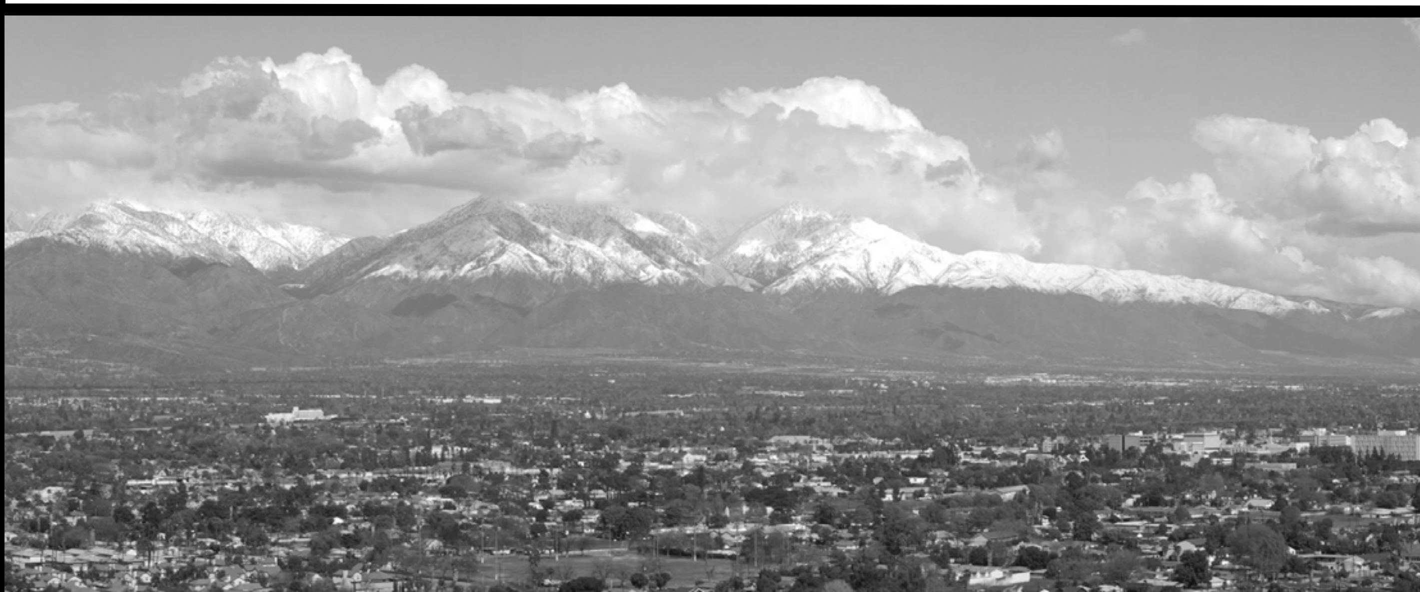
Volume II H

City of Upland



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1.0 INTRODUCTION

1.1 Overview

The Chino Groundwater Basin (Basin) Dry-Year Yield (DYY) Program Expansion (Program Expansion) is a comprehensive water resources management program to maximize conjunctive-use opportunities in the Basin. Program Expansion details are provided in a Project Development Report (PDR). Volume I traces the development of the original DYY Program, describes the Program Expansion, and presents the technical, financial, and institutional framework within which individual projects will move forward. Volume II consists of 10 lettered sub-volumes (A-J) defining facilities to be developed by the Program Expansion's ten participating appropriators. This Volume II-H describes proposed facilities for the City of Upland (Upland). Chapter 2 provides conceptual development of the groundwater production well facilities required for Upland to participate in the Program Expansion. An Opinion of Probable Cost is presented in Chapter 3. This Introduction chapter provides background information on the DYY Program, the Program Expansion, and the Upland system.

1.2 Evolution of DYY Program and Program Expansion

The Program Expansion is being developed by the Chino Basin Watermaster (Watermaster) in association with the Inland Empire Utilities Agency (IEUA), Metropolitan Water District of Southern California (Metropolitan), Three Valleys Municipal Water District (TVMWD), and Western Municipal Water District (WMWD). Table 1-1 summarizes the history and evolution of the Expansion Program, which could provide an additional 17,000 acre-feet (acre-ft) of groundwater for dry-year use.

Table 1-1
Evolution of Chino Basin DYY Program Expansion*

Item	Description	Comments
Chino Basin Optimum Basin Management Program (OBMP)	Developed in response to a 1998 court ruling governing water use in the Basin (Chino Judgment). The Judgment was a continuation of a 1978 ruling providing a legal definition for the Basin and establishing a court-appointed Watermaster.	OBMP objectives are to enhance Basin water supplies, protect and enhance water quality, enhance Basin management, and provide equitable financing. Of the OBMP's nine Program Elements, three are applicable to the Expansion Program: Salt Management (7), Groundwater Storage Management (8), and Conjunctive-use (9).
DYY Program	Conjunctive-use program initiated in 2002 among Metropolitan, IEUA, Watermaster, and participating Basin appropriators. IEUA, which manages the distribution of imported water to Basin appropriators, acts as liaison between Watermaster and Metropolitan.	The Program provides for 100,000 acre-ft of water through in-lieu exchange and direct recharge of surplus Metropolitan imported supplies. Water can be "put" into and "taken" out of the Basin at a maximum rate of 25,000 acre-feet per year (afy) and 33,000 afy, respectively.
DYY Program Expansion	Expansion of 2002 DYY Program to produce up to 17,000 afy of additional groundwater for dry-year use, in-lieu of imported water.	Each of the participating appropriators will contribute a portion of the 17,000 acre-ft of additional dry-year yield or necessary "puts" into the Basin.

* Additional details are provided in PDR Volume I.

1.3 Documentation

IEUA assembled the consultant team for the DYY Program and the Program Expansion. Both Programs have been accomplished through a series of cooperative activities working extensively with Watermaster and the Basin appropriators. From this collaboration, several reports, technical memoranda (TMs), and computer models were produced, which serve as the framework of this PDR.

The PDR is organized into four volumes. Volumes I and II, prepared by Black & Veatch (B&V), provide general information on the DYY Program Expansion. Volume I presents background information on the Basin and Program operation, while Volume II presents design criteria specific to each participating agency. Volume III, the Preliminary Modeling Report prepared by Wildermuth Environmental, Inc. (WEI), presents results of a groundwater model used to evaluate the water resources impacts of the DYY Program on the Basin. Volume IV presents the California Environmental Quality Act (CEQA) documentation conducted for this project and was prepared by Tom Dodson & Associates (TDA).

