2010 Recharge Master Plan Update
Technical Memorandum
Task 3 Planning Criteria

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INTRODUCTION

The objective of Task 3 is to articulate the investigation requirements and planning assumptions that will be used in the 2010 Chino Basin Recharge Master Plan Update. These criteria include those from the Judgment, the Peace Agreement, the Peace II Agreement, the December 21, 2007 Court Order approving the Peace II Agreement and facility planning information and assumptions that will be used to evaluate new recharge projects and alternatives that will be investigated in the Recharge Master Plan. The Recharge Master Plan Update is required by Court to contain recharge estimations and summaries of the projected water supply availability as well as the physical means to accomplish the recharge projections. The Plan will reflect an appropriate schedule for planning, design, and physical improvements as may be required to provide sufficient replenishment capability to meet the reasonable projected replenishment obligations. The objective of this task memorandum is to record these criteria and assumptions early in the investigation and to provide opportunity for the stakeholders to comment early and during the investigation prior to the development and analysis of new recharge projects and recharge alternatives. The memorandum will be routinely updated throughout 2009 to reflect new information and assumptions that will be built into the Recharge Master Plan. This memorandum is a joint product of Black & Veatch and Wildermuth Environmental.

The first part of this memorandum discusses the planning criteria and assumptions from the Judgment, the Peace Agreement, the Peace II Agreement, the December 21, 2007 Court Order approving the Peace II Agreement. This is followed by facility planning, operating, and cost estimating criteria. The cost estimating methodology for projects and alternatives will be included in a subsequent version of this memorandum; regulatory and robustness requirements will also be included in subsequent versions.

This document provides the planning criteria for the Recharge Master Plan related to the following:

LEGAL REQUIREMENTS

Chino Basin Judgment

The Chino Basin Watermaster was established under a Judgment entered in the Superior Court of the State of California for the County of San Bernardino, entitled "Chino Basin Municipal Water District v. City of Chino et al," (originally Case No. SCV 164327, file transferred August 1989, by order of the Court and assigned new Case No. RCV 51010).

The Honorable Judge Howard B. Wiener signed the Judgment on January 27, 1978. The effective date of this Judgment for accounting and operations was July 1, 1977.

The Chino Basin Judgment resulted from studies and discussions that began in the early 1970's and continued for several years. Safe yield is defined on page 4 of the Judgment as:

> "The long-term average annual quantity of ground water (excluding replenishment or stored water but including return flow to the Basin from the use of replenishment or stored water) which can be produced from the Basin under cultural conditions of a particular year without causing an undesirable result."

On page 6 of the Judgment the amount of safe yield is numerically defined as: "The safe yield of the Chino Basin is 140,000 acre-feet per year." The safe yield is allocated among the three producers pools as follows:

Overlying agricultural pool	82,800 acre-ft/yr
Overlying non-agricultural pool	7,366 acre-ft/yr
Appropriative pool	49,834 acre-ft/yr

A fundamental premise of the Judgment is that all Chino Basin water users will be allowed to pump sufficient water from the Basin to meet their requirements (page 24, paragraph 42). To the extent that pumping exceeds the share of the safe yield assessments are levied by the Watermaster to replace overproduction. Watermaster uses these assessments to purchase supplemental water to replace the overproduction. The Judgment also provides that "Any subsequent change in the safe yield shall be debited or credited to the appropriative pool" (page 25, paragraph 44). This means that if the safe yield is determined by Watermaster to change at some point in time after the Judgment was entered that the change would exclusively be debited or credited to members of the appropriative pool and the rights allocated to the other pools and their respective parties would remain unchanged. The overlying agricultural pool consists of all overlying producers that produce groundwater for other than industrial or commercial purposes and the State of California. The overlying non-agricultural pool consists of overlying producers that produce groundwater for industrial and commercial purposes. The appropriative pool consists of owners of appropriative rights. All of the parties were assigned to a pool when the Judgment was entered and the Watermaster maintains current list of all parties and their pool assignments.

