



Volume II

FRAMEWORK

for a Regional Desalination Initiative

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Prepared for:



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By:

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INTRODUCTION

The purpose of this document is to provide a framework for the development and implementation of a regional desalination project in the State of California. Desalination as a water supply alternative can produce reliable potable water to help water agencies meet their water needs during droughts, emergencies, and maintenance-related facility outages as well as to provide supplemental part-time or full-time supplies. A regional desalination facility would allow groups of water agencies to leverage existing infrastructure to receive desalination product water¹ or transfer water among their distribution systems. Sharing common facilities and infrastructure to the maximum extent possible minimizes the facility's environmental footprint. In addition, a regional facility would reduce the costs that any one agency would otherwise incur from developing desalination as an alternative water supply. Most importantly, however, a regional desalination facility that serves multiple water agencies has the potential to reduce adverse environmental and socioeconomic effects along the California coast.

A regional desalination project is a single project involving multiple water agencies with common goals and objectives. The project must provide benefits to a "region." It satisfies a need that conventionally is filled through multiple individual projects. Substantial collaboration, cooperation, and flexibility are required of the participating agencies for a successful regional desalination project.

This document provides a decision-making program for water agencies considering regional desalination. Specific issues concerning the development of institutional agreements and the assessment of site and infrastructure options are discussed. The decision-making processes are presented in a sequence of steps that will enable water agencies to effectively develop and implement regional plans. In addition to providing clear and defensible processes for initiating a regional desalination project, the steps presented in this document help to define a coordinated and centralized management approach that would most likely yield public savings by pooling resources; minimizing environmental effects of constructing multiple desalination plants; and providing the public with a reliable, drought-proof and safe source of water.

The organization of the framework is as follows:

- Step 1 – Identify concept for regional project
- Step 2 – Develop institutional agreement
- Step 3 – Assess potential sites
- Step 4 – Assess regional conveyance options and constraints
- Step 5 – Evaluate and rank project alternatives
- Step 6 – Conduct public outreach
- Step 7 – Develop a project implementation plan

¹ Desalinated water conveyed to consumers. Product water may consist wholly of desalinated water or a blend of desalinated water plus filtered but undesalinated water.

STEP 1 – IDENTIFY CONCEPT FOR REGIONAL PROJECT

Water agencies' supply and demand characteristics can vary greatly and are unique to each agency due to supply source, climate variations, population density, and types of users. Therefore, each agency will have to evaluate its needs internally based on projected demand, ability to satisfy demand using rationing or other conservation measures, and available alternative water sources. Needs for desalination supply should be characterized both in quantity and frequency. This needs assessment is critical for determining the ultimate purpose of the regional desalination facilities (e.g., drought relief, emergency use, or supplemental full-time supply).

Project decision-makers from the water agencies will need to identify a broad concept for a regional desalination plant. This could include several project characteristics such as preliminary sites for the plant and options for integration with existing or new water distribution infrastructure facilities. Certain minimum capacity and operational goals may also need to be defined to ensure that the plant can meet the needs of multiple agencies.

STEP 2 – DEVELOP INSTITUTIONAL AGREEMENT

The development of a regional desalination plant requires significant collaboration and coordination among regional water agencies or stakeholders. Because different agencies often have different needs, constraints, and value systems, developing an institutional agreement among the agencies can be challenging. A transparent and defensible process must be used to make and document key technical and policy decisions. This process is delineated in the following recommended tasks.

Task A – Define Criteria for Successful Collaboration of Regional Agencies

The member agencies will need to define criteria for successful collaboration. The criteria will identify characteristics of the agencies that increase the potential to achieve interagency agreements. Examples of such characteristics include prior collaboration, interconnectivity of the existing infrastructure facilities, common vulnerability to interruption of water supply from natural or human-made hazards, and political leadership that would encourage and support a regional project. The criteria should also identify any fatal flaws that could prevent the agencies from collaboration, such as current disputes about water rights.

Task B – Identify Institutional Issues Requiring Agreement

As the regional desalination project is planned and structured, each of the agencies will have to consider and agree on a number of issues. Some of the key issues that will eventually drive the types of agreements that the agencies enter into are described below.