1.4 Summary of Program Participants

Volume II describes the specific site requirements and design criteria for the proposed facilities required to provide the 17,000 acre-ft of additional dry-year yield. Table 1-2 lists the appropriators and the corresponding PDR volume which identifies their project-specific facilities. Construction of these facilities is required for full Program implementation.

Table 1-2
Summary of Program Participants and Facility Requirements

Agency/PDR Volume	Facility Requirements
Chino (II A)	▸ Regenerable ion exchange (IX) treatment at existing Well Nos. 3 and 12 ▸ Aquifer storage and recovery (ASR) Site at Well No. 14: Regenerable IX treatment at existing Well No. 14 and replacement of existing Chino agriculture well for injection
Chino Hills (II B)	▸ Convert existing Well No. 19 to ASR
Cucamonga Valley Water District (II C)	▸ Four new ASR wells
Jurupa Community Services District (II D)	▸ New Well No. 27 ("Galleano Well") ▸ New Well No. 28 ("Oda Well") ▸ New Well No. 29 ("IDI Well")
Monte Vista Water District (II E)	▸ New ASR Well and regenerable IX treatment ▸ Rehabilitate existing Well No. 2 and regenerable IX treatment ▸ Regenerable IX treatment at existing ASR Well Nos. 4 and 27 ▸ Conveyance facilities to deliver water from Monte Vista Water District (MVWD) via Chino Hills to Walnut Valley Water District Service Area
Ontario (II F)	▸ Conveyance facilities to establish interconnection with Cucamonga Valley Water District (CVWD)
Pomona (II G)	▸ Regenerable IX treatment at existing Reservoir No. 5 site
Upland (II H)	▸ New well in Six Basins
Three Valleys Municipal Water District (II I)	▸ Treated water pipeline from Water Facilities Authority (WFA) Water Treatment Plant (WTP) to Miramar WTP ▸ Turnout along Azusa-Devil Canyon Pipeline
Western Municipal Water District (II J)	▸ Conveyance facilities to establish interconnection between planned Riverside-Corona (RC) Feeder and Jurupa Community Services District (JCSD) service area ▸ Conveyance pipeline to establish interconnection between WMWD service area and Chino II Desalter

1.5 Conceptual Design Assumptions

Facilities described in Volume II were designed based upon information available and using the following general design assumptions:

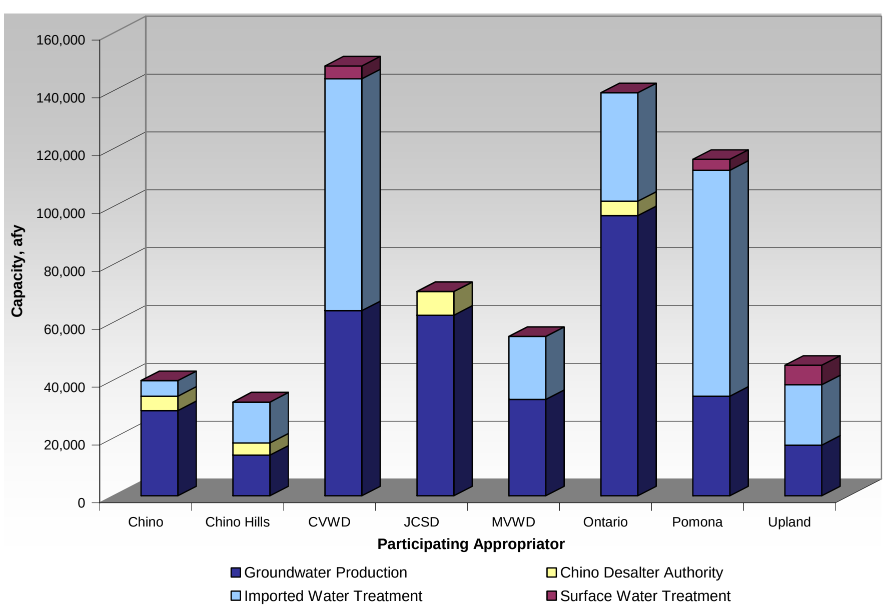
- Elevations were based upon United States Geological Survey (USGS) maps and maps obtained online from Google® Earth. They are estimated to be accurate to within 10 percent of the actual elevation. Topographical surveys would be performed as part of the final design.
- Typical engineering calculations and assumptions were used to develop preliminary sizing for equipment and IX facilities where appropriate. The final designs may vary slightly dependent upon results of the Title 22 water quality testing as well as detailed discussions with IX resin manufacturers.
- There would be no significant permitting restrictions. Investigations of potential permit requirements for each project would be carried out during final design.

- Brine discharge to the Non-reclaimable Wastewater or Waste System (NRWS) would not have a significant impact on NRWS capacity. The available capacity of the NRWS would be evaluated during final design.
- Groundwater levels and flows, anticipated drawdown from well operation and location, and concentration of contaminants were derived from available data provided by WEI based upon their recent modeling efforts.
- Facilities to be constructed on agency or city property would not require additional land purchase. In addition, pipelines constructed in city or county streets were assumed to be within the right-of-way limits.
- The opinion of probable cost is intended to provide a budgetary estimate of the capital and operational costs. Detailed quantity and unit cost figures for the facilities would depend on the final design and specific manufacturer equipment and prices as quoted at the time of bidding and construction.

1.6 Facility Requirements

An investigation ("Asset Inventory") consisting of several meetings and site visits was conducted to determine the condition of existing facilities and production capacities of each participating appropriator. The Asset Inventory presents a comprehensive list of the facilities available for each appropriator and identifies each participating appropriator's groundwater production capabilities and imported water treatment capacity. The results of the Asset Inventory are discussed in Volume I, Appendix A. Figure 1-1 summarizes Asset Inventory results.

Figure 1-1
Water Resource Capacities for Participating Appropriators(1)(2)



Notes:
(1) Participating Appropriators include current Basin appropriators interested in participating in the DYY Program Expansion. This does not include agencies outside the Basin, such as TVMWD and WMWD.
(2) Does not include recycled water deliveries provided by IEUA.

