APPENDIX 4.1-1G

Land Exchange Alternative
Water Conservation Plan

DEXTER WILSON ENGINEERING, INC.

WATER • WASTEWATER • RECYCLED WATER

CONSULTING ENGINEERS

OTAY RANCH
VILLAGE 14 AND PLANNING AREA 16/19 - LAND EXCHANGE EIR ALTERNATIVE WATER CONSERVATION PLAN

February 2018

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OTAY RANCH
VILLAGE 14 AND PLANNING AREA 16/19 - LAND EXCHANGE EIR ALTERNATIVE WATER CONSERVATION PLAN

February 2018

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ABBREVIATIONS

ac -	acre
ac-ft -	acre-foot
AF-	Acre-Foot
BMPs-	Best Management Practices
cfd -	community facilities district
cfs -	cubic feet per second
gpd -	gallons per day
gpf -	gallons per flush
gpm -	gallons per minute
HOA-	homeowner's association
mgd -	million gallons per day
MF-	Multi-Family
MWD-	Metropolitan Water District
psi-	pounds per square inch
SDCWA-	San Diego County Water Authority
SF-	Single Family
UWMP-	Urban Water Management Plan

USEFUL CONVERSIONS

1 acre-foot	=	325,829 gallons
1 mgd	=	1,000,000 gallons/day
1 cfs	=	448.8 gpm
1 cubic foot	=	7.48 gallons
1 mgd	=	694.4 gpm

EXECUTIVE SUMMARY

This report presents a review of presently available technologies and practices which result in water conservation in primarily residential development and presents water conservation measures that will be incorporated into the planning and design of the Otay Ranch Village 14 and Planning Areas 16 and 19 Land Exchange Project (Land Exchange Alternative) by the project applicant, Jackson Pendo Development Company.

The Land Exchange Alternative development proposes a residential community of 1,530 dwelling units along with a mixed use site, a school, parks, a site for public safety facilities, and open space/MSCP Preserve uses. The residential component proposes 1,407 single family and 123 multi-family and mixed use attached residential units.

The Otay Water District is the local water agency that will supply potable water to the Land Exchange Alternative. The total estimated average potable water use for the Land Exchange Alternative is 0.89 mgd. The use of recycled water is not being proposed for the Land Exchange Alternative due to its proximity relative to Upper Otay Reservoir and since recycled water facilities have not been extended to the area.

The State of California (Green Building Standards Code) and County of San Diego (Water Conservation in Landscaping Ordinance, 2016) have mandated a number of water conservation measures. The focus of this study is on the implementation of non-mandated water conservation measures. The Land Exchange Alternative would install hot water pipe insulation, pressure reducing valves and water efficient dishwashers in all single family and mixed use residential units. By complying with the model water use ordinance, outdoor demands at single family residences would also be reduced. In addition, the Land Exchange Alternative, where feasible, will provide graywater systems and rain water harvesting for residential units and will contribute toward water supply offsets in the event OWD declares a Drought Level 3 emergency. Hot water pipe insulation and pressure reducing valves would also be installed in non-residential development. At buildout of the Land Exchange Alternative, implementation of water conservation measures would result in an estimated water savings of 57,394 gallons per day for the residential component of the Land Exchange Alternative. This does not include potential additional savings from graywater systems and rain water harvesting systems as well as potential savings from non-residential development.

INTRODUCTION

In recent years, the subject of water conservation has been given increased public attention. The growing awareness of the need and value of water conservation has been sparked by local and regional water purveyors concerned about meeting the future water demands of their customers, particularly during drought conditions or due to reduced water supplies. Water conservation programs provide mechanisms for reducing the use of water demand for proposed urban development. The intent of water conservation is to manage water demand so that the customers receive adequate service but use less water.

Much has been done to educate consumers about limitations of water supply, the serious implications of a long-term drought, and the need for water conservation, but there is a practical limit to the percentage reduction of water use in established communities. This limit is a result of the types of plumbing fixtures installed in existing homes as well as the difficulty in altering consumers' established patterns of water use. Any water conservation effort, voluntary or mandatory, requires the cooperation of the public. Public information should be utilized to inform and convince the consumer that a change in personal water use habits is in everyone's best interest.

In recent years, the private development sector has become more attuned to the concerns of water availability, and has recognized the value of addressing water conservation issues throughout planned development projects. By incorporating low water use plumbing fixtures, installing and promoting drought tolerant landscaping, and providing educational materials to home buyers, private developments can do much to cultivate an interest in water conservation and establish new patterns of water use. These efforts can have significant impacts with regard to reducing the need for securing and importing water for use in San Diego County.

In 2006 the State repealed the Water Conservation in Landscaping Act and adopted a new Water Conservation in Landscaping Act, Government Code sections 65591 et seq. The new Act requires the Department of Water Resources to update the previously adopted model efficient landscape ordinance that provides for greater efforts at water conservation and more efficient use of water in landscaping. The County of San Diego has adopted an ordinance in 2010 that complies with the findings and declaration of the State's Water Conservation in Landscaping Act and is as effective as the State's updated model water efficient landscape ordinance. In response to the Governor's Executive Order B-29-15 issued in April 2015, the County of San Diego adopted an amended Water Conservation in Landscaping Ordinance in

April 2016. This Water Conservation Plan incorporates the requirements of the County's current ordinance.

PURPOSE

The State's Legislature determined in the Water Conservation in Landscaping Act that the State's water resources are in limited supply. The Legislature also recognized that while landscaping is essential to the quality of life in California, landscape design, installation, maintenance, and management must be water efficient. This Water Conservation Plan presents a review of presently available technologies and practices which result in water conservation in primarily residential developments. This plan also discusses water conservation measures that will be implemented in non-residential areas and the documents that will ensure that water conservation measures are incorporated into the landscaping systems in these areas.

The purpose of this Water Conservation Plan is to determine how these technologies and the implementation of the County Water Conservation in Landscaping Ordinance will impact water use within the Land Exchange Alternative Area. The water conservation measures presented in this Water Conservation Plan will be incorporated into the planning and design of the Land Exchange Alternative. This Plan also provides an estimate of the anticipated water savings from these measures. Although not covered in detail, there are several secondary benefits to conserving water that should be kept in mind when reviewing this Plan. These benefits include