Facility Ownership, Operations, and Maintenance

There are three primary alternatives for ownership of the desalination facilities. The facilities could be owned by the agency in whose service area the facilities are located, with cost sharing and water sharing obligations defined by a binding contractual agreement among the agencies. In this case, one agency would likely have all management, operation and maintenance (O&M)

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responsibilities, and discretion. The governing board of the agency that owns the facility would have the overall responsibility for the facilities, including residual benefits and risks of ownership if the agreement is terminated. It is possible that the agency that owns the facility could be perceived as having a greater potential risk or benefit through ownership. Other participating agencies would receive water supply benefits and share in capital and O&M costs based on the terms of the agreement.

The second option would be joint responsibility of the facilities with benefits and obligations, including water supply and share of costs, defined by the terms of an agreement among the agencies. The facilities would be most efficiently operated and maintained by the agency in whose service area the facilities are located. Protocols and procedures for O&M of the facilities would be subject to agreement by the agencies. The agreement would also have to provide for the governance of the facilities and the manner in which policy-level decisions are made. The agreement should also provide for disposition of the facilities in the event that the agreement is terminated.

The third option would be the formation of a separate public entity (an Authority) through a Joint Powers Authority (JPA). The Authority would own the facilities, and the benefits and obligations of the member agencies would be defined by the JPA. The JPA would also identify infrastructure that it would use to convey or store water, but may not own, such as pipelines and reservoirs owned by the individual members of the JPA.

The Authority could hire its own employees to manage, operate, and maintain the facilities, or it could contract with one of the agencies or a third party for such services. One of the benefits of a JPA is that the member agencies can share the benefits of the facility as defined in the JPA while being at least partially insulated from some of the liabilities and risks of ownership. No agency would be perceived as having greater risks or benefits than those defined in the JPA.

Responsibility for policy decisions and management would be shared by the Authority member agencies through the governance structure of the JPA.

The initial agreement that assigns the roles and responsibilities of the member agencies of the regional desalination project, regardless of the type selected, will serve as the project's implementing agreement (hereafter referred to as the Master Agreement).

Water Supply Distribution

It may not be feasible or practical to directly deliver desalination product water to all of the member agencies. In some cases, only one or two agencies may be able to receive the water generated by the desalination plant, and that agency or agencies would then have the obligation of transferring water to other members, as defined in the Master Agreement. In cases where interconnectivity options between agencies are limited, transfers and/or exchanges may need to take place among agencies that do not directly receive any desalination water. As such, transfer or exchange agreements will be required to provide for the delivery of water from the agency receiving the desalination product water to other agencies, and subsequently for other agencies exchanging water. Water transfers and exchanges among individual agencies may take the forms of standard contracts or Memoranda of Understanding (MOUs). These agreements may modify or replace existing MOUs that govern emergency interties and other interconnections between agencies' water delivery systems.

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The recipient of the desalination product water may or may not be party to agreements between other member agencies exchanging water, based on the roles and responsibilities assigned in the Master Agreement.

Key issues in each transfer/exchange agreement will include timing of deliveries, conditions and costs for use of existing water transfer facilities, and possibly cost differentials related to different water quality and levels of treatment. The configuration of the relationships among agencies and the individual transfer or exchange agreements may vary depending on factors including water supply rights and entitlements of the member agencies, and capacity and design constraints of existing infrastructure such as conveyance and storage facilities.

Water Supply Rights and Entitlements

Water agencies may rely on various water sources to meet demand in their service areas. Each agency has water rights and entitlements attached to its current water supply. Modifications to the point of diversion, place of use, and purpose of use will be required to exchange water among agencies. For example, an agency may have rights to a certain river. Modifications to the point of diversion to supply water to another agency will need to consider the rights of other water agencies entitled to use that river's water.

Water transfer/exchange agreements that affect the point of diversion, place of use, and purpose of use are typically subject to review and approval by the State Water Resources Control Board (SWRCB).

Water Banking

A regional desalination facility may be used for protection against droughts, emergencies, and facility repair/maintenance. Needs and priorities of each agency may vary substantially during times of emergency. The impacts of a drought on water users, for example, will depend on the extent to which water uses can be maintained by drawing on stored water, and how the available water is allocated among potential users.

Water banking is a management tool that can supplement traditional reliance on surface water reservoirs. Water banks can facilitate voluntary water transfers to help mitigate the impacts of an emergency by increasing water supplies for highly valued uses during water shortages.

A water bank can be involved to differing degrees in a water exchange, as determined by the participating agencies. If water supply from the desalination plant exceeds the regular water needs identified by the agencies, excess water supply can be pooled and made available to third-party buyers. During water shortages, any of the member agencies can purchase the banked water.