Peace Agreement

Section 5.1 (e) of the Peace Agreement contains Watermaster's commitments regarding the recharge of supplemental water in the Chino Basin. This analysis focuses on the Watermaster's implementation of the Peace Agreement Section 5.1 (e) items (i), (iii), (v), (vii), and (viii), which are as follows (see Peace Agreement, pages 20 and 21):
"Watermaster shall exercise Best Efforts to:

(i) protect and enhance the safe yield of the Chino Basin through Replenishment and Recharge; …

(iii) direct Recharge relative to Production in each area and sub-area of the Basin to achieve long term balance and to promote the goal of equal access to groundwater in all areas and sub-areas of the Chino Basin; …
(v) establish and periodically update criteria for the use of water from different sources for Replenishment purposes; …
(vii) recharge the Chino Basin with water in any area where groundwater levels have declined to such an extent that there is an imminent threat of Material Physical Injury to any party to the Judgment;
(viii) maintain long-term hydrologic balance between total Recharge and discharge in all areas and sub-areas;"

The *OBMP Implementation Plan* (Exhibit B of the Peace Agreement) contains language identical to that in Peace Agreement Section 5.1 (e), but is mostly silent as to the schedule for implementation of the specific commitments listed above (see Exhibit B, paragraph 11 on page 20 and the implementation schedule on pages 22 and 23). Paragraph 9 on page 20 of the Implementation Plan includes additional recharge guidelines that Watermaster must consider regarding recharge:

"9. When locating and directing physical recharge, Watermaster shall consider the following guidelines:
(i) provide long term hydrologic balance within the areas and sub-areas of the basin
(ii) protect and enhance water quality
(iii) improve water levels
(iv) the cost of recharge water
(v) any other relevant factors"

Section 7 of the Rules and Regulations repeats the commitments of Section 5.1 (e) of the Peace Agreement and adds (see Rules and Regulations, page 37, 7.1 (b) (iv)):

"(b) Watermaster shall exercise Best Efforts to: …
(iv) Make its initial report on the then existing state of Hydrologic Balance by July 1, 2003, including any recommendations on Recharge actions which may be necessary under the OBMP. Thereafter, Watermaster shall make written reports on the long term Balance in the Chino Basin every two years; …"

Peace II Agreement

The Peace II Agreement states that Watermaster will update and obtain Court approval of its update to the Recharge Master Plan to address how the Chino Basin will be managed to secure and maintain Hydraulic Control and operated at a new equilibrium at the conclusion of the period of Re-Operation.

This plan must reflect an appropriate schedule for planning, design, and physical improvements as may be required to provide reasonable assurance that following the full beneficial use of the groundwater withdrawn in accordance with the Basin Re-Operation and authorized controlled overdraft, that sufficient replenishment capability exists to meet the

reasonable projections of Desalter Replenishment obligations. With the concurrence of Inland Empire Utilities Agency (IEUA) and Watermaster, the Recharge Master Plan will be updated and amended as frequently as necessary with Court approval and not less than every five (5) years.

Peace II Article 8.4 summarizes s recharge in Management Zone 1 (MZ1), specifically the 6,500 acre-ft/yr supplement recharge to MZ1. The Parties make the following acknowledgments regarding the 6,500 Acre-Foot Supplemental Recharge:

> "(a) fundamental premise of the Physical Solution is that all water users dependent upon Chino Basin will be allowed to pump sufficient waters from the Basin to meet their requirements. To promote the goal of equal access to groundwater within all areas and sub-areas of the Chino Basin, Watermaster has committed to use its best efforts to direct recharge relative to production in each area and subarea of the Basin and to achieve long-term balance between total recharge and discharge. The Parties acknowledge that to assist Watermaster in providing for recharge, the Peace Agreement sets forth a requirement for Appropriative Pool purchase of 6,500 acre-feet per year of Supplemental Water for recharge in Management Zone 1 (MZ1). The purchases have been credited as an addition to Appropriative Pool storage accounts. The water recharged under this program has not been accounted for as Replenishment water.
>
> (b) Watermaster was required to evaluate the continuance of this requirement in 2005 by taking into account provisions of the Judgment, Peace Agreement and OBMP, among all other relevant factors. It has been determined that other obligations in the Judgment and Peace Agreement, including the requirement of hydrologic balance and projected replenishment obligations, will provide for sufficient wet water recharge to make the separate commitment of Appropriative Pool purchase of 6,500 acre-feet unnecessary. Therefore, because the recharge target as described in the Peace Agreement has been achieved, further purchases under the program will cease and Watermaster will proceed with operations in accordance with the provisions of paragraphs (c), (d) and (e) below.
>
> (c) The parties acknowledge that, regardless of Replenishment obligations, Watermaster will independently determine whether to require wet-water recharge within MZ1 to maintain hydrologic balance and to provide equal access to groundwater in accordance with the provisions of this Section 8.4 and in a manner consistent with the Peace Agreement, OBMP and the Long Term Plan for Subsidence."
>
> Watermaster will conduct its recharge in a manner to provide hydrologic balance within, and will emphasize recharge in MZ1. Accordingly, the Parties acknowledge and agree that each year Watermaster shall continue to be guided in the exercise of its discretion concerning recharge by the principles of hydrologic balance. (d) Consistent with its overall obligations to manage

the Chino Basin to ensure hydrologic balance within each management zone, for the duration of the Peace Agreement (until June of 2030), Watermaster will ensure that a minimum of 6,500 acre-feet of wet water recharge occurs within MZ1 on an annual basis. However, to the extent that water is unavailable for recharge or there is no replenishment obligation in any year, the obligation to recharge 6,500 acre-feet will accrue and be satisfied in subsequent years.

1. Watermaster will implement this measure in a coordinated manner so as to facilitate compliance with other agreements among the parties, including but not limited to the Dry-Year Yield Agreements.

2. In preparation of the Recharge Master Plan, Watermaster will consider whether existing groundwater production facilities owned or controlled by producers within MZ1 may be used in connection with an aquifer storage and recovery ("ASR") project so as to enhance recharge in specific locations and to otherwise meet the objectives of the Recharge Master Plan.

(e) Five years from the effective date of the Peace II Measures, Watermaster will cause an evaluation of the minimum recharge quantity for MZ1. After consideration of the information developed in accordance with the studies conducted pursuant to paragraph 3 below, the observed experiences in complying with the Dry Year Yield Agreements as well as any other pertinent information, Watermaster may increase the minimum requirement for MZ1 to quantities greater than 6,500 acre-feet per year. In no circumstance will the commitment to recharge 6,500 acre-feet be reduced for the duration of the Peace Agreement."

Special Referee's December 2007 Report, Sections VI (Assurances Regarding Recharge), VII (Declining Safe Yield), and VIII (New Equilibrium)

In the Final Report and Recommendations on Motion for Approval of Peace II Documents, the Special Referee sated that "A key element of the proposed Peace II Measures is that Watermaster must develop recharge capability throughout the Basin Reoperation period, to ensure that sufficient recharge capability exists at the end of the period." (Final Report, page 25)

The Special Referee recommended and the Court ultimately ordered several elements be included within the updated Plan (from Motion to Approve Watermaster's Filing in Satisfaction of Condition Subsequent 5; Watermaster Compliance With Condition Subsequent 6, August 21, 2008):

"1. Baseline conditions must be clearly defined and supported by technical analysis. The baseline definition should encompass factors such as pumping, demand, recharge capacity, total Basin water demand, and availability of replenishment water.

2. Safe Yield should be estimated annually, though it is recognized that it is not to be formally recalculated until 2011. Watermaster should develop a technically defensible approach to estimating Safe Yield annually.

3. Measures should be evaluated to lessen or stop the projected Safe Yield decline. All practical measures should be evaluated in terms of their potential benefits and feasibility.

4. Evaluations and reporting of the impact of Basin Re-Operation on groundwater storage and water levels should be done on an annual basis.

5. Total demand for groundwater should be forecast for 2015, 2020, 2025, and 2030. The availability of imported water for supply and replenishment, and the availability of recycled water should be forecast on the same schedule. The schedules should be refined in each Recharge Master Plan update. Projections should be supported by thorough technical analysis.

