URS

Memorandum

Date: October 22, 2007

To: Arden Wallum, General Manager
Brent Gray, Director of Operations,
Mission Springs Water District

From: Tim Volz, Sarah Sandoval, and Emily Lowell, URS Corporation

Cc: Dan Patneaude, Engineering Manager, MSWD
Debbie Kaye, Kayebability Consultants
Russ Allison, SunCal
Doug Reinhart, RCE

Subject: **MSWD Northwest Area Water Master Plan Update**

A. Introduction and Background

In 2004, MSWD through the support of URS completed the Districts Comprehensive Water Master Plan Study (CWMP). Since this time, development within the Mission Springs Water District has increased at a rapid pace, especially in the Northwest region of the District. The District has been contacted by four large developments within this Northwest corridor, each requesting water and wastewater services. Additionally, one of the four developers, SunCal Acquisitions Inc. (SunCal), has requested a pressure zone review and adjustment to the current Comprehensive Water Master Plan (CWMP) pressure zones. In light of these two matters, MSWD has requested URS to review, evaluate, and provide recommendations to adjusting the current water master plan primary pressure zones that would better serve SunCal's development.

The CWMP, completed by URS in November 2004, includes an incorporation of land use plans for a 25-year planning period and an update of the MSWD water supply and distribution system model. The Northwest Area update includes revisions to the previously established pressure zones, the corresponding affect on water distribution model, and demand and infrastructure requirements based on an ultimate Northwest Area water demand scenario.

B. CWMP Existing and Northwest Area Revised Pressure Zones

As part of the CWMP, URS recommended a reconfiguration of the primary pressure zones in order to resolve concerns over high and low pressures along existing pressure zone boundaries to standardize on current and future primary pressure zones and thereby decrease the current 26 pressure zones into 12 primary pressure zones. Table 1 summarizes the resulting primary pressure zone reconfiguration and identifies the existing service zones within each.

Table 1

(CWMP Table 9-1 and 9-2)

CWMP Primary Pressure Zone Summary

Primary Pressure Zone	Existing Service Zones	Minimum Topographic Elevation (ft)	Maximum Topographic Elevation (ft)	Minimum Static Pressure (psi)	Maximum Static Pressure (psi)
913	Reduced Valley View	635	800	49	120
1070	Valley View, Two Bunch	800	970	43	117
1240	Terrace, Quail, Reduced Overhill	970	1,140	43	117
1400	Overhill, Annandale, High Desert View, Reduced High Northridge	1,140	1,300	43	113
1530	Mission Lakes, Gateway, High Northridge, Rebud	1,300	1,430	43	100
1630	Highland, Vista, Gateway Hydro	1,430	1,530	43	87
1800	None	1,530	1,700	43	117
1975	None	1,700	1,880	41	119
2155	None	1,880	2,060	41	119

The Northwest Area Master Plan Update is to consider a request by SunCal to limit the number of primary pressure zones crossing their development. Therefore, SunCal requested MSWD evaluate and revise the CWMP 1800 and 1975 pressure zones to 1876 and 2034, respectively. In order to stay consistent with established CWMP primary pressure zone designations, the requested zone adjustments were rounded to the nearest five foot increment; 1875 and 2035.

Upon review, URS determined that the proposed revisions to Zones 1800 and 1975 would also affect the 1630 Zone. The increase in coverage for Zone 1630 would create extremely low pressures along the high elevation boundary and reduce significantly the over pressure band width of the zone. Thus, URS incorporated the revision requests into three proposed zone alternatives as submitted in April 20th memorandum to the District (Attachment 1). Two of the alternatives preserve the existing 1630 Zone, yet incorporated either a Pressure Reducing Valve (PRV) or noted a high pressure exceeding criteria of 120 psi. As part of the CWMP recommendation, primary pressure zones are required to have multiple terminal water storage tanks in order to increase overall system reliability and flexibility in operation. After review by MSWD and SunCal, Alternative 1, as shown in Table 2 was found to be the preferred alternative that addressed all concerns and allowed URS to move forward with development of the Northwest Area water distribution system infrastructure. Therefore, the Northwest Area primary pressure

zone boundaries were revised to match the new upper and lower elevations as shown in Figure 1.