Water Capacity Constraints

The existing infrastructure for distributing and exchanging water among participating agencies may impose physical limitations. Hydraulic modeling will be warranted to determine actual conveyance capacities among the agencies. In addition, each member agency will need to consider existing uses and available capacities in the individual water transfer/exchange agreements.

Pipeline Design Constraints

Pipeline design and current use often dictates the exchange of raw or treated water and the direction of the water flow. These issues will also affect how agreements are established and determine which parties can exchange water. Any cost differentials associated with the transfer that are dictated by pipeline infrastructure will have to be considered in the appropriate transfer/exchange agreements.

Other Considerations in Formulating Agreements

The cost and distribution of water during emergencies or droughts should be clearly identified in the Master Agreement for the project. Responsibilities for water transfers should also be clearly assigned. The Master Agreement should identify mechanisms for dispute resolution and termination of the regional desalination project. The Master Agreement should also clearly describe the “seniority” or first right of refusal for each member during situations that may require using the desalination facilities.

Task C – Establish Organization/Process for Consensus Building

The member agencies will need to establish an organization/process to address any mutually exclusive constraints not resolved in the previous step. An interagency consensus-building group, with appropriate responsibility and authority, will need to be established to resolve any remaining mutually exclusive constraints. The group will develop guidance for conflict resolution including group membership; roles and responsibilities of members; and processes for interaction, negotiation, and decision making. An independent third party should moderate the interagency consensus-building group. All mutually exclusive constraints should be resolved through this process.

Task D – Identify Type of Implementing Agreement

Agencies may enter into three basic types of agreements for the implementation of a regional desalination project. Although other permutations may exist, the types of agreements listed below generally describe the categories of agreements that may be considered.

Joint Powers Agreement

A Joint Powers Agreement (JPA) is a legally binding way to link several public agencies to create a new entity that will share in fulfilling a specific and agreed-upon goal such as a regional desalination project. A JPA is a contract that is limited in authority to what each of the agencies is individually legally authorized to do. A JPA provides *flexibility* to meet goals, *protection* for local identity interests, and *opportunity* to meet agency needs. A JPA provides for the ability of agencies to share risks and costs without incurring direct liability to member agencies for other member financial obligations.

The JPA can be organized in many different ways, depending upon member preferences. A Governing Board can be established that sets the policy direction for the JPA. It is relatively simple to form since the statutory authority necessary to execute its functions already exists. The JPA would have public agency status and the ability to aggregate, finance, and/or own infrastructure. Thus, the JPA would own the facilities that are directly associated with the

regional desalination project and are designed for exclusive use by the project. Auxiliary facilities that may be used by the regional desalination project but are not designed for its exclusive use, such as pipelines and reservoirs, would continue to be owned by agencies that currently own them; the JPA would have rights to use those facilities for conveyance or water storage. The rights and obligations of the JPA would be established in the implementing agreement of the project.

If a JPA is selected for the development of a regional desalination project, the agencies must consider that participation is limited to public entities. Potential private stakeholders would be excluded from the regional partnership.

Memorandum of Understanding

A Memorandum of Understanding is an approved written agreement of a non-contractual, non-legally binding nature between two or more parties, in this case the participating agencies, that documents an intent by all parties to cooperate in the regional desalination project undertaking. The MOU will clarify relationships and responsibilities among the agencies but is characteristically general and non-binding in nature.

Standard Contract

A contract is a legally binding agreement among two or more parties that can be used to define relative benefits, obligations, and liability of the parties with respect to the proposed project. While a contract can define terms, conditions, and obligations as agreed to by the parties, it does not create a new entity for the purposes of ownership of the new facilities. The regional desalination facilities would either be owned jointly pursuant to the contract or owned by one agency with terms of participation by other agencies defined by the contract. Private entities could be parties to a contract.

Task E – Identify Key Principles and Management Decisions for Institutional Agreement

Agencies have a number of options, both for establishing the framework for the desalination facility or facilities, and for transferring and delivering water among individual water districts. The form that these agreements take (JPA, MOU, or contract for the project implementation and transfer/exchange agreements for water distribution) will depend on the management decisions that guide the development of the project.

A range of issues including ownership, physical and regulatory constraints, and individual agency needs and priorities will have to be taken into consideration in the formulation, structuring, and implementation of agreements associated with the regional desalination project. These issues, in turn, will have important implications on cost, water delivery, conditions of use, and water quality. Once participating agencies are in agreement on how the issues will be handled for the purposes of the project, appropriate contractual mechanisms can be identified and executed.