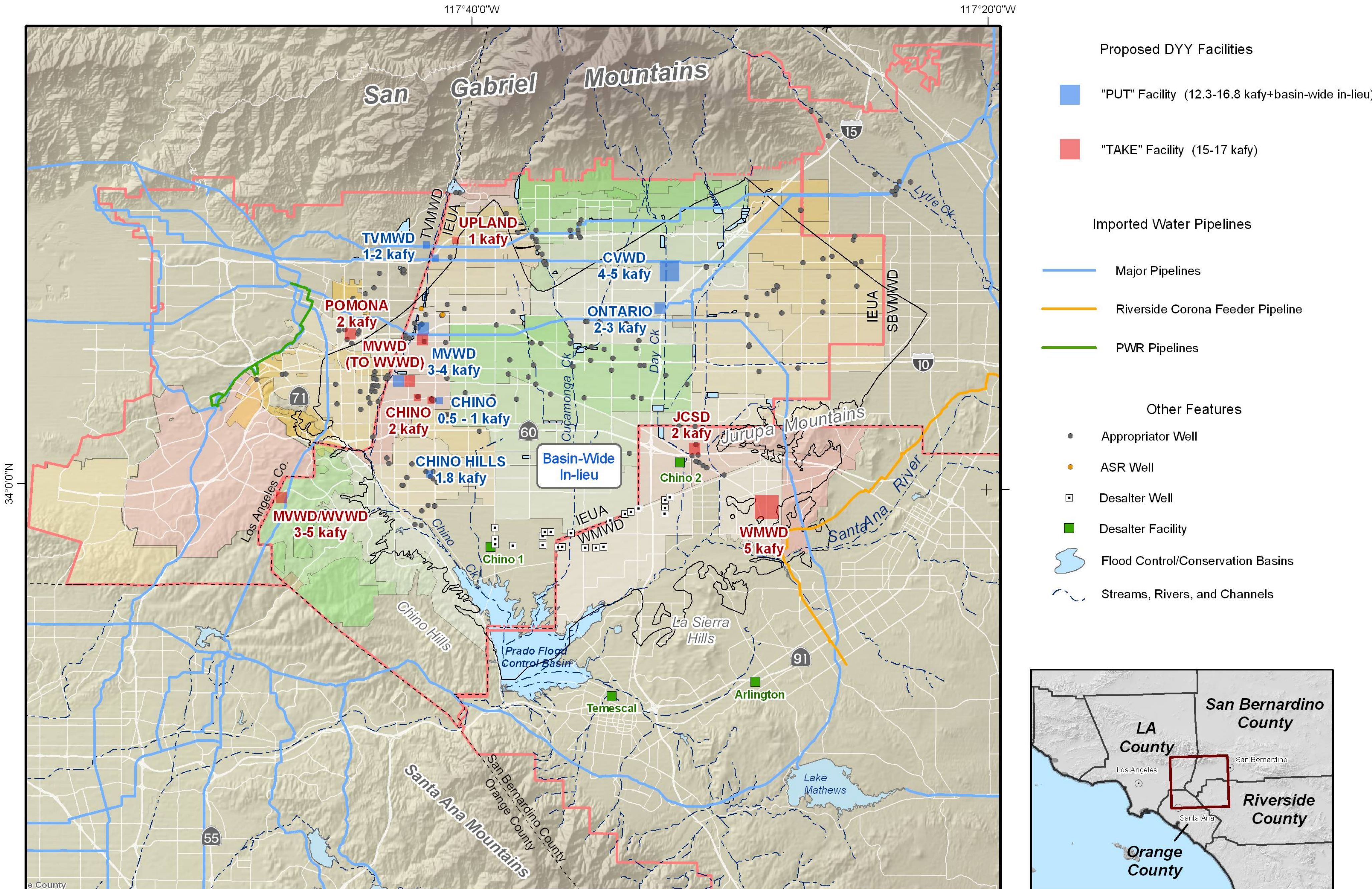
Table 1-3 lists potential Program participants and each agency's potential "put" and/or "take" contribution. The combined "take" capacity of these agencies ranges from 15,000 to 17,000 afy. The combined "put" capacity of these agencies is approximately 12,300 to 16,800 afy of direct capacity plus Basin-wide in-lieu deliveries and surface spreading contributions.

Figure 1-2 shows the locations of each agency's proposed facilities and/or locations where potential "puts" and "takes" could occur within the Basin. As the figure demonstrates, the "puts" and "takes" may be balanced on the east and west sides of the Basin. Through groundwater modeling, Program operations were evaluated to determine the potential for material physical injury to a party of the Chino Judgment or to the Chino Basin as required by the Peace Agreement (refer to Volume III, Program Modeling Report).

Table 1-3
Summary of Initial and Expanded DYY Program Participants and Proposed Put/Take Capacities

Agency	Initial DYY Program (1)		DYY Program Expansion (2)	
	Put Capacity (afy)	Take Capacity (afy)	Put Capacity (afy) (4)	Take Capacity (afy) (6)
Chino	(3)	1,159	500-1,000	2,000
Chino Hills[5]		1,448	1,800	0
Cucamonga Valley Water District		11,353	4,000-5,000	0
Jurupa Community Services District		2,000	0	2,000
Monte Vista Water District		3,963	3,000-4,000	3,000-5,000
Ontario		8,076	2,000-3,000	0
Pomona		2,000	0	2,000
Upland		3,001	0	1,000
Three Valleys Municipal Water District		0	1,000-2,000	0
Western Municipal Water District		0	0	5,000
Total	25,000	33,000	12,300 – 16,800	15,000 – 17,000

Notes:
(1) Initial 100,000 acre-ft DYY Program includes maximum 25,000 afy "put" over a four-year period of surplus water and a maximum 33,000 afy "take" over a three-year dry period.
(2) DYY Program Expansion includes increases in total storage, "put" capacity, and "take" capacity.
(3) "Puts" for the initial DYY Program are accomplished by a combination of direct recharge and in-lieu deliveries.
(4) Does not include Basin-wide in-lieu deliveries and direct recharge.
(5) MVWD assumed Chino Hills' shift obligation of 1,448 afy per an amendment to the agreement between the agencies dated March 5, 2007.
(6) Post modeling, adjusted take capacities. See Volume III for details.



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Proposed DYY Participants and Put/Take Locations

Figure 1-2

Therefore, while the Basin has adequate storage capacity, any increases in groundwater production during dry years would likely require additional production capacity and/or groundwater treatment. Groundwater treatment during dry years would contribute to the long term sustainable use of the Basin. A further discussion of the Basin Operations Plan is provided in Volume I.

1.6.1 Water Resources, Historical Water Use, and Shift Obligation for Upland

The Asset Inventory data summarizing Upland's existing water resources capabilities is presented in Table 1-4. The complete Asset Inventory is provided in Appendix A of Volume I. The results of the Asset Inventory indicate that Upland has an imported water treatment capacity of 18.6 million gallons per day (mgd) (20,900 afy) and groundwater production capacity of 15.6 mgd (17,500 afy). Upland receives its treated imported water from the WFA Agua de Lejos WTP.