Table 2
Alternative 1 – Recommended Northwest Area
Primary Pressure Zone Boundary Revisions

Proposed Pressure Zone	Static Head psi	Proposed Elevation (ft)	Existing Pressure Zone	Current Pressure Range	Current EL Range
Pressure Zone 1530	100	1300	No Change	100	1300
	43	1430		43	1430
Pressure Zone 1700	117	1430	Current Zone 1630	87	1430
	43	1600		43	1530
Pressure Zone 1875	119	1600	Current Zone 1800	117	1530
	41	1780		43	1700
Pressure Zone 2035	111	1780	Current Zone 1975	119	1700
	50	1920		41	1880
Pressure Zone 2155	102	1920	Zone Boundary Change	119	1880
	41	2060		41	2060

C. Water Demand and Supply Requirements

The Northwest Area primary pressure zones were delineated and overlain with the latest land use plan as provided by the District (Figure 1). Ultimate development build out Average Day Demands (ADD) were determined for each zone based on the ADD per land use as identified in the CWMP. The Maximum Day Demand (MDD) is approximately 2 times the ADD per the CWMP report. The resulting demands for each pressure zone are shown in Table 3 below.

Table 3
Northwest Area Pressure Zone
AAD and MDD Water Demand Summary

Pressure Zone	Zone ADD gpm	Zone MDD gpm	Sun Cal Percentage*
1700	5,004	10,008	-
1875	4,376	8,752	21%
2035	3,660	7,319	8%
2155	2,028	4,057	-

*Sun Cal demand values were determined using the latest land use plan provided by the District.

As shown in Table 1, Zone 1630 includes existing water infrastructure and supply within the Gateway Tank area. The Sun Cal demand percentages in Table 3 were determined in the same way as the water demand values, using the ADD per land use as identified in the CWMP. These values differ slightly from the values Sun Cal proposed because they were determined using the land use plan and were not determined by number of dwelling units.

The 2025 water supply for the revised pressure zones is assumed to come from the same well locations as proposed in the 2004 CWMP. However, based on a study conducted by PSOMAS (April, 2007), some of the future well locations may need to be revised. It is also understood that the identified future wells in CWMP will serve areas where demand exists or to exist in the future, thus for this analysis it is assumed that additional supply necessary to accommodate ultimate demand will be available and provided by wells identified at some future time. It is important to note that the CWMP water supply goal for the Northwest Area is to get water into the (1800) 1875 tank in order to increase water supply redundancy and flexibility. Additionally, Section 5 of the CWMP indicates that MSWD will need 17 additional groundwater wells to provide supply capacity and reliability by 2025.

D. Revised Pressure Zone Storage Requirements

Storage requirements for each pressure zone were determined by calculating the Maximum Day Demand (MDD) plus the required fire flow. The following is a list of assumptions used to calculate the storage volume for each zone:

Fire flow Residential Demand = 1000 gpm
Fire flow Commercial Demand = 1500 gpm
Fire flow Duration = 2 hr

Based on an email from RCE Consultants dated 4/26/2007, the SunCal development will include 1994 residential dwelling units in Zone 1875 and 187 residential dwelling units in Zone 2035. The following table lists the storage requirements for the Northwest Area primary pressure zones and SunCal storage requirement in each zone.