6. The Recharge Master Plan must include a detailed technical comparison of current and projected groundwater recharge capabilities and current and projected demands for groundwater. The Recharge Master Plan should provide guidance as to what should be done if recharge capacity cannot meet or is projected not to be able to meet replenishment needs. This guidance should detail how Watermaster will provide sufficient recharge capacity or undertake alternative measures so that Basin operation in accordance with the Judgment and the Physical Solution can be resumed at any time.

   These recommendations are a reflection of the requirements described in the Peace II Measures. Peace Agreement II section 8.1 and the Amendment to Judgment Exhibit "I" section 2(b)(5) require that the updated Recharge Master Plan must:

7. Address how the Basin will be contemporaneously managed to secure and maintain Hydraulic Control and subsequently operated at a new equilibrium at the conclusion of the period of Re-Operation.

8. Contain recharge estimations and summaries of the projected water supply availability as well as the physical means to accomplish the recharge projections.

9. Reflect an appropriate schedule for planning, design, and physical improvements as may be required to provide reasonable assurance that sufficient Replenishment capacity exists to meet the reasonable projections of Desalter Replenishment obligations following the implementation of Basin Re-Operation.

Peace Agreement II section 8.4(d)(2) further requires that the Recharge Master Plan:

10. Consider whether existing groundwater production facilities owned or controlled by producers within MZ1 may be used in connection with an aquifer storage and recovery ("ASR") project so as to further enhance recharge in specific locations and to otherwise meet the objectives of the Recharge Master Plan."

The Outline of the Recharge Master Plan Update report and the scope of work were designed to respond to the Special Referee's report as ordered by the Court on December 21, 2007. Note that the Court has subsequently approved the outline and the stakeholders have reviewed and approved the scope of work.

DESIGN REQUIREMENTS FOR WELLS, CONVEYANCE, STORAGE AND TREATMENT FACILITIES

This section presents the planning level design criteria for wells, conveyance, storage, and treatment facilities to help enhance recharge opportunities in the Chino Basin. These facilities may be further refined and integrated into future water recharge projects to meet the following groundwater recharge goals: (1) enhance recharge of storm water runoff, (2) increase recharge of recycled water and (3) develop new facilities to capture supplemental imported water.

New ASR Wells

Aquifer Storage and Recovery (ASR) is a process that consists of injecting treated water down through a well for storage in a confined aquifer system and recovery through reversing operation when groundwater production is needed. Table 1 shows the planning level design criteria for an ASR well. Estimates for production and injection capacities are conceptual and presented for basin wide initial planning purposes only. The equipping design of the ASR well shall be based upon an above ground vertical turbine type pump with premium efficiency motor. This type of pump/motor arrangement is commonly found on existing production wells located in the Chino Basin. Each ASR well may include a well enclosure building to accommodate the pump/motor, electric control panels, and other required components.

Table 1
ASR Well Design Criteria

Facility Component	Design Criteria
Estimated production capacity, gpm	1,500 - 2,500
Assumed production to injection ratio, %	50
Estimated injection capacity, gpm	750 - 1,250
Well Depth	TBD
Pump type	Vertical deep well
Well enclosure building (if used)	Single story structure w/ CMU block wall (or) pre-fab type structure
Required land, sf	2,500 - 5,000

Specific ASR well siting considerations shall be developed and evaluated under future Recharge Master Plan tasks.

Although local water quality would be reviewed during site selection, groundwater treatment for production mode of ASR is not evaluated in this study.

New Injection Wells

An injection well enables artificial aquifer recharge by injecting treated surplus water underground where it will replenish groundwater within the local aquifer. The design criteria for the proposed injection wells facilities are provided in Table 2.

Table 2
Injection Well Design Criteria

Facility Component	Design Criteria
Estimated injection capacity, gpm	750 - 1,250
Well enclosure building (if used)	Single story structure w/ CMU block wall (or) pre-fab type structure
Required land, sf	2,500 - 5,000

Recharge Basin

This section describes the general design criteria for recharge basin facilities, which are also referred to as stormwater retention, debris, and conservation basins. Table 3 presents the design criteria for a typical recharge basin. The criteria was developed based upon a typical basin layout utilizing a conservative percolation design rate (ft/day) as determined by previous programs implemented in the Chino Basin.