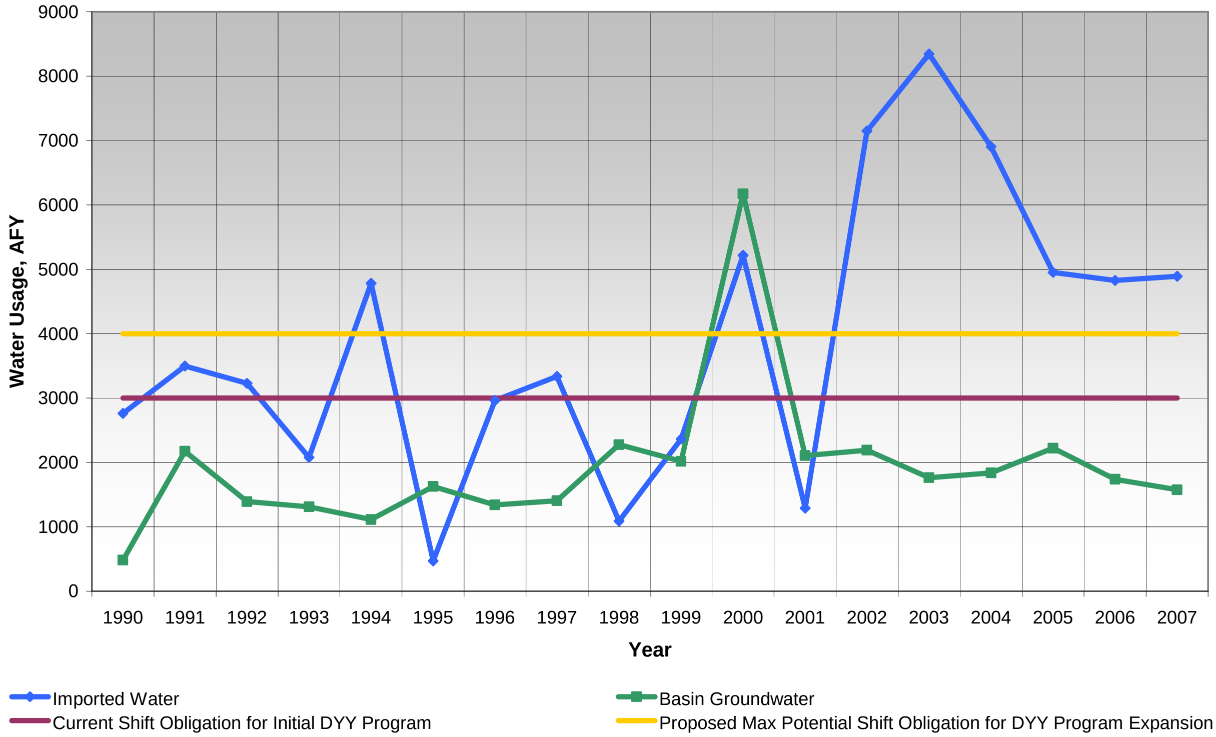
Table 1-4
Existing Water Resource Capacities for Upland

Water Resource	Upland Capacity, mgd (afy)
Local Surface and Imported Water	
Local Surface Water (San Antonio Canyon)	6.0 (6,700)
Subtotal	6.0 (6,700)
Imported Metropolitan Water	
WFA	18.6 (20,900)
Subtotal	18.6 (20,900)
Total Local Surface and Imported Water	24.6 (27,600)
Groundwater(1)	
Chino Basin Wells	7.4 (8,300)
Non-Chino Basin Wells	8.2 (9,200)
Total Groundwater	15.6 (17,500)
TOTAL WATER RESOURCES	**40.2 (45,100)**

Notes:
(1) Accounts for all well production capacity, regardless of water quality.

Figure 1-3 presents the historical groundwater production and imported water purchases for Upland. In 2007, approximately 24 percent of Upland's 6,962 acre-ft of water usage was Basin groundwater versus approximately 76 percent from imported water supplied by Metropolitan. Based on historical imports and on future growth projections, Upland has elected to take an additional 1,000 afy of groundwater as part of the potential 17,000 afy Program Expansion. To achieve this, Upland has proposed the construction of a new well (New Well No. 1) in Six Basins. Facilities associated with the new Well No. 1 are discussed in Section 1.6.2.

Figure 1-3
City of Upland Historical Imported Water and Groundwater Usage



1.6.2 Program Expansion Facility Requirements

As part of Upland's contribution to the Program Expansion, a new groundwater production well and disinfection system would be constructed in the City of Upland at the existing Reservoir 15 site, on West 17th Street and North Benson Avenue. New Well No. 1 would provide a production capacity of approximately 1,000 gallons per minute (gpm). Water from the well would be pumped into the existing reservoir for subsequent distribution into Zones 3 and 4 using existing plant and conveyance pipework.

Further details of the new production well and associated facilities are provided in Chapter 2. The preliminary opinion of probable cost is presented in Chapter 3.

1.7 Abbreviations and Acronyms

The following abbreviations/acronyms are used in this report:

acre-ft	acre-feet
afy	acre-feet per year
ASR	aquifer storage and recovery
B&V	Black & Veatch
Basin	Chino Basin
bgs	below ground surface
CEQA	California Environmental Quality Act

CML&C	cement mortar lined and coated
CML&W	cement mortar lined and wrapped
CVWD	Cucamonga Valley Water District
DWR	California Department of Water Resources
DYY	Dry-Year Yield
DYY Program	initial Chino Basin Dry-Year Yield Program
DYY Program Expansion	Chino Basin Dry-Year Yield Program Expansion
gpm	gallons per minute
gpm/ft	gallons per minute per foot
HP	horsepower
ID	inside diameter
IEUA	Inland Empire Utilities Agency
IX	Ion Exchange
JCSD	Jurupa Community Services District
Judgment	Chino Basin Municipal Water District vs. the City of Chino et al. (1978)
kVA	kilovolt-ampere
MCL	maximum contaminant level
mgd	million gallons per day
Metropolitan	Metropolitan Water District of Southern California
mg/L	milligrams per liter
MVWD	Monte Vista Water District
NO_3^-	nitrate
NRWS	Non-reclaimable Wastewater, or Waste, System
Ontario	City of Ontario
OBMP	Optimum Basin Management Program
ppd	parts per day
Program	DYY Program, DYY Program Expansion
Program Expansion	Chino Basin Dry-Year Yield Program Expansion
RC	Riverside-Corona
SAWCo	San Antonio Water Company
SCADA	Supervisory Control and Data Acquisition
SCE	Southern California Edison
TDA	Tom Dodson & Associates
TDH	total dynamic head
TDS	total dissolved solids
TEFC	totally enclosed fan-cooled
TM	technical memorandum
TVMWD	Three Valleys Municipal Water District
Upland	City of Upland
USGS	United States Geological Survey
VOCs	volatile organic compounds
Watermaster	Chino Basin Watermaster
WEI	Wildermuth Environmental, Inc.
WFA	Water Facilities Authority
WTP	water treatment plant

WMWD Western Municipal Water District

1.8 References

General references are listed in Volume I, Section 1.9. Agency-specific references for the facilities listed in this Volume II H are shown below.