The following is a summary of some example key principles and management decisions for an inter-agency institutional framework.

Planning

Key Principles:

- The agencies agree to share costs of planning.
- Cost savings and overruns will be shared in proportion to costs incurred.

Key Management Decisions:

- Does each agency agree to continue to share planning-related costs related to perceived benefits, level of interest, etc.?
- Will multiple sites be selected for the pilot testing?
- Which site(s) will be selected for pilot testing?

Governance

Key Principles:

- Under a JPA or with individual agency ownership, the agencies will share costs in a manner that is commensurate with individual agency benefits from the project.
- The agencies commit to share costs of O&M based on quantities of water to be received by each agency.
- The Master Agreement will provide for the addition and withdrawal of members in a manner that keeps members whole financially.

Key Management Decisions:

- Will the regional desalination facilities be owned jointly through a JPA, or individually by the agency in whose service area the plant(s) is located?
- If a JPA is selected, should funding of the JPA be based on relative quantities of water received from the project, or should 50 percent of the costs be shared on an equal basis, and the remaining 50 percent shared on the basis of relative water amounts?
- If individual ownership is selected, should a) the agency that owns the facilities have all management, operation, and maintenance responsibility, and primary responsibility for these costs (excluding O&M that can be shared); or b) the agencies be jointly responsible for cost, sharing all expenses associated with management, operation, and maintenance? (For efficiency, the agency in whose service area the facilities are located would still take the lead.)

Plant Design and Construction

Key Principles:

- Agencies will share capital costs in a manner that is commensurate with individual agency benefits (capacity and water quality) from the project.
- Assumption of design, technology, and construction risks will be factored into the agreement.

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- The owner of the regional desalination facilities will make final decisions and incur liabilities as defined by the governance agreement.

Key Management Decisions:

- Do agency managers agree that capital costs should be shared in a manner that is proportionate to the relative water benefits they receive?
- Should design, technology, and construction risks be borne by the facility owner, or shared among agencies equally?

Operation and Maintenance

Key Principles:

- Facility staffing will be determined by ownership structure.
- Baseline O&M costs may be shared proportionately among agencies. Each agency would incur the additional O&M costs needed to obtain water supply associated with the regional desalination project.
- The owner will be responsible for renewing and maintaining permits.

Key Management Decisions:

- Who will take responsibility for staffing the regional desalination facilities (JPA-hired, member agency staff, or private contractors)?
- Do agencies agree with the approach for the assignment of O&M costs above?

Water Distribution and Redistribution

Key Principles:

- Share of cost for delivery of water to a designated point of delivery will be relative to quantity and quality of water received from the project.
- No one agency will be adversely affected by facilitating a transfer; the transferring agency will be made whole in costs and expenses by the agency receiving the benefit.
- To the extent possible, water rights issues related to transfers and exchanges necessary to distribute the water to member agencies will be dealt with during the water rights proceedings for the regional desalination project.

Key Management Decisions:

- Should the point of delivery be a) exit from the treatment plant or any conveyance facilities owned and operated by the project, or b) the point at which the receiving agency takes water into its distribution system? The selection can affect the assignment of cost responsibilities.
- Determine water quality (treated vs. raw) and cost of additional treatment.

Emergencies

Key Principles:

- Water supply quantities to member agencies may change depending on the effect and nature of the water supply disruption.
- The cost of changes in water conveyance necessary for the affected agency(s) to obtain water through the project will be borne by that agency(s).
- Member agencies that may or may not be affected by the emergency agree to convey water through their pipelines in order to facilitate efficient water supply to members.
- Provisions will be made for non-member agencies facing emergencies to use desalination facilities or product water during emergencies.

Key Management Decisions:

- Do agencies agree with the contingency emergency actions outlined above?

Utilization of Excess Capacities / Unused Facilities

Key Principles:

- Partner agencies that do not use their full capacities may enter into separate agreements with other agencies for using the excess capacities. These separate agreements will include the same terms and conditions of the project agreement.

Key Management Decisions:

- Do agencies agree with the principle stated above?