Table 4

Primary Pressure Zone
Ultimate and SunCal Water Storage Requirements

Pressure Zone	Zone MDD MGD	Zone Storage MG	SunCal Storage MG	SunCal %
1700	14.4	15	NA	0%
1875	12.6	13	2.7	21%
2035	10.5	11	0.9	8%
2155	5.8	6	NA	0%

Per discussions with the District, SunCal will be responsible for acquiring the land and building the facilities required to serve their development and will be reimbursed for any over sizing capacity constructed. The proposed tank to serve the 1875 Zone portion of SunCal is located in the upper northwest corner of the SunCal development tract as shown in Figure 2. SunCal has proposed tank dimensions equal to approximately 3.6 MG as shown in Attachment 2. However, URS suggests SunCal increase this tank size to 4 MG in order to allow for additional water storage for construction purposes.

The property selected by SunCal to serve their portion of the 2035 Zone is located directly west of the proposed 1875 Zone tank at a ground elevation of approximately

2020 ft. URS analyzed the property dimensions and determined the property is sufficient to hold a tank with a capacity up to 5.5 MG.

All other facilities required to serve the revised pressure zones were incorporated into the model using these two tank locations and the location of the future development as a guide. Figure 2 conceptually illustrates all proposed infrastructure for the Northwest Area update, which includes an additional 4 MG tank near the location of the SunCal 1875 Zone tank and an additional 5.5 MG tank on the same site as the proposed SunCal 2035 zone tank. All proposed facilities including transmission, pumping, and storage are shown in Figure 2. It should be noted that all transmission alignments and well inclusions are conceptual and will be dependent upon the progress of development. The proposed features in the water distribution system are further discussed below.

E. Water Distribution System

Figure 3 is an update to the water distribution system hydraulic profile for the Northwest Area. Hydraulic modeling provided the ability to size the primary transmission systems (pumps and pipes) that are reflected in Figure 2 and 3 and summarized in Table 5.

Table 5

Northwest Area Water Pump Stations and Transmission Pipeline Summary

Pressure Zone	Tank(s)	Booster Station (South)	Booster Station (North)	Transmission Lines
1700	(3) – 5 MG	2,400 GPM (SunCal) 14,500 GPM (Ultimate)	14,500 GPM	36”
1875	(2) – 4 MG (1) – 5 MG	10,000 GPM	10,000 GPM	30”
2035	(2) – 5.5 MG	NA	600 GPM (SunCal) 9,400 GPM (Ultimate)	24”
2155	(2) – 3 MG	2,000 GPM	2,000 GPM	18”

As shown in Figure 2 and 3, initially SunCal development would be served by a pump station and transmission pipeline (Red) from the new Gateway Facilities to move water to the 1875 tank thereby bypassing the 1700 tank and 1875 pump station. This system will reduce the infrastructure cost to SunCal while meeting the needs of the SunCal development. At a future time when development is occurring in the 1700 zone, the 1875 pump station would be retrofitted to pump to the 1700 tank with a new pump station at the 1700 tank to convey water to the 1875 tank(s). At that time, a PRV station will be located on the red transmission line (Figure 3) at the 1700/1875 Zone boundary to provide water distribution system reliability.

F. Water Supply

1. Introduction

Water supply infrastructure will be critical in meeting the ultimate water demands to the northwest region of MSWD. As discussed in Section C, the water supply infrastructure must be properly sized and phased to meet the projected ultimate

maximum day demand for the northwest area of approximately 29,000 gpm. Based on current well production rates in the area and a minimum MSWD requirement of 1,000 gpm per well, URS assumed that each future water supply well will provide approximately 1,500 gpm. This assumption will require an additional 20 groundwater production wells to supply the ultimate maximum day demand for the northwest region. An initial groundwater well location study performed by GSi identified four potential areas as potential well site locations (Figure 4) that could meet the production criteria discussed. URS used the MSWD water distribution system hydraulic model to evaluate different options for infrastructure necessary to supply water from these potential well sites to the appropriate zones in the northwest region. The model was also used to assess the impact the proposed infrastructure would have on the existing water supply system.

