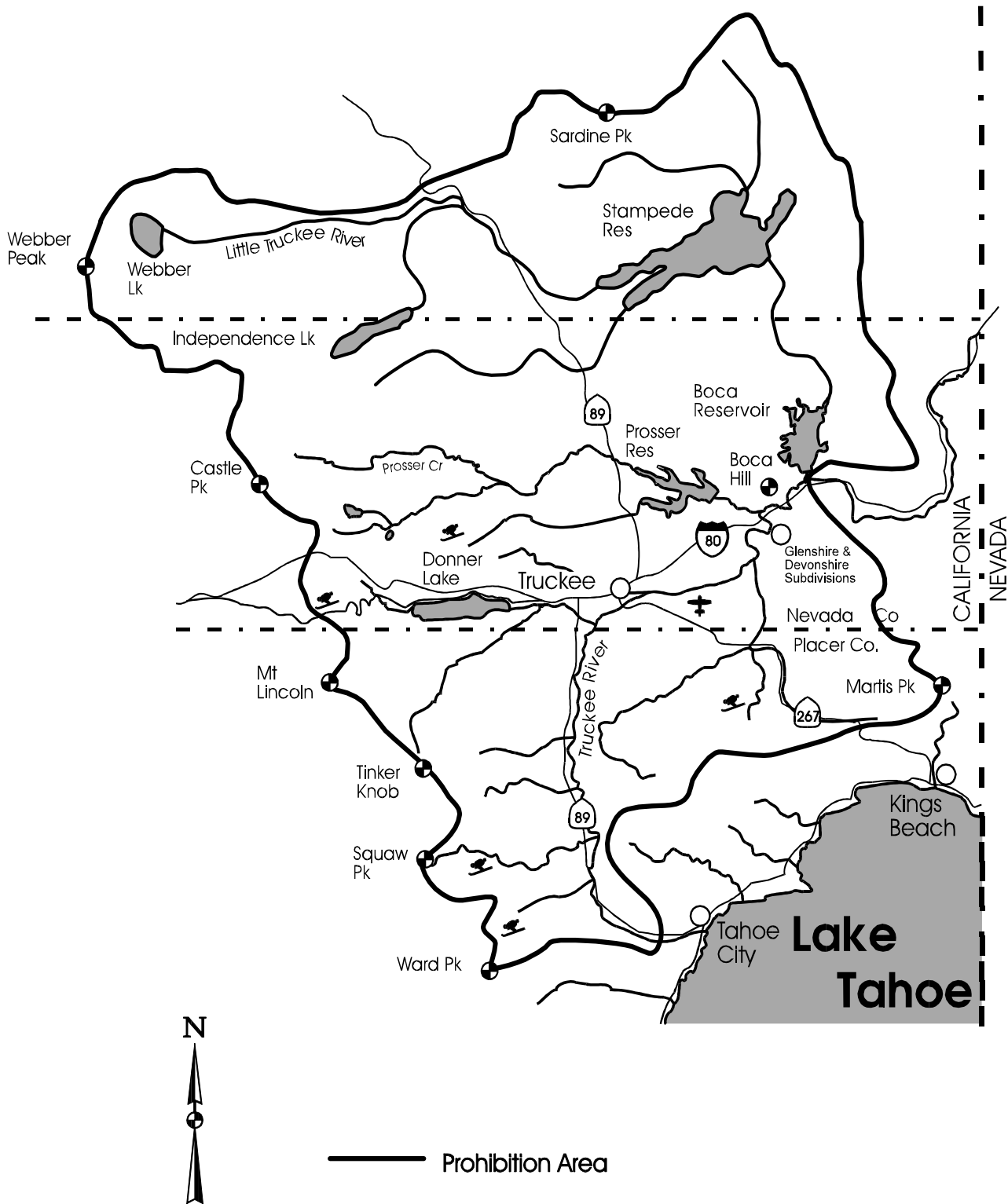


Figure 4.1-8A
Prohibition 7

Figure 4.1-8A
Septic System Prohibition Flowchart to Determine Permitting Authority in the Truckee & Little Truckee River Hydrologic Units above the Confluence of the Truckee River and the Boca Outlet (see Fig 4.1-8)

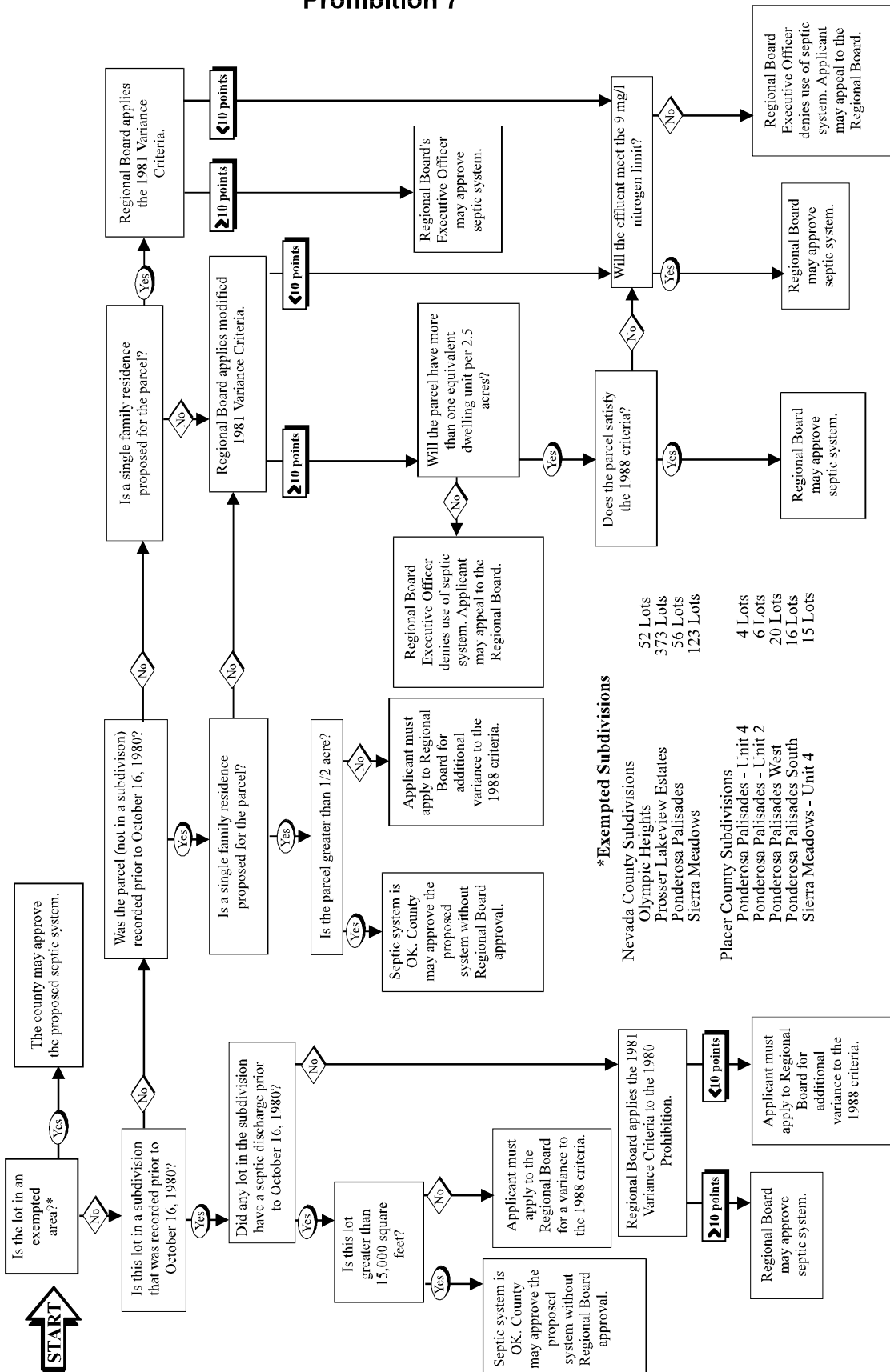
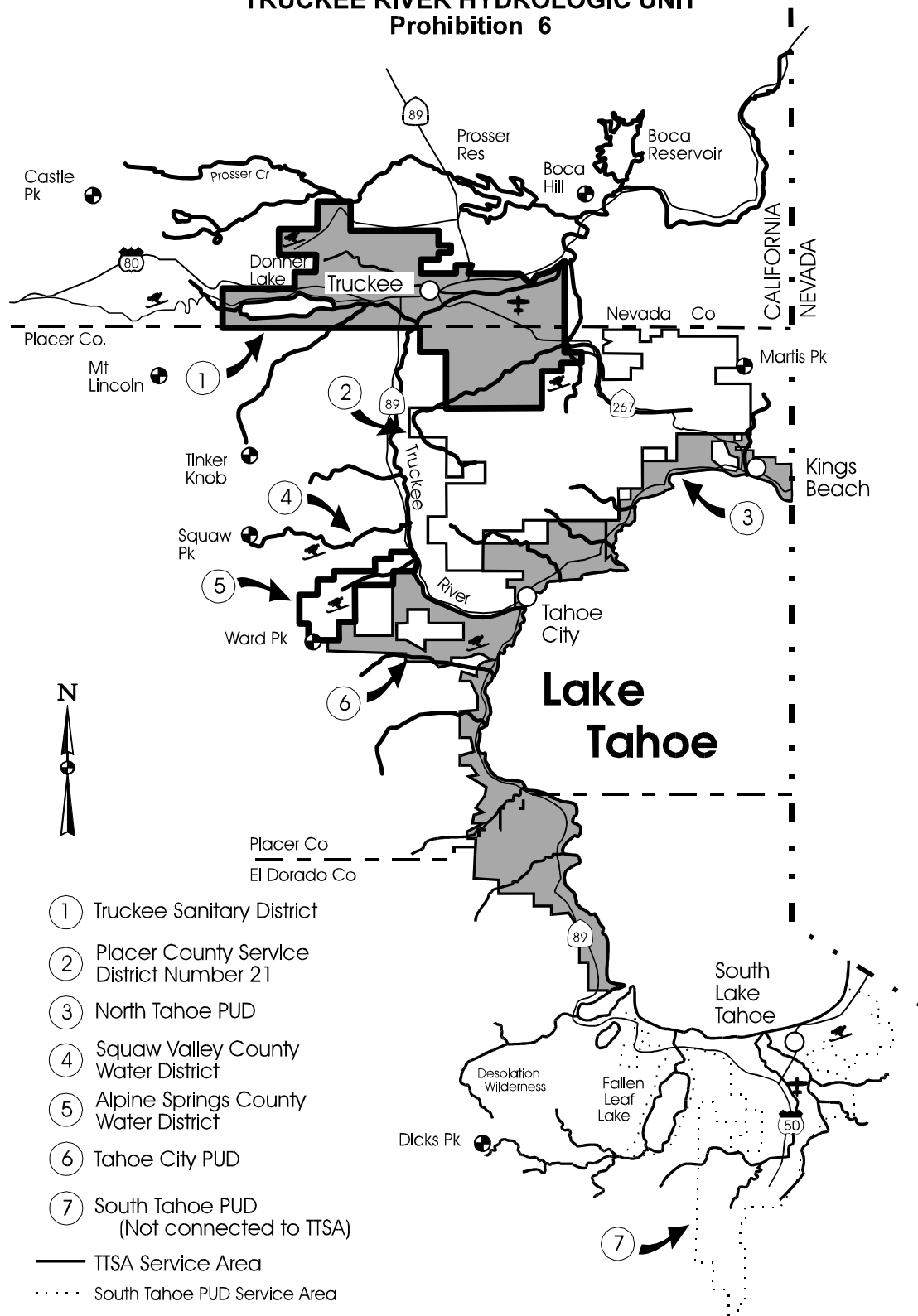
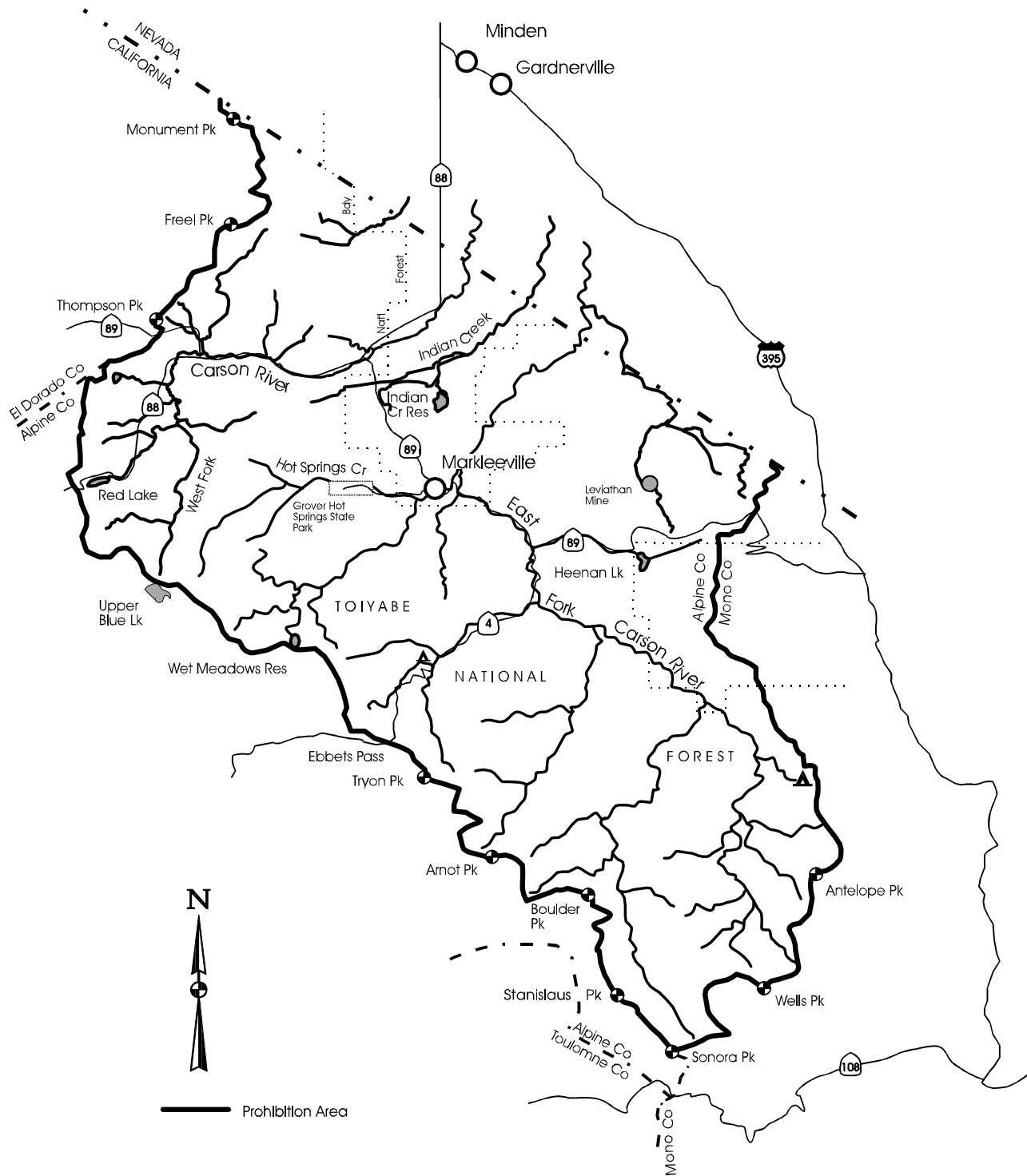


Figure 4.1-9
TRUCKEE RIVER HYDROLOGIC UNIT
Prohibition 6



**Figure 4.1-10
CARSON RIVER HYDROLOGIC UNITS
EAST & WEST FORKS**



**Figure 4.1-11
WALKER RIVER HYDROLOGIC UNITS
EAST & WEST FORKS**

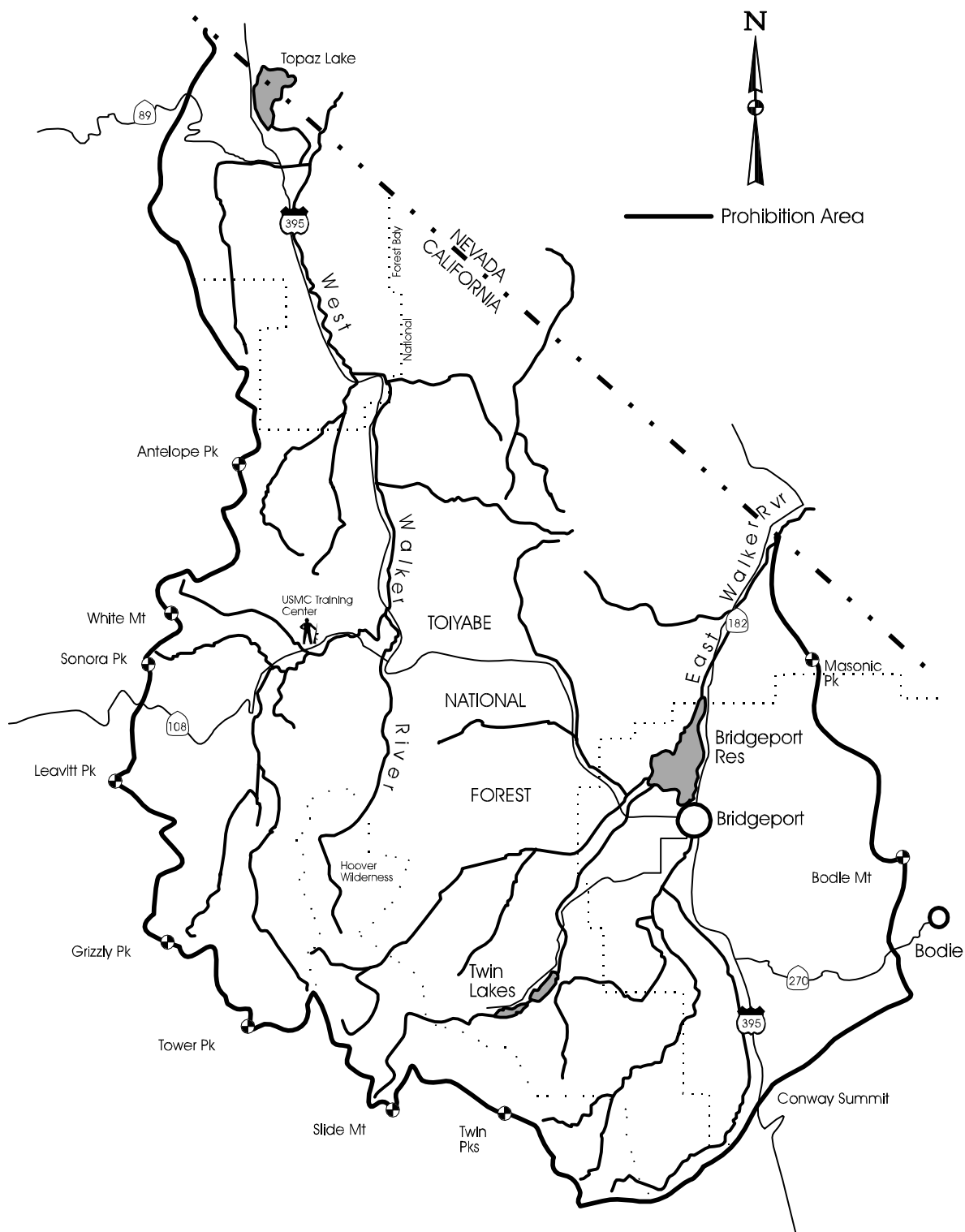


Figure 4.1-12
MONO HYDROLOGIC UNIT
Prohibitions 1a; 1b; 2a; 4a

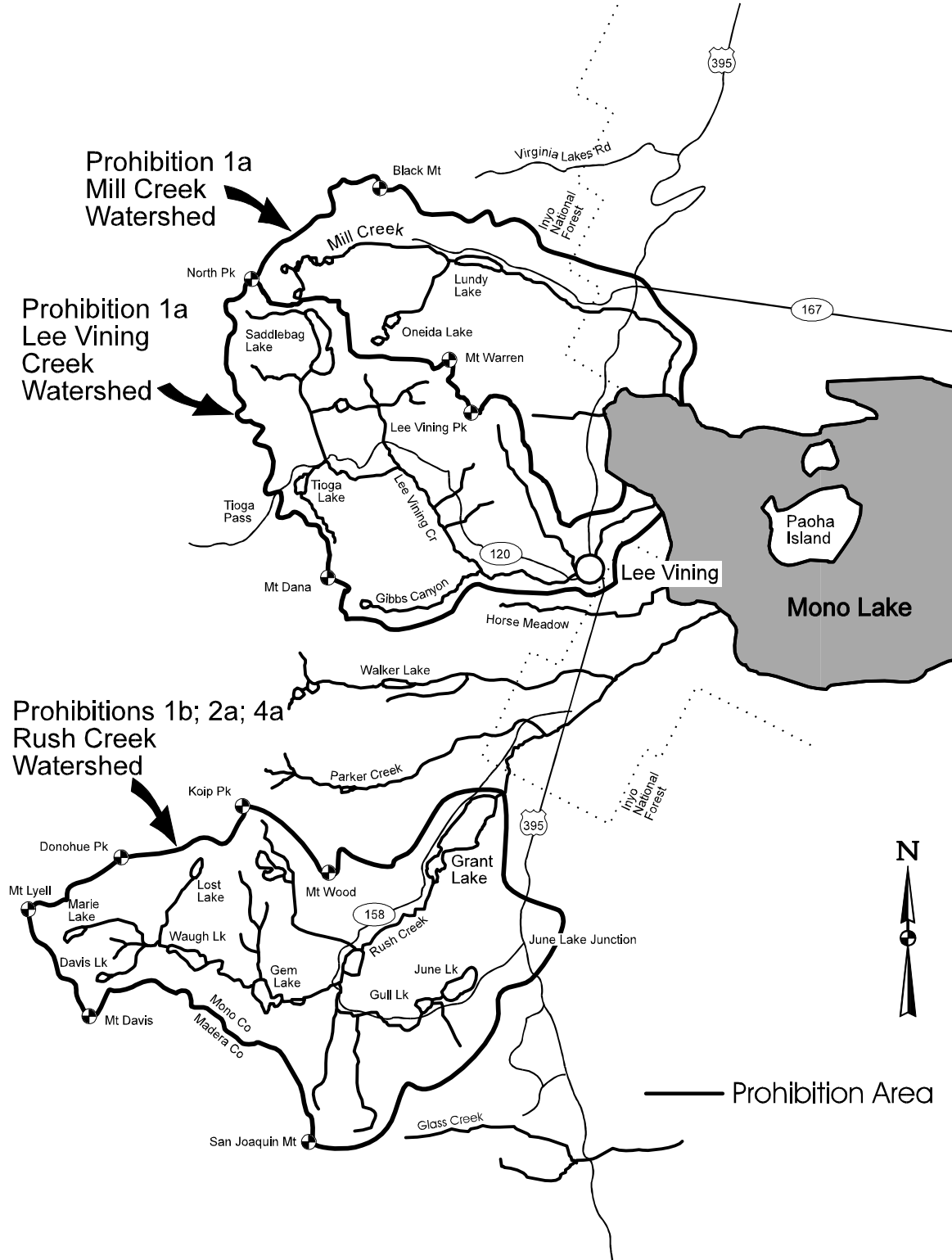
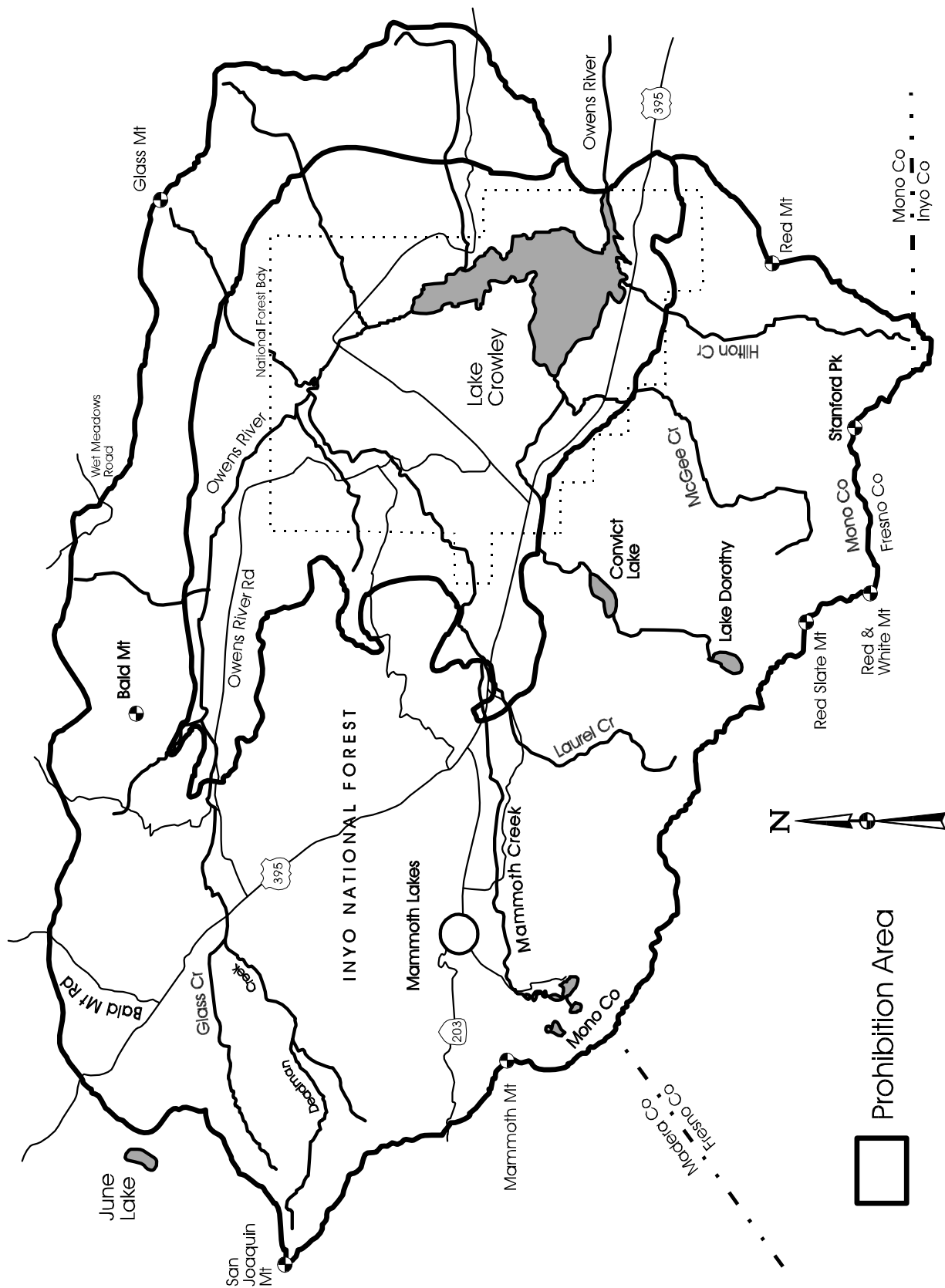


Figure 4.1-13
OWENS HYDROLOGIC UNIT
Prohibition 1c



**Figure 4.1-14
OWENS HYDROLOGIC UNIT
Prohibition 1d**

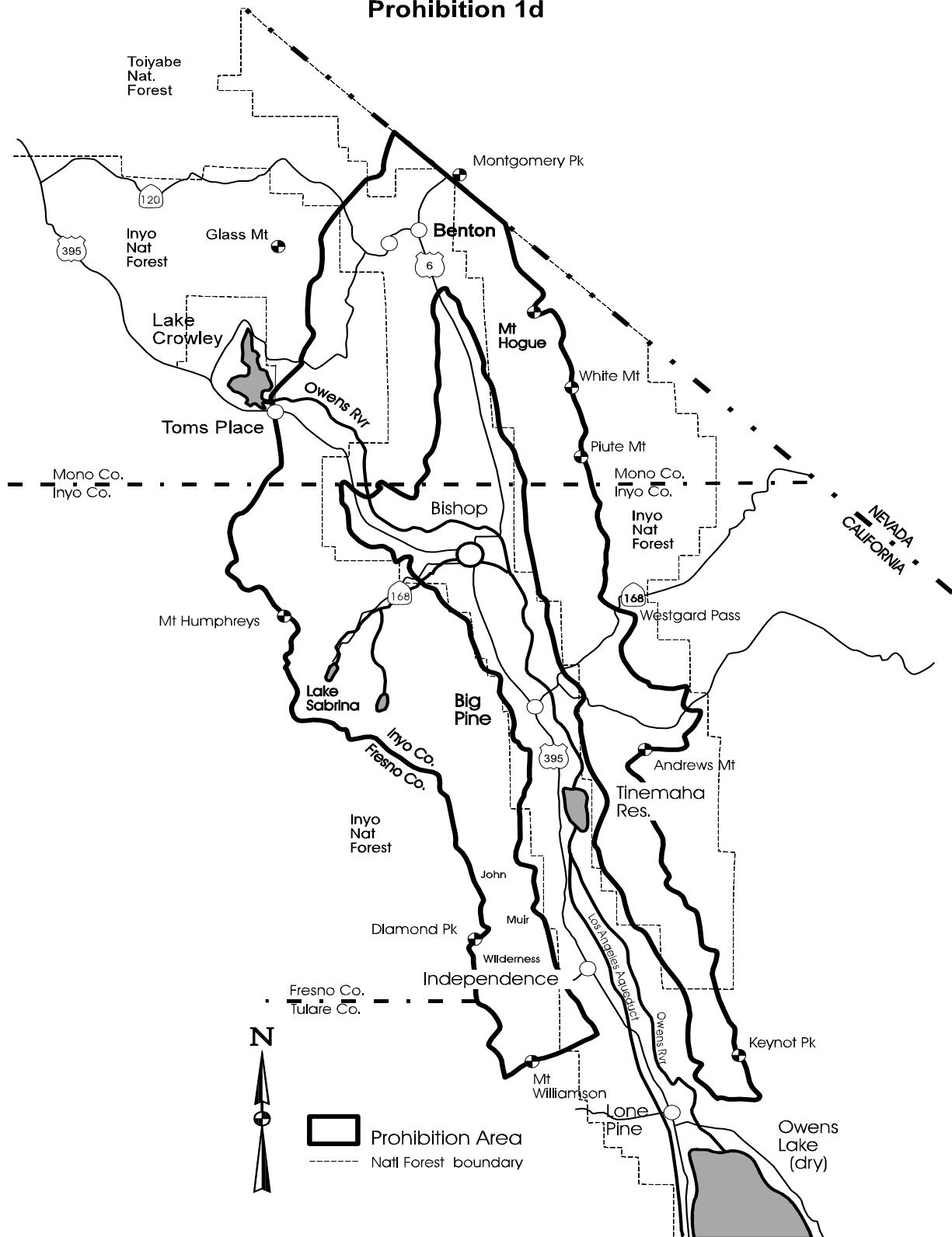


Figure 4.1-15
OWENS HYDROLOGIC UNIT
Prohibitions 2b; 4d

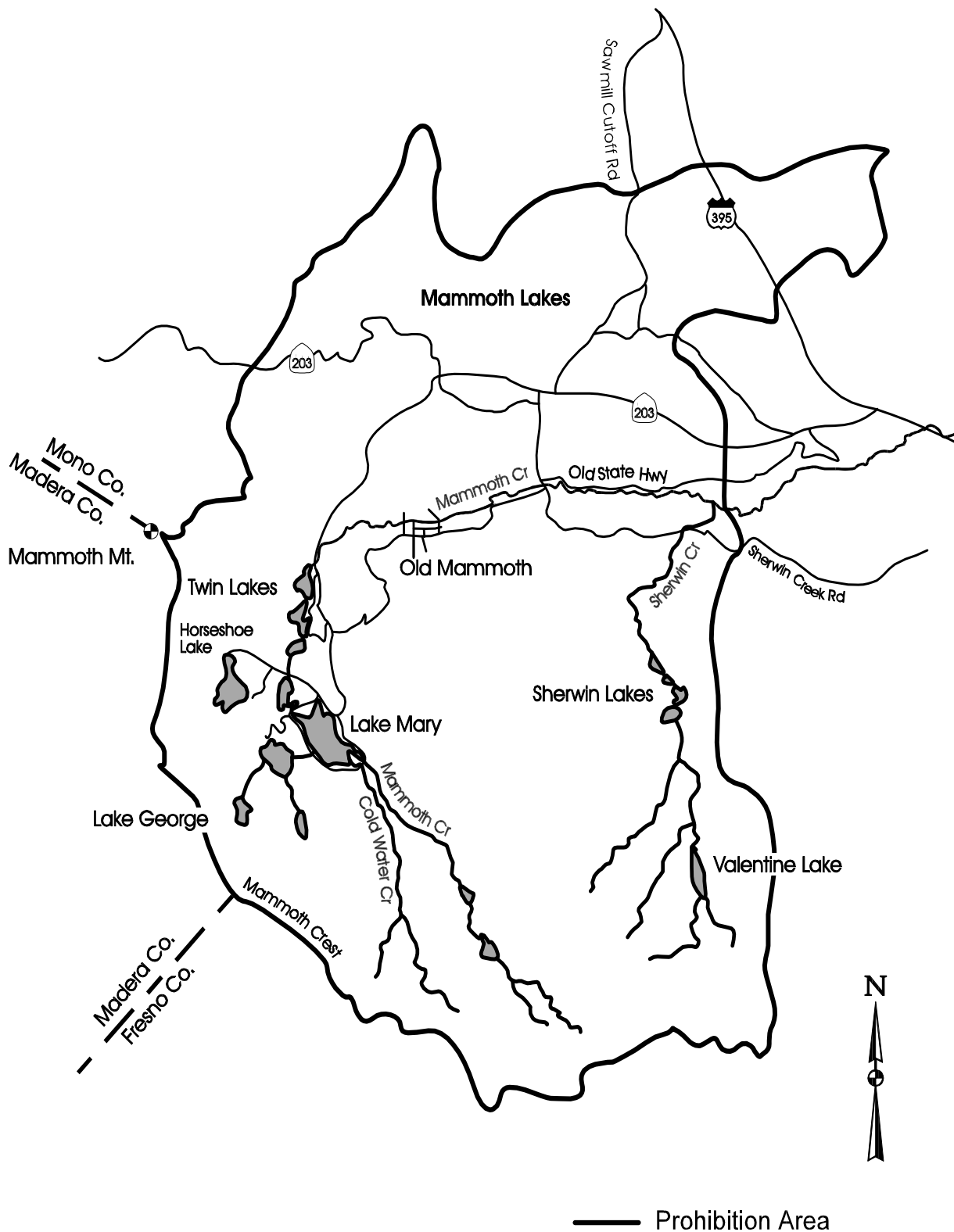


Figure 4.1-16
OWENS HYDROLOGIC UNIT
Prohibitions 3a, 3c; 4c(1), 4c(3), 4c(4)

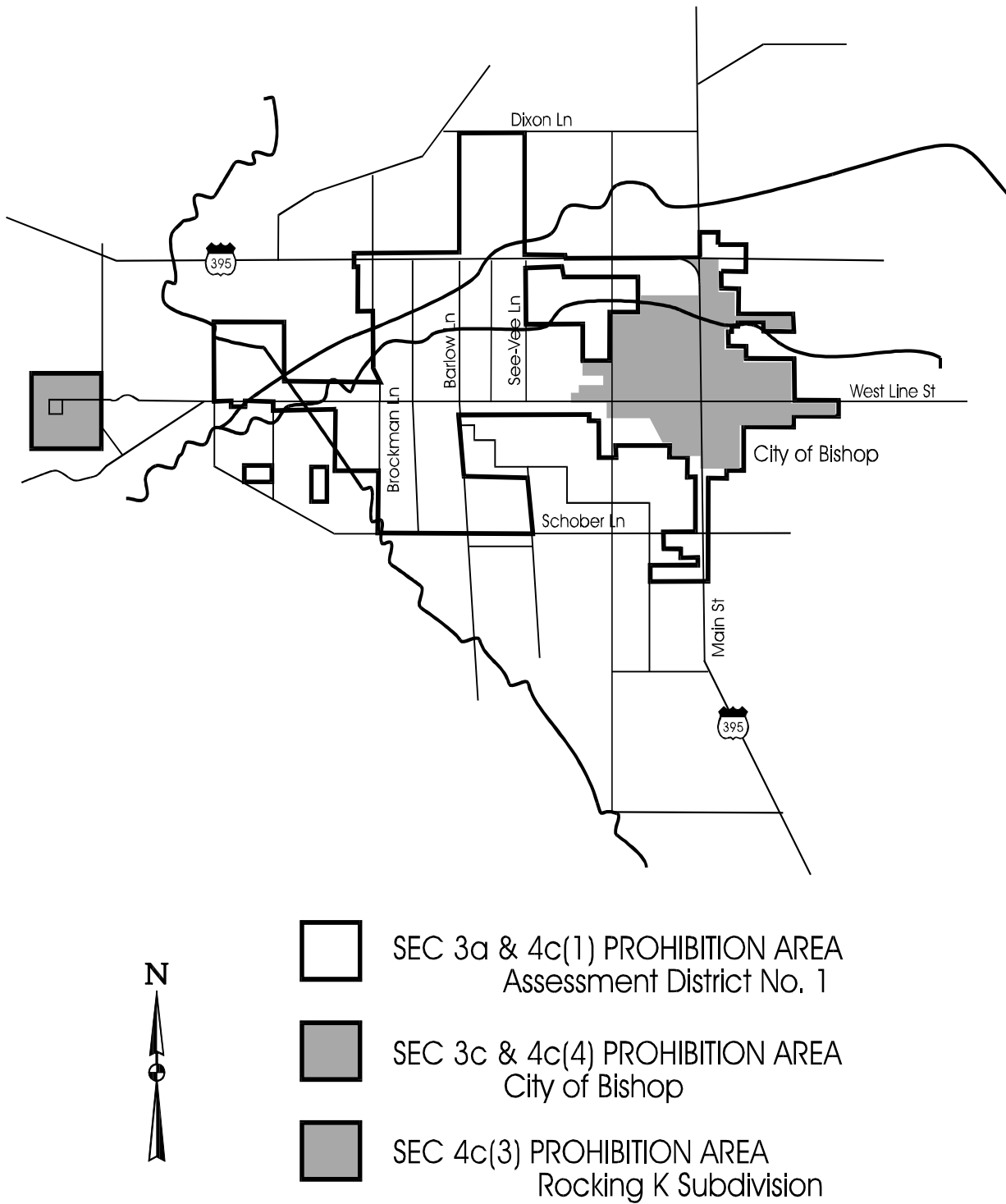


Figure 4.1-17
OWENS HYDROLOGIC UNIT
Prohibitions 3b; 4c(2)

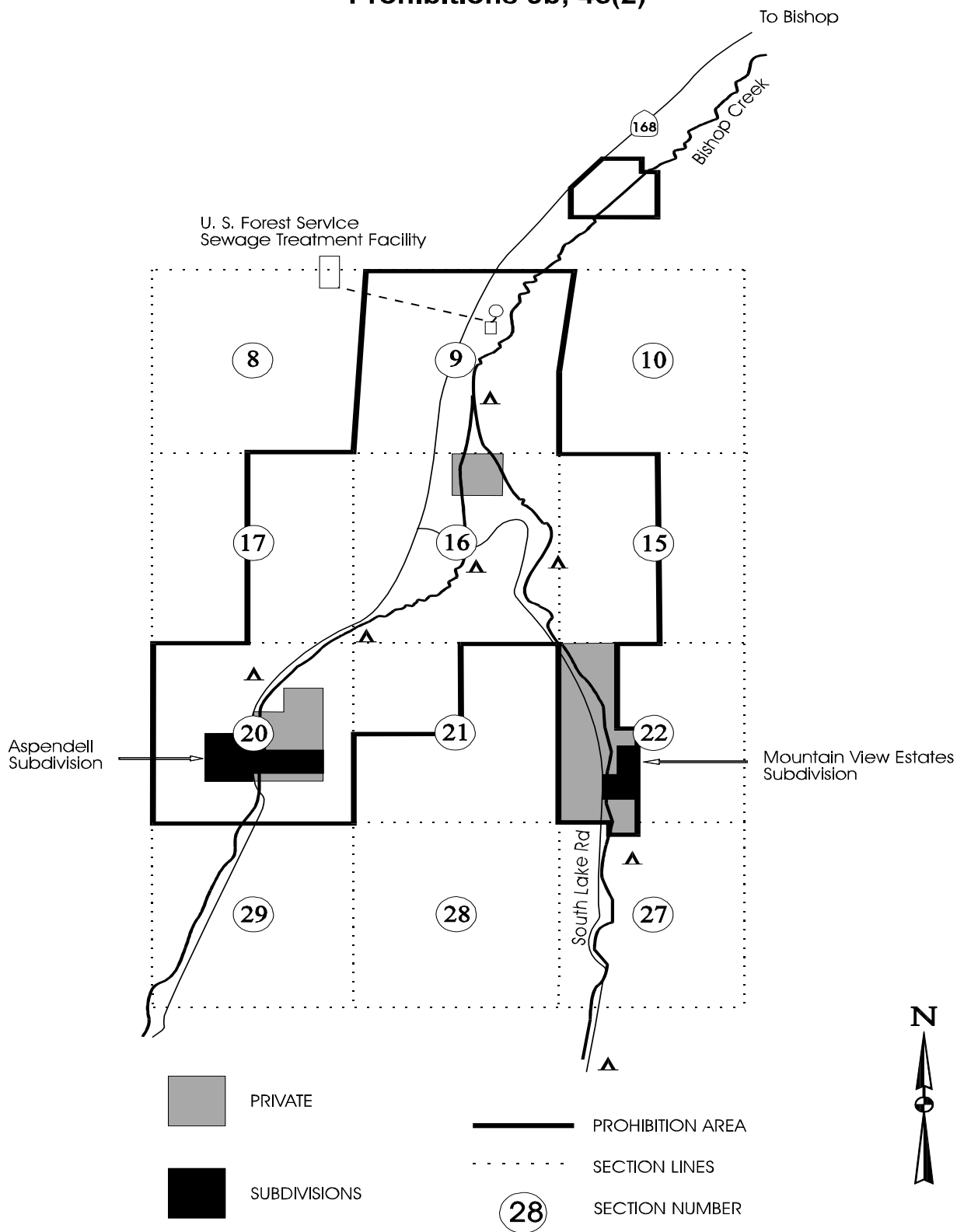


Figure 4.1-18
OWENS HYDROLOGIC UNIT
Prohibition 4b

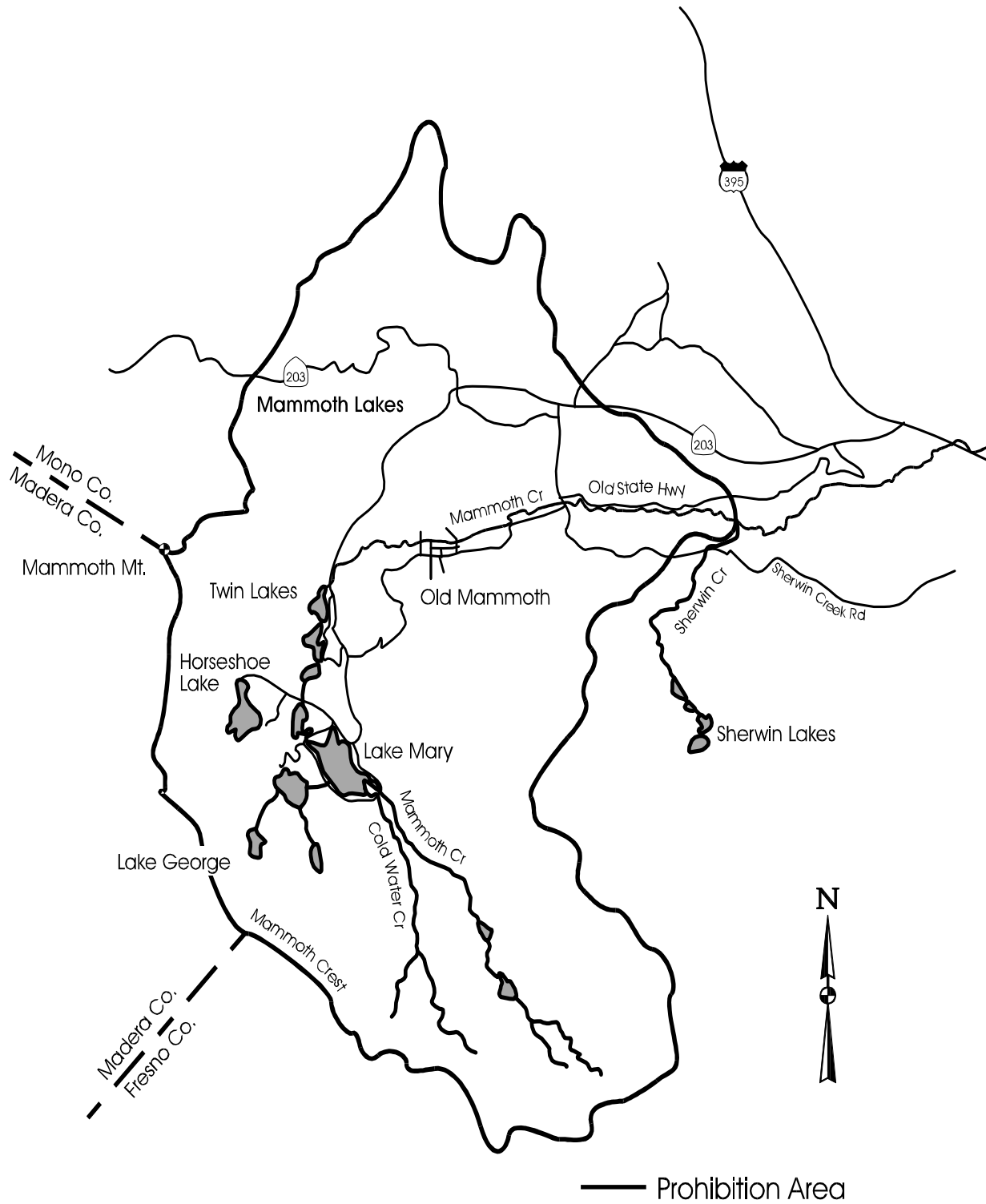
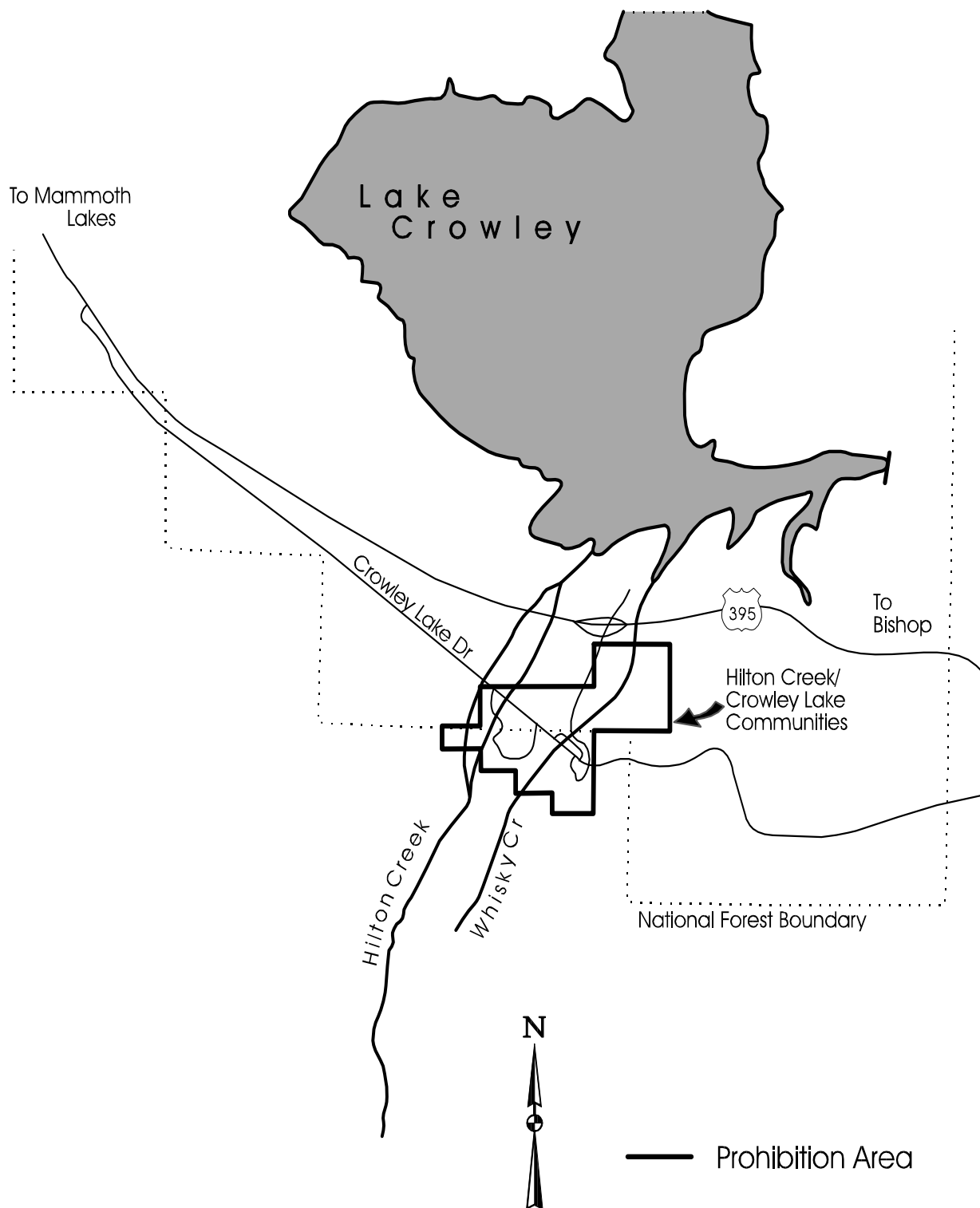


Figure 4.1-19
OWENS HYDROLOGIC UNIT
Prohibition 5



**Figure 4.1-20
AMARGOSA HYDROLOGIC UNIT**

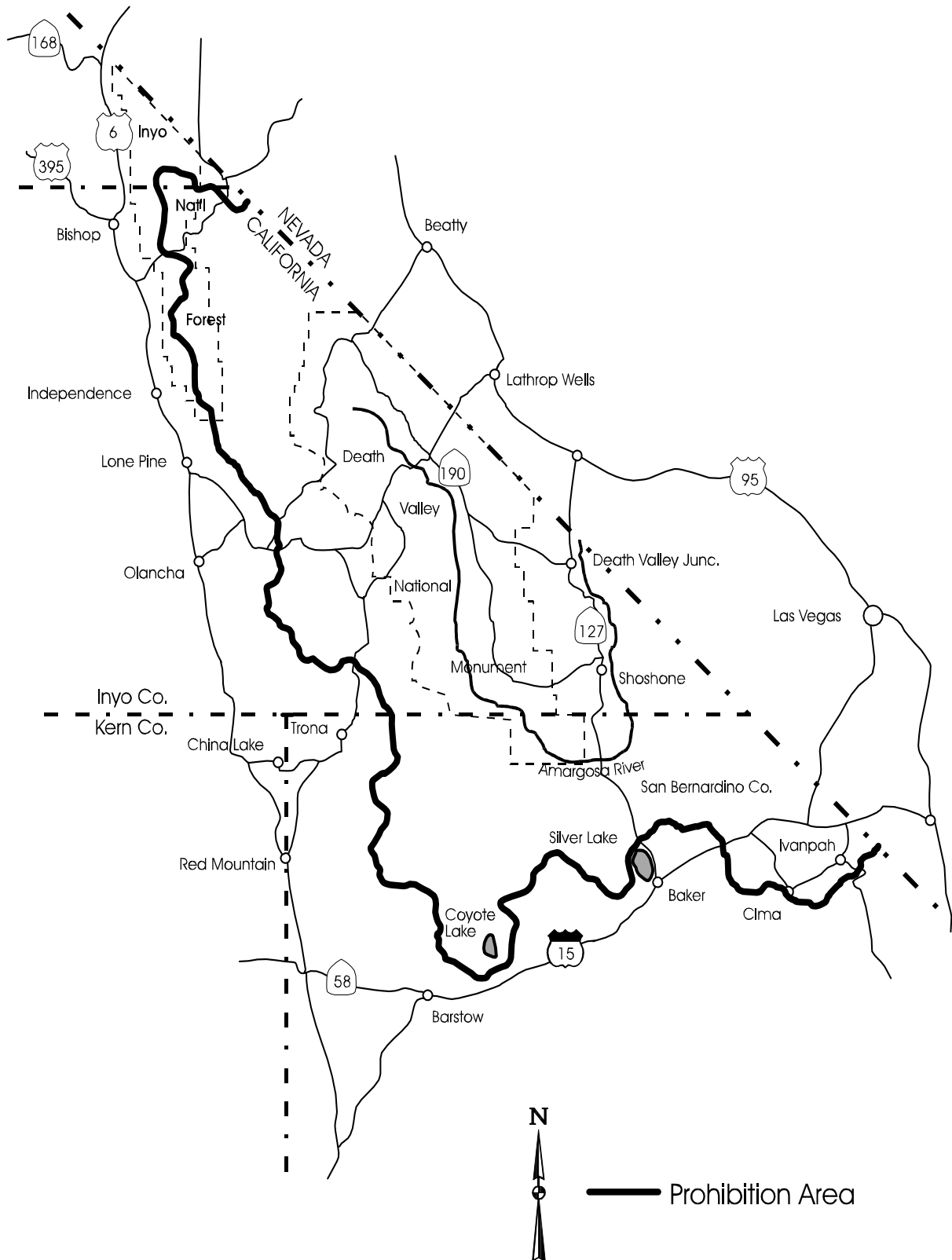


Figure 4.1-21
SEARLES VALLEY HYDROLOGIC AREA

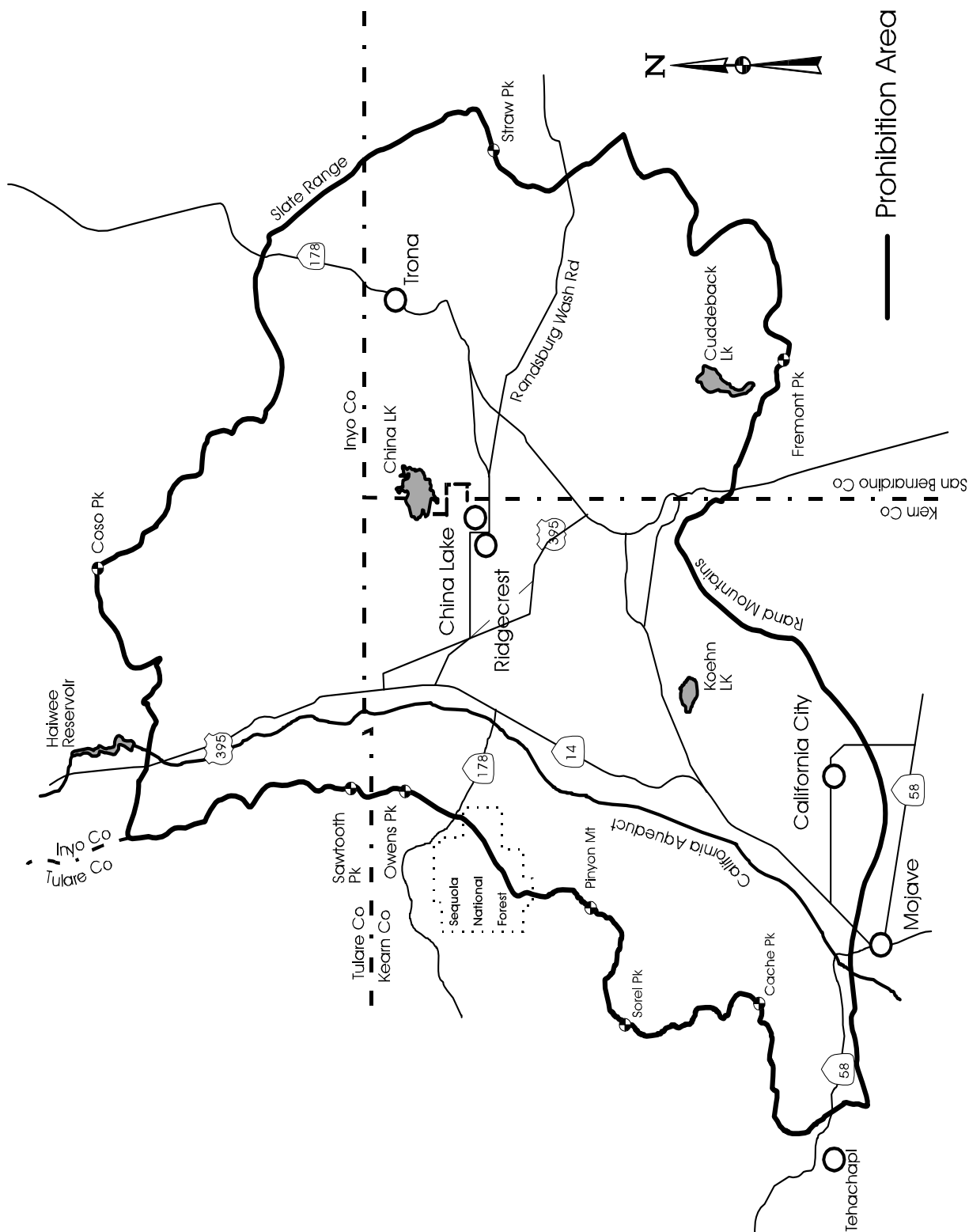


Figure 4.1-22
ANTELOPE HYDROLOGIC UNIT

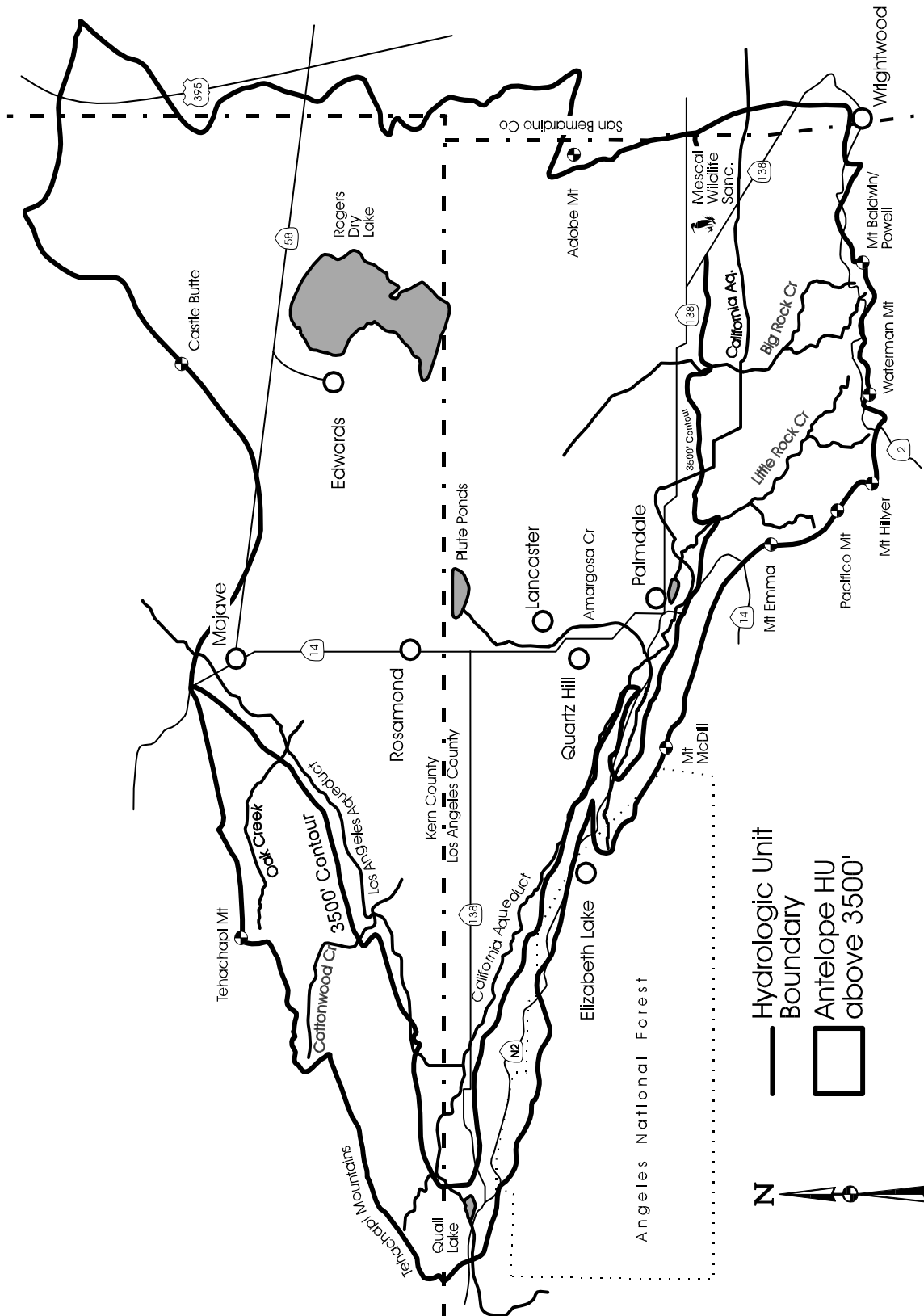


Figure 4.1-23
MOJAVE HYDROLOGIC UNIT
Prohibitions 1; 2; 3

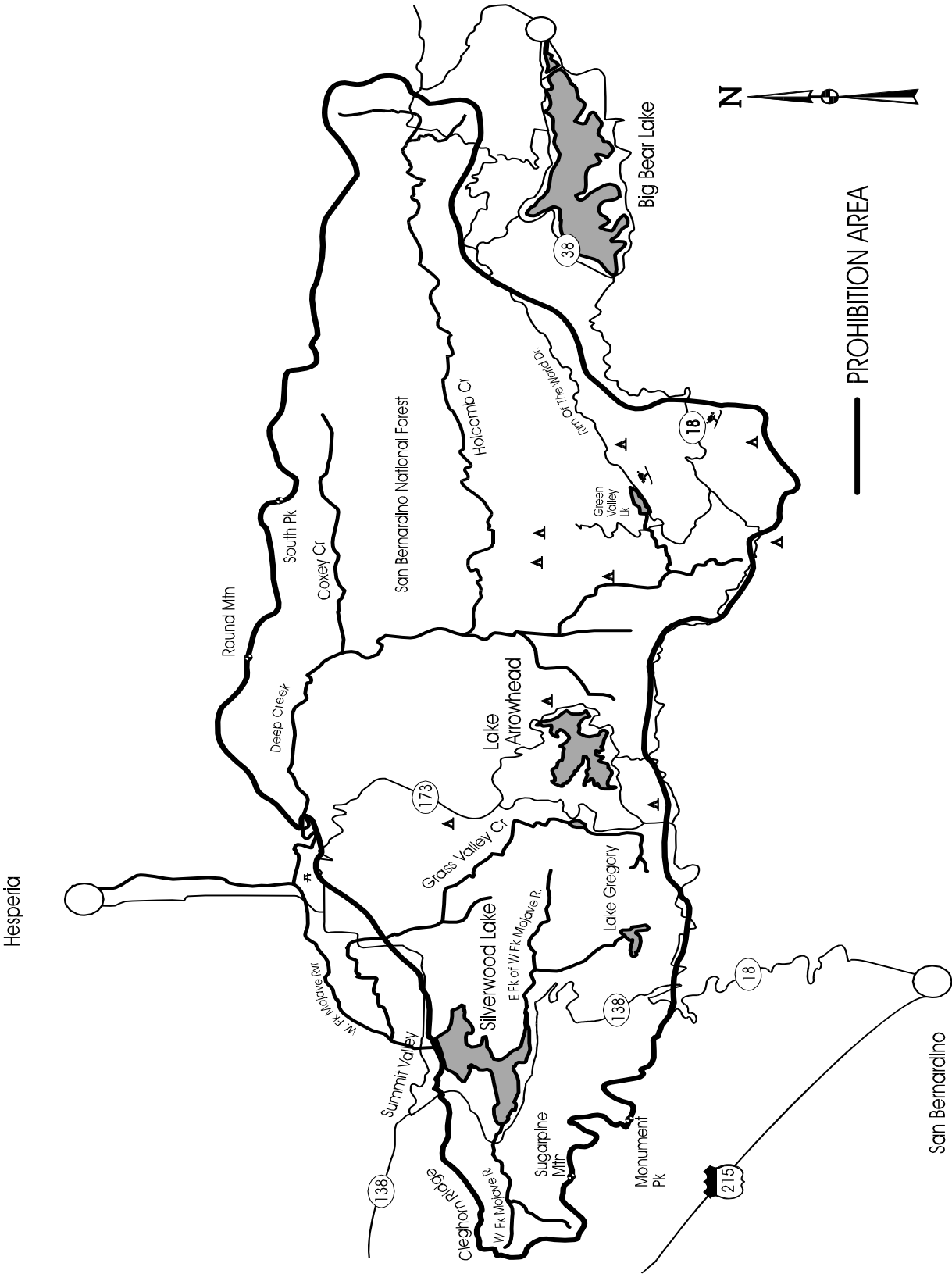
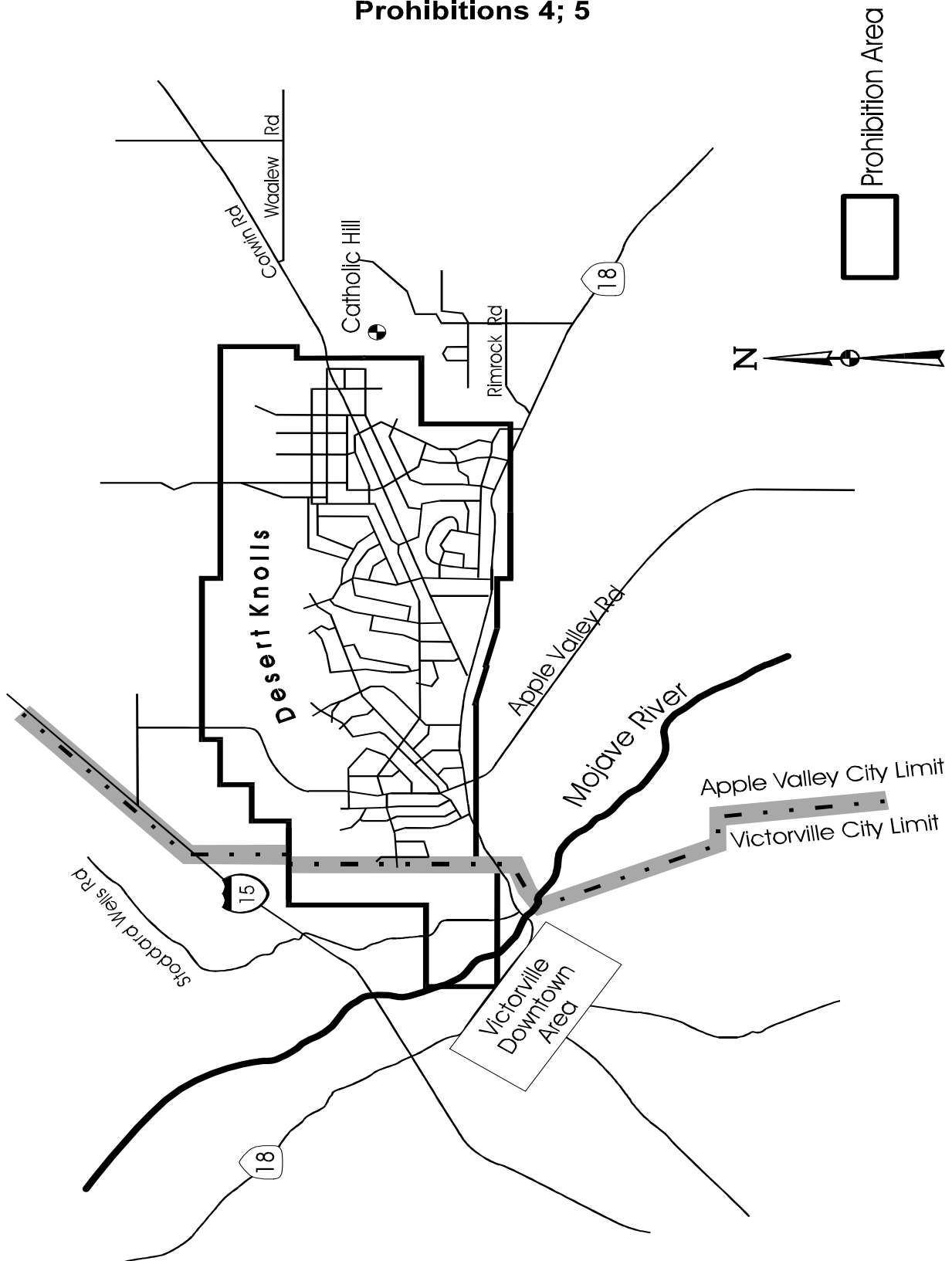


Figure 4.1-24
MOJAVE HYDROLOGIC UNIT
Prohibitions 4; 5



4.2 SPILLS, LEAKS, COMPLAINT INVESTIGATIONS, AND CLEANUPS

The Regional Board receives complaints of discharges through verbal or written notification from the public to staff at either of the Regional Board offices. The Regional Board responds to complaints of discharges (such as spills, leaks, intentional dumping, etc.) of substances which may impact water quality. It is the policy of the Regional Board to ensure that responses to all complaints involving threats to water quality be made in an expeditious manner. Proper response includes the following components:

- Thorough documentation of complaints.
- Appropriate follow-up, including: site inspections, referral to (or notification of) other regulatory agencies, corrective actions, enforcement actions, etc.
- Notification to complainant, as appropriate, of findings and subsequent actions.