Table 3
Recharge Basin Design Criteria

Facility Component	Design Criteria
Percolation design rate, feet/day	1.0 – 2.0
Total basin usable area (usable perc./total area), %	90
Typical basin layout	
Aspect ratio (length : width)	1.5 : 1
Basin wall slope (horizontal : vertical)	2 : 1
Basin depth, ft	8 - 16
Perimeter driveway width, ft	15
Fine grading depth, ft	1
Perimeter fencing	Chain link
Spillway / overflow	Concrete lined or large rock lined
Diversion design	Drop inlet structure or rubber dam
Flow control gates	Sluice gate flow control
Instrumentation & control	RTU, radio system, security system

Well Rehabilitation / Conversion

In addition to new facilities, opportunities to use, rehabilitate, or reactivate existing production and/or ASR well facilities would be reviewed. These existing wells would be evaluated on a case by case basis.

Treatment

This section introduces the treatment facilities required to enhance the recharge opportunities in the Chino Basin. Treatment concepts have been developed for the following source water alternatives: (1) State Water Project (SWP) water; (2) Colorado River Aqueduct (CRA) water; and (3) recycled water sources. Each water source has specific treatment opportunities, which are described below.

SWP Water. SWP water is an imported water supply delivered by Metropolitan Water District of Southern California (Metropolitan). SWP water is primarily conveyed to the Basin through the Rialto Pipeline that flows east to west along the northern portion of the Basin. The SWP water recharge plan would utilize surplus water, when available, and treated at two existing surface water treatment plants: the Cucamonga Valley Water District's Lloyd W. Michael Water Treatment Plant (LMWTP) and/or the Water Facilities Authority (WFA) Aqua De Lejos WTP. Table 4 describes criteria related to the LMWTP treatment plant.

Table 4
CVWD Lloyd W. Michael Water Treatment Plan

Description	Criteria/Information
Owner	Cucamonga Valley Water District
Plant Location	Rancho Cucamonga, California
Capacity	60 MGD (expanded in yr 2003)
Treatment Process	Chemical Coagulation, Flocculation, Sedimentation, Dual Media Filtration, Disinfection
Water Source	State Water Project, Local surface water
Source Water Purveyor	Metropolitan Water District
Distribution Users	CVWD service area (Rancho Cucamonga)

Table 5 describes criteria related to the WFA treatment plant.

Table 5
WFA Aqua De Lejos Water Treatment Plant

Description	Criteria / Information
Owner	Water Facilities Authority
Plant Location	Upland, California
Capacity	88 MGD
Treatment Process	Conventional
Water Source	State Water Project
Source Water Purveyor	Metropolitan Water District
Distribution Users	City of Upland, City of Ontario, City of Chino, City of Chino Hills, Monte Vista Water District

The current projected availability of surplus water from Metropolitan has been substantially reduced because of drought and the uncertainty of pumping operations from the SWP due to requirements for protection of Delta Smelt and other environmental issues. It is assumed that surplus water would be available to the Watermaster in three out of every ten years. This assumption will impact the facilities required to handle the surplus supply during replenishment periods.

The SWP water replenishment and treatment cost rates are addressed in the cost criteria section of this memorandum.

In addition to the Metropolitan Rialto Pipeline, a secondary conveyance source of SWP water may include the San Gabriel Valley Municipal Water District (SGVMWD) Azusa-Devil Canyon Pipeline. Opportunities to use this pipeline for replenishment deliveries will be evaluated during development of the Recharge Master Plan.

CRA Water. The Colorado River Aqueduct (CRA) is a 242-mile aqueduct which diverts water from the Colorado River at Lake Havasu on the California-Arizona border west across the Mojave and Colorado Deserts to the east side of the Santa Ana Mountains. The CRA terminates at Lake Mathews in western Riverside County, where water is then distributed to Metropolitan's member agencies via the Upper Feeder.