2. Water Supply Infrastructure

To meet Suncal water supply needs, Suncal through consultation with GSi identified four potential groundwater well locations. Suncal will need two groundwater wells at 1500 gpm each to meet their maximum day demand (Figure 4). For the ultimate maximum day demand scenario there will be 18 additional wells needed to supply the area (Figure 4). For this study it was assumed that these additional 18 groundwater wells will be in the same general location as the four potential well locations identified by GSi with a distance of about ½ mile between each well. The distance of ½ mile is an approximation of the necessary well spacing to minimize the impact one well could have on another, potentially limiting its long-term capacity. Well locations shown in Figure 4 are only representations of potential future well locations. Actual well locations will be determined at some future time and will require additional well site tests to verify the area and available production. However, for this study it is assumed that the additional wells and their respective locations will accommodate ultimate demand.

The proposed water supply system infrastructure (Figure 4) will convey ultimate maximum day demand via 20 groundwater wells grouped into three sections of future wells. This allows for only one section of infrastructure to be built at a time, minimizing initial costs. The transmission pipelines from these three groups of wells are along Pierson Blvd (splitting at Karen Ave.), Western Ave. (tying into existing lines along Mission Lakes), and Two Bunch Palms (to Diablo Rd. connecting back to Pierson Blvd.). The water supply strategy assumes that if one transmission line is temporarily out of service, the water storage tanks in the Northwest Area will be able to augment the maximum day demand while portions of the demand would be supplied through the other parts of the system. If MSWD would want the flexibility to deliver full max day demands with either northern (Karen Ave. to 11th, west on 11th, north to Diablo Rd.) or southern (along Pierson Blvd.) water delivery system out of service, then the transmission mains would need to be upsized to be able to supply the ultimate day demand to the northwest area.

The water transmission pipelines needed for the 20 wells and delivery system is summarized in Table 6. Based on the delivery system strategy and the use of MSWD

hydraulic distribution model, existing infrastructure in Zone 1530 and new distribution/transmission system was verified and sized to convey water needs to the Zone 1400 and 1530 storage tanks and Zone 1530 and 1700 Pump Stations. Table 6 summarizes the proposed transmission pipelines sizes (diameters) necessary to supply the ultimate day demand to the northwest area. This table includes the northern and southern transmission lines that will "loop" the system and the transmission lines that are necessary to convey the water from the well sites to the appropriate tanks to pump the water to the necessary pressure zones. These lines were not identified in Section E above. Two additional 5 MG tanks (Zone 1400) and two additional booster stations (Zone 1530 and Zone 1700) are proposed to be added to the system. The rest of the booster stations and tanks remain the same as from section E above.

Table 6

Water Supply Transmission Pipeline Summary

Pressure Zone	Diameter (in)	Length (ft)
1400	16	4,000
1400	20	2,000
1400	24	4,500
1400	27	2,500
1400	36	13,200
1530	12	8,000
1530	16	8,500
1530	18	5,500
1530	24	9,800
1530	30	2,900
1530	36	2,200
1530	42	2,000
1700	36	9,200
1875	24	11,000
1875	30	11,300
2035	24	2,300
2155	18	11,500

3. Water Treatment/Well Head Facilities

Well head treatment for these proposed groundwater supply wells should be similar to the well head treatment that is already used by MSWD. The well head treatment process is discussed at length in the 2005 MSWD CWMP and is referenced here from that document, "The District has standardized on providing an injection point at the well discharge for liquid sodium hypochlorite followed by a collection tank or what the District calls a 'suction tank' at each new well head or well field discharge. The collection tank is intended to provide a supply of water for the distribution system booster pumps that pump water from the tank into the respective water distribution zone system." With appropriate sizing/baffling the collection or suction tank could provide nine minutes of hydraulic retention time based on general water quality

characteristics prior to first customer use as required by SDWA regulations. There are other opportunities to integrate the collection/suction tank into other zone water storage tanks in the system and thereby providing additional benefits. If this alternative is considered, it is important to recognize that the pump station(s) would need to be sized to convey water to the 1530 Zone tanks.