Subsequent follow-up actions include determination of responsible party, enforcement, or issuance of waste discharge requirements.

The Regional Board notifies other responsible agencies (e.g., local public health, law enforcement, and fire officials, and/or the State Departments of Toxic Substances Control, Fish and Game, Pesticide Regulation, Integrated Waste Management Board, etc.) whenever the content of a complaint falls within another agency's jurisdiction.

Except for a discharge in compliance with waste discharge requirements, any person who causes or permits any reportable quantity of hazardous substance or sewage to be discharged in or on any waters of the State, or discharged or deposited where it is or probably will be discharged in or on any waters of the State, shall, as soon as possible, notify the Office of Emergency Services of the discharge in accordance with the spill reporting provision of the State toxic disaster contingency plan. The person shall also immediately notify the State Board or the appropriate Regional Board of the discharge (CA Water Code § 13271).

Similarly, any person who discharges any oil or petroleum product under the above stated conditions

shall, as soon as possible, notify the Office of Emergency Services of the discharge in accordance with the spill reporting provision of the State oil spill contingency plan. Immediate notification of an appropriate agency of the federal government, or of the appropriate Regional Board (in accordance with the reporting requirements set under CA Water Code § 13267 or 13383) shall satisfy the oil spill notification requirements of this paragraph (CA Water Code § 13272).

Major Hazardous Spills

The Regional Board staff will respond to assist local agencies and work cooperatively at large-scale hazardous material releases resulting from surface transportation accidents. The Regional Board staff's role is primarily to provide immediate, onsite technical assistance concerning water quality in order to minimize the potential damage to the public health and safety, and the environment. Regional Board staff will interact with local authorities in an organized and predictable manner in accordance with the California Office of Emergency Services Railroad Accident Prevention and Immediate Deployment Plan, or RAPID (Public Utilities Code Section 7718). Regional Board staff activities include: (1) providing information on existing downstream beneficial uses and potential impacts from the substance being released, (2) providing toxicity information about the substance, (3) setting up a water and sediment monitoring program, (4) collecting samples or requesting that a local agency equipped to enter a hazardous area take samples for the Regional Board, and (5) coordinating available resources (lab support, vehicles, sampling equipment).

Reportable Quantities Of Hazardous Waste And Sewage Discharges

Water Code Section 13271 requires that the State Board and the Department of Toxic Substances Control adopt regulations establishing reportable quantities for substances listed as hazardous wastes or hazardous materials pursuant to Section 25140 of the Health and Safety Code. Reportable quantities are those which should be reported because they may pose a risk to public health or the environment if discharged to ground or surface water.

Similarly, the State Board was required to adopt regulations establishing reportable quantities for sewage. These requirements for reporting the discharge of sewage and hazardous materials do not supersede waste discharge requirements or water quality objectives.

The regulations for reporting spills of hazardous materials are given in Sections 2701, 2703, and 2705

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of Chapter 2, Subchapter 3, of Title 19 of the California Code of Regulations and are incorporated by reference into this plan. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

The Water Code (Section 13272.1) requires Regional Boards to publish and distribute quarterly reports on methyl tert butyl ether (MTBE) discharges to public water system operators within their jurisdictions. The reports must list MTBE discharges which occurred within the quarter and locations where MTBE was detected in groundwater within the region.

Proposition 65 Program

The Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65), became effective January 1, 1987. Proposition 65 (CA Health and Safety Code § 25249.5, et seq.) prohibits discharges of any chemical “known to the State to cause cancer or reproductive toxicity” to a potential source of drinking water, with certain exceptions. It also requires “clear and reasonable warnings,” with certain exceptions, to be provided prior to an exposure to any of the listed chemicals (list is described below). Implementation of the Proposition specifies certain actions for designated governmental employees and for private parties.

Designated Governmental Employees

Health and Safety Code Section 25180.7 requires designated governmental employees to disclose specific information to a local Board of Supervisors and a local health officer in the event of a hazardous discharge or threatened hazardous discharge (as defined below). A designated employee is an employee so identified by his or her (state or local) government agency who is required to sign a conflict of interest statement. A list of designated employee positions for the State and Regional Boards is available from the State Board's Office of the Chief Counsel.

Any designated employee who knowingly and intentionally fails to report information, as required by Proposition 65, shall be subject to imprisonment (not more than 3 years), fines (\$5,000 to \$25,000), and upon felony conviction, forfeit state employment.

There is no liability for designated employees who, in good faith, report hazardous waste discharges to the counties that are later determined not to be a substantial threat to the public health and safety.

Section 25180.7 of the Health and Safety Code states: “Any designated government employee who obtains information in the course of his official duties revealing the illegal discharge or threatened illegal discharge of a hazardous waste within the geographical area of his jurisdiction and who knows that such discharge or threatened discharge is likely to cause substantial injury to the public health or safety must, within seventy-two hours, disclose such information to the local Board of Supervisors and to the local health officer.” The information is disclosed via a Proposition 65 Notification Report, which includes the following information:

- discharge type
- how the discharge was discovered
- location of discharge
- probable discharger
- possible contacts
- concentration of contaminant in soil and/or water

Private Party Responsibilities

Private parties must examine workplace chemicals, facilities emissions and products to determine if chemicals subject to the Proposition are present. If the chemicals are determined to be present at levels which cause significant risks, the private parties must provide precautionary warnings as specified by the Proposition. The attorney general, or any district attorney or city attorney may initiate enforcement actions against a violator. Also, any person or organization may bring an action in the public interest if the above officials are notified and fail to diligently prosecute the violation within 60 days. Exceptions to these warning requirements and discharge prohibitions are included in the Proposition.

Proposition 65 List

The Proposition requires the State Governor to publish a list of chemicals known to cause cancer or reproductive toxicity, and revise and republish the list with any new information at least once per year. The first list was published in February 1989. More than 400 chemicals and substances have been listed as carcinogens, and more than 200 for reproductive toxicity, as of May 1998. The list is included in the California Code of Regulations (22 Cal. Code of Regs. § 12000[b-c]). Subsection (b) lists the chemicals known to cause cancer; Subsection (c) lists the chemicals known to cause reproductive toxicity.

Requirements for Site Investigation and Remediation

The State Board adopted State Board Resolution No. 92-49 "Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304" in June of 1992, and amended it in April, 1994 and October, 1996. The Resolution contains the policies and procedures which all Regional Boards shall follow for the oversight and regulation of investigations and cleanup and abatement activities for all types of discharge or threat of discharge subject to Section 13304 of the Water Code. (CA Water Code § 13304 requires that any person who has discharged or discharges waste into waters of the State in violation of any waste discharge requirement or other order or prohibition issued by a Regional Board or the State Board, or who has caused or permitted, causes or permits, or threatens to cause or permit any waste to be discharged or deposited where it is, or probably will be, discharged into waters of the State and creates, or threatens to create, a condition of pollution or nuisance may be required to clean up the discharge and abate the effects thereof. This Section authorizes the Regional Board to require complete cleanup of all waste discharged and restoration of affected water to background conditions, i.e., to the water quality that existed before the discharge.)

Thus, the Regional Board will follow State Board Resolution No. 92-49 for determining:

- when an investigation is required;
- scope of phased investigations necessary to define the nature and extent of contamination or pollution;
- cost-effective procedures to detect, clean up or abate contamination;
- reasonable schedules for investigation cleanup, abatement, or any other remedial action at a site.

State Board Resolution No. 92-49 outlines the five basic elements of a site investigation. Any or all elements of an investigation may proceed concurrently, rather than sequentially, in order to expedite cleanup and abatement of a discharge, provided that the overall cleanup goals and abatement are not compromised. State Board Resolution No. 92-49 investigation and cleanup and abatement activity components are as follows:

- **Preliminary site assessment:** To confirm the discharge and identity of dischargers; to identify

affected or threatened waters of the State and their beneficial uses; and to develop preliminary information of the nature, and horizontal and vertical extent of the discharge;

- **Soil and water investigation:** To determine the source, nature and extent of the discharge with sufficient detail to provide the basis for decisions regarding subsequent cleanup and abatement actions, if any are determined by the Regional Board to be necessary;
- **Proposal and selection of cleanup action:** To evaluate feasible and effective cleanup and abatement actions, and to develop preferred cleanup and abatement alternatives;
- **Implementation of cleanup action:** To implement the selected alternative and verify progress via monitoring; and
- **Monitoring:** To confirm short- and long-term effectiveness of cleanup and abatement.

State Board Resolution No. 92-49 directs the Regional Board to ensure that the discharger is aware of and considers techniques which provide a cost-effective basis for initial assessment of a discharge such as use of current and historical photographs and site records, soil gas surveys, shallow geophysical surveys, and remote sensing techniques, as well as standard site assessment techniques (e.g., sampling and analyses of surface water, sediment, aquatic biota, ground water, and/or soil).

As directed by State Board Resolution No. 92-49, the Regional Board will also ensure that the discharger is aware of and considers the following cleanup and abatement methods or combinations thereof, to the extent that they may be applicable to the discharge or threat thereof:

- Source removal and/or isolation
- In-place treatment of soil or water (bioremediation, aeration, fixation)
- Excavation or extraction of soil, water, or gas for on-site or off-site treatment (techniques include bioremediation, thermal destruction, aeration, sorption, precipitation, flocculation, sedimentation, filtration, fixation, evaporation)
- Excavation or extraction of soil, water, or gas for appropriate recycling, re-use, or disposal.

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In every case, effluent discharged to waters of the Region shall contain essentially none of the following substances:

Chlorinated hydrocarbons
Toxic substances
Harmful substances that may bioconcentrate or bioaccumulate
Excessive heat
Radioactive substances
Grease, oil, and phenolic compounds
Excessively acidic and basic substances
Heavy metals such as lead, copper, zinc, mercury, etc.
Other deleterious substances

In addition, the following general discharge requirements are also applicable to discharges to waters of the Region:

- a. Neither the treatment nor the discharge shall cause a nuisance.
- b. The discharge of wastewater except to the designated disposal site is prohibited.
- c. All facilities used for collection, transport, treatment, or disposal of waste shall be adequately protected against overflow, washout, and flooding from a 100-year flood.
- d. A monitoring program shall be required. The monitoring program and reports shall include items and a time schedule to be determined by the Regional Board considering the needs and benefits to be obtained (CA Water Code § 13267).

Cleanup Levels

State Board Resolution No. 92-49 also requires conformance with State Board Resolution No. 68-16 and applicable provisions of the California Code of Regulations, Title 23, Chapter 15, to the extent feasible. State Board Resolution No. 92-49 directs the Regional Board to ensure that dischargers are required to clean up and to abate the effect of discharges. This cleanup and abatement shall be done in a manner that promotes attainment of background water quality, or the highest water quality which is reasonable if background levels of water quality cannot be restored. The determination of what is reasonable shall consider all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible, and intangible. Any cleanup less stringent than background shall be consistent with

maximum benefit to the people of the State and shall not unreasonably affect present and anticipated beneficial uses of such water.

Where cleanup to background is infeasible, cleanup standards will be set:

- at the lowest concentrations for the individual pollutants which are technically and economically achievable;
- so as not to exceed the maximum concentrations allowable under applicable statutes and regulations for individual pollutants (including water quality standards in State and Regional Board water quality control plans and policies);
- so as not to pose a hazard to health or to the environment; and,
- so that theoretical risks from chemicals associated with the release are considered additive across all media of exposure and are considered additive for those pollutants which cause similar toxicologic effects and for those which are carcinogens.

Ground Water Cleanup Levels

The overall cleanup level established for a waterbody is based upon its most sensitive beneficial use. In all cases, the Regional Board first considers high quality or naturally occurring "background" concentration objectives as the cleanup levels for polluted ground water and the factors listed above in "Cleanup Levels." Generally, compliance with approved cleanup levels must occur at all points within the plume of pollutants.

Ground water cleanup levels are approved on a case-by-case basis by the Regional Board, following the guidance and criteria found in the State Board's Resolution 92-49. Approved cleanup levels will consider the mobility, toxicity, and volume of pollutants. Further guidance for cleanup feasibility may be found in Subpart E of the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300); Section 25356.1(c) of the California Health and Safety Code; and USEPA's guidance documents on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

Soil Cleanup Levels

The Regional Board will determine soil cleanup levels for the unsaturated zone based upon threat to water quality. In its determination, the Regional Board will

4.2, Spills, Leaks, Complaint Investigations, and Cleanups

use guidance from the USEPA, and Cal/EPA's Office of Health Hazard Assessment, and Department of Toxic Substances Control.

If it is unreasonable to clean up soils to background concentration levels, the Regional Board may consider site-specific recommendations for soil cleanup levels above background provided that applicable ground water quality objectives are met and health risks from surface or subsurface exposure meet current guidelines. The Regional Board may require follow-up ground water monitoring to verify that ground water is not polluted by chemicals remaining in the soil. The Regional Board may require that soils with remaining pollutants are covered and managed to minimize pollution of surface waters and/or exposure to the public. If significant amounts of waste remain onsite, the Regional Board may implement provisions contained in the California Code of Regulations, Title 23, Chapter 15 to the extent applicable.

Spills, Leaks, Investigations, and Cleanups (SLIC Program)

The SLIC Program was established by the State Board so that Regional Boards could oversee cleanup of illegal discharges, contaminated properties, and other unregulated releases adversely impacting the State's waters but not covered by another program.

Sites managed within the SLIC Program include sites with pollution from recent or historic spills, subsurface releases (e.g., pipelines, sumps), complaint investigations, and all other unauthorized discharges that pollute or threaten to pollute surface and/or ground waters. Investigation, remediation, and cleanup at SLIC sites proceed as directed in State Board Resolution No. 92-49 as described above.

Use of the Cleanup and Abatement Account to Fund Cleanups

The State Water Resources Control Board manages the Cleanup and Abatement Account (CAA) Fund. The CAA receives funds statewide as a result of court judgments from civil and criminal actions and from administrative civil liabilities.

The California Water Code provides for the disbursement of funds from the CAA to:

- Public agencies with the authority to clean up waste or abate its effects; and

- Regional Boards attempting to remedy an actual or potential water pollution problem for which adequate resources have not been budgeted.

The State Board has the authority to approve funding. Applicants do not have a right to these funds.

The Regional Board's Executive Officer, his/her designee, or a public agency may request emergency funds orally for amounts up to \$50,000. These requests are to be directed to the Chief Counsel. In the absence of that individual, other designated staff should be called in the order listed: the Executive Director, the Chief Deputy Director, or the Administrative Services Division Chief. Any of these four individuals may review and approve the request. Within one week following the oral request, the requesting agency shall submit the terms in writing. Non-emergency requests must be written to be considered by the State Board, and must include a specific Regional Board Resolution.

The agency or Regional Board receiving the funds shall notify the Office of Chief Counsel (OCC) upon project completion and submit a follow-up report. This report must describe the work accomplished and fund recoupment. OCC will review the report to verify that the agency performed the work.

OCC shall pursue the recovery of CAA funds expended for cleanup and abatement when a discharger refuses to perform or pay for the work.

Any funds not committed or expended within 12 months of encumbrance or approved project end date (whichever is later) shall be disencumbered. The agency has 90 days to submit a bill. The Executive Director may grant a time extension if no additional funding is required. Disencumbered funds become available for other projects.

If additional funding is required, approval must be given by the State Board or the designated approval authority (for emergency requests).

Federal Superfund Program

The federal "Superfund" program was established in 1980 with the passage of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The CERCLA provided funding and guidelines for the cleanup of the most threatening hazardous waste sites in the nation. High priority sites scheduled for cleanup under this program are placed on the National Priority List (see Section 4.12, "Military Installations").

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Risk Assessment

In site-specific risk assessments, cleanup levels must be set to maintain the excess upperbound lifetime cancer risk to an individual less than 1 in 10,000 (10^{-4}) or a cumulative toxicological effect as measured by the Hazard Index of less than one. For all sites performing risk assessments, an alternative with an excess cancer risk 1 in 1,000,000 (10^{-6}) or less must also be considered. Risk assessment procedures are found in the USEPA's "Risk Assessment Guidance for Superfund" (Volume I, Parts A, B, C, and Supplemental Guidance, 1989). Additional information may be found in Cal/EPA's Office of Environmental Health Hazard Assessment guidelines.

4.3 STORMWATER RUNOFF, EROSION, AND SEDIMENTATION

Water quality problems related to stormwater discharges, erosion and sedimentation are among the most frequent and widespread water quality problems in portions of the Lahontan Region which receive significant amounts of precipitation. Such problems are interrelated because eroded sediment is often carried to surface waters in stormwater. However, wind erosion and deposition are also locally important problems. Erosion and surface runoff are considered the most critical controllable sources of nutrient loading to Lake Tahoe (see Chapter 5). The following are general discussions of stormwater and erosion problems and relevant control measures. More specific information is included in subsequent sections on specific sources such as land development, agriculture, and resources management activities.

Stormwater Problems and Control Measures

The term “stormwater” includes surface runoff resulting from rainfall and snowmelt. It is essentially synonymous with “urban runoff,” “highway runoff,” and “surface runoff” (as used in Chapter 5 of this Plan which deals with the Lake Tahoe Basin).

Under natural conditions, most rainfall and snowmelt is absorbed by soils and taken up by vegetation, and very little surface runoff occurs. Air pollutants in precipitation are largely removed by soils and vegetation before they reach surface waters. (Natural surface runoff events can be significant in the case of desert flash floods, and where soils and vegetation have been disturbed by natural events such as wildfires.) Human activities in watersheds, especially the creation of large amounts of impervious surface (e.g., roads, parking lots, and buildings) can greatly increase the potential for surface runoff, reduce the potential for soil/vegetation treatment of chemicals in rain and snow, and add a large variety of contaminants to the runoff discharge.

Human development of a watershed affects surface runoff quality by increasing the intensity of peak discharges, the volume of runoff per storm, the velocity of runoff during the storm, and the frequency and severity of flooding. These changes can lead to increases in stream bedload sediment transport and streambank erosion, and to consequent degradation of aquatic habitat.

Urban runoff quality varies to some extent with land use (industrial vs. commercial vs. residential). Stormwater constituents of concern include sediment (from construction sites and unstabilized areas); other particulate matter (including glass and plastics); nutrients (from sediment, fertilizer, and animal wastes); and petroleum products, solvents, wood preservatives, paints, and heavy metals from wear and tear on roads, buildings, and vehicle parts. Organic matter (e.g., from animal wastes and fallen leaves) can give stormwater a significant biochemical oxygen demand (BOD). Coliform bacteria (from soils, animal excrement, and sewage spills) can also be present. Toxic “priority pollutants” in urban runoff include lead, zinc, copper, arsenic, chromium, cadmium, nickel, cyanide, and asbestos. In mountainous areas of the Lahontan Region, runoff containing salt and other deicing chemicals used on roads and parking lots during the winter is of concern (see the “Land Development” section of this Chapter). High intensity stormwater flows reaching surface waters can also raise stream temperatures, scour streambeds, and damage aquatic habitat, particularly fish spawning habitat.

Stormwater quality also varies with time. In California, which generally has dry summers and wet winters, pollutants can accumulate on pavement over the summer and can be flushed into surface waters in high concentrations by the first significant fall rainstorm. These high “first flush” concentrations may be especially stressful to aquatic organisms. Runoff from later storms may have lower pollutant concentrations. Spring snowmelt may also provide a flush of accumulated atmospheric acids and nutrients, including nitrogen, into surface waters (see the discussion of atmospheric deposition in the “Resources Management and Restoration” section of this Chapter). Flushing by desert flash floods and by summer thunderstorms in mountainous portions of the Lahontan Region are both of concern.

Nutrients from stormwater are considered a major source of pollution to Lake Tahoe. Deicing compounds are of special concern in the Lake Tahoe/Truckee region because the death of roadside vegetation due to salt impacts can increase erosion, and thus sediment and nutrient loading, to sensitive surface waters. Few quantitative data are available on concentrations of heavy metals and other toxic pollutants in stormwater in these areas.

Although stormwater quality (particularly that of urban and highway runoff) has not been well studied elsewhere in the Lahontan Region, many communities and highways are located near surface waters. Stormwater runoff of metals, deicing agents,

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and petroleum products from paved surfaces may be contributing to water quality problems. Even in desert areas, infrequent flood events may flush pollutants from urban surfaces and lead to surface and/or ground water quality problems.

Surface water “in systems designed or modified to collect or treat...storm water runoff” is not considered a “source of drinking water” under State Board Resolution 88-63 (Appendix B), “provided that the discharge from such systems is monitored to assure compliance with all relevant water quality objectives as required by the Regional Boards.” The “source of drinking water” designation affects the implementation of Proposition 65 (see “Spills, Leaks, Complaint Investigations, and Cleanups” section of this Chapter) in relation to toxic substances in stormwater. However, most surface and ground waters in the Lahontan Region which receive treated or untreated stormwater **are** designated sources of drinking water. Protection of these sources is a major consideration in the Regional Board's regulatory process.

Stormwater Control Measures

Implementation of control measures for the different types of nonpoint sources which are discussed throughout this Chapter will help to prevent water quality problems related to stormwater. Erosion control is particularly important.

Much of the information below is taken from the “State of California Stormwater Best Management Practices Handbooks,” prepared by the American Public Works Association Storm Water Task Force (APWA Task Force 1993). Also, see the general discussion of Best Management Practices (BMPs) in the introduction to this Chapter.

This Basin Plan does not include detailed discussion of specific stormwater BMPs. Such detail is provided in a variety of BMP Handbooks (e.g., TRPA 1988, APWA Task Force 1993, USEPA 1993). Different types of controls for stormwater may be justified in different locations depending upon the type of development and the sensitivity of the affected waters.

Examples of source control BMPs for stormwater problems include control of air pollutants (see “Resources Management and Restoration” section on atmospheric deposition), enforcement of anti-litter ordinances, educational programs (to limit fertilizer and pesticide use by home gardeners and dumping of waste motor oil in storm drains), street and storm drain maintenance practices, spill prevention and

cleanup, and BMPs for erosion control. Ultimately, nationwide efforts to redesign pollutant sources, comparable to the phaseout of leaded gasoline, may be necessary to reduce or eliminate some urban runoff constituents (e.g., zinc from tire wear and asbestos from brake linings).

Land use controls can also function as stormwater source controls. Protection and restoration of natural vegetation, soils and the duff layer, particularly in steep headwater areas, and in wetlands, floodplains, and riparian areas, preserves natural infiltration and nutrient uptake capabilities, as does limitation of impervious surface coverage. Naturally functioning soil/vegetation systems, particularly wetland systems, can act as buffers between urban areas and surface waters.

Examples of treatment control BMPs for stormwater include infiltration, wet ponds, extended detention basins, biofilters (such as grassy swales), media filtration (e.g., a settling basin followed by a sand filter), oil/water separators, and constructed wetlands. Because of differences in efficiency among BMPs, combinations of different methods often provide the best treatment.

The following are important considerations in the choice of treatment control BMPs:

- Because treatment methods are not 100 percent efficient, and the efficiency of treatment is difficult to predict, the highest priority should be given to source control. Source control is often less expensive than treatment.
- The type of pollutants to be treated (dissolved vs. particulate, nutrients vs. toxics, or combinations of pollutants) and the variability of pollutant concentrations among storms and/or snowmelt events will affect the efficiency of treatment.
- Many treatment BMPs using vegetation were developed in states with wetter climates than California's, where vegetation can be maintained without irrigation. The need for irrigation of vegetation in stormwater treatment systems during the summer is an important factor in the Lahontan Region. The long-term performance of vegetative treatment systems under the harsh winter climates of the mountainous portions of the Lahontan Region has also not been well documented.

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- Treatment BMP measures often require frequent visual inspections and periodic maintenance to ensure operation at maximum efficiency.
- The “design storm” for sizing of treatment facilities varies with local precipitation regimes. The design storm for Lake Tahoe facilities is specified in the local BMP handbook (TRPA 1988, Vol. II). The Regional Board may specify design storms for other areas in stormwater permits.
- Treatment BMPs may have both extra environmental benefits (passive recreation opportunities, wildlife habitat, ground water recharge) and adverse environmental side effects (potential drowning and mosquito breeding hazards in ponds, ground water contamination by infiltration).

“Areawide treatment systems” for municipal stormwater which involve combinations of infiltration, retention and detention basins, and natural and artificial wetlands, are being proposed in the Lake Tahoe Basin (see Chapter 5). Their ability to meet effluent limitations has not yet been demonstrated. In some states, wastewater treatment plants similar to those used for domestic wastewater have been constructed to treat stormwater.

Utilization of Wetlands for Stormwater Treatment

Natural and artificial wetlands are employed elsewhere in the U.S. for treatment of municipal wastewater and acid mine drainage. Large scale wetland treatment systems for urban runoff are in service in coastal areas of California. The utilization of “Stream Environment Zones” for removal of sediment and nutrients from stormwater in the Lake Tahoe Basin is an important part of that area's water quality program (see Chapter 5). In general, wetlands slow the flow of stormwater, allowing time for settling out of sediments, adsorption of dissolved constituents onto soils, and uptake of nutrients by soil microorganisms and rooted vegetation (see “Wetlands Protection” in Section 4.9 of this Chapter for a more detailed discussion of wetland functions).

Natural wetlands in the Lahontan Region are waters of the State and of the United States. They have designated beneficial uses and are subject to all of the water quality objectives in Chapter 3 of this Basin Plan, including nondegradation objectives for water quality and for biological communities and populations. Because the long-term impacts of urban, highway, and mine stormwater discharges on beneficial uses of natural wetlands are unknown (particularly in terms of bioaccumulation and

bioconcentration of toxic trace metals), such wetlands should ideally be used only for final dissolved nutrient removal after pretreatment by other means has removed oil and grease, sediment, and sediment-bound metals. The quality of stormwater discharged to natural wetlands should be fully protective of designated beneficial uses. Long-term monitoring of stormwater impacts, especially biological impacts, on wetland ecosystems in the Lahontan Region is needed to support future Regional Board decisions on protection and utilization of such systems.

Artificial, or constructed wetlands, may be built specifically for the purposes of treating stormwater runoff. If not created as mitigation for the loss of natural wetlands, constructed wetlands need not attempt to replicate all of the functions (e.g., wildlife habitat) of natural wetlands. The Regional Board will not generally designate beneficial uses for or assign water quality objectives to wetlands created solely for the purpose of stormwater treatment. Such wetlands may be as simple as a gravel bed planted with cattails, or they may include pretreatment devices such as forebays or detention ponds, to reduce sediment loading and thus improve their efficiency.

Important considerations for those constructing artificial wetlands for the treatment of stormwater include:

- Wetlands can act as “sinks” for pollutants. If pollutants accumulate to levels that become toxic, remedial action(s) may be required.
- The efficiency of pollutant removal will vary with the seasons. Winter temperatures and ice formation will reduce or halt pollutant removal by plants and microorganisms. Nutrients may be released from the wetland seasonally as vegetation decays. Over a 12-month period, a constructed wetland may be no more effective than a wet pond.
- The ability of a constructed wetland to treat certain pollutants such as phosphorus may decline over time as soils become saturated with the pollutant and plants reach maximum density. Cleanout of accumulated sediments, harvesting and replanting of wetland vegetation, or other maintenance activities may be necessary to preserve the stormwater treatment function. A qualified wetland ecologist should be involved in the design and installation of wetland vegetation. Constructed wetlands should be designed to facilitate access for maintenance. (As of 1992, constructed wetlands were exempt from the requirement to

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obtain a Section 404 permit for the removal of accumulated material.)

Because the ability of constructed wetlands to meet effluent limitations for discharges to other waters has not been demonstrated over the long-term under the environmental conditions within the Lahontan Region, it is important for wetland proponents to consult with Regional Board staff during the planning phase.

NPDES Permits

The 1987 amendments to the federal Clean Water Act mandated the issuance of NPDES permits for stormwater discharges from certain types of municipalities, industries, and construction sites. The State and Regional Boards are administering the stormwater NPDES program in California. The State Board interprets federal stormwater control regulations to “include the use of BMPs to control and eliminate sources of pollutants and limitations which prohibit the discharge of non-storm water.” A set of statewide BMP handbooks has been prepared to provide guidance for dischargers on compliance with the NPDES permits (APWA Task Force 1993).

BMPs include schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce pollution. For industrial stormwater discharges, BMPs also include treatment devices, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste removal, or drainage from raw material storage (APWA Task Force 1993).

The statewide permits prohibit most non-stormwater discharges. Certain non-stormwater discharges, such as discharges from firefighting, fire hydrant flushing, and uncontaminated ground water resulting from dewatering activities, may be permitted if they do not cause significant pollution problems. However, all direct waste discharges to surface waters are prohibited in many parts of the Lahontan Region; these prohibitions would supersede the exceptions in the general permits.

Municipal NPDES Stormwater Permits

Municipal stormwater NPDES permits are required for municipalities with populations over 100,000, for drainage systems interconnected with the drainage systems of such municipalities, and for municipalities which are determined to be significant contributors of pollutants. The collective populations of the portions of Los Angeles and San Bernardino Counties within the Lahontan Region may warrant the issuance of municipal stormwater NPDES permits (the coastal portions of these Counties already have such

permits). Because of the extraordinary resource values of Lake Tahoe, and the threat to its water quality posed by stormwater discharges containing sediment and nutrients, the State Board determined in 1980 that municipal stormwater was a significant source of pollutants and directed that stormwater NPDES permits should be issued to local governments. Municipal stormwater NPDES permits have been issued to the portions of Placer and El Dorado Counties within the Lake Tahoe Basin, and to the City of South Lake Tahoe, even though their populations are less than 100,000. A special set of surface runoff effluent limitations applies to stormwater discharges in the Lake Tahoe Basin (see Chapter 5).

Municipal stormwater NPDES permits require the development of a management program for construction activities within the permittee's jurisdiction. The program must: (1) address appropriate planning and construction procedures, (2) ensure BMP implementation at, and inspection and monitoring of, construction sites which discharge into municipal storm sewers, and (3) provide for education or training for construction site operators. The factors that should be addressed in a municipal stormwater management program are as follows:

For Residential/Commercial Activities:

- Roadway and drainage facility operations and maintenance programs
- BMP planning for new development and redevelopment projects
- Retrofitting existing or proposed flood control projects with BMPs
- Municipal waste handling and disposal operations
- Pesticide, herbicide, and fertilizer use controls

For Improper Discharge Activities:

- Prevention, detection, and removal program for illegal connections to storm drains
- Spill prevention, containment, and response program
- Program to promote proper use and disposal of toxic materials
- Reduction of stormwater contamination by leaking/overflowing separate sanitary sewers

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For Industrial Activities:

- Inspection and control prioritization and procedures
- Monitoring of significant industrial discharges

For Construction and Land Development Activities:

- Water quality and BMP assessments during site planning
- Site inspection and enforcement procedures
- Training for developers and contractors

Source: APWA Task Force (1993)

The municipal and statewide NPDES construction permit programs interact. The municipality sets construction policies and standards, and is expected to enforce all local stormwater ordinances, floodplain management regulations, and local standards for grading and erosion control. Post-construction control measures required under the statewide construction permit (such as final site grading, and maintenance of erosion and drainage control measures) will be subject to municipal review and approval through existing procedures.

Because municipal stormwater permits have been in place in California for only a short time, the details of financing and implementation of control programs are still being worked out. In other states, areawide “stormwater utilities” have taken responsibility for construction, operation and maintenance of facilities.

Construction NPDES Stormwater Permit

The USEPA's guidance for the issuance of stormwater NPDES permits (USEPA 1993), treats construction projects as a subset of industrial discharges. The State Board treats industrial and construction discharges separately, and has issued a statewide construction NPDES permit. The permit applies to construction projects resulting in land disturbance of five acres or greater; the area requirement affects both one-time disturbances and phased projects which cumulatively disturb more than five acres. (A court decision may result in application of the NPDES program to smaller projects, but guidance is not yet available.) The permit does not apply to routine or emergency maintenance work sponsored by public agencies, to dredging and/or filling permitted by the U.S. Army Corps of Engineers, or to projects on Indian lands or within the Lake Tahoe Basin.

Project proponents are required to: (1) prepare a Stormwater Pollution Prevention Plan (SWPPP) before construction begins, (2) file a Notice of Intent (NOI) with the State Board before construction begins, and (3) file a Notice of Termination with the State Board once construction is complete. These requirements are summarized as follows:

- The NOI certifies that the applicant will comply with conditions in the statewide general NPDES permit. It is not a permit application and does not require approval, although an annual fee must be submitted with it.
- The SWPPP is directed toward construction staff; it describes erosion and runoff control measures to be used during and after construction, and a plan to inspect and maintain these control measures. The SWPPP may be revised during construction in response to changed conditions, or if the properly installed BMPs are ineffective in preventing sediment transport off the site. Revisions to the SWPPP are also required if there are changes in activities which could result in a significant amount of pollutants discharged in stormwater.
- The State Board must be notified (via a Notice of Termination form) once construction is complete. It must also be notified if a change of ownership occurs during construction. In this case, a revised NOI must be submitted, and the SWPPP must be revised by the new owner to reflect any changes in construction conditions. The general construction permit requires that the project owner arrange for maintenance of drainage/stormwater control facilities after project completion; maintenance may be done by private parties or by a public agency such as a community service district. Municipalities may require maintenance agreements.

Construction project proponents may request to be placed under individual NPDES permits rather than the general permit. The Regional Board may issue individual stormwater NPDES permits to construction projects when more stringent controls are necessary to protect water quality. As noted above, individual construction projects may also be regulated under a municipality's NPDES management program.

Industrial NPDES Stormwater Permits

The State Board has adopted a statewide general industrial NPDES permit which applies to facilities which discharge stormwater to surface waters either directly or through a storm drain system. The general

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permit does not apply to facilities which discharge stormwater to a municipal sanitary sewer system, or to facilities which discharge to evaporation ponds, percolation ponds, or dry wells (ground water injection wells) where there is no discharge to surface waters under any circumstances. The general industrial permit applies to the following types of facilities:

- “heavy” manufacturing facilities
- certain other types of manufacturing facilities if materials are exposed to stormwater
- active and inactive mining and oil and gas facilities
- recycling facilities
- transportation facilities (including marinas)
- facilities subject to the requirements of 40 CFR Subchapter N (facilities subject to USEPA-promulgated stormwater effluent limitation guidelines, new source performance standards, or toxic pollutant effluent standards)
- hazardous waste treatment, storage, or disposal facilities
- landfills, land application sites, and open dumps
- steam electric generating facilities
- wastewater treatment plants with design flows greater than 1 million gallons per day.

The list above is a general summary from the draft statewide BMP handbook for industrial permits (APWA Task Force 1993). Some specific facilities within the categories above may not necessarily require NPDES permits. More detailed lists of specific industries requiring permits are contained in the statewide industrial NPDES permit, which is included as an appendix to the handbook.

For facilities such as wastewater treatment plants which discharge both stormwater and a primary industrial effluent to surface waters, both the general industrial stormwater NPDES permit and an individual NPDES permit for the primary effluent discharge would apply.

In addition to the stormwater industrial general permit, Regional Boards may, at their discretion, issue an industry-specific general permit. Industries may request individual NPDES permits instead of the general permit. Because the process is expensive and time-consuming, Regional Boards may chose

not to issue an individual permit. Regional Boards are only expected to consider individual permits where individual facilities have unique characteristics or pose significant threats to water quality.

There is relatively little manufacturing industry in the Lahontan Region. Industrial facilities of concern include mines and mineral processing operations, energy production plants, automobile junkyards and repair shops, lumberyards, corporation yards, concrete batch plants, metal plating shops, carpet and steam cleaners, airports, and marinas.

Industrial stormwater discharges must meet the requirements of Clean Water Act Sections 301 and 402, which mandate the use of best available technology economically available (BAT) and best conventional pollution control technology (BCT) to reduce pollutants, and any more stringent controls necessary to meet water quality standards. Compliance with the requirements of a variety of other laws and regulations for the control of hazardous materials and hazardous wastes may help to reduce potential stormwater pollutants. Such programs include state and local laws to control toxic air pollutants, hazardous material storage and emergency response planning, the workers' right-to-know program, and hazardous waste source reduction and management review.

The industrial general permit process involves submittal of a Notice of Intent to the State Board, and preparation of a Storm Water Pollution Prevention Plan (SWPPP) and monitoring program. Requirements for NOIs and SWPPPs are similar to those discussed above for construction permits; they are discussed in detail in the BMP handbook (APWA Task Force 1993). The stormwater management programs developed by municipalities under NPDES permits (above) may include regulation of stormwater discharges from industries to municipal storm drain systems. Industries should check with local stormwater management authorities to identify applicable requirements. Other considerations in industrial stormwater control include possible needs for stormwater control facilities to comply with state and local air quality regulations, fire code requirements, and local sewer district requirements for discharges to a sanitary sewer.

Waste Discharge Requirements

The Regional Board issues waste discharge requirements (WDRs) addressing both stormwater and erosion control, rather than NPDES permits, to smaller construction projects in sensitive areas such as the Lake Tahoe, Truckee River, and Eagle Lake

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Basins, and the Mammoth Lakes area. As noted in Chapter 5, a set of general WDRs has been adopted for small construction projects in the Lake Tahoe Basin. For smaller projects in less sensitive areas, waivers of WDRs may be appropriate. Waivers are best used to regulate small, short-term projects which do not present a threat to water quality. Specific types of projects for which waivers of stormwater WDRs may be considered are identified in the Regional Board's current waiver policy (see Chapter 6).

When reviewing environmental documents for projects which may be placed under WDRs, Regional Board staff should give special attention to stormwater control needs in relation to receiving water objectives, particularly the non-degradation and toxics objectives contained in this Basin Plan and the USEPA's National Toxics Rule.

WDRs should address inspection, operation, and maintenance of stormwater control facilities, as well as their installation.

Requirements for use of stormwater BMPs in connection with new construction should be distinguished from requirements for "retrofit" of BMPs to existing development. The most active retrofit program in the Lahontan Region is being implemented in the Lake Tahoe Basin (see Chapter 5). Retrofit is being addressed in WDRs for some dischargers elsewhere, such as ski resorts in the Truckee River HU. However, the Regional Board may issue WDRs, including requirements for stormwater control, for any discharge which causes or threatens to cause water quality problems.

Regional Board staff should continue to evaluate the need for municipal stormwater permits for communities outside of the Lake Tahoe Basin, particularly in sensitive watersheds such as the Truckee River, June Lakes, and Mammoth/Hot Creek areas. As part of this evaluation, staff should investigate needs for retrofit of stormwater BMPs. As an alternative to a municipal permit, WDRs could be issued to facilities with large areas of impervious surface (e.g., existing shopping centers, convention centers, sports stadiums, etc.) which do not fall under one of the other NPDES categories. If local governments independently adopt requirements for the application of BMPs and for treatment of stormwater to ensure attainment of standards, municipal permits may not be necessary for communities with fewer than 100,000 residents.

Only one set of general stormwater effluent limitations has been adopted in the Lahontan Region: the

"Tahoe Regional Runoff Guidelines" (see Chapter 5). As more information becomes available about surface runoff quality in different areas, the Regional Board should consider adopting other effluent limitations for specific areas or types of stormwater discharges.

There are a large number of inactive mines in the Lahontan Region (see "Mining, Industry, and Energy Development" section of this Chapter). Limited biological and ambient water quality monitoring to date indicates that erosion and stormwater from these mines may be contributing to impairment of beneficial uses of surface waters, particularly in the Owens HU. Under the State Board's Toxic Substances Monitoring Program (see Chapter 7) elevated levels of metals have been detected in the tissues of fish from a number of water bodies with inactive mines in their watersheds. Regional Board staff should continue to review Industrial NPDES permit NOIs for these mines and should determine the need for individual permits. Monitoring programs should be adopted where appropriate to document impacts of mine stormwater on water and sediment quality and on aquatic biota. (The USEPA is proposing to develop and issue a general stormwater permit for inactive mines on federal lands.)

Through the Section 319 outreach program, Regional Board staff should continue to provide information to other agencies, dischargers, and the public about stormwater problems, permitting requirements, and voluntary BMP implementation.

Very little information is available on the quality of stormwater in most parts of the Lahontan Region, or on its impacts on beneficial uses. The Regional Board should encourage Caltrans, local governments, road maintenance entities, and university researchers to conduct additional studies of stormwater quality and impacts.

Stormwater Control Measures Implemented by Other Agencies

The U.S. Forest Service and Bureau of Land Management jurisdictions in California, and the California Department of Transportation, have adopted statewide plans under Section 208 of the Clean Water Act which include commitments to implement BMPs for erosion and surface runoff control in connection with their activities. The Regional Board reviews the activities of these agencies under Memoranda of Understanding and Management Agency Agreements. (See the summaries of these plans in Chapter 6, and the discussions of impacts in the "Resources

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Management,” “Land Development,” and “Recreation” sections of this Chapter.) Stormwater controls are being implemented (usually together with erosion controls) in watershed restoration activities under a number of Coordinated Resource Management Plans (CRMPs; see “Range Management” in Section 4.9 of this Chapter). These plans often involve cooperation among federal and state agencies, and private landowners.

The Regional Board may issue waste discharge requirements to Caltrans and to local governments to control the impacts of stormwater from road construction and maintenance activities (see “Land Development” section of this Chapter). Caltrans developed a statewide Section 208 plan which was approved by the State Board in 1979; it contains a commitment to implement BMPs but does not include great detail on the BMPs themselves. The State Board should encourage Caltrans to update its 208 plan to provide such detail, with particular attention to:

- stormwater and erosion control along existing highways
- erosion control during highway construction and maintenance
- reduction of direct discharges (e.g., through culverts)
- reduction of runoff velocity
- infiltration, detention and retention practices
- management of deicing compounds, fertilizer, and herbicide use
- spill cleanup measures
- treatment of toxic stormwater pollutants

Since Caltrans' contractors are responsible for most BMP implementation on highways, the selection of qualified contractors and the ongoing education of construction and maintenance personnel are particularly important.

Caltrans is required to obtain a municipal NPDES stormwater permit for discharges of stormwater from state-owned roads located in geographic areas for which municipal stormwater NPDES permits have been issued. Caltrans may be issued an individual stormwater permit which is separate from the permit issued to the municipality, or the Regional Board may require Caltrans to join as a co-permittee with the

local agency which has jurisdiction over disposal of stormwater.

Local governments, whether or not they are under municipal stormwater NPDES permits, have authority to control stormwater discharges. A number of State laws and regulations affecting local governments have important implications for stormwater control. These include the General Plan Act, the California Environmental Quality Act, and the Subdivision Map Act. Local Governments may adopt zoning ordinances, flood control and drainage ordinances, and sewer use ordinances. As a result of the “non-designated” Section 208 planning process in the 1970s, some local governments in the Lahontan Region evaluated stormwater-related problems and strengthened their grading ordinances to prevent erosion and sedimentation. A BMP handbook was developed for the high elevation portions of Placer and Nevada Counties, although the BMPs were never formally certified.

All local governments within the Lahontan Region should consider the prevention and control of stormwater problems as high priorities in zoning for, and design of, new development and redevelopment. Needs for retrofit of stormwater controls to existing development should be considered on an areawide basis through periodic general plan updates. Local governments are strongly encouraged to apply for federal grant funds under Sections 205(j), 314, and 319 of the Clean Water Act for studies of stormwater problems and implementation of control measures.

Flood control agencies should consider the water quality impacts of flood management programs as well as flood control objectives. Flood control facilities should be designed, operated and maintained to reduce pollutant concentrations in stormwater discharges.

The Tahoe Regional Planning Agency implements land use controls and sets conditions in its permits for construction projects which serve to control stormwater discharges in the Lake Tahoe Basin (see Chapter 5 of this Basin Plan).

Voluntary implementation of stormwater control BMPs by private parties (including retrofit to existing development) will be an important factor in achieving complete control of this pollution source. Public education programs, including newsletters distributed to homeowners, extension and “master gardener” programs, BMP demonstration sites, school curricula, videos, electronic bulletin boards, etc., are being developed and implemented by a variety of public

agencies, schools and colleges, and environmental and citizens groups. Better coordination of these programs is desirable to make information widely available and to avoid duplication of effort.

Erosion and Sedimentation

Erosion has been defined as: "The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep," and sedimentation as: "The process by which mineral or organic matter is removed from its site of origin, transported, and deposited by wind, water or gravity" (California Resources Agency 1978).

Erosion is a natural process, which generally proceeds at a slow rate unless large-scale vegetation disturbance occurs (e.g., as a result of wildfire or intentional land clearing activities). Human activities in a watershed can greatly accelerate the rate and amount of erosion.

The potential for erosion is determined by soil characteristics (such as particle size and gradation, organic content, soil structure, and soil permeability), vegetative cover, topography (slope length and steepness), and the frequency, intensity, and duration of precipitation. Many parts of the Lahontan Region are characterized by highly erodible soils, steep slopes, and harsh climates which limit the reestablishment of vegetation after disturbance.

Wind erosion, transport and deposition of sediment and toxic trace elements (such as arsenic) into downwind surface waters are problems in some desert areas of the Lahontan Region. Although wind erosion from desert playa lakebeds is a natural process, water diversions from tributaries of other desert lakes have partly or completely dried them up, increasing the likelihood of wind erosion. In some cases, human activities such as agriculture, mining, and illegal dumping, have increased the levels of pollutants subject to wind erosion. Owens Lake has been estimated to contribute five percent of all the particulate air pollution in North America (Polakovic 1993). Windblown arsenic concentrations from Mono Lake pose a human cancer risk of 1:10,000, which is one hundred times more dangerous than toxic factory emissions (Polakovic 1993). During drought years, windblown dust from the bed of Honey Lake in Lassen County can be carried about 40 miles to the Reno, Nevada area.

Sedimentation of surface waters affects beneficial uses by increasing turbidity, and physically altering

streambed and lakebed habitat. Sediment affects prey capture by sight-feeding predators, clogs gills and filters of fish and aquatic invertebrates, covers and impairs fish spawning substrates, reduces survival of juvenile fish, reduces angling success, and smothers bottom dwelling plants and animals. Nutrients (such as phosphorus) and trace metals are often associated with sediment. Suspended sediment particles can act as substrates for the growth of bacteria which can concentrate dissolved nutrients from the water column. Toxic pollutants in stormwater have been found to concentrate in sediments. Sediment-bound pollutants can be remobilized under suitable environmental conditions.

Sediment can reduce the hydraulic capacity of stream channels, causing an increase in flood crests and flood damage. It can fill drainage channels, especially along roads, plug culverts and storm drainage systems, and increase the frequency and cost of maintenance.

Sedimentation can decrease the useful lifetime of a reservoir by reducing storage capacity for municipal supplies and increasing treatment costs to remove turbidity. Sedimentation of harbors and drainage systems results in higher maintenance costs and potential problems associated with disposal of removed material. The accumulation of sediment in recreational lakes affects boating activity in the shorezone, and can lead to demands for dredging to deepen marinas and channels.

Farmers are generally aware that soil loss is an economic as well as an environmental problem. Homeowners may not be aware of this unless their homes and neighborhood streets are damaged by mudslides or streambank or lakeshore erosion.

Understanding the cumulative impacts of all past, present, and proposed human activities in a watershed is important in predicting the impacts of erosion on surface waters. Various sediment loading models have been developed. The U.S. Forest Service, Pacific Southwest Region has developed a "Cumulative Watershed Effects" methodology to predict sediment loading from timber harvests. This method has been adapted in the Lake Tahoe Basin for the evaluation of the impacts of new ski resort construction and the effectiveness of offsetting watershed restoration projects (see "Recreation" section of this Chapter).

Erosion and Sedimentation Control Measures

Erosion and sedimentation control measures are discussed in detail later in this Chapter in connection with a variety of problem types. They may be summarized as follows:

- Avoidance or limitation of disturbance of soils and vegetation, especially during the wet season.
- Use of structural and/or vegetative Best Management Practices (BMPs) to stabilize soils during and after activities which involve soil disturbance. Erosion control BMPs may require maintenance and possibly eventual replacement.
- Retrofit of BMPs, implementation of remedial erosion control projects, and watershed restoration projects to correct problems from past soil-disturbing activities.

Erosion and Sedimentation Control Measures Implemented by the Regional Board

Eroded sediment and other earthen materials which reach surface waters as a result of human activities are considered waste discharges under the Porter-Cologne Water Quality Control Act. Such discharges are subject to the prohibitions discussed elsewhere in this Chapter.

Under the State Board's 1988 Nonpoint Source Management Plan, the general approach to erosion control is to rely on voluntary implementation of BMPs, and to use regulatory controls if necessary. Because of the sensitivity of the Lahontan Region's waters and the high erodibility of its soils, the Regional Board takes a regulatory approach to erosion control for many types of new development in the mountainous parts of the Region (see the sections on "Land Development" and "Recreation" in this Chapter).

Statewide municipal, industrial, and construction NPDES permits can involve the implementation of erosion control measures. The Regional Board can issue waste discharge requirements or conditional waivers for construction projects and activities which do not fall under these statewide permits, or to projects which pose special threats to water quality, in order to prevent or mitigate the impacts of erosion and sedimentation.

As described elsewhere in this Chapter, the Regional Board works with other agencies and private landowners, often under Management Agency Agreements, to ensure that BMPs for erosion control

are implemented in connection with timber harvesting and other silvicultural activities, mining, agriculture, range management, and recreational activities on public and private lands. In cooperation with the Tahoe Regional Planning Agency, the Regional Board implements a comprehensive erosion control program in the Lake Tahoe Basin (see Chapter 5). Specific erosion control guidelines have also been adopted for the Mammoth area; they are included in the "Land Development" section of this Chapter.

Erosion and Sedimentation Control Measures Implemented by Other Agencies

Some of the most erosion-sensitive lands in the Lahontan Region are protected from major watershed disturbance because they are under public ownership and are being managed for wilderness or low intensity, undeveloped recreation uses. Acquisition of other sensitive lands by public agencies such as the Wildlife Conservation Board and by private land trust and conservancy agencies can further reduce the risk of erosion and sedimentation problems. Public land acquisition programs are an important factor in reducing sedimentation to Lake Tahoe.

The U.S. Forest Service, U.S. Bureau of Land Management, and California Department of Transportation adopted statewide "208 plans" in the 1970s which include commitments to implement BMPs for erosion control. The USFS has developed a detailed BMP handbook (USFS 1979). The California Department of Forestry and Fire Protection's Forest Practice Rules also address erosion control, and its "Urban Forestry Program" provides advice and assistance to owners of smaller private forest parcels.

The U.S. Soil Conservation Service, in cooperation with Resource Conservation Districts, provides advice on agricultural erosion control. In some areas, such as the Tahoe Basin, the Resource Conservation Districts can assist homeowners in design of BMPs. University Extension offices also provide assistance on erosion control.

Local governments, through their planning and zoning authority, have the ability to direct new development to areas where it will cause the fewest erosion problems. Grading ordinances can limit the extent of grading without a permit, require erosion and sediment control plans which meet specific standards, and require posting of performance bonds to ensure proper implementation of erosion control measures. The State has developed a model grading ordinance (California Resources Agency 1978). Many of the local governments within the Lahontan Region strengthened their grading ordinances as a result of

the “208 planning” process in the 1970s. These ordinances should be updated from time to time as the “state-of-the-art” in erosion control evolves. Local governments with municipal NPDES stormwater control permits are now required to address erosion control as part of their stormwater management planning process.

The Tahoe Regional Planning Agency has recognized the importance of windblown sediment in nutrient loading to Lake Tahoe, and has called for increases in the rate of BMP retrofit, and additional controls on offroad vehicle use, to reduce wind erosion. The Great Basin Air Pollution Control District is leading an interagency effort to reduce wind erosion from the Owens Lake bed through means such as vegetative stabilization. The need for and feasibility of similar controls for other ephemeral lakes in the Lahontan Region (such as Honey Lake, Mono Lake, and the Alkali Lakes in Modoc County) should be investigated.

Remedial erosion control projects to correct problems associated with past land disturbance activities are being implemented throughout the Lahontan Region by public agencies such as the U.S. Forest Service and Caltrans, and by public/private cooperative efforts such Coordinated Resource Management Plans (CRMPs). Such efforts should be continued and expanded wherever feasible. See the discussion of watershed restoration programs in “Resources Management and Restoration” section of this Chapter.

4.4 MUNICIPAL AND DOMESTIC WASTEWATER: TREATMENT, DISPOSAL, AND RECLAMATION

Municipal and domestic wastewater¹ discharges can cause chemical, bacteriological and toxic contamination to both ground and surface waters. Ground and/or surface water contamination can also occur from poor disposal practices, such as discharging wastes into unlined ponds, pits or sumps. Such waste discharges are regulated by the Regional Board or a designated agency with proper authority. Municipal wastewater, individual waste disposal systems, effluent limitations and policies under Regional Board authority are discussed below. Most of these requirements and policies are implemented through the Regional Board permitting process. However, some requirements are implemented by local agencies. For example, under a Memorandum of Understanding with the Regional Board, the County Health Departments issue permits to install and operate individual waste disposal systems. Methods used to determine compliance with limitations and requirements are further discussed in this Section.

Waste discharge prohibitions concerning sewage are listed in Section 4.1, “Waste Discharge Prohibitions.” Effluent limitations and treatment policies concerning wastewater treatment and disposal are set forth below. Discussion of specific wastewater facilities in the Lahontan Region follows the policy statements.

Effluent Limitations

Effluent limitations for disposal of treated point source wastes to surface waters are developed for individual point sources and included in waste discharge requirements or NPDES permits. They are numeric and narrative limits placed on the quality and quantity of the waste discharge or effluent. Effluent limitations are based on water quality objectives for the area of effluent disposal and applicable state and federal policies and effluent limits. Numeric and narrative

water quality objectives and policies are based on beneficial uses established for the receiving waters.

Treatment process selection is discussed in general for wastewater discharges and more specifically for two types of disposal: surface water disposal and land disposal. Waste discharge prohibitions related to treated point source wastes also determine methods of treatment and disposal. Prohibitions concerning wastewater are contained in the Waste Discharge Prohibitions section, above. Treatment policies, including pretreatment, unlined sewage ponds, constructed wetlands, package treatment plants and wastewater reclamation, are discussed under “Treatment Policies” below.

In the past, federal water quality control programs for surface water protection emphasized a “technology-based” approach to regulation of waste disposal. The current emphasis is on “water quality based controls.” States have been directed to identify “Water Quality Limited Segments,” which are surface water bodies that are not attaining water quality objectives or protection of beneficial uses and are not expected to do so even with technology-based controls. For these waters, states must conduct point and nonpoint source wasteload allocations, and establish Total Maximum Daily Loads (TMDLs) of pollutants which can be permitted from each discharger to ensure attainment and maintenance of water quality objectives and protection of beneficial uses. TMDLs are used, together with a margin of safety, to set effluent limitations in discharge permits. Additions to and deletions from the Lahontan Region’s list of Water Quality Limited Segments are considered every two years as part of the water quality assessment process (Chapter 7). Priorities for developing TMDLs for listed waters are also updated through this process. Section 4.13 of this Basin Plan includes approved TMDLs for specific surface waters.

Because the Lahontan Region has many high quality water bodies where state and federal nondegradation policies and regulations apply, effluent limitations are set to prevent degradation of water quality. Special considerations in effluent limitations for particular treatment plants (such as the Tahoe-Truckee Sanitation Agency) are discussed in the “Facilities Discussion” below.

General Requirements

Discharge requirements are prescribed for each discharger on a case-by-case basis; however, in every case, industrial and municipal effluent discharged to waters of the Region shall contain essentially none of the following substances:

¹ **Note:** “Municipal and domestic wastewater” is defined as sewage or a mixture of predominantly sewage and other waste from districts, municipalities, communities, hospitals, schools, and publicly or privately owned wastewater systems.

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Chlorinated hydrocarbons
Toxic substances
Harmful substances that may bioconcentrate or bioaccumulate
Excessive heat
Radioactive substances
Grease, oil, and phenolic compounds
Excessively acidic and basic substances
Heavy metals such as lead, copper, zinc, mercury, etc.
Other deleterious substances

Furthermore, any person who is discharging or proposes to discharge waste, other than into a community sewer system, must file a Report of Waste Discharge (RWD) with the Regional Board unless this requirement is waived by the Regional Board. Detailed lists of information needed in the Report of Waste Discharge can be obtained from Regional Board staff. Upon receipt of the RWD, the Regional Board, with information and comments received from state agencies and the public, will prescribe discharge requirements including any appropriate limitations on biological and mineral constituents, as well as toxic or other deleterious substances. Additionally, revised waste discharge reports may be required prior to additions of waste, changes in treatment methods, changes in disposal area or increases in effluent flow.

Discharge requirements will be established that are consistent with the water quality objectives for the receiving water (see Chapter 3 of this Plan), including wasteload allocations or Total Maximum Daily Loads (TMDLs) established for the discharge, the State Board's "non-degradation" policy, the federal anti-degradation and anti-backsliding regulations, and the principle of obtaining the optimum beneficial use of the Basin's water resources.

Land Disposal of Sewage Effluent

Land disposal of sewage effluent is exempt from the land disposal requirements contained in the California Code of Regulations, Title 23, Chapter 15 (see Solid and Liquid Waste Section). Some sewage-related discharges, such as sludge and septage may be regulated by Chapter 15. Land disposal of sewage effluent includes disposal to evaporation-percolation basins, irrigation of land, disposal to constructed or natural wetlands, drying ponds or beds for municipal effluent sludge, and disposal to lined evaporation ponds.

Principal factors affecting treatment process selection for land disposal are the nature of soils and ground waters in the disposal areas and, where irrigation is

involved, the nature of crops (see Wastewater Reclamation Policy). Wastewater characteristics of particular concern are total salt content, nitrate, boron, pathogenic organisms, and toxic chemicals. Where percolation alone is considered, the nature of underlying ground waters is of particular concern. Treatment processes should be tailored to insure that local ground waters are not degraded. U.S. Environmental Protection Agency (USEPA) guidelines for secondary treatment (based on the federal Clean Water Act, Section 301) do not apply to land disposal cases. However, municipal treatment facilities must provide effective solids removal and some soluble organics removal for percolation bed operations and for reduction of nuisance in wastewater effluent irrigation operations. Disinfection requirements are dictated by the disposal method. Oxidation ponds may be cost-effective in some remote locations and may be equivalent to secondary treatment. The exact constituents and limitations must be established on a case-by-case basis. Nitrate removal is required in some cases where percolating waste may impact beneficial uses of ground water due to increased nitrate levels. Percolation basins operated in alternating wet and dry cycles can provide significant nitrogen removal through nitrification/denitrification processes in the soil column. Finer textured soils are more effective in removing nitrogen than coarse soils. Monitoring in the immediate vicinity of the disposal site is required in either case. Where the need for nitrate removal is not clear, removal could be considered at a possible future stage depending on monitoring results.

The closed hydrologic systems of the Lahontan Region allow the accumulation of minerals in ground water. Therefore, discharge requirements for wastewater may generally specify a maximum limit for mineral constituents in order to meet the water quality objectives established for the receiving ground water. In areas where insufficient data preclude the establishment of objectives, and as an interim measure until such data are available, effluent limits may specify a reasonable incremental increase for constituents above the level contained in the underlying ground water. These limits may be superseded by more stringent requirements where necessary for effective water quality management of the receiving water. In all cases, ground waters of the Region are specified as a source of drinking water unless the Regional Board has granted an exemption in accordance with the Sources of Drinking Water Policy (see Chapter 6, Plans and Policies). Therefore, all effluent discharged to land must not adversely

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impact an underlying aquifer which is a designated drinking water supply.