Task F – Develop a Formal Document for Interagency Agreement

After completing Tasks D and E, the member agencies will need to identify the appropriate mechanism for an institutional agreement. The agreement will then be drafted based on information obtained from Tasks A through E. This should reflect the guiding principles established among the participating agencies in areas including planning, governance, design and construction, O&M, distribution, and other agency-identified project objectives. The agreement will constitute the contractual basis for implementing the regional desalination project.

STEP 3 – ASSESS POTENTIAL SITES

Task A – Identify Potential Sites

Potential sites for a desalination plant should be identified based on meetings with the agencies, previous studies, review of related materials, and knowledge of local conditions. Sites should be selected that leverage existing distribution infrastructure and supply water to all participating agencies. In the event of changes to the partnership, the appropriateness of sites will have to be re-evaluated.

Task B – Conduct Initial Site Screening Based on Hard Constraints (“Fatal Flaws”)

The agencies will need to apply a screening process to eliminate less attractive sites and produce a set of feasible sites that should be pursued further in the evaluation process. The initial screening process uses hard constraints (“fatal flaws”) such as proximity to environmentally sensitive areas and community acceptance. A site that is affected by a hard constraint is eliminated from further consideration. This task will result in a set of feasible sites that are carried forward for further evaluation.

Task C – Rank Feasible Sites Based on Evaluation Criteria

Evaluation criteria should be developed to rank the remaining sites for suitability for a regional desalination project. The following are example criteria developed by other agencies and through a review of information from the California Department of Water Resources (DWR) Water Desalination Task Force (DWR 2003).

- **Feedwater Quality:** Source water quality issues that may affect product water quality, such as proximity of intake location to wastewater discharges, or potential seabed contamination.
- **Water Cost:** Cost factors that will affect overall water costs, including power cost, feedwater salinity, existing agency infrastructure (distribution pipelines), operation with a high demand factor, and co-location with existing intake/discharge infrastructure (power plant, wastewater treatment plant).
- **Permitting:** Permit requirements to license a plant including water rights issues, intake/brine discharge permit issues (intake/outfall ecological impacts, waste stream characterization, ecological impacts of brine disposal), land use compatibility, hydrogeology, public health, and energy use.
- **Public Acceptance:** Public acceptance based upon such factors as environmental justice, land use compatibility/visual impacts, growth inducement issues, and demonstrated need.
- **Grant Potential:** The best potential to receive grant funding. Important factors include innovative design features and regional benefits.
- **Regional Capability:** Production capacity to supply several agencies during droughts or emergencies through either interties (locations at which agencies can directly transfer water to each other) or other water transfers.

The feasible sites should then be evaluated against the criteria using a rating scale representing a range from least desirable to most desirable. Specialists knowledgeable about the specific criteria should review and conduct independent rating of the sites. The independent ratings will then be reviewed and compared among specialists. Consensus should be reached for a final single scoring. The sites are then ranked based on the sum of their rating scores.

STEP 4 – ASSESS REGIONAL CONVEYANCE OPTIONS AND CONSTRAINTS

This objective of this task is to 1) determine the feasibility of water exchanges among the member agencies through an initial assessment of the capacity of existing water transmission

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facilities, and 2) identify any potential fatal flaws that would prevent the regional project from meeting the needs (identified in Step 1) of the participating agencies.

Outcomes of the preliminary siting effort (Step 3) will result in the selection of a set of preferred potential plant sites (e.g., one, two, or three top-ranked sites). The analysis of conveyance options will assume that the regional desalination plant could be located at one or more of the top ranked sites. Conveyance options are possible pathways for each of the participating agencies to share/exchange water from a desalination plant to receive their agreed-upon allotment.

The tasks described below are based on a qualitative evaluation of the conveyance systems involving gross assumptions. Therefore, it is recommended that hydraulic modeling of the conveyance systems near each potential plant site be conducted before selecting a preferred site. Blending studies should also be conducted for all of the water sources that could be exchanged to determine any potential limitations.

Task A – Identify Water Transmission Lines and Transfer Locations

Water can be transferred through the use of interties, water rights transfers, sharing/exchanging of service to common customers, or other methods of sharing water among the agencies. Through this task, the participating agencies will identify the types and locations of such transfers. In addition, major water transmission lines near the preferred potential plant sites that could be used to convey the desalination water will be identified. The existing conveyances should be large enough to convey the entire plant's production volume. Information to be obtained for the water transfer facilities/methods should include location, capacity, type of water conveyed (raw or treated), and any institutional limitations on the use of the facilities/methods.