4. Water Supply Infrastructure Phasing

The proposed water delivery infrastructure described above will need to be constructed in a number of phases based on the number of groundwater well construction. An important aspect of the water supply infrastructure will be when the Southern most (Two Bunch Palms to Pierson.) water transmission pipeline will need to be constructed. Based on the water supply strategy discussed above and the need for approximately 20 wells to meet full build out condition, the northern transmission pipeline route will need to be implemented when the last 10 of 20 groundwater wells are constructed. Building in phases will provide for better economics for developers to construct the proposed water supply infrastructure that is needed to serve their respective developments. However, initial developments will be paying additional costs associated with the pipeline over-sizing and the Pierson transmission pipeline system.

Legend

- NWA Revised Zone Boundaries
- 2004 CWMP Zone Boundaries
- Residential
- Commercial
- Industrial
- Open Space

CWMP
Comprehensive Water Master Plan
NWAR
Northwest Area Revised

2004 CWMP Zone 2155

2004 CWMP Zone 1975

2004 CWMP Zone 1800

2004 CWMP Zone 1630

SunCal Development Boundary

NWAR Zone 2155

NWAR Zone 2035

NWAR Zone 1875

NWAR Zone 1700

CWMP Zone 1530

CWMP Zone 1400

CWMP 1240

MSWD Northwest Area Water Master Plan Update

Figure 1
Revised Pressure Zone and Land Use Overlay

URS
June, 2007

Zone 2035
Tanks
(2) 5.5 MG

Zone 2035
Booster Station
7,400 gpm

Zone 1875
Booster Station
5,600 gpm

Zone 2155
Booster Station
2,000 gpm

Zone 1875
Tanks
(2) 4 MG

Zone 1700
Tanks
(2) 5 MG

18" L = 6,500'

24" L = 2,300'

24" L = 2,400'

24" L = 2,800'

24" L = 2,000'

Zone 2155 Tanks
(2) 3.0 MG

SunCal
Development

Conceptual
Future Wells*

Zone
2155

18" L = 5,500'

Zone
2035

24" L = 11,000'

Zone
1700

EXISTING
Zone 1530
Tank (1) 1 MG

Zone 2155
Booster Station
2,000 gpm

Zone 1875
Tank
(1) 5 MG

24" L = 5,000'

Zone
1875

Gateway (Zone 1700)
Booster Station
2,850 gpm

Gateway (Zone 1530)
Tank - (1) 4 MG

PRV

24" L = 1,100'

24" L = 1,200'

24" L = 1,900'

Zone
1530

Zone 1875
Booster Station
2,900 gpm

Zone 1700
Tank
(1) 5 MG

Zone
1400

EXISTING
Overhill (Zone 1400)
Booster Station & Tanks

Legend

Pipe

- 2004 CWMP
- Northwest Area Update
- Interim Transmission
- Junction
- M — Pump
- Reservoir
- Tank
- SunCal Development Boundary

*Well locations are not representative and are to be determined at some future time.

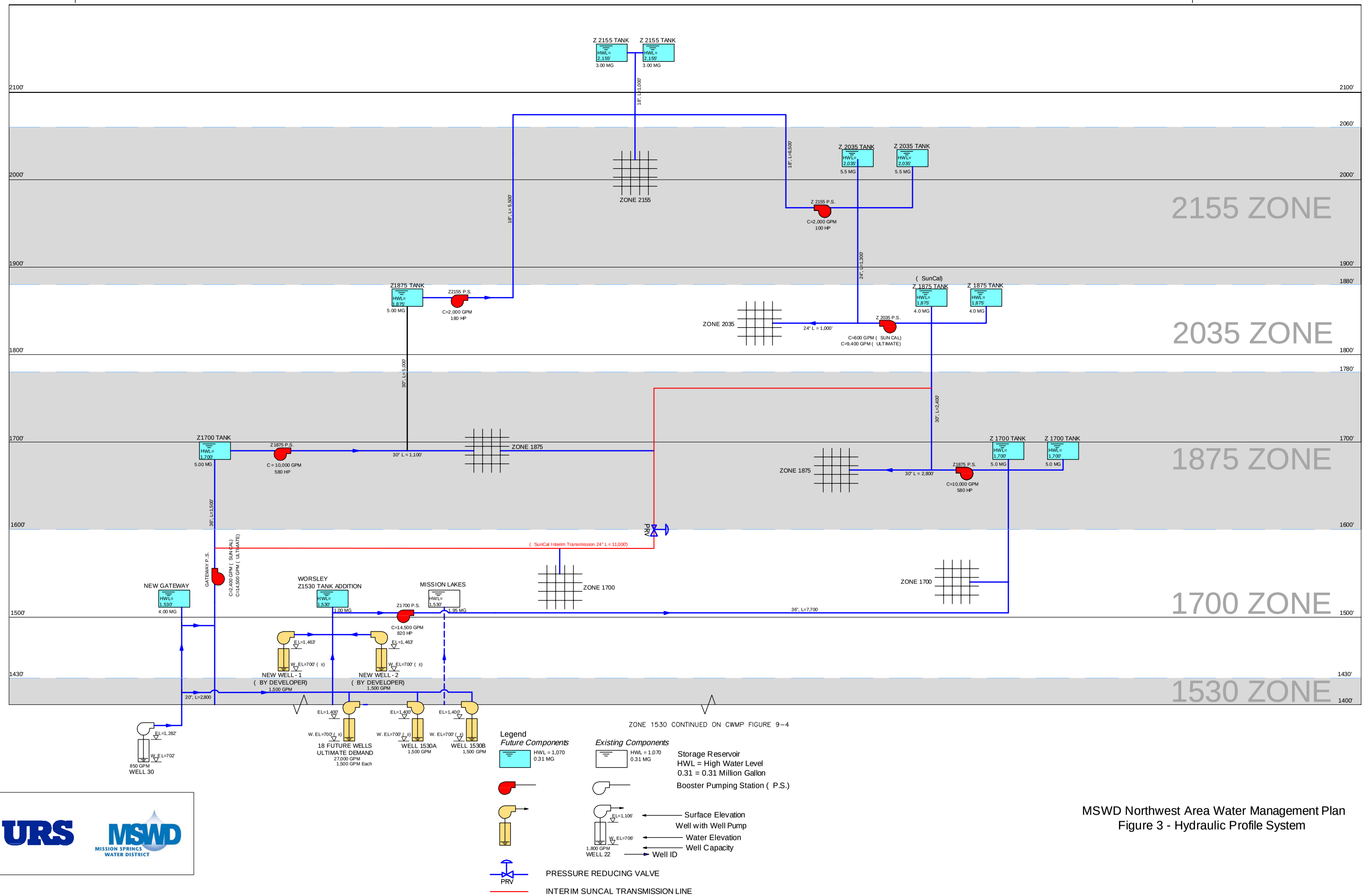
MSWD
MISSION SPRINGS WATER DISTRICT

MSWD Northwest Area Water Master Plan Update

Figure 2
Proposed Infrastructure for Ultimate Demand Scenario

URS
June, 2007

MSWD NORTHWEST AREA UPDATE HYDRAULIC PROFILE
(REVISED PRESSURE ZONE BOUNDARIES)



MSWD Northwest Area Water Management Plan
Figure 3 - Hydraulic Profile System

T:\PROJECTS\22329482_NORTHWEST_WATER_MASTER_PLAN_UPDATE\SUB_005.6.6_PROJ_DELIV\5.6.09 CAD\FIGURE_3_REV2.DWG, 10/23/2007 8:15:53 AM, LOWELL (ROBINSON), EMILY