Surface Water Disposal of Sewage Effluent

The general purpose of sewage treatment is to provide a stable effluent that can be disposed of without hazard or actual damage to the environment, that will commingle with and remain a part of the usable water supply, and that will not impair the quality of the receiving water for present and probable future beneficial uses. Surface water disposal is prohibited in some watersheds; see "Treatment Policies." (Also see Section 4.1, Regionwide Prohibition No. 4.)

Primary factors governing treatment process selection for disposal to surface waters are federal and state effluent limits, state public health regulations, and water quality objectives for beneficial use protection. At a minimum, discharges of sewage to surface waters shall meet effluent limitations in accordance with the USEPA standards for secondary treatment as presently established for the particular method of treatment. The current USEPA standards for minimum level of effluent quality attainable by secondary treatment (40 CFR § 133.102) are as follows:

Constituent ²	30-Day Arithmetic Mean	7-Day Arithmetic Mean
20°C BOD ₅ (mg/L)	30	45
Suspended Solids (mg/L)	30	45

pH: The effluent values for pH shall remain within the limits of 6.0 to 9.0

In areas where there is no direct discharge to surface waters, but there is rapid percolation, conventional secondary treatment is currently adequate. USEPA guidelines for best practicable treatment would also apply in these cases. Where water contact recreational use is to be protected, the California Department of Health Services (DHS) requires coagulation, filtration, and disinfection providing a median coliform Most Probable Number (MPN) of 2.2/100 ml or less in receiving waters. Detoxification

² **Note:** The arithmetic mean of the values for effluent samples collected for 20°C BOD₅ and Suspended Solids in a period of 30 consecutive days shall not exceed 15 percent of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (85 percent removal).

is required where fishery protection is a concern. Detoxification would include effluent limits for identified toxicants, pursuant to Section 307 of the Clean Water Act. Source control of specific toxicants may be necessary to comply with the Act. Acute and/or chronic biological toxicity testing is required to ensure compliance with all applicable state and federal toxicity standards. Additional effluent limitations and waste discharge prohibitions may be specified in accordance with appropriate plans or policies of the State or Regional Boards (see Chapter 6, Plans and Policies).

Septage and Sludge Disposal

Septage is generated from the use of holding tanks and septic tanks (see discussion of "Individual Wastewater Treatment Systems" later in this section). Sludge is the semi-solid material which settles out or is filtered out of sewage or water during the wastewater or drinking water treatment process. Septage and sludge may contain any substance that may be poured down a drain or flushed down a toilet. Metals, acids, alkalies, and pesticides may be present in small quantities. High levels of ammonia, coliforms, and BOD will almost certainly be found. Wastewater treatment sludge will also contain any substances used by the treatment plant to cause the solids to settle out of the liquid wastewater during the treatment process. Drinking water treatment sludge may have low levels of substances found in wastewater treatment sludge. Because of the concentrated nature of any percolate from sludge and septage, any percolate to ground or surface waters can seriously impact beneficial uses. Since municipal wastewater sludge is considered solid waste, disposal is regulated under Chapter 15. (See "Solid and Liquid Waste Disposal" section.)

Septage is generated from numerous sources including residential septic tanks, holding tanks for recreational vehicle waste dumping, marina and individual vessel holding tanks, and commercial and industrial septic tanks. Because of the various sources, the quality of septage is also highly variable. It is desirable to have septage pumped and transported to either lined evaporation ponds or a sewage treatment plant where treatment of septage can be accomplished rather than direct disposal to a lined impoundment. Treatment of such concentrated waste, however, poses a problem for many smaller or at-capacity wastewater treatment plants in the Region. Not all wastewater treatment plants in the Lahontan Region accept septage from waste haulers who pump out septic tanks and holding tanks. The Regional Board will encourage that local officials

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review all proposals for new holding tanks or septic tanks to ensure that adequate septage disposal capacity is available. If necessary, the Regional Board will consider making adequate septage disposal a condition of permitting new holding tanks or septic tanks. Proposals for new holding tanks or septic tanks which may be accepting industrial waste or chemical toilet wastes should be reviewed carefully by local agencies and Regional Board staff to ensure that proper treatment and final disposal of the septage generated can be accomplished without detriment to water quality. If septage is not commingled with wastewater for treatment at an approved wastewater treatment facility, septage must be placed in a Class II surface impoundment, under Chapter 15 regulations (see "Solid and Liquid Waste Disposal" section). This is a lined containment structure, preventing the septage from contacting either surface or ground water.

The Regional Board specifically prohibits discharge of waste from boats and marinas to surface waters of several hydrologic units. The Regional Board also prohibits the discharge of waste directly to many surface waters of the Region (see "Waste Discharge Prohibitions"). Floating latrines are one possible way of reducing discharges of sewage from boats into lakes. Floating latrines will generally be of benefit, however, only for lakes that are so large that boaters in mid-lake find it inconvenient to return to shore to make use of on-shore facilities. Proposals for installation of floating latrines will be reviewed by the Regional Board on a case-by-case basis. Floating latrines should be vandalism-proof, and good maintenance agreements will be required. Boater surveys are recommended prior to installation, to verify that such facilities will actually be used by boaters. See Section 4.11, "Recreation" for a discussion of the impacts of boat fuel discharges.

Treatment Policies

Pretreatment Policy

It is the responsibility of the State and Regional Boards to implement and administer the federal Pretreatment Program for controlling the discharge of toxic and hazardous pollutants by industrial users into publicly-owned treatment works (POTWs) with capacity of 5 million gallons per day (mgd) or greater. The Pretreatment Program is administered through the National Pollutant Discharge Elimination System (NPDES). The Pretreatment Program is administered by the State through a Memorandum of Agreement (MOA) between the USEPA and the State Board.

Regional Board responsibilities are summarized below.

- Enforce national pretreatment standards prohibiting discharges (40 CFR § 403.5)
- Enforce national categorical pretreatment standards (40 CFR, Subchapter N, Effluent Guidelines and Standards)
- Review, approve or deny POTW pretreatment programs (40 CFR § 403.8, 403.9 and 403.11)
- Require POTWs to develop and enforce local discharge limits [40 CFR § 403.5(c)]
- Oversee POTW pretreatment programs to ensure compliance with 40 CFR § 403.8, and with other pretreatment requirements in the POTW's waste discharge permits or NPDES permit
- Perform POTW audits, compliance inspections, and review of quarterly and annual reports to assure POTW compliance with pretreatment requirements
- Provide the State Board and USEPA, upon request, with copies of all notices received from POTWs that relate to new or changed introduction of pollutants to the POTW or other pertinent information
- Review and approve POTW requests for authority to modify categorical pretreatment standards to reflect removal of pollutants by a POTW (40 CFR § 403.7, 403.9 and 403.11)
- Apply all other pretreatment requirements as required by 40 CFR Part 403

Few municipal wastewater treatment plants in the Lahontan Region are large enough (greater than 5 mgd) to require pretreatment of commercial and industrial wastewater under the federal regulations. However, there is increasing concern for all wastewater facilities regarding the impacts of not only industrial, but also household chemicals on effluent quality.

Unlined Sewage Ponds

There are numerous small unlined sewage ponds throughout the Region that are believed to be a threat to ground water quality because they allow the percolation of inadequately treated sewage to underlying ground water. These facilities are owned by either private parties or small public entities that have very limited financial resources. There is

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typically no ground water monitoring associated with these small ponds, so their actual impact on ground water is unknown. To require that all of these facilities be immediately upgraded to where they produce a secondary level effluent would create, in most cases, a significant financial burden to the owners of the ponds. Such an approach may also result in upgraded facilities that are not needed to protect ground water quality. Although it can also be expensive, ground water monitoring at each of these facilities is needed to determine whether they are degrading the ground water. If it is determined that the discharge from an unlined pond is impacting ground water, action will be taken to require either elimination or improved treatment of the wastewater discharge. The requirement for upgrading treatment (or elimination of the discharge by placing it in a lined evaporation pond) should be made with provisions allowing for the improvements to be made within two years.

Recommended Control Actions to Address Unlined Sewage Ponds

1. Inventory all unlined ponds in the Region that are receiving sewage that has not received at least secondary-level treatment.
2. Prioritize the ponds by their threat to water quality, taking into account factors such as: (a) the volume of waste discharged, (b) the quality and existing beneficial uses of the receiving waters and (c) the likelihood of the sewage containing any industrial wastes.
3. Beginning with the highest priority facilities, revise waste discharge requirements to require the installation of at least three groundwater monitoring wells within two years.
4. If degradation of the ground water is detected at any time after the first two years of semi-annual ground water monitoring, waste discharge requirements will be revised to require that treatment of the discharge be upgraded to a secondary level within two years. If no degradation (either actual or predicted violations of water quality objectives) is detected, the discharge will be allowed to continue with ongoing sampling of the ground water monitoring wells.

An exemption to the groundwater monitoring well requirement may be obtained if the discharger can submit evidence that demonstrates to the satisfaction of the Regional Board's Executive Officer that the underlying groundwater will not be

adversely impacted by any discharge from the pond.

Constructed Wetlands

The use of constructed wetlands as a method to provide final treatment and disposal for municipal wastewater continues to grow throughout the country and may be proposed for use in the Lahontan Region. Constructed wetlands are generally of two types: (1) free water surface wetland and, (2) subsurface flow wetlands. Both types of constructed wetlands consist of shallow beds or channels utilizing the roots and rhizosphere of aquatic plants as the surface media for bacteriological activity. Free water surface wetlands also use the chemical uptake by the emergent vegetation and, sometimes floating vegetation (duckweed or water hyacinth) and zooplankters (daphnia) for treatment. Treatment of wastewater through constructed wetlands often achieves effluent of better than secondary treatment quality. Concerns over the use of constructed wetlands in the Lahontan Region include harsh climatic conditions (from excessive heat to excessive cold) which may significantly alter the plants' ability to grow, disposal/harvesting of plant material, and high operation and maintenance costs. At a minimum, constructed wetlands should be designed and constructed using guidelines contained in the USEPA's 1988 manual entitled "Constructed Wetlands and Aquatic Plant Systems for Municipal Wastewater Treatment." Some experimental wetlands are currently in use in the Lake Tahoe Basin for treatment of stormwater (see sections on Stormwater and Wetlands Policy). Wetlands are also being considered for treatment of acid mine drainage (see section on Mining). Data gathered from these experimental operations will provide useful information for future applications of constructed wetlands.

Package Treatment Plant Policy

Commercially available prefabricated treatment plants, known as package treatment plants, were originally designed to serve areas that could not be easily connected to an existing municipal sewage treatment plant. Such areas include the subdivisions constructed in the once remote areas surrounding the major desert communities in the southern portion of the Lahontan Basin and commercial establishments such as restaurants, motels, and RV parks. More recently, package plants have increased to a size that can serve small municipalities. Many plants employing biological treatment were installed with the idea that the plants would operate themselves and therefore, could be turned on and forgotten. However,

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to meet the current pollution discharge regulations, these plants require daily attention by a knowledgeable, conscientious and certified operator. Without proper maintenance and sludge disposal practices, waste discharges from these plants may cause unacceptable odor and nuisance conditions, and/or violate water quality objectives and waste discharge requirements.

The Regional Board encourages persons to connect new developments to community sewer systems in lieu of the installation and use of package treatment plants. If community sewer systems are not available, and the area and development are unsuitable for individual waste disposal systems because:

- 1) the density of the subdivision or commercial development is greater than allowable for individual waste disposal systems (exceeds 2 single family equivalent dwelling units per acre or has a wastewater discharge volume greater than 500 gallons per day per acre), **or**
- 2) the nitrate concentration of the underlying ground water equals or exceeds 10 mg/L as nitrogen, then

the Regional Board will likely approve the use of package plants for treating waste discharges from the development. In areas with condition No. 2 above, the effluent from the package treatment plants will be required to meet a limitation of 10 milligrams per liter nitrate-nitrogen.

Package Treatment Plant Criteria

- a. Design should be based on peak daily flow estimates. A flow equalization chamber at the headworks may be appropriate for some applications so as not to overload the treatment capacity of the plant.
- b. Measures to control odor and/or eliminate nearby odor receptors must be included in the design and proposal.
- c. Package plants must include adequate storage and/or treatment (digestion) area for waste sludge. Proposed sludge disposal measures must be included in the project plan.
- d. For commercial, institutional or industrial systems, pretreatment may be necessary if the chemical composition of the wastewater is significantly different from domestic wastewater.
- e. Package plants should contain duplicate equipment components for components subject

to failure. If equipment is not on-site, the manufacturer should have the ability to provide replacement equipment to the operator so that a replacement component can be installed within forty-eight hours of failure.

- f. Package treatment plants which rely on soil absorption for treatment and/or disposal of any of the wastewater generated will be required to meet the criteria established for individual waste disposal systems (see "Individual Wastewater Treatment Systems" in this Chapter) applicable to soil absorption and ground water protection (soils, depth to ground water, slope of disposal field).
- g. Effluent from package treatment plants must meet all current Regional Board criteria. In addition, to be used for reclamation purposes, it must meet all current regulations of the Regional Board and the Department of Health Services regarding reclamation of wastewater (see Wastewater Reclamation Policy, below).

Package Treatment Plant Responsible Entity

The package treatment plant should be owned or controlled by a public agency or a private entity with adequate financial and legal resources to assume responsibility for waste discharges. The owner is ultimately legally and administratively responsible for the performance of the treatment plant. The owner is also responsible for adding capacity and/or renovations to the treatment plant when needed, controlling sewer construction practices in the services area, keeping supplies at the plant, and supervising the operator. The operator of the plant shall be certified in the State of California with the appropriate classification for the specific treatment processes and effluent quality required of the plant. Additionally, the owner should provide for outside help for special problems which may arise in the operation of the package treatment plant. The outside help may be a consulting engineer, or an operator of a larger treatment plant in a nearby town. The owner shall notify the Regional Board of the designated person or persons qualified to handle special problems at the plant.

Package Treatment Plant Permitting

The Regional Board will consider the adoption of waste discharge requirements (WDRs) for all package treatment plants. WDRs will contain specific effluent limitations (see section on effluent limitations, above). WDRs will also include monitoring and reporting requirements. Monitoring of the effluent may include analyses for the following parameters: flow, biological and/or chemical oxygen demand

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(BOD/COD), total dissolved solids, suspended solids, total and fecal coliform bacteria, nitrate, total nitrogen, total phosphorus, methylene blue active substances (MBAS), and purgeable halocarbons and aromatics. Monitoring requirements will also include monitoring of the receiving water, including the underlying ground water. At a minimum, four monitoring wells will be required.

Wastewater Recycling

Parts of the Lahontan Region, like California in general, are experiencing an increasing water shortage. In the southern portions of the Lahontan Region, for instance, the Antelope Valley and the Mojave Ground Water Basins are possibly overdrafted due to increased pumping to meet the water demands of the growing Victor Valley, Lancaster and Palmdale areas. In light of this increasing statewide water shortage, development of water supply alternatives is important. For many uses, recycled wastewater is a viable alternative water supply and sales of recycled water can sometimes be used to offset the costs of treating wastewater. (The terms “recycled water” and “water recycling” are now used in the California Water Code in place of the formerly used terms “reclaimed water” and “water reclamation”.) Residential greywater use decreases residential water demand and is discussed below in “Individual Wastewater Treatment Systems.”

Recycled water has a wide variety of applications. The applications include agricultural irrigation, landscape irrigation (including highway landscape, parks and golf courses), impoundments for landscape, recreational and/or wildlife uses, wetland and wildlife enhancement, industrial processes (e.g., cooling water, process water, wash water, dust control), construction activities and ground water recharge.

Wastewater recycling is an important component of wastewater management in the Lahontan Region. As of 1994, a total of 17 wastewater recycling plants in the Lahontan Region accounted for 7% of all recycled water reuse in the State. In fact, the Los Angeles County Sanitation District No. 14 - Lancaster water recycling plant and the South Tahoe Public Utility District sewage treatment plant were among the top twelve major recycled water producers in the State. Other recycled water producers in the Region include the Susanville Consolidated Sanitary District, the Crestline Sanitation District, the Lake Arrowhead Community Services District, and the Ridgecrest/China Lake Naval Weapons Center wastewater treatment facility.

Recycled water in the Lahontan Region is used for golf course, alfalfa, tree and other agricultural irrigation, as well as for soil compaction and dust control. Some recycled water from the Lancaster Water Reclamation Plant is used for wildlife habitat enhancement at Piute Pond and to supply a recreational lake at Apollo Lake County Park. Other uses of recycled water, such as for snow making in areas of Lake Arrowhead and Mammoth Lakes, have been proposed to the Regional Board. (See Waste Discharge Prohibitions Section for Mojave River HU for exemption language concerning reclaimed wastewater.)

The State Board adopted the “Policy with Respect to Water Reclamation In California” and the related “Action Plan for Water Reclamation in California” in 1977 (State Board Resolution No. 77-1). This policy specifies actions to be implemented by the State and Regional Boards, as well as other agencies, in relation to reclaimed water use. The policy directs the State and Regional Boards to encourage reclamation and reuse of water, and to promote water reclamation projects which preserve, restore, or enhance instream beneficial uses. The policy also states that the State and Regional Boards recognize the need to protect public health and the environment in the implementation of reclamation projects.

The Porter-Cologne Act requires Regional Boards to consider the need to develop and use recycled water when establishing water quality objectives. The Porter-Cologne Act also requires the State Department of Health Services (DHS) to establish statewide recycling criteria for each type of recycled water use to protect public health. The Act requires any person proposing to discharge recycled water to file appropriate information related to the discharge with the Regional Board. The Act also states that, after consulting with and receiving recommendations from DHS, and after any necessary public hearing, the Regional Board shall, if necessary to protect the public health, safety or welfare, adopt water reclamation requirements for the recycled water discharge.

The California Water Code provides encouragement for the use of recycled water in relation to water rights decisions, as follows (Section 1010 [a][1]):

“The cessation of, or reduction in, the use of water under any existing right regardless of the basis of right, as the result of the use of recycled water, ... is deemed equivalent to and for purposes of maintaining any right shall be construed to constitute, a reasonable beneficial use of water to the extent and

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in the amount that the recycled ... water is being used not exceeding however, the amount of such reduction.”

The Porter-Cologne Act (Section 13522[b]) provides that the use of reclaimed water pursuant to uniform statewide reclamation criteria “does not cause, constitute, or contribute to, any form of contamination” unless the Department of Health Services or the Regional Board determines that contamination exists.

The Porter-Cologne Act (Sections 13523.1 and 13263[h]) allows Regional Boards to issue master reclamation or recycling permits for suppliers and/or distributors of reclaimed or recycled water. Master reclamation permits must include waste discharge requirements and requirements for the following: compliance with statewide reclamation criteria, establishment and enforcement by the permittee of rules or regulations for reclaimed water users, quarterly reporting on reclaimed water use, and periodic compliance inspections of water users by the permittee.

The California Water Code (Sections 13550 through 13556) declares that use of potable water for certain purposes (e.g., irrigation of parks, golf courses, cemeteries, and residential landscaping, and toilet and urinal flushing in nonresidential structures) is a waste and unreasonable use of water if nonpotable water is available, under specific conditions. Section 13555.2 declares the Legislature's intent to encourage the design and construction of distribution systems for nonpotable water separate from those for potable water. Section 13556 allows water suppliers to acquire, store, provide, sell and deliver recycled water for any beneficial use if the water use is in accordance with state water recycling criteria and with Chapter 7 of the Water Code.

While the Regional Board supports the concept of water recycling, it must also consider potential impacts from recycling on ground and surface water quality. When reviewing proposed water recycling projects, the Regional Board carefully considers potential public health impacts from pathogens or conservative organic compounds, as well as the potential of the proposed project to create pollution or nuisance conditions. The Board also considers potential impacts on the quality and beneficial uses of any receiving surface or ground waters including the potential for eutrophication of surface waters due to nutrient loading from recycled water. Discharges of recycled water are prohibited in areas of the Lahontan Region where waste discharge prohibitions are in place, unless exemption criteria, where applicable,

can be met. The Water Code (Sections 13529.2 and 13529.4) includes provisions for reporting cleanup, and administrative civil liabilities for unauthorized discharges of recycled water which has been treated at secondary or tertiary levels.

Accumulation of minerals is a common potential impact to receiving waters from recycled water uses. Accumulation of minerals must be minimized to provide for protection of beneficial uses. A variety of techniques can be used. Where well controlled irrigation is practiced, nitrate problems can be controlled. Vegetative uptake will utilize soluble nitrates which would otherwise move into ground water under a percolation operation. Demineralization techniques or source control of total dissolved solids may be necessary in some areas where ground waters have been or may be degraded. Presence of excessive salinity, boron, or sodium in the effluent could be a basis for rejection of proposals to irrigate cropland with effluent. However, the Porter-Cologne Act allows issuance of water recycling requirements to a project which **only** violates salinity objectives.

Water Recycling Control Measures for Indian Creek Watershed

Recycled water from the South Tahoe Public Utility District (STPUD) is exported from the Lake Tahoe Basin to Alpine County, where it is used for irrigation. In order to protect the beneficial uses of the Indian Creek watershed, the Regional Board must regulate the use of recycled water for irrigation in coordination with regulation of other discharges such as septic systems, irrigation return flows from lands not irrigated with effluent, and stormwater from pasture lands and manure storage areas. (High nutrient and coliform bacteria levels measured in Indian Creek and the lower West Fork Carson River indicate that better management of animal wastes is desirable in these watersheds.) The amount of nutrients leaching into ground waters from areas irrigated with domestic wastewater effluent should be minimized.

The Regional Board should maintain stringent waste discharge requirements for the irrigation of agricultural lands with STPUD's effluent, and extensive monitoring should be done to ensure that public health is adequately protected.

Waste discharge requirements for ranchers irrigating with effluent must specify control measures at least as strict as the following:

- Irrigation efficiency must be at least 50% in all effluent discharge areas. Higher efficiencies should be mandated for specific areas to the

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maximum practical extent, based on site limitations and the limitations of available technology.

- Application of effluent to agricultural lands must be prevented during the winter period when crops are not growing.
- Prohibition of discharge to surface waters of tailwaters from lands irrigated with effluent.
- Strict effluent limits for Total Coliform Organisms
- Provision for pre-discharge assessment of potential effluent disposal sites to determine the risks of ground water contamination.
- Buffer areas to prevent effluent disposal too close to wells and spray disposal too close to dwellings and traveled ways.
- Ground and surface water monitoring to assess impacts of irrigation return flows.

Facilities Discussion

Regional Wastewater Treatment Facilities

Victor Valley Wastewater Reclamation Authority

In the past, local wastewater disposal systems in the Victor Valley area were adequate to serve its scattered development. However, in the 1970s the intensity of development reached the level where continued independent use of these systems and individual disposal units did not afford effective area wide control of wastewater. Based on long-range economic and water quality benefits to the immediate or downstream area, treatment and disposal facilities in the Victor Valley area needed consolidation. The disposal of wastewater necessitated a coordinated approach in the use of local ground, surface, and imported water to form an integral part of a water resources management program that provides for salinity control.

The Regional Board implemented control actions in the 1970s which resulted in the completion of a regional treatment plant in 1981, which is owned and operated by the Victor Valley Wastewater Reclamation Authority (VWVRA).

The VWVRA Treatment Plant, which is located approximately five miles north of the City of Victorville and approximately one mile northeast of George Air

Force Base, collects, treats, and disposes of domestic wastewater.

The VWVRA transports wastewater to the treatment plant by means of interceptor sewers from the City of Victorville, Spring Valley Lake (San Bernardino County Service Area No. 64), Apple Valley, Oro Grande (San Bernardino County Service Area No. 42), and Hesperia.

The VWVRA project and Regional Board control actions were also instrumental in the construction of sewer systems for the Apple Valley Desert Knolls, Basin Plan prohibition area, Apple Valley Village and Bear Valley Road area, which are currently served by the VWVRA treatment plant.

The original capacity of the VWVRA treatment facility was 4.8 million gallons per day (mgd). VWVRA has subsequently expanded the plant to 9.5 mgd. The plant currently treats and discharges an average of 7.0 mgd to the Mojave River.

The VWVRA treatment facility is designed to provide a level of treatment greater than standard secondary treatment for the discharge to the Mojave River and to provide standard secondary treatment for the discharge to percolation ponds. Treatment processes consist of screening, grit removal, primary sedimentation, flow equalization, biological treatment, using activated sludge, secondary sedimentation, secondary effluent percolation, coagulation, a combination of pressure and rapid sand filtration, and chlorination.

Tahoe-Truckee Sanitation Agency

The Tahoe-Truckee Sanitation Agency (TTSA) provides tertiary treatment for wastewater collected by the North Tahoe and Tahoe City Public Utility Districts in the Lake Tahoe Basin; and by the Alpine Springs and Squaw Valley County Water Districts, the Truckee Sanitary District, and Placer County Service Area 21 in the Truckee River watershed. Wastewater is carried from member districts by an interceptor pipeline which generally parallels the Truckee River. Export of domestic wastewater from the Lake Tahoe Basin is mandated by the Porter-Cologne Act. The high level of treatment provided by TTSA is necessary to protect instream beneficial uses of the Truckee River in California and municipal use of the River in the Reno-Sparks, Nevada area.

The TTSA plant has an approved capacity of 5.83 mgd (maximum 7-day average, 7.4 mgd) during the summer. It provides high levels of nitrogen and phosphorus removal. Effluent limitations for nutrients

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and other parameters are established in the waste discharge requirements adopted for the facility. Treated wastewater is discharged to subsurface disposal trenches in hydrologic continuity with the Truckee River and Martis Creek, or used for spray irrigation in the same general area. Because subsurface disposal has not provided the additional phosphorus removal initially expected, TTSA has increased its relative emphasis on spray irrigation.

Numerical water quality objectives for the Truckee River and Martis Creek were revised in 1980 with consideration of the TTSA discharge. Nitrate-nitrogen was considered the most critical constituent for the protection of beneficial uses. Nitrate objectives (see Chapter 3) were established for different stream reaches based on a flow-related wasteload allocation model. (TTSA's ability to meet the objectives depends partly upon river flows which are managed by a federal watermaster under a court decree. River operating agreements are discussed in Section 4.9 of this Chapter.) Objectives for stations downstream of the TTSA discharge allow for increased nitrate loading (over natural background levels) from TTSA, and also allow increased loading of total dissolved solids, chloride, and sulfate, which are byproducts of the TTSA treatment process. In adopting these objectives, the Regional Board recognized that increases in loading of byproduct chemicals are necessary tradeoffs for the high levels of nitrogen removal.

Although TTSA is capable of removing nitrogen to a level of 2 mg/L in the effluent, the Regional Board set the effluent limitation at 9 mg/L in recognition of economic constraints. TTSA agreed to increase its level of nitrogen removal in the future if necessary for protection of beneficial uses. TTSA's effluent limitations were established on the premise that little or no improvement in quality would occur through soil percolation; the Regional Board had received no evidence of reliable long-term soil treatment at that time. Subsequently, TTSA initiated studies to define the capability of the soil in the effluent travel path to remove certain waste constituents. If adequate soil removal capacity is demonstrated, TTSA treatment levels for certain constituents may be reduced, with significant reductions in operation and maintenance costs and in capital costs for facilities expansion. No allowance for soil treatment should be established unless it is supported by substantial evidence of reliable constituent removals for extended periods of time.

Waste discharge prohibitions which affect the Truckee River watershed, are set forth in the "Waste Discharge Prohibitions" section of this Chapter.

If the counties within the TTSA service area desire to accommodate growth beyond the growth predicted in the TTSA Facilities Expansion Environmental Impact Report (TTSA 1981), it is recommended that the total number of septic tank discharges in the Tahoe-Truckee area be decreased or kept at current levels. This can be accomplished by requiring sewerage of existing septic tank subdivisions and/or by limiting build-out of such subdivisions. Each single family dwelling septic tank discharge which is eliminated by sewerage will allow approximately two additional single family dwelling discharges to TTSA.

Community Systems

South Tahoe Public Utility District

The South Tahoe Public Utility District (STPUD) provides collection and treatment for municipal wastewater from the El Dorado County portion of the Lake Tahoe Basin. Wastewater is given advanced secondary treatment and pumped over Luther Pass to Alpine County, where it is stored in Harvey Place Reservoir and used for pasture irrigation. (Export of wastewater from the Lake Tahoe Basin is mandated by the Porter-Cologne Act. An amendment to that Act allowed STPUD to submit a conceptual plan for the reuse of treated wastewater within the Tahoe Basin. However, any project involving reuse of reclaimed water in the Lake Tahoe Basin would still be required to comply with all water quality objectives and to protect beneficial uses.) STPUD's approved capacity is 7.7 mgd; its effluent limitations are established in the waste discharge requirements for the facility. The Regional Board maintains water recycling waste discharge requirements on ranchers who use the effluent for irrigation. Issues associated with the STPUD plant include treatment capacity; and continuing problems with spills within the Lake Tahoe Basin.

The Regional Board should continue to review progress toward the restoration of Indian Creek Reservoir, and may require additional measures if necessary to protect beneficial uses. During normal and heavy water years, the Regional Board should evaluate the potential for illegal overflows from the reservoir and should require STPUD to take action to prevent such overflows. STPUD's waste discharge requirements should continue to prohibit leakage from effluent storage and conveyance facilities, and the Regional Board should strictly enforce the Basin Plan requirement which states:

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"All facilities used for collection, transport, treatment or disposal of waste shall be adequately protected against overflow, washout, and flooding from a 100-year flood."

As a condition of Alpine County's approval of Harvey Place Reservoir, storage capacity in the reservoir was reserved for possible future discharges of secondary effluent from development in Alpine County. (See separate section on Markleeville PUD.) A decision to use this capacity would trigger review by the Regional Board and modification of STPUD's waste discharge requirements.

Alpine County should continue to regulate the density of new septic systems within the area affected by the STPUD discharge through zoning regulations and the MOU implementing the Regional Board's region-wide septic system criteria. The County should also continue to enforce ordinances concerning septic system installation which implement the criteria in this plan. The County should give Regional Board staff the opportunity to review any new ordinances which could affect water quality.

The Regional Board should continue to work with Alpine County, the Alpine Resource Conservation District, and affected landowners to remedy other nonpoint source problems which may contribute nutrients cumulatively with septic systems and irrigation with reclaimed wastewater to the waters of the East and West Fork Carson River HUs.

City of Adelanto Public Utility Authority

The City of Adelanto Public Utility Authority wastewater treatment facility receives domestic and commercial sewage from the community of Adelanto, including an industrial park and several prison complexes. The facility is designed to produce an advanced secondary level of wastewater treatment. Before September 15, 1998, the City conveyed its wastewater to the Victor Valley Wastewater Reclamation Authority's regional wastewater treatment facility for treatment and disposal.

The design capacity of the facility is 1.5 mgd. Currently the City treats and disposes an average of approximately 0.7 mgd of wastewater. Treatment processes are preliminary treatment, two lined extended aeration lagoons, two secondary clarifiers, filtration, and disinfection. Sludge from the secondary clarifiers is thickened, centrifuged and routinely trucked offsite for disposal. Treated effluent is discharged to percolation pond for disposal. The City plans to construct a regional septage receiving station at the facility. Future City plans include possible use

of recycled wastewater from the wastewater treatment facility.

The Adelanto wastewater treatment facility is regulated by waste discharge requirements for the discharge of treated wastewater to percolation ponds. A requirement to implement an industrial pretreatment program is included.

Los Angeles County Sanitation District Number 14—Lancaster

The District's plant currently treats municipal wastewater from the City of Lancaster, the surrounding unincorporated area and Fox Airfield. The capacity of the treatment plant is 11.6 mgd; it currently treats and discharges an average of 8.4 mgd. The treatment and disposal capacity is proposed to be expanded to 16.0 mgd by the year 1995.

All wastewater is treated by primary sedimentation tanks followed by additional treatment in oxidation ponds. Sludge from the primary sedimentation tanks is treated by anaerobic digesters. Digested sludge is stockpiled onsite until exported. In July 1988 the Mira Loma Jail facility located at 45100 60th Street West in Lancaster began using the digested sludge as a soil conditioner. An average of approximately 5,400 cubic yards per month have been exported to this facility during the period inclusive of July 1988 through October 1988. Potentially much of the stockpiled sludge would be used as soil amendment by a large ranch currently under waste discharge requirements. Currently most of the effluent is discharged to Nebeker Ranch and/or chlorinated and discharged to Piute Pond. Piute Pond is a marsh-like area that is located on Edwards Air Force Base (AFB) property and is used for duck hunting and wildlife viewing as well as wastewater disposal. At Nebeker Ranch the treated wastewater is used for irrigation of fodder crops.

Oxidation pond effluent not discharged to Nebeker Ranch or Piute Pond receives further treatment by a tertiary treatment plant with a design capacity of 0.6 mgd. This plant includes chemical addition, coagulation, sedimentation, filtration, and chlorination facilities. The effluent from the tertiary treatment plant is discharged to Apollo County Park where it is used as a source of supply for three artificial recreational lakes. The lake waters are used for fishing, boating and landscape irrigation within the park and fire protection at the Fox Airfield. In addition, the lake waters are used for dust control and compaction during county road construction and maintenance activities.

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Los Angeles County Sanitation District No. 20—Palmdale

Los Angeles County Sanitation District (LACSD) No. 20 treats domestic wastewater from the incorporated City of Palmdale and the surrounding unincorporated area. Secondary wastewater treatment is provided by ferric chloride (FeCl_3) and polymer enhanced primary sedimentation tanks, anaerobic digesters, and oxidation ponds. Additional treatment is provided by oxidation pond aeration. Sludge from the anaerobic digesters is dried in drying beds and stockpiled on site. Stockpiled sludge is intermittently exported for use as fertilizer and soil conditioner at approved offsite locations. The current design capacity of the secondary treatment and disposal facility is 8.0 mgd. An average of 8.0 mgd is currently treated and used for reclamation. LACSD No. 20 is proposing new construction and modifications at the facility by 1995 which will result in an increase of design capacity to 15.0 mgd.

The effluent from the District's 30th and 40th Street East oxidation pond sites is conveyed by two gravity pipelines and a force main to the City of Los Angeles, Department of Airports (LADOA) Irrigation Site where effluent is discharged to land and a portion is used to surface irrigate pasture, fodder crops, pistachio trees and various other types of trees that will be harvested for firewood. The capacities of the gravity pipelines are 1.0 mgd and 3.1 mgd. The area of the irrigation site is 2,560 acres. This includes an increase of 1,800 acres adjacent to the existing 760 acres currently in use.

Eastern Sierra Community Service District

The Eastern Sierra Community Service District was formed in 1977 to provide wastewater treatment for Inyo County Service Area No. 1 (which surrounds the City of Bishop) and the Bishop Indian Reservation. This area consists of all lands west and north of the Bishop City limits (West Bishop, Indian Reservation, Lazy A, Meadow Farms and Dixon Lane). The entire district is served by a multiple collection system that ranges in size from 8" to 27". All homes and businesses within the district are currently connected to said system.

This facility has a design capacity of 0.85 mgd and is located adjacent to the City of Bishop wastewater plant. The facility currently treats and disposes an average of 0.64 mgd of wastewater. The Eastern Sierra Community Service District wastewater plant consists of a primary clarifier, an anaerobic sludge digester and an aerated facultative pond. The effluent is then discharged onto pasture land or into one of 3

evaporation/percolation ponds. Each pond has a surface area of 15 acres.

Barstow Wastewater Treatment Facility

The City of Barstow Wastewater Treatment Plant receives domestic and commercial wastewater from the communities of Barstow and Lenwood. The wastewater treatment plant also receives industrial wastewater from the Atchison, Topeka and Santa Fe Railway Company classification yard located in Barstow.

The design capacity of the Barstow Wastewater Treatment Plant is 4.5 mgd. Wastewater treatment processes at the plant include preliminary treatment, primary clarification, activated sludge and chlorination. The discharger has eight percolation ponds and two fodder crop irrigation (spray) sites to dispose of treated secondary effluent. One of the irrigation sites has an area of 72 acres and the other site has an area of 67 acres. The treatment plant, percolation ponds and 72-acre irrigation site are located along the southern edge of the Mojave River bed. The 67-acre site is located along the opposite edge of the river bed.

The discharger treats primary sludge from the primary clarifiers with a grit removal system, sludge thickener and centrifuge. The dewatered primary sludge is incinerated, and sludge wasted from the activated sludge process is treated by an aerobic digester and is then discharged to the sludge drying beds. The dried sludge is hauled to the fodder crop irrigation sites where it is used as a soil conditioner and fertilizer.

The Wastewater Treatment Facility is regulated by waste discharge requirements for disposal of treated wastewater to the percolation ponds and irrigation site. Currently the City is pursuing a long range plan for treatment and disposal of wastewater.

Bishop Wastewater Treatment Facility

The City of Bishop wastewater treatment plant receives domestic and commercial sewage from the community of Bishop. The Eastern Sierra Community Service District Sewage Treatment Plant serves local residents outside the City of Bishop.

The design capacity of the plant is approximate 1.6 mgd. Currently the City treats and disposes an average of approximately 0.6 mgd of domestic wastewater. Treatment processes are two primary clarifiers, one clay-lined aeration lagoon, and two clay-lined oxidation ponds. Sludge from the primary clarifiers is treated by two anaerobic digesters and

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then discharged to two drying beds. Approximately once per year the sludge from the drying beds is spread on a pasture irrigation area owned by the Los Angeles Department of Water and Power. Treated effluent is discharged to percolation ponds or pasture irrigation land for disposal. Approximately 125 acres are irrigated for non-milking animals.

The Bishop Wastewater Treatment Facility is regulated by waste discharge requirements for the discharge of treated wastewater to percolation ponds and irrigation pasture and for the discharge of sludge to irrigation pasture.

Lake Arrowhead Community Services Dist.

Present sewered communities in the Lake Arrowhead area are served by an extensive collection system operated by the Lake Arrowhead Community Services District (LACSD). Wastewater is collected from the communities of Lake Arrowhead, Blue Jay and Twin Peaks, for treatment and disposal at the District's plants and effluent outfall system. Effluent exported from the San Bernardino Mountains via the outfall system is presently used to surface irrigated fodder crops at Lake Arrowhead Ranch in Hesperia. The LACSD treats an average of 1.5 mgd of domestic wastewater from the Lake Arrowhead area. Maximum wet weather flows of 8.5 mgd have occurred due to large amounts of inflow/infiltration. Wet weather flows have caused significant problems and the district is currently embarking on projects to reduce inflow/infiltration to the system. Flow during a holiday weekend may average as much as 3 mgd.

Wastewater treatment is provided by two treatment plants, the Willow Creek treatment plant and The Grass Valley treatment plant. The Willow Creek treatment plant provides secondary treatment and disinfection of wastewater by an aerated grit chamber, primary clarifiers, parallel contact-stabilization activated sludge/secondary clarifier units, chlorine contact tanks, and effluent equalization ponds. Sludge handling units include a gravity thickener, vacuum filter, sludge conveyer, incinerator, and an ash conveyer and storage system. The Grass Valley treatment plant provides secondary treatment and disinfection utilizing aerated grit chambers, primary clarifiers, high-rate plastic media trickling filters, secondary clarifiers, and chlorine contact tanks. An effluent equalization pond is also included. Sludge handling units include a gravity thickener and a belt filter press. Presently the sludge from the Willow Creek and Grass Valley plants is dewatered and disposed of at a sanitary landfill by burial.

Effluent from both treatment plants is discharged to a ten-mile outfall pipeline conveying the treated wastewater to a 300-acre site where it is used for spray irrigation of alfalfa (Lake Arrowhead Ranch). The irrigation site contains four percolation ponds which are used only when the effluent cannot be disposed of by irrigation.

Located approximately one-half mile northeast of the Willow Creek treatment plant are a series of hillside contour ponds which previously constituted the disposal site for the District. The ponds are not designated disposal sites, and any discharge to these ponds constitutes a violation of waste discharge requirements and applicable discharge prohibitions contained in this Basin Plan. Hillside ponds, however, have been used under emergency conditions.

Ridgecrest-China Lake Area

The City of Ridgecrest's Regional Domestic Wastewater Treatment Plant is located in the Indian Wells Valley one mile northeast of downtown Ridgecrest. The plant serves the City of Ridgecrest and the China Lake Naval Weapons Center. The City collects, treats, and disposes of an average of 3.3 mgd of domestic wastewater in the winter and 4.2 mgd in the summer. The additional wastewater flow that occurs in the summer is believed to be due to the discharge of evaporative cooler reject water to the sewer. The current capacity of the treatment plant is 4.4 mgd. The plant is owned and operated by the City of Ridgecrest. Wastewater treatment is provided by preliminary treatment, primary clarifiers, four (4) oxidation ponds, and chlorination facilities. Effluent from the City's oxidation ponds is chlorinated and used to spray irrigate the Naval Weapons Center golf course. Wastewater disposal is also accomplished by discharging primary or secondary effluent to the City's three (3) evaporation ponds and four (4) percolation ponds. A portion of effluent is also used to surface irrigate grasses and trees on 73 acres owned by the City. The oxidation ponds and evaporation ponds are reportedly lined with clay. Sludge from the City's primary clarifiers is treated by two (2) anaerobic digesters and discharged to drying beds. The dried sludge will be used as a fertilizer and soil conditioner for fodder crops (barley and alfalfa) or will be disposed of by burial at the Ridgecrest solid waste disposal site. Since 1987, Ridgecrest has been under a cease and desist order due the formation of a ground water mound in the area. Percolation from the City's treatment plant ponds has been the primary cause for the formation of a ground water mound in the area. The mound has caused two problems. The first problem is the ponding of wastewater on the

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ground surface adjacent to the designated disposal ponds. The second problem caused by the mounding is the threatened migration of poor quality ground water toward domestic water supply wells located to the southwest. In response to the problem, Ridgecrest initiated the reclamation of wastewater to reduce percolation. Ridgecrest disinfects the reclaimed wastewater at the treatment plant by chlorine. The reclaimed wastewater is then pumped through approximately 3.5 miles of 6-inch diameter PVC pipe to four unlined ponds, comprising a total of ten acres, for storage. Thence the water is pumped for spray irrigation to 73 acres of pasture, including four acres of tree irrigation, adjacent to the old Ridgecrest sewage treatment pond and to 17 acres of golf course driving range. The China Lake Naval Weapons Center is also using the reclaimed wastewater to irrigate their golf course.

Silverwood Watershed Wastewater Treatment Plants

All developed areas in the Silverwood Watershed are served by the treatment and effluent outfall system operated by the Crestline Sanitation District. Wastewater is collected from Crestline, Lake Gregory, and Lake Silverwood areas in the San Bernardino Mountains. The integrated system is comprised of three regional secondary treatment facilities: Houston Creek, Seeley Creek, and Cleghorn, which are served by an export outfall system for effluent disposal at Las Flores Ranch below Silverwood Watershed. The Crestline Sanitation District treats an average of 0.5 mgd of domestic wastewater. Due to excessive collection system infiltration/inflow that occurs during wet weather, the combined flow to the Crestline Sanitation District's treatment facilities and outfall pipeline has reached a maximum of 3.0 mgd. Wet weather flows have caused significant problems and the District is currently embarking on projects to reduce inflow/infiltration to the collection system.

The Houston Creek Treatment Plant process includes primary sedimentation, grit chamber clarification, primary clarifier, trickling filter, secondary clarification, chlorination, sludge holding tank. The Cleghorn treatment plant process includes an aeration chamber, secondary sedimentation, and chlorination. Each of the three treatment plants discharges disinfected secondary effluent to an 11-mile outfall pipeline system, which conveys the treated wastewater from the Silverwood Lake watershed to a disposal site located below Silverwood Lake and adjacent to the West Fork of the Mojave River. Disinfected effluent from the outfall pipeline is

disposed of by discharging to either percolation ponds or to pasture irrigation at Las Flores Ranch. Another plant also within the Silverwood Watershed is owned and operated by the U.S. Forest Service; it serves a campground. Treated effluent is discharged to Las Flores Ranch through the effluent outfall operated by the Crestline Sanitation District.

Susanville Consolidated Sanitary District

Domestic and municipal wastewater from the incorporated City of Susanville and some of the surrounding unincorporated area is treated by the District's secondary treatment facility. Wastewater receives secondary treatment consisting of screening, comminution, grit removal, extended aeration using oxidation ditches with rotor aerators, secondary clarification, and chlorination. Onsite unlined emergency storage ponds are available to store flows during power outages, system failures or plant maintenance periods. The plant has a septic tank dump station which accepts 6,000 gallons per month of septic material which is diluted, chlorinated and metered into the plant headworks. The plant provides aerated storage and centrifuge drying for wastewater sludge which is stored onsite for ultimate application onto agricultural lands. Treated wastewater is discharged to Jensen Slough, approximately one-half mile upstream from its confluence with the Susan River. During the growing season, water is diverted from Jensen Slough for irrigating nearby agricultural lands. The District's wastewater system is regulated under a NPDES permit which specifies effluent and receiving water limits and a pretreatment program. The permit also requires surface water monitoring.

Bridgeport Public Utility District

Wastewater from the community of Bridgeport (1990 population about 500) is treated by the District's stabilization pond system which consists of three unlined oxidation ponds and two percolation ponds. As of 1991, only one of the percolation ponds was used. The facility treats and disposes of up to 0.2 mgd of domestic wastewater and septage. Sludge has not yet been removed from this facility, which was constructed in 1968. Prior to 1990, the facility was not consistently meeting the maximum 30 mg/L BOD limitation (for secondary treatment) for wastewater available for percolation. A pollution study conducted in 1990 for the State Board (Toxic Technology, Inc. 1990) found indications of pond leakage and migration of wastewater constituents into ground water. However, no quantification could be made. As part of that study, ground water monitoring wells were installed. Waste discharge requirements revised in 1991 required additional treatment to meet secondary

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treatment standards and periodic ground water monitoring to evaluate the effects of the discharges.

Markleeville Public Utility District

Wastewater from the community of Markleeville is treated by the District's facility consisting of a mechanically aerated oxidation pond and two evaporation-percolation ponds. The system is designed to treat 0.04 mgd. All of the ponds are currently unlined and the subsurface flow migrates towards Markleeville Creek, located approximately 100 feet south of the ponds. There are numerous seeps at the toe of the slope below the ponds. It is unknown if the seeps are natural or are a result of the ponds. Regional Board staff is investigating potential impacts to water quality. Future increases in capacity may be handled by reserve capacity available in Harvey Place Reservoir which is currently used by South Tahoe Public Utility District (see Community Facility discussion for STPUD).

Other Small Community Systems

The Lahontan Basin has several small community wastewater treatment systems. These systems include eight oxidation pond systems located in Fort Bidwell, northern Eagle Lake (Stones-Bengard Sanitary Cooperative), southern Eagle Lake (USFS), Eagle Lake Ranger District, Leavitt Lake, Sierra Army Depot, Floriston, and the Woodfords Indian Community. Many other small communities and facilities discharge to community leachfield systems. Nine such facilities in the North Lahontan Basin are regulated by waste discharge requirements. In the South Lahontan Basin, there are many more small communities and individual industrial, commercial and recreational facilities that utilize separate wastewater treatment and disposal systems. Individual systems range from community leachfields to evaporation-percolation ponds to package activated sludge treatment plants. Approximately sixty-four such systems are regulated under waste discharge requirements.

Other potential small community systems considered in the 1975 North Lahontan Basin Plan include systems for Cedarville, Johnstonville/Janesville, Lake Forest Estates, Walker, and Twin Lakes. Other potential small community systems considered in the 1975 South Lahontan Basin Plan included systems for Randsburg, Johannesburg and Red Mountain, Little Rock, Pearblossom, Leona Valley, portions of the San Gabriel Mountains, Wrightwood, Hinkley, and Daggett. These systems have not been constructed. The need for community systems in these areas will

be evaluated on a case-by-case basis if problems with current septic systems become apparent.

Individual Wastewater Treatment Systems (Septic Systems)

The following principles and policies will be applied by the Regional Board in review of water quality factors relating to land developments and waste disposal from individual waste disposal systems:

1. The following criteria will be applied as the minimum to ensure continued adequate protection of water quality, protection of present and future beneficial uses, and prevention of pollution, contamination and nuisance conditions. The Regional Board will prohibit the discharge from individual disposal systems which do not conform to these criteria.
2. These criteria prescribe minimum conditions for waste disposal from individual on-site systems and do not preclude the establishment of more stringent criteria by local agencies or the Regional Board. The Regional Board does not intend to preempt the authority of local agencies and will support local agencies to the fullest extent possible, particularly in the implementation of more stringent regulations.
3. Detailed procedures to implement these criteria and to process exemptions to these criteria are included in "Regional Board Guidelines for Implementation of Criteria for Individual Waste Disposal Systems" (see Appendix C).
4. The criteria contained herein are applicable to the entire Lahontan Region and pertain to any and all proposed building that involves wastewater discharges to other than a community sewer system. The criteria apply to: (1) proposed building on lots within new subdivisions or parcels, **and** (2) proposed building on existing subdivided lots or parcels, **and** (3) proposed subdivisions. The criteria do not apply to: (1) existing individual waste disposal systems, or (2) projects which have final building permits prior to June 16, 1988, unless evidence exists which necessitates retrofit of septic systems to conform with current criteria. The "Regional Board Guidelines for Implementation of Criteria for Individual Waste Disposal Systems" specifies separate exemption procedures for existing developments and for new developments. Existing development includes projects for which **final** development plans, such as a final tract

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map, were approved by local agencies **prior** to June 16, 1988. New development includes subdivisions or individual parcels which **do not** have final development plans approved by local agencies **prior** to June 16, 1988.

5. These criteria do not apply to projects within septic system prohibition areas where the criteria are more stringent (for prohibitions, see Section 4.1 of this Chapter); and these criteria will preempt less stringent criteria in septic system prohibition areas.
6. Where community sewer systems are available, the Board will encourage connection to the sewer system in lieu of use of individual disposal systems.

Criteria for Individual Waste Disposal Systems

1. *Maximum Density*

Individual waste disposal systems associated with new developments which have a gross density greater than two (2) single family equivalent dwelling units per acre will be required to have secondary-level treatment of wastewater. Equivalent dwelling units (EDUs) are defined as a unit of measure used for sizing a development based on the amount of waste generated from that development; the value used in implementation of these criteria is 250 gallons per day per EDU. For the purposes of these criteria, the discharge from a single family dwelling is equal to one EDU. Senior citizen dwelling units and second units as defined in Government Code Sections 65852.1 and 65852.2 will not be considered as additional dwelling units. In addition to residential developments, this secondary level treatment policy also applies to wastewater discharges from commercial, industrial, recreational and all other developments with wastewater discharge volumes exceeding two EDU per acre density (500/gal/day/acre based on 250 gal/day/EDU). Use of new septic systems is permitted in existing developments with lot sizes having a net area greater than or equal to 15,000 square feet. The net area is that contained within the boundaries as set forth in the legal lot description.

2. *Minimum Distances*

The Regional Board has established the minimum distances (see Table 4.4-1 entitled, "Minimum Distances For Siting Individual Waste Disposal Systems") necessary to provide

protection to water quality and/or public health. Local hydrogeological conditions may necessitate greater separation of the sewage disposal system from a well or watercourse for protection of beneficial uses (e.g., drinking supply and water contact recreation).

3. *Additional Minimum Criteria*

- a. The percolation rate in the disposal area shall not be slower than 60 minutes per inch if the discharge is to a leachfield or 30 minutes per inch if discharge is to a seepage pit. If percolation rates are faster than 5 minutes per inch, then the soil for a total thickness of five feet below the bottom of the leaching trench shall contain at least 15% of material passing the No. 200 U.S. Standard Sieve and less than one-fourth of the representative soil cross-section shall be occupied by stones larger than 6 inches in diameter. Where the percolation rates are faster than 5 minutes per inch and the above requirement is not met, the minimum distance to ground water between the bottom of the disposal facilities and the anticipated high ground water shall be 40 feet. (The percolation rates shall be determined in accordance with procedures prescribed by the appropriate local public health agency).
- b. Clay, bedrock, other material impervious to the passage of water, or fractured bedrock, shall not be less than 5 feet below the bottom of the leaching trench or less than 10 feet below the bottom of the seepage pit. Impervious is defined for design purposes as a stratum with percolation times of greater than 120 minutes per inch.
- c. Depth to anticipated high ground water below the bottom of the leaching trench shall not be less than 5 feet. Depth to anticipated high ground water below the bottom of the seepage pit shall not be less than 10 feet. Greater depths are required if native material does not provide adequate filtration.
- d. Ground slope in the disposal area shall not be greater than 30 percent.
- e. Minimum criteria specified above must be met within the area of the proposed system and within the 100% expansion area for the proposed system.

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Exemptions to the Criteria for Individual Waste Disposal Systems

In certain locations and under special circumstances, the Board or its Executive Officer may waive individual criteria.

1. Waiver of one or more individual criteria may occur if:
 - a. The area beneath the proposed septic system discharge has no significant amount of ground water having present or future beneficial uses; or
 - b. It can be proven that no pollution, nuisance or unreasonable degradation of either surface or ground waters will occur as a result of the proposed septic system density when considered individually or cumulatively with other discharges in the area; or
 - c. Construction of a community collection, treatment, and disposal system is imminent. Short-term, interim use of individual waste disposal systems may be allowed.

Implementation of Criteria for Individual Waste Disposal Systems

1. The Regional Board and the local agencies have adopted, through Memoranda of Understanding, criteria which are compatible with or more stringent than these criteria.
2. The Memoranda of Understanding include the procedures of the review and processing of applications for proposed discharge of wastewater from land developments which only discharge **domestic** waste, including single-family-unit residential, multi-unit residential, commercial, industrial and recreational developments. The Memoranda of Understanding include provisions for Regional Board review and processing of specific application (e.g., for industrial waste discharges).
3. For those local agencies which have adopted these or more stringent criteria, land developments which only discharge **domestic** waste, including single-family-unit residential, multi-unit residential, commercial, industrial and recreational developments, will be permitted entirely by the local agency. (However, the Regional Board reserves the authority to take action, if necessary, as described in item 6 below.)

4. Whenever the proposed development will not meet the minimum criteria and no Memorandum of Understanding or other equivalent document exists between the Regional Board and the local agency, applications for all projects shall be transmitted to the Regional Board along with a complete report of waste discharge and a filing fee.
5. The Regional Board will review, on a project-by-project basis, proposals for commercial, industrial, recreational and all other types of developments which discharge **industrial** waste. If required, the report of waste discharge will contain information on estimated wastewater flows, types of wastes, and occupancy rates which will enable the Regional Board to evaluate the discharge in terms of EDUs.
6. In any case, the Regional Board will prohibit the discharge of wastes from land developments which will result in violation of water quality objectives, will impair present or future beneficial uses of water, or will cause pollution, nuisance, or contamination, or will unreasonably degrade quality of any waters of the State.

Implementation for Other Types of Waste Disposal from Land Developments

1. Severe impact on water quality can result from failure to implement adequate measures to control storm drainage and erosion. Land developers must provide plans for the control of such runoff from initial construction up to the complete build-out of the development. (See "Land Development" section.)
2. The disposal of solid waste can have adverse impacts on water quality and public health. Land developers must submit a plan which conforms to the regional or county master plan and contains adequate provisions for solid waste disposal for complete build-out of the development.
3. The disposal of septic tank sludge is an important part of any area-wide master plan for waste disposal. Land developers must submit a plan which conforms to the regional or county master plan and contains adequate provisions for septic tank sludge disposal for complete build-out of the development.
4. The responsibility for the timely submittal of information necessary for the Board to determine compliance with these guidelines rests with persons submitting proposals for development or

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discharge. The Porter-Cologne Water Quality Control Act provides that no person shall initiate discharges of waste prior to filing a report of waste discharge and prior to (1) issuance of waste discharge requirements, (2) the expiration of 120 days after submittal of an adequate report of waste discharge, or (3) the issuance of a waiver by the Regional Board.

Alternative Individual Waste Disposal Systems

In areas where conditions do not support the use of conventional individual subsurface waste disposal systems (e.g., septic systems), the use of engineered alternative systems can be considered. Alternative waste disposal systems include, but are not limited to, mound systems, evapotranspiration beds, sand filters (intermittent and/or recirculating), and lined evaporation ponds. The Regional Board supports the use of engineered alternative systems for waste disposal as a remedy for otherwise unsuitable existing lots. However, the Regional Board discourages the use of engineered alternative systems for new construction, lots, or subdivisions.

Several factors the Local Health Officer and/or the Regional Board staff will consider when evaluating a proposal for the use of an alternative system include, but are not limited to:

1. **size of parcel**
2. **density of surrounding development**
3. **depth to ground water and bedrock**
4. **depth of soils** suitable for waste disposal as classified under the USDA classification system
5. **climate**
6. **access**
 - (a) for maintenance and pumping year-round
 - (b) control to prevent public contact
7. **emergency contingency plans** (including plans for expansion, replacement or repair)
8. **operation and maintenance requirements**
9. **distance to sewer**

Criteria for Alternative Systems

1. The conditions (soils, ground water, slope) which limit the use of conventional septic tank systems may also apply to alternative systems which rely on soil absorption for treatment and/or disposal of all or most of the wastewater generated (see Criteria for Individual Waste Disposal Systems).
2. **Mound Systems.** Mound systems shall be installed in accordance with criteria established in the State Board's *Guidelines for Mound Systems* (1980) or other criteria acceptable to the

Executive Officer in conformance with standard engineering practices.

3. **Evapotranspiration Systems.** Evapotranspiration systems shall be installed in accordance with criteria contained in the State Board's *Guidelines for Evapotranspiration Systems* (1980) or other criteria acceptable to the Executive Officer in conformance with standard engineering practices.
4. **Sand Filters.** Sand filters shall be installed in accordance with the specifications for sand filters in the State of Oregon, Department of Environmental Quality's *On-site Sewage Disposal Rules* (July 1, 1991) or other criteria acceptable to the Executive Officer in conformance with standard engineering practices.
5. **Grey Water Systems.** Under certain circumstances, grey water systems may be an acceptable method of disposal in conjunction with a composting toilet or holding tank to handle black water. Examples of appropriate applications include recreational areas such as campgrounds, day use facilities, and trailheads. Grey water systems shall be installed in accordance with the California Plumbing Code (24 Cal. Code of Regs., Part 5) and the local administrative authority. If properly constructed and operated, grey water systems are not expected to create a nuisance or pollution.
6. Other proposals for alternative systems shall be evaluated jointly by the local regulatory agency and Regional Board staff on a case-by-case basis. Some engineered systems may be considered experimental by the Regional Board. Experimental systems will be handled with caution. A trial period of at least one year should be established whereby proper system operation must be demonstrated. Under such an approach, experimental systems are granted a one-year conditional approval.
7. All proposals for alternative systems shall be designed by a Civil Engineer, Engineering Geologist or Sanitarian licensed to practice in California.

Maintenance Requirements

System designers should be responsible for developing specifications and procedures for proper system operation. Designers should provide to system owners an informational operation and maintenance document that includes: (1) clear and

4.4, Municipal and Domestic Wastewater: Treatment, Disposal, and Reclamation

concise procedures for operation and maintenance, and (2) instructions for repair and/or replacement of critical items within forty-eight hours following failure. Engineered systems should be inspected by a licensed Civil Engineer, Engineering Geologist or Sanitarian during installation to insure conformance with approved plans.

Permitting Authority

The County Health Officer may approve alternative systems when **all** of the following conditions are met:

1. The Health Officer has found the system to be in compliance with criteria approved by the Regional Board Executive Officer (see Criteria for Individual Waste Disposal Systems and Criteria for Alternative Systems above); **and**
2. The Health Officer has either: (1) informed the Regional Board Executive Officer of the proposal to use the alternative system and the Executive Officer agrees that it complies with the finding in (a) above; or (2) a written agreement that the Executive Officer has delegated approval authority to the County Health Officer; **and**
3. A public or private entity has agreed in writing to assume responsibility for the inspection, monitoring, maintenance, and eventual decommissioning/reclamation of the system.

If all of the above conditions cannot be met, the Regional Board will consider issuing waste discharge requirements for alternative systems.

Table 4.4-1
MINIMUM DISTANCES FOR SITING WASTE DISPOSAL SYSTEMS (in feet)

Facility	Domestic Well	Public Well	Perennial Stream ¹	Drainage Course or Ephemeral Stream ²
Septic tank or sewer line	50	50	50	25
Leaching field	100	100	100	50
Seepage pit	150	150	100	50
continued...				
Facility	Fill Bank ³	Cut or Property Line ⁴	Lake or Reservoir ⁵	
Septic tank or sewer pit	10	25	50	
Leaching field	4h	50	200	
Seepage pit	4h ⁶	75	200	

¹ As measured from the line which defines the limit of a 100-year-frequency flood.

² As measured from the edge of the channel.

³ Distance in feet equals four times the vertical height of the cut or fill bank. Distance is measured from the top edge of the bank.

⁴ Distance in feet from property line of any neighboring lot on which individual well(s) are used. (Distances are to property lines of neighboring lots, i.e., not street easements)

⁵ As measured from the high water line. (Regional Board Resolution No. 82-6 defines the high water line for Eagle Lake, Eagle Drainage Hydrologic Area as 5117.5 feet, a definition used in prohibiting the discharge of wastes from subsurface disposal systems on a lot with an elevation of less than 5130 feet. See Section 4.1 of this Basin Plan for waste discharge prohibitions for Eagle Lake.)

⁶ As measured from the high seepage level.

4.5 SOLID AND LIQUID WASTE DISPOSAL TO LAND

The Regional Board regulates the disposal of waste to land under Chapter 15, Division 3, Title 23, of the California Code of Regulations, known as “Chapter 15.” Chapter 15 applies to wastes which cannot be discharged directly or indirectly to waters of the State and which therefore must be discharged to land for treatment, storage, or disposal.

Types of operations in the Lahontan Region which are subject to Chapter 15 include solid waste disposal sites (landfills), industrial wastewater ponds (surface impoundments), septage and sludge disposal (see “Septage and Sludge Disposal” in Section 4.4), mining and geothermal operations (see “Mining, Industry, and Energy Development”), and some confined animal facilities (see “Agriculture”). This section contains: (1) a summary of the pertinent sections of Chapter 15, (2) a discussion of Region-specific requirements and prohibitions, and (3) a discussion of the Solid Waste Assessment Test Program.

Chapter 15

Chapter 15 contains minimum, prescriptive standards for proper management of applicable wastes. Regional Boards may impose more stringent requirements to accommodate regional and/or site-specific conditions.

Dischargers may propose alternatives to the construction or prescriptive standards contained in Chapter 15 if they can show that the prescriptive standard is not feasible (i.e., too difficult or costly to implement, or not likely to perform adequately under the given circumstances). The proposed alternative must be able to provide equivalent management of the waste, and must not be less stringent than the prescribed standards.

Discharges to land which may be exempt from Chapter 15 are listed in Appendix D.

Wastes fall into four categories under the current classification system. These four categories are: Hazardous, Designated, Non-Hazardous, and Inert, and are defined in Appendix D. Hazardous and Designated wastes can often be generated by the same source and may differ only by their concentrations of given constituents.

Wastes must be disposed of differently depending on their liquids content and the waste category into which they fall. A table containing the Summary of Waste Management Strategies for Discharge of Waste to Land (see Appendix D) shows the proper level of containment for the various categories of waste. A table containing Geologic and Siting Criteria for Classified Waste Management Units is included in Appendix D.

Receiving water monitoring is required at all waste management units. Appendix D discusses the monitoring requirements for the various classes of waste management units, and describes the progressive phases of monitoring.

The routine ground water monitoring conducted during the entire compliance period of a project's life is referred to as “detection monitoring.” If a leak is detected during the course of detection monitoring, an “evaluation monitoring” program must be established. If the evaluation monitoring verifies the presence of a leak, a “corrective action program” must be established and conducted until the problem has been successfully corrected.

Vadose zone monitoring must be conducted at all waste management units. Appendix D discusses the minimum requirements for an acceptable vadose zone monitoring program.

Special requirements for confined animal facilities are discussed in Article 6 of Chapter 15. These facilities are also subject to other portions of Chapter 15 as applicable. Confined animal facilities are discussed in detail in the section entitled “Agriculture.”