[Hydrogeologic Study, 2000]

Hydrogeologic Evaluation and Well Feasibility Study, prepared by Richard C. Slade & Associates, July 2000.

[Upland, 2005] *Upland Water Master Plan Update*, *Water Network Map*, prepared by Kennedy/Jenks Consultants, December 2005.

2.0 GROUNDWATER PRODUCTION WELL

2.1 Overview

This chapter describes the location and facilities for the construction, testing, and commissioning of a new groundwater production well in the Six-Valleys/Upper Claremont Heights Groundwater Basin. Construction of the New Well No. 1 would enable the City of Upland to meet its proposed DYY Program Expansion shift obligation with respect to the Chino Basin. The proposed location for the New Well No. 1 is on Upland's existing Reservoir 15 site, at the corner of 17th Street and Benson Avenue. Figure 2-1 presents a vicinity map for the well location.

2.2 Groundwater Supply and Water Quality

2.2.1 Historical Groundwater and Operating Conditions

Historic groundwater elevations and operating conditions are not directly available for the new Well No. 1, since it has not yet been drilled or developed. However, Upland commissioned a hydrogeologic study (Slade, 2000), to evaluate the feasibility of drilling a new municipal-supply water well within its boundaries. As part of that study, historic groundwater levels from 1921 through June 2000, water quality, and operational data from a number of surrounding wells were investigated in order to establish the most likely depth, construction, and production capacity of a new well. The results of the study were used as the basis of design for the new Well No. 1.

The study concluded that water levels in this area are directly affected by rainfall recharge, infiltration, and water spreading operations along the San Antonio Creek. Table 2-1 presents the anticipated groundwater elevations for the new Well No. 1.

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City of Upland – New Well Location Map

Figure 2-1

Table 2-1
Anticipated Operating Conditions (1)

Conditions	New Well No. 1
General Conditions	
Basis for Operating Conditions, Well No.	Various
Distance from Basis Well Above, feet	600+
Location	W. 17th/ Benson
Site Elevation, feet amsl (2)	1,610
Well HGL/Delivery Zone, feet amsl (3)	1,630 / Zone 3 (7)
Operating Conditions	
Production Capacity, gpm	1,000
Est. Avg. Static Groundwater Elev., ft bgs (4)	270
Estimated Average Drawdown, feet (5)	400
Approximate Specific Capacity, gpm/ft (6)	5-15 (1)

Notes:
(1) Based on Hydrogeologic Evaluation and Well Feasibility Study, July 2000, Richard C. Slade & Associates.
(2) Above mean sea level (amsl).
(3) From Upland Water Master Plan Update.
(4) Feet, below ground surface (bgs).
(5) Drawdown is the difference between static and dynamic groundwater elevations.
(6) Gallons per minute per foot of drawdown.
(7) Existing site facilities include ability to boost to City's Zone 4.

Significant fluctuations are anticipated in both the static and pumped water levels. The static groundwater levels for the proposed well are anticipated to be approximately between 270 to 470 feet bgs. The dynamic groundwater elevation is estimated to be as great as 670 feet bgs.

The data in Table 2-1 was used to develop the operating conditions of the replacement well.

It should be noted that there are a number of operational San Antonio Water Company (SAWCo) wells in the vicinity of the Reservoir 15 site, namely Well Nos. 27, 27A, and 26. Well No. 26 lies approximately 600 feet to the west of the proposed Well No. 1.

Discussions with SAWCo confirm that the groundwater elevations in their operational wells fluctuate significantly, to the extent that pumping had to be reduced this year. The potential impact of the New Well No. 1 on the future operation of the SAWCo wells needs to be modeled and evaluated as part of further design efforts.

SAWCo Well No. 25 is closest to the proposed new well, but is no longer used and has been rendered 'beyond service.'

2.2.2 Expected Operating Conditions and Well Performance

Table 2-2 presents the anticipated operating conditions and performance for the new Well No. 1 based on the data from Table 2-1. Based on the recommendations from the hydrogeologic survey report, the new well production capacity would be approximately 1,000 gpm.

Table 2-2
Anticipated Operating Conditions and Well Performance

Description	New Well No. 1
Operating Conditions	
Location	W 17th Street & N Benson Ave.
Site Elevation, feet (1)	1610
Max. Water Elevation of On Site Reservoir 15, feet (1)	1630 est.
Delivery Pressure Zone (2)	Zone 3 (+ boost to Zone 4)
Maximum Operating Elevation of Pressure Zone, feet	1630
Approximate Depth to Static Groundwater, feet bgs (3)	270
Approximate Screened Interval, feet bgs	300-770
Performance (4)	
Estimated Production Capacity, gpm	1,000
Estimated Specific Capacity, gpm/ft	5-15
Estimated Drawdown, feet	400
Approximate Maximum Total Static Head, feet	690

Notes:
(1) Above mean sea level.
(2) From Upland Water Master Plan Update.
(3) Feet below ground surface.
(4) Based on Hydrogeologic Evaluation and Well Feasibility Study, July 2000, Richard C Slade & Associates.

2.2.3 Anticipated Water Quality

As part of the Hydrogeologic Study, limited historic water quality data was obtained for a number of wells in the vicinity of the proposed new well. Based on water quality data from the California Department of Water Resources (DWR) water quality database and in-house files of Richard C. Slade & Associates, the expected maximum nitrate concentration (as NO_3) is below the maximum contaminant level (MCL). Iron and manganese are not anticipated at excessive levels and total dissolved solids (TDS) concentrations are expected to be in the range of 200 - 300 milligrams per liter (mg/L). No volatile organic compounds (VOCs) are expected, with the possible exception of low levels of chloroethane, which currently has no specific State MCL. Wellhead treatment is not anticipated.

It is recommended that a minimum of five aquifer zone isolation tests be conducted as part of the well development and testing to confirm this assumption, specifically in regard to chloroethane.

2.3 Well Drilling and Development

Although the Reservoir 15 site was not specifically considered during the July 2000 hydrogeologic study, the extensive information obtained for existing wells in the surrounding area and the Reservoir site's proximity to the study sites indicates that the results are a valid reference at this stage of design. Based on the recommendations of the study, a 36-inch diameter conductor casing would be installed to a depth of 50 feet and cemented in a minimum 42-inch borehole. A pilot hole of up to 18 inches diameter would then be drilled to a depth of approximately 800 feet, followed by geophysical surveying and water quality testing. The pilot hole would then be reamed to 28-inches; final depth of the ream would be based on the findings of the geophysical survey.