Zone 2035 Tanks (2) 5.5 MG
Zone 2035 Booster Station 600 gpm (Sun Cal) 9,400 gpm (Ultimate)
Zone 1875 Booster Station 10,000 gpm
Zone 1700 Tanks (2) 5 MG
Zone 2155 Booster Station 2,000 gpm
Zone 1875 Tanks (2) 4 MG
Mission Lakes Zone 1530 1.95 MG Tank
Annandale Zone 1400 2.57 MG Tank
Zone 2155 Tanks (2) 3.0 MG
Zone 1400 Tank (1) 5 MG
18" L=6,500'
24" L=2,300'
30" L=2,400'
30" L=2,800'
ZONE 2155
SunCal Development
ZONE 2035
24" L=11,000'
36" L=7,700'
18" L=5,000'
Western
Indian
Well 34 Zone 1530 2,000 gpm
Worsley Zone 1530 Tank (1) 2 MG
Zone 1530 Well 30 850 gpm
Zone 1400 Well 28 1950 gpm
Mission Lakes
Zone 1700 Booster Station 14,500 gpm
Well 35 Zone 1530 1200 gpm
Proposed Well 36 Zone 1530
ZONE 1875
State Highway 62
ZONE 1700
16" L=2,000'
12" L=2,600'
12" L=4,000'
18" L=5,500'
Zone 2155 Booster Station 2,000 gpm
30" L=5,000'
Gateway (Zone 1700) Booster Station 2,400 gpm (Sun Cal) Ultimate 14,500 gpm
Zone 1875 Tank (1) 5 MG
Pierson
30" L=1,100'
Gateway (Zone 1530) Tank - (1) 4 MG
36" L=1,500'
36" L=2,200'
42" L=2,000'
24" L=7,200'
24" L=2,600'
Well 1530 A 1500 gpm
Zone 1240 Well 22 1750 gpm
Little Morongo
30" L=2,900'
16" L=2,500'
Zone 1530 Booster Station 15,000 gpm
Zone 1400 Tank (2) 5 MG
Karen Ave.
Well 1530 B 1500 gpm
16" L=2,000'
Zone 1240 Well 24 1300 gpm
ZONE 1530
ZONE 1400
Future Well 1500 gpm (Typical of 18)
12" L=2,000'
Zone 1240 Well 29 1700 gpm
Hacienda
Zone 1875 Booster Station 10,000 gpm
Zone 1700 Tank (1) 5 MG
36" L=5,200'
Proposed Well 37 Zone 1400
Two Burch Palms
EXISTING Overhill (Zone 1400) Booster Station & Tanks
36" L=8,000'
27" L=2,500'
24" L=2,000'
24" L=2,500'
ZONE 1240
Verbena
Park
Camino Campanero
20" L=2,000'
16" L=2,000'
Zone 913 Tank (1) 2.0 MG
Zone 1070 Tank (1) 2.5 MG
Valley View Zone 1070 Tank (1) 0.31 MG
West
Camino Aventura
Palm
Desert Hot Springs

Legend

- Junction
- **Tank**
  - **PHASE**
    - Existing
    - 1
    - 2
- **Reservoir**
  - **PHASE**
    - Existing
    - 1
    - 2
- **Pump**
  - **PHASE**
    - Existing
    - 1
    - 2
- **Pipe**
  - **ZONE, PHASE**
    - Existing
    - 1400, 2
    - 1530, 1
    - 1530, 2
    - 1700, 1
    - 1700, 2
    - 1875, 1
    - 1875, 2
    - 2035, 2
    - 2155, 2
    - SunCal Development Boundary
- **Proposed Well Locations**
  - **Location**
    - 1
    - 2
    - 3
    - 4

0 0.25 0.5 Miles

MSWD Northwest Area
Water Master Plan Update

Figure 4
Proposed Water Supply Infrastructure

8181 East Tufts Avenue
Denver, CO 80237

URS

September, 2007