Under Chapter 15, mining waste discharges are only subject to the requirements of Article 7, or other portions of Chapter 15 as referenced by Article 7. Mining wastes are also subject to regulation under the Surface Mining and Reclamation Act (SMARA, CA Public Resources Code, Title 14, Division 2, Chapter 9). Article 7 and SMARA are discussed in detail in the section entitled “Mining, Industry, and Energy Development.”

An inactive waste management unit can still pose a threat to water quality. In fact, due to the nature of some wastes and the characteristics of some disposal sites, sometimes water quality problems do not become evident until years after a site has closed. Therefore, Chapter 15 requires that all waste management units have a plan for acceptable closure procedures and post-closure maintenance and monitoring.

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Solid and Liquid Waste Requirements

Solid wastes are disposed of in a landfill or Solid Waste Disposal Site (SWDS). A landfill, as defined in Chapter 15, is a waste management unit at which waste is discharged in or on land for disposal. A landfill may be classified as Class I, II, or III, depending on the type of waste being accepted, but the term “landfill” typically refers to a Class III municipal solid waste landfill which accepts only inert or non-hazardous, municipal solid waste. Landfills are an integral component of most communities in the Lahontan Region, except for those of the Lake Tahoe Basin. Solid waste generated in the Lake Tahoe Basin is exported out of the Basin.

“Hazardous” solid wastes must be disposed of in Class I landfills or waste piles. “Designated” solid wastes must be disposed of in Class I or II landfills or waste piles. Liquid wastes may not be disposed of to Class III waste management units. Rather, liquid wastes must be discharged to Class I or II surface impoundments, depending on their classification.

Discharges from solid and liquid waste management units can impact both ground and surface waters. The receiving water most likely to be at risk from a waste management unit is the ground water beneath the site. Precipitation or runoff may enter the unit and contact the waste, percolate through it, and travel to ground water, carrying constituents of the waste with it. Solid waste may contain enough free liquids to form a leachate and travel to ground water. Vapors may migrate from a waste management unit into the soils and ground water below the unit. Gases forming in a closed waste management unit may pressurize the unit and force contaminants into the ground water. A liquid waste impoundment may leak its contents into the soils and ground water beneath the unit. Liquids may exit a waste management unit and travel to nearby surface waters. Uncontained solid waste may also be transported to surface waters by wind.

The Regional Board regulates all the active waste management units and some of the closed units in the Region under waste discharge requirements which contain pertinent Chapter 15 regulations. Some of the applicable requirements include:

1. Waste management units must be sited in locations where they will not extend over a known Holocene fault or into areas with inadequate separation from ground water.
2. Waste management units must be constructed to minimize (Class III) or prevent (Class I and II) the possibility of leachate contacting ground water.

This may be done by siting the unit in an area where the depth to ground water is very great or where natural geologic features will provide containment. A Class III waste management unit may also have a clay or synthetic liner with a leachate collection and removal system (LCRS), if there is a possibility that ground water could be impacted by leakage from the unit. Class I and II units **must** be lined. A discharger may propose engineered alternatives to the Chapter 15 containment requirements, but the alternatives must provide equal or greater protection to the receiving waters at the site, per Article 1.

3. To minimize or prevent the formation of leachate, solid waste management units shall be covered periodically with soil or other approved materials. Runoff from offsite should be prevented from entering a waste management unit and contacting the wastes in the unit.
4. The potential receiving waters shall be monitored. A waste management unit shall have sufficient ground water monitoring wells at appropriate locations and depths to yield ground water samples from the uppermost aquifer to provide the best assurance of the earliest possible detection of a release from the waste management unit. Perched ground water zones shall also be monitored. Background monitoring should be conducted for one year prior to opening a new waste management unit.

Chapter 15 requires that the vadose zone shall be monitored at all new sites and at any existing site, unless it can be shown to the satisfaction of the Regional Board that there are no vadose zone monitoring devices that would work at the site, or that installation of vadose zone monitoring devices would require unreasonable dismantling or relocating of permanent structures.

5. All operating waste management units must have an approved closure/post-closure monitoring and maintenance plan and their operators must provide the Regional Board with assurance that sufficient funds are irrevocably committed to ensure that the site will be properly reclaimed and maintained.
6. The operator of a waste management unit must obtain and maintain assurances of financial responsibility for foreseeable releases from the unit.

Municipal Wastewater Sludge Management

Wastewater sludge (biosolids) is a by-product of wastewater treatment. Raw sludge usually contains 93 to 99.5 percent water with the balance being solids that were present in the wastewater and that were added to or cultured by wastewater treatment processes. Most POTWs treat the sludge prior to ultimate use or disposal. Normally, this treatment consists of dewatering and/or digestion. In some cases, such as at Lake Arrowhead and Barstow, a portion of the sludge is incinerated.

Treated and untreated sludges may contain high concentrations of heavy metals, organic pollutants, pathogens, and nitrates. Storage and disposal of municipal sludges on land can result in degradation of ground and surface water if not properly performed. The Regional Board currently regulates handling and disposal of sludge pursuant to Chapter 15 and Department of Health Services (DHS) standards for sludge management (Cal. Code of Regs., Title 22, Division 4, Section 60301).

Sludge may be placed in a Class III landfill (see section on Chapter 15) if it can meet the following requirements, otherwise it must be placed in a Class II surface impoundment:

1. The landfill is equipped with a leachate collection and removal system, **and**
2. The sludge must contain at least 20 percent solids if primary sludge, or at least 15 percent solids if secondary sludge, mixtures of primary and secondary sludges, or water treatment sludge, **and**
3. A minimum solids-to-liquid ratio of 5:1 by weight must be maintained to ensure that the co-disposal will not exceed the initial moisture-holding capacity of the nonhazardous solid waste. The Regional Board may require that a more stringent solids-to-liquid ratio be maintained, based on site-specific conditions.

In addition to landfilling, sludge may be disposed of in a number of other ways, provided it meets the requirements specific to the given disposal method. Sludge may be incinerated, applied to land as a soil amendment, made into commercial fertilizer, or stockpiled in piles or drying beds. Generally, the Regional Board regulates the disposal of sludge under the requirements for the treatment plant which generates the sludge. However, for land application of sludge, separate waste discharge requirements for

the landowner will be considered. The State's Integrated Waste Management Board (CIWMB) also regulates the disposal of sludge.

The USEPA has promulgated a policy of promoting those municipal sludge management practices that provide for the beneficial use of sludge while maintaining or improving environmental quality and protecting public health. On February 19, 1993, the USEPA published final sewage sludge regulations in 40 CFR Part 503. The regulations are intended to assure that use and disposal of sewage sludges comply with federal sludge use and disposal criteria developed by USEPA. The State Board or the CIWMB may develop a state sludge management program consistent with the USEPA policy and criteria for land application, surface disposal, and incineration of sewage sludge. Applicable federal regulations for the disposal of sewage sludge in municipal solid waste landfills are contained in 40 CFR Parts 257 and 258 (Subtitle D).

Subtitle D

These federal regulations apply to municipal solid waste landfills (Class III landfills under California's "Chapter 15"). The Subtitle D regulations outline the classification of municipal landfills, siting criteria, design criteria, operation procedures, water quality monitoring parameters and standards, closure and post-closure care requirements, and financial assurance guidelines, similar to Chapter 15. USEPA considers Subtitle D to be minimum standards for landfill operation. States may have equal or more stringent requirements, but may not have less stringent requirements. If a state's landfill regulation program meets USEPA's approval, that state may apply to become a USEPA "approved state" for landfill regulation, and Subtitle D provisions do not apply. However, if all or a part of a state's regulations do not meet USEPA's approval, more stringent portions of Subtitle D take precedence until that state modifies its program and obtains approval. California has obtained approval from USEPA.

Discharge Prohibitions that Apply to Solid Wastes

Discharge prohibitions that apply to solid wastes and prohibition exemptions are described in the Waste Discharge Prohibitions section of this Chapter, and in Chapter 5 (Lake Tahoe Chapter).

Solid Waste Water Quality Assessment Test (SWAT)

Section 13273 was added to the California Water Code with Assembly Bill (AB) 3525. This section

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required the State Board to rank the approximately 2,100 active and inactive solid waste disposal sites throughout the State on the basis of the potential threat they may pose to water quality. The State Board approved a ranked list of solid waste disposal sites, containing 13 ranks with 150 sites per rank, and an incomplete Rank 14.

On July 1, 1987, operators of landfills in Rank 1 were to submit solid waste assessment test (SWAT) reports. By July 1 of each succeeding year, the SWAT reports were due for landfills in the next rank, through rank fourteen, due July 1, 2001. The Porter-Cologne Water Quality Control Act (CA Water Code § 13273[b]) requires SWAT reports to contain the following:

1. An analysis of the surface and ground water on, under, and within one mile of the solid waste disposal site to provide a reliable indication of whether there is any leakage of hazardous constituents.
2. A chemical characterization of the soil-pore liquid in those areas which are likely to be affected if the solid waste disposal site is leaking, as compared to geologically similar areas near the solid waste disposal site which have not been affected by leakage or waste discharge.

The Regional Board must review the SWAT report to determine whether any hazardous waste has migrated into the receiving waters. If hazardous waste has migrated, the Regional Board must notify the Department of Health Services and the Integrated Waste Management Board, and take appropriate remedial action (CA Water Code § 13273[e]). As of August 1992, the Lahontan Region has approximately 161 solid waste disposal sites on the SWAT list, with an average of twelve sites in each rank. A number of solid waste disposal sites throughout the Lahontan Region were not included on the SWAT list, due to age, size, type of wastes being accepted, and other reasons.

Toxic Pits Cleanup Act

The Toxic Pits Cleanup Act of 1984 (TPCA) required that all impoundments containing liquid hazardous wastes or free liquids containing hazardous waste be retrofitted with a liner/leachate collection system, or dried out by July 1, 1988, and subsequently closed to remove all contaminants or contain any residual contamination.

4.6 GROUND WATER PROTECTION AND MANAGEMENT

The Lahontan Region includes over 1,581 square miles of ground water basins. Ground waters in the Region supply high quality drinking water and irrigation water, as well as industrial service supply, wildlife habitat supply, and aquaculture supply waters. Ground waters in the Region also provide a source of freshwater for the replenishment of inland lakes and streams of varying salinity.

Historic and ongoing agricultural, urban, and industrial activities can degrade the quality of ground water. Discharges to ground water from these activities include: underground and aboveground tank and sump leaks, agricultural and industrial chemical spills, landfill leachate, septic system failures, and chemical seepage via shallow drainage wells and abandoned wells. Severe ground water overdraft has occurred in portions of the Region. Ground water overdraft can affect beneficial uses of surface waters such as wetlands and springs, particularly in dry areas, by reducing natural flows into these areas. It can concentrate trace chemicals, including naturally occurring salts and contaminants resulting from human activities. Overdraft can lead to land subsidence and surface soil cracking. Some soil types (fine grained silts and clays), once compacted, can never again hold as much water upon rewatering of the aquifer. Increased ground water pumping in overdrafted aquifers can draw pollutants toward wells. Imported water used for ground water recharge, if it is of naturally lower quality than local ground water, is a discharge because it contains contaminants above background concentrations (Sawyer 1988). Discharges from some types of construction projects (e.g., placement of fill in wetlands) can reduce ground water recharge.

The resulting impacts on ground water quality from these discharges are often long-term and difficult to remediate. Remediation is often very costly. Consequently, as waste discharges are identified, prompt and expedient efforts to clean up and contain the source areas, as well as to prevent further ground water quality impacts, must be undertaken. Activities that may potentially affect ground waters must be managed to ensure that ground water quality is protected.

The following sections describe the beneficial uses, water quality objectives, and water quality control

(implementation) measures specific to ground waters. Much of the information on beneficial uses, water quality objectives, and some of the control measures are described in more detail elsewhere in this Basin Plan. Appropriate references to other parts of this Basin Plan are included.

Beneficial Uses

For purposes of this Basin Plan, “ground water” includes all subsurface waters in the Lahontan Region. Ground water basins in the Region are shown on maps located in Plates 2A and 2B. Beneficial uses applicable to ground waters in the Region include: municipal and domestic water supply (MUN), industrial process supply (IND), agricultural supply (AGR), freshwater replenishment to surface waters (FRSH), wildlife habitat (WILD), water contact recreation (REC-1), water quality enhancement (WQE), and aquaculture supply (AQUA). Beneficial uses of specific ground water basins in the Region are designated in Table 2-2 of this Basin Plan.

Unless otherwise designated by the Regional Board, all ground waters are considered suitable, or potentially suitable, for municipal or domestic water supply (MUN). In making exceptions, the Regional Board will consider the criteria referenced in Regional Board Resolution No. 6-89-94, “Incorporation of “Sources of Drinking Water Policy” into the Water Quality Control Plans (Basin Plans),” where:

- The total dissolved solids (TDS) exceed 3,000 mg/L (5,000 uS/cm, electrical conductivity) and the ground water is not reasonably expected by the Regional Board to supply a public water system; *or*
- There is contamination, either by natural processes or by human activities (unrelated to a specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices or best economically achievable practices; *or*
- The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day; *or*
- The aquifer is regulated as a geothermal energy producing source or has been exempted administratively pursuant to 40 CFR § 146.4 for the purpose of underground injection, or fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR § 261.3.

Water Quality Objectives for Ground Water

The Nondegradation Objective (State Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California" is described in Chapter 3 of this Basin Plan and applies to ground waters. Other water quality objectives for ground water consist primarily of narrative objectives combined with a limited number of numerical objectives, and are included in Chapter 3 of this Basin Plan. Ground waters shall not contain concentrations of bacteria, chemical constituents, radioactivity, or substances producing taste and odor in excess of the ground water objectives described in Chapter 3. These objectives define the upper concentration or other limit that the Regional Board considers protective of beneficial uses. These objectives apply to all ground waters, rather than only at a wellhead, at a point of consumption, or at point of application of discharge.

As mentioned above, a limited number of numerical objectives are included in this Basin Plan. The Regional Board is limited in its resources to independently establish numerical ground water objectives for all constituents in all ground water basins.

Numerical ground water objectives for individual ground water basins may be developed in the future. As the Regional Board obtains information which provides more detailed delineation of beneficial uses within basins, revised objectives may be developed to protect these beneficial uses.

Regional Board Control Measures for Ground Water Protection and Management

To protect ground water resources, the Regional Board allows few waste discharges to land. (See the "Solid and Liquid Waste Disposal to Land" section of this Chapter.) Those that are permitted (e.g., landfills) are closely regulated under existing laws and regulations to maintain and to protect ground water quality for beneficial uses. Another category of discharges to land is individual waste disposal systems (e.g., septic systems). In most instances, the Regional Board has waived its regulation of individual waste disposal systems provided that counties (and some cities) in the Region regulate the systems. Specific provisions of the regulation are included in Memoranda of Understanding (MOUs) with each county or city. The MOUs stipulate that regulation of

the systems must comply with all Regional Board requirements (see "Wastewater" section of this Chapter).

Discharges of hazardous and nonhazardous waste, and the waste management units at which the wastes are discharged (e.g., landfills, surface impoundments), are regulated by the Regional Board through waste discharge requirements to properly contain the wastes, and to ensure that effective monitoring is undertaken to protect water resources of the Region (also see "Solid and Liquid Waste" section of this Chapter). These waste discharges are also concurrently regulated by other State and local agencies. Local agencies implement the State's solid waste management programs as well as local ordinances governing the siting, design, and operation of solid waste disposal facilities (usually landfills) with the concurrence of the California Integrated Waste Management Board (CIWMB). The CIWMB also has direct responsibility for review and approval of plans for closure and post-closure maintenance of solid waste landfills. The Department of Toxic Substance Control (DTSC) issues permits for all hazardous waste management, treatment, storage, and disposal facilities. The State Board, Regional Boards, CIWMB and DTSC have entered into a Memorandum of Understanding to coordinate their respective roles in the concurrent regulation of these discharges.

The laws and regulations governing both hazardous and nonhazardous solid waste disposal have been revised and strengthened in recent years. Implementation of these laws and regulations through the following programs is summarized below: California Code of Regulations, Title 23, Chapter 15; Resource Conservation and Recovery Act; Toxic Pits Cleanup Act; Solid Waste Assessment Tests. (See the "Solid and Liquid Waste" section of this Chapter for detailed control actions).

California Code of Regulations, Title 23, Chapter 15

Referred to as "Chapter 15," this is the most significant regulation used by the Regional Board in regulating hazardous and nonhazardous waste treatment, storage, and disposal. These regulations include very specific siting, construction, monitoring and closure requirements for all existing and new waste treatment, storage, and disposal facilities. Chapter 15 requires operators to provide assurances of financial responsibility for initiating and completing corrective action for all known or reasonably foreseeable releases from their waste management

units. Detailed technical criteria are provided for establishing water quality protection programs, and corrective action programs for releases from waste management units. Chapter 15 requires the review and update of waste discharge requirements for all hazardous waste treatment, storage, and disposal sites by January 1, 1993 and for all nonhazardous waste, storage, and disposal sites by July 1, 1994. Chapter 15 defines waste types to include hazardous wastes, designated wastes, nonhazardous solid wastes, and inert wastes.

The Federal Resource Conservation and Recovery Act (RCRA)

The State implements RCRA's Subtitle C (Hazardous Waste Regulations for Treatment, Storage, and Disposal) through the DTSC and the Regional Boards. In August 1992, the USEPA formally delegated RCRA Subtitle C program implementation authority to DTSC. As described above, regulation of hazardous waste discharges is also included in the California Code of Regulations ("Chapter 15"). (Chapter 15 monitoring requirements were also amended in August 1991 so as to be equivalent to RCRA requirements). These will be implemented through the adoption of waste discharge requirements for hazardous waste sites covered by RCRA. The discharge requirements will then become part of a State RCRA permit issued by DTSC.

Federal regulations required by the RCRA's Subtitle D have been adopted for municipal solid waste landfills (40 CFR Parts 257 & 258). The USEPA has approved California's Subtitle D program (see Section 4.5 for more information about Subtitle D). USEPA delegation of authority to the State Board for implementation of Subtitle I (Underground Storage Tanks) is pending.

Toxic Pits Cleanup Act

The Toxic Pits Cleanup Act of 1984 (TPCA) required that all impoundments containing liquid hazardous wastes or free liquids containing hazardous waste be retrofitted with a liner/leachate collection system, or dried out by July 1, 1988, and subsequently closed to remove all contaminants or contain any residual contamination.

Solid Waste Assessment Tests (SWATs)

Section 13273, added to the California Water Code in 1985, requires all owners of both active and inactive nonhazardous landfills to complete a Solid Waste Assessment Test (SWAT) to determine if hazardous wastes have migrated from the landfill into ground water. There were 161 sites identified in the Lahontan

Region subject to this program. Pursuant to a list adopted by the State Board, 150 site owners statewide per year would complete this evaluation by 2001. The SWAT program is discussed in detail in the "Solid and Liquid Waste" section of this Chapter.

Underground Storage Tank Program

Implementation of the Underground Storage Tank (UST) Program is unique, as the Health and Safety Code gives local agencies the authority to oversee investigation and cleanup of UST leak sites. The Corrective Action regulations (23 Cal. Code of Regs., Ch. 16, Article 11) use the term "regulatory agency" in recognition of the fact that local agencies have the option to oversee site investigation and cleanup, in addition to their statutory mandate to oversee tank permitting, leak reporting, and tank closure. Several local agencies now have the authority (through Local Oversight Program contracts with the State Board or Memoranda of Understanding with the Regional Board) to act on the Regional Board's behalf in requiring investigations and cleanup. The Regional Board retains the authority to approve case closure.

Reports of leaking USTs are submitted by local agencies (city, county, etc.) and by private parties to the Regional Board. Submittals are on a standard form that complies with Proposition 65 notification (Underground storage tank Unauthorized Releases [Leak]/Contamination Site Report). The local agencies forward copies of the leak reports to the Regional Board. (See also "Proposition 65 Program" in Section 4.2.)

The cleanup and enforcement elements of the program are shared between the Regional Board and the local agencies. Regional Boards are responsible for oversight of investigation and remediation where unauthorized releases from USTs pose a threat to, or have impacted, water quality. Local agencies, such as County Health Services, are responsible for tank permitting, monitoring, and removal, and the investigation and remediation of releases that do not pose a threat to water quality. Additionally, several local agencies have contracted with the State Board under the Local Oversight Program (LOP) to oversee the investigation and remediation of releases that threaten or have impacted water quality.

The California Code of Regulations, Title 23, Division 3, Chapter 16, contains State regulations regarding underground tank construction, monitoring, repair, release reporting, and corrective action. The objectives of the regulations are to:

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- Place all USTs storing hazardous substances, covered by law, under permit;
- Ensure that all existing USTs, covered by law, meet standards for the detection of releases of hazardous substances;
- At the time of application for an UST permit, ensure that all new USTs covered by law, meet standards to prevent releases of hazardous substances;
- Ensure that the UST program complies with the federal UST requirements and secure authorization from USEPA to regulate USTs in the State;
- Identify leaking USTs and decide whether the Regional Board or local implementing agency will have the lead for supervision of cleanup within 90 days of the discovery of a leak. Undertake cleanup supervision of 10-25% of existing backlogged and new leak cases each year. The annual caseload will depend on the severity of the water quality problems and the availability of Regional Board resources to oversee cleanup;
- Provide funding for eligible local agencies, under a local oversight program, for the oversight of leaking UST cleanup;
- Ensure that appropriate cleanup actions are undertaken in a timely manner at UST sites which have no identifiable Responsible Party (RP) or which have an insolvent RP (orphan site);
- Ensure that all tank integrity tests, conducted within the State, are performed by or under the direct supervision of a licensed tank tester;
- Require all existing underground pressurized piping to be equipped with an automatic leak detector;
- Ensure that all UST owners and operators shall maintain evidence of financial responsibility for taking corrective action and for compensating third parties for bodily injury and property damage caused by a release;
- Require secondary containment for pressurized piping, corrosive protection for tanks, and spill and overfill prevention equipment for UST systems.

Number of UST Cases in the Region

As of July, 1993, a total of 591 leaking USTs had been documented in the Lahontan Region. Of these

591 releases, approximately 150 (25%) have impacted ground water. A list of these UST releases and the status of investigation and remediation at each site is published quarterly by staff of the Regional Board.

Areas With the Greatest Number of UST Releases Affecting Ground Water

Throughout the Lahontan Region several areas have been identified as containing a significant number of leaking USTs that have impacted ground water. Generally, these areas are light industrial/service areas that typically have shallow ground water and/or coarse soils. Because of the significant number of documented releases in these areas, a substantial amount of geologic and hydrologic data have been generated.

UST Cleanup Trust Fund (SB 2004)

In 1991 the State Legislature passed SB 2004, which required that 0.006 cents be paid by tank owners to the State for each gallon of petroleum products stored in a UST. This tax program generates revenue to provide a maximum of \$990,000 grant money per claim for investigation and remediation to those persons who operated or owned USTs that have leaked. The fund reimburses monies that are spent by the discharger during investigation and cleanup. Staff of the Regional Board and State Board are responsible for reviewing technical proposals for investigation and remediation to ensure plans are technically and economically effective.

Dischargers applying for the fund are separated into "A," "B," "C," and "D" categories. These categories are generally based on gross annual income, with "A" applicants having the least income. Since the fund is designed to assist those dischargers with the least financial ability to conduct investigation and remediation, "A" applicants have the highest priority for funding. Since many tank owners and operators lack resources, assistance from the fund increases opportunities for remedial actions.

UST Remediation Goals

Regional Board staff is responsible for ensuring that dischargers are required to clean up and abate the effects of discharges in a manner that promotes attainment of background water quality, or the highest water quality which is reasonable if background levels of water quality cannot be restored. Factors to be considered include: environmental characteristics of the hydrographic unit under consideration, past, present and future beneficial uses of the water, economic factors, and the need to prevent nuisance (CA Water Code § 13241).

Source Removal

The most important factor in ground water remediation is source removal. Sources of ground water pollution at UST sites include leaking tanks and piping, existing soil pollution, and free-phase petroleum products that may be floating on top of the water table. These major sources can feasibly be removed in the short-term at minimal costs as compared to the long-term process necessary to clean up the dissolved phase portion of ground water pollution.

Interim Remedial Actions for USTs

At a site where a leak has occurred from a UST, sources of ground water pollution can be removed in the short-term while investigation of the extent of ground water pollution and ground water remedial design is on-going. Interim remedial actions are considered a cost-effective method of protecting water quality and beneficial uses. Interim remedial actions include the following:

- *Removal of Free-Phase Petroleum Hydrocarbons.* Petroleum products typically spread laterally on top of the water table and within the capillary fringe prior to dissolving into the ground water. Until completely dissolved, this “free product” provides a continuing source of pollution both to the ground water and capillary fringe soils. Removal of this free product can be accomplished while any further investigation of soil and ground water pollution is being conducted.
- *Remediation of Contaminated Soil.* If polluted soils are in direct contact with the ground or surface waters, these soils may pose a continuing threat to water quality and adversely impact beneficial uses. Volatile organic constituents may move within unsaturated soils by leaching or in a vapor phase, which may adversely impact water quality and beneficial uses. This soil pollution can feasibly be removed while investigation of ground water pollution is continuing.
- *Ground Water Pollution Containment.* Containment of ground water pollution as an interim remedial action is necessary if: (a) petroleum constituents in the ground water pose an immediate threat to water supplies or public health and safety, or (b) the pollution plume appears to be migrating off-site at a rate that will limit the dischargers ability to later remediate the pollution. Containment may also be required as a part of overall site remediation.

Dissolved Phase Ground Water Remediation

In cases where ground water has been impacted, dissolved phase ground water pollution must be remediated. Remedial activities shall be conducted to assure that pollution is cleaned up in a manner that: (a) is consistent with maximum benefit to the people of the State, (b) does not unreasonably affect present and anticipated beneficial uses of such water, and (c) does not result in water quality less than that prescribed in the water quality control plans and policies adopted by the State and Regional Boards.

Ground Water Monitoring

In order to determine the effectiveness of any ground water remedial action, ground water monitoring will be necessary. Ground water monitoring may also be necessary to track the movement of pollution plumes, and can be used to monitor any natural degradation of ground water pollution.

Reports of Waste Discharge

The Regional Board requires that dischargers file a report of waste discharge (RWD) when any waste is proposed to be discharged to land or surface waters. RWDs are required for treated ground water discharges to land and surface waters, for in-situ soil and ground water bioremediation projects where substances other than oxygen are being discharged, and for large scale ex-situ bioremediation projects where liquids are being discharged. For specific treatment discharges, a listing of information to support a RWD is available from the Regional Board office. Once a RWD is filed, the Regional Board may issue a waiver or may adopt Waste Discharge Requirements (WDRs) for the discharge.

Cleanup Levels

In addition to the following discussion of cleanup levels for soil and ground water at a UST site, reference should be made to Section 4.2 of this Basin Plan.

Section 2725, Article 11, Chapter 16, Title 23 of the California Code of Regulations outlines what elements are required to be included in a Corrective Action Plan (CAP). Section 2725(g) requires the establishment of target cleanup levels for ground water in the final CAP. Any CAP that proposes final ground water cleanup levels above background must include justification demonstrating that the Plan: (1) is consistent with maximum benefit to the people of the State, (2) will not unreasonably affect present and anticipated beneficial uses of such water, and (3) will not result in water quality less than that prescribed in the water quality control plans and policies adopted by the State and Regional Boards.

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Prior to the initiation of a corrective action, it may not be feasible to generate sufficient technical justification to support not remediating ground water to background concentrations. Target levels are recommended to be set at minimum laboratory detection limits (background) for petroleum related constituents. Technical and economic feasibility of attaining background can best be determined during the remedial process. Dischargers shall consider those items listed in Title 23, Chapter 15, Article 5, Section 2550.4d (Cal. Code of Regs.) in presenting their justification. Final justification for not remediating to background levels may include, but not be limited to, chemical transport modelling, evidence of asymptotic concentrations of pollutants over a duration during remediation, and social/economic considerations.

Final cleanup levels may be allowed between background and established water quality standards in certain cases. (Established standards include primary and secondary drinking water standards and USEPA Health Advisory levels.) Any proposal to remediate ground waters to levels between background and an established numerical water quality standard must include a justification for such degradation. Any justification must consider those items listed in Title 23, Chapter 15, Article 5, Section 2550.4d (Cal. Code of Regs.).

The City of Bishop

The majority of documented releases in the Bishop area have occurred in the light industrial/service area along Hwy. 395 (Main Street). Depth to ground water along Main Street ranges from three to eight feet below ground surface (bgs). Ground water dominantly flows east toward the Owens River.

Soils in the Bishop area are variable. Coarse alluvial cobbles and boulders are present on the alluvial fan of the eastern Sierra Nevada range at the western edge of Bishop. However, throughout the City, soils appear to be predominantly clayey sands and clayey silts with low permeability characteristics. A shallow unconfined aquifer is present beneath the City of Bishop at depths ranging from three to eight feet below ground surface. The ground water gradient of this aquifer throughout the City of Bishop is gently sloping. Additionally, the low permeability soils result in slow ground water velocities.

Municipal supply wells for the City of Bishop are located east and north of known petroleum dispensing facilities. No known water supply wells are located in areas of known or suspected ground water pollution.

Dischargers at several UST sites in the City of Bishop have installed ground water monitoring wells. The results of well sampling indicate that pollution plumes have little or no natural degradation without active remediation, but these plumes also migrate very slowly.

UST Policy for Bishop. Based on the principles of State Board Resolution No. 92-49, Board staff has developed a policy to set time schedules for completing soil and ground water cleanup. To the extent feasible, schedules will be set to coincide with the availability of resources, including UST Trust Funds. The policy specifically applies to potential Trust Fund "A," "B," and "C" applicants in specific hydrogeologic areas of Bishop. The policy is as follows:

1. When USTs are removed, all identified soil pollution will be excavated to the property boundaries to the depth of the ground water table (depth to ground water in Bishop ranges from 3 to 8 feet below ground surface). Contaminated soil beneath existing onsite buildings will not be required to be removed at this time.
2. Soil samples will be collected from all excavation sidewalls to document effective removal of contaminated soils or the location of any remaining soil contamination that persists offsite.
3. The discharger will remove any fuel found floating on the water table surface.
4. Field investigation methods (such as Hydropunch™ and cone penetrometers) can be effectively used to preliminarily define the lateral extent of ground water pollution. This data will then be used to locate a maximum of three ground water monitoring wells that approximately define the down-gradient extent of ground water pollution. It is expected that these wells will be installed offsite.
5. Monitoring of the ground water will be conducted by the discharger. Monitoring includes laboratory analysis of ground water samples collected from the installed monitoring wells. The discharger will continue to remove any identified fuel found floating on the water table surface.
6. The UST owner/operator would not be required to perform additional soil or dissolved phase ground water remediation until SB 2004 funding is available, provided that the discharger supplies

the Regional Board documentation that a grant application has been filed with the State Board.

7. Dissolved phase ground water remediation would only be required prior to receiving SB 2004 funding if it becomes evident that the discharger will not qualify for SB 2004 funding, or the pollution poses an imminent threat to public health. This policy does not change the overall remedial goals of the Regional Board.

UST Discharges in Hydrogeologic Areas Other than Bishop

Ground water pollution plumes may migrate slowly in other areas of the Region besides Bishop. However, data must be generated in these additional areas that conclusively demonstrates that these conditions exist. In areas where it can be conclusively demonstrated that hydrological conditions similar to Bishop exist, the above policy may be applied to remediation of UST release sites. In areas where pollution plumes do not migrate slowly, failure to initiate ground water remediation in the short-term may result in a substantially more extensive condition of pollution, and may also increase the threat to public health and safety.

Aboveground Storage Tanks

Spills and leaks from aboveground petroleum storage tanks and their associated piping can cause contamination of surface and ground waters. In the past, aboveground storage tanks in California were operated without requirements for secondary containment or for maintaining spill contingency plans.

The State enacted the Aboveground Petroleum Storage Act (APSA) in 1990 (CA Health and Safety Code § 25270, Chapter 6.67). The APSA requires owners or operators of specified aboveground petroleum storage tanks to file a storage statement describing the location and capacity of their facility, submit a filing fee, and perform specified spill prevention and response actions. The APSA also grants authority to the Regional Boards to, under certain circumstances, require the installation of leak detection systems, secondary containment, and/or ground water monitoring.

The APSA does not apply to tanks containing products such as propane, which are not liquid at standard temperatures and pressures.

The Regional Board will conduct periodic inspections of aboveground tanks. The schedule of inspections will focus on those facilities which are near navigable

waters, potable water supplies, and/or near sensitive ecosystems.

Spills, Leaks, Investigation, and Cleanup (SLIC) Program

Sites managed within the SLIC Program include sites with pollution from recent or historic spills, subsurface releases (e.g., pipelines, sumps), complaint investigations, and all other unauthorized discharges that pollute or threaten to pollute surface and/or ground waters. Investigation, remediation, and cleanup at SLIC sites proceed as directed in State Board Resolution No. 92-49 as described below. (For further details regarding the SLIC Program, see Section 4.2, "Spills, Leaks, Complaint Investigations, and Cleanups.")

Federal Superfund Program

The federal "Superfund" program was established in 1980 with the passage of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The CERCLA provided funding and guidelines for the cleanup of the most threatening hazardous waste sites in the nation. High priority sites scheduled for cleanup under this program are placed on the National Priority List (NPL).

To clean up pollution at federal military sites, the State has signed a Memorandum of Agreement with the Department of Defense which established procedures under which site investigation and cleanup will proceed. Investigation and cleanup at these sites must meet the requirements of the USEPA "Superfund" hazardous waste cleanup program. This involves completion of a formal Preliminary Assessment, Site Investigation, and Remedial Investigation and Feasibility Study, leading to a Record of Decision on an acceptable Remedial Action Plan. (For further details, see Section 4.12, "Military Installations.")

Implementation of State Board Resolution No. 92-49 "Policies and Procedures for Investigation, Cleanup and Abatement of Discharges Under Water Code Section 13304"

This Resolution contains policies and procedures that all Regional Boards shall follow for the oversight and regulation of investigations and cleanup and abatement activities resulting from all types of discharge or threat of discharge subject to Section 13304 of the Water Code. State Board Resolution No. 92-49 outlines the five basic elements of a site investigation. The Resolution requires that the

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Regional Board ensure that the discharger is aware of and considers minimum cleanup and abatement methods. (For further details, see Section 4.2, “Spills, Leaks, Complaint Investigations, and Cleanups.”)

Ground Water Overdraft and Related Water Quality Problems

Ground water overdraft can affect water quality, particularly in terms of total dissolved solids and organic compounds. (See also “Water Quality/Quantity Issues; Water Export and Storage,” in Section 4.9 of this Chapter for additional discussion of ground water problems.)

The Regional Board will consider issuance of waste discharge requirements for ground water recharge with imported water which is of lower quality than local ground water. The Regional Board will also consider issuance of waste discharge requirements for projects which would interfere with ground water recharge. The Regional Board will consider monitoring ground water extraction in contaminated basins to ensure that pumping patterns do not cause the migration of pollutants within the basins, causing contaminants to move to unpolluted areas of the basins.

Agricultural Activities

Irrigation practices, pesticide and fertilizer use, and confined animal operations can adversely impact the quality and beneficial uses of ground water. The Regional Board encourages the use of Best Management Practices to minimize water quality impacts from these activities.

The Regional Board participates in a statewide monitoring program for pesticides in ground water, as mandated by the Pesticide Contamination Prevention Act (AB 2021). When appropriate, the Regional Board also issues waste discharge requirements to regulate discharges of waste and/or wastewater from irrigated fields and operations such as confined animal facilities. (See “Agriculture” section, later in this Chapter, for further details.)

Stormwater Management

Infiltration of stormwater is a common treatment method (see Section 4.3, “Stormwater”). It allows removal of nutrients and some other constituents through physical filtration or adsorption, and through biological uptake by plant roots and soil microorganisms. However, in areas with high ground water tables, infiltration may lead to ground water contamination by toxic metals, deicing salts, and/or organic compounds which are common in urban

stormwater. In these cases pretreatment to remove toxic stormwater constituents before infiltration, or choice of an alternative treatment method may be necessary. Regional Board staff will review proposals for infiltration of stormwater on a case-by-case basis, and place appropriate conditions in waste discharge permits to ensure protection of ground water quality.

Regional Board staff is currently conducting a study to determine the effectiveness of infiltration trenches in the treatment of surface runoff and in the protection of ground water. Three infiltration trenches in South Lake Tahoe are being studied. Ground water up and down gradient of each trench, and soil moisture from varying depths is being collected and analyzed. Data will be evaluated to determine whether any pollutants are entering ground water via the trenches, and whether any reduction of pollutants in runoff is occurring as the runoff percolates from the bottom of the trenches to the ground water. Contingent on available funding, the Regional Board may continue the study over the next one to five years.

Federal Control Measures for Ground Water Protection and Management

1. A number of federal statutes (e.g., the Clean Water Act, the Resource Conservation and Recovery Act, the Safe Drinking Water Act, the Comprehensive Environmental Response, Compensation and Liability Act, and the Federal Insecticide, Fungicide, and Rodenticide Act) provide the U.S. Environmental Protection Agency (USEPA) with the authority to prevent and control sources of ground water contamination, as well as to clean up existing contamination. USEPA recognized that these authorities to protect ground water were fragmented among many different statutes and were largely undefined. As a result, in 1984, the USEPA adopted a Ground Water Protection Strategy to articulate the problem and USEPA's role in ground water protection. The Strategy provides a system for internal coordination as well as a strengthening of state programs (National Research Council 1986). Guidelines have been issued for USEPA decisions affecting ground water protection and cleanup. The guidelines include a three-tiered system for classification of ground water. Class I is a strict nondegradation category for irreplaceable drinking water supplies and aquifers associated with ecologically vital systems; Class II includes current and potential sources of drinking water

and waters having other beneficial uses; Class III consists of nondrinkable water based on existing poor quality and isolation from drinking water aquifers. The USEPA accords different levels of protection to each water class and is developing guidelines on how the classes will be applied. In its Strategy, the USEPA intends to apply its classification system through all of its programs.

2. The USEPA has authority, under Section 1424 of the Safe Drinking Water Act, to designate certain ground waters as “**sole source aquifers**.” There are no USEPA designated sole source aquifers in the Lahontan Region, although ground waters eligible for this designation may exist. Any federal financially-assisted project proposed within an area receiving this designation will be subject to USEPA review to ensure that the project is designed and constructed to protect water quality. The criteria for sole source designation are:
 - The aquifer must be the sole or principal source of drinking water for the area.
 - No economically feasible alternative drinking water sources exist within the nearby area.
 - If contaminated, a significant public health hazard would result.

Ground Water Control Actions by other State Agencies

1. California does not have statewide comprehensive ground water management laws; management is shared by many agencies using authority provided by various State statutes. The California Department of Water Resources' role in ground water management and protection is to provide technical assistance to other agencies, collect data, and conduct investigations. The responsibility of protecting ground water from pollution is shared with the State Board by other departments within the California Environmental Protection Agency (e.g., Department of Pesticide Regulation, Department of Toxic Substances Control, Integrated Waste Management Board, and Office of Environmental Health Hazard Assessment).
2. California water rights law does not require State permits for ground water diversions, except for underground waters which flow in defined channels (e.g., the lower Mojave River). Possible means of addressing the water quality impacts associated with ground water pumping and

overdraft include use of nuisance law, the Public Trust doctrine, and existing State Board authority. Adjudication of ground water rights is also possible; this could result in court appointment of a watermaster, with court-defined authority ranging from monitoring and recording to broad management powers. The State Board may also place conditions to protect ground water in grant contracts or water rights permits for surface water use (Sawyer 1988). Adjudications to protect the quality of ground water are further discussed in Section 2100 and Section 2101 of the California Water Code. Water Code Section 2100 allows the State Board to file a Superior Court action or to intervene in an existing or proposed adjudication proceeding to “restrict pumping, or to impose physical solutions, or both, to the extent necessary to prevent destruction or irreparable injury to the quality of such water.”

3. Improperly constructed, altered, maintained, or destroyed wells (including monitoring wells) are potential pathways for introducing contaminants to ground water. Such wells can act as conductors or pipelines through which waters of varying water quality can commingle. This may result in the degradation of high quality water supplies. The potential for ground water quality degradation increases as the number of wells and borings in an area increases.

Improperly constructed, altered, maintained, or destroyed wells can facilitate ground water quality degradation by:

- Allowing contaminants or poor quality water to enter ground water from the surface.
- Allowing ground water from polluted or naturally poor quality aquifers to migrate (via the well annulus), thus contaminating high quality aquifers.
- Allowing the well bore to be used for illegal waste disposal.

Permanently inactive or “abandoned” wells that have not been properly destroyed pose a serious threat to water quality. They are frequently forgotten and become dilapidated with time, and thus can become conduits for ground water quality degradation. In addition, humans and animals can fall into wells left open at the surface.

The California Department of Water Resources (DWR) is responsible for establishing statewide

well standards for the protection of water quality (CA Water Code § 231). State law (CA Water Code § 13801), also requires each county, city, or water agency where appropriate, to adopt ordinances that meet or exceed DWR standards for proper well placement, construction, and abandonment. The same law specifies that local governments which fail to adopt an adequate well ordinance shall enforce the DWR standards. State well standards are found in DWR Bulletins No. 74-81 and 74-90, entitled "Water Well Standards, State of California."

4. Section 13169 of the California Water Code authorizes the State Board to develop and implement a ground water protection program, as provided under the Safe Drinking Water Act, Section 300 and following of Title 42 of the United States Code, and any federal act that amends or supplements the Safe Drinking Water Act. This authority allows the State Board to apply for and accept State ground water protection grants from the federal government, and to take any additional action as may be necessary or appropriate to assure that the State's ground water protection program complies with any federal regulations issued pursuant to the Safe Drinking Water Act or any federal act that amends or supplements the Safe Drinking Water Act.

Ground Water Control Actions by Local Agencies

1. The roles of local agencies in regulation of individual waste disposal systems and in oversight of underground storage tanks are described above.
2. County water districts have broad authority to conserve, protect, and replenish ground water supplies. The Subdivision Map Act allows cities and counties to adopt ground water recharge facility plans, construct recharge facilities, and charge a fee for the construction of such facilities as a condition of approval for subdivision maps and building permits (Sawyer 1988).
3. State law permits the formation of local ground water management districts. A few such districts have been established within the Lahontan Region. Local governments should strictly enforce well construction and abandonment standards. Where wellhead protection ordinances have been adopted, they should be strictly enforced.

Recommended Control Actions for Ground Water Protection and Management

1. The potential exists for physical solutions to water quality problems related to ground water overdraft, such as provision of alternative water supplies, artificial recharge, or the establishment of physical barriers or injection barriers to pollutants. Such solutions can be required by the courts in connection with water rights adjudications, or as part of ground water management programs which could include regulation and augmentation of supply. Physical solutions could also be authorized during approval of water development projects. These solutions may involve conjunctive use projects where surface waters are used for ground water recharge or as a substitute supply for ground water users. It is important to manage ground and surface waters as an interconnected resource (Sawyer 1988).
2. Basic data are needed to evaluate potential threats to ground water quality and beneficial uses. This database should contain information on hydrogeology, soil characteristics, ground water location and level, ground water quality, ground water movement, water well location and construction, ground water extractions, land use, waste discharges, potential and existing pollution sources (e.g., landfills, underground storage tanks, significant quantities of chemicals used in land use practices such as pesticides and fertilizers, concentrated areas of septic system use, and drilling operations) and extent of contamination. A database of this type would also be useful to determine cumulative impacts of discharges and other activities on ground water basins. This database could be maintained by the Regional Board. Most of the information could be obtained from other agencies.
3. Ground water quality monitoring is essential to determine to what extent ground water beneficial uses and water quality are threatened and to evaluate the effectiveness of any actions implemented to protect beneficial uses and water quality. The Regional Board will encourage ground water quality monitoring. All data collected should be entered into STORET or compatible databases.
4. In areas of high septic system density, nitrate and chloride levels should be monitored to detect

contamination to ground water from the septic systems.

5. The U.S. Soil Conservation Service, Resource Conservation Districts and U.C. Cooperative Extension Farm Advisors will be encouraged by the Regional Board to promote Best Management Practices such as minimal applications of fertilizers and other chemicals to protect ground waters.
6. The Regional Board will encourage the formation of local ground water management districts. The districts should cooperate with the Regional Board in the regulation of such things as ground water recharge and irrigation practices to conserve ground water.
7. Local governments should consider land use zoning to restrict the type and amount of development in critical ground water recharge areas.
8. To conserve ground water resources, the Regional Board will encourage the use of Best Management Practices to minimize water use for agricultural, landscape, and turf irrigation.
9. To conserve ground water resources, the Regional Board will encourage the use of reclaimed water wherever feasible without adversely impacting beneficial uses. (Regional Boards are required, when establishing water quality objectives, to consider the need to develop and use reclaimed water.)
10. Regional Board staff, in reviewing environmental documents for projects which could affect ground water quality, should ensure that CEQA requirements for public disclosure on impacts, alternatives and mitigation measures are fulfilled.
11. The Regional Board should consider holding public fact finding hearings on specific ground water quality/quantity problems. Such hearings could result in recommendations for State Board action.

4.7 MINING, INDUSTRY, AND ENERGY PRODUCTION

The primary industries¹ in the Lahontan Region are mining and mineral processing. Other industries in the Region include lumber mills, energy production facilities, chemical manufacturing facilities, and concrete and asphalt batch plants.

Nearly all industrial operations have the potential to produce “general” types of water quality impacts, similar to those of any large construction site (e.g., erosion/sedimentation and spillage of motor vehicle fluids). Additionally, each type of industrial operation may pose its own industry-specific threats to water quality. For example, lumber mills can contribute significant quantities of tannins, lignins, BOD, and color to receiving waters. Concrete batch plants can contribute TDS, high alkalinity, and metals to receiving waters. Mining operations can contribute cyanide, heavy metals, or acid mine drainage to receiving waters.

General Discharge Limitations

Waste discharge requirements are prescribed for each discharger on a case-by-case basis; however, in every case, industrial and municipal effluent discharged to waters of the Region shall contain essentially none of the following substances:

- Chlorinated hydrocarbons
- Toxic substances
- Harmful substances that may bioconcentrate or bioaccumulate
- Excessive heat
- Radioactive substances
- Grease, oil, and phenolic compounds
- Excessively acidic and basic substances

¹ **Note:** For purposes of this Basin Plan, “industry” is defined as any servicing, producing, manufacturing or processing operation of whatever nature, including, but not limited to: mining, gravel washing, geothermal operations, air conditioning, ship building and repairing, oil production, storage and disposal operations, or water well pumping. (This definition is taken from California State Water Resources Control Board and California Regional Water Quality Control Board, 1989). The word “industry” may have a broader meaning in other contexts; for example, in the sense used by modern economists, one of the largest “industries” in the Lahontan Region is tourism. However, the waste discharge prohibitions, effluent limitations, and control measures in this Basin Plan should be understood in the context of the more narrow definition above.

Heavy metals such as lead, copper, zinc, mercury, etc.
Other deleterious substances

Furthermore, any person who is discharging or proposes to discharge waste, other than into a community sewer system, must file a Report of Waste Discharge (RWD) with the Regional Board unless this requirement is waived by the Regional Board. Detailed lists of information needed in the RWD can be obtained from Regional Board staff. Upon receipt of the RWD, the Regional Board, with information and comments received from state agencies and the public, will prescribe discharge requirements including any appropriate limitations on biological and mineral constituents, as well as toxic or other deleterious substances. Additionally, revised waste discharge reports may be required prior to additions of waste, changes in treatment methods, changes in disposal area or increases in effluent flow.

Discharge requirements will be established that are consistent with the water quality objectives for the receiving water (see Chapter 3 of this Plan), including wasteload allocations or Total Maximum Daily Loads (TMDLs) established for the discharge, the State Board's “non-degradation” policy, the federal anti-degradation and anti-backsliding regulations, and the principle of obtaining the optimum beneficial use of the Basin's water resources.

Mining and Mineral Processing Operations

Many quarries exist in the Lahontan Region, extracting such commodities as iron ore, pumice, marble, limestone, talc, and asbestos. Most such quarries do not use chemical extraction processes, and effects on water quality are usually limited to the general impacts described above.

Sand and gravel quarries are also fairly common in the Region, and are of concern because they often occur in riparian and/or floodplain areas. In general, discharges from sand and gravel operations comply with water quality objectives; such operations are usually considered to be minor, because potential adverse water quality impacts can most often be mitigated with relatively simple measures. The final restoration phase is the most critical—at the end of the project, the site must be stabilized, revegetated, and/or restored in a manner which will ensure long-term water quality protection.

An unknown number of recreation prospectors use “dry wash” or recirculating water systems to gravity separate gold. These activities have the potential to degrade water quality and beneficial uses by

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disturbing streambeds and riparian and floodplain areas.

The mining operations which pose the most significant threat to water quality in the Lahontan Region are hard rock mining for precious metals (e.g., gold or silver). Toxic chemicals, such as cyanide or mercury, are often leached through ores to obtain precious metals. The chemical leaching process involves placement of crushed ore material onto a liner (heap leaching) or into a tank or vat (vat leaching), and saturation of the ore with the leaching chemical solution ("barren" solution). The solution leaches metals as it percolates through the ore, then drains to a pond ("pregnant" solution pond) where the metals can be recovered. Spent ores are washed with water to remove any remaining chemical solution prior to disposal.

Ore preparation generally involves some crushing or pulverizing. This process exposes a maximum amount of ore surface area for the chemical leaching process. This also maximizes the amount of surface area that will be exposed to the elements after the ore has been processed and disposed. Prolonged exposure to the elements (and/or to acid mine drainage) will result in the leaching of heavy metals and/or salts which the ore may contain.

Acid mine drainage (AMD) is the product of sulfurous rock, bacteria, water, and oxygen. This highly acidic drainage is associated with mining because, although it may occur naturally, mining activities tend to enhance the formation of AMD by opening tunnels (introducing water and/or oxygen to subterranean sulfurous rock) and by exposing large quantities of susceptible rock to the elements (waste tailings piles). Once AMD formation has been established, control is extremely difficult. The best control is prevention.

Water is utilized in mining operations for dust control, equipment cooling, make-up for leaching solutions, and for other purposes. In sand and gravel quarrying, water is used to wash aggregate. Process water may become contaminated with metals, salts, toxic chemicals, oils and greases, fuels, and/or sediments. If allowed to escape containment, process water is likely to impact or threaten to impact receiving waters. When a mining operation ceases, large water-filled ponds often remain on the site. These ponds may threaten receiving waters by concentrating on-site contaminants (becoming toxic pits), and by overflowing into surface waters.

Regulatory Authority

Mining waste discharges are regulated under Article 7 of Chapter 15 (Cal. Code of Regs.). Further regulations for mines are contained in the California Water Code, Section 13260.

All mining operations are subject to the Surface Mining and Reclamation Act (SMARA, CA Public Resources Code, Title 14, Division 2, Chapter 9). SMARA requires that anyone proposing to conduct a mining operation file a reclamation plan with (and be permitted by) the Lead Agency (typically the County) in the area where the mine is to be sited. The reclamation plan must include, in part, a description of the type of operation to be conducted; the initiation and termination dates; and a description of the manner in which reclamation will be accomplished, including a description of the manner in which contaminants will be controlled and mining waste will be disposed of, and a description of the manner in which rehabilitation of affected streambed channels and streambanks to a condition of minimizing erosion and sedimentation will occur. The reclamation plan is a useful tool for the Regional Board in evaluating the level of regulation appropriate for a given operation. Whatever the level of regulation the Board decides upon, the operation will be regulated by the Lead Agency, and the operator will be required to reclaim the site at the end of the operation.

Federal Superfund Program

The federal "Superfund" program was established in 1980 with the passage of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The CERCLA provided funding and guidelines for the cleanup of the most threatening hazardous waste sites in the nation. High priority sites scheduled for cleanup under this program are placed on the National Priority List (NPL). The federal government normally places large sites with identified problems on the Superfund list for cleanup. Ideally, the owner(s) or responsible parties are then required to conduct cleanup operations. However, if the owner(s) cannot be located or do not have sufficient funds, the cleanup becomes the responsibility of federal or state government. Smaller sites, or sites without identified problems may also pose significant threats to water quality, but do not make it onto the Superfund list. Once these sites are identified, they must be handled on a case-by-case basis by the Regional Board, ideally by responsible parties, but otherwise by State or local agencies.

Active Mine Sites

Case History—Mountain Pass Mine and Mill Operations

The Mountain Pass Rare Earth Mine, first located in 1949, is in the Ivanpah district of the South Lahontan Basin. The district was mined intermittently until 1940, for silver, lead, zinc, and copper.

The Mountain Pass Mine and Mill is currently operated by Molycorp. The ore body consists of carbonates, sulfates, bastnaesite, and quartz. Bastnaesite is a rare earth fluorocarbonate which contains lanthanide (rare earth) metals. Lanthanide metals include cerium, lanthanum, samarium, gadolinium, neodymium, praseodymium, and europium, and are used in such things as lighter flints, ultraviolet absorbing glass, coloring agents for glass, and television tubes.

The Mountain Pass Mine and Mill is an open pit mine with milling, beneficiation, and processing facilities. The three major milling plants are the flotation plant, chemical plant, and separation plant. Mine wastewaters were discharged to percolation ponds onsite until 1980, causing degradation of underlying ground waters. Most mine wastewater is currently collected from various discharge points at the mill site and discharged to a 100-acre evaporation pond located on Ivanpah Dry Lake about 13 miles to the east. Mine waste overburden is stockpiled onsite. Process water, tailings, and product storage ponds still exist at the millsite.

Major water quality concerns at the Mountain Pass Mine include the continued leakage from the active main tailings pond. This leakage continues to degrade ground water already polluted by dissolved minerals, nitrates, and sodium lignin sulfonate, which is a surfactant used in the floatation plant. Other concerns included inactive waste disposal sites and lead sulfide precipitates stored at the Molycorp hazardous waste storage site. Molycorp is currently working under Regional Board and Department of Toxic Substances Control schedules to correct the problems.

Abandoned/Historic Mines

In the past, mining operations were often conducted with little concern for immediate or future environmental impacts. Tailings were placed in waterways, ore processing occurred on unlined ground surfaces, toxic chemicals were often not rinsed from ore prior to ore disposal, and no effort was made to reclaim exposed slopes. As a result, numerous old, mostly abandoned, mine sites are now

severely impacting surface and ground waters in the Lahontan Region. Many surface waters in the Region, such as Monitor Creek, Leviathan Creek, Bodie Creek, and the Carson River, have moderate to high levels of heavy metals, salts, and/or mercury, due at least in part to past mining activities. High levels of metals have been detected in fish tissue under the State Board's Toxic Substances Monitoring Program. Surface and ground waters are also being impacted by acid mine drainage and severe erosion problems at mine sites.

Case History—Leviathan Mine

The Leviathan Mine, located in Alpine County, is the most significant abandoned mine site in the Lahontan Region. The soil and underlying geology of the site are sulfur-rich, and the mine has primarily been exploited for that mineral (although the earliest mining at the site was for metals). Operations at the site began in 1863, and continued under various owners until the late 1960s.

Until 1952, operations at the site involved tunnel mining, with minimal impact to nearby surface waters. In 1952, Anaconda Copper Company purchased the site and began an open-pit mining operation, dumping tailings directly into surface waters (Leviathan Creek). Acid mine drainage (AMD) then began leaching into surface waters in significant quantities.

After a fish kill occurred in 1959, Anaconda implemented some mitigation measures, but the impacts were difficult to control. In 1962, the Regional Board determined that the mine should be regulated, and requested a report of waste discharge from Anaconda. Anaconda responded by removing all the previously installed mitigation measures and selling the mine to Alpine Mining Enterprises, a small corporation with no assets.

The Regional Board adopted waste discharge requirements on Alpine Mining Enterprises in 1962 and spent the next several years trying unsuccessfully to make Alpine Mining Enterprises correct the AMD and erosion problems at the site. In 1969, the Regional Board referred the matter to the Attorney General, but litigation efforts were stymied by Alpine Mining Enterprises' lack of resources and the apparent lack of recourse against Anaconda under California law.

In 1978, California voters approved a bond measure which enacted the State Assistance Program (SAP), and the State Board granted the Regional Board \$3.76 million from this bond act to address the

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Leviathan Mine problem, which was now causing occasional cattle kills and which had left an eight mile stretch of Leviathan and Bryant Creeks sterile. At about the same time, the Regional Board successfully negotiated with ARCO, the now parent company of Anaconda, for a \$2.337 million settlement in lieu of litigation. As part of the settlement, the State of California purchased the mine for \$50,000. The State Board was given the responsibility of overseeing restoration activities at the mine. The State Board assigned much of the oversight responsibility to the Regional Board.

In 1985, a restoration project was completed and the mine site was revegetated. The reclamation strategy was designed (by Brown and Caldwell Consulting Engineers) to control or eliminate approximately 75 percent of the AMD pollution previously entering Leviathan Creek. However, the plant species selected for revegetation were not tolerant to site conditions, and most of the plants have since died. This has left acres of eroding slopes which are currently inundating the mine's pollution abatement facilities with sediment, jeopardizing their function. Earth is also eroding from beneath the mine's pollution abatement facilities, undermining their structural stability. Additionally, the road system at the site has little drainage control and is contributing to the erosion and sedimentation problem. The eroding slopes and resulting contaminated sediment loads also endanger the restoration of the potential beneficial uses of the Leviathan Creek system.

Water quality monitoring data (for parameters including nickel, aluminum, iron, arsenic, sulfate, total dissolved solids, and pH) indicates a significant decrease in pollutant concentrations since the project was constructed. However, downstream beneficial uses have not been fully restored, pollutant loading is still significant, and all monitoring has been conducted during drought years when production of AMD is expected to be at a minimum.

On June 9, 1989, the USEPA issued its final decision on Section 304(l) of the Clean Water Act. As a result of this decision, Leviathan Creek was identified on the Section 304(l)(1)(B) "short list" as a waterbody impaired by toxic pollutants, specifically arsenic and nickel. Concurrently, the Leviathan Mine was listed under Section 304(l)(1)(C) as the point source contributing toxics to Leviathan Creek. In addition, the State of California submitted Aspen, Bryant and Leviathan Creeks for inclusion on the 304(l)(1)(A) "long list" as waterbodies not meeting State water quality standards.

The Section 304(l) listing required the State of California to prepare an Individual Control Strategy (ICS) for the Leviathan Mine by February 4, 1990. USEPA and the Lahontan Regional Board discussed a coordinated effort on the ICS during a workshop in January, 1991. No further actions have been taken by the State or Regional Board to pursue the ICS since that time.

Control Measures for Mining and Mineral Processing

1. The Regional Board shall review all new mining, mineral processing, and exploratory operations (and existing unpermitted operations on a case-by-case basis) and issue conditional waivers, waste discharge requirements, or NPDES permits for operations that may (individually or cumulatively) result in potentially significant impacts to water quality or beneficial uses.
2. To control general water quality threats posed by mining and mineral processing operations, Best Management Practices (BMPs) shall be required, including mechanical or vegetative soil stabilization, runoff collection/treatment systems, vehicle fluid containment facilities, etc. Process water, aggregate washwater, and/or dust control water should be contained in ponds or behind dikes, or otherwise treated to remove sediments. (See BMP and stormwater control discussions in Section 4.3 and in the introduction to this Chapter).
3. Specific control measures include the following:
 - **Gravel and Sand Operations:** The Executive Officer may issue a conditional waiver to any site where all operations and washwaters are confined to land, no discharge to surface waters, including wetlands, will occur, and stockpiles are protected from flooding. If disturbance is proposed in a wetland, Clean Water Act Section 401/404 Water Quality Certification must be obtained.
 - **Leaching Operations:** The Regional Board shall regulate all discharges of cyanide or other toxic chemicals used in precious metal extraction, regardless of the size of the operation. Toxic chemicals should be prevented from escaping any portion of the leaching cycle. Pregnant and barren solution impoundments and leach pads should be lined and monitored; leaching vats and chemical storage facilities should have additional containment (e.g., an outer tank) and

monitoring. If toxic chemicals are identified in underlying soils or ground water, the leaching process should be stopped until the leak can be located and repaired, and the contamination remediated.

- **Hard Rock Mining:** When new mining operations are proposed, the discharger must comprehensively test waste materials for acid generation potential. Waste which has a high acid generation potential must be placed in engineered containment or otherwise disposed of to either prevent AMD formation or to contain any AMD which is generated. The potential for leaching of soluble metals and salts should also be evaluated prior to commencement of operation at a new mine site. Mine wastes which will generate significant quantities of metals or salts should be disposed of to engineered containment or otherwise prevented from contaminating surface or ground waters.

Recommended Future Actions for Mining and Mineral Processing

1. Pursuant to 304(l) regulations, the State Board must consider funding various remediation alternatives for the Leviathan Mine. The Regional Board shall consider the following alternatives and recommend some or all of them to the State Board for consideration:

- **Control eroding slopes and mine tailings.** Implement a comprehensive slope stabilization and revegetation program specifically designed to establish plants that are tolerant to acidic soil and low water conditions, such as those which occur at the mine site. The established plants and structural improvements should stabilize the soils and significantly reduce erosion and sediment transport to pollution abatement facilities as well as the Leviathan Creek system. An established vegetative cover will also reduce stormwater percolation and the resultant generation of AMD.
- **Control roadside drainage and erosion.** Regrade roads for proper drainage and install drainage control and treatment structures. By properly directing the concentrated runoff from roads and installing drainage structures, the integrity of the roads will be maintained while erosion and sediment transport to streams will be reduced.

- **Control excess AMD.** Construct projects to reduce the pollution loading to area surface waters, construct an additional holding pond to contain AMD overflow from the existing evaporation ponds, and/or establish a wastewater treatment system to treat AMD overflows from the existing evaporation ponds to Leviathan Creek.

- **Reline the ponds**

- **Examine water diversion to prevent AMD formation**

2. In order to maintain the beneficial effects of the pollution mitigation project at Leviathan Mine, a number of regular maintenance activities must be conducted. These include: (1) periodic fence repairs, (2) annual sediment removal from drainageways, (3) flow regulation to and between ponds, (4) emergency repairs, and (5) periodic water quality monitoring to ensure that pollution levels are not increasing. Over the long-term, major efforts will be required to either rehabilitate the existing project or to otherwise reduce the level of pollutants leaving the site.
3. The Regional Board should investigate the water quality impacts of other inactive mines and identify and implement appropriate control actions.
4. The Regional Board should consult with the California Department of Fish and Game to develop leaching operations control measures to protect wildlife from lethal chemicals. Such control measures could include covering or otherwise containing all waters with chemical concentrations at levels lethal to wildlife.

Industrial Activities other than Mining and Mineral Processing

Cement production. There are currently several large cement production facilities located in the southern part of the Lahontan Region. These facilities quarry mineral products, crush and blend them proportionally, heat them together in a kiln, and then crush finely the resulting clinker product to form cement. The cement manufacturing process can result in degradation of both surface and ground water quality due to parameters and constituents including pH, chloride, sulfate, potassium, sodium, calcium, and metals such as chromium.

Two significant waste types are generated during cement production. The first, kiln dust, is off-

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specification product that is unable to meet the cement industry's alkalinity requirements because of the type of raw minerals mined at some plants. (Not all cement plants produce kiln dust.) Kiln dust is frequently dumped onsite near the plants and spread.

The pH of kiln dust is usually very high, ranging from 11 to 13.5 pH units. Due to its corrosive pH, kiln dust can be classified as a "hazardous" waste (under Title 23, Chapter 15, Cal. Code of Regs.). However, if a particular manufacturer has been granted a variance from the California Department of Toxic Substances Control, the Regional Board may find that their kiln dust could be classified as a "designated" waste (under Title 23, Chapter 15, Cal. Code of Regs.) or a "special" waste (under Title 22, Cal. Code of Regs.). The USEPA is currently studying this issue to determine how kiln dust should be classified.

The second type of waste, kiln refractory liner brick, is used to line the kilns and historically contained leachable amounts of chromium in concentrations considered hazardous. Often, when kiln brick containing chromium was replaced, it was disposed onsite. Recently, the kiln brick composition has been reformulated and new brick is now available that does not contain chromium. Currently, when kiln bricks are replaced, most cement plants will crush and recycle the old bricks through the cement manufacturing process.