Casing would be installed the full length of the well and would be copper-bearing steel, with the upper 300 feet having a 3/8-inch wall thickness and that below 300 feet having a wall thickness of 5/16-inch. The casing diameter would be 16-inches inside diameter from ground surface down to a total casing depth of approximately 790 feet bgs. It is estimated that approximately 350 feet of screened casing would be interspersed in the depth interval from 300 to 770 feet. The actual lengths and depth settings would depend on the geological log of the drill cuttings and the geophysical survey logs. Gravel pack would be placed in the depth interval of approximately 250 feet to 800 feet bgs.

A 20-foot section of 16-inch inside diameter (ID) blank casing with end cap would be placed below the lowest screen, to give a total casing depth of 790 feet.

A sand-cement grout seal would be installed from ground level to a depth of approximately 250 feet bgs.

A 3-inch ID steel sounding pipe would be placed to a depth of approximately 600 feet bgs.

A 4-inch ID steel permanent gravel feed tube would be placed to 20 feet below the bottom of the cement seal, to a depth of 270 feet bgs.

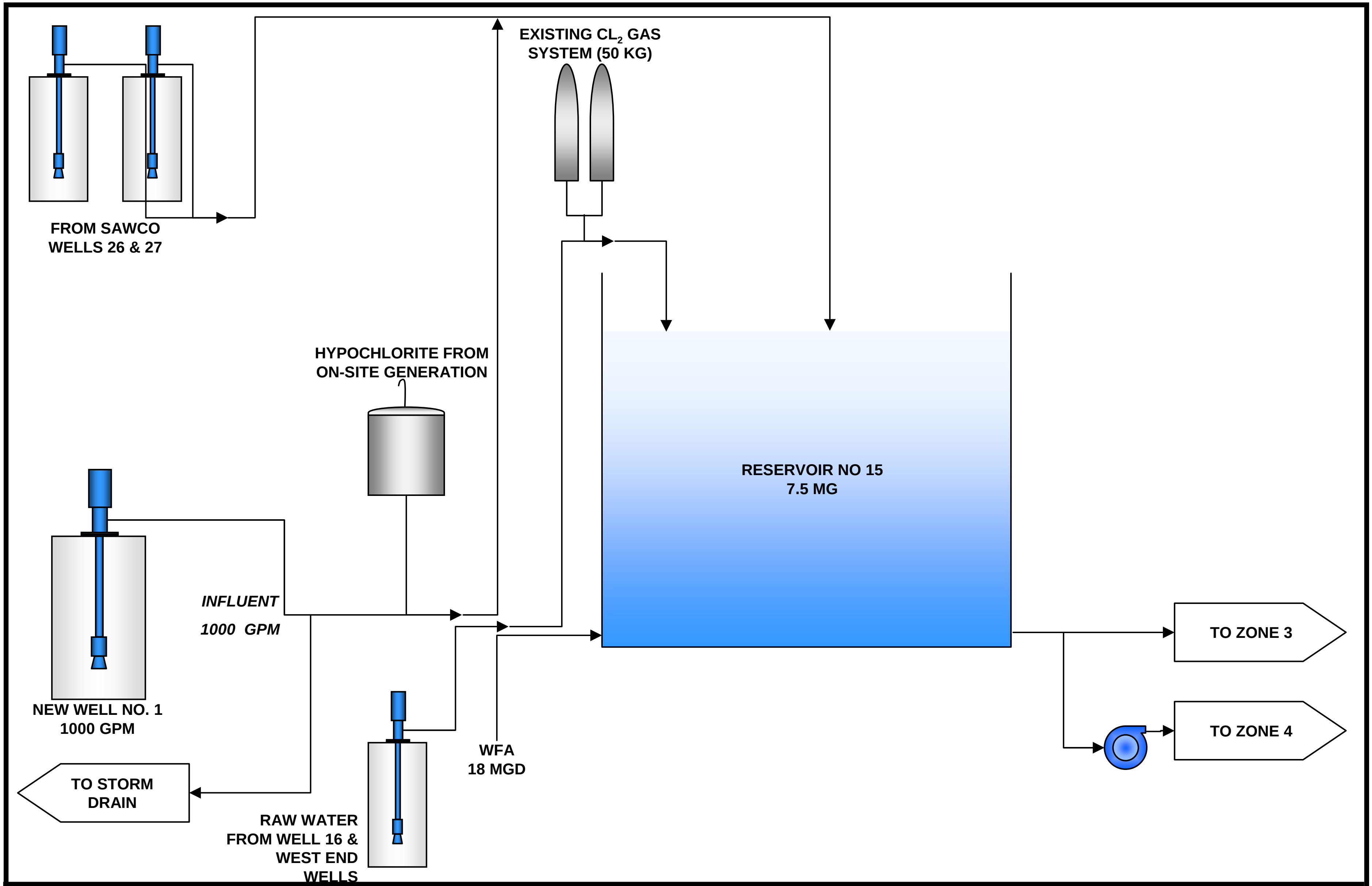
A 2-inch ID air vent tube would be placed to a depth of 2 feet bgs.

Mechanical development, comprising simultaneous swabbing and air lifting, would be carried out for approximately 100 hours after well construction. Mechanical development would be followed by pumping and surging at rates of 1,500 gpm for additional well development. Aquifer testing would then comprise a 2-day step-drawdown and constant-rate procedure, with a flow meter (spinner) survey.

After removal of the test pump, an alignment test, color video survey, and disinfection would be carried out.

2.4 Well Facilities and Wellhead Equipment

New wellhead facilities would be provided including a pump, pipework, valves, disinfection system, and electrical and control equipment. The control for the pump and the disinfection unit would be integrated into the existing Supervisory Control and Data Acquisition (SCADA) system. New discharge and blow-off piping would be required. Figures 2-2 and 2-3 present a process schematic and a site plan for the new well facility, respectively.