Task B – Develop Conveyance Options

Development of conveyance options will depend on the project's goals and ultimate use of the regional desalination facility. For example, if the ultimate use is to provide drought relief to each of the participating agencies, then conveyance options need to ensure delivery of each of the agencies' allotments, assuming concurrent needs. If the ultimate use is to provide emergency relief, the conveyance options may need to identify how to distribute the entire plant's capacity to a single agency. A conveyance option may contain several transfers to achieve the targeted distribution.

Task C – Identify Conveyance Constraints

Constraints on conveyance options can take three forms: capacity, water quality, or institutional. Capacity constraints occur when water transmission lines and/or interties have inadequate capacity.

To identify water quality constraints, the members need to compare the differences in treated water quality standards and examine the water quality implications of blending water from various sources/agencies. Water from a desalination facility would be of high quality and low mineral and solids content. In general, desalinated water should have minimal impact on the water agencies' water quality, and the blended water may improve water quality overall. Desalinated water would require chemical adjustment for corrosion control when delivered to all

water agencies. For example, blending of waters from different sources has been known to impact the following aspects of the water quality delivered to the consumer:

- Taste and odor
- Variability of water, causing customers to notice the difference in quality
- Impacts on industrial users on process water treatment
- Corrosivity
- Disinfection
- Denitrification in distribution systems
- Precipitated particulate material

These water quality issues would be difficult to predict without blending studies.

Institutional constraints are mainly associated with limitations that existing water rights impose on quantity and place of use.

STEP 5 – EVALUATE AND RANK PROJECT ALTERNATIVES

Task A – Develop Project Scenarios

Project scenarios are feasible combinations of site and infrastructure configurations. This task uses assumptions developed from the steps above to develop criteria for identifying feasible options for infrastructure facilities. Examples of criteria include minimizing construction of new facilities, minimizing the number of water exchanges needed to meet all agency demands, increasing reliability for emergency use, or minimizing the need to treat water more than once. Some of the infrastructure configurations may not be feasible at one or more sites because of site-specific constraints. The output of this task is a set of five to 10 feasible project scenarios.

Task B – Define Measurable Issues to Evaluate the Project Scenarios

The objectives of this task are to define issues for the regional desalination project and to establish one or more specific measures for each issue. Each measure should provide a scale that quantifies the degree of desirability of the underlying issue. The scale could be natural (such as acre-feet of storage capacity, million gallons per day [mgd] of supply, or cost per acre-foot of product water) or constructed (e.g., high, medium, and low levels of environmental impact). The set of measurable issues should be *complete* (the set should include all aspects of system performance that are of concern to the agencies), *unique* (there should be no double counting among the selected measures), and *efficient* (only significant aspects of system performance should be represented to produce a minimum-size set).

The set of issues should include both common issues for all participating agencies and distinct individual issues for each agency. Examples of common issues include total project cost and project completion schedule. Individual issues may include the achieving some minimum water quality for the new yield and minimizing the construction of new infrastructure facilities.

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An example of a process to establish a set of measurable issues involves a third party (e.g., a consultant) meeting individually with each of the participating agencies and defining first the major issues relevant to evaluating the feasible scenarios and then specific relevant sub-issues within each issue. These issues are based on factors that one or more of the agencies view as important in selecting a site, and form the criteria by which the scenarios are ranked. Examples of such issues are reported in Table 1.

Table 1
Example of Issues for the Evaluation of Project Scenarios

Issue	Subissue
Environmental Resource Protection	Visual sensitivity of plant location
	Potential impacts to land-based biology
	Potential impacts to water-based biology
	Potential impacts to historic resources
	Presence of sensitive noise receptors in the vicinity
	Potential impacts to recreational resources
	Potential impacts to agricultural lands
	High energy requirement for plant operation
Permitting	National Pollutant Discharge Elimination System (NPDES) Permit
	Bay Conservation and Development Commission (BCDC) Permit
	Coastal Development Permit
	Encroachment Permit
	Appropriative Water Rights Permit
Institutional/Legal	Need for multiple exchanges to allocate water to each agency
	Pipeline constraints due to type of water conveyed (raw or treated)
	Agencies give up higher-quality water in exchange for lower-quality water (non-desalination water only)
	Agencies serve as a “pass-through” with no net increase in water supply
Cost	Product water costs
Public Perception	Proximity of intake to wastewater outfall
Reliability	Plant susceptibility to natural hazards
	Water supply system reliability

Task C – Develop a Value Model Based on Consensus of Participating Agencies

The objective of this task is to develop a model of the value judgments of the agencies that would guide their preferences among the various project scenarios. A key component of the value model is the value tradeoffs between competing measures. For example, a particular alternative may provide greater reliability with added redundancy but may generate greater environmental impacts. Such value tradeoffs, in turn, provide the means to assess the relative weights of the different evaluation measures. These weights may be assessed using the structured *Delphi* method of assessment, feedback, and opportunity to revise. The *Delphi* method is useful

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in developing a consensus among experts or policy makers by facilitating an exchange of information and viewpoints.