Concrete production. There are numerous concrete batch plants throughout the Region. Concrete batch plants combine gravel, water, and cement to form concrete. Liquid and semi-solid waste from truck and equipment washout is produced. This waste is very alkaline (the pH may be as high as 12.5 in fresh cement), is high in TDS, and may contain assorted heavy metals. The washout may contain various additives or other chemicals that are used in concrete production. This wastewater is usually disposed to a settling pond, and then to a sewer (POTW) or to onsite percolation ponds. Waste concrete, left over from individual projects, is often disposed onsite by dumping in a large pile, where it hardens

Asphalt production. Asphalt batch plants generally involve mixing petroleum products (usually diesel fuel) with earthen materials. Large quantities of both materials are generally stored onsite. Water quality can be significantly degraded if these materials reach water courses.

Lumber mills. Lumber mills generally consist of outdoor log and lumber storage, indoor milling facilities, energy cogeneration facilities, and waste

piles/ponds. Threats to water quality include wastewater from log watering (high in tannins, lignins, color, BOD, etc.), process wastewater from energy cogeneration (high in TDS, plus any chemical additives), ash from energy cogeneration (highly alkaline, possibly high in metals), and spillage of wood treatment chemicals (such as cupric arsenate, pentachlorophenol, etc.).

Control Measures for Industrial Activities other than Mining and Mineral Processing

1. Industrial operations in the Lahontan Region shall be reviewed on a case-by-case basis, and regulated as appropriate. Conditional waivers, waste discharge requirements, or NPDES permits shall be issued as necessary to protect water quality and beneficial uses.
2. To control general water quality threats posed by erosion and stormwater from industrial operations, Best Management Practices (BMPs) shall be used, including mechanical or vegetative soil stabilization, runoff collection/treatment systems, vehicle fluid containment facilities, etc. (See BMP and stormwater control discussions in Section 4.3 and in the introduction to this Chapter). If industrial wastewater is being discharged to a wastewater treatment plant, pretreatment of the wastewater may be required (refer to Pretreatment Policy, discussed in Section 4.4, "Wastewater").
3. The Regional Board should continue to review Notices of Intent (NOIs) for statewide Industrial Stormwater NPDES permits, and should issue individual permits when needed to protect water quality.

Specific control measures applicable to industrial operations are as follows:

4. **Cement Industry:** The Regional Board shall regulate cement kiln dust disposal and all ready mix cement plants where water quality could be impacted. Wastewater from cement batch plants is considered to be a designated waste, and may need to be discharged to a lined impoundment, if site-specific characteristics (e.g., soil type, depth to ground water, ground water quality, etc) will not protect ground water from degradation. The Regional Board will consider, on a case-by-case basis, the need to line cement wastewater ponds. Solid or semi-solid wastes should be deposited in landfills or other legal points of disposal unless the

discharger can demonstrate that the waste will not pose a threat to water quality if deposited onsite.

5. **Asphalt Batch Plants:** Waste control measures are fairly straightforward at such sites. Petroleum products should be stored in tanks, and the tanks placed in lined holding areas. If spillage to soil occurs, contaminated soils should be scraped up, stored on a liner, and incorporated into asphalt as soon as possible. A berm (or other runoff control) should be placed downgradient from earthen material stockpiles.
6. **Lumber mills:** Waste control measures include lined ponds for untreated wastewater, containment of surface runoff, and proper storage and disposal of ash (ash is usually landfilled, but may also be used as a soil amendment).

Recommended Future Actions for Industrial Activities

1. The Regional Board should consider developing a policy for addressing the disposal of “off-specification” concrete. Possible policy might include requiring that the material be stored on a liner or stored indoors, or that ground water monitoring be conducted around the on-site spreading areas.
2. The Regional Board should consider developing a policy or policies for addressing the large, potentially toxic pits left at mining operations. Possible policies might include (but are not limited to) requiring that the pits be filled at the end of a site's operation, requiring long-term financial assurance to correct future water quality problems resulting from the pits, or lining the pits.

Energy Production

There are several facilities in the Lahontan Region that produce electricity or provide energy for heating purposes. These facilities utilize sources including geothermal fluids, solar energy, fossil fuels, biomass, and hydroelectric power. Facilities producing energy from these sources all generate some type of waste products which can impact water quality if not properly treated, contained or disposed. (The disposal of wastes to land is discussed separately in “Wastewater and Solid Waste” and the “Ground Water Protection” sections of this Chapter).

Potential adverse impacts to water quality may result from the following waste stream components: spent geothermal fluids, cooling tower blowdown, boiler blowdown, ash, and supply water treatment system

wastewater. Constituents which can impact water quality include: total dissolved solids (TDS), sediment, heavy metals, solvents, biocides, and residual chlorine. The temperature of discharged water can also affect receiving waters. Additionally, with hydroelectric projects, there may be flow depletions in the affected reach of the river or stream, resulting in impacts to water quality and beneficial uses.

Geothermal

Geothermal resources in the Lahontan Region have been explored and developed in the Surprise Valley, the Honey Lake Valley, Bridgeport Valley, Long Valley near Mammoth Lakes, and the Coso Known Geothermal Resource Area northwest of Ridgecrest. Exploration is currently underway at Fort Irwin. Geothermal resources found in the Region provide many opportunities for alternative energy development. Geothermal power plants extract hot water through large wells drilled from 500-10,000 feet below the surface. The hot water is either passed through heat exchangers (binary process) to create steam to generate electricity, or is used directly for space heating or in a heat exchange process to heat water for domestic and/or commercial uses. Hot water return flows from these processes are usually injected back into the geothermal reservoirs through separate wells, but in some cases are discharged to surface waters or to land. Geothermal steam and condensate may be highly mineralized and corrosive, and special precautions must be taken to ensure that geothermal development will not create pollution problems. Besides spent geothermal fluids, other wastes discharged from geothermal exploratory and production projects are: cuttings from well drilling operations, and fluids from well testing. Until it can be shown that such activities can be conducted without risk of water quality degradation, the Regional Board will oppose further consideration of geothermal exploration or development in the Eagle Lake Basin, Lassen County (see Resolution 82-7 in Appendix B).

Fossil fuels

Fossil fuel energy production facilities in the Lahontan Region include coal-fired steam plants and a gas compressor station. Future development of fossil fuel powered steam plants could occur in the South Lahontan Basin to meet the increasing energy needs of Southern California. Southern California Edison Company operates a coal gasification facility and a coal-fired steam plant using coal fines or underflow from a traditional coal-fired steam plant in Nevada. Waste discharges result from the following components: cooling tower blowdown, boiler blowdown, sulfur recovery processes, slag (from coal

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gasification) or fly-ash (from coal-fired plants), and supply water treatment system wastewater. The primary concern with the wastewater is the high concentration of total dissolved solids that threaten the water quality of underlying aquifers. Because of the high concentrations of salts and the further concentration through evaporation, the liquids in the waste ponds are considered designated wastes under Chapter 15. Southern California Gas Company operates a gas compressor station that discharges cooling tower blowdown water. The water discharged is of better quality than a nearby well used for irrigation, so most of the wastewater is being reclaimed for irrigation; the remaining water is discharged to an unlined evaporation-percolation pond.

Solar

Solar energy stations use a heating transfer fluid (HTF) to transfer heat from solar energy to water, in order to create steam for generating electricity. Waste stream components include: cooling tower blowdown, sodium regeneration water, demineralization blowdown, solar boiler blowdown, supply water treatment system wastewater, and power block runoff. Biocides are used in the cooling towers to prevent biological growth; the resulting waste products are acids and amines. Blowdown water contains sulfuric salts, due to the use of sulfuric acid to minimize scale buildup in condensers. The wastewaters are similar to those described for fossil fuel facilities and are considered designated wastes under Chapter 15. The HTF is not considered a waste, since it is used for production and is recirculated in a closed system. However, HTF spills do occur and the contaminated soil is classified as a waste. Such contaminated soil must be removed and properly treated and/or stored prior to disposal at an appropriate facility.

Biomass

Several energy production facilities exist in the Region that utilize biomass as a fuel source. Biomass fuels are typically the products or by-products of logging or milling operations, however, household, medical, or other wastes may also be proposed for incineration. The primary water quality concern is the disposal of ash produced by such facilities. Such ash is often hazardous due to high pH and/or metals content. Ash generated by energy production facilities must be tested to determine its degree of hazard and disposed of in compliance with Chapter 15.

Hydroelectric Power

Hydroelectric power, or hydropower, is the power generated by conversion of the energy of running

water. Hydroelectric facilities are usually constructed in or immediately adjacent to the water body being utilized. Water may be diverted from the water body, run through the facility, and returned to the river at some point downstream. Alternately, the flow of the entire river may be utilized. Impacts to a water body from hydroelectric projects include erosion and sedimentation resulting from construction, increased turbidity and temperature, and possibly discharge from turbines in the watercourse. Additionally, there may be flow depletions in the affected portion of the stream and loss of habitat and reduction in the recreational/aesthetic quality of the stream, resulting in impairment of the beneficial uses.

Control Measures for Energy Production

1. The Regional Board regulates energy production facilities through the adoption of waste discharge requirements (WDRs) which specify effluent limitations, receiving water limitations, and other provisions in accordance with all applicable laws, regulations, and policies. The WDRs can also prohibit certain discharges, such as PCBs or waste discharges to surface waters or land. Spill control and prevention plans and closure plans, including assurance of financial responsibility, are required. Self-monitoring programs are issued along with the WDRs. The Regional Board may consider issuing a waiver of waste discharge requirements for interim discharges or where discharges are appropriately controlled by another permitting authority.
2. When adopting or amending WDRs for energy facilities, the Regional Board shall implement the following measures wherever appropriate:
 - Where interim waste discharges (such as drilling cuttings and test waters) are proven to be non-hazardous and no impacts to water quality will occur, discharges may be allowed to unlined sumps. Wastes left after evaporation may be buried on site. Such discharges would likely not require regulation by the Regional Board.
 - Where discharges may impact water quality or the waste is considered hazardous, wastes shall be discharged to lined ponds. Closure will require a synthetic liner for capping, or removal of cuttings to an appropriate disposal location. Such discharges would likely require waste discharge requirements or other regulation by the Regional Board.

- Wastewaters from energy production facilities may be used for dust control during construction and operation where no adverse impacts to surface water or ground water quality will occur and where the wastewater is not hazardous.
 - Waste discharges from energy production facilities may be allowed to land (irrigation) or to unlined ponds where the effluent quality is similar to or of better quality than the receiving waters. Monitoring will be required to ensure that adverse impacts to the water quality of the receiving waters (either the underlying ground water or the nearby surface waters) will not occur.
3. For all proposed **geothermal operations**, the Regional Board encourages re-injection of spent geothermal fluids to an aquifer with similar water quality as the best measure to protect surface waters and good quality ground waters. If re-injection is not possible, the Regional Board will require all other proposed methods of disposal of spent geothermal fluids to result in a discharge which complies with all provisions of this Basin Plan.

The Regional Board will coordinate with other permitting authorities to determine whether WDRs are appropriate. Where adequate water quality protection can be provided by another permitting authority, the Regional Board may choose not to issue a waste discharge permit. The California Division of Oil and Gas (CDOG), which has jurisdiction and responsibility for geothermal development, supervises all well drilling and abandonment activities on private lands. CDOG also implements the Underground Injection Control Program, including the reinjection of geothermal fluids on private lands. The Regional Board works closely with the CDOG to regulate these facilities in accordance with the Memorandum of Agreement (MOA) between the State Board and CDOG as amended by State Board Resolution No. 88-61. The U.S. Bureau of Land Management and the U.S. Environmental Protection Agency have responsibility for regulation of reinjection on federal lands.

4. For proposed **hydroelectric projects**, the Regional Board will coordinate permitting processes with the Federal Energy Regulatory Commission (FERC) and the State Board. All hydroelectric projects which will produce energy for sale must comply with the FERC licensing

process, or acquire an exemption from FERC. The FERC licensing process includes an optional preliminary permit, giving the permitted developer "first-in-line" status for a given project, while feasibility and environmental impact studies are performed for the project. After review of the feasibility studies, FERC may deny the license, grant it without conditions, or reserve continuing jurisdiction. Projects with capacity of 5 MW or less may be exempt from any FERC licensing requirements if the proposed facility is located at an existing dam, or will use an existing natural water feature. FERC also exempts projects producing 100 KW or less. (Note that hydro projects exempt from FERC may still require State water rights permits and/or waste discharge permits). All FERC licenses have expiration dates. Applicants for relicensing must complete the pre-filing requirements two years prior to the expiration of the current license. Before FERC will issue a license, applicants must provide evidence of compliance with State water rights laws.

Section 401 of the Clean Water Act requires that applicants for a federal license or permit, such as a FERC license, for any activity which may result in a discharge to navigable waters, obtain a water quality certification from the State. The federal agency cannot issue the permit or license unless the State issues or waives 401 certification, and any conditions of the State's certification must be included as conditions of the federal permit or license. If the State denies the request, the federal permit or license cannot be issued. If the State fails to act on the request for certification within a mandated timeframe, the request is deemed waived. The State Board is the California agency designated to issue Section 401 certifications for hydroelectric projects. The certification process, as related to hydropower projects, is described below.

Water Rights Permit. An applicant for development of hydropower must either possess a valid water right or else apply for one to the State Board. Generally, the State Board requires that the feasibility studies be nearly completed in order to show that the applicant has demonstrated diligence in acquiring a water rights permit. The State Board will also only issue one water rights permit per site. In the case of competing water rights applications, the State Board will wait until the FERC permit is granted.

Protests regarding water rights applications must be filed with the State Board within the 45 or 60-

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day review period indicated in the notice of application for water rights. If the protestants and applicant cannot resolve their differences directly, the State Board will resolve the issue during an evidentiary hearing.

California Environmental Quality Act (CEQA). Action cannot be taken by the State Board on a request for water quality certification for a hydroelectric project (Section 401 Certification) until compliance with CEQA is demonstrated. Whether or not a water rights permit is required for the project, the State Board will ordinarily be the lead agency for CEQA purposes. Until the State Board adopts an appropriate CEQA document or determines that the proposed project is exempt, no action will be taken on water quality certification. If the project proponent is a local agency, that agency should be the lead agency under CEQA. Again, no action on water quality certification will be taken until the local agency adopts an appropriate CEQA document.

Section 401 Water Quality Certification. When a complete application and request for water quality certification has been received by the Regional Board, the Board immediately forwards the application and certification request to the State Board. The State Board 401 coordinator and the Regional Board coordinate to make a certification decision (certification issued, issued with conditions, or denied) within the mandated timeframe. The Regional Board may adopt waste discharge requirements in addition to Section 401 Water Quality Certification for hydroelectric projects. However, the WDRs may be preempted by FERC license provisions.

As a result of January 1, 1993 legislation, the State and Regional Boards have limited authority over hydroelectric projects. Their authority includes:

- Full authority over projects which are exempt from FERC licensing (the Los Angeles Department of Water and Power's Owens River Gorge facility is exempt).
 - For multi-purpose projects, the State and Regional Boards may apply its requirements to the use of the project for irrigation, municipal use, or similar purposes.
 - The State may still apply its water right requirements to the extent necessary to protect proprietary rights.
 - The State may apply authority assigned or delegated to it under other federal laws, including water quality certification authority under Section 401 of the Clean Water Act, as described above.
5. For **hydroelectric projects**, in addition to the control actions described in No. 1 and 2 above, the Regional Board will recommend, as appropriate, the following as conditions of waste discharge permits and/or as recommended conditions for Section 401 Water Quality Certification:
 - Temporary and permanent erosion and drainage control measures during project construction and operation, including ongoing sediment cleanout from diversion structures, and stabilization of all disturbed areas associated with the project (e.g., transmission lines, access roads).
 - Mitigation of effects from reduced flows on maintenance of water quality and instream beneficial uses (including impacts on riparian habitat).
 6. For **cogeneration facilities**, boiler blowdown and other process waters high in Total Dissolved Solids or conditioning chemicals should be appropriately contained (either by a liner system or by natural geologic containment). Ground water monitoring should be conducted around process water disposal areas.

Recommended Future Actions for Energy Production

In cooperation with other appropriate local, state, and federal agencies, and private landowners, the Regional Board should develop a monitoring program to detect water quality trends, identify problem areas, and determine any needed levels of action.

4.8 LAND DEVELOPMENT

The construction and maintenance of urban and commercial developments can impact water quality in many ways. Construction activities inherently disturb soil and vegetation, often resulting in accelerated erosion and sedimentation. Stormwater runoff from developed areas can also contain petroleum products, nutrients, and other contaminants.

This section contains a discussion of the potential water quality impacts expected to result from land development activities, followed by control measures to reduce or offset water quality impacts from such activities.

Construction Activities and Guidelines

Construction activities often produce erosion by disturbing the natural ground surface through scarifying, grading, and filling. Floodplain and wetland disturbances often reduce the ability of the natural environment to retain sediment and assimilate nutrients. Construction materials such as concrete, paints, petroleum products, and other chemicals can contaminate nearby water bodies. Construction impacts such as these are typically associated with subdivisions, commercial developments, and industrial developments.

Control Measures for Construction Activities

The Regional Board regulates the construction of subdivisions, commercial developments, industrial developments, and roadways based upon the level of threat to water quality. The Regional Board will request a Report of Waste Discharge and consider the issuance of an appropriate permit for any proposed project where water quality concerns are identified in the California Environmental Quality Act (CEQA) review process. Any construction activity whose land disturbance activities exceed five acres must also comply with the statewide general NPDES permit for stormwater discharges (see “Stormwater” section of this Chapter).

The following are guidelines for construction projects regulated by the Regional Board, particularly for projects located in portions of the Region where erosion and stormwater threaten sensitive watersheds. The Regional Board recommends that each county within the Region adopt a grading/erosion control ordinance to require

implementation of these same guidelines for all soil disturbing activities:

1. Surplus or waste material should not be placed in drainageways or within the 100-year floodplain of any surface water.
2. All loose piles of soil, silt, clay, sand, debris, or other earthen materials should be protected in a reasonable manner to prevent any discharge to waters of the State.
3. Dewatering should be performed in a manner so as to prevent the discharge of earthen material from the site.
4. All disturbed areas should be stabilized by appropriate soil stabilization measures by October 15th of each year.
5. All work performed during the wet season of each year should be conducted in such a manner that the project can be winterized (all soils stabilized to prevent runoff) within 48 hours if necessary. The wet season typically extends from October 15th through May 1st in the higher elevations of the Lahontan Region. The season may be truncated in the desert areas of the Region.
6. Where possible, existing drainage patterns should not be significantly modified.
7. After completion of a construction project, all surplus or waste earthen material should be removed from the site and deposited in an approved disposal location.
8. Drainage swales disturbed by construction activities should be stabilized by appropriate soil stabilization measures to prevent erosion.
9. All non-construction areas should be protected by fencing or other means to prevent unnecessary disturbance.
10. During construction, temporary protected gravel dikes, protected earthen dikes, or sand bag dikes should be used as necessary to prevent discharge of earthen materials from the site during periods of precipitation or runoff.
11. Impervious areas should be constructed with infiltration trenches along the downgradient sides to dispose of all runoff greater than background levels of the undisturbed site. Infiltration trenches are not recommended in areas where infiltration poses a risk of ground water contamination.

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12. Infiltration trenches or similar protection facilities should be constructed on the downgradient side of all structural drip lines.
13. Revegetated areas should be continually maintained in order to assure adequate growth and root development. Physical erosion control facilities should be placed on a routine maintenance and inspection program to provide continued erosion control integrity.
14. Waste drainage waters in excess of that which can be adequately retained on the property should be collected before such waters have a chance to degrade. Collected water shall be treated, if necessary, before discharge from the property.
15. Where construction activities involve the crossing and/or alteration of a stream channel, such activities should be timed to occur during the period in which stream flow is expected to be lowest for the year.
16. Use of materials other than potable water for dust control (i.e., reclaimed wastewater, chemicals such as magnesium chloride, etc.) is strongly encouraged but must have prior Regional Board approval before its use.

Specific Policy and Guidelines for Mammoth Lakes Area

To control erosion and drainage in the Mammoth Lakes watershed at an elevation above 7,000 feet (Figure 4.8-1), the following policy and guidelines apply:

Policy:

A Report of Waste Discharge is required not less than 90 days before the intended start of construction activities of a **new development** of either (a) six or more dwelling units, or (b) commercial developments involving soil disturbance on one-quarter acre or more.

The Report of Waste Discharge shall contain a description of, and time schedule for implementation, for both the **interim erosion control measures** to be applied during project construction, and **short- and long-term erosion control measures** to be employed after the construction phase of the project. The descriptions shall include appropriate engineering drawings, criteria, and design calculations.

Guidelines:

1. Drainage collection, retention, and infiltration facilities shall be constructed and maintained to prevent transport of the runoff from a 20-year, 1-hour design storm from the project site. A 20-year, 1-hour design storm for the Mammoth Lakes area is equal to 1.0 inch (2.5 cm) of rainfall.
2. Surplus or waste materials shall not be placed in drainageways or within the 100-year flood plain of surface waters.
3. All loose piles of soil, silt, clay, sand, debris, or earthen materials shall be protected in a reasonable manner to prevent any discharge to waters of the State.
4. Dewatering shall be done in a manner so as to prevent the discharge of earthen materials from the site.
5. All disturbed areas shall be stabilized by appropriate soil stabilization measures by October 15 of each year.
6. All work performed between October 15th and May 1st of each year shall be conducted in such a manner that the project can be winterized within 48 hours.
7. Where possible, existing drainage patterns shall not be significantly modified.
8. After completion of a construction project, all surplus or waste earthen material shall be removed from the site and deposited at a legal point of disposal.
9. Drainage swales disturbed by construction activities shall be stabilized by the addition of crushed rock or riprap, as necessary, or other appropriate stabilization methods.
10. All nonconstruction areas shall be protected by fencing or other means to prevent unnecessary disturbance.
11. During construction, temporary erosion control facilities (e.g., impermeable dikes, filter fences, hay bales, etc.) shall be used as necessary to prevent discharge of earthen materials from the site during periods of precipitation or runoff.
12. Revegetated areas shall be regularly and continually maintained in order to assure adequate growth and root development. Physical

erosion control facilities shall be placed on a routine maintenance and inspection program to provide continued erosion control integrity.

13. Where construction activities involve the crossing and/or alteration of a stream channel, such activities shall be timed to occur during the period in which streamflow is expected to be lowest for the year.

Land Development/Urban Runoff Control Actions for Susan River Watershed

1. To protect riparian vegetation and wetlands from land disturbance activities, the Regional Board shall recommend that Lassen County and the City of Susanville require new development or any land disturbing activities to include buffer strips of undisturbed land, especially along the Susan River and its tributaries.
2. The Regional Board, with assistance from the City of Susanville and the California Department of Transportation (Caltrans), should conduct monitoring of the Susan River and Piute Creek within the City of Susanville to assess impacts from urban runoff. Control measures should be planned and implemented based on the results of the monitoring. The monitoring plan should be developed to identify nonpoint sources needing control. Monitoring proposals will be submitted by the Regional Board, and work will be conducted as resources allow and as the Susan River gains priority.
3. The Regional Board shall encourage and assist other agencies in watershed restoration efforts along the Susan River.
4. The Regional Board shall encourage the City of Susanville and Lassen County to adopt a comprehensive grading ordinance. These ordinances should require, for all proposed land disturbing activities, the use of Best Management Practices to reduce erosion and stormwater runoff, including but not limited to temporary and permanent erosion control measures.
5. The Regional Board shall encourage the City of Susanville, Lassen County and Caltrans to implement Best Management Practices to reduce erosion and stormwater runoff when constructing and maintaining roads, both paved and unpaved, under their jurisdiction.

Road Construction and Maintenance

Road construction activities often involve extensive earth moving, including clearing, scarifying, excavating for bridge abutments, disturbing or modifying floodplains, cutting, and filling. Additionally, the potential for land disturbance exists from construction materials, equipment maintenance, fuel storage facilities, and general equipment use.

Once constructed, impervious road surfaces create another source of water pollution. Oils, greases, and other petroleum products, along with such toxic materials as battery acid, antifreeze, etc., may be deposited along the road surfaces. These contaminants become suspended or dissolved in any stormwater runoff that is generated on the road surfaces. Unless otherwise treated, these contaminants will flow toward local surface or ground waters. (See "Stormwater" section of this Chapter.)

Road maintenance can be potentially threatening to water quality in a number of ways. Below-grade culverts slowly fill with sediment and are cleaned out periodically, sometimes by flushing accumulated sediment into downstream drainageways. Grading of shoulders and drainageways can detach sediments and increase the risk of erosion into nearby surface waters. Road surfaces may be repainted or resealed with materials that harden quickly, but which can be washed off while still fresh by stormwater runoff.

In the winter, roads are often snowy, icy, or wet. To reduce winter road hazards, maintenance crews may remove the snow or ice, apply sand to provide added traction, and/or apply deicing chemicals to melt the snow and ice. Sand is rapidly dissipated or crushed by the traffic, and must be replaced frequently. Great quantities of sediment enter drainageways and/or surface waters due to this practice. Snow may be removed mechanically via snowplow or snowblower. This practice is not particularly detrimental to water quality in itself, but the snow often carries substances from the roadway when removed. Sediments, chemical deicers, and vehicle fluids may travel much farther than they would otherwise, possibly reaching area surface waters. Ice and small accumulations of snow may be removed with chemical deicers. The deicer in widest use is rock salt (sodium chloride), due to its low cost, high availability, and predictable results.

Winter road maintenance was brought to the forefront in 1989 when significant numbers of roadside trees in the Lake Tahoe Basin suddenly started dying. The

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public outcry caused many environmental groups and regulatory agencies, including the Regional Board, to look more closely at what had been a more or less unscrutinized, unregulated process in the past. Data began to show that Caltrans was using very high amounts of salt each winter, and the figure seemed to increase from one year to the next. The consensus of the various regulatory agencies was that Caltrans should reduce salt use, explore various alternate deicers, and monitor the impacts of salt applications on soil, water, and vegetation. Salt use decreased significantly from 1989-1992, due to more careful application procedures and to drought conditions.

At least three alternate deicers have been explored: calcium magnesium acetate, potassium acetate, and magnesium chloride with corrosion inhibitors. These products have shown some promise, but further study is required. The cost to switch to an alternate deicer will be significant. The road departments are unwilling to make the switch unless an alternate deicer is demonstrably better environmentally, will not require too much adjustment on the part of the maintenance crews and equipment, and will actually do an effective and predictable job when applied.

However, Caltrans' monitoring of vegetation showed minimal and temporary salt accumulation within the vegetation. During the spring, any salt that had accumulated in the vegetation was flushed out from the plant material. The impacts of chemical deicers on fish and wildlife within the Lahontan Region have not been studied.

Control Measures for Road Construction and Maintenance

(Additional control measures for roads are included in the "Stormwater" section of this Chapter.)

The Regional Board regulates road construction and maintenance projects within the Lahontan Region, concentrating efforts on major construction and construction in sensitive areas. Major construction projects and those projects in sensitive areas are most often regulated under individual WDRs, and are routinely inspected. Less significant projects may be issued conditional waivers of WDRs. The Regional Board has also adopted road maintenance waste discharge requirements for some county governments in the Region. Road construction and maintenance in the Lake Tahoe Basin is also regulated under municipal NPDES Stormwater Permits (see Chapter 5).

For all road projects, the Board requires that construction be conducted in a manner which is

protective to water quality, and that, at the end of a given project, the site be restabilized and revegetated. These requirements are detailed in a Management Agency Agreement with Caltrans regarding the implementation of BMPs. Additionally, all road projects are to be in compliance with the Caltrans Statewide 208 Plan (CA Dept. of Transportation 1980), which was approved by the State Board in 1979. This Plan contains a commitment to implement BMPs, but does not include great detail on the BMPs themselves. The State Board should encourage Caltrans to update its 208 plan to provide such detail, with particular attention to:

- stormwater/erosion control along existing highways
- erosion control during highway construction and maintenance
- reduction of direct discharges (e.g., through culverts)
- reduction of runoff velocity
- infiltration, detention and retention practices
- management of deicing compounds, fertilizer, and herbicide use
- spill cleanup measures
- treatment of toxic stormwater pollutants

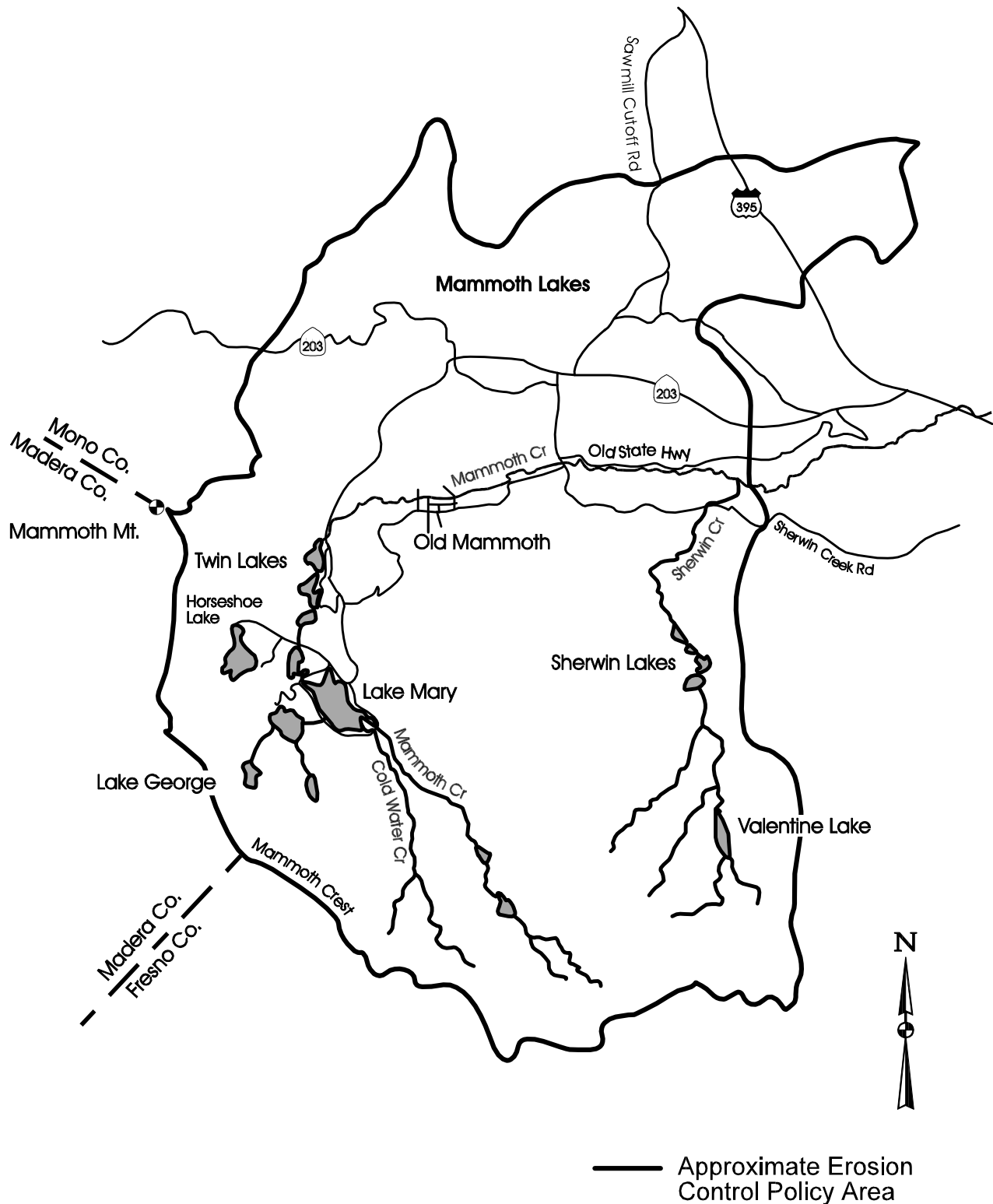
Since much of the implementation of BMPs on highways is done by Caltrans' contractors, the selection of qualified contractors and ongoing education of construction and maintenance personnel on BMP techniques are particularly important.

In the Lake Tahoe Basin, all governmental agencies assigned to maintain roads are required to bring all roads in the Lake Tahoe Basin into compliance with current "208" standards within a specified time schedule. That is, all existing facilities must be retrofitted to handle the stormwater runoff from the 20-year, 1-hour storm, and to restabilize all eroding slopes. The twenty-year time frame for this compliance process ends in 2008.

The Regional Board should allow salt use to continue as one component of a comprehensive winter maintenance program. However, the Regional Board should continue to require that it be applied in a careful, well-planned manner, by competent, trained crews. Should even the "proper" application of salt be shown to cause adverse water quality impacts, the

Regional Board should then require that it no longer be used in environmentally sensitive areas, such as the Lake Tahoe Basin. Similarly, should an alternate deicer be shown to be effective, environmentally safe, and economically feasible, its use should be encouraged in lieu of salt.

**Figure 4.8-1
OWENS HYDROLOGIC UNIT**



4.9 RESOURCES MANAGEMENT AND RESTORATION

Natural resources abound within the Lahontan Region. Surface and ground waters are of high quality and in abundant supply relative to surrounding areas. Large expanses of coniferous forests, woodlands and sagebrush lands intermixed with meadows, riparian areas and wetlands are found throughout the Region. Much of this land is publicly owned and managed.

Activities which extract, export, restore or otherwise manage these natural resources can impact beneficial uses and water quality. For instance, water exports from the Region can impact water quality. Diversion of tributaries can result in increased salinity or alkalinity and decreased volume of lakes. Sediment discharges from reservoirs used to store water for export have resulted in fish kills. Ground water pumping for export can impact the quality of the Region's ground water as well as the quantity. Timber harvest operations and related road construction can impact water quality through increased sediment load and changes in water temperature. Ranching activities can adversely affect water quality by contributing excessive sediment, nutrients, and pathogens. Additional examples of land management activities which can impact water quality are: controlled burning, recreation management, and habitat management for threatened, endangered or rare species.

Water quality protection policies, resource management and restoration activities, their related water quality problems and control actions are all described in this section.

Special Designations to Protect Water Resources

Certain waters within the Region are considered exceptional resources for a variety of reasons. The special designations described below are available to protect these exceptional resources.

Wild and Scenic River

The federal Wild and Scenic Rivers Act of 1968 (P.L. 90-542) declared that "the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers

and to fulfill other vital national conservation purposes."

Federal Wild and Scenic status prohibits construction of new dams and major water diversions. Eligible and designated rivers may include both public and private land. The Act does not prohibit development on private property along designated rivers, but allows for the acquisition of such lands to protect Wild and Scenic values. On public lands, both eligible and designated river segments are specifically managed to protect identified Wild and Scenic values.

There are currently no federally-designated Wild and Scenic Rivers in the Lahontan Region. However, numerous river segments in the Region are eligible for federal Wild and Scenic status (see Table 4.9-1). Federal guidelines require that rivers eligible for National Wild and Scenic River designation be managed to protect their outstandingly remarkable values and free-flowing character until Congress makes a decision concerning designation. A condition (No. 7) of the Nationwide Permit under Clean Water Act Section 404 for dredge and fill activities states that no activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status.

In 1972, the California Legislature passed the California Wild and Scenic Rivers Act (California Stats. 1972, c. 1259, p. 2510, § 5093.50 to 5093.69), which is very similar to the federal legislation. The Act prohibits the construction of dams, reservoirs, and most water diversion facilities on river segments designated by the Legislature to be included in the system. Reaches of two rivers in the Lahontan Region, the West Walker and East Fork Carson, are currently designated as California Wild and Scenic Rivers:

- **West Walker River** -- Approximately 37 river miles from Tower Lake at the headwaters downstream to the confluence with Rock Creek, near the town of Walker on the edge of Antelope Valley, as well as about one mile of one tributary (Leavitt Creek).
- **East Fork Carson River** -- Approximately ten river miles from the town of Markleeville to the California/Nevada state line.

Outstanding National Resource Water

The federal antidegradation regulation (40 CFR § 131.12), initially adopted in 1975, establishes requirements for protection of high quality waters.

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Implementation of the federal antidegradation regulations includes the potential to designate certain waters of the Lahontan Region as Outstanding National Resource Waters (ONRWs).

The water quality of the waters which are designated an ONRW must be maintained and protected. No permanent or long-term reduction in water quality is allowable in areas given special protection as ONRWs (48 Fed. Reg. 51402). Examples of such waters include, but are not limited to, waters of national and state parks and wildlife refuges, waters of exceptional recreational or ecological significance, and state and federally designated wild and scenic rivers. To date, the only California waters designated as ONRWs are Lake Tahoe and Mono Lake. However, other California waters would certainly qualify. ONRWs may be designated as part of adoption or amendment of water quality control plans. It is important to note that even if no formal designation has been made, lowering of water quality should not be allowed for waters which, because of their exceptional recreational and/or ecological significance, are eligible for the special protection assigned to ONRWs.

Beneficial Use Designations

Certain beneficial use designations recognize special qualities of the waterbody which received the designation. For example, the beneficial use of BIOL (Preservation of Biological Habitats of Special Significance) is designated for waters which support designated areas or habitats such as sanctuaries and ecological reserves. The beneficial use of RARE (Rare, Threatened, or Endangered Species) is designated for waters which support habitats necessary for the survival and successful maintenance of plant and/or animal species established by state or federal law as rare, threatened or endangered. (See also "Beneficial Uses," Chapter 2 of this Basin Plan.)

Stream Environment Zone (Lake Tahoe Basin)

A Stream Environment Zone (SEZ) designation is used in the Lake Tahoe Basin for perennial, ephemeral and intermittent streams, lakes, ponds, areas of beach or marsh soils, areas of riparian vegetation and other similar areas. Many discharge prohibitions apply to protect SEZs. (See Chapter 5 for further details.)

Sole Source Aquifer

The U.S. Environmental Protection Agency (USEPA) has authority, under Section 1424 of the Safe

Drinking Water Act, to designate certain ground waters as "sole source aquifers." Any federal financially-assisted project proposed within an area receiving this designation will be subject to USEPA review to ensure that the project is designed and constructed to protect water quality. For a more detailed discussion, see the "Ground Water Protection and Management" section of this Chapter.

Significant Natural Areas

In 1981, Significant Natural Areas legislation (Assembly Bill 1039) was passed to promote awareness and protection of biological diversity throughout California. In response to this mandate, the California Department of Fish and Game (DFG) established the Lands and Natural Areas Program (LNAP) to encourage recognition and perpetuation of California's most significant biological resources (CA Fish and Game Code 1930-1932). The LNAP issues periodically updated reports identifying Significant Natural Areas (SNAs) throughout the State. To qualify for SNA status, a site must meet at least one of the following criteria:

- the site harbors a species and/or community element that is extremely rare
- the site harbors an assemblage of three or more rare biotic elements
- the site is the "best example" of a rare community or habitat type
- the site is a center of high biological diversity

DFG has utilized the Natural Diversity Data Base to identify SNAs by county; exact boundaries of SNAs have not been established through field surveys. Numerous SNAs have been identified in the Lahontan Region. Many of these SNAs harbor special biological resources that are indicative of beneficial uses of water.

The Regional Board considers SNA and other Natural Diversity Data Base information when updating beneficial use designations for the Region's waters and when updating the Region's Geospatial Waterbody System (GeoWBS) database (see Chapter 7).

Special Aquatic Sites

Special Aquatic Sites (SASs) include wetlands, mudflats, vegetated shallows, coral reefs, riffle and pool complexes, sanctuaries and refuges (as listed in 40 CFR § 230.3), vernal pools, and riparian areas. For the purposes of the SAS definition, "riparian

areas” are areas within the jurisdictional waters of the United States which are comprised of the following habitat types, as characterized by the U.S. Fish and Wildlife Service: Palustrine Emergent Wetland, Palustrine Scrub-Scrub Wetland, Palustrine Forested Wetland (Cowardin et al. 1979). U.S. Army Corps of Engineers Section 404 nationwide permits for discharges of dredge and fill materials are not certified, except under certain conditions, for discharges which will affect SAS sites (see also “Wetlands Protection” discussion later in this section). Parts of many waters of the Lahontan Region qualify for the SAS designation as wetlands, riffle and pool complexes, sanctuaries, refuges and riparian areas. The Regional Board considers SAS information when updating beneficial use designations for the Region's waters and when updating the Region's Geospatial Waterbody System (GeoWBS) database (see Chapter 7).

Research Natural Areas and Special Interest Areas

The U.S. Forest Service (USFS) uses the designation of Research Natural Area (RNA) to preserve a specific area as a representative sample of an ecological community, primarily for scientific and educational purposes. The USFS designation of Special Interest Areas (SIA) establishes areas to managed for their unique and special features including botanical and other features. The Regional Board considers USFS RNA and SIA designations when updating beneficial use designations for the Region's waters, and when updating the Region's Geospatial Waterbody System (GeoWBS) database (see Chapter 7).

Areas of Critical Environmental Concern

The U.S. Bureau of Land Management uses the Area of Critical Environmental Concern (ACEC) designation for areas where special management is needed to protect and prevent irreparable damage to important resources including fish and wildlife resources, or other natural systems. The ACEC designation signifies that the area contains significant values or resources. The Regional Board considers BLM Areas of Critical Environmental Concern designations when updating beneficial use designations for the Region's waters, and when updating the Region's Geospatial Waterbody System (GeoWBS) database (see Chapter 7).

Water Quality/Quantity Issues; Water Export and Storage

Because much of the Lahontan Region is desert, water supplies are often limited under natural conditions. Diversions of water for human use have threatened or impaired other beneficial uses in several portions of the Region. Although the authority to issue and modify water rights licenses rests with the State Water Resources Control Board rather than with the Regional Board, the Regional Board can bring water quality problems related to water diversions to the State Board's attention, and request that solutions be considered.

Most surface water in the Lahontan Region has already been allocated through court adjudications, water rights licenses, or interstate agreements (a map illustrating all adjudicated basins in the State is available from the State Board, Division of Water Rights). The California-Nevada Interstate Water Compact was negotiated in the 1960s, approved by the states in the early 1970s, and partially ratified by Congress in 1990 as P.L. 101-618. This law allocates the surface and ground waters of the Carson River and Lake Tahoe/Truckee River watersheds between the two states. Management of reservoirs and flows of regulated streams in these watersheds is the responsibility of a federal watermaster.

Large amounts of water are exported from the Mono Lake and Owens River watersheds by the Los Angeles Department of Water and Power for municipal use in Southern California. Smaller amounts are exported to the American River and Feather River watersheds from the North Lahontan Basin. Some water is imported into the Lahontan Region via the California Aqueduct. Many natural lakes in the Region have been dammed to increase storage, and are operated as reservoirs; new reservoirs have also been constructed. (See the separate discussion of “Reservoir Management,” below.)

Diversions have totally or almost totally dewatered some lakes and streams in the Lahontan Region, impairing or precluding the attainment of aquatic beneficial uses (e.g., Owens Lake). Recent court decisions have required the rewatering of the Owens River Gorge and some Mono Lake tributaries. Where diversion is not total, lower flows, or changes in the timing of flows, can stress aquatic ecosystems through higher summer temperatures, greater winter ice formation, increases in the concentrations of pollutants, and other factors.

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Temperature and flow variations can affect critical life stages of aquatic organisms, and can change the nature and rate of nutrient and mineral cycles. In some cases (e.g., Mono Lake), lower water levels can increase the vulnerability of water-dependent wildlife to predators. Low streamflows stress riparian vegetation. Water diversions can aggravate natural stresses on aquatic and wetland ecosystems which result from droughts. Low flows can affect the ability of dischargers to surface waters to ensure attainment of receiving water objectives downstream of the discharge. The magnitude and timing of stormwater flows affects the concentration of pollutants, and the “first flush” of concentrated pollutants which have accumulated on urban pavement during the dry season can be especially stressful to aquatic organisms (see the “Stormwater” section in this Chapter). Diversions from lakes and reservoirs used for boating can result in increased demands for dredging to facilitate access to marinas and piers, with consequent water quality impacts related to resuspension of sediment and contaminants. In some parts of California, removal of vegetation, or conversion of vegetation to a different community type, is being used to increase surface runoff to increase water supplies. Water quality impacts of such practices, in terms of increased erosion and sedimentation, and loss of riparian/wetland values, can be significant.

Most municipal and agricultural water supplies used within the Lahontan Region come from ground water, often from individual wells. Ground water diversions are likely to increase because of new federal regulations which increase treatment requirements for surface sources of drinking water. Severe ground water overdraft has occurred in portions of the Region ranging from Surprise Valley in Modoc County to the Antelope and Victor Valleys in the South Lahontan Basin. Ground water overdraft can affect beneficial uses of surface waters such as wetlands and springs, particularly in dry areas. It can concentrate trace chemicals, both naturally occurring salts and contaminants due to human activities. Overdraft can lead to land subsidence and surface soil cracking. Some soil types (fine grained silts and clays), once compacted, can never again hold as much water upon rewatering of the aquifer. Severe cracking has occurred at Edwards Air Force Base near Lancaster, leading to the concern that cracks extending to the water table may facilitate the entry of toxic substances into water supplies. Increased ground water pumping in overdrafted aquifers can draw pollutants toward wells. Improperly constructed or abandoned wells can also act as conduits for pollutants (see the discussion

of well standards in the “Ground Water” section of this Chapter). Imported water used for ground water recharge, if it is of naturally lower quality than local ground water, can be considered a discharge even if no new introduction of wastes into the environment is involved (Sawyer 1988). Some types of construction projects (e.g., placement of fill in wetlands) can reduce ground water recharge.

The potential exists for increased diversion and export of water from the Lahontan Region. The Reno and Las Vegas, Nevada areas are growing rapidly, and are considering increased ground water pumping on the Nevada side of the state line. Such pumping could affect beneficial uses of surface and ground waters in California, including springs and wetlands in Death Valley which support endangered species. Concern has also been expressed about the migration of radionuclides from the Nevada Test Site in California ground waters in the area.

Water quality problems can also occur as a result of flooding. In some areas the potential for flooding has increased due to hydrologic modification, increased impervious surface, and disturbance of wetlands and riparian vegetation. Flooding can erode streambanks, and wash out sewer lines and stored fuels and hazardous materials. (See also Section 4.3, “Stormwater, Runoff, Erosion, and Sedimentation”; and the “Floodplain and Riparian Area Protection” discussion later in this section.)

Control Measures to Prevent or Mitigate Water Quality Problems Related to Water Quantity

Regional Board and other state, as well as federal and local, control actions related to water quantity/quality are described below.

Regional Board Control Actions

Actions which can be taken by the Regional Board to prevent or mitigate the impacts of water quality problems related to water quantity include:

1. Establishment of flow-weighted numerical water quality objectives for surface waters, based on long-term hydrologic data, in order to reduce the frequency of violations due to natural drought conditions.
2. Consideration of the flow and water supply needs of aquatic organisms, riparian/wetland vegetation, and wildlife when establishing biological water quality objectives.

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3. Consideration of water availability before the issuance of waste discharge requirements, and placement of conditions in requirements limiting water use in order to protect water quality. (The State Board has determined that such conditions are appropriate under limited circumstances. Because the Porter-Cologne Act provides that the Regional Board cannot specify the method of compliance, the authority to include water use limits in waste discharge requirements does not provide authority to specify water conservation measures to achieve those limits [Sawyer 1988].) One example would be placement of conditions in waste discharge requirements for hydroelectric projects to mitigate the impacts of releases from impoundments on downstream uses. (See also the "Ground Water" section in this Chapter.)
4. Issuance of waste discharge requirements for ground water recharge with imported water which is of lower quality than local ground water.
5. Issuance of waste discharge requirements for projects which would interfere with ground water recharge.
6. Encouragement of the use of Best Management Practices to minimize water use for agricultural, landscape, and turf irrigation.
7. Undertaking investigations (e.g., fact finding hearings) into ground water quality/quantity problems, and making recommendations for State Board action under Water Code Section 2100.
8. Encouragement of the use of reclaimed water wherever feasible without adverse impacts on beneficial uses. (Regional Boards are required, when establishing water quality objectives, to consider the need to develop and use reclaimed water.)
9. Recommendations to the State Board during review of construction projects which may also require water rights permits.
10. Encouragement of the adoption and implementation of wellhead protection programs. (See the discussion of well standards in the "Ground Water Protection and Management" section of this Chapter.)
11. Continued participation by Regional Board staff as observers in meetings involving proposed changes in water exportation from the Lahontan

Region (e.g., changes in the Truckee River operating agreement). Staff should also attempt to stay informed on large scale diversion proposals even when no formal meetings are being held.

12. Careful review of and consideration of waste discharge requirements for any proposals to manage vegetation or convert vegetation types in order to increase water yield from a watershed.
13. Careful staff review of CEQA documents to ensure that water quality/quantity issues are adequately addressed.

Control Measures for Water Quantity/Water Quality by other State Agencies

The Porter-Cologne Act provides authority for planning in relation to water quantity/flow issues, but implementing authority is generally separate from the authority provided by State water quality plans (Sawyer 1988).

1. Under the Public Trust Doctrine (see Chapter 1 of this Plan), the State Water Resources Control Board must consider the protection of a variety of environmental values when making decisions to issue or renew water rights permits. The State Board can grant appropriative water rights for the protection of beneficial uses, and can ensure that natural flows remain in a water body to protect designated beneficial uses. For some areas, the State Board has adopted water rights policies which give direction for future actions on water rights applications. The policy affecting the Lake Tahoe Basin was adopted in 1969 and is in need of update.
2. California water rights law does not require State permits for ground water diversions, except for underground waters which flow in defined channels (e.g., the lower Mojave River). However, the State is bound by limits such as those set by the California-Nevada Interstate Water Compact on all diversions from the Carson River and Lake Tahoe/Truckee River systems. Possible means of addressing the impacts of ground water pumping and overdraft include use of nuisance law, the Public Trust doctrine, and existing State Board authority. Adjudication of ground water rights is also possible; this could result in court appointment of a watermaster, with court-defined authority ranging from monitoring and recording to broad management powers. The State Board may also place conditions to protect ground water in grant contracts or water

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rights permits for surface water use (Sawyer 1988). See also the discussion of Water Code Section 2100 in Section 4.6 of this Chapter.

3. The Department of Fish and Game should continue to define instream flow requirements for fish and other aquatic organisms, and should bring water quality problems related to water quantity to the attention of the State and Regional Boards. The Wildlife Conservation Board can purchase land and acquire associated riparian water rights for the protection of fish and wildlife.
4. The Attorney General of California has authority to bring legal action for protection of the natural resources of the State. This authority could be used to correct water quality problems related to water quantity.

Federal Control Measures for Water Quantity/ Water Quality

1. The U.S. Environmental Protection Agency should continue to give special attention to water quality/quantity relationships in the arid west when giving direction to states on the adoption of water quality standards and the implementation of these standards in permits.
2. The Federal Energy Regulatory Commission should give special attention to the water quality/quantity impacts of hydroelectric projects proposed within the Lahontan Region.
3. Federal land management agencies within the Lahontan Region should define the water supply needs for all beneficial uses which occur within their jurisdictions, and should bring these needs to the attention of the State Board for consideration during the formulation of water rights policies and the revision of water rights permits.

Local Control Measures for Water Quantity/Water Quality

1. County water districts have broad authority to conserve, protect, and replenish ground water supplies. The Subdivision Map Act allows cities and counties to adopt ground water recharge facility plans, construct recharge facilities, and charge a fee for the construction of such facilities as a condition of approval for subdivision maps and building permits (Sawyer 1988).
2. State law permits the formation of local ground water management districts. A few such districts have been established within the Lahontan

Region, and more may be formed in response to proposed ground water pumping on the Nevada side of the state line. Local governments should strictly enforce well construction standards. Where wellhead protection ordinances have been adopted, they should be strictly enforced.

3. The Tahoe Regional Planning Agency has adopted an "environmental threshold carrying capacity" standard to protect fisheries in the Lake Tahoe Region. This standard provides that, until instream flow standards are established in the TRPA Regional Plan, a nondegradation standard shall apply to instream flows. The threshold standards also state the policy of the TRPA Governing Body to seek transfer of existing points of water diversion from streams to Lake Tahoe. The Best Management Practices Handbook in the 208 Plan (TRPA 1988) includes lists of approved native and "adapted" grass, shrub, and tree species for use in landscaping and revegetation.

Recommended Future Actions for Water Quantity/Water Quality

1. The potential exists for physical solutions to water quality problems related to ground water overdraft, such as provision of alternative water supplies, artificial recharge, or the establishment of physical barriers or injection barriers to pollutants. Such solutions can be provided through the courts in connection with water rights adjudications, or as part of ground water management programs including regulation and augmentation of supply. Physical solutions could also be authorized during approval of water development projects. These solutions may involve conjunctive use projects where surface waters are used for ground water recharge or as a substitute supply for ground water users. It is important to manage ground and surface waters as an interconnected resource (Sawyer 1988).
2. Long drought periods beginning in the 1970s inspired a variety of legislation related to water conservation and reclamation. Local governments are now required to have ordinances regulating landscape irrigation. Local governments within the Lahontan Region should be encouraged to require use of native plants or species adapted to local conditions, which have low requirements for irrigation, fertilizer, and pesticides for survival and maintenance.

Reservoir Management

Reservoirs and natural lakes used as reservoirs, are widely utilized throughout the Lahontan Region to store water for municipal and agricultural supply. These reservoirs also supply aquatic and wildlife habitat and meet ground water recharge, recreation, and flood control needs. Reservoir operations and maintenance activities can impact water quality and beneficial uses both within and downstream of reservoirs.

Reservoir release practices can result in the release of high levels of nutrients and sediments, deoxygenated water, or insufficient downstream flows to sustain fish and maintain aquatic habitats. The release of deoxygenated water from the bottom of reservoirs is extremely detrimental as it can result in large downstream fish kills. Likewise, the release of warmer water can also impact downstream aquatic life forms. Reservoir discharges through improperly designed spillways can increase downstream erosion.

Stored or impounded water can develop taste and odor problems caused by algal growth or other microorganisms. Water impoundment can also cause water temperature to increase. Temperature differences between inflowing water and reservoir surface water can result in the formation of density or turbidity currents. These currents plunge below the surface, carrying any sediment load to the reservoir dam.

Point and nonpoint sources of pollution within a reservoir's drainage area, such as fertilizer applications, bank erosion, timber harvesting, stormwater runoff, wastewater discharges and industrial discharges, can contribute to the sediment and nutrient load into a reservoir. High nutrient levels in a reservoir can contribute to accelerated eutrophication and/or impact downstream waters. Most reservoirs act as large sediment basins and accumulate sediments. Coarse sediments usually deposit in a delta at the head of the reservoir, while finer sediment can remain in suspension and may eventually settle in the deepest pools or be carried to the dam. Some pollutants, such as metals, can be re-suspended from the sediments into the water column. Certain conditions, such as flooding or reservoir dewatering, can cause accumulated reservoir sediments to be discharged into downstream waters.

Dredging is sometimes used to remove sediment, and to control internal nutrient cycling and macrophyte growth. However, dredging itself can impact water quality and beneficial uses. Specific

impacts and regulation of dredging are discussed in the "Boating and Shorezone Recreation" discussion of the "Recreation" section of this Chapter.

Control Measures for Reservoirs

(See also Control Measures for Lake Restoration later in this Section.)

The reservoirs (both constructed and natural lakes operated as reservoirs) in the Lahontan Region and their beneficial uses are listed in Chapter 2. Past control measures for these reservoirs included adoption of waste discharge requirements (WDRs) for construction activities (regulation of discharges related to waste earthen materials, stormwater runoff, construction-related wastes, domestic wastewater generated during construction). WDRs have also been adopted for hydroelectric projects associated with reservoirs (hydroelectric projects are discussed in the "Mining, Industry, and Energy Development" section of this Chapter). The WDRs included surface water discharge limitations for a variety of water quality parameters including nutrients, turbidity, pH, taste, odor, temperature and algal growth potential, as well as Best Management Practices (BMPs) to prevent discharge of waste earthen materials. Construction of future reservoirs will be regulated in a similar manner. During review of any future proposed reservoirs, the Regional Board will coordinate closely with the State Board's Division of Water Rights, California Department of Fish and Game, California Division of Dam Safety, as well as other agencies.

Recommended Future Actions for Reservoir Management

In addition to careful review of proposed new reservoirs, the Regional Board should focus on operations and maintenance of existing reservoirs to minimize impacts on water quality and beneficial uses. This regulation should incorporate relevant provisions contained in the State Board's Thermal Plan. (The Thermal Plan is summarized in Chapter 6.) Through MAAs, MOUs or WDRs, operation and maintenance activities such as dredging, discharges, and repairs should include control measures to prevent increases in nutrient levels and sediment loads, as well as BMPs to prevent downstream bank erosion and impacts to downstream aquatic habitats. The Regional Board should consider a prohibition against the release of deoxygenated water from reservoirs.

Wetlands Protection and Management

California historically supported an estimated 5 million acres of wetlands. Wetlands have not always been considered as valuable natural resources. Thus, in California, an estimated 91 percent of wetlands have been lost due to alterations in their biological, chemical and physical properties (National Research Council 1992). The remaining wetlands are considered very valuable resources. Wetland values and functions include high productivity, water purification, flood control, nutrient removal and transformation, sediment stabilization and retention, water supply, ground water recharge and erosion control. The high biological productivity of wetlands results in important wildlife habitat for both aquatic and terrestrial animals and plants, including feeding, breeding and nursery grounds. A greater than average number of rare species are found in wetland habitats. Wetlands also provide a number of other scientific, educational and aesthetic uses.

The statewide Water Quality Assessment database (see Chapter 7 of this Basin Plan) lists some of the wetlands within the Lahontan Region. The Regional Board also maintains a separate wetland database that includes general locations (maps), descriptions, and assessments of the condition of many wetlands within the Region. Because of the seasonality of rainfall in the Region, some wetlands may not be easy to identify by simple means (e.g., aerial photographs) or by obvious wetland characteristics. Thus, site-specific boundaries of the Region's wetland areas will be determined on an as-needed basis using methods in the current "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" (U.S. Army Corps of Engineers, 1987) performed by certified wetland delineators (certification program established in accordance with Section 307[e] of the Water Resources Development Act of 1990) or by other qualified professionals acceptable to the Regional Board. A separate method of identifying "Stream Environment Zones" in the Lake Tahoe Basin is used for regulatory purposes in that watershed (TRPA 1988, Vol. III).

Wetlands within the Region are defined to include areas that are "inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (including) playa lakes, swamps, marshes, bogs and similar areas such as sloughs, prairie potholes, wet meadows,

prairie river overflows, mudflats, and natural ponds" (40 CFR § 110.1[f]).

The federal Clean Water Act formally equates "navigable waters" with "waters of the United States" (§ 502[7]). The Code of Federal Regulations also equates "navigable waters" to "waters of the United States" and specifically incorporates wetlands in navigable waters definitions, including those for interstate and intrastate waters (40 CFR § 232.2[q]). The Porter-Cologne Water Quality Control Act (CA Water Code § 13050[e]) defines "waters of the State" to be "any water, surface or underground, including saline waters, within the boundaries of the State." Thus, wetlands are both waters of the State and waters of the United States. Therefore, provisions of the California Water Code apply. These provisions include protection of beneficial uses and water quality. Beneficial uses of wetlands are listed in Chapter 2 of this Plan. Water quality objectives which apply to surface waters, including wetlands, are included in Chapter 3 of this Plan. (The Regional Board recognizes that the natural pH of some wetlands may not meet the pH narrative objective.)

Numeric criteria to protect one or more designated uses of surface waters have been developed by the U.S. Environmental Protection Agency (USEPA). Where appropriate, these criteria directly apply to wetlands. For example, wetlands which actually are, or recharge, municipal water supplies should meet human health criteria. The USEPA numeric criteria for protection of freshwater aquatic life, as listed in "*Quality Criteria for Water—1986*," although not developed specifically for wetlands, are generally applicable to most wetland types (USEPA 1990).

As with other types of surface waters, such as saline or alkaline lakes, natural water quality characteristics of some wetlands may not be within the range for which the criteria were developed. Adjustments for pH, hardness, salinity, temperature, or other parameters may be necessary.

Impacts to the water quality of wetlands can negatively affect any or all of the wetlands' functions and values. Thus, the following control measures are necessary to protect wetlands.

Control Measures for Wetland Protection

As direction for implementing control measures for wetlands protection, the Regional Board will use Senate Concurrent Resolution No. 28 which states that "*It is the intent of the Legislature to preserve, protect, restore, and enhance California's wetlands*

and the multiple resources which depend upon them for the benefit of the people of the State.”

Regional Board and other State, as well as federal and local, wetland protection control actions are described below and apply to all wetlands which are considered “waters of the State” and/or “waters of the United States.” Additional control measures applicable to “Stream Environment Zones” in the Lake Tahoe Basin are discussed in Chapter 5. Control measures specific to constructed/artificial wetlands are also included below, and in the sections of this Chapter on “Wastewater” and “Stormwater.” The “Stormwater” section includes a detailed discussion of the use of wetlands for stormwater treatment. Control measures specific to wetland restoration are discussed separately, later in this section.

Regional Board Control Measures for Wetland Protection and Management

1. For proposed discharges of municipal wastewater, stormwater, solid wastes, earthen materials, or other wastes to wetlands, the Regional Board will ensure that wetlands are afforded the same level of protection as other types of surface waters with respect to standards and minimum treatment requirements. For discharges to wetlands, all applicable water quality standards for the wetland and any adjacent waters must be met. Recommended conditions pursuant to Clean Water Act Section 401 Water Quality Certification, waste discharge requirements, monitoring and inspections programs, Cease and Desist/Clean-up and Abatement Orders will be implemented as necessary. The monitoring may include water quality, sediment quality, whole effluent toxicity and biological measurements such as diversity indices. Monitoring the fate of persistent or bioaccumulative contaminants may also be required by the Regional Board.
2. Hydrology is a major factor influencing the type and location of wetlands. To protect the beneficial uses and water quality of wetlands from impacts due to hydrologic modifications, the Regional Board will carefully review proposed water diversions and transfers (including ground water pumping proposals), and require or recommend control measures and/or mitigation as necessary and applicable.
3. In conjunction with beneficial use designations and water quality objectives, the Regional Board will implement the State Board's Resolution No. 68-16 “Statement with Respect to Maintaining High Quality Waters In California” (see “Nondegradation Objective” in Chapter 3; also see Chapter 6, “Plans and Policies”) to regulate point and nonpoint source discharges to wetlands, particularly for those types of impacts difficult to assess through compliance with established water quality objectives alone (e.g., impacts due to physical and hydrological modifications).
4. The Clean Water Act Section 401 program (Water Quality Certification process) gives the Regional Board extremely broad authority to review proposed activities in and/or affecting the Region's waters (including wetlands). The Regional Board can then recommend that the State Board grant, deny, or condition certification of federal permits or licenses that may result in a discharge to “waters of the United States” (e.g., U.S. Army Corps of Engineers CWA Section 404 permits, licenses from the Federal Energy Regulatory Commission). The Regional Board, in coordination with the State Board, will use this authority to prevent impacts to beneficial uses of wetlands and/or violation of wetlands water quality objectives. In addition to recommending that the State Board grant, deny or condition certification of federal permits or licenses, the Regional Board has independent authority under the California Water Code to regulate discharges to wetlands through waste discharge requirements or other orders (see No. 1 above).
5. Many beneficial uses and the water quality of wetlands can be impacted by filling and dredging. For proposed discharges due to dredging activities, and for proposed discharges of dredged and/or fill materials into wetlands regulated under Clean Water Act Section 404 (U.S. Army Corps permit program), the Regional Board will utilize the process described above in No. 4.

Note: U.S. Army Corps Section 404 nationwide permits for discharges of dredge and fill materials are not certified, except under certain conditions, for discharges which will affect “Special Aquatic Sites.” Special Aquatic Sites are defined in the “Special Designations to Protect Water Resources,” at the beginning of this Section.

During its review of projects proposing discharges of dredged and/or fill materials into wetlands, the Regional Board will consider whether the project is water dependent and

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whether there are viable project alternatives. For projects where no viable alternatives exist, the Regional Board will consider whether wetland impacts can be made acceptable through certification and/or permit conditions. The Regional Board may elect to use its independent authority under the California Water Code to regulate discharges to wetlands through waste discharge requirements or other orders (see No. 1 above).