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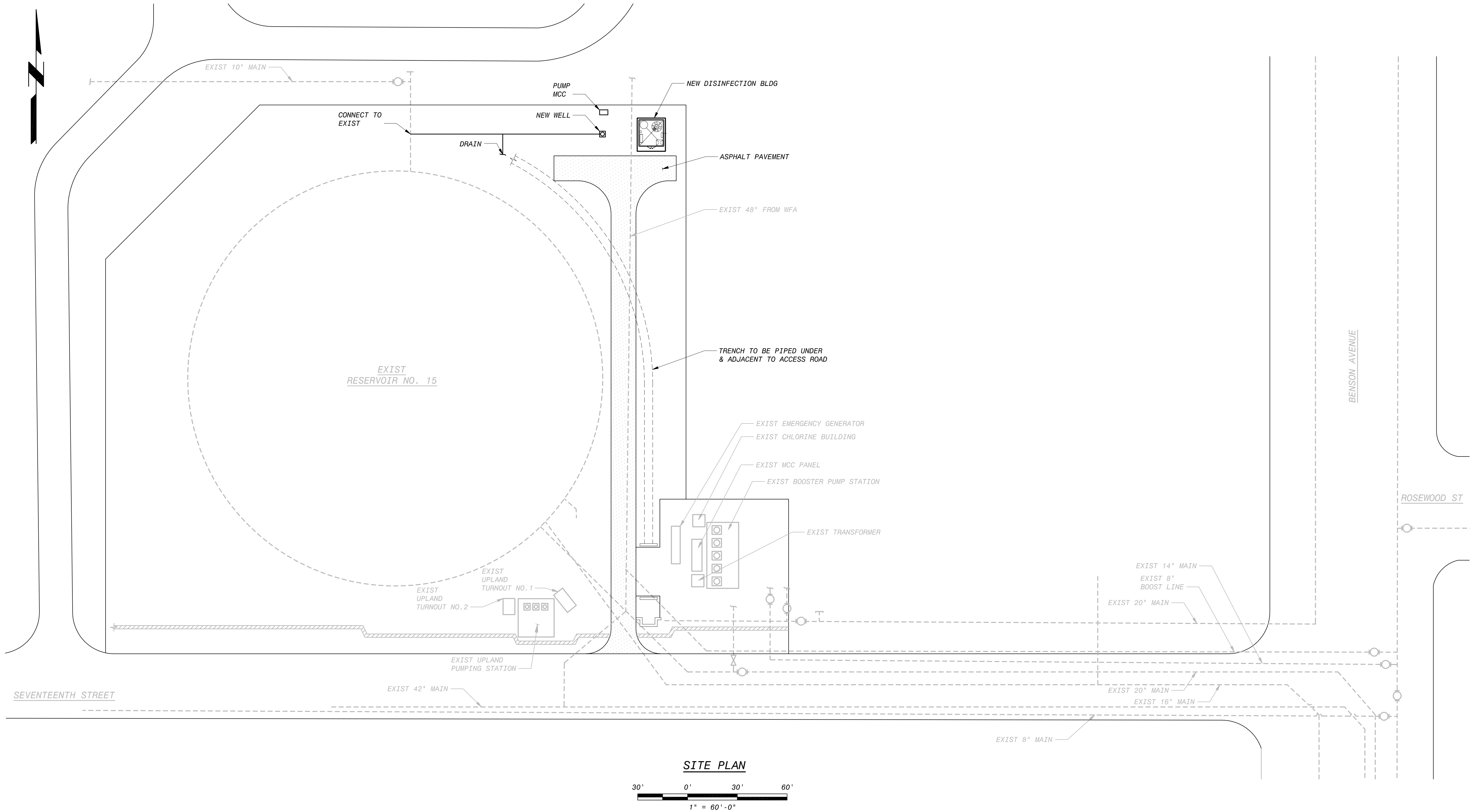
City of Upland – Process Flow Diagram

Figure 2-2



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REVISIONS AND RECORD OF ISSUE

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Black & Veatch Corporation
Irvine, California

CHINO BASIN DYY PROGRAM EXPANSION PROJECT
PROJECT DEVELOPMENT REPORT

CITY OF UPLAND
NEW WELL SITE AND YARD PIPING PLAN

DESIGNED: JEG
DETAILED: JEG
CHECKED:
APPROVED:
DATE:

PROJECT NO.
160374

FIGURE 2-3

FD160374
D160374

2.4.1 Well Pump and Motor

The wellhead pump would be a multistage vertical turbine with an electric motor mounted at ground level. The drive shaft would be lubricated with water or food grade vegetable oil, and a pre-lubrication of the line shaft bearings would be provided during the pump startup. To proceed with preliminary design, pump performance design criteria were developed for the expected production as presented in Table 2-3.

Table 2-3
Assumed Pump Performance

Description	New Well No. 1
Pump	
Type	Deep Well Turbine
Capacity, gpm	1,000
Total Dynamic Head, feet (1)	703
No. of Stages	9
Pump Efficiency, percent	80
Discharge Column Diameter, in	12
Motor	
Type	TEFC High-Efficiency (2)
Nominal Motor Horsepower, HP	250
Motor Drive	Fixed speed
Maximum Motor Speed, rpm	1760

Notes:
(1) Includes frictional losses and mechanical shaft losses.
(2) TEFC - Totally enclosed fan cooled.

The existing onsite Southern California Edison (SCE) transformer is a 1000 kilovolt-ampere (kVA) unit. It appears that the only existing major equipment fed off the transformer are the booster pumps, Turnout 2 pumps, and the gas chlorination equipment. If the switchboard is matched to the transformer, the site power supply should be adequate to include the new well pump and disinfection system. It is therefore proposed that the well pump starter be located in a cabinet adjacent to the pump, with a feed from the main switchboard.

2.4.2 Discharge and Blow-off Piping

A new 10-inch connection would be needed to connect the well discharge piping to Reservoir 15. The well would be connected into the north side of the reservoir, either via the existing 10-inch main from the SAWCo Well Nos. 26 and 27 or via a new, larger diameter connection into the reservoir itself. The re-use of the SAWCo piping would depend on its condition and the operation of the SAWCo wells with respect to the reservoir.

New 10-inch blow-off piping would be utilized for discharge to local storm water drainage during startup and run-to-waste. Currently, an open drainage channel runs around the perimeter of the reservoir structure, which takes storm flows to an existing storm drain in 17th Street. In order to install an access road to the new well, the open channel will become a culvert along the east side of the reservoir. Blow-off flows would be discharged to the new culvert, with final discharge into the existing storm water pipe at the south of the site.

2.5 Disinfection Facilities

Disinfection of the well water would be required to satisfy chlorine demand and provide a free chlorine residual in the finished water. Fully treated water comes into the reservoir from both WFA and the nearby SAWCo wells. An existing chlorine gas disinfection facility at the site provides in-reservoir disinfection of raw water from Well No. 16 and the West End Water Company wells. Upland is currently looking into replacing the existing gas system with an onsite hypochlorite generation system for safety reasons. However, the existing chlorination system has insufficient capacity for the additional water from the new Well No. 1.

For the purposes of this concept design and preparing cost estimates, it was assumed that an onsite sodium hypochlorite generation system for treating a flow of 1000 gpm would be required and that the raw water from the well would be treated independently.