One major advantage of the decision analysis process is that the value judgments that would be used to evaluate alternatives are fully documented. Both consensus value judgments and any differing viewpoints are documented so that the sensitivity of results to the differing viewpoints can be evaluated (as described in Task E, below). Note that the value judgments are assessed in terms of the relative importance of issues and measures rather than direct preferences for project scenarios. This approach minimizes the influence of any agency bias toward specific alternatives on the assessment of value judgments regarding the importance of fundamental project goals and measures.

This step may require structured workshops with the participating agencies to develop consensus on value judgments. Values and tradeoffs regarding common goals as well as individual goals are assessed based on the input provided by each agency.

For example, each participating agency is asked to independently assess relative values of improving different subissues within an issue from its least desirable level to its most desirable level. To do this, each agency considers a hypothetical site, defined by a mediator (e.g., a consultant), for which every subissue is at its least desirable level. The agencies are instructed to identify the subissue that they would improve to its most desirable level in the order of first, second, and so forth. Based on their prioritization, each agency gives each subissue a relative value on a scale of 0 to 10, with 10 representing the highest value and 0 representing no or little value. The results of this assessment provide the means to calibrate the relative weights of different subissues within each issue.

A similar exercise can be used to assess relative values of improving different issues by improving a specific subissue within each issue. The agencies consider a hypothetical scenario for which one specific subissue within each issue is at its least desirable level while all other subissues remain neutral. Again, agencies independently assign a relative value of 0 to 10 to show which subissue they would improve ahead of other subissues representing different issues. The results of this assessment provide the means to calibrate the relative weights of the different issues. An example of such results are presented in Table 2.

Table 2
Example of Assessment of Inter-Issue Values

Issue	Specific Subissue (least desirable)	Agency 1	Agency 2	Agency 3	Agency 4
		(Scale of 0 to 10)			
Environmental	Potential impacts to water-based biology	4	9	6	6
Permitting	Appropriative water rights permit	7	10	7	6
Institutional/Legal	Agencies give up higher-quality water in exchange for lower-quality water (non-desalination water only)	9	8	8	10
Cost	Product water cost	10	6	9	5
Public Perception	Proximity of intake to wastewater outfall	8	7	5	5
Reliability	Water supply system reliability (during emergencies)	4	5	10	8

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Task D – Assess the Impact of Project Scenarios on Issues

The objective of this task is to estimate the impacts of each project scenario on the evaluation measures defined in Task B. The layout and design of each alternative should be developed in sufficient detail so that necessary data can be compiled to estimate the impact of the alternative on such measures as cost, schedule, reliability and redundancy; potential safety and security hazards; permitting difficulties; environmental impacts; and socioeconomic impacts.

For example, to assess the impact of project scenarios on issues, the agencies may collectively rate each of the project scenarios for each subissue using a rating scale of –2 to +2, with –2 representing the least desirable outcome and +2 representing the most desirable outcome. With the participation of a moderator, the agencies may engage in a group discussion to identify the pros and cons of each subissue for each scenario and try reaching a consensus on the ratings. If not, ratings are recorded as agency-specific. Table 3 presents an example of such ratings for one issue.

Table 3
Example of Group and Agency-Specific Ratings for Institutional Issues

Criteria for Scenario Evaluation	Scenarios				
	1	2	3	4	5
Need for multiple exchanges to allocate water to each agency	0	0	0	0	0
Pipeline constraints that necessitate differences in water treatment level between water received and water conveyed	-1	+1	+1	+1	+1
Agencies give up higher quality water in exchange for lower quality water (non-desalination water only)*	Agency 1 – 0 Agency 2 – 0 Agency 3 – 0 Agency 4 – +1	Agency 1 – +1 Agency 2 – 0 Agency 3 – 0 Agency 4 – 0	Agency 1 – +1 Agency 2 – 0 Agency 3 – 0 Agency 4 – 0	Agency 1 – +1 Agency 2 – 0 Agency 3 – 0 Agency 4 – +1	Agency 1 – 0 Agency 2 – 0 Agency 3 – 0 Agency 4 – +1
One or more agencies serve as a “pass-through” with no net increase in water supply.	0	0	0	0	0

*Rating varied among agencies, reflecting different agency-specific priorities.