6. The Regional Board now coordinates wetlands permitting with other agencies. Staff will work with local governments toward further streamlining of the permitting process by facilitating earlier consultation with and coordination among all permitting agencies, including the U.S. Army Corps of Engineers and the California Department of Fish and Game. Improved coordination may also include measures such as development of a single permitting package containing necessary forms and instructions for all appropriate agencies, with coordinated review times, and development of Memoranda of Understanding with local governments.
7. The Regional Board will also explore the feasibility of streamlining permitting by defining wetland values and mitigation requirements on an areawide basis (e.g., for an existing subdivision) and then issuing general waste discharge requirements, waiving waste discharge requirements, or recommending waiver of Water Quality Certification for subsequent individual projects in that area. Areawide permits, or new Regional Board policy language, would define the specific types of wetland disturbance covered and the extent of mitigation required. This process could be coordinated with the U.S. Army Corps of Engineers' Special Area Management Plan (SAMP) process and/or with local governments' wetlands plans and policies (see the section below on "Local Control Measures for Wetland Protection and Management"). Areawide general permits or new Regional Board policies would require CEQA compliance, with project level detail on required mitigation.
8. For proposed fill activities or other discharges which will result in wetland loss, the Regional Board will require compensatory mitigation so that there will be no net loss of wetland acreage and no net loss of wetland functions and values when the project and mitigation lands are evaluated together. The Regional Board may require an inventory of wetland characteristics to

take place prior to wetland disturbance to determine wetland size, functions and values, to serve as a guide for wetland restoration or creation, and to form a comparative basis for evaluating the success of the mitigation project.

In determining the functions and values of the wetland, the Regional Board will consider integrated physical, chemical and biological wetland parameters including water purification, flood control, nutrient removal and transformation, sediment stabilization and retention, water supply, ground water recharge/discharge, erosion control, recreation, wildlife diversity/abundance and aquatic diversity/abundance. Suggested methods to determine wetland function and values are shown in Table 4.9-2. The Regional Board will consider wetland function and value determinations made by other methods such as the Wetland Evaluation Technique (WET) developed by Adamus et al. (1987) for the U.S. Army Corps of Engineers. Wetland function and value determinations made using other methodologies will be considered by the Regional Board on a case-by-case basis. In recognition that determining wetland function and value uses relatively new methods, the Regional Board will carefully and judiciously make wetland function and value determinations. The Regional Board will also track the development of new methodologies, and review such methodologies for application in future wetland function and value determinations.

The Regional Board will consider wetland boundaries determined by using the U.S. Army Corps of Engineers' 1987 "Federal Manual for Identifying and Delineating Jurisdictional Wetlands." Delineation of wetlands shall be performed by certified wetland delineators (certification program established in accordance with Section 307[e] of the Water Resources Development Act of 1990) or by other qualified professionals.

The Regional Board will coordinate all wetland mitigation requirements with those of the U.S. Army Corps of Engineers.

9. The Regional Board prefers avoidance of wetland disturbance to disturbance followed by mitigation such as restoration or creation. In its review of projects with potential wetland impacts, the Regional Board will follow the sequence of:

Avoid; Minimize; Mitigate. Through a thorough analysis of project alternatives, the project proponent must first demonstrate to the Regional Board that wetland impacts are not avoidable. If the impacts are not avoidable, the proponent must then demonstrate that the impacts to the wetland area are the minimum necessary for the project. The project proponent must then propose mitigation to compensate for any wetland impacts.

When mitigation is necessary, the Regional Board prefers in-kind, on-site mitigation whenever possible. If not possible, the Regional Board will then consider in-kind, off-site mitigation. As a last choice, the Regional Board will consider out-of-kind mitigation. "In-kind" means that the mitigation wetland site will have similar function and value to that of the disturbed wetland site in terms of physical, chemical and biological wetland parameters including water purification, flood control, nutrient removal and transformation, sediment stabilization and retention, water supply, ground water recharge/discharge, erosion control, recreation, wildlife diversity and abundance, and aquatic species diversity and abundance. "Out-of-kind" means that the mitigation wetland site will substantially differ from the disturbed wetland site in regard to these same parameters.

Regional Board staff is available to assist the project proponent by identifying potential mitigation opportunities. The Regional Board may accept payment by the project proponent to a mitigation bank or to another entity that will provide the required mitigation.

10. Restoration of an historic wetland (once functioning wetland but now damaged or destroyed) generally will have a greater chance of success in terms of restoration of wetland functions and long-term persistence than constructed wetlands at an upland site (Kusler and Kentula 1990). Thus, for mitigation purposes, the Regional Board prefers wetland restoration rather than wetland creation.
11. For restored or created wetlands, measures may be necessary to protect the wetland from excessive sedimentation, foot traffic, offroad vehicles, exotic species, or other factors that may inhibit wetland functions or degrade wetland values. Protective measures may include buffers (between the mitigation site and the surrounding

area), fences or other barriers, and sedimentation basins. Thus, the Regional Board will require that the proposed mitigation provide for buffer zones or other protective measures, as appropriate.

12. When mitigation is necessary, the Regional Board will require, as a waste discharge permit condition, or as a recommended condition for Clean Water Act Section 401 Water Quality Certification, that a mitigation plan be prepared and executed. The plan must demonstrate that no net loss of wetland acreage and no net loss of wetland functions and values will occur when the project and mitigation lands are evaluated together. Proof of ownership, easement, or similar documents for the mitigation site must be provided in the mitigation plan. The plan should also clearly establish specific goals of the mitigation that can be targeted in subsequent evaluations. Wetland restoration or creation proposed as compensatory mitigation, which could or will result in a waste discharge, will be regulated as necessary by the Regional Board to ensure compliance with all provisions of this Basin Plan (see also "Wetland Restoration" discussion later in this Section, as well as "Constructed Wetlands" discussion in Section 4.4 of this Chapter). For both restored or created compensatory wetlands, the mitigation plan should include details of establishing and maintaining the restored wetland, as well as a monitoring program to evaluate the status and success of the restoration or creation.
13. Created wastewater treatment wetlands designed, built, and operated solely as wastewater treatment systems are generally not considered to be waters of the United States (USEPA 1990). Water quality standards that apply to natural wetlands generally do not apply to such created wastewater treatment wetlands. However, many created wetlands are designed, built, and operated to provide, in addition to wastewater treatment, functions and values similar to those provided by natural wetlands. Under these circumstances, such created multiple use wetlands may be considered waters of the U.S. and applicable water quality standards would apply. The applicability of water quality standards to created wetlands will be determined by the Regional Board on a case-by-case basis. In its determination, the Regional Board will consider factors such as size, type of waste to be treated, location, degree of isolation of the created wetlands, and other appropriate factors.

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Any discharge from a created wetlands which does not qualify as "waters of the U.S." must meet applicable water quality standards of its receiving water(s).

Control Measures for Wetland Protection and Management by Other State Agencies

1. Through required conditions in its Lake/Streambed Alteration Permits, the California Department of Fish and Game can provide some wetland protection, especially for fish and wildlife resources, and other aquatic resources.
2. The California Resources Agency, including the Departments of Fish and Game and Water Resources, is developing a comprehensive wetlands conservation plan. State Board staff is participating in the Resources Agency's planning process. An implementation strategy is to be included in the conservation plan. The strategy may include specific legislation, bond acts, administrative law changes, and other means as necessary to accomplish the goals of the conservation plan.
3. The California Department of Parks and Recreation has developed a Wetlands Protection Policy.
4. The California Department of Forestry utilizes a streamside protection zone system which provides some wetlands protection.

Federal Control Measures for Wetland Protection and Management

1. The United States Army Corps of Engineers (COE) addresses intrusions into navigable waters and issues permits for discharge of fill and dredge material to navigable waters (including wetlands). These permits are referred to as Clean Water Act (CWA) Section 404 permits. In its permitting process, the COE considers comments from other federal agencies, such as the U.S. Fish and Wildlife Service and from state agencies, such as the Regional Board and the California Department of Fish and Game. The permits are reviewed by the U.S. Environmental Protection Agency. The USEPA has veto authority over COE CWA Section 404 permits for discharges to navigable waters.
2. Under the Emergency Wetlands Resources Act of 1986, the U.S. Fish and Wildlife Service (USFWS) is required to complete the mapping of wetlands within the lower 48 states by 1998 through the National Wetlands Inventory and to

assess the status of the nation's wetland resources every ten years. The maps, status and trends resulting from the USFWS's work will provide necessary documentation to support additional wetlands protection measures if necessary.

3. The U.S. Forest Service utilizes a streamside protection zone system which provides some wetlands protection.

Local Control Measures for Wetland Protection and Management

1. The Tahoe Regional Planning Agency, in cooperation with the Regional Board, implements discharge prohibitions and other protection measures for "Stream Environment Zones," including wetlands, in the Lake Tahoe Basin (see Chapter 5 of this Plan).
2. Mono County is developing a Wetland Preservation Policy. The draft policy includes wetlands protection or "buffer" zones, development guidelines and mitigation requirements including provisions for the development of a local mitigation bank.
3. The Mojave River Task Force, with members from the staff of the Town of Apple Valley, the Cities of Hesperia and Victorville and San Bernardino County Regional Parks, is developing a multiple objective resource management plan for the Mojave River Corridor (San Bernardino County). One main objective of the plan is to balance the many uses of the riparian corridor such as wetland habitat, recreation and flood control while still providing the necessary level of resource protection.

Recommended Control Measures for Wetland Protection and Management

1. When practical, where wetland restoration or creation is required as mitigation, the Regional Board should consider requiring that the mitigation be completed **before** allowing wetland disturbance to occur.
2. Because of the risks inherent in restoring or creating certain wetland types, such as those which support threatened or endangered species or unique biological communities, area ratios of disturbed to restored/created wetlands should be 1:1.5, 1:2, or higher, for some mitigation projects. Larger mitigation areas increase the likelihood of successfully restoring or creating the wetland function and value of the disturbed wetland.

3. Design of wetland restoration and creation should consider the relationship of the wetlands to the watershed (including water sources, other wetlands, adjacent upland and deep water habitats).
4. The Regional Board should encourage local government entities to develop and execute wetland protection policies. The policies should include provisions to develop local mitigation banks whose primary focus is on the restoration of historic wetland sites (once functioning wetland sites that are now damaged or destroyed).
5. The Regional Board should encourage evaluation of past wetland mitigation efforts to guide future efforts.
6. The Regional Board should discourage wetland disturbance in areas designated by the California Department of Fish and Game as Significant Natural Areas (see "Special Designations to Protect Water Resources" at the beginning of this Section).

Floodplain and Riparian Area Protection

(See also "Wetlands" discussion above, and the discussion of discharge prohibitions in Section 4.1.)

A 100-year floodplain is defined as the extent of a flood that has a statistical probability of occurring once in 100 years. Floods of this extent may occur more than once every 100 years, and floods of even greater extent are possible. Most state, federal and local floodplain protection planning is based upon the 100-year floodplain. Floodplains often include wetland and riparian areas which may extend beyond the limits of the 100-year floodplain. Riparian areas are typically defined as the terrestrial moist soil zone immediately adjacent to wetlands, lakes, and both perennial and intermittent streams.

Undisturbed floodplains and riparian areas provide natural storage for flood waters and thus moderate downstream flood flows and augment dry season (base) flows. The wetland and riparian areas of floodplains can provide water treatment including settling of suspended matter as flood flows are slowed, physical filtration of sediment and associated chemicals by vegetation, uptake of nutrients by roots and foliage, adsorption of chemicals on soil particles, and uptake and chemical transformation of substances by soil microorganisms. Riparian areas are important habitat for fish and other wildlife

(including significant habitat for threatened or endangered species), providing drinking water, abundant food, a moderate climate (with more shade and cooler temperatures than many upland areas), and shelter. Riparian areas support abundant and diverse mixtures of plant and animal life. An estimated 25 percent of California's mammals, half of its reptiles, and three-fourths of its amphibians are closely associated with riparian areas (Warner and Hendrix 1984). Riparian vegetation is important in providing streambank stability and shading, temperature control, and food for aquatic systems.

In addition to the values of flood control, water quality protection, base flow augmentation, and wildlife habitat, floodplains and riparian areas can provide opportunities for dispersed recreation, access points for water contact recreation, and open space for aesthetic enjoyment. As all of these values can be impacted by development or other disturbances in the floodplain and riparian areas, protection measures are necessary.

Control Measures for Floodplain and Riparian Areas

Regional Board and other state, as well as federal and local, floodplain and riparian protection control actions are described below.

Regional Board Floodplain Control Actions

Regional Board prohibitions regarding floodplains, as well as prohibition exemption criteria, are described in the Waste Discharge Prohibitions section of this Chapter, and in the Lake Tahoe Chapter.

Control Measures for Floodplain and Riparian Areas by other State Agencies

1. California Executive Order 8-39-77 directs that "all agencies responsible for programs which affect land use planning, including state permit programs, shall take flood hazards into account in accordance with recognized floodway and 100-year frequency flood design standards when evaluating plans and shall encourage land use appropriate to the degree of hazard involved."
2. The California Department of Water Resources (1980) flood management policy includes the following provisions:
 - The preferred method of flood damage reduction is to adjust use and occupancy of the floodplain through management or regulation of uses, rather than solely by structural works in the stream;

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- Structural flood damage reduction projects should usually be limited to those already developed areas in which flood-proofing or relocation of development is not economically or socially feasible;
 - The social values of essentially natural streams will be recognized, and flexibility in degree of protection will be considered where a community so desires since the traditional solution of channelization or elimination of a stream is often seen as a bigger problem by the community;
 - The structural integrity of existing flood protection works must be assured through effective management and surveillance programs, accompanied by programs to deal with residual risks;
 - Flood management efforts will be carried out in a way that incorporates ground water recharge, wetland, fish and wildlife protection and enhancement, and recreational development as integral parts of the flood management program. This includes recognition of the values of wetland and riparian habitat and native vegetation and maximum efforts to preserve these values and resources.
3. California Department of Forestry and Fire Protection (CDF) Forest Practice Rules (Rules) detail specific best management practices to protect riparian areas during timber harvest operations on non-federal lands throughout California. These Rules require establishment of Watercourse and Lake Protection Zones adjacent to lakes, streams, wetlands, and springs to exclude equipment, roads, and landings, and to retain sufficient canopy cover.
 4. Other state agency programs which may regulate floodplain and riparian protection activities include the Department of Fish and Game's stream alteration permit program and endangered species review process (see "Sensitive Species and Biological Communities" discussion later in this section).

Federal Control Measures for Floodplain and Riparian Areas

1. The 1977 Executive Order 11988 (floodplain management) and Executive Order 11990 (wetlands) directed federal agencies to avoid actions that would adversely affect floodplains

and wetlands. The floodplain order states that if avoidance is not practical, agencies are to restore and preserve natural floodplain values. The order also provided a basis for coordination among the many federal agencies with floodplain management authority.

2. A U.S. Forest Service policy (Leven 1984) provides that preferential consideration be given to riparian area-dependent resources over other resources and activities when conflicts occur.
3. The U.S. Army Corps of Engineers federal Clean Water Act Section 404 permit program for dredging and filling activities also affects floodplains. For details of the Section 404 permit program, see "Wetlands Protection" discussion above.

Local Control Measures for Floodplain and Riparian Areas

Many counties in the Region provide general protection for floodplains and riparian areas through zoning, land use ordinances and the project review process. Examples include specified buffer zones, building setbacks, grading limits, and building bans within floodplains.

Recommended Future Actions for Floodplain and Riparian Areas

1. For proposed projects with probable floodplain impacts where floodplains have not been mapped by FEMA or the Corps of Engineers, the Regional Board should require appropriate floodplain mapping by the project applicant.
2. The Regional Board should consider adopting floodplain discharge prohibitions for other environmentally sensitive areas of the Region such as Mammoth Lakes.
3. The Regional Board should continue to promote protection of riparian areas on U.S. Forest Service, U.S. Bureau of Land Management, and non-federal grazing operations, allotments, and leases.

Forest Management

Forested lands are found throughout the Lahontan Region. Management of these lands can include timber harvests, fire suppression, the use of prescribed fire, and other activities. Forest management activities can also include the use of pesticides and various restoration techniques. Restoration techniques and pesticide use are discussed elsewhere in this Chapter.

Silviculture/Timber Harvests

Silvicultural activities in the Lahontan Region occur on both federal and non-federal forest land. Tree harvesting methods include commercial thinning, clearcutting, sanitation, and salvaging of dead or dying trees. These harvesting operations are performed on areas of up to several thousand acres, and involve equipment such as chainsaws, tractor skidders, dozers, logging trucks, and road watering trucks. Many of these areas have not been harvested for many decades, if at all, and therefore have thick undergrowth, especially near streamcourses or wetlands. Logging activities such as road construction and improvement, log landings, watercourse crossing construction, and endlining, can result in soil erosion and discharge to streams, streamcourse damage, compaction or removal of riparian soil and vegetation, and soil and plant loss in wetlands.

Control Measures for Silvicultural Activities

The Regional Board reviews proposed forest management activities for compliance with the provisions of this Basin Plan, and acts as a "responsible agency" under CEQA to review timber harvest proposals in the Region. The review of timber harvest activities includes reviewing timber harvest plans to assess the potential for adverse effects to water quality from silvicultural activities, inspecting the planned harvest area with the land owner or representative, and prescribing water quality protection measures. If Regional Board concerns during this review are not satisfactorily addressed, the Regional Board can appeal the harvest plan. The Regional Board reserves the option to adopt waste discharge requirements for forest management activities that pose a threat to water quality.

The Regional Board reviews timber harvest proposals for both federal and non-federal lands. However, such review for National Forest System (NFS) lands differs from that on nonfederal lands. Special forest management provisions apply to the Lake Tahoe Basin (see Chapter 5).

Federal Lands. The USFS has the authority and responsibility to manage and protect the land which it administers, including protection of water quality. When the USFS plans a timber harvest, it generally writes a NEPA document and routes it for public review. When the Notice of Decision is approved, the USFS writes a timber sale contract agreement with the hired logger. This agreement lists the terms of contract and includes protection measures for streamcourses, sensitive vegetation, soil stabilization, and erosion prevention that the logger must follow.

The State of California has a Memorandum of Understanding (MOU) with the USFS to insure that the State Clearinghouse receives copies of NEPA documents for major projects. The Clearinghouse then distributes copies to the appropriate state agencies for the designated review period. The MOU applies to projects which have the potential to exceed State or regional water quality standards or violate other provisions of this Basin Plan.

More specific to timber harvest plans is the Management Agency Agreement (MAA) between the USFS and State Water Resources Control Board (State Board). The MAA recognizes the mutual desire of each agency to achieve the goals of the Federal Water Pollution Control Act and to assure control of water pollution through implementation of Best Management Practices (BMPs). Each agency mutually agrees to coordinate water quality monitoring, share data, and cooperate in other water quality management planning activities.

During timber harvest activities on NFS lands, the USFS requires use of BMPs to directly or indirectly mitigate adverse effects to water quality and beneficial uses. Once BMPs are applied during a timber operation, their effectiveness is evaluated by the USFS. If BMP implementation did not produce the desired results, the USFS initiates corrective action and the BMPs may be modified as needed.

Timber harvest BMPs that are intended to protect water quality include:

- The location and method of streamcrossings, and location of skid trails and roads, must minimize impacts to water quality.
- Maintenance of the natural flow of streams and reduction of sediment and other pollutants that may enter watercourses.
- All project debris must be removed from the streamcourse in the least disturbing manner.
- Timber operators must repair all damage to streamcourses, banks and channels.
- Water bars and other erosion control structures must be located to prevent water and sediment from being channeled into streamcourses and to dissipate concentrated flows.
- Equipment must stay a set minimum distance from streamcourses depending upon slope and high water mark.

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- Proper drainage must be maintained during use of log landings.
- Used landings must be ditched or sloped to permit drainage and dispersion of water.
- Appropriate water quality monitoring shall be conducted.

Non-federal lands. The State Board recognizes the water quality authority of the Board of Forestry (BOF) and the California Department of Forestry (CDF) during timber operations on non-federal lands. The State Board has certified a water quality management plan which includes Best Management Practices for these timber operations on non-federal lands.

When a timber owner wishes to harvest on private lands, a registered professional forester (RPF) is required to complete and sign a Timber Harvest Plan (THP). The THP includes a topographic map of the area, determination of number of acres, expected time period of operation, locations of roads, large landings and stream crossings, type of harvest, and watercourse and wetland protection measures. This THP is then filed with CDF. A review team meeting is held at the regional CDF office. This meeting may include representatives from CDF, the Regional Board, California Department of Fish and Game (DFG), and California Department of Parks and Recreation (CDP&R). After the meeting, a copy of the THP with any revisions is sent to the Regional Board for its review of potential water quality impacts.

Regional Board staff may elect to meet on-site with CDF staff and the RPF who completed the THP. The land or timber owner and a DFG inspector may also be present. The timber harvest operation is inspected to ensure compliance with State Forest Practice Rules (FPRs) and the Regional Board's Basin Plan. These FPRs include the following provisions:

- Timber operations shall prevent unreasonable damage to riparian vegetation, and site productivity must be maintained by minimizing soil loss.
- Appropriate levels of protection are assigned to different types of watercourses, including minimum distances logging machinery must be kept away from streamcourses and wet areas (buffer zones). The widths of the buffer zones depend on side slope and beneficial uses of the water.
- At least 50% of the understory (acts as sediment filter) and overstory (shades water to maintain temperature) must be retained along streamcourses and wetlands.
- Watercourse crossings must be kept to a minimum.
- If fish are present, the crossing must allow unrestricted passage of fish and water.
- Roads must be located and constructed to minimize impacts to water quality.
- Roads and landings should have adequate drainage.
- Heavy equipment is not to be operated on unstable soils or slide areas.
- Waterbreaks must be installed before the winter period. Standards are to be followed for distances between water breaks on slopes. These water breaks should allow water to discharge into vegetative cover, duff, slash, rock or less erodible material to minimize erosion and should be maintained during timber operations.
- Timber operations during the winter period must not be performed under saturated soil conditions.
- Material from logging operations shall not be discharged into waters of the State in quantities deleterious to beneficial uses of water.
- Timber operators shall not use watercourses, marshes or wet meadows as log landings, roads or skid trails.
- Vegetation and soil bordering or covering meadows and wet areas shall be retained and protected during timber operations.
- Trees cut within watercourse and lake protection zones shall be felled away from the watercourse by endlining to protect vegetation from heavy equipment operations.

Lake Tahoe Basin. Special control actions for forest management activities within the Lake Tahoe Basin are included in Chapter 5 of this Plan.

Recommended Future Actions for Silvicultural Activities

Regional Board staff should continue to actively review both federal and non-federal timber harvest proposals and to conduct on-site inspections as

necessary. Future Regional Board efforts should focus on cumulative water quality impacts of forest management activities.

Fire Control and Prescribed Burns

Wildfires are part of the natural process of the forest ecosystem. Some species of trees and other plants are dependent upon wildfires for seed germination and/or seedling establishment. However, these fires, both natural and human caused, can have major impacts on vegetation conditions with subsequent effects on soils and water quality. In many forests, fire suppression techniques are commonly used, adding an abundance of available “fuel” to the forest. This “fuel” can contribute to a high intensity wildfire which magnifies impacts on vegetation, soils, and water quality.

Fires initiate a process of soil movement that continues through subsequent rainstorms. The process begins as fires consume vegetation. With the vegetation removed, effective ground cover to hold soils in place is also removed. The vegetation is no longer removing and using soil nutrients like nitrogen and phosphorus. Many nutrients are left in the ashes which can easily be transported to surface waters by stormwater runoff or ground water flow. If the fire destroys the duff layer (a biologically rich protective layer of decaying needles and branches), only easily erodible ashes are left to cover the bare mineral soils. The duff layer normally functions like a sponge, soaking up precipitation, including snow melt. Without the duff layer, the water which would normally infiltrate to ground water becomes erosive runoff. In areas of sandy soils, intense burning of the duff layer can chemically alter the soils, creating a water repellent or “hydrophobic” layer which can further increase runoff. Runoff can rapidly erode bare mineral soil and flush nutrient-rich ashes into rills and gullies. With more runoff, these gullies can increase in size, eventually draining to surface waters, eroding upland areas, scouring some natural stream channels while adding sediments to some channels and lakes. This increased sedimentation can impact fish spawning gravels and fill pools and riffles which are important aquatic habitat components. Sediments also contribute large amounts of nutrients to streams and lakes. Fires can further impact water quality by increasing the return periods of floods associated with moderate and extreme storms. Fires can also impact water temperature by reducing stream shading.

Burning under prescribed conditions to control undesirable vegetation, control insects or pathogens, or to maintain ecological succession, can have similar

water quality impacts to those of wildfires, but usually on a lesser scale.

Thus, from a water quality perspective, controlling fires is important. However, fire fighting can also leave its mark on watersheds. The activities of firefighters and heavy equipment can result in soil disturbance, vegetation removal, and stream sedimentation. Chemical fire retardants also have the potential to impact water quality. Many of these fire retardants are ammonium-based and decompose to such products as ammonia, sodium cyanide and sulfuric and phosphoric acids. Some retardants are mixes of foaming and wetting agents. Aquatic toxicity testing of these fire retardants has shown aquatic organism sensitivity to many retardants. In the case of foaming agents, the water surface tension is reduced which interferes with the ability of fish and other organisms to obtain oxygen from the water.

Control Measures for Fire Control and Prescribed Burn Operations

The Regional Board shall rely on the water quality expertise of the USFS and CDF to promptly take measures after fires to reduce the adverse effects on water quality and beneficial uses. The Regional Board shall further rely on the USFS and CDF in the design and use of fire control activities and prescribed burn activities which avoid or minimize adverse impacts on water and soil resources. The Regional Board encourages the USFS and CDF to consider the following measures to protect water quality and beneficial uses.

- Burning under prescribed conditions should generally be located away from stream channels or standing water. Some types of burns may be closer to standing water. The Regional Board should be notified of any proposal to conduct burning activities near watercourses.
- When the residual fuel load will be acceptable, non-burning techniques such as scattering or hauling away slash are preferred, especially where the slash will provide soil protection. (Timber harvests and herbicide use, both possible means of reducing fuel loads, are discussed elsewhere in this Chapter).
- When fighting fires, direct drops of fire retardants into streams, lakes, wetland areas, or riparian areas should be avoided.

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Recommended Future Actions for Fire Control and Prescribed Burn Operations

The Regional Board should request each state and federal land management agency within the Region to submit information on any fire retardant proposed for use in fire fighting. This information should include chemical composition, chemical decomposition products, results of any aquatic organism toxicity or other toxicity testing and mode of action (foaming, wetting, etc.). Following any fire fighting activities, information on amounts used and locations of use should be submitted to the Regional Board.

Range Management

Rangeland is the most extensive landtype in California, accounting for more than 40 million acres of the State's 101 million acres. As most of the rangelands are located between forested areas and major river systems, nearly all surface waters in the State flow through rangelands. Thus, rangeland activities can greatly impact water quality. In this section, grazing activities are discussed. Other rangeland management activities, such as riparian restoration and erosion control, are discussed elsewhere in this Chapter.

Livestock Grazing

Grazing activities (particularly overgrazing), by contributing excessive sediment, nutrients and pathogens, can adversely impact water quality and impair beneficial uses. Soil erosion and sedimentation are the primary causes of lowered water quality from rangelands. When grazing removes most of the vegetative cover from pastures and rangelands, the soil surface is exposed to erosion from wind and water. With runoff, eroded soil becomes sediment which can impair stream uses and alter stream channel morphology. With steep slopes, highly erodible soils and intense storm events, the sediment delivery ratio (a measure of the amount of eroded soil delivery to a waterbody) on rangeland can be very high. Streambank erosion and lakeshore erosion are other sources of sediment on rangelands. Lakeshores, streambanks and associated riparian zones are often subjected to heavy livestock use. Trampling and grazing of vegetation contribute to lakeshore and streamside instability as well as accelerated erosion.

Sediments can contribute large amounts of nutrients to surface water. Nutrients, mainly nitrogen and phosphorous, from manure and decaying vegetation also enter surface waters, particularly during runoff periods. Very critical nutrient problems can develop where livestock congregate for water, feed, salt and

shade. Pasture fertilization can also be a source of nutrients to surface waters, as well as a source of pesticides, particularly if flood irrigation techniques are used on rangelands. (Irrigation return flows are discussed in the "Agriculture" section of this Chapter).

Stream zone and lakeshore areas are important for water quality protection in that they can "buffer" (intercept and store nutrients which have entered surface and ground waters from upgradient areas). These "buffer zones" are more sensitive to processes which can increase nutrient discharges such as soil compaction, soil erosion, and vegetation damage than other areas of the rangeland.

Localized contamination by pathogens in surface water, ground water and soils can result from livestock in pastures and rangelands. Rangeland streams can show increased coliform bacterial levels with fecal coliform levels tending to increase as intensity of livestock use increases. Fecal coliform serve as indicators that pathogens could exist and flourish. The extent of the pathogens is usually determined by livestock density, timing and frequency of grazing, and access to the surface waters.

Control Measures for Grazing

Grazing activities occur on both public and private lands in the Lahontan Region. Regulation of grazing on federal lands differs from that on private lands.

Federal lands. Grazing activities on federal lands are regulated by the responsible land management agency, such as the U.S. Bureau of Land Management (BLM) or the U.S. Forest Service (USFS). Through MOUs and MAAs, the Regional Board recognizes the water quality authority of the USFS and BLM in range management activities on federal lands. Both the USFS and BLM require allotment management plans (AMPs) to be prepared for a specific area and for an individual permittee. The Regional Board relies on the water quality expertise of the USFS or BLM to include appropriate water quality measures in the AMPs. Most AMPs include specific Best Management Practices (BMPs) to protect water quality and existing and potential beneficial uses.

Non-federal (private) lands. The Range Management Advisory Committee (RMAC) is a statutory committee which advises the California Board of Forestry on rangeland resources. The RMAC has identified water quality protection as a major rangeland issue and it assumed a lead role in developing a water quality management plan for private rangelands in California. The California Rangeland Water Quality Management Plan

(Rangeland Plan) was accepted by the State Water Resources Control Board (SWRCB) in 1995. The Rangeland Plan summarizes authorities and mandates for water quality and watershed protection, and specifies a framework for the voluntary and cooperative development of ranch management strategies for water quality protection under Tier I of the SWRCB's Nonpoint Source Management Plan. (See the Introduction to Chapter 4 of this Basin Plan for an explanation of the Nonpoint Source Plan.) The Rangeland Plan provides that where water quality or the beneficial uses of water are impaired or threatened, ranch owners shall develop an individual Rangeland Water Quality Management Plan (RWQMP) or participate in one of the several other recognized individual or coordinated rangeland planning processes. The Rangeland Plan also describes sources of technical and financial assistance available to ranch owners.

On private lands whose owners request assistance, the U.S. Natural Resources Conservation Service (NRCS), in cooperation with the local Resource Conservation Districts (RCDs), can provide technical and financial assistance for range and water quality improvement projects. An MOU is in place between the NRCS and the State Board for planning and technical assistance related to water quality actions and activities undertaken to resolve nonpoint source problems on private lands.

On both public and private lands, the Regional Board encourages grazing strategies that maintain adequate vegetative cover to reduce erosion and sedimentation. The Regional Board promotes dispersal of livestock away from surface waters as an effective means of reducing nutrient and pathogen loading. The Regional Board encourages use of BMPs to improve water quality, protect beneficial uses, protect streamzone and lakeshore areas, and improve range and watershed conditions. These BMPs include:

- Implementing rest-rotation grazing strategies
 - Changing the season of use (on/off dates)
 - Limiting the number of animals
 - Increasing the use of range riders to improve animal distribution and use of forage
 - Fencing to exclude grazing in sensitive areas
 - Developing non-lakeshore and non-stream zone watering sites
- Constructing physical improvement projects such as check dams
 - Restoring riparian habitat

These same BMPs may result in improved range and increased forage production, resulting in increased economic benefit to the rancher and land owner. The Regional Board also encourages land owners to develop appropriate site-specific BMPs using technical guidance documents from the Natural Resources Conservation Service and the U.S. Environmental Protection Agency (USEPA 1993).

Regional Board Control Actions for Livestock Grazing

In addition to relying on the grazing management expertise of agencies such as the USFS, BLM or RMAC, the Regional Board can directly regulate grazing activities where voluntary implementation of BMPs is deemed by the Regional Board or its Executive Officer to be inadequate to ensure protection of water quality and beneficial uses of water. Actions available to the Regional Board include:

1. Require that a Report of Waste Discharge be filed, that an AMP be prepared, or that an Individual Rangeland Water Quality Management Plan (RWQMP) or Coordinated Resource Management Plan (CRMP) be adopted within one year of documentation of erosion problems, destruction or major impairment of vegetation, or significant addition of nutrients, pathogens and/or sediments to surface waters or ground waters resulting from grazing or grazing management activities. Such problems indicate impairment of beneficial uses or violation or threatened violation of water quality objectives.
2. Require that all AMPs, RWQMPs and CRMPs contain BMPs necessary to correct existing water quality problems or to protect water quality so as to meet all applicable beneficial uses and water quality objectives contained in Chapters 2 and 3 of this Basin Plan. Corrective measures would have to be implemented within one year of submittal of the AMP, RWQMP or CRMP, except where staged BMPs are appropriate. Implementation of a staged BMP must commence within one year of submittal of the AMP, RWQMP or CRMP.
3. Require that each AMP, RWQMP or CRMP include specific objectives, actions, and monitoring and evaluation procedures. The

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discussion of actions must establish the seasons of use, number of livestock permitted, grazing system(s) to be used, a schedule for rehabilitation of ranges in unsatisfactory condition, a schedule for initiating range improvements, and a schedule for maintenance of improvements. The schedule for initiating and maintaining range improvements must include priorities and planned completion dates. The discussion of monitoring and evaluation must propose a method and timetable for reporting of livestock forage conditions, watershed condition, and surface and ground water quality.

4. Require that all AMPs and CRMPs be circulated to interested parties, organizations, and public agencies.
5. Consider adoption of waste discharge requirements if an AMP, RWQMP or CRMP is not prepared or if the Executive Officer and the landowner do not agree on BMPs proposed in an AMP, RWQMP or CRMP.
6. Decide that AMPs, RWQMPs and CRMPs prepared to address a documented watershed or water quality problem may be accepted by the Regional Board's Executive Officer in lieu of adoption of Waste Discharge Requirements.
7. Oversee monitoring of water quality variables and beneficial uses. Provide data interpretation.

Eagle Lake. The following control measures apply to the Eagle Drainage Hydrologic Area (see map in Section 4.1):

- A Report of Waste Discharge must be filed, or an AMP, RWQMP or CRMP prepared for specific areas within one year of documented proof of (1) erosion problems that threaten water quality or beneficial uses of water, (2) destruction, or major impairment of vegetation, or (3) significant addition of nutrients to surface waters or ground waters resulting from grazing or grazing management activities.
- All AMPs, RWQMPs or CRMPs must contain Best Management Practices (BMPs) necessary to correct existing water quality problems or to protect water quality. Corrective measures must be implemented within one year of submittal of the plan, except where staged BMPs are appropriate. Implementation of a staged BMP must commence within one year of submittal of the plan. The BMPs required because of documented watershed or

water quality problems may be accepted by the Regional Board's Executive Officer in lieu of adoption of Waste Discharge Requirements.

- AMPs and CRMPs must be circulated to interested parties, organizations, and public agencies. Each AMP, RWQMP and CRMP must address objectives, actions, and monitoring and evaluation. The discussions of actions must establish the seasons of use, number of livestock permitted, grazing system to be used, a schedule for rehabilitation of ranges in unsatisfactory condition, a schedule for initiating range and watershed improvements, and a schedule for maintenance of range and watershed improvements. The schedule for installing and maintaining range and watershed improvements must include priorities and planned completion dates. The discussion of monitoring and evaluation must propose a method and timetable for reporting of livestock forage conditions, watershed condition, and surface and ground water quality. Each plan should describe all BMPs in enough detail to show that all water quality standards of this Basin Plan will be protected or restored.

Recommended Future Actions for Grazing Management

1. Provide information to private landowners, local RCDs and other agencies regarding grant monies available through the SWRCB and other sources for water quality planning and BMP implementation on rangelands. When requested, Regional Board staff should participate in the voluntary implementation of BMPs on rangelands by providing information and technical assistance to facilitate grant applications.
2. Encourage private landowners to request technical and financial assistance from the Natural Resources Conservation Service and the University of California Cooperative Extension, in cooperation with the local Resource Conservation Districts, in the preparation of AMPs, RWQMPs and CRMPs, and the implementation or construction of grazing and water quality improvements.

Fisheries Protection and Management

Fisheries protection, including the preservation and enhancement of aquatic habitat, is a necessary consideration during project review, when potential impacts may occur as a result of a project.

Recommended control actions for protecting fishery-related beneficial uses are described below.

Fisheries management activities in the Lahontan Region include operation of public hatcheries to rear fish, restoration of habitat, and use of fish toxicants (i.e., rotenone) to eliminate undesirable fish populations. Regulation of activities related to public hatcheries and fish toxicants are discussed in this section. Habitat restoration is discussed elsewhere in this Chapter.

Control Actions for Fisheries Protection

1. The Regional Board will coordinate with the California Department of Fish and Game (DFG) and the U.S. Fish and Wildlife Service (USFWS) to decide on the appropriate and necessary protection measures to protect a specific fish population and its habitat. Fisheries protection requirements should be considered during review of any proposed project that may impact any fishery or its habitat.
2. Chapter 2 of this Plan designates beneficial uses of the Region's surface waters. The general uses related to fish habitat are: "Cold Freshwater Habitat" (COLD), "Warm Freshwater Habitat" (WARM), "Inland Saline Water Habitat" (SAL). Some surface waters have also been further designated for "Migration of Aquatic Organisms" (MIGR) and "Spawning, Reproduction, and Development" (SPWN). Where migration and/or spawning occur, the special measures listed below are required to protect spawning areas and migration corridors:
 - Prior to activities which may impact spawning habitat, an assessment of the gravel bed condition will be made by the discharger with assistance from DFG. Waste discharge activities with detrimental impacts to the gravel bed will not be allowed.
 - During construction, maintenance or operation of any project, minimum stream flows are to be maintained for fish survival and/or passage.
 - During construction, maintenance or operation of any project, fish passage shall be provided.
 - When designing facilities to be placed in a streambed, such as a culvert, stream velocities shall be maintained at a reasonable level which will not result in obstruction of fish passage.

Fish Hatcheries

Discharges produced by fish hatcheries include suspended solids and nutrients from fish wastes and unconsumed fish food, as well as potential discharges of pesticides or other substances used to control fish diseases. Potential water quality impacts downstream from these discharges include increased productivity and algal growth, increased biological oxygen demand, and impaired aquatic habitat. However, in one instance, discharges from a hatchery (Hot Creek Hatchery) promoted the growth of vegetation fed upon by the endangered Owens tui chub. Because the routine removal of the vegetation was threatening the endangered fish, hatchery personnel stopped removing the vegetation.

Hatchery operations are themselves sensitive to water conditions. For example, optimum propagation of fish is restricted to a narrow range of temperatures; alteration of ambient water temperature can have a severe effect on hatchery fish production. In one instance, geothermal development in the vicinity of a fish hatchery could alter the temperature of geothermal springs that are used as water supplies for hatchery operations. The potential loss in productivity due to altered temperature of the hatchery water supplies could potentially result in several million dollars in monetary damages. (Geothermal development is discussed in the "Mining, Industry and Energy Development" section of this Chapter.)

Control Actions for Hatcheries

All hatchery operations which include point source discharges to surface waters are regulated under National Pollutant Discharge Elimination System (NPDES) permits. Effluent discharge parameters limited in the NPDES permits include suspended solids and settleable matter. Receiving water limitations in the NPDES permits for hatcheries include color, taste, odor, foaming agents, toxic substances, dissolved oxygen, turbidity and aquatic growth.

Recommended Future Actions for Hatcheries

The Regional Board should be advised of routine and other applications of pesticides or other substances potentially containing toxic substances.

Rotenone Use in Fisheries Management

The California Department of Fish and Game (DFG) often has cause to eliminate competitors, predators, and otherwise undesirable fish populations as part of its fishery management programs. Such management programs include the restoration or

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protection of threatened or endangered species, control of fish diseases, elimination of prohibited species, actions to increase the abundance of desirable sport fish species, and actions to establish and maintain wild trout stocks.

In carrying out its management programs, the DFG often finds it necessary to completely eliminate existing fish populations in designated areas; this practice provides optimum conditions for propagation of healthy, desirable fish. The DFG has determined that in certain situations the use of rotenone, a fish toxicant, is the only effective, practical method of achieving this objective.

The discharge of rotenone formulations and the detoxifying agent, potassium permanganate, can violate water quality objectives and adversely affect beneficial uses of water. Impacts may occur both within project boundaries and outside of those boundaries. (Project boundaries are defined as encompassing the treatment area, the detoxification area, and the area downstream of the detoxification station up to a thirty-minute travel time.) Outside of project boundaries, impacts are expected to be minimal. Trace amounts of rotenone or other compounds may escape project boundaries, but these residues do not tend to persist beyond one or two days, and beneficial uses are not expected to be impaired in the long-term.

Rotenone treatment is typically followed by the addition of potassium permanganate, which is a strong oxidant used to detoxify the active ingredient(s). In the past, some potassium permanganate has occasionally escaped project boundaries, and has sometimes been visible as much as one or two miles below project boundaries (permanganate has a characteristic purple color). Unexpected fish kills have also occurred downstream of project boundaries due, at least in part, to permanganate toxicity. However, potassium permanganate decomposes quickly in water and does not persist for more than a day following the end of detoxification. At these levels, potassium permanganate is not considered a health threat to humans.

In addition to the active ingredient, liquid rotenone formulations also contain "inert" ingredients (e.g., carriers, solvents, dispersants, emulsifiers), and may also contain, in trace amounts, organic contaminants. Such "inert" ingredients and contaminants may include naphthalene, methylnaphthalene, xylene, acetone, trichloroethylene (TCE), benzene, and ethylbenzene.

Benzene is a known human carcinogen. TCE is a known animal carcinogen, and a suspected human carcinogen. Concentrations of these compounds in rotenone-treated water are expected to meet current drinking water standards. However, the Regional Board expects the DFG to make every reasonable effort to encourage the development of rotenone formulations containing less objectionable compounds, and to prepare annual progress reports.

Long-term impacts of rotenone use are distinct from short-term impacts. Long-term impacts normally last from two to six years and are expected to be limited to the area within project boundaries. Long-term impacts result because the treatments are typically repeated at a given project site for several consecutive years, after which time the treated waters are restocked with fish. During this time, however, most or all fish have been eliminated from the project site. Other gill-breathing organisms (such as aquatic invertebrate and amphibian populations) are also impacted, but are expected to recover over time.

The long-term impacts therefore consist of a temporary loss of beneficial uses, specifically aquatic habitat and recreational fishing opportunities. In the case of endangered species restoration projects, permanent replacement of existing species with a threatened or endangered species is the project objective, and fishing opportunities for the existing species are permanently lost at the project site.

Short-term impacts last only as long as chemical residues from the rotenone treatment persist. These chemicals are introduced to the water during the treatment process, but tend to decompose or volatilize in a matter of hours or days, depending on site conditions. Some chemical residues may be detectable for up to two weeks. In addition to effects on aquatic life, short-term impacts can adversely affect aesthetics, recreation, and water supplies. Short-term impacts are generally limited to the area within project boundaries, except on occasions when chemical residues escape beyond these boundaries.

As described above, the application of rotenone to surface waters by the DFG will result in a temporary lowering of water quality. The State Board's "Statement of Policy with Respect to Maintaining High Quality of Waters in California" (Resolution No. 68-16) directs that whenever the existing quality of waters is better than standards established in water quality objectives, the existing level of quality shall be maintained. Deterioration of water quality is permissible only if the Regional Board finds that such a change will be consistent with maximum benefit to

the people of the State. Similarly, the Federal Antidegradation Policy (40 CFR § 131.12) dictates that water quality shall be preserved unless deterioration is necessary to accommodate important economic or social development.

The temporary deterioration of water quality due to the use of rotenone by the DFG is justifiable in certain situations. The Regional Board recognizes that the State and federal Endangered Species Acts require the restoration and preservation of threatened and endangered species. The Regional Board also recognizes that situations may arise where outbreaks of fish disease or the threat presented by prohibited or exotic species may require immediate action to prevent serious damage to valuable fisheries resources and aquatic habitat. These resources are of important economic and social value to the people of the State, and the transitory degradation of water quality and short-term impairment of beneficial uses that would result from rotenone application is therefore justified, provided suitable measures are taken to protect water quality within and downstream of the project area.

Pursuant to federal regulations (40 CFR § 131.13), the Regional Board may grant variances to water quality objectives under certain circumstances. Narrative water quality objectives applicable to rotenone treatments include: toxicity, pesticides, color, and species composition (see Chapter 3, "Water Quality Objectives").

In 1990, the Regional Board adopted Resolution No. 6-90-43 to allow the conditional use of rotenone by the DFG in the Lahontan Region. The Resolution granted authority to the Regional Board's Executive Officer to waive waste discharge requirements and reports of waste discharge for rotenone application projects meeting the conditions listed below. The Resolution also directed the Executive Officer to execute a Memorandum of Understanding with the DFG to facilitate the implementation of rotenone projects within the Lahontan Region. The MOU was executed on July 2, 1990.

Control Measures for Rotenone Use

The Regional Board's Executive Officer may grant conditional variances from applicable water quality objectives for DFG projects involving the use of rotenone, subject to the following conditions. A variance will not be granted for any project that fails to meet these conditions. If a variance is denied, any discharge of rotenone formulation or potassium permanganate may be subject to enforcement action by the Regional Board.

Conditions:

1. The purpose of the proposed project must be one of the following:
 - (a) The restoration and protection of threatened or endangered species.
 - (b) The control of fish diseases where the failure to treat could result in significant damage to fisheries resources or aquatic habitat.
 - (c) The elimination of prohibited species (as defined in CA Fish and Game Code § 2118), where competition or predation from such species threatens valuable sport fish or native fish populations, or populations of other valuable organisms.

The Regional Board may, on a project-by-project basis, grant variances for the use of fish toxicants in other kinds of fisheries management activities, when the DFG can provide the necessary justification for allowing a temporary lowering of water quality according to the provisions of the Federal Antidegradation Policy (contained in 40 CFR § 131.12) and State Board Resolution No. 68-16.

2. Chemical residues resulting from rotenone treatment must not exceed the narrative or numerical limitations established in Chapter 3 of this Basin Plan, under the section entitled "Water Quality Objectives For Fisheries Management Activities Using the Fish Toxicant Rotenone."
3. Within two years of the last treatment for a specific project, a fisheries biologist or related specialist from the DFG must assess the restoration of applicable beneficial uses to the treated waters, and certify in writing that those beneficial uses have been restored. A project will be considered to have been completed upon written acceptance by the Regional Board's Executive Officer of such certification.
4. Based on information and project plans submitted by the DFG, the Regional Board's Executive Officer must determine that the proposed project will meet all applicable provisions (including subsequent amendments or revisions) of this Basin Plan, the DFG's Environmental Impact Report *Rotenone Use for Fisheries Management* (1994), and the Memorandum of Understanding between the Regional Board and the DFG regarding rotenone use. Whenever the language

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contained in the above-mentioned documents may overlap, the requirements that will provide the most restrictive protection of water quality shall apply. Furthermore, the Regional Board's Executive Officer must determine that the project meets all of the following additional criteria:

- (a) The limitations on chemical residue levels referenced in Condition #2 (above) can be met.
- (b) The planned treatment protocol will result in the minimum discharge of chemical substances that can reasonably be expected for an effective treatment.
- (c) Chemical transport, spill contingency plans, and application methods will adequately provide for protection of water quality.
- (d) Suitable measures will be taken to notify the public, and potentially affected residents.
- (e) Suitable measures will be taken to identify potentially affected sources of potable surface and ground water intakes, and to provide potable drinking water where necessary.
- (f) A suitable monitoring program will be followed to assess the effects of treatment on surface and ground waters, and on bottom sediments.
- (g) For each project, the DFG has satisfied the requirements of the California Environmental Quality Act (CEQA).
- (h) The chemical composition of the rotenone formulation has not changed significantly (based on analytical chemical scans to be performed by the DFG on each formulation lot to be used) in such a way that potential hazards may be present which have not been addressed.
- (i) Plans for disposal of dead fish are adequate to protect water quality.

The Regional Board recognizes that allowing rotenone use may have unavoidable adverse impacts. Some of these impacts could be mitigated in the long-term through the discovery or development of formulations whose "inert" ingredients (i.e., carriers, solvents, dispersants, and emulsifiers) have less objectionable properties, and which are free of

objectionable contaminants. The DFG shall: (1) make every reasonable effort to encourage the development of such formulations, and (2) provide annual updates to the Regional Board (by December 31 of each calendar year) detailing DFG's progress and obstacles encountered during reformulation efforts.

Recommended Future Actions for Rotenone Use

1. In cooperation with the DFG, monitor projects involving the discharge of fish toxicants to determine impacts on water quality and beneficial uses.
2. In cooperation with the DFG, modify rotenone application, detoxification, and monitoring procedures, whenever measures are identified that will provide greater protection for water quality and beneficial uses.
3. In cooperation with other state and federal agencies, and private entities, encourage the rapid development of rotenone formulations containing less objectionable compounds.

Sensitive Species and Biological Communities

Because of its great topographic, geologic and climatic diversity, and because of environmental changes over time which have created ecological islands which facilitate evolutionary change, the Lahontan Region supports a wide variety of plant and animal species and many biological community types. Numerous plant and animal species in the Region are listed as threatened or endangered under the federal Endangered Species Act and/or the California Endangered Species Act (CESA), or are candidates for such listing. Examples include the Lahontan and Piute cutthroat trout, several kinds of desert pupfish, the Lake Tahoe shorezone plant Tahoe yellowcress, and springsnails which are restricted to a few springs in the Owens River watershed. These and many other sensitive species depend directly on aquatic or wetland habitats for survival. The Lahontan Region also includes water bodies which support rare or unique combinations of species (biological communities). Examples include the Grass Lake sphagnum bog in the Lake Tahoe Basin, the Mono Lake ecosystem, and the springs and wetlands in the Amargosa River watershed. In some cases, these communities have been given special recognition and protection, as U.S. Forest Service Research Natural Areas or Special Interest Areas, U.S. Bureau of Land Management Areas of Critical Environmental Concern, etc. Detailed information on sensitive

species and communities in the Lahontan Region can be found in the Department of Fish and Game's (DFG's) Natural Diversity Database, which is updated on an ongoing basis. The Regional Board's Geospatial Waterbody System (GeoWBS) database can also provide information on the presence of sensitive species and communities in association with specific water bodies.

Aquatic and wetland habitats for many sensitive species have been degraded, impaired, or threatened by water diversions and/or the nonpoint source problems (mining, silviculture, livestock grazing, etc.) discussed elsewhere in this Chapter. For example, nonpoint source pollution has contributed to the decreasing clarity of Lake Tahoe and this decreased clarity is believed to be a threat to its unique deepwater macrophyte communities. The human introduction of nonnative predator and competitor species or species capable of hybridizing with sensitive plants and animals is also a problem. Because little chemical or biological monitoring has been done for most water bodies in the Lahontan Region, the habitat requirements of many sensitive species are not well known.

Control Measures for Sensitive Species and Biological Communities

1. The U.S. Fish and Wildlife Service and the California Department of Fish and Game (through the Fish and Game Commission) are responsible for "listing" threatened and endangered species, defining critical habitats, and preparing and implementing recovery plans. These agencies review proposed projects which could affect sensitive species or critical habitats. Under the CESA, state agencies which are lead agencies under the California Environmental Quality Act must consult with the California Department of Fish and Game (DFG) before approving projects with potential impacts on state-listed species. If the DFG issues a determination of "jeopardy," the lead agency must provide for DFG-approved mitigation in order to approve the project. The Regional Board consults with DFG under CESA regarding potential impacts of its Basin Plan amendments, policy changes, and the development projects for which it occasionally takes lead agency responsibility.
2. The Regional Board has recognized existing or potential habitats for sensitive species and biological communities through the "RARE" and "BIOL" beneficial use designations in Chapter 2 of this Plan. Additional water bodies will be so designated as new species are listed or new

information about species distribution becomes available. In 1990, the Regional Board amended its narrative regionwide objective for pesticides to allow the use of rotenone in treatment of water bodies prior to the reintroduction of threatened or endangered fish species (see the sections on pesticides and rotenone elsewhere in this Chapter). During future revisions of water quality objectives for specific water bodies, the habitat needs of sensitive species will receive special consideration.

Recommended Future Actions for Sensitive Species and Biological Communities

1. The State Water Resources Control Board and/or the Department of Fish and Game should provide the necessary funds for the biological and chemical monitoring in the Lahontan Region to support Regional Board determinations on the adequacy of statewide objectives to protect threatened/endangered species, and to support the development of site-specific objectives if necessary.
2. Local governments should recognize and provide protection for sensitive aquatic/wetland species and communities in their land use planning, zoning and project review activities.

Watershed Restoration

As water flows through a watershed, its quality is determined by many factors within that watershed including climate, geology and topography. Natural events within the watershed, such as fire and flooding, can affect the quality of the ground waters, lakes, streams and wetlands within the watershed. The quality of these ground waters, lakes, streams and wetlands can also be impacted by human land use activities within the watershed, including the precipitation and dry deposition of atmospheric contaminants.

"To restore and maintain the chemical, physical and biological integrity of the Nation's waters" is a proclaimed goal of the federal Clean Water Act (33 U.S.C. 466 et seq.). Part of this goal, maintaining or protecting water quality, is addressed in many parts of this Plan, including nondegradation policy statements (Chapters 3 and 6), designation of water quality standards (Chapters 2 and 3) and identification of special designations to protect water quality (Chapter 4). The second part of this goal is to "restore." As described above, water quality is so closely related by drainage basin or watershed conditions that water

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quality restoration relies to a great extent on watershed restoration.

In this section, the term *restoration* means the reestablishment of pre-disturbance functions and related physical, chemical and biological characteristics of aquatic ecosystems (National Research Council 1992). The goal of restoration is to return an ecosystem to a former natural condition—to emulate a natural system which is ecologically integrated with its surrounding area.

This section is divided into three parts: lake, river/stream and wetland restoration. However, the Regional Board supports an integrated approach to restoration—an approach which tries to consider ecological interactions within a watershed. As all watershed components (lakes, streams, rivers, ponds, ground water, wetlands) are interconnected, successful restoration of one component must consider all other components, including cumulative impacts to the watershed.

In each part of this section, impacts and stresses to the water body type which could create the need for restoration are described, followed by a discussion of restoration techniques, water quality control measures and recommended actions for the restoration techniques. Potential sources of funding for restoration are also included.

Lake and Reservoir Restoration

Main causes of degradation of lake quality include eutrophication (increased biological productivity due to excessive loading of nutrients and organic matter), hydrologic changes (e.g., artificially stabilizing lake level), siltation from erosion, acidification (from atmospheric sources or acid mine drainage) and toxic contamination (National Research Council 1992).

Eutrophication is a natural process. However, excessive addition of inorganic nutrients, organic matter and/or silt to lakes and reservoirs can accelerate the process, leading to increased biological production (such as increased populations of algae and rooted plants) and a decrease in lake or reservoir volume. Sediment and associated nutrients from nonpoint sources (such as land development, agriculture, livestock grazing, forest practices, and recreational activities) are often the cause of accelerated eutrophication. Signs of accelerated eutrophic conditions include algal blooms, surface scum, rapid loss of volume in lakes and reservoirs, noxious odors, tainted fish flesh, tainted domestic water supplies, depleted dissolved oxygen, fish kills and development of nuisance plant or animal

populations such as common carp. Thus, eutrophic conditions affect water quality and impair the aesthetic, recreational, fish and wildlife, industrial, domestic and other beneficial uses of lakes and reservoirs. Eutrophication can result in decreased property values and the need for expensive water treatment or the development of new water supplies, including construction of new reservoirs.

In the Lahontan Region, accelerated eutrophication is a concern in many lakes and reservoirs. As early as 1946, possible impacts on the water quality of Lake Tahoe from land use activities were noted. Land uses such as waste treatment from septic systems in the Eagle Lake basin of Lassen County are contributing to the eutrophication of Eagle Lake. The prolific growth of aquatic weeds in Twin Lakes of the Mammoth Lakes Basin is considered a nuisance by many Basin residents.

Hydrologic changes to a lake include diversions of tributary stream flows which can result in long-term lowering of the lake level and ecological impacts to both the tributaries and the lake. Diversion of tributaries into Mono Lake resulted in a lowered water supply, increased the lake's salinity and caused ecological damage to the tributaries and to the lake itself. Stabilizing lake levels through use of a control structure such as a dam can lead to damage to near-shore ephemeral wetlands, loss of fish spawning areas, and degraded water quality from accumulation of littoral sediments (oxidizing organic sediments) (National Research Council 1992).

Acidification of poorly buffered lakes by acidic deposition can affect the entire ecosystem. Acid deposition is discussed in detail later in this section (see "Atmospheric Deposition" later in this Section).

Lake restoration technology can be divided into two main categories (National Research Council 1992). The first category includes steps to divert, prevent or treat excessive nutrient, silt and organic loads. This first category of technology may be insufficient to produce immediate and long-lasting effects due to internal nutrient recycling and associated algal/macrophyte production. Thus, a second category of technologies may be necessary which changes or controls internal physical, chemical or biological processes of the lake or reservoir. In the first category, several restoration techniques have been documented to achieve the physical and chemical control of nutrients (diversion, advanced waste treatment, dilution, flushing, sediment removal and hypolimnetic flushing or aeration). Likewise, several techniques in the second category such as

plant biomass control measures (harvesting, biological controls, herbicide use) have also been documented.

Examples of both of these categories of restoration are found in the Lahontan Region. To prevent pollutant loading into Lake Tahoe, waste discharge prohibitions have been implemented and many millions of dollars have been spent on slope stabilization, revegetation and other remedial erosion control measures (see “Stormwater Runoff, Erosion, and Sedimentation” section in this Chapter). The clarity, nutrient levels and both phytoplankton and periphyton productivity in Lake Tahoe are carefully monitored. To prevent nutrient loading into Eagle Lake (Lassen County), waste discharge prohibitions are also implemented. The prolific growth of aquatic weeds in Twin Lakes of the Mammoth Lakes Basin often results in a weed harvest.

Generally, the Lahontan Regional Board encourages the restoration of water quality and beneficial uses through lake and reservoir restoration measures, particularly those techniques which prevent pollutant loading into lakes or reservoirs. However, to prevent possible detrimental impacts to water quality or beneficial uses from certain restoration techniques, the following control measures are necessary.

Control Measures for Lake/Reservoir Restoration

1. Erosion control and other nonpoint source control measures designed to prevent pollution loading into lakes and reservoirs must comply with proven, standard Best Management Practices (see BMP discussion in the Introduction to this Chapter). Proposed alternative BMPs may be considered on a case-by-case basis.
2. The Regional Board will review, and regulate as necessary, grazing practices and other land use practices to minimize damage to lake ecosystems and to restore damaged lakes. Where appropriate, the Regional Board may require a protection or buffer zone for the restoration project.
3. Herbicidal and algicidal chemicals have been associated with major adverse impacts on lake systems, none of which are considered restorative. These impacts include nutrient releases to the water after plant death, dissolved oxygen depletion following plant decay, toxic effects on nontarget organisms at recommended doses, rapid regrowth of plants following treatment, as well as conflicting and unresolved issues regarding the mutagenic and carcinogenic

effects of some of the chemicals. Thus, the use of herbicides and algicides for lake/reservoir restoration purposes is strongly discouraged. Any proposals for such uses will be carefully reviewed and regulated by the Regional Board if necessary to ensure that water quality standards will not be violated. The narrative objective of “no detectable pesticides” (see Chapter 3) essentially precludes the use of aquatic herbicides (also see discussion of “Agricultural Chemicals” in the “Agriculture” section of this Chapter).

4. Restoration projects which propose the use of biological controls will be carefully reviewed and regulated by the Regional Board if necessary to ensure the protection of beneficial uses of the lake/reservoir. To avoid the unintentional development of pest populations, review of biological control proposals will be coordinated with the California Department of Fish Game.
5. Restoration techniques which could or will result in a waste discharge, such as sediment removal (see discussion on “Dredging” in the “Recreation” section of this Chapter), flushing, nutrient precipitation/removal, bank sloping, placement of woody debris, and/or placement of spawning gravel will be regulated as necessary by the Regional Board to ensure compliance with all provisions of this Basin Plan including waste discharge prohibitions. The prohibitions and exemption criteria for restoration work are discussed in the “Waste Discharge Prohibitions” section of this Chapter.
6. Any proposal to reduce the effect of lake/reservoir acidification (e.g., liming or calcite treatments, dilution) will be reviewed by the Regional Board on a case-by-case basis and will be regulated as necessary.
7. Eroding shorelines should be stabilized. Vegetative methods are strongly preferred unless structural methods are more cost-effective, considering the severity of wind and wave erosion, offshore bathymetry, and the potential adverse impacts on other shorelines and offshore areas.

The USEPA (1993) summarizes information on a variety of shoreline protection practices. General considerations include design of all shorezone structures so that they do not transfer erosion energy or otherwise cause visible loss of surrounding shorezones; establishment and enforcement of no wake

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zones to reduce erosion potential from boat wakes, establishment of setbacks for upland development and land disturbance, and direction of upland drainage away from bluffs and banks so as to avoid accelerating slope erosion.

8. The Regional Board will recommend that all proposals for lake/reservoir restoration include adequate monitoring to evaluate the success of the project. The monitoring may include the establishment of baseline water quality, habitat assessment and biotic community data as a reference from which to evaluate project success, as well as monitoring after implementation of the restoration project. Where appropriate, the monitoring may be required by the Regional Board.

Recommended Future Actions for Lake/Reservoir Restoration

1. The Regional Board should encourage evaluation of past lake restoration efforts to guide future efforts.
2. The Regional Board should encourage lake restoration methods which promote a stable, self-sustaining system.
3. The Regional Board should support lake restoration projects which develop improved techniques for aquatic plant (macrophyte) and littoral zone management.
4. The Regional Board should support projects which result in the ability to predict a lake's trophic state from nutrient loading.
5. The Regional Board should support demonstration watershed-scale restorations which integrate lake components with river/stream and wetland components. Whenever possible, demonstration projects should be conducted outside of sensitive areas such as the Lake Tahoe Basin.

Potential Sources of Funds for Lake and Reservoir Restoration

A potential source of funds for lake restoration projects is the federal Clean Lakes Program. The Clean Lakes Program is administered by the U.S. Environmental Protection Agency (USEPA). The Program includes funding for both diagnostic and feasibility studies, and for implementation projects. The Regional Board coordinates with the State Board and the USEPA to solicit and evaluate lake

restoration proposals, and also participates in the grant award process. State Board Nonpoint Source (§ 319), Water Quality Management (§ 205[j]) and Special Investigations Programs also are potential sources of funds for lake restoration projects.

River and Stream Restoration

Healthy, vegetated riparian habitat is essential to the natural ecological functioning of associated rivers and streams (National Research Council 1992). The removal of riparian vegetation by livestock, farming, logging, mining and urban development can result in wider, shallower and warmer streams and rivers, as well as introduction of excessive sediment loads and toxics from runoff into the water. Flood control practices, such as straightening stream channels, can cause water to gouge wide, shallow channels, resulting in altered riparian vegetation.

Diversions have totally or almost totally dewatered some streams in the Lahontan Region, impairing or precluding the attainment of aquatic beneficial uses (e.g., the Owens Gorge, Mono Lake tributaries). Recent court decisions have required the rewatering of the Owens River Gorge and some Mono Lake tributaries. Where diversion is not total, lower flows, or changes in the timing of flows, can stress aquatic ecosystems through higher summer temperatures, greater winter ice formation, increases in the concentrations of pollutants, and other factors. Temperature and flow variations can affect critical life stages of aquatic organisms, and can change the nature and rate of nutrient and mineral cycles.

Environmental stresses to streams and rivers, such as those described above, can impact water quality parameters including temperature, turbidity, dissolved oxygen, nutrients and pH. The stresses can also impact aquatic habitat quality by affecting substrate type, water depth and velocity, spawning and nursery areas, and habitat diversity (pools, riffles, woody debris).

The goal of river and stream restoration is to restore the natural sediment and flow regimes, a natural channel morphology, the natural riparian plant community, and the native aquatic plants and animals (National Research Council 1992). River and stream restoration technology can be divided into the two categories of nonstructural and structural techniques. Both nonstructural and structural techniques can be used in species-centered restoration, such as restoring stream habitat to improve trout productivity, or in general restoration.

Nonstructural techniques include policies and procedures that limit or regulate activities such as withdrawal of water from a stream or land use practices such as grazing. Other examples of nonstructural techniques are the preservation or restoration of floodplains (see “Floodplain” discussion above), the establishment of riparian protection zones (buffer zones) and exclusion of riparian areas from heavy human and livestock use.

Structural techniques include installation or removal of instream structures, or modifications such as installation of fish ladders or selective water withdrawal structures to maintain downstream temperatures. Structural instream techniques also include placement of logs, root wads or artificial structures for habitat improvement and channel modifications. Structural bank modifications include use of vegetation for stabilization, bank sloping, sheet piling and riprap. These structural techniques can be divided into three types: biotechnical engineering (e.g., channel modification which uses vegetation); natural or “soft” engineering (e.g., restoration which uses local natural materials such as woody debris and alluvium), and “hard” hydraulic engineering (e.g., use of concrete, sheet piling, riprap).

Generally, the Lahontan Regional Board encourages the restoration of water quality and beneficial uses through stream and river restoration measures, particularly erosion control or other measures which prevent pollutant loading into streams and rivers. However, to prevent possible detrimental impacts to water quality or beneficial uses from certain restoration techniques, the following control measures are necessary.

Control Measures for River and Stream Restoration

1. Erosion control and other measures to prevent pollution loading must comply with proven, standard Best Management Practices (see BMP discussion in the Introduction to this Chapter). Proposed alternative BMPs may be considered on a case-by-case basis. The Regional Board will encourage erosion control by biotechnical or “soft” engineering approaches for bank stabilization and repair, where appropriate, in preference to dams, levees, channelization, riprap or other “hard” engineering approaches.
2. The Regional Board will review, and regulate as necessary, grazing practices and other land use practices to minimize damage to riparian ecosystems and to restore damaged streams and rivers. Where appropriate, the Regional

Board may require a protection or buffer zone for the restoration project.

3. Restoration techniques which could or will result in a waste discharge such as bank sloping, placement of woody debris, and/or placement of spawning gravel or sediment removal, will be regulated as necessary by the Regional Board to ensure compliance with all provisions of this Basin Plan, including waste discharge prohibitions. The prohibitions and exemption criteria for restoration work are discussed in the “Waste Discharge Prohibitions” section of this Chapter.
4. The Regional Board will recommend that all proposals for river and stream restoration include adequate monitoring to evaluate the success of the project. The monitoring may include the establishment of baseline water quality, habitat assessment and biotic community data as a reference from which to evaluate project success, as well as monitoring after implementation of the restoration project. Where appropriate, the monitoring may be required by the Regional Board.

Recommended Future Actions for River/Stream Restoration

1. The Regional Board should encourage evaluation of past river/stream restoration efforts to guide future efforts.
2. The Regional Board should encourage river/stream restoration methods which promote a stable, self-sustaining system. This could include designation of floodplain/riparian protection zones or removal of dikes/levees to reestablish connections between rivers, streams, riparian wetland areas and floodplains.
3. During the issuing or renewal of water rights permits (e.g., renewal of hydroelectric licenses, dam operating permits), the Regional Board should support opportunities to allocate waters to instream uses. Similarly, the Regional Board should support opportunities to allocate waters to instream uses when water conservation efforts result in surplus water.
4. The Regional Board should support demonstration watershed-scale restorations which integrate river/stream components with lake and wetland components. Whenever possible, demonstration projects should be

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conducted outside of sensitive areas such as the Lake Tahoe Basin.

Potential Sources of Funds for Stream/River Restoration

Federal Clean Lakes Program funds are also available for projects affecting tributaries into lakes (see program description above). River and stream restoration funds are available from the State Board Nonpoint Source (§ 319), Water Quality Management Programs (§ 205[j]) and Special Investigations Programs. Funds for urban stream restoration are available from the California Department of Water Resources. Urban stream restoration funds are awarded to reduce damage from flooding and from bank erosion while restoring the aesthetic value of the stream.

Wetland Restoration

(Creation of artificial wetlands for mitigation purposes is discussed in the “Wetlands Protection” section above; SEZ restoration is discussed in the Lake Tahoe Chapter.)

Unlike lakes and rivers, wetlands have not always been considered as valuable natural resources. Thus, in California, an estimated 91 percent of wetlands have been lost due to alterations in their biological, chemical and physical properties (National Research Council 1992). Biological alterations include damage to or removal of natural biota, including impacts from the introduction of non-native plants and animals. Many riparian wetland areas of the Owens River have been impacted by grazing which causes soil compaction and destruction of the natural wetland vegetation. Physical alterations include changes in the hydrology and topography which support the wetland. Mono Basin wetlands have been impacted by water diversions, as have wetlands in the Owens River basin. Draining wetlands for agriculture, dredging and filling in rivers and lakes and construction of dams all can physically damage wetlands. Construction of the Tahoe Keys subdivision at the delta of the Upper Truckee River into Lake Tahoe resulted in dredge and fill of over 300 acres of wetlands. Point and nonpoint source runoff can chemically alter wetlands by discharging nutrients, toxic, hazardous or other chemical wastes into the wetland.

Wetland restoration techniques include reestablishing flow (restoring river flows, restoring flood regimes, controlling drainage) reestablishing topography (removing fill, replacing dredged materials), controlling pollutant loading and reestablishing wetland biota.

Generally, the Lahontan Regional Board encourages the restoration of water quality and beneficial uses through wetland restoration measures, particularly erosion control or other measures which prevent pollutant loading into the wetlands. However, to prevent possible detrimental impacts to water quality or beneficial uses from certain restoration techniques, the following control measures are necessary.

Control Measures for Wetland Restoration

1. Erosion control and other measures to prevent pollution loading into the wetland restoration site must comply with proven, standard Best Management Practices (see BMP discussion in the Introduction to this Chapter). Alternative management practices may be considered on a case-by-case basis.
2. The Regional Board will review, and regulate as necessary, grazing practices and other land use practices to minimize damage to wetland ecosystems and to restore damaged wetlands. Where appropriate, the Regional Board may require a protection or buffer zone for the restoration project.
3. Restoration techniques which could or will result in a waste discharge, such as removal of fill or replacement of dredged materials, will be regulated as necessary by the Regional Board to ensure compliance with all provisions of this Basin Plan, including waste discharge prohibitions. The prohibitions and exemption criteria for restoration work are discussed in the “Waste Discharge Prohibitions” section of this Chapter.
4. The Regional Board will recommend that all proposals for wetland restoration include adequate monitoring to evaluate the success of the project. The monitoring may include the establishment of baseline water quality, habitat assessment and biotic community data as a reference from which to evaluate project success, as well as monitoring after implementation of the restoration project. The monitoring may include sampling off the project site wherever affected by the restoration. Where appropriate, the monitoring may be required by the Regional Board.
5. In instances where natural wetlands are to be restored for the main purpose of wastewater treatment (including stormwater treatment), the Regional Board will determine the applicability of water quality standards to the wetland on a case-

by-case basis, and may elect to develop site-specific objectives. In its determination, the Regional Board will consider factors such as size, type of waste to be treated, location, degree of isolation of the created wetlands, and other appropriate factors.

Recommended Future Actions for Wetland Restoration

1. The Regional Board should encourage evaluation of past wetland restoration efforts to guide future efforts.
2. The Regional Board should encourage wetland restoration methods which promote a stable, self-sustaining system.
3. The Regional Board should encourage wetland restoration assessment to evaluate both structural (hydrology, flora, fauna) and functional (sediment retention, nutrient cycling) parameters.
4. The Regional Board should promote projects which will result in more natural wetland restoration (e.g., native wetland plant propagation, baseline studies of natural wetland ecosystems).
5. When practical, where wetland restoration is required as mitigation, the Regional Board should require that the mitigation is completed **before** allowing wetland damage to occur.
6. The Regional Board should support demonstration watershed-scale restorations which integrate wetland components with lake and river/stream components. Whenever possible, demonstration projects should be conducted outside of sensitive areas such as the Lake Tahoe Basin.

Potential Sources of Funds for Wetland Restoration

The State and Regional Board coordinate in submittal and administration of federal wetland grants issued under Clean Water Act § 104(b)(3). The focus of these grants is wetland protection but wetland restoration can be included when it is part of an overall wetland protection program. Other grant programs (e.g., § 314, § 319, § 205[jj]) administered by the State Board may also provide funds for wetland restoration.

Atmospheric Deposition (“Acid Rain” and Dry Deposition of Pollutants)

Public concern over the impacts of air pollutants on water quality has increased in recent years. Acidic rain, snow, and fog have been measured in California. Dry deposition of pollutants can also occur directly onto surface waters. Nitric acid from vehicle emissions tends to be the most important acidic pollutant, in contrast to the eastern United States where sulfuric acid from the burning of coal is more abundant. Organic acids are also present in acid rain. The California Air Resources Board (CARB) has documented long distance transport of pollutants from urban coastal areas to the Sierra Nevada and the Mojave Desert. The CARB is sponsoring long-term research on the impacts of wet and dry deposition of air pollutants on Sierra Nevada ecosystems. Although much of this research is centered on the west slope of the Sierra, the results are applicable to comparable soils and waters of the Lahontan Region.

Atmospheric deposition is of concern because of the direct and indirect impacts of acidification on beneficial uses of water, and because of the potential for increased eutrophication due to the deposition of nitrogen, which is known or presumed to be the limiting nutrient for many Sierra waters. Many of the high elevation lakes and streams of the Lahontan Region naturally have very low alkalinity, and their granitic watersheds provide very little buffering capacity for incoming acidity. Short-term drops in the pH of streams in the Lake Tahoe Basin have been documented during the snowmelt season (U.S. Forest Service, Lake Tahoe Basin Management Unit 1990) but the long-term acidification of surface waters in the Lahontan Region has not been conclusively documented. Limited sampling by the U.S. Environmental Protection Agency (1987) and the Department of Fish and Game (McClenaghan et al. 1987) demonstrated that some Lahontan Region lakes have pH values below the 6.5 unit objective in Chapter 3 of this Plan. However, in the absence of long-term baseline monitoring data for most of these lakes, it is difficult to ascertain whether these low pH values are natural or the result of acidification.

Changes in pH may stress or kill aquatic organisms directly. Spring flushes of acidity accumulated in winter snowpacks may be directly damaging. Experiments have shown that acidity increases the tendency of benthic invertebrates to leave their stream substrates and “drift” downstream. This

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obviously affects local nutrient and energy cycling and the availability of food for fish. Acidity also affects aquatic biota by changing the mobility of nutrients and toxic trace elements in soils, and their availability in waters. In the eastern United States, the increased availability of aluminum as a result of acidification is a major factor in the decline of fish populations. There are naturally high levels of metals in many Lahontan Region watersheds, as shown by the large number of inactive mines and the results of the Toxic Substances Monitoring Program (see Chapter 7). Increased mobilization of these metals due to atmospheric deposition would be of great concern. Through one or more of these mechanisms, atmospheric acidity may be involved in the documented declines of amphibian populations in the Sierra Nevada in the 1980s.

Although the magnitude of the impacts is still controversial, acid deposition has been linked to “forest decline” in the northeastern U.S. and in Europe. The CARB has documented stress to forest trees in the San Bernardino Mountains from air pollutants from the South Coast air basin. The death of terrestrial vegetation may affect nutrient loading to surface waters by increasing rates of erosion and reducing nutrient uptake. Studies in and near the Lake Tahoe Basin have shown that undisturbed meadow soils and vegetation are capable of removing at least 98% of the nitrogen in incoming precipitation.

The impacts of direct wet and dry nutrient deposition on eutrophication of surface waters have not been studied for most surface waters of the Lahontan Region. Logically, one would expect such eutrophication to occur in small, shallow lakes near the Sierra crest which receive more precipitation than waters further east. Such eutrophication has not been documented.

Atmospheric deposition is considered a significant part of the nitrogen budget of Lake Tahoe. Precipitation chemistry in the Lake Tahoe Basin has been monitored on an ongoing basis since the early 1980s. Direct wet and dry deposition on the Lake have also been studied by the University of California Tahoe Research Group. The relative importance of long distance transportation of nitrogen oxides from outside of the Lake Tahoe Basin and of nitrogen oxides from vehicle and space heater emissions within the Basin has not been conclusively established. Atmospheric nutrients are important considerations for Lake Tahoe because of the lake's large surface area in relation to the size of its

watershed, and the long residence time of lake waters (about 700 years).

Recommended Control Measures for Acid Deposition

1. The control of air pollution is outside of the authority of the State and Regional Boards. However, these agencies should work with state and regional air pollution control, transportation, and land use planning authorities to ensure that atmospheric deposition continues to be monitored, and that pollution emissions are minimized to the greatest extent feasible.
2. The CARB expects to continue studying the impacts of acid deposition on aquatic ecosystems, and has been directed to consider the feasibility of air quality standards for areal loading of pollutants (e.g., kilograms of nitrogen per hectare per year). Regional Board staff should continue to review CARB reports related to water quality issues and should comment on the loading standards if and when they are proposed.
3. The State and Regional Boards should work with the Department of Fish and Game, the Department of Water Resources, and university researchers to ensure that adequate biological and chemical monitoring of Lahontan Region waters is done so that trends toward acidification and/or eutrophication as a result of atmospheric deposition can be detected before such problems become significant and perhaps irreversible.
4. Restoration techniques for acidified waters (e.g., liming) are being developed, largely in the eastern United States. However, these methods are expensive, require long-term maintenance, and are probably not feasible for the remote lakes in federal wilderness areas which are the most vulnerable to acidification.
5. Regional Board staff should consider atmospheric nutrient loading when constructing nutrient budgets for specific watersheds, for use in wasteload allocations and effluent limitations, and for revisions to receiving water objectives. Atmospheric deposition may be an important consideration in stormwater NPDES permits (see the “Stormwater Runoff” section of this Chapter). Staff should evaluate whether existing objectives for nutrients, pH, and biological communities are adequate to protect beneficial uses threatened by acidification. Additional site specific objectives may be necessary.

6. The Tahoe Regional Planning Agency has adopted a regional “environmental threshold carrying capacity” standard to reduce annual “vehicle miles travelled” (VMT) within the Lake Tahoe Basin by 10% from the 1981 level in order to reduce nitrogen oxide emissions and consequent atmospheric deposition to the Lake. The 208 Plan (TRPA 1988), outlines control measures to be implemented by TRPA and local governments to reduce atmospheric nutrient deposition. These include increased and improved mass transit; redevelopment, consolidation, and redirection of land uses to make transportation systems more efficient; controls on combustion heaters and other stationary sources of air pollution; protection of vegetation, soils, and the duff layer; and controls on offroad vehicles to control suspension of nutrient-laden dust. In order to reduce transport of airborne nutrients from upwind areas, the 208 Plan commits TRPA to work with California legislators “to encourage additional research into the generation and transport of nitrogen compounds, to require regular reports on the subject from the CARB, and to provide incentives or disincentives to control known sources of NO_x emissions upwind from the Tahoe Region. TRPA shall actively participate in the review and comment on draft air quality control plans from upwind areas to encourage additional NO_x control measures.” TRPA is also committed to further monitoring of the nature and extent of transport of airborne nutrients into the Lake Tahoe region.

Table 4.9-1

List of rivers in Lahontan Region determined eligible for National Wild & Scenic River designation by federal land management agencies

Hydrologic Unit Number	Name of river/creek followed by managing agency	NF = National Forest; RA =USBLM Resource Area
601	Lee Vining Creek	Inyo NF
601	Mill Creek	Inyo NF
601	South Fork Mill Creek	Inyo NF
601	Upper Parker Creek	Inyo NF
603	Walker Creek	Inyo NF
603	Convict Creek	Inyo NF
603	Cottonwood Creek (Sierra Nevada)	Inyo NF
603	Fish Slough	Bishop RA
603	George Creek	Bishop RA
603	Glass Creek	Inyo NF
603	Hot Creek	Inyo NF & Bishop RA
603	Independence Creek	Bishop RA
603	Laurel Creek	Inyo NF
603	Lone Pine Creek	Inyo NF
603	McGee Creek	Inyo NF
603	Rock Creek	Inyo NF & Bishop RA
603	South Fork Bishop Creek	Inyo NF
603	Upper Owens River	Inyo NF
604	Cottonwood Creek (White Mountains)	Inyo NF
630	Atastra Creek	Bishop RA
630	Dog Creek	Bishop RA
630	East Walker River	Toiyabe NF
630	Green Creek	Bishop RA
630	Rough Creek	Bishop RA
630	Virginia Creek	Bishop RA
631	West Walker River	Toiyabe NF
632	East Fork Carson River	Toiyabe NF
634	Cold Creek	Tahoe NF
634	Martis Creek	Tahoe NF
634	Upper Truckee River	LTBMU
635	Alder Creek	Tahoe NF
635	Lower Truckee River	Tahoe NF
636	Independence Creek	Tahoe NF
636	Little Truckee River	Tahoe NF
636	Perazzo Canyon	Tahoe NF
636	Sagehen Creek	Tahoe NF

Table 4.9-2
SUGGESTED METHODS FOR EVALUATING
WETLAND FUNCTIONS AND VALUES

Function/Value	Suggested Methods of Evaluation
HYDROLOGY	
Surface Water Inflow/Outflow	Monitor flow rates; hydrological model of watershed dynamics (usually a simple model of extent of wetland, timing and volume of inputs, depth and duration of flooding, discharge from wetland); install and monitor staff gages.
Ground Water Discharge/Recharge	Monitor water levels in appropriate wells; Install and monitor piezometers; Model of watershed dynamics (see above).
Nutrient Supply and their limiting factors	Analyze soil texture and organic matter content; Determine soil and pore water nutrient concentrations; Sample inflowing and outflowing waters for nutrient concentrations (use to estimate nutrient removal); Survey for toxic substances; Conduct bioassays for limiting factors.
Flood Storage	Monitor water levels in relation to flow velocity; Model of watershed dynamics (see above).
Erosion/Accretion/Sedimentation	Measure in channels and in wetlands
Shoreline Stabilization	Map shoreline from aerial photographs; Install and monitor markers.
PRODUCTIVITY	Assess cover of floating or epibenthic algae by calculating change in biomass through time; also see "Plant Growth" below.
VEGETATION	
Plant Cover	Use aerial photographs to determine cover of dominant species; Verify aerial photograph determinations by using methods such as belt transect (forested wetlands), replicate transect (herbaceous wetlands), multiple quadrants (shrub dominated wetlands); Establish and use fixed point panoramic photograph locations.
	continued...

(from National Research Council, 1992; Kusler and Kentula, 1990)

Table 4.9-2 (continued)
SUGGESTED METHODS FOR EVALUATING
WETLAND FUNCTIONS AND VALUES

Function/Value	Suggested Methods of Evaluation
Plant Growth and its Limiting Factors	Measure end-of-season live standing crop (EOSL); use linestrip/elongated quadrant (to monitor survival and growth of weedy species); Assess/monitor organic matter composition; Measure soil redox potential; Measure nutrient content of inflowing waters; Establish and use fixed point panoramic photograph locations.
Sensitive Plant Species/Communities	Quantitatively survey populations of sensitive plant species; Determine life history characteristics to predict ability to survive in restored wetland (e. g., numbers, seed production and germination, seedling establishment, recruitment).
WILDLIFE / FISHERY HABITATS	Survey/censuses; Sample community composition, seasonally if necessary, including macroinvertebrate sampling (artificial substrate samplers); reliable observations (record habitat use and movements between habitats, identify areas for feeding, nesting, refuge, spawning, nursery.
Sensitive Species/Communities	Quantitatively survey populations; Determine life history characteristics to predict ability to survive.
RESILIENCE	Follow recovery of species impacted by environmental extremes; Establish and use fixed point panoramic photograph locations.
RESISTANCE TO INVASIVE EXOTICS	Map occurrence of weedy plants, and rank species abundance; census exotic animals and evaluate population (stable, declining, increasing).
RECREATION (Contact and non-water contact)	Survey recreational uses.
ECOLOGICAL WATERSHED CONTEXT	Use analytical models to evaluate the relationships between wetland, upland, and transitional areas in terms of factors such as flood control, habitat, and food chain support.

(from National Research Council, 1992; Kusler and Kentula, 1990)

4.10 AGRICULTURE

Agriculture is an important land use in many parts of the Lahontan Region. Agricultural uses include ranching, dairying, aquaculture, and the production of irrigated crops¹. Rangeland livestock grazing is a major agricultural use in the Region that is discussed separately in the “Range Management” discussion of the “Resources Management and Restoration” section of this Chapter. Public fish hatcheries are discussed separately in the “Fisheries Management” discussion of the “Resources Management and Restoration” section of this Chapter.

Agricultural activities can affect water quality in a number of ways. Agricultural drainage contributes salts, nutrients, pesticides, trace elements, sediments, and other by-products that can degrade the quality of surface and ground waters. There are unique problems associated with irrigated agriculture, animal confinement operations, aquaculture facilities, and the use of agricultural chemicals.

Irrigated Agriculture

Irrigation drainage can contain significant amounts of pesticides, fertilizers, salts, trace elements, and sediment. (Control of pesticides and fertilizers is discussed in the following section entitled “Agricultural Chemicals.”)

Trace elements (such as molybdenum, boron, arsenic, selenium, etc.) can have both chronic and acute toxic effects on humans and other animals. Sedimentation impairs fisheries and, by virtue of the characteristics of many organic and inorganic compounds to bind to soil particles, it serves to distribute and circulate toxic substances through stream, lake, and riparian systems. The cost of pumping and treating water for municipal and industrial use also increases with increasing sediment load.

Salts contained in irrigation water become concentrated as evaporation and crop transpiration remove water from soils. Depending on the fraction of applied irrigation water that is leached through the soil, salts may either accumulate in the crop root zone or be carried with the drainage water. Salt accumulation in the root zone can result in reduced crop yield and quality. Salts present in drainage

waters may reach surface or ground water via natural flows or via discharge of surface drains (e.g., tailwater ditches) or subsurface drains (e.g., tile drains).

Improved irrigation efficiency can substantially reduce the rate of salt accumulation, allowing crop production to continue into the foreseeable future even in the low rainfall areas. Water saved through implementation of irrigation efficiency programs could be used for dilution of agricultural wastewater, recharge of ground water, and/or non-agricultural uses.

However, in areas experiencing chronic salt accumulation, agriculture can be sustained in the long-term only if degraded waters are removed at a sufficient rate to maintain low salt levels and to achieve a satisfactory balance between imports and exports of salts. This may be achieved by installation of drainage systems and by export of saline drainage to temporary or permanent “salt sinks.” Salt sinks are designated acceptor areas for saline wastewaters, where such waters can be stored and evaporated. Both the North and South Lahontan Basins contain a number of alkali and dry lakes that could possibly be adapted for use as salt sinks. However, any such proposal(s) must comply with the water quality objectives contained in this Basin Plan, and with all other applicable laws, regulations, and policies.

Salt inputs to a basin can be reduced in part by improved management of salt sources such as fertilizers, animal wastes, and soil amendments. Regulation may be required, but an appreciable improvement can also be expected from education of farmers to understand and better utilize existing information and Best Management Practices.

In the North Lahontan Basin, areas where irrigated agriculture is important include the East and West Walker Rivers, Carson River, and lower Susan River watersheds. In the South Lahontan Basin, the majority of irrigation occurs in the Antelope, Owens, and Fremont Valleys, and along the Mojave and Amargosa Rivers.

Until about 1960, irrigated agriculture constituted the South Basin's major developed land use, with the greatest acreage in the Antelope Valley. Around 1950, however, rising ground water-pumping costs, resulting from dropping ground water levels in parts of the Antelope Valley, caused a decline in agricultural acreage. The 30,000-acre reduction in the Basin's irrigated agriculture experienced from 1950 to 1970 is largely attributed to the declining ground water levels in Antelope Valley. Irrigated acreage in Antelope Valley will probably continue to decline until the year

¹ **Note:** Other agricultural activities include, but are not limited to: operations associated with confined animal and concentrated animal feeding, confined animal feeding, confined animal holding, confined and concentrated aquatic animal production facilities, and the treatment and/of disposal of agricultural wastewater.

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2000, and agricultural waste loads will decline correspondingly.

The effect of irrigation drainage on the receiving ground water is highly variable. For instance, in the Owens Valley, irrigation has produced no appreciable effect on the ground water quality due to the low mineral content of the irrigation supply water and the relatively minor amount of irrigated acreage. However, in the Little Rock area and along the Mojave River, irrigation drainage has noticeably contributed to localized increases in mineral and nitrate content of the underlying ground water.

Water supply wells are discussed in the "Ground Water Protection and Management" section of this Chapter. The use of reclaimed water is discussed in the "Wastewater" section of this Chapter.

Control Measures for Irrigated Agriculture

Regional Board Actions

The Regional Board shall take all appropriate measures, as required by the California Constitution (Article X, § 2) and the California Water Code (§ 275), to prevent waste of water, unreasonable use of water, unreasonable method of use of water, and/or unreasonable method of diversion of water within the Lahontan Region. Irrigation practices shall also be regulated by implementing relevant provisions of the State Board's "Sources of Drinking Water Policy," and Nonpoint Source Management Plan. Both the Policy and Plan are summarized in Chapter 6 of this Basin Plan.

Specific Control Actions for the Susan River Watershed

1. The Regional Board shall work with the Resource Conservation District, the Soil Conservation District and private agricultural landowners to formulate a plan to begin implementation of Best Management Practices on agricultural lands to reduce pollutant loading to the Susan River.
2. The State Board, with assistance from the Regional Board and the Department of Water Resources, should examine water rights on the Susan River to determine if violations are occurring which threaten beneficial uses. As water rights permits are renewed, the Regional Board will work with State Board staff to ensure that beneficial uses are adequately protected.
3. In cooperation with agricultural users of the CSD effluent, the Susanville CSD with assistance from

Regional Board staff, shall establish a monitoring program for the effluent ditch/Brockman Slough system to quantify point and non-point sources of pollutants that are contributing to the degradation of the sloughs and hence, the Susan River.

Federal Control Measures for Irrigated Agriculture

1. Under the authority of the amended Coastal Zone Management Act, the U.S. Environmental Protection Agency has developed guidance specifying management measures for sources of nonpoint water pollution (including agriculture) in coastal waters (USEPA 1993). Measures have been proposed for sediment control, animal waste management, nutrient and pesticide management, grazing, and irrigation. This guidance may be applicable to many non-coastal waters as well.
2. In April 1992, the U.S. Environmental Protection Agency and the U.S. Department of Agriculture signed a Memorandum of Agreement (MOA) to implement increased pollution prevention in the agricultural sector. The MOA calls for the development of a pollution prevention strategy which targets the areas of nutrient management, total resource management planning, voluntary livestock or poultry management agreements, safer pesticide registration, and voluntary action projects in selected watersheds. The strategy emphasizes reduced risk to human health and natural ecosystems from agricultural activities through voluntary action.
3. The federal Conservation Reserve Program (CRP), administered by the USDA, takes fragile farmland out of production for between 10 and 15 years. The land owners receive an annual rental payment for idling the land, as well as cost-share assistance for establishing permanent vegetative cover. Stream corridors, wellhead protection areas, and other environmentally critical lands are also eligible for CRP.

Recommended Future Actions for Irrigated Agriculture

In cooperation with other appropriate local, state, and federal agencies, and private landowners, the Regional Board should:

1. Develop a monitoring program to detect water quality trends, identify problem areas, and determine the needed levels of action.
2. Encourage the use of irrigation methods designed to reduce deep percolation and nitrate

leaching, and to eliminate surface runoff and erosion (e.g., drip irrigation systems, surge valves on furrow irrigation systems, etc.).

3. Support efforts by the Soil Conservation Service, Resource Conservation Districts, University Cooperative Extension, and others to develop guidelines to improve irrigation practices and to educate individual farmers about the principles of irrigation efficiency, and methods of controlling salt inputs.
4. Regulate the reclamation of new lands which could contribute large quantities of salts or pollutants to waters of the State.
5. Regulate the importation and reuse of wastewater to minimize the application of waters which are of poorer quality than existing or imported supplies. If such import or transport to upslope areas for reuse is allowed, the Regional Board should take suitable steps to mitigate short- and long-term adverse effects of increased salt load resulting from wastewater recycling.
6. Restrict the use of reclaimed waters, where water supplies are limited, to existing irrigated acreage rather than developing new irrigated acreage to utilize the reclaimed water.

Agricultural Chemicals

Agricultural chemicals include pesticides (insecticides, herbicides, fungicides, rodenticides, etc.), fertilizers, soil amendments, and other compounds. Pesticides and fertilizers can contaminate surface and ground water supplies, posing health hazards to humans and animals. Fertilizers can also contribute to the eutrophication of streams, lakes, and rivers by adding nutrients to these systems.

Pesticides

The California Department of Pesticide Regulation (DPR) is the lead agency responsible for pesticide registration and regulation in California. The DPR maintains a computerized data base that contains information on the kinds and quantities of pesticides used in the State, including the location and acreage of chemical applications, and the type of crop treated.

Local administration of the DPR's pesticide regulatory program is the responsibility of the County Agricultural Commissioners (CACs), with coordination, supervision, and training provided by the DPR. The CACs enforce pesticide laws and regulations, and evaluate permit requests for the use of restricted

pesticides. In addition, the CACs monitor and inspect pesticide handling and use operations, investigate suspected pesticide misuse, and take enforcement action against violators. The CACs are required by law to consult quarterly with Regional Board staff to report any problems resulting from pesticide use.

Effective control of problems related to pesticides is difficult because application practices tend to vary, depending on the particular chemicals and crops involved. Furthermore, the types of pesticides and formulations that are currently in use tend to change rapidly, as often as every three to five years.

On March 19, 1997, the State Water Resources Control Board and DPR entered into a Management Agency Agreement (MAA) and approved a "California Pesticide Management Plan for Water Quality" for implementation of the MAA. The MAA provides for cooperation and communication between the two agencies, and summarizes their respective roles and responsibilities. In the MAA, the State Board conditionally agrees to accept the MAA and plan as measures consistent with the State's Nonpoint Source Management Plan. Both agencies commit to exchange information, and to work together in the development of plans, policies, and "reduced risk practices" for the protection of water quality from the impacts of pesticides. Implementation of "reduced risk practices" is to be initially on a voluntary basis, followed by regulatory action if necessary. The MAA includes a section on "Reservation of Authority" which provides that nothing in its text shall be construed as limiting the authority of the State and Regional Boards "in carrying out their legal responsibilities for management, regulation, coordination, and control of water quality." The plan describes more specifically how DPR and the CACs will work with the State and Regional Boards. It includes provisions for outreach programs, compliance with water quality standards, ground and surface water protection programs, self-regulatory and regulatory compliance, interagency communication, and conflict resolution. Appendices to the plan include a list of "reduced-risk practices" for minimizing the potential for offsite pesticide movement and transport of residues to surface or ground waters, and summaries of applicable state and federal regulations.

The Director of the DPR, in consultation with the State Board, the Regional Boards, and the California Office of Environmental Health Hazard Assessment, is required under the Pesticide Contamination Prevention Act (AB 2021) to annually report the following information to the California Legislature:

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- The location and number of ground water wells sampled for pesticide active ingredients, and the agencies responsible for drawing and analyzing the samples.
- The location and number of well samples with detectable levels of pesticide active ingredients, and the agencies responsible for drawing and analyzing the samples.
- An analysis of the results of well sampling described above to determine the probable source of the residues. The analysis shall consider factors such as the physical and chemical characteristics of the economic poison, volume of use, method of application, irrigation practices, and types of soil in areas where the economic poison is applied.
- Actions taken by the DPR and the State and Regional Boards to prevent economic poisons from migrating to ground waters of the State.

Regional Board responsibilities in the AB 2021 Program include compiling and transmitting to the State Board any of the activities described above that have occurred in the Region during the year. The State Board combines information from all of the Regional Boards to assist in the preparation of the annual AB 2021 report to the California Legislature.

Fertilizers

Nutrients contained in fertilizers (including animal manure) can reach surface water via storm runoff, irrigation drainage, or by natural subsurface flows. Fertilizers can contribute to nitrate accumulation in ground water, resulting in violations of the drinking water standard. Fertilizers can also contribute to cumulative nutrient loading, along with other sources such as septic systems and urban runoff.

Because the primary agricultural land use in the Lahontan Region is range livestock grazing, agricultural fertilizer use is relatively low compared to that in some other parts of the State. However, localized water quality problems have resulted from agricultural fertilizer applications. For example, increases in salinity and nitrates in ground waters of the Mojave River and Antelope Valley areas are believed to have resulted in part from excess applied fertilizers. Off-site application of manure from dairies also has resulted in water quality degradation.

More efficient application of fertilizers could help to reduce the amount of nutrients reaching surface and ground waters with agricultural drainage and runoff.

Vector Control and Weed Control

Agricultural chemicals are often employed for non-agricultural uses. For instance, aquatic herbicides are sometimes used for the control of aquatic weeds to improve vehicle access, to enhance recreational opportunities, or for aesthetic reasons. The use of terrestrial herbicides may be proposed for forest management, landscaping, fire control, golf course maintenance, or for other similar purposes. Pesticides are also used by public agencies for vector control (i.e., to eliminate pests and disease-carrying organisms such as mosquitoes).

The Regional Board has asked to be notified by public agencies of any large-scale applications of such chemicals within their jurisdiction. For example, the U.S. Forest Service is expected to notify the Regional Board of plans for chemical applications associated with timber harvest or other forest management activities. The California Department of Food and Agriculture, which is currently responsible for certain pest control programs such as that for the gypsy moth, has been asked to notify the Regional Board of plans for pesticide applications in this Region. The U.S. Bureau of Land Management, in implementing its Noxious Weed Control Program, has been asked to notify the Regional Board of aerial herbicide applications and of any spills in, or near, surface waters. Upon such notification, the Regional Board is able to become involved in the environmental consultation process required by the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). In this way, the Regional Board can ascertain whether potential water quality impacts from such activities will be mitigated.

For smaller-scale applications, such as the use of herbicides for golf courses or other turf areas, the Regional Board has adopted waste discharge requirements which include control measures for herbicide use. The Regional Board may wish to have staff review projects on a case-by-case basis, in order to determine whether there is any potential for water quality impacts and if waste discharge requirements are necessary.

In some instances, use of these substances will have unavoidable water quality impacts, particularly in situations where the chemicals are applied directly into or near surface water (such as aquatic weed control or vector control). In these cases, the use of such chemicals can result in the violation of water quality objectives for pesticides and toxic substances, as well as in the violation of waste discharge

prohibitions. Federal regulations (40 CFR § 131.13) allow the Regional Board to grant conditional variances to water quality objectives under certain circumstances. Furthermore, pursuant to Section 13269 of the California Water Code, the Regional Board may waive the need for waste discharge requirements and reports of waste discharge, for specific types of discharge, where such a waiver is in the public interest. Such actions nevertheless must conform to State and federal nondegradation requirements. Although these policies do allow limited decline in water quality when the State finds that an overriding public benefit will result, both the federal and State policies require that water quality be maintained at a level sufficient to protect existing beneficial uses. USEPA guidance on variances from water quality standards is summarized in Chapter 3 of this Basin Plan under "General Direction Regarding Compliance With Objectives."

Control Measures for Agricultural Chemicals

Regional Board Control Actions

Chapter 3 of this Basin Plan includes a narrative water quality objective for pesticides which states that pesticide concentrations in waters of the Region shall not exceed the lowest detectable levels, using the most recent detection procedures available. (This objective was amended in 1990 to provide limited exemptions for the use of rotenone by the California Department of Fish & Game.)

The use of agricultural chemicals shall be further regulated by implementing relevant provisions of the State Board's Nonpoint Source Management Plan, and, once adopted, the plan guiding implementation of the State Board's 1991 MOU with the Department of Pesticide Regulation. Some pesticides are also included in the California Department of Health Services' Proposition 65 list of carcinogens which should not be present above "action levels" in sources of drinking water. (Proposition 65 is discussed in the "Spills, Leaks, Complaint Investigations and Cleanups" section of this Chapter.)

The narrative water quality objective for pesticides, and nondegradation objectives for water quality and aquatic communities and populations, are important considerations in the Regional Board's regulation of discharges which may include pesticides. These objectives essentially preclude the use of aquatic pesticides or the direct discharge of pesticides to surface waters.

Federal Control Measures for Agricultural Chemicals

1. Under the authority of the amended Coastal Zone Management Act, the U.S. Environmental Protection Agency (USEPA) has developed guidance specifying management measures for sources of nonpoint pollution (including agriculture) in coastal waters (USEPA 1993). Measures have been proposed for nutrient and pesticide management. This guidance may be applicable to many non-coastal waters as well.
2. In April 1992, the USEPA and the U.S. Department of Agriculture (USDA) signed a Memorandum of Agreement (MOA) to implement increased pollution prevention in the agricultural sector. The MOA calls for the development of a pollution prevention strategy which includes safer pesticide registration. The strategy emphasizes reduced risk to human health and natural ecosystems from agricultural activities through voluntary action.
3. The USEPA and USDA are cooperating in the development and implementation of environmentally-sound pest management practices, and in the identification of the best methods of applying integrated pest management in agriculture. As a first step, both agencies sponsored a public/private Integrated Pest Management Forum in June 1992.
4. In April 1992, a *Federal Register* notice and public workshop solicited public comments on possible criteria, policies, and procedures for encouraging the development and registration of negligible-risk pesticides and replacement pesticides than are less hazardous than currently-registered products. Options suggested included faster review of applications, lower fees and registration costs for safer pesticides, reconsideration of current registrations for riskier pesticides, and public listing of risky pesticides as targets for replacement.
5. The Agriculture in Concert with the Environment (ACE) grant program is administered by the USEPA's Office of Pollution Prevention and the USDA Cooperative State Research Service. ACE grants have been awarded for projects whose objective is adopting sustainable agriculture practices and reducing the use of herbicides and other pesticides.
6. The USDA's Sustainable Agriculture and Research Program gives grants to develop and

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distribute to farmers practical, reliable information on alternative farming practices.

Recommended Future Actions for Agricultural Chemicals

In cooperation with other appropriate local, state, and federal agencies, and private landowners, the Regional Board should:

- Encourage the State Board to develop a monitoring program to detect water quality trends related to agricultural chemicals, identify problem areas, and determine the needed levels of action.
- Review proposals for weed control and vector control projects on a case-by-case basis, and consider adopting Basin Plan policies and/or waivers to allow qualified projects to proceed.
- Support efforts by the Soil Conservation Service, Resource Conservation Districts, University Cooperative Extension, and others to educate individual farmers about Best Management Practices for fertilizer and irrigation management, including, but not limited to, developing fertilizer management plans and/or other strategies to optimize the type, amount, rate, and timing of application.
- Develop Best Management Practices or other guidance for the control of aerial applications of agricultural chemicals.

Confined Animal Facilities

Confined animal facilities are used to raise or shelter high population densities of animals such as cattle, pigs, chickens, turkeys, sheep, horses, commercial furbearers, and pets. A number of such facilities presently exist in the Lahontan Region.

Confined animal facilities may potentially impact water quality in a number of ways. Stormwater runoff can carry by-products of such operations into surface waters. Such pollutants include washwater from milking areas, salts present in animal feed and manure, nutrients and pathogens found in manure, and sediment that has been detached by trampling and other land disturbances. Manure disposal can also affect ground water quality by increasing concentrations of total dissolved solids (salt) and nitrate.

Manure and wastewater from confined animal facilities may generally be applied to disposal fields or crop lands, provided that the quantities applied are reasonable. "Reasonable" is defined as the amount

the land or crops can beneficially utilize. Overloading may be detrimental to the application site, as well as nearby receiving waters.

The confined animal facilities presently of most concern in the Lahontan Region are dairies. Studies have shown that the total dissolved solids (salt) content of the ground water along the Mojave River has become elevated both along the length of the river and over time. Dairy manure is one likely contributor to the overall salt loading of this closed basin.

In the early 1980s, dairy operators in the increasingly urbanized Chino basin began looking to the high desert along the Mojave River to relocate. A proposal to establish a large number of dairies in Summit Valley (the headwaters of the Mojave River) prompted the Regional Board to commission a study to identify and evaluate potential areas of concern associated with the location/siting of confined animal facilities. That study, conducted by the Department of Water Resources, concluded that a two- to three-mile band along the Mojave River would most rapidly be impaired by percolation of dairy and other wastes, and that other areas outside of the Mojave River floodplains could also be impacted by dairy waste, but at a slower rate. The Regional Board responded by adopting waste discharge requirements for large dairies located along the Mojave River.

Control Measures for Confined Animal Facilities

(For confined animal facilities regulations which apply in the Lake Tahoe Basin, see Chapter 5.)

The State and Regional Water Boards have authority under the California Water Code, in general, and regulations contained in the California Code of Regulations, Title 23, Chapter 15, Article 6, in particular, to fully regulate waste disposal activities at confined animal facilities.

Regional Board Control Actions

The Regional Board has adopted waste discharge requirements (WDRs) for several dairy operations in the Lahontan Region. Regional Board staff will periodically inspect all confined animal facilities for which WDRs have been adopted. Based on inspections and other information, the WDRs will be periodically evaluated to determine if they are protective of water quality and in conformance with the minimum standards contained in the California Code of Regulations (23 Cal. Code of Regs. § 2560-2565). Control systems must be designed to minimize surface runoff, minimize percolation of field-applied

wastewater to ground water, and minimize percolation of water through manure into ground water. Any control system utilizing retention ponds should either be lined or situated over soil of relatively low permeability to allow slow infiltration and percolation. Additional and/or more stringent measures may be required in areas overlying threatened or impaired sources of drinking water. The need for construction/retrofit of pollution prevention or ground water monitoring facilities (including time schedules) will be considered on a case-by-case basis.

The State Board's Dairy Waste Task Force issued guidelines in 1991 to facilitate consistent regulation of waste management at dairies throughout California. Those guidelines (and any future amendments) will be used by the Regional Board to assess and respond to the potential water quality impacts of dairy operations. The regulatory process for existing dairies is initiated by surveying dairy owners and encouraging the use of Best Management Practices. If a dairy owner does not voluntarily implement BMPs, a conditional waiver of waste discharge requirements may be issued. Waste discharge requirements may be adopted for those facilities that fail to comply with the conditional waiver. Regardless of the tier under which a facility is regulated, all confined animal operations are required to comply with the minimum standards contained in the California Code of Regulations and this Basin Plan.

All proposed new or re-opening dairies must file a report of waste discharge with the Regional Board. The Regional Board will require that the report of waste discharge include the information outlined in the Dairy Waste Task Force guidance. Based on the report of waste discharge (and other information as available), the Regional Board will either adopt waste discharge requirements or a conditional waiver stipulating that, at a minimum, facilities will be designed, constructed and operated to meet the minimum criteria contained in the California Code of Regulations and this Basin Plan. Monitoring programs may be required to assure compliance.

The Regional Board relies heavily upon the USDA Soil Conservation Service (SCS), which has the technical expertise and congressional authority to assist farmers in developing pollution prevention plans to comply with state regulations, including this Basin Plan. In some cases, matching funds are available through the SCS to assist the owners of confined animal facilities in the design and construction of pollution prevention measures.

The process described above for the regulation of dairies will also be utilized to assess and regulate other types of confined animal facilities, whenever deemed appropriate by the Regional Board's Executive Officer.

Regulation of confined animal facilities by the Regional Board shall account for cumulative effects such as salt and nitrate accumulations in ground water from other sources.

Waste discharge requirements adopted for a specific confined animal facility may not effectively regulate the off-site disposal of manure. Potential water quality degradation due to such disposal shall be regulated by implementing relevant provisions of the State Board's Nonpoint Source Management Plan.

Federal Control Measures for Confined Animal Facilities

1. Under the authority of the amended Coastal Zone Management Act, the U.S. Environmental Protection Agency has developed guidance specifying management measures for sources of nonpoint water pollution (including agriculture) in coastal waters (USEPA 1993). Measures have been proposed for animal waste management. This guidance may be applicable to many non-coastal waters as well.
2. In April 1992, the U.S. Environmental Protection Agency and the U.S. Department of Agriculture signed a Memorandum of Agreement (MOA) to implement increased pollution prevention in the agricultural sector. The MOA calls for the development of a pollution prevention strategy which includes voluntary livestock or poultry management agreements. The strategy emphasizes reduced risk to human health and natural ecosystems from agricultural activities through voluntary action.

Recommended Future Actions for Confined Animal Facilities

1. In cooperation with other agencies, the Regional Board should develop a monitoring program to detect water quality trends, identify problem areas, and determine the needed levels of action.
2. Where appropriate, the Regional Board should begin actively regulating all confined animal facilities that may adversely affect water quality or beneficial uses.
3. To aid in the development of BMPs for dairy systems, the Regional Board should cooperate

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with other agencies to collect and review, whenever feasible, field-scale data on salt and plant-available nitrogen for cropped or pastured dairy production systems.

4. The Regional Board should encourage the use of plant nutrients in liquid and solid animal wastes as a resource, rather than a waste to be disposed of.
5. The Regional Board should encourage and assist in the development of criteria for allowable animal units/acre for different site-specific crop, soil, climate, and management variables.

Aquaculture Facilities

(Public fish hatcheries are addressed in the “Fisheries Management” discussion within the “Resources Management and Restoration” section of this Chapter.)

Discharges from aquaculture operations can contain waste products (nutrients and suspended solids) as well as pesticides and other substances. Potential water quality impacts downstream of these discharges include increased productivity and algal growth, increased biological oxygen demand, and impaired aquatic habitat. The temperature of discharged waters can also affect receiving waters.

Another concern with aquaculture facilities is the release of exotic species. If commercial species are not properly contained, they could escape and become established outside of the facility, potentially violating objectives for species diversity and nondegradation of aquatic communities.

Regional Board Control Actions for Aquaculture Facilities

All aquaculture facilities which include point source discharges to surface waters shall be regulated under National Pollutant Discharge Elimination System (NPDES) permits.

Recommended Future Actions for Aquaculture Facilities

The Regional Board should be advised of routine and other applications of pesticides or other substances potentially containing toxic substances.

4.11 RECREATION

Tourism related to outdoor recreation is a major sector of the Lahontan Region's economy. Recreational activities range from backpacking in wilderness areas to golfing, boating, and skiing at highly developed resorts. Water quality concerns associated with outdoor recreation include sanitation, erosion/stormwater problems (related to disturbance of soils and vegetation), and water contamination due to the use of pesticides at golf courses and fuel and paint at marinas.

Impacts of recreation are of special concern in the Lake Tahoe Basin, which receives as many as 20 million visitors annually. The application of special control measures to recreational projects on sensitive lands in the Lake Tahoe Basin is discussed in Chapter 5.

Water quality problems associated with specific recreational activities are discussed below, together with recommended regionwide control measures.

Backcountry Recreation

The Lahontan Region includes at least part of nine National Forests and ten designated wilderness areas within these forests. Wilderness recreation in the eastern Sierra Nevada is so popular that quotas for overnight use have been established for several areas. Much of the National Forest land which is not designated wilderness is managed for dispersed recreation, with few developed facilities such as parking lots, restrooms, etc. Much of the Bureau of Land Management land within the Region is also managed for dispersed recreation. Dispersed recreation can include hiking, backpacking, packing with livestock, fishing, hunting, camping at undeveloped areas, recreational use of natural hot springs, cross-country skiing, snow camping, etc. (Problems related to use of offroad vehicles are discussed in a separate section below.)

Problems related to dispersed and wilderness recreation include disposal of human and animal waste too close to surface waters, littering, destruction of meadow and riparian vegetation by trampling from humans and livestock, erosion of trails, and watershed damage by human-caused wildfires. One unusual type of problem results from the unauthorized "development" of natural hot springs for spa use, including physical alterations to create pools, and use of disinfectant chemicals and soaps which may be harmful to unique hot spring biota.

Relatively little quantitative information is available on the baseline quality of backcountry water bodies to enable the evaluation of the extent of problems related to recreation.

Control Measures for Backcountry Recreation

Designated wilderness and national park areas are of special concern. Land use practices in these areas must assure protection of beneficial uses of water. Erosion control in the vicinity of surface waters must be implemented for all human activities which disturb the natural ground surface. Animal wastes must be managed to prevent nuisance and to protect beneficial uses of water.

Recommended Control Measures for Backcountry Recreation

1. The USFS and BLM have ongoing programs of trail maintenance and watershed restoration, including the restoration of wetlands disturbed by recreational use. Information is provided to wilderness users at trailheads regarding sanitation, etc., and wilderness rangers patrol backcountry areas to increase public awareness. These programs should be continued.
2. The USFS and BLM should conduct additional water quality monitoring to determine the impacts of dispersed recreational use. Where problems are apparent, the Regional Board should work with land managers to prevent further impacts and to ensure the implementation of remedial measures.
3. Regional Board staff should review and comment on recreation and wilderness management plans prepared by public agencies, and should encourage these agencies to mitigate water quality problems that have been identified by monitoring and/or public complaints.

Campgrounds and Day Use Areas

Developed recreation areas such as campgrounds, picnic areas, vista points, and interpretive centers generally have roads and parking lots and may have restrooms and recreational vehicle waste dumping facilities. They generally result in more soil disturbance and compaction, and a greater amount of impervious surface, than undeveloped recreational facilities. They are often located near surface waters, and heavy foot traffic may damage streambanks and lakeshores. Pesticides may be used at such facilities to control mosquitoes or rodent vectors of disease.

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Control Measures for Campgrounds and Day Use Areas

1. The Regional Board regulates developed recreation facilities on public lands under MOUs and MAAs (see Chapter 6). It may also issue waste discharge requirements where necessary to protect water quality. Wastewater disposal at developed recreational facilities is subject to the control measures discussed in the “Wastewater” section of this Chapter, and to the regionwide septic system density limits and areawide waste discharge prohibitions where applicable.
2. New private recreation facilities involving soil disturbance of 5 acres or greater are subject to the statewide stormwater construction NPDES permit (see “Stormwater” section of this Chapter).

Recommended Control Measures for Campgrounds and Day Use Areas

1. In portions of the Region where erosion and stormwater problems threaten sensitive surface water bodies, waste discharge requirements (WDRs) should be considered for the construction of new private recreational facilities even when the statewide construction permit does not apply. WDRs may also be necessary to require installation of BMPs by existing private facilities in such areas. Waivers of WDRs may be appropriate in less sensitive areas.
2. New campgrounds and day use recreation facilities should be designed to minimize water quality impacts by avoiding disturbance of steep slopes, highly erodible soils, and riparian/wetland areas. Best Management Practices can be applied to new and existing campgrounds and day use areas to reduce erosion and provide treatment for stormwater. Control of erosion from unpaved roads and parking areas is particularly important. Interpretive displays and programs at recreational facilities should address water quality impacts of recreation and request public cooperation (e.g., use of designated fishing trails rather than random trampling of streambank vegetation).
3. Campgrounds and other recreational facilities on public lands are occasionally closed and remodeled or relocated to allow the recovery of compacted soils and natural vegetation. Public agencies operating developed recreational facilities which have encroached on wetlands or riparian areas should be encouraged to relocate facilities outside of these sensitive areas, and to restore riparian/wetland functions where feasible.

4. Where other disposal facilities are not locally available, public and private campgrounds which attract significant numbers of recreational vehicles should provide waste dumping stations to reduce the extent of illegal dumping.
5. Additional monitoring of the water quality impacts of developed recreation in the Region should be performed in order to facilitate the implementation of control measures, as needed.

Boating and Shorezone Recreation

Water quality problems related to boating result both from discharges of wastes from boats, and from construction and operation of facilities to support recreational and commercial boating. “Support” activities and facilities include dredging, piers, marinas, boat launching facilities, boat parking and storage facilities. (The term “boats” for purposes of this section includes river rafts, jet skis, and other watercraft.) Lake Tahoe has the greatest number of developed support facilities, including a U.S. Coast Guard station. Large commercial tour boats operate on Lake Tahoe, and there are plans for expanded “waterborne transit.” However, boating is popular at other large lakes in the Region (e.g., Arrowhead, Eagle, Crowley), and there are public and private marinas and launching facilities at many smaller lakes. There are many private piers at some lakes which are surrounded by residential development, such as Donner Lake. When flows permit, the Truckee and East Fork Carson Rivers are very popular for rafting.

Waste discharges associated with boating include human sewage, garbage and litter, fuels from leaks, spills, and engine exhausts, and antifouling chemicals in boat paints. Boat wakes and propwash in shallow waters can also erode shorelines or suspend bottom sediment, increasing turbidity and mobilizing nutrients and contaminants in the sediment.

Almost all surface waters in the Lahontan Region are designated sources of drinking water pursuant to Proposition 65 (see “Spills, Leaks, Complaint Investigations, and Cleanups” section of this Chapter), and many of them, including Lake Tahoe, Donner Lake, and some of the Mammoth and June Lakes, have existing surface water intakes for municipal supply. (The Mammoth and June Lakes, and Crowley Lake, a very popular boating area, are part of the Los Angeles Department of Water and Power's domestic supply system.) It is thus very

important to protect these domestic supplies from vessel wastes.

Dredging, whether it is done to create marinas or to maintain or increase boat access to marinas and piers under low water conditions, can have a number of potentially significant water quality impacts. It disturbs sediments, smothers bottom-dwelling organisms, and releases nutrients and contaminants which had settled out of the water. The sediments may also be redeposited elsewhere. Disposal of dredged material in the shorezone of a lake may allow leaching of dissolved nutrients and contaminants back into the lake.

The construction of piers and other shorezone structures can involve localized erosion, suspension of bottom sediments, and destruction of valuable riparian vegetation. Even after construction, piers, jetties, and marinas constitute physical alterations in natural shorezone conditions. Impermeable (e.g., rock crib) piers can alter natural patterns of sand and sediment transport along the shore, adversely affecting habitat values. Even permeable shorezone structures may have cumulative impacts on sand transport.

Many marinas are enclosed areas which trap sediment, nutrients and contaminants. Higher water temperatures within enclosed marina areas may lead to algae blooms and/or dissolved oxygen depletion. Some pollutants may accumulate in marina sediments, and affect biological processes both through gradual long-term release and through resuspension of sediment upon dredging. Pollutants may enter marinas from boats, maintenance activities near or over water, and stormwater runoff from parking lots and other onshore impervious surfaces. In some cases, disposal of fish-cleaning wastes can increase biochemical oxygen demand (BOD). The level of pollutant accumulation in the marina depends on the level of flushing; however, flushing merely redistributes pollutants elsewhere in the lake.

Metals and metal containing compounds are widely used in boats and marina related activities. Examples include lead as ballast, arsenic in paint pigments, pesticides and wood preservatives, zinc anodes used to deter corrosion of metal hulls and engine parts, and copper and tin in antifoulant paints. Boatyard hull pressure washing operations may release metals in concentrations of environmental concern (USEPA 1993).

Elevated levels of petroleum hydrocarbons may occur in marina waters as a result of refueling activities and

bilge or fuel discharges from boats. Petroleum hydrocarbons tend to adsorb to particulate matter and become incorporated into sediments. They persist for years, with long-term impacts on benthic organisms (USEPA 1993).

Shorezone structures near stream inlets to lakes can act as barriers to fish migration and/or alter currents and the transport of sediment from streams. The visual presence of large numbers of piers and shorezone structures can alter the quality of visitors' recreational experiences and thus affect recreational beneficial uses.

Beach use is popular at Lake Tahoe and at other lakes around the Region. Water quality problems associated with beach use can include sanitation, littering, and stormwater problems related to nearshore parking facilities. Because the beaches of Sierra lakes are often rocky, resorts sometimes import sand to create beaches. Lake currents may repeatedly transport the sand away from the beach, making ongoing replenishment necessary. Sand used for replenishment may contain nutrients, salts, or contaminants. Private landowners with rocky beaches may also rearrange underwater rocks offshore to create a sandy bottom for swimming and wading, with detrimental impacts on fish habitat.

Control Measures for Boating and Shorezone Recreation

1. ***Vessel Wastes.*** Direct discharges of wastes, including sewage, garbage, and litter into surface waters of the Lahontan Region are prohibited (see "Waste Discharge Prohibitions" section of this Chapter). Control of discharges of human sewage from boats is discussed in detail in the "Wastewater" section of this Chapter. Briefly, the Regional Board should determine needs for specific marinas and public launching facilities serving larger boats with holding tanks to have wastewater pumpout facilities; and should request the State Board to use its authority under the Harbors and Navigation Code to require installation of these facilities. Dumping stations for "portapotties" from smaller boats should also be readily available onshore, and floating latrines may be appropriate in some areas. Public land managers and river rafting businesses should provide restrooms or chemical toilets at heavily used raft put-in and take-out points; these facilities will be subject to regionwide onsite disposal system criteria and any local discharge prohibitions.

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2. Public education programs are needed to increase use of wastewater disposal facilities and to prevent the dumping of garbage and litter from boats and rafts. Local governments should strictly enforce anti-litter laws. Voluntary beach and stream litter cleanup operations should be encouraged.
3. Most boat engines are designed for operation near sea level. These engines operate on a “rich” (very high) fuel-to-air ratio on high mountain lakes. Soot and unburned fuel can be discharged from engines not adjusted for high altitude operation. Boats based year-round at high elevations should have their engines adjusted for high altitude operation.

Regional Board staff should obtain additional information about the extent and impacts of petroleum product discharges from boat engine exhausts to surface waters of the Region. If the problem appears to be significant, the Regional Board should work with the State Board, the Department of Boating and Waterways, the Department of Fish and Game, county and state health departments, and other appropriate agencies to develop control measures. Statewide and possibly national action, like that used to control tributyltin (TBT), may be necessary to promote or require alternative fuels and more efficient engines.

4. The use of paint containing the antifouling agent TBT on smaller boats is now prohibited by State and federal legislation. Vessels painted with TBT before January 1, 1988 may continue to be used, but may not be repainted with TBT paint. Maintenance activities on older boats need careful controls to prevent TBT paint from entering lakes in stormwater (see marina discussion below). Regional Board staff should attempt to stay aware of new information on other antifouling paint ingredients (e.g., copper) which could have significant water quality impacts.
5. Local governments, resource management agencies, and other entities with authority to regulate boating activity should exclude motorized vehicles from shallow water areas which support important habitat in order to prevent sediment and shorezone disturbance from propwash. Speed limits and “no-wake zones” can also be used for this purpose.
6. *Dredging and Underwater Construction.* The following guidelines apply primarily to dredging in

connection with recreational activities. However, dredging is also performed for other purposes, such as removal of sediment from reservoirs and hydroelectric facilities. Many of the considerations below apply to these types of projects as well; see also the separate discussions of these facilities elsewhere in this Chapter.

For regulatory purposes, Regional Board staff divide dredging activities into “maintenance” and “new” dredging. Maintenance dredging involves areas and sediment depths which have been previously dredged. The depth of dredging is important to water quality because the concentrations of nutrients, organic matter, and toxic substances in sediment may vary with depth depending upon physical, chemical, and biological processes. (In Lake Tahoe, maintenance dredging may not be done below an authorized lake bottom elevation; see Chapter 5.) New dredging is that done outside of maintenance dredging boundaries, or below any applicable approved lake bottom elevation. Waste discharge permits for marinas may include conditions for allowable ongoing maintenance dredging; new dredging generally requires a new or revised permit.

There are two major types of dredging equipment: bucket (“clamshell”) dredges, and suction dredges. Bucket dredging involves the scooping and transfer of sediments to a dewatering site, and the subsequent removal of sediments to an approved disposal site. Such operations typically create highly turbid water due to bucket drag on the lake bottom as it pulls free from the sediment. Turbidity barrier installation is usually required to isolate water disturbed by mechanical dredging operations.

Suction dredges are operated like a vacuum cleaner. Sediments are removed in a slurry, which is pumped through a semi-flexible pipeline to a dewatering and/or settling area. (“Bypass” dredging may involve redeposition of sediments in another area of the lakebed.) Experience has shown that water quality impacts can be minimized if suction dredging is employed and the slurry is pumped out of the lake; in such cases, turbidity barriers may not be necessary.

Dewatering and settling areas must be designed to accommodate the expected flow and to provide necessary removal of suspended and dissolved solids. If dewatering and/or settling areas are not designed to accommodate the

expected flow, temporary shutdown of dredging operations may be necessary to avoid overloading the system. Overloading the system may lead to the failure of containment berms and/or the release of water which may violate water quality standards. It is important to note that dewatering and settling areas need not be adjacent to the dredging site. Slurries can be pumped for distances of several thousand feet to several miles, depending upon particle size. In some dredging operations in Lake Tahoe, dredged sediments have been pumped from an outer channel area and discharged within a marina to be removed mechanically. In these cases, turbidity barriers are usually required to isolate the disturbed water from the lake.

Suction dredging is often the most effective and most environmentally safe method, especially with offsite disposal. However, even with turbidity barriers, suction dredging followed by interim storage of dredged material in an “inner harbor” situation may create more problems than bucket dredging. Localized problems related to turbidity may result from repeated disturbance of stored material for final disposal. Practical limitations, such as land availability for dewatering and/or settling, may also make bucket type dredging more appropriate in some cases.

In the Lake Tahoe Basin, Regional Board staff apply the local stormwater effluent limitations to nutrient discharges from dredged material dewatering and settling areas (see “Stormwater” section of this Chapter; see also Chapter 5). In other watersheds, effluent limitations for such operations should reflect the characteristics of the slurry, and receiving water standards. In all cases, the Regional Board may require additional site-specific analysis of the material proposed to be dredged (e.g., analysis of the proportion of colloidal material or silt to sand) and may require additional mitigation as necessary.

Turbidity barriers must be designed and used with caution. Failures or breaches of turbidity barriers are usually the result of wind and current loadings which cause the barrier to pull away from its bottom anchoring. A breach in the turbidity barrier is always accompanied by a release of waters which may violate water quality standards. To avoid failures, turbidity barriers should be designed to withstand expected wind and current loadings. Care must be taken to ensure that the barrier conforms to the lake bottom, forming an adequate seal. A recommended method of

bottom anchoring is to sew a heavy chain into the bottom of the barrier. It is important to realize that the weight of an object decreases when placed under water. For example, the weight of a sand bag is reduced to 1/3 when placed in water, and additional bags must be used to effectively anchor the barrier. Turbidity barriers may contribute to localized temporary water quality problems since they trap nutrients from suspended sediments, and reduced water circulation increases water temperature inside the barrier; both of these factors can lead to algae blooms.

Entanglements with dredging machinery are often the cause of breaches in the barrier. A ten-foot buffer zone between the barrier and machinery could prevent such occurrences.

Freeboard is the distance between the water surface and the top of the turbidity barrier. The amount of freeboard should be based on site-specific characteristics. In some cases, it may be desirable to allow some splash over the barrier, while in others it may be impossible to limit splashover without violating water quality standards. Too much freeboard can allow the barrier to act as a sail, catching the wind, which puts additional stress on the barrier and bottom anchoring. Too little freeboard could allow splashover to occur, leading to a violation of water quality standards. Fastening the tops of turbidity curtains to sections of floating piers can be very effective. In all cases, turbidity barriers should be designed with a freeboard which will limit the stress placed on the bottom anchoring and ensure that splashover discharges do not result in violation of standards.

Turbidity barriers are classified into two types, permeable and impermeable. Permeable barriers allow water and dissolved solids to pass through while stopping all but the smallest of suspended solids; impermeable barriers prevent passage of water and dissolved or suspended constituents. In dredging of an area with a high concentration of nutrients and/or toxics, and low wind and current loadings, an impermeable barrier might be more effective at isolating the nutrients and/or toxics. In cases where nutrients and/or toxics are not in high concentrations and wind and current conditions are high, permeable barriers may be preferred. Permeable barriers also have the advantage of preventing barrier failure due to excessive water pressure behind the curtain.

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Site specific design is the key to successful dredging operations. The configuration of the area to be dredged, land type and availability for dewatering and or settling, types and amount of material being dredged, nutrient concentrations within the sediments, and expected weather conditions should all be considered. By tailoring the dredging operations to the specific site, violations of water quality standards can be avoided.

Dredging and filling activities within surface waters may require a Section 401 or 404 permit from the U.S. Army Corps of Engineers (see “Wetlands” discussion in the “Resources Management and Restoration” section of this Chapter). Most lakebeds and streambeds in California are owned by the State, and their disturbance may also require a permit from the State Lands Commission and/or the Department of Fish and Game.

Proposals for dredging, filling, or dredged material disposal should continue to be evaluated on a case-by-case basis; the Regional Board should consider issuing waste discharge requirements where necessary to protect beneficial uses.

7. *Beach Creation and Replenishment.* Because it disturbs natural shorezone habitats and associated wetland/riparian values, the importation of sand to create new recreational beaches at natural lakes and reservoirs should be discouraged. Replenishment of existing sand beaches should use only clean sand.
8. *Shorezone Protection.* Eroding shorelines should be stabilized. Vegetative methods are strongly preferred unless structural methods are more cost-effective, considering the severity of wind and wave erosion, offshore bathymetry, and the potential adverse impacts on other shorelines and offshore areas.

The USEPA (1993) summarizes information on a variety of shoreline protection practices. General considerations include design of all shorezone structures so that they do not transfer erosion energy or otherwise cause visible loss of surrounding shorezones; establishment and enforcement of no wake zones to reduce erosion potential from boat wakes, establishment of setbacks for upland development and land disturbance, and direction of upland drainage away from bluffs and banks so as to avoid accelerating slope erosion.

9. *Piers.* Discharges attributable to the construction of new piers in certain habitat types in Lake Tahoe are prohibited (see Chapter 5). Although there are no specific pier-related prohibitions applicable to other lakes in the Region, the general discharge prohibitions discussed elsewhere in this Chapter apply to pier construction. The Regional Board has historically regulated piers serving single family homes to a lesser extent than public piers, breakwaters, jetties, marinas, and other large in-lake construction projects. Pier construction projects throughout the Region should meet the following conditions:

- The disturbance of lake bed materials should be kept to a minimum during construction. Best practicable control technology should be used to keep suspended earthen materials out of the lake. (This may involve techniques such as installation of pilings within caissons.)
- No petroleum products, construction wastes, litter or earthen materials should enter surface waters. All construction waste products should be removed from the project site and dumped at a legal point of disposal. Any mechanical equipment operating within the lake should be cleaned and maintained prior to use.
- No wood preservatives should be used on wood which will be in contact with lake water.
- The pier owner should ensure that the project contractor is aware of these and any other applicable conditions.

Regional Board staff should continue to review proposals for shorezone and underwater construction on a case-by-case basis through the Section 401 water quality certification process, and the Board should consider waste discharge requirements where necessary to protect water quality.

10. *Marinas.* Certain types of marinas in California are subject to the statewide industrial stormwater NPDES permit (see the “Stormwater Runoff, Erosion, and Sedimentation” section of this Chapter). These include marinas which are primarily in the business of renting boat slips, storing boats, cleaning boats, and repairing boats, and which generally perform a range of other marine services (USEPA 1993). The

NPDES permit applies only to point sources of stormwater from the maintenance areas at the marina. The NPDES program does not apply to marinas that are not involved in equipment cleaning or vehicle maintenance activities, or to “marine service stations” which are primarily in the business of selling fuel without vehicle maintenance or equipment cleaning operations (USEPA 1993). Marina construction or maintenance activities which do not fall under the statewide industrial stormwater NPDES permit may be subject the statewide construction stormwater NPDES permit and/or areawide municipal stormwater NPDES permits (e.g., at Lake Tahoe).

Because of the sensitivity of the affected surface waters, the Regional Board should keep individual waste discharge requirements in effect for all larger existing marinas, in order to effectively regulate the maintenance of fueling and wastewater disposal facilities, maintenance dredging, and other operation and maintenance activities which could adversely affect water quality. Proposals for new or significantly expanded marinas should be evaluated on a case-by-case basis against applicable water quality objectives, prohibitions, and effluent limitations.

Boat maintenance areas at marinas should be designed and operated to prevent the entry of toxic pollutants from marina property into surface waters. The USEPA (1993) recommends the designation of discrete impervious areas for maintenance activities, the use of roofed areas to prevent rain from contacting pollutants, and the diversion of offsite runoff away from the maintenance area for separate treatment. It also recommends source controls to collect pollutants and thus keep them out of runoff, such as sanders with vacuum attachments, the use of large vacuums to collect debris from the ground, and the use of tarps under boats which are being sanded or painted. Infiltration of runoff from non-maintenance areas is recommended; in some parts of the United States hull-cleaning waste is required to be pretreated and discharged to a sewer.

Over-water boat maintenance activities by marina tenants should not require opening more than a pint-size paint can. Engine oil changes should not be done while a boat is in the water. The State Board's BMP handbook for industrial NPDES permits (APWA Task Force 1993) contains

additional recommendations to prevent problems from over-water maintenance activities.

Liquid and solid wastes produced by marina operation, maintenance, and repair activities, including waste oils, solvents, antifreeze, and paints, should be properly disposed of. Marinas with heavy use by fishermen should also manage fish waste disposal. Fish waste management can include establishment of fish cleaning areas with waste receptacles, issuance of rules controlling or prohibiting fish cleaning at the marina, education of boaters about waste problems, and implementation of composting where appropriate (USEPA 1993).

The USEPA (1993) recommends the use of automatic shutoff nozzles, and fuel/air separators (on air vents or tank stems of inboard fuel tanks), to reduce the amount of fuel spilled into surface waters during fueling of boats. It also recommends the use of oil-absorbing materials in the bilge areas of all boats with inboard engines. These materials should be examined at least once a year and replaced as necessary.

Marina fueling stations should be designed to allow for ease in cleanup of spills. This includes allowance for booms to be deployed to surround a fuel spill. Marinas should have fuel spill contingency plans meeting local and State requirements. These plans should include health and safety procedures, notification, and spill containment and control. Appropriate containment and control materials should be stored in a clearly marked, easily accessible location. Materials should include absorbent pads and booms, fire extinguishers, a copy of the spill contingency plan, and other equipment deemed suitable. Marina tenants and employees should be educated on spill prevention and cleanup (USEPA 1993, APWA Task Force 1993).

Some marinas have chemical over-water fire retardant systems. In reviewing marina projects, Regional Board staff should investigate the types of chemicals being used and their potential water quality impacts in relation to applicable water quality objectives.

Marina water treatment systems (to remove nutrients and turbidity) have been suggested as mitigation for the impacts of marina expansion at Lake Tahoe. The Tahoe Keys subdivision currently has a treatment system to remove phosphorus from the waters of its artificial

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lagoons. Any new proposals for marina water treatment systems in the Lahontan Region should be evaluated based upon site specific conditions and water quality risks associated with the proposed treatment (see discussion of lake restoration in the “Resources Management and Restoration” section of this Chapter.)

Additional monitoring should be conducted in areas of heavy boating and rafting use to document the water quality impacts of vessel wastes, shorezone construction, and dredging. In particular, marina sediments should be sampled for TBT when dredging is proposed.

Offroad Vehicles

Offroad vehicles (ORVs), (also called “off-highway” vehicles or OHVs), include, but are not limited to, any of the following: bicycles, motorcycles, “all terrain vehicles,” snowmobiles, and any other vehicle (including passenger trucks and cars) operated off of paved roads. While the impacts of “mountain” bicycles are still being debated, motorized vehicles can cause serious erosion problems, directly (through soil detachment, compaction, or creation of ruts) or indirectly (through damage to vegetation or by starting wildfires). Operation of over-the-snow vehicles can also disturb soils and vegetation if there is insufficient snow cover.

Control Measures for Offroad Vehicles

1. The U.S. Forest Service and Bureau of Land Management designate ORV routes on public lands and prohibit operation away from these routes. ORV use may be further restricted during extremely dry conditions in order to prevent fires, and during wet (i.e., winter/spring) conditions when excessive soil disturbance is likely. However, illegal use can and does occur. Compliance should be encouraged via well planned and targeted public education efforts, as well as strict enforcement of regulations.
2. Regional Board staff should continue to review and comment on proposed changes in ORV management plans of public agencies. These agencies should be encouraged to monitor the water quality impacts of legal ORV use, and to modify or close routes where water quality problems are occurring. Modifications could include rerouting of trail segments away from surface waters and wetlands, or installation of bridges at stream crossings. Closed routes should be stabilized and revegetated.

3. Some local governments have ordinances regulating ORV use, although these may be directed at problems unrelated to water quality (e.g., noise). All local governments in the Region should be encouraged to adopt and enforce ordinances which will prevent erosion from ORV use on private lands.
4. Although waste discharge requirements are generally an infeasible means of controlling the impacts of private ORV use, the Regional Board can issue requirements or cleanup orders to landowners whose property is contributing to water quality problems as a result of ORV damage. Waste discharge requirements can also be issued to commercial ORV facilities to ensure proper operation (e.g., to ensure that snowmobiles are operated over snow deep enough to prevent soil damage).

Ski Areas

Alpine skiing facilities are found on public and private lands in the San Bernardino and San Gabriel Mountains and in the Sierra Nevada, including the Mammoth Lakes, June Lakes, Lake Tahoe, and Truckee areas. Some of these ski areas have stimulated neighboring private resort development, which can include facilities such as golf courses and bike trails designed to attract summer visitors. The potential exists for the expansion of existing ski areas and the creation of new ones.

Downhill skiing facilities tend to be located at high elevations on steep terrain with poorly developed soils, in areas receiving high amounts of precipitation. Water quality problems associated with ski areas include: erosion and sedimentation from construction and maintenance activities, disturbance of wetlands, stormwater runoff from parking lots and other impervious surfaces, and disposal of domestic wastewater in areas which are remote from urban wastewater treatment plants and which are usually unsuitable for septic systems. Snow-making and snow-grooming are also of concern. Installation of pipelines and excavation of storage ponds for snow-making can lead to severe erosion. Some ski areas use bacteria as nucleating agents for snow crystals; the bacteria can contribute nitrogen to surface runoff. Salts such as ammonium nitrate and sodium chloride may be used to groom ski slopes. Upon snowmelt, these salts may adversely affect instream uses and/or riparian vegetation.

Older ski areas were constructed with little consideration of water quality impacts. Preparation for

the 1960 Winter Olympics at Squaw Valley involved channelization of a creek, filling of a wet meadow to support parking, and construction of a wastewater treatment plant which raised nitrate levels in a sole-source municipal aquifer. Later ski area developments have been more carefully planned. However, even the use of Best Management Practices (BMPs) for erosion and stormwater control cannot completely eliminate water quality impacts. The fragile soils, harsh climates, and short growing seasons at ski areas make the revegetation of cleared roads, trails, and ski slopes very difficult. Disturbed areas at most older ski resorts are still not adequately stabilized. A State Water Resources Control Board study of one ski area which used "state-of-the-art" BMPs showed an erosion rate six times higher than natural levels (White and Franks 1978).

The U.S. Forest Service uses conceptual models to evaluate the risk of Cumulative Watershed Effects (CWE) and adverse impacts on beneficial uses of water from land management activities. The methodology is primarily used to evaluate the effects of proposed timber harvest activities; however, it has recently been adapted to predict the impacts of new land disturbance during construction of skiing facilities. Chapter 20 of the U.S. Forest Service's Soil and Water Conservation Handbook (R-5 FSH 2509.22) provides a general overview of CWE methodology and analysis recommendations. The U.S. Forest Service's 1993 report entitled *Cumulative Watershed Effects Analysis for Heavenly Valley Ski Area* discusses the potential use of CWE procedures for ski areas in the Lake Tahoe Basin.

Analyses are performed by an interdisciplinary team, and include some degree of professional judgement. CWE analysis involves quantifying existing and proposed watershed disturbance as "Equivalent Roaded Acres" (ERA). (An acre of road is assigned an ERA of 1.0. An acre of well-vegetated ski run on a gentle slope might be assigned an ERA coefficient of 0.2; an acre of badly eroding ski run on a steep slope might be given a value of 2.0 ERA.) Disturbed areas can be analyzed after the performance of remedial erosion or drainage control work, and the ERA value can be revised downwards. CWE analysis also involves determination of a "Threshold of Concern" (TOC) for each watershed affected. The TOC is an upper limit of tolerance to disturbance (in ERA). The risk of initiating adverse cumulative water quality effects greatly increases as this upper limit is approached or exceeded. Determination of the TOC is an interactive and multi-step process which

involves comparison of several watersheds with respect to the extent of land use disturbance and the occurrence or nonoccurrence of adverse cumulative impacts.

Where CWE analysis indicates that the TOC of a subwatershed in a ski area is currently exceeded or is expected to be exceeded as a result of proposed development, conditions may be placed in the ski area permits on additional new projects. These conditions can be used as a means of phasing new projects in relation to the accomplishment of remedial erosion control programs. This approach is being used by the U.S. Forest Service, Lake Tahoe Basin Management Unit and the Tahoe Regional Planning Agency for proposed ski area expansions in the Lake Tahoe Basin, and may be applied to Forest Service ski area permits elsewhere.

Control Measures for Skiing Facilities

1. The Regional Board has adopted waste discharge requirements (WDRs) and/or NPDES permits for all large ski areas in the Region, to address the problem areas identified above in relation to locally applicable water quality objectives, discharge prohibitions, and effluent limitations. These WDRs are updated periodically to address proposed ski area expansions and/or changes in operation and maintenance activities which could affect water quality. Permit conditions include the use of temporary and permanent BMPs, the prevention and cleanup of fuel and sewage spills, and in some cases, remedial measures to correct water quality problems created by past development. Permit conditions also regulate the use of snow-making chemicals and bacteria in addition to snow-grooming chemicals.
2. The Regional Board shall review proposed new skiing facilities and issue WDRs and/or NPDES permits as appropriate.
3. Skiing facilities in the Lake Tahoe Basin shall continue to be regulated under the provisions of Chapter 5, Section 5.15 of this Basin Plan, in addition to the general control measures outlined in Chapter 4.

Recommended Control Measures for Skiing Facilities

1. The U.S. Forest Service and local governments with permitting authority over ski areas should consider placing conditions in their permits to require:

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- the effective implementation of all applicable temporary and permanent BMPs
 - measures to prevent, report, and clean up fuel and sewage spills
 - measures to limit the use of snow-making and snow-grooming chemicals where appropriate, in order to protect water quality
 - sufficient monitoring to assess water quality impacts and the effectiveness of mitigation measures
2. Land management agencies and local governments which have lead agency responsibility for permitting new or expanded ski areas outside of the Lake Tahoe Basin should encourage the preparation of comprehensive master plans and master environmental documents which recognize and mitigate the potential direct, indirect, and cumulative water quality impacts of each new project.
 3. New and expanded ski areas should be designed to minimize soil and vegetation disturbance, particularly the disturbance of wetlands. Modern techniques permit ski lift installation without road construction. Logging for clearance of ski slopes and trails can also be done by helicopter, cable, over-the-snow vehicles or other means that minimize soil disturbance. Stream crossings should be kept to a minimum. Because of the difficulty of revegetation, native herbaceous and shrubby plants should be left in place on ski slopes and trails to the greatest extent possible.
 4. Local governments, land management agencies, and the Regional Board should use the Cumulative Watershed Effects (CWE) model as a means to evaluate the water quality impacts of, and the adequacy of mitigation for, development of new skiing facilities outside of the Lake Tahoe Basin. Where appropriate, CWE analyses should be prepared for existing ski areas to determine necessary remedial improvements. Where CWE analysis indicates that current or projected disturbance is in excess of the Threshold Of Concern (TOC) for subwatersheds within the ski area, further development should be permitted only in conjunction with remedial erosion control programs and monitoring plans which ensure that the ERAs within those subwatersheds are substantially reduced and driven toward or below the TOC.

Golf Courses and Other Turf Areas

For visual amenity and to provide water hazards, golf courses are often located near surface waters. Construction of golf courses may include hydrologic modification, such as diversion or damming of streams or alteration of wetlands. Golf courses involve intensive management of turf, including the use of pesticides and fertilizer which may run off into surface waters or percolate into ground water. Mowing of turf creates large volumes of clippings containing nutrients and pesticides which must be considered in decisions on disposal or composting. Golf course turf demands large amounts of water for irrigation. In some portions of the Region, reclaimed water is used to irrigate golf courses; however, as noted elsewhere in this Chapter, the use of reclaimed water is not without a risk of water quality problems.

Other large turf areas, such as athletic fields and urban parks, can pose water quality problems similar to those created by golf courses, and should be addressed through similar control measures.

Control Measures for Golf Courses and other Turf Areas

(Control measures concerning the use of pesticides and fertilizers are discussed separately in the "Agriculture" section of this Chapter.)

1. The Regional Board has adopted waste discharge requirements (WDRs) for golf courses in the sensitive Lake Tahoe and Truckee River watersheds, and should consider issuing similar WDRs for any golf courses which have the potential to cause significant impacts on surface or ground waters. WDRs should include effective implementation of Best Management Practices, record-keeping of fertilizer and pesticide use, and monitoring of surface and/or ground water quality. Construction stormwater NPDES permits may be required for new or expanded golf courses.
2. New and remodeled golf courses should be designed to minimize the need for hydrologic modification and disturbance of wetlands and riparian vegetation.
3. New and remodeled golf courses should also be designed to require minimal fertilizer and pesticide application (e.g., through the use of target greens which require intensive maintenance on only a small portion of the course).

4. Water use for irrigation of golf courses should be minimized to the greatest extent possible. In addition to making limited water supplies available for other uses, such conservation will reduce the loading of nutrients and pesticides to surface and ground waters. New technology in irrigation systems can greatly reduce water use. Any proposed use of reclaimed water for golf course irrigation should be evaluated carefully in relation to site-specific water quality constraints.
5. In addition to irrigated turf, golf courses include buildings such as clubhouses and maintenance facilities, and parking lots, all of which may contribute to erosion or stormwater problems. Pretreatment of any pesticides and/or petroleum products in this stormwater may be necessary before such discharges could be permitted. Stormwater containment and treatment should be an integral part of golf course design in portions of the Region where surface waters may be affected. Although water hazard ponds may be used as stormwater retention or detention basins, eutrophication is likely to be a problem and these basins may need frequent maintenance. In desert areas of the Region, stormwater control for golf courses may be a less important consideration; however, toxic substances should be protected against the hazard of washout from flash floods.
6. Local governments should evaluate proposals for new or expanded/remodeled golf courses, or for zoning to facilitate such projects, against the water quality concerns outlined above, and should incorporate appropriate water quality mitigation measures into their conditional permits.

4.12 MILITARY INSTALLATIONS

Military installations have created some of the nation's largest and most complex environmental contamination problems. Executive Order No. 12580, adopted in 1987, directs all federal facilities to investigate and remediate areas of environmental contamination. As a result, the U.S. Department of Defense (DOD) has assumed responsibility for investigation and remediation at military installations.

The Regional Board is actively involved in investigation and remedial activities at military installations, including seven active military sites, one recently closed site, and six formerly used defense sites. All but two of these installations are in the South Basin and include three of the world's largest bases. Following are lists of active military bases in the Lahontan Region with one noted as being recently closed. (These lists are current as of 1994).

South Lahontan Basin:

Fort Irwin National Training Center
George Air Force Base (closed)
Edwards Air Force Base
Air Force Plant #42, Palmdale
Marine Corp Logistics Base, Barstow
China Lake Naval Air Weapons Station

North Lahontan Basin:

Sierra Army Depot
Marine Corps Mountain Warfare Training Center

The operations of the above military installations for the past 60 years have yielded hazardous substance releases that have degraded water quality within, and in some cases, outside of base properties. The manner in which these hazardous substances were handled was, in fact, common practice at all federal facilities across the nation during this time. As a result of past waste disposal practices, spills, and inadequate regulations, the military installations have created significant water quality problems.

Adverse impacts to water quality can result from discharge of petroleum hydrocarbons, heavy metals, solvents, acids and alkalis, landfill leachate, explosive organic compounds, and low-level radionuclides. These pollutants originate from the following sources:

- gas stations
- fuel pipelines
- stormwater retention basins
- contaminated wells
- fire training facilities

- evaporation ponds
- target ranges
- waste piles
- washwater/solvent catchment basins
- storage tanks (above and underground)
- waste disposal sites (solid, hazardous, pesticides, munitions, low-grade radioactive)

These releases have created substantial soil, surface water, and ground water contamination affecting or threatening to affect wildlife and aquatic habitats and causing domestic wells to be abandoned.

Control Measures for Military Installations

The Regional Board has the regulatory responsibility under the federal Clean Water Act and the California Water Code to protect water quality on federal property in the State, including military installations. Past control measures on bases included adoption of waste discharge requirements (WDRs) for discharges related to storm runoff, construction activities, and municipal wastewater treatment facilities. The WDRs included surface and ground water discharge limitations for water quality parameters such as nutrients, turbidity, pH, taste, odor, temperature and algal growth, as well as BMPs to prevent discharge of waste earthen materials. Other control measures by the Regional Board have been to review and regulate military base compliance in detecting and removing leaking underground storage tanks, uncovering and eliminating toxic pits, and issuance of Cleanup and Abatement Orders or other actions to remediate polluted ground water.

The State of California entered into a Memorandum of Agreement (DSMOA) with the DOD that identified 92 federal facilities within California for site remediation. The purpose of site remediation is to characterize and remove hazardous pollutants that pose a potential or actual threat to human health and/or the environment. Upon completion of site remediation, the facilities may be available for unrestricted use. The DSMOA acknowledges the State's role for providing oversight of the site remediation and provides for the State to receive payment for its oversight costs.

At military installations where water quality is threatened due to the release of hazardous substances, both the Regional Board and the Department of Toxic Substances Control (DTSC) have overlapping jurisdiction to order cleanup of sites. A Memorandum of Understanding (MOU) was executed in 1990 between the DTSC, the State Water Resources Control Board, and the Regional Boards, which specified each agency's

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responsibilities in hazardous waste site cleanup. Under that MOU, the Regional Board retained lead responsibility for certain cleanup operations at military installations. Subsequently, in 1994, the Secretary of Cal/EPA designated DTSC as the lead agency for all DSMOA military installations in California. DTSC is now responsible for coordinating cleanup activities and for ensuring that the Regional Boards' concerns regarding water quality issues are addressed. The Regional Board remains the state lead agency for regulation of active sites permitted by WDRs (such as landfills and sewage treatment plants), cleanup of leaking underground storage tank sites, and other programs mandated by the federal Clean Water Act.

The Regional Board acts as state lead agency at George Air Force Base.

Recognizing that a large number of federal facilities have been contaminated by hazardous substances which may pose a risk to human health and the environment, Congress has passed many acts to provide funding, regulations, and guidelines for site cleanup.

Installation Restoration Program

The Department of Defense (DOD) developed the Installation Restoration Program (IRP) to comply with the federal Resource Conservation and Recovery Act (RCRA) of 1976. (RCRA required federal agencies to comply with local and state environmental regulations concerning waste disposal practices at federal facilities.) The objective of the IRP is to assess hazardous waste disposal and spill sites at military installations and to develop remedial actions consistent with the National Contingency Plan (NCP) for those sites which pose a threat to human health and the environment. The IRP is the DOD's primary mechanism for response actions at all military installations.

Federal "Superfund" Program (CERCLA)

The federal "Superfund" program was established in 1980 with the passage of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The CERCLA provided funding and guidelines for the cleanup of the most threatening hazardous waste sites in the nation. High priority sites scheduled for cleanup under this program are placed on the National Priority List (NPL). In California, a large number of federal facilities have been placed on the NPL; a significant proportion of these are military installations.

As of 1994, three federal facilities within the Lahontan Region are on the NPL, all being military bases in the

South Basin. They are: the Marine Corps Logistics Base near Barstow, Edwards Air Force Base, and George Air Force Base.

Over the years, provisions of the IRP have been developed and modified to insure DOD compliance with other federal enactments such as the CERCLA, and the Superfund Amendment and Reauthorization Act (SARA), an amendment to the CERCLA. SARA requires that all federal facilities on the NPL enter into a Federal Facilities Agreement (FFA) with the USEPA. States can also be a party to the FFA but this is not a requirement. The FFA is a site-specific document which defines the USEPA's and the State's expectations as to site investigation and problem remediation. It specifies tasks and compliance schedules, describes a dispute resolution process, and stipulates penalties for compliance schedule violations. In the Lahontan Region, all three military bases on the NPL have signed a FFA of which the Regional Board is a signatory party.

Response Process. All military bases in the State with historical discharges that threaten or have potential to threaten human health and the environment are being cleaned up in compliance with the CERCLA guidelines. The guidelines include a response process consisting of removal, remedial, and enforcement programs. The rigorous response process includes the following actions:

- *Preliminary Assessment*, to determine release sites and the extent of contamination or threat of contamination to the environment.
- *Remedial Investigation/Feasibility Study (RI/FS)*, evaluates all information obtained during the Remedial Investigation (an investigation to fully characterize the contaminant sources requiring remediation), identifies ARARs (Applicable or Relevant and Appropriate Requirements, which are numerical constituent limits for cleanup and/or discharge, and other action-, location-, or chemical-specific requirements), compares treatment technologies and recommends a Preferred Alternative for the cleanup operation.
- *Record of Decision*, a document disclosing the cleanup action to be pursued, including ARARs which list the numerical final constituent limits for cleanup or discharge.
- *Remedial Design/Remedial Action*, is the design of the cleanup technology used at the site and the remedial activities to take place.

- *Operation and Maintenance*, is the operation and maintenance of the cleanup activities at the site during the time of remediation.

SARA requires federal facilities with FFAs to comply with applicable state standards in performing remedial actions. Thus, applicable state agencies can be involved in the CERCLA response process regarding ranking, long-term planning, RI/FSs, remedial action selection, and other negotiations.

The Regional Board takes an active role in the response process for the military installations with FFAs to assure that ground water investigations and cleanup activities are completed in accordance with Regional Board policies for the protection of water quality. This is achieved by establishing ARARs, providing input for remedial design and remedial actions, overseeing operation and maintenance of cleanup activities, and conducting inspection of bases to insure compliance with FFAs. Sometimes, however, disagreements will occur between signatory parties of FFAs regarding how and when to achieve compliance. In these cases, the parties enter the dispute resolution process under the FFA to alleviate disagreements and achieve resolution.

Non-NPL Federal Facilities

Another provision of SARA requires federal facilities not listed on the NPL to comply with all state laws for the cleanup of hazardous substances released into the environment. Section 120(a)(4) allows states to pursue all enforcement remedies, including assessment of civil liability against federal facilities not implementing acceptable remedial actions for contaminated sites. Federal facilities, including military bases, not on the NPL can sign into a state compliance agreement called a Federal Facilities Site Remediation Agreement (FFSRA). This is a document that formalizes a working agreement between the federal facility and state agencies. It establishes a schedule for site investigations and any necessary cleanup, and it provides the enforcement mechanism for commitments not met. As of 1994, one non-NPL military base in the Lahontan Region (Sierra Army Depot) has signed a FFSRA.

As of 1994, the other military bases in the Region (the Marine Corps Mountain Warfare Training Center, Fort Irwin, Air Force Plant #42, and the China Lake Naval Weapons Center) are not on the NPL and do not have FFSRAs. These facilities, however, have sites contaminated with petroleum products, heavy metals, and other pollutants that have led to degradation of water quality. Site agreement (FFSRA) negotiations are in progress for some bases.

Formerly Used Defense Sites (FUDS)

There are six major FUDS in the Lahontan Region, all being in the South Basin. Most of the operations on these now-closed bases were similar to operations on other bases where investigations revealed serious water quality problems. As of 1994, these six FUDS have not been formally investigated by the Department of Defense to determine if contamination problems exist, and if water quality is being impacted or threatened. The U.S. Army Corps of Engineers is responsible for environmental investigations and cleanup of FUDS.

Recommended Future Actions for Military Installations

The Regional Board should continue to work with DTSC and other state agencies to obtain FFSRAs for the military bases in the Region without this document. Having a FFSRA can assist facilities in acquiring funding for remedial activities and insure that progress is made towards achieving compliance with State water quality standards. The agreements can also ensure that cleanup activities at the bases are performed in a timely manner, or that enforcement action will be taken and civil penalties pursued by the Attorney General's office. The Regional Board should continue to monitor compliance at all other bases to insure that remediation work is being performed to comply with FFSRAs and FFAs.

The Regional Board should work to see that all FUDS are investigated to determine if they pose a threat to water quality. If water quality is being impacted or threatened at these sites, the Regional Board must ensure that appropriate remediation actions are being pursued by the DOD.

4.13 TOTAL MAXIMUM DAILY LOADS

Section 303(d)(1) (A) of the Clean Water Act requires that "Each State shall identify those waters within its boundaries for which the effluent limitations... are not stringent enough to implement any water quality standard applicable to such waters." The Clean Water Act also requires states to establish a priority ranking for waters on the Section 303(d) list of impaired waters and to establish Total Maximum Daily Loads (TMDLs) for such waters. TMDLs are essentially strategies to ensure the attainment of water quality standards in impaired waters.

The requirements of a TMDL are described in 40 CFR 130.2 and 130.7 and Section 303(d) of the Clean Water Act. A TMDL is defined as "the sum of the individual wasteload allocations for point sources and load allocations for nonpoint sources and natural background" (40 CFR 130.2) such that the capacity of the water body to assimilate pollutant loadings (the "loading capacity") is not exceeded. TMDLs are also required to address seasonal variations and to include a margin of safety to address uncertainty in the analysis. In addition, federal regulations (40 CFR 130.6) require states to develop water quality management plans to implement water quality control measures including TMDLs.

The U.S. Environmental Protection Agency (USEPA) is required to review and either approve or disapprove the TMDLs submitted by states. If the USEPA disapproves a TMDL submitted by a state, the EPA is required to establish a TMDL for that water body. Upon establishment of the TMDL by the USEPA, the state is required to incorporate the TMDL, along with appropriate implementation measures, into the state water quality management plan.

This section of the Lahontan Basin Plan contains Total Maximum Daily Loads (TMDLs) for specific water bodies and pollutants. Future TMDLs will be added as they are approved. Background information used to develop each of the specific TMDLs will be retained with the administrative record of the Basin Plan amendments, and will be available to the public on request.

Heavenly Valley Creek, El Dorado County

Introduction. Heavenly Valley Creek is a tributary of Trout Creek in the southern portion of the Lake Tahoe watershed. The segment of Heavenly Valley Creek within the permit boundaries of the Heavenly Ski Resort is impaired by sedimentation related to historic ski resort development (including roads and ski runs). Sedimentation of Heavenly Valley Creek is of concern not only because of its impacts on instream uses but also because of its cumulative contribution to the degradation of Lake Tahoe. All of the subwatershed affected by the Total Maximum Daily Load (TMDL) for sediment is National Forest land administered by the U.S.D.A. Forest Service, Lake Tahoe Basin Management Unit (LTBMU) and within the permit boundaries of the Heavenly ski resort.

The purpose of this TMDL is to ensure attainment of all sediment-related water quality standards, especially narrative objectives related to protection of instream beneficial uses. (When this TMDL was developed, Heavenly Valley Creek was close to attainment of the numerical suspended sediment objective applicable to tributaries of Lake Tahoe.) The LTBMU has modeled sediment delivery to Heavenly Valley Creek, and reductions in sediment loading expected as a result of ongoing erosion control work. This TMDL is based on LTBMU modeling and monitoring data, interpreted by Regional Board staff to translate hillslope sediment delivery to instream loads. The TMDL implementation program is based substantially on continuation of existing erosion control and monitoring programs which are being carried out under an adaptive management approach by the LTBMU and the ski resort. Progress toward attainment of water quality standards in Heavenly Valley Creek will be evaluated in relation to monitoring data for Hidden Valley Creek, another tributary of Trout Creek with an undisturbed watershed within National Forest lands. A Regional Board staff report (California Regional Water Quality Control Board, Lahontan Region, 2000) provides the technical information supporting the regulatory elements of this TMDL. The staff report should be considered as the reference for all of the information in Tables 4.13-HVC-1 through 4.13-HVC-6 below.

Problem Statement. The water quality standards of concern in relation to this TMDL are beneficial uses related to aquatic life (COLD, RARE, MIGR, and SPWN; see Chapter 2 of this Basin Plan), and narrative water quality objectives for sediment,

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settleable materials, suspended sediment, and nondegradation (see Basin Plan Chapter 5). Ski resort development began in the Heavenly Valley Creek watershed in 1956, and there is evidence of significant sediment-related impacts on water quality and beneficial uses in the early 1970s, before adoption of the North Lahontan Basin Plan. The creek has been significantly affected by hydromodification (including a snowmaking reservoir and diversion of part of the creek into a culvert). Monitoring data show that the creek has elevated suspended sediment concentrations and loads compared to the reference stream (Hidden Valley Creek). Problems have been identified with stream channel stability (although improving trends in channel conditions have been documented since the beginning of the erosion control program). The creek has been rated as "marginal" fish habitat since 1982.

Desired Conditions. A variety of parameters, reflecting desired instream and hillslope conditions, have been selected for tracking to evaluate the effectiveness of the TMDL. They are shown in Tables 4.13-HVC-1 and 4.13-HVC-2. Most of these parameters are already being monitored or tracked by the LTBMU. As used in the desired instream conditions, the loading capacity, and load allocations, the term "5 year rolling average" means the arithmetic mean of 5 contiguous annual load estimates (T/yr). For example, in the fifth year, the mean of annual averages for years 1-5 will be calculated. In the sixth year, a new mean, based on data for years 2-6 will be calculated, and so on. The terms "parameter" and "desired condition(s)," as used in this TMDL, are equivalent to the terms "indicator" and "target(s)" as used in USEPA guidance for the development of TMDLs (e.g., USEPA, 1999) and are not meant to have any additional regulatory meaning. The terms "indicator" and "target" will be used in future TMDLs.

Source Analysis. Modeled sediment delivery from various hillslope source categories to Heavenly Valley Creek is shown in Table 4.13-HVC-3. Monitoring data for 1996-99 were used to estimate the instream suspended sediment load, which was converted to a total (suspended plus bedload) sediment load using the assumptions that instream bedload sediment constitutes 20 percent of the total. Since there has been a concerted effort to implement Best Management Practices (BMPs) in the watershed since 1991, instream sediment loads in 1996-99 presumably reflect improved

water quality compared to unmitigated conditions. Using information provided by LTBMU staff regarding BMP implementation to date, back-calculations were done to estimate the total unmitigated sediment load (150 tons) shown in Table 4.13-HVC-4. That unmitigated load was divided among hillslope sources using the same relative percentages shown in Table 4.13-HVC-3. Natural sediment loading in Hidden Valley Creek is included in Table 4.13-HVC-4 for reference.

The discrepancy between the estimated hillslope sediment delivery and the instream total sediment load can be attributed partly to the limitations of the sediment delivery model. Sediment delivery is a long term process; other factors contributing to the discrepancy may include temporary storage of eroded sediment on hillslope sites and in ephemeral channels before it reaches Heavenly Valley Creek.

Loading Capacity/Total Maximum Daily Load and Linkage Analysis. The loading capacity for total annual instream sediment loading to Heavenly Valley Creek, measured at the "Property Line" station near the resort permit boundaries, is 58 tons of sediment per year, expressed as a 5 year rolling average. The loading capacity was calculated by assuming an overall 65% efficiency for BMPs and therefore a 65% reduction in the unmitigated instream sediment load. After consideration of differences in watershed size, this figure is reasonably close to the estimated 45 tons/year total sediment load in the reference stream. Because the wasteload allocation is zero and the TMDL margin of safety is implicit, the loading capacity is also the Total Maximum Daily Load.

It is difficult to predict precise relationships between hillslope sediment delivery and instream conditions because these linkages are often indirect (e.g., temporal and spatial lags between erosion and instream impacts) and because of the seasonal and annual variability in ecosystem processes. This TMDL uses an "inferred linkage" based on comparison of conditions in Heavenly Valley and Hidden Valley Creeks, and a literature review, summarized in the staff report, which indicates that the loading capacity will adequately protect aquatic life uses. Compliance with standards will be measured through long term evaluation of all of the parameters in Tables 4.13-HVC-1 and 4.13-HVC-2. If the desired conditions are attained, erosion rates and sediment delivery should decline to levels which will allow instream habitat and beneficial

4.13, Total Maximum Daily Loads

uses to recover, over time, from the impacts of excessive sedimentation in the past.

Wasteload Allocations. There are no point sources of sediment to the Section 303(d) listed segment of Heavenly Valley Creek, and the wasteload allocation for point sources is zero.

Load Allocations. Load allocations are shown in Table 4.13-HVC-5. The contributions to the mitigated instream sediment load from the "undisturbed lands" and "impervious surface" source categories are assumed not to change as a result of TMDL implementation. The allocation for new development is based on LTBMU modeling data and reflects estimated loading after full application of BMPs. The road and ski run source categories have been given a single load allocation as "historically disturbed lands".

Margin of Safety. The TMDL includes an implicit margin of safety to account for uncertainty in the analysis. Sources of uncertainty include: interpretation of compliance with standards, including narrative objectives and beneficial use support; limited data available for some parameters; limitations of the LTBMU sediment delivery model, and inherent seasonal and annual variability in sediment delivery and instream impacts of sediment.

The TMDL provides a margin of safety by: 1) interpreting compliance with standards through use of multiple parameters to evaluate progress toward desired conditions; 2) incorporating conservative assumptions in the source analysis and development of load allocations; and 3) incorporating a rigorous monitoring and review program and schedule which provides an ongoing mechanism to adjust the TMDL if adequate progress toward attainment of standards is not being made.

Seasonal Variations and Critical Conditions. The TMDL evaluates a variety of parameters in order to integrate the net cumulative effects of sedimentation over longer time frames. The loading capacity and the load allocations are expressed as 5 year rolling averages to account for natural seasonal and annual variation in sediment loads, with the recognition that trends may not be apparent within shorter time frames. Other parameters are also expressed as long term trends. The TMDL and load allocations are set at levels which, over time, will allow instream aquatic

habitat to recover to a level which adequately supports aquatic life uses.

Implementation Measures and Schedule. Implementation is the responsibility of the U.S. Forest Service, Lake Tahoe Basin Management Unit (the landowner) and the Heavenly Ski Resort (an LTBMU permittee). The program of implementation summarized in Table 4.13-HVC-6 is based primarily on continuation of the existing LTBMU erosion control program which requires application of Best Management Practices to all disturbed areas in the ski resort under an adaptive management approach. The implementation program includes full application of Best Management Practices to all new and existing disturbed areas within the ski resort. Implementation also include the monitoring and review and revision programs discussed below.

The Regional Board will use its existing authority, including the Lake Tahoe Basin control measures outlined in Chapter 5 of this Basin Plan, and the three-tier compliance approach (ranging from voluntary compliance to regulatory action) in the statewide Nonpoint Source Management Plan, to ensure implementation of the TMDL. If needed, the Regional Board will use enforcement orders to ensure implementation. The LTBMU and the Tahoe Regional Planning Agency have authority, and have made commitments, to ensure implementation in the Nevada portion of the Heavenly Valley Creek watershed.

Erosion control work within the Heavenly Valley Creek watershed is expected to be complete by 2006. The consequent reduction in hillslope sediment delivery is expected to allow recovery of instream physical conditions to more natural levels, leading to gradual recovery of aquatic life uses. Attainment of instream standards is projected to occur within 20 years after final approval of the TMDLs (by 2021). The technical staff report includes additional information on authority for and commitments to implementation, and demonstrates that there is reasonable assurance of continued implementation and attainment of standards.

Monitoring. The TMDL monitoring program will focus on the parameters listed in Tables 4.13-HVC-1 and 4.13-HVC-2. Suspended sediment concentration and flow will continue to be monitored to enable calculation of annual sediment loads. With the exception of macroinvertebrate community health, all of these parameters are already being monitored as part of the LTBMU's

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adaptive management program. Most of these parameters are sampled annually; surveys for others, such as the Pfankuch stream channel condition index, are conducted at longer intervals to detect long term trends. TMDL monitoring will include stations in both the Heavenly Valley Creek and Hidden Valley Creek watersheds. The technical staff report for the Heavenly Valley Creek TMDL includes recommendations for sampling locations and frequencies. However, because of the adaptive management approach to implementation, and the pending completion of the first comprehensive review of five years of monitoring data, this TMDL allows flexibility for modification of the monitoring program over time. No later than 120 days after the final approval of the Heavenly Valley Creek TMDLs, Regional Board staff will reach agreement with LTBMU and Heavenly ski resort staff on initial sampling frequencies and locations for all of the TMDL parameters. This agreement may be formalized either through a Memorandum of Understanding or through modifications to the monitoring program in the waste discharge requirements for the Heavenly ski resort.

Results of the TMDL monitoring will be reported in the annual reports produced by the LTBMU as part of its adaptive management program for the Heavenly ski resort as a whole, and in the projected comprehensive evaluations for this program which are to be produced at five year intervals beginning in 2001.

Schedule for Review and Revision of the TMDL.

Regional Board staff will continue to participate in the interagency technical advisory group for the LTBMU's erosion control and monitoring programs. Staff will review the annual and five year monitoring and evaluation reports described above from the perspective of progress toward implementation of controls necessary to meet the load allocations, and toward attainment of water quality standards. If significant progress is not apparent at the conclusion of the second (2005-2006) review, Regional Board staff will evaluate the need for revision of the TMDLs and/or the implementation program.

Table 4.13-HVC-1. Desired Instream Conditions, Heavenly Valley Creek TMDL

Parameter	Desired Condition(s)
<i>Instream Total Sediment Load</i> ¹	Maximum 58 tons/year as a 5 year rolling average, as measured at the Property Line monitoring station.
<i>Geomorphology Measures</i>	
Pfankuch channel stability rating (composite rating includes numeric scores for 15 different indicators) ²	Increasing trend over time from "fair-poor" to "good" (comparable with overall rating of Hidden Valley Creek)
USFS Region 5 "Stream Condition Inventory" (SCI) ²	Improving trends in channel morphology over time
<i>Biological Parameters</i>	
Macroinvertebrate community health-	Improving trends in benthic invertebrate community metrics over time, approaching conditions in Hidden Valley Creek

¹ Incorporated by reference in CRWQCB, Lahontan Region ,2000 (technical staff report, Sections 3.2 and 3.5, with May 2002 supplement.

² Incorporated by reference in U.S. Forest Service, 1996 (pages 5-2 to 5-9); U.S. Forest Service, 1997, pages 5-1 to 5-9; Hazelhurst and Widegren ,1998, and Hazelhurst *et al.*, 1999 (annual U.S. Forest Service Heavenly Ski Resort environmental monitoring reports).

Table 4.13-HVC-2. Desired Hillslope Conditions, Heavenly Valley Creek TMDL

Parameter	Desired Condition(s)
Watershed disturbance ¹	Schedules in ski resort master plan mitigation program (TRPA 1995, 1996) for implementing and maintaining BMPs for roads and ski runs are met, with progress and BMP effectiveness reported annually and evaluated at 5-year intervals
Effective soil cover (vegetation, woody debris, organic matter, rocks) on ski runs and roads ²	Cover meets modeled mitigation targets set for specific road/run segments in watershed, and overall cover rating is "good" or better using LTBMU evaluation criteria

¹ Incorporated by reference in Tahoe Regional Planning Agency (TRPA) Draft EIR/EIS/EIS for Heavenly Ski Resort Master Plan (1995), pages 4.1-50 to 4.1-72 (CWE Soil Erosion Reduction Program) and Appendices H and I; TRPA (1996), pages 6.4-1 to 6.5-6 (Revised Mitigation and Monitoring Plan); and U.S. Forest Service (1998), Appendix G (CWE Technical Memorandum No. 1).

² Incorporated by reference in TRPA (1995) Appendix I, Road and Run Segment Mitigation Tables; Hazelhurst and Widgren (1998) pages 3.1 to 3.13 (on effective soil cover evaluation); and Hazelhurst *et al.*, 1999, pages 3.1 to 3.7 and 6.3 to 6.7 (on effective soil cover evaluation).

Table 4.13-HVC-3. Modeled Sources of Upland Sediment Delivery to Heavenly Valley Creek. (Sediment delivery figures are for the 1341 acre watershed. Data are from TRPA 1995, 1996, with changes by Regional Board staff as explained in the staff report.)

Source Category	Area (acres)	Sediment Delivery (tons/year)	Percent of Total Load
Roads	19	349	62
Ski Runs	182	176	32
Impervious surface	1	0 ¹	0 ¹
Undeveloped Area	1119	34 ²	6
TOTAL	1341	559	100

¹ Sediment delivery from impervious surface is considered "de minimis".

² Number rounded upwards

Table 4.13-HVC-4. Source Analysis for Instream Total Sediment Loading to Heavenly Valley and Hidden Valley Creeks (Loads are estimated *unmitigated* values, rounded to the nearest ton.)

Source Category	Loading (Tons/Year)	Percent of Total Load
<i>Heavenly Valley Creek</i>		
Roads	93	62
Ski Runs	48	32
Undisturbed Lands	9	6
Impervious Surface	0 ¹	0
TOTAL	150	100%
<i>Hidden Valley Creek</i>		
Undisturbed Lands	45	100%
TOTAL	45	100%

¹ Sediment delivery from impervious surface is considered "de minimis".

Table 4.13-HVC-5. Instream Load Allocations for Total Sediment in Heavenly Valley Creek (measured at the Property Line Station)

Source Category	Load Allocation (tons/year as a 5 year rolling average)
Historically Disturbed Lands	48
New Development	0.7
Undisturbed lands	9
Impervious surface ¹	0
TOTAL	57.7 ²

¹ The contribution of impervious surface to sediment loading is considered *de minimis*. See the text.

² The discrepancy between the total load allocations and the loading capacity (58 tons/year) is considered to be within the margin of error of the calculations.

Table 4.13-HVC-6. Summary of TMDL Implementation Program

Implementation Measure	Schedule
Abandon and restore 7.59 acres of existing unpaved roads ¹	Complete by 2006
Stabilize 21.10 acres of existing roads which will remain in use ¹	Complete by 2006
Restore 182 acres of existing ski runs ¹	Complete by 2006
Maintain BMPs as necessary ¹	Annually
Review success of specific BMPs at specific sites; identify and implement improvements through adaptive management approach ¹	Annually
Conduct a comprehensive review of progress toward watershed restoration and attainment of water quality standards and identify needs for change through adaptive management program. ¹	At five year intervals beginning in 2000: (first evaluation report completed in 2001)-

¹ Incorporated by reference in Tahoe Regional Planning Agency (TRPA) Draft EIR/EIS/EIS for Heavenly Ski Resort Master Plan (1995), pages 4.1-50 to 4.1-72 (CWE Soil Erosion Reduction Program) and Appendices H and I; TRPA (1996), pages 6.4-1 to 6.5-6 (Revised Mitigation and Monitoring Plan); Hazelhurst and Widegren (1998); Hazelhurst *et al.* (1999); and U.S. Forest Service (1998), Appendix G (CWE Technical Memorandum No. 1).

Indian Creek Reservoir, Alpine County

Introduction. Indian Creek Reservoir was constructed in 1969-70 on an ephemeral tributary of Indian Creek, a tributary of the East Fork Carson River. The location of the reservoir within the Carson River watershed is shown in Figure 3-7 of this Basin Plan. The reservoir was designed to store tertiary wastewater effluent exported from the Lake Tahoe watershed for later use in pasture irrigation and to support a trout fishery. The U.S. Bureau of Land Management (USBLM) operates a campground and day use facilities at the reservoir. The reservoir became eutrophic during the 1970s and was placed on the Section 303(d) list for eutrophication in the 1980s. It no longer receives wastewater, and its level is maintained with water diverted from the West Fork Carson River and Indian Creek.

The subwatershed affected by this TMDL is shown in Figure 4.13-ICR-1. It includes the lands that contribute surface runoff directly to the reservoir and the lands tributary to upper Indian Creek and to Snowshoe Thompson Ditch #1 downstream of the diversion point from the West Fork Carson River. Water entering the ditch at the diversion point is considered "background" quality for purposes of the TMDL. The TMDL implementation program does not include controls for nonpoint sources in the West Fork Carson River watershed above the diversion point. Nonpoint source problems in that watershed will be addressed through other Regional Board programs (e.g., the nonpoint source, stormwater, and Watershed Management Initiative programs).

The purpose of this TMDL is to ensure the attainment of all water quality standards for Indian Creek Reservoir that are affected by eutrophication, including beneficial uses for aquatic life and recreation. Attainment will be interpreted in terms of a change from eutrophic to mesotrophic conditions and maintenance of mesotrophic conditions over time. A Regional Board staff report (California Regional Water Quality Control Board, Lahontan Region, 2001), and a 2002 supplement to that report, provide the technical information supporting the regulatory elements of this TMDL.

Problem Statement. The South Tahoe Public Utility District (STPUD) discontinued wastewater disposal to Indian Creek Reservoir in 1989 and acquired water rights to maintain a minimum reservoir level to support recreational uses.

Monitoring showed decreases in the concentrations of most wastewater-related constituents after wastewater disposal ceased. Concentrations of total phosphorus decreased but remained at levels which the scientific literature indicates will maintain eutrophic conditions, apparently due to internal loading from the sediment. The reservoir has continued to show symptoms of eutrophication including blooms of blue-green algae, low transparency, and depletion of dissolved oxygen in the hypolimnion.

Numeric Targets and Indicators. Total phosphorus was selected as the quantitative focus of the TMDL because frequent violations of the water quality objective for this constituent have occurred even after the cessation of wastewater disposal and because of the important role of phosphorus as a factor in the eutrophication of many north temperate lakes. Other parameters are also potentially important in control of eutrophication, and a variety of other indicators and targets have been selected for monitoring and periodic evaluation.

The primary numeric target for the Indian Creek Reservoir TMDL is an annual mean concentration in the water column of 0.02 mg/L total phosphorus. A scientific literature review, summarized in the staff report, indicates that this target represents the threshold between mesotrophic and eutrophic conditions. Mesotrophic conditions should adequately protect aquatic life and recreational uses of the reservoir. Based on the literature review and modeling of tributary water quality, the target can feasibly be attained if phosphorus loading from the sediment is significantly reduced. Phosphorus loading can be reduced by methods such as increased flushing, removal of phosphorus-rich sediment, or chemical treatment to prevent phosphorus release to the water column.

The current water quality objective for total phosphorus (0.04 mg/L expressed as a mean of monthly means) was based the water quality achievable when the reservoir was receiving tertiary wastewater effluent, rather than on criteria for protection of beneficial uses. An interim total phosphorus target based on this objective is proposed, and is projected for attainment by 2013. The Regional Board recognizes that potential reservoir management measures (oxygenation of the hypolimnion or significantly increased dilution and flushing) may lead to attainment and maintenance of mesotrophic conditions at an ambient total phosphorus concentration higher than

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the long term target. If monitoring demonstrates that beneficial uses are supported at a higher phosphorus concentration, the Board may consider revising that target. Targets and indicators for the TMDL are summarized in Table 4.13-ICR-1.

Source Analysis. Indian Creek Reservoir does not receive phosphorus loading from any natural tributary streams. (The ephemeral stream reach dammed during construction of the reservoir was completely inundated.) Phosphorus enters the reservoir in water diverted from the West Fork Carson River and Indian Creek, in precipitation and direct surface runoff, and by internal loading from the sediment. Internal loading is the most important source of phosphorus. The estimated "existing" loads are based on modeling of tributary inputs using water quality and flow data for 1999. Literature sources were used to estimate precipitation and runoff inputs and internal phosphorus loading rates. Numbers are rounded to the nearest pound. The "tributary inflow" source represents combined diversions from the West Fork Carson River and Indian Creek. All sources are considered to be nonpoint. Estimated loads from all sources are summarized in Table 4.13-ICR-2.

Loading Capacity. Assuming a uniform phosphorus concentration throughout the water column and a reservoir volume of 1515 acre feet (at the minimum staff gage level maintained under an agreement between STPUD and Alpine County), the maximum amount of phosphorus that can be present in the water column if a concentration of 0.02 mg/L total phosphorus is to be maintained is 82 lb/yr.

Load Allocations. There are no point sources of phosphorus loading to Indian Creek Reservoir; thus, the wasteload allocation is zero. Load allocations for external and internal nonpoint sources of phosphorus are summarized in Table 4.13-ICR-3. The load allocations for external sources assume no reduction in phosphorus loading from precipitation, a 75% reduction in loading from surface runoff and tributary inflow, and an 87 % reduction in internal loading. No load allocations are being established for indicators other than total phosphorus.

Loading capacity linkage analysis. The loading capacity and the associated numeric target for phosphorus are based on a strong quantitative framework, developed through a large set of empirical scientific data, that allows for the

prediction of algal biomass and other associated water quality parameters from nutrient loading and water column nutrient concentrations (USEPA, 1999). The proposed phosphorus concentration target corresponds to a literature threshold between mesotrophic and eutrophic conditions.

The literature review summarized in the staff report indicates that the proposed numeric target and the associated loading capacity, if attained, will be adequate to protect designated aquatic life and recreational uses of Indian Creek Reservoir, the beneficial uses most likely to be impaired by eutrophication, and to ensure compliance with applicable narrative water quality objectives.

Margin of safety. The Indian Creek Reservoir TMDL provides an implicit margin of safety by:

1. Interpreting compliance with standards (including beneficial use support and progress from eutrophic to mesotrophic conditions) through multiple targets and indicators.
2. Incorporating conservative assumptions in the source analysis and development of load allocations. Assumptions that provide a margin of safety include:
 - Development of the TMDL for total phosphorus rather than for orthophosphate or "soluble reactive phosphorus," which are the forms of phosphorus most readily available to plants. The analysis assumes that all P in the system, including sediment P, will eventually be recycled and made biologically available.
 - The "worst case" assumption that all phosphorus released from the sediment during summer stratification is made available for algal growth in the hypolimnion during the summer.

Seasonal and interannual factors and critical conditions. The TMDL for Indian Creek Reservoir accounts for seasonal and annual variations in external and internal phosphorus loading and associated impacts on beneficial uses in several ways:

- The load allocations for surface runoff and tributary inflow are set as a 10 year rolling averages to account for seasonal and annual variations in runoff, tributary flows, and phosphorus concentrations.

- The most critical conditions for attainment of aquatic life and recreational uses in Indian Creek Reservoir occur during summer stratification, when the greatest release of phosphorus from the sediment occurs and warm temperatures promote algal blooms and depletion of oxygen in the hypolimnion. Attainment of the loading capacity will require significant reduction of internal phosphorus loading through methods such as removal of phosphorus rich sediment or chemical treatment to lower phosphorus release from the sediment, or else a significant increase in the level of dilution and flushing with fresh water. Summer stratification of the reservoir may continue to occur, but reduced phosphorus loading will reduce the risk of oxygen depletion in the hypolimnion.

Implementation Plan. Implementation of the TMDL is the responsibility of the STPUD (for control of internal phosphorus loading) and of the U.S. Bureau of Land Management, Alpine County, STPUD, and other land owners and land managers in the watershed (for control of external sources). The implementation program does not specify the means of compliance with the TMDL, but rather establishes a process for identification and implementation of controls for external and internal sources of phosphorus loading to Indian Creek Reservoir. (The Regional Board is prohibited by Section 13360 of the California Water Code from specifying the manner of compliance with its orders.) The implementation program will involve an adaptive management approach.

Implementation will be done in coordination with the Regional Board's ongoing watershed management planning and nonpoint source control efforts. The California State Water Resources Control Board's 2000 *Plan for California's Nonpoint Source Pollution Control Program* (California Nonpoint Source Plan) and the 1995 *California Rangeland Water Quality Management Plan* will be used as appropriate in the implementation process.

The implementation process will include the following:

1. For control of all sources:

Within 4 months after final approval of the TMDL, Regional Board staff will convene a stakeholder group for ongoing communication about TMDL issues. The group should include, but will not be limited to, representatives of STPUD, the USBLM,

the U.S. Forest Service and Alpine County, and other public and private landowners in the subwatershed affected by the TMDL (Figure 4.13-ICR-1). Participation should also be invited from the U.S. Natural Resource Conservation Service, the Alpine Resource Conservation District, the Alpine County Watershed Group, and downstream stakeholders in California and Nevada, including the Nevada Division of Environmental Protection, the Upper Carson River Coordinated Resource Management Plan group and the Carson Water Subconservancy District.

2. For control of internal loading:

- Immediately after final approval of the TMDL, Regional Board staff will request a report from the STPUD on the method(s) it intends to use to reduce internal loading of phosphorus to Indian Creek Reservoir from the sediment and to optimize reservoir management for protection and enhancement of aquatic life and recreational uses.
- By 15 months after final approval of the TMDL, STPUD will investigate the feasibility of controls for internal phosphorus loading to Indian Creek Reservoir and the feasibility of other management measures to protect and enhance beneficial uses and will submit a plan for approval by the Regional Board. Depending upon the nature of the proposed action, the Regional Board may provide direction to staff for implementation, issue waste discharge requirements and/or a formal monitoring program for activities to control internal phosphorus loading, or take other appropriate action.
- By 2013, STPUD will fully implement controls for internal phosphorus loading.

3. For control of external loading:

- By 1 year after final approval of the TMDL, Regional Board staff and stakeholders will identify specific sites within the watershed contributing direct surface runoff to Indian Creek Reservoir that need Best Management Practices (BMPs) for phosphorus control.
- By 1 year after final approval of the TMDL, Regional Board staff and stakeholders will identify specific sites needing BMPs for phosphorus control on public and private lands within the watershed tributary to the irrigation

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ditch that provides inflow to Indian Creek Reservoir from Indian Creek and the West Fork Carson River. Problem assessment and planning for BMP implementation on non-federal rangelands will follow the implementation procedures in the *California Rangeland Water Quality Management Plan*.

- By 3 years after final approval of the TMDL, depending on progress toward BMP implementation under the 1995 *California Rangeland Water Quality Management Plan* and the 2000 California Nonpoint Source Plan, staff will consider the need for regulatory action to ensure implementation of BMPs to control external sources of phosphorus loading to Indian Creek Reservoir.
- By 2013, BMPs will be fully implemented for nonpoint sources of phosphorus loading to Indian Creek Reservoir within the subwatershed affected by the TMDL. The California Nonpoint Source Plan requires implementation of management measures for all nonpoint source problems statewide by 2013.

Attainment of the interim total phosphorus and dissolved oxygen targets is projected to occur by 2013. Attainment of the long term total phosphorus and dissolved oxygen targets, other TMDL targets and the narrative water quality objectives related to protection of beneficial uses is projected to occur by 2024.

Potential implementation measures include BMPs to control external sources of phosphorus loading and in-lake measures to increase flushing of phosphorus from the reservoir, remove phosphorus-rich sediment or inactivate the internal phosphorus release process. Agricultural BMPs potentially relevant to control of external phosphorus loading to Indian Creek Reservoir include: range and pasture management, proper livestock to land ratios, irrigation management, livestock waste management, fences (livestock exclusion), retention/detention ponds, constructed wetlands, streambank stabilization, sediment ponds; and riparian buffers (USEPA, 1999). The STPUD (2002) has proposed conversion of the irrigation ditch tributary to Indian Creek Reservoir to an underground pipeline; this could eliminate some or all of the need for agricultural BMPs in that area. Additional potentially relevant nonpoint source management measures include: education outreach; runoff control for existing development;

road, highway and bridge runoff systems; marina and recreational boating management measures (including shoreline stabilization); instream habitat restoration; and vegetated treatment systems.

Further study will be necessary to identify the best and most cost effective in-lake phosphorus control method(s) for Indian Creek Reservoir. The STPUD is considering the acquisition of additional water for flushing phosphorus from the reservoir through purchase and changes in the place and time of use of water rights. Based on the literature review summarized in the staff report, both phosphorus inactivation (by one of several chemical methods) and phosphorus removal (by dredging or bulldozing) appear to have the potential for rapid attainment of the numeric target. Other potential control methods include hypolimnetic withdrawal, hypolimnetic oxygenation, biomanipulation, and treatment systems involving harvest of periphyton to remove nutrients.

The BMPs and lake restoration measures summarized in the staff report and supplement are technically feasible and have been shown to be effective in reducing phosphorus loading and/or abating eutrophic conditions. The Regional Board recommends that, in addition to any in-lake treatment measure(s), STPUD should use the full amount of its existing water rights, under the constraints imposed by the Alpine Decree, in a manner that will maximize fresh water inflow into Indian Creek Reservoir.

Monitoring. The proposed TMDL monitoring plan involves continuation of current monitoring by the STPUD of Indian Creek Reservoir and its tributary inflow. (Not all of the parameters sampled are necessary for determining compliance with TMDL load allocations.) Regional Board staff recognize that sampling parameters, stations and frequencies may need to be changed over time as a result of an adaptive management approach to implementation. Consequently, the Basin Plan does not specify sampling parameters, locations and frequencies or sampling and analytical protocols. The Regional Board's Executive Officer may adopt a formal monitoring program for Indian Creek Reservoir and its tributary inflow pursuant to the California Water Code, and changes in this program may be made over time without the necessity for further Basin Plan amendments.

The TMDL monitoring program is expected to involve:

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- monitoring of tributary inflow and water quality (including P concentration)
- monitoring of Indian Creek Reservoir including gage height, water quality, and algal cell/colony counts
- monthly depth-profile measurements in Indian Creek Reservoir including dissolved oxygen and temperature
- monthly measurements of total phosphorus concentrations at several depths including the hypolimnion
- monthly measurement of chlorophyll a at the near-surface depth
- monthly measurements of Secchi depth in Indian Creek Reservoir during the stratification period, and
- periodic inspections of BMPs, once they have been installed.

The phosphorus concentration and inflow amounts of precipitation and surface runoff to the reservoir will not be measured directly. The success of BMPs to reduce phosphorus runoff to Indian Creek Reservoir will be assessed through measurements of reservoir quality. If implementation results in increased outflow from the reservoir, monitoring of the outflow channel and Indian Creek may be necessary to document impacts on downstream water quality and beneficial uses.

Schedule for review and revision of the TMDL.

Regional Board staff will continue to review monitoring reports on an ongoing basis and will periodically discuss them with STPUD and other stakeholders. The review process will use all indicators and targets to evaluate progress from eutrophic to mesotrophic conditions. Comprehensive reviews of monitoring data and progress toward implementation and attainment of targets will be conducted at five year intervals following final approval of the TMDL. Because some of the targets and load allocations are expressed as ten year rolling averages to account for seasonal and annual variability, the first decision point on the need for revision of the TMDL will not occur until after the comprehensive review held in the tenth year.

Table 4.13-ICR-1. Numeric Targets and Indicators for Indian Creek Reservoir TMDL

Indicator ¹	Target Value	Reference
Total P concentration	(Interim ²) No greater than 0.04 mg/L, annual mean	Current water quality objective (mean of monthly means); see Basin Plan Table 3-14
Total P concentration	(Long term ²) No greater than 0.02 mg/L, annual mean	USEPA, 1988, 1999.
Dissolved oxygen concentration	(Interim ²) 30 Day Mean 6.5 mg/L; 7 Day Mean Minimum 5.0 mg/L; 1 Day Minimum 4.0 mg/L	Regionwide water quality objective for waters designated for COLD use; see Basin Plan Table 3-6
Dissolved oxygen concentration	(Long term ²) Shall not be depressed by more than 10 percent, below 80 percent saturation, or below 7.0 mg/L at any time, whichever is more restrictive.	Water quality objective for surface waters of Indian Creek watershed; see Basin Plan Chapter 3
Secchi depth	Summer mean no less than 2 meters	USEPA, 1988. 1999
Chlorophyll a	Summer mean no greater than 10 ug/L	USEPA, 1988,1999
Carlson Trophic Status Index	Composite index no greater than 45 units	USEPA 1988, 1999

¹ These indicators will be measured for at least one depth profile sampling station in Indian Creek Reservoir. The Carlson Trophic Status Index will be computed from other parameters as explained in the technical staff report.

² Interim targets are expected to be attained by 2013. Long term targets are expected to be attained by 2024. See the Implementation Plan below.

Table 4.13-ICR-2. Estimated Existing Phosphorus Loads to Indian Creek Reservoir from External and Internal Sources (rounded to the nearest pound)

Source	Load (pounds per year) and % of total
EXTERNAL SOURCES	
Precipitation	3
Direct surface runoff	68
Tributary inflow	43
Minor sources ¹	0
A. Total External Load (lb/yr)	114 [24%]
INTERNAL SOURCES	
Total anoxic load (by literature formula from Welch and Cooke, 1999, for 120 day stratification period)	204
Total oxic load (by subtraction)	150
B. Total Internal Load (lb/yr)	354 [76%]
C. Loss in Reservoir outflow (lb/yr)	137
TOTAL LOAD (A + B)	468
NET WATER COLUMN LOAD (A + B – C)	331

¹Loading and losses from the minor sources and sinks discussed in the staff report are considered *de minimis*.

Table 4.13-ICR-3. Load Allocations for Indian Creek Reservoir

Source	Load Allocation (lb/yr)
EXTERNAL	
Precipitation	3
Direct Surface Runoff ¹	17
Tributary Inflow ¹	32
Total external allocation	52
INTERNAL	
Total internal allocation	46
OUTFLOW	18
Total Load Allocation	98
Net Load Allocation²	80

¹Allocations for these parameters are interpreted as 10 year rolling averages to account for seasonal and annual variability.

²This allocation is to the water column, with the assumption that an additional 18 lb/yr of internally derived phosphorus will leave the reservoir in the outflow.

FIGURE 4.13-ICR-1. INDIAN CREEK WATERSHED