CRA water is essentially no longer used in the Basin due to high concentrations of total dissolved solids (TDS). CRA projected surplus availability may be increasing due to potential supply available to MWD from the unused portion of California's normal apportionment and existing contracts in place to divert additional surplus water on an annual basis. Treatment obstacles would need to be considered to manage the water quality issues associated with CRA water to maintain salt balance in the Basin and meet maximum benefit based TDS objectives. Two treatment scenarios introduced and evaluated under the CRA imported source water plan include: (1) CRA without TDS reduction and (2) CRA with TDS reduction. Each of these two scenarios concepts are discussed below.

<u>CRA Without TDS Reduction.</u> This scenario is based upon the strategy to maintain an overall salt balance in the Basin. The plan would incorporate conventional surface treatment

of CRA water without provisions for TDS reduction. To offset the potential additional salt loading into the Basin, it is likely that IEUA regional recycled water facilities would require additional advance treatment to further reduce the TDS concentration in recycled water. Under this concept, the CRA water could be used for direct recharge if an equivalent salt reduction from recycled water was implemented to maintain compliance under the Basin's maximum benefit objectives.

CRA with TDS Reduction. This scenario would include advanced treatment of CRA water to reduce its TDS to acceptable levels, as required by Basin Plan objectives. The treatment process would likely include the following steps: flocculation, sedimentation, gravity filtration, sidestream reverse osmosis, disinfection. Facilities could be constructed utilizing conventional methods of construction, such as concrete basins, or opportunities may be available to use a more packaged type treatment facility.

Rehabilitation of the Galvin WTP has been previously identified as an opportunity to use CRA water. Under the DYY Expansion Program Project, the City of Ontario expressed interest in rehabilitating and reactivating its existing Galvin WTP, which was initially designed in 1958 and has been out of service for over ten years. Once the Surface Water Treatment Rule was implemented by the CDPH in June 1993, the existing WTP could no longer comply with regulatory criterion, nor was there sufficient space within the existing building for additional processes. The WTP would likely require demolition, expansion, and conversion to membrane filtration. The raw water supply for the Galvin WTP is the Upper Feeder. This project is likely more than 5-10 years out and is part of Ontario's long-term planning. This project could be considered to provide treatment of surplus CRA water to enhance replenishment opportunities in the Basin.

Recycled Water

This section addresses advanced treatment of recycled water at IEUA's Regional Plant (RP) sites. Advanced recycled water treatment would be used to achieve a target TDS to maintain a salt balance in the Basin, in turn, more imported CRA water could be used to enhance recharge operations in the Basin. The facilities operated by IEUA represent the best potential source for advanced treatment and groundwater recharge and are listed in Table 6.

Table 6
Potential Sources of Recycled Water

Agency	Facility
LA Sanitation District	Pomona Water Reclamation Plant
IEUA	Regional Plant No. 1
	Regional Plant No. 2
	Regional Plant No. 4
	Regional Plant No. 5
	Carbon Canyon Water Reclamation Plant
City of Upland	Upland Hills Water Reclamation Plant
California Institute for Men at Chino	CIM Water Reclamation Plant
Jurupa Community Services District	Indian Hills Water Reclamation Plant
WMWD	West Riverside Regional

COST METHODOLOGY AND FINANCIAL CRITERIA

This section presents the cost methodology and planning-level construction, operations and maintenance (O&M) and general financial cost criteria to be used for development of Basin recharge facility cost opinions.