Task E – Evaluate and Rank Project Alternatives

The objective of this task is to integrate the information from the previous tasks and compute an overall value of each project scenario. The scenarios can then be ranked in a descending order of the overall value. For example, the overall desirability scores of each scenario can be calculated using a scale of 0 to 100. For both group and individual ratings, a score of 100 would result if a scenario were rated as +2 on each subissue within every issue. Conversely, a score of 0 would result if a scenario were rated as –2 on each subissue within every issue.

An important part of the decision analysis is evaluating the sensitivity of the ranking of alternatives to the various assumptions and value judgments used in the analysis. For example, the acceptable value tradeoffs between conflicting measures may vary among agencies. The degree of acceptability of scenarios among the agencies can be evaluated by examining the influence of the different value tradeoffs on the overall value of the scenario. Results of the sensitivity analysis help to identify one or more scenarios that consistently receive high rankings under a variety of plausible value judgments, and hence are likely to receive wider acceptance among the agencies.

The following is an example of a sensitivity analysis on the impact of interagency differences on the ranking of the scenarios. The agencies are asked to assess the relative values of two scenarios, each with the same average rating across the agencies. The two scenarios are different with regard to interagency assessments. One scenario specifies the same rating by each of the member agencies, while the other scenario specifies the same rating by a majority of agencies (which is higher than that for the first scenario), but a substantially lower rating by the minority of agencies. Based on the relative values assessed by the agencies for these two scenarios (one emphasizing a lower rating but greater consistency and agreement among agencies, and the second emphasizing a lesser degree of consensus, but greater appeal to some of the agencies), the project team defines sensitivity analysis cases that represent different views of the impact of interagency differences. A case can be that the average score of a scenario is increased by a certain percentage if the majority of the agencies give it consistently higher ratings than the minority of agencies. Another case is that the average score of a scenario is reduced by a certain percentage if there are substantial interagency differences.

STEP 6 – CONDUCT PUBLIC OUTREACH

Public outreach is an important component of any desalination project, regardless of the phase of the project. Although desalination projects have been implemented throughout the world for several decades, they have not been widely implemented in the United States, including California, as part of municipal water supplies. Therefore, desalination is not very well known or understood by the general public. However, desalination has been getting more attention in California in recent years as more conventional sources of water become scarcer and municipal water districts look to diversify their supply portfolios.

Several forms of media can be used for public outreach. An agency website is an excellent vehicle for disseminating information. Project-specific websites can be developed. It is important to use multiple methods or vehicles for disseminating information to maximize the outreach efforts.

Key public outreach activities may include:

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- Preparation of informational materials, including a project website, fact sheets, and letters to stakeholders
- Presentations to interest groups
- Public forums
- Regulatory agency meetings
- Response to public inquiries and comments

Public outreach efforts should be tailored to the targeted audience for each event such as the general public, interest groups, or regulatory agency staff. Regulatory agencies appreciate early involvement on these types of projects since they can provide input to help minimize environmental impacts and express their views on the important contemporary issues.

Since the project is regional, it is important to include stakeholders from all of the agencies' service areas and not just those located in the vicinity of the proposed plant site.

STEP 7 – DEVELOP A PROJECT IMPLEMENTATION PLAN

In this step, a plan is developed to implement the selected project alternative. The agencies should conduct detailed hazardous materials/wastes and geotechnical investigations of the preferred project site to confirm the feasibility or constraints of the location. A pilot plant study should be conducted at or in the vicinity of the proposed plant site to evaluate the best combination of pretreatment and reverse osmosis technologies for the location's source water, to develop engineering parameters for the full-scale facility, and to conduct environmental studies associated with impingement/entrainment of aquatic organisms and effects of brine disposal on water quality and marine life. Following the pilot study, the agencies should prepare a site-specific site layout and conceptual engineering design. After preliminary design information is developed, then environmental impact studies of the proposed desalination plant project and environmental permitting should be initiated. After completion of the environmental review and permitting process, the desalination plant would be designed and constructed.



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