At a flow rate of 1000 gpm and a chlorine dose of 1.4 ppm, the well would require 16 pounds per day (ppd) of chlorine to be produced. This duty would be achieved using a ClorTec MCT24 (which is capable of producing up to 24 ppd of chlorine), or equivalent. The system would require a power supply, a potable water supply, and a drain for waste from the softener regeneration. Since the process involves the manufacture of sodium hypochlorite from a strong brine solution, salt deliveries would be required at the site.

Decisions on the final disinfection methodology would require re-examination during the final design stage, as part of Upland's overall strategy for the site.

2.6 Conveyance Piping

Conveyance piping includes on-site raw water piping and on-site finished water piping. The sections below provide a brief summary of these facilities.

2.6.1 Description of Existing Facilities

An existing 48-inch treated water line from WFA to the City of Ontario (Ontario) runs from north to south on the site, to a 42-inch main in 17th Street. The reservoir site has two turnouts: Turnout 1 off the 48-inch WFA line and Turnout 2 off the 42-inch distribution main. Turnout 2 is not currently used. Downstream of Turnout 1, treated water passes either into the reservoir or to the 5 onsite booster pumps for boosting into Zone 4 and distribution system via 20-inch and 14-inch mains in Benson Avenue. Flow from the reservoir itself can pass directly by gravity into Zone 3, via a 20-inch pipeline, to Benson Avenue.

In addition to the turnout from WFA, treated water from SAWCo Well Nos. 26 and 27 passes into the reservoir via a 10-inch pipeline to the north of the reservoir. Raw water from Upland Well No. 16 and the West End wells enters the reservoir off a 16-inch pipeline in 17th Street.

The new Well No. 1 would require pipework and a new connection into the reservoir, from where it can be boosted or gravitate into the local distribution system.

2.6.2 Raw Water Piping

Approximately 100 feet of 10-inch diameter raw water piping would convey groundwater from the new Well No. 1 to Reservoir 15. Sodium hypochlorite injection would take place on the discharge pipeline upstream of the reservoir. All new piping would be on-site and would be steel cement mortar lined and coated (CML&C) and steel cement mortar lined and wrapped (CML&W). Buried piping would have polyethylene wrap. Pipe beneath roads, concrete pads, or other facilities would be concrete encased, if subjected to vehicular loads.

2.6.3 Operations and Hydraulic Conditions

The new well pump would be sized such that it would pump groundwater from the well, through chlorine injection and mixing, and into the on-site reservoir. The estimated total dynamic head (TDH) required includes the head needed to pump the groundwater to the ground surface based on the anticipated worst case (maximum) drawdown level of 670 ft bgs, to the reservoir maximum water level at 20 feet above ground level. From the reservoir, the existing booster station would boost the water into the higher pressure zones of the distribution system or flow would pass by gravity into Zone 3, following the current operational regime. Losses attributed to pipe friction, specials (bends, valves, flowmeter, etc.) and static mixer are accounted for in the TDH requirement. The TDH required for the new Well No. 1 is 703 feet. A 250 HP well motor would be required to achieve this TDH.

3.0 OPINION OF PROBABLE COST

3.1 Overview

This chapter presents the opinion of probable cost for the facilities described in this Volume II H of the PDR. General cost assumptions and the opinion of probable capital and annual operations and maintenance (O&M) costs are presented below.

The opinion of probable cost was based on conceptual-level unit cost criteria intended to provide a budgetary estimate of each facility's capital and annual O&M costs. Table 3-1 summarizes the estimated capital and annual O&M costs for the City's proposed facilities. As shown in the table, the total opinion of probable capital and annual O&M costs for the new facilities would be $3,164,000 and $231,000, respectively.

Table 3-1
Summary of Opinion of Probable Capital and Annual O&M Costs

Component	Cost
Capital Cost	
Construction Cost	$2,397,000
Contingency [1]	$479,000
Engineering/Administration/CM [2]	$288,000
Total Capital Cost	**$3,164,000**
Midpoint of Construction Cost [3]	$3,457,000
Annual Cost	
Annual O&M Cost	$231,000
Annualized Capital Cost [4]	$270,000
Total Annual Cost	**$501,000**

Notes:
(1) Based on 20 percent contingency.
(2) Based on 12 percent engineering/administration/construction management (CM).
(3) Assumes midpoint of construction in year 2012 at 3 percent escalation rate.
(4) Assumes amortization period of 25 years and discount rate of 6 percent.

3.2 General Cost Assumptions

The conceptual-level opinion of probable capital and O&M costs developed in this PDR were derived from quotes received from equipment manufacturers, a survey of bid pricing from participating agency facilities previously or currently under construction, and bid results or construction cost estimates from similar and recent B&V projects. Volume I, Chapter 9, presents a summary of the basis for the unit costs used in this PDR.

Volume I, Chapter 9, also presents the construction, annual O&M, general, and financing unit cost criteria used to develop the cost estimates provided in this chapter.

3.3 Capital Cost

Table 3-2 presents the opinion of probable capital cost for construction of the City's new facilities. As shown, the total estimated capital cost for the facilities would be $3,164,000. Midpoint of construction costs are also provided and indicate the constructions costs in year 2012 using a 3 percent escalation rate.

Table 3-2
Summary of Opinion of Probable Capital Cost

Component/Facility Detail	Cost
Well Facilities [1]: New Production Well	
Drilling/Casing/Cap	$900,000
Equipping	$1,000,000
Disinfection System	$200,000
Pumphouse/Electrical Building	$250,000
General Costs	
General Requirements [2]	$47,000
Total Construction Cost	$2,397,000
Contingency [3]	$479,000
Engineering/Administration/CM [4]	$288,000
Total Capital Cost	**$3,164,000**
Total Midpoint of Construction Cost [5]	$3,457,000

Notes:
(1) Includes any new production, ASR, and injection wells and well conversion/rehabilitation costs.
(2) Includes general requirements costs for all facilities (except land and SARI/NRWS).
(3) Based on 20 percent contingency.
(4) Based on 12 percent engineering/administration/CM.
(5) Assumes midpoint of construction in year 2012 at 3 percent escalation rate.

3.4 Annual O&M Cost

Table 3-3 presents the opinion of probable annual O&M cost for the City's new facilities. As shown, the total estimated annual O&M cost for the facilities would be $231,000.

Table 3-3
Summary of Opinion of Probable Annual O&M Cost

Component/Facility Detail	Cost
Well Facilities [1]: New Production Well (250 HP)	
Power	$206,000
Miscellaneous Maintenance	$25,000
Total Annual O&M Cost	**$231,000**
Annualized Capital Cost [2]	$270,000
Total Annual Cost	$501,000

Notes:
(1) Includes any new production, ASR, and injection wells and well conversion/rehabilitation costs.
(2) Assumes amortization period of 25 years and discount rate of 6 percent.