Cost Methodology

This section presents the unit cost criteria assumptions used to develop the planning level cost opinion. Unit cost criteria and assumptions were developed for construction costs, annual O&M costs, and other general and financing terms. Some of the major unit costs included rolled up costs as part of the lump sum (LS) costs. The following list identifies the components included as part of the rolled up unit cost criteria:

Source Water
- ASR Wells – drilling, equipping, well enclosure building
- Injection Wells – drilling, equipping, well enclosure building
- Recharge Basins – mass excavation, fine grading, diversion control equipment, instrumentation, security

Conveyance
- Piping – major material, trenching and installation
- Pipeline Crossing – bridge, freeway, railroad, and storm channel
- Pump Stations – major equipment, sitework, electrical, mechanical, instrumentation

Treatment
- Conventional surface water treatment (coagulation, flocculation, sedimentation, dual media filtration, disinfection)
- Advanced surface water treatment (coagulation, flocculation, sedimentation, dual media filtration, sidestream reverse osmosis, disinfection)
- Advanced recycled water treatment (sidestream microfiltration, reverse osmosis)

Construction Cost Criteria

Table 7 presents a summary of the unit construction cost criteria to be used in development of the alternative cost estimates.

Table 7
Summary of Unit Construction Cost Criteria

Item	Unit Cost
Conveyance Facilities	
Pipelines installed, $/in-dia/lf	$ 15
Distribution system booster pump station, $/HP	$ 5,000
Crossings	
Bridge supported, $/lf	$ 900
Freeway crossing (microtunnel), $/lf	$ 1,100
Railroad crossing (auger boring), LS	$ 200,000
Storm channel crossing (auger boring), LS	$ 150,000
Turnouts & Miscellaneous connections	
Transmission pipeline turnout, LS	$ 500,000
Connection to storm channel, LS	$ 100,000
Valve & Metering, LS	$ 25,000
Well Facilities	
New ASR Well, LS	$ 2,800,000
New Injection Well, LS	$ 1,300,000
Well Rehabilitation/ASR Conversion, LS	$ 1,900,000
Treatment Facilities	
New conventional Surface WTP $/gal	$ 2.50
New Advanced Surface WTP, $/gal	$ 3.00
Advanced Recycled WTP (retrofit), $gal (1)	$ 4.00
Land	
Undeveloped	$ 500,000
Recharge Basin Facilities	
Mass Excavation, $/CY	$ 10
Fine Grading, $/CY	$ 15
Perimeter Fence, $/LF	$ 15
Instrumentation, LS	$ 100,000

Notes:
(1) Estimate, to be confirmed.

Annual O&M Cost Criteria

Table 8 presents a summary of the unit annual O&M cost criteria to be used in development of the alternative cost estimates.

Table 8
Summary of Unit O&M Cost Criteria

Item	Unit Cost
Conveyance Facilities	
Pipelines – general, $/mile	$ 4,000
Pump Stations – general, % construction cost	2 percent
Well Facilities	
Misc. well maintenance, $/year/well	$ 25,000
Surface Water and Treatment Facilities	
SWP and CRA replenishment rate, $/AF (1)	$ 294
Surface WTP surcharge, $/AF (2)	$ 75
Advanced Surface WTP surcharge, $/AF (3)	$ 100
Advanced recycled WTP surcharge, $/AF (4)	$ 250
Recharge Basin Facilities	
Misc. basin maintenance, $/year/basin	$ 50,000

Notes:
(1) Metropolitan projected rate effective 1/1/2009. Rates expected to increase to $365/AF, $398/AF, and $438/AF in years 2010 to 2012, respectively.
(2) Estimate based on conversations with and information received from CVWD and WFA. Reflect costs to cover treatment only and does not include other administration or capital charges.
(3) Estimate based on current SWTP treatment surcharge and anticipated sidestream RO process.
(4) Estimate based on cumulative 2008 OCWD GWRS costs including electricity, chemicals, and plant maintenance. Excludes labor (assumed current IEUA staff), research, and debt service.

General Financial Criteria

Table 9 presents a summary of the financing and general unit cost criteria to be used in development of the cost opinions. A 25-percent contingency will be applied to all costs, which is reflective of the planning level of detail. A 15-percent markup will also be applied to all costs to account for engineering, administration, and construction management activities. The financing and amortization period and discount rate used to develop annualized cost are also presented.

Table 9
Summary of Unit Construction Cost Criteria

Item	Criteria
Contingency, %	25
Engineering, Administration, CM, %	15
Energy, $/kwh	0.14
Project life (amortization period), years	25
Online factor, %	90
Interest Rate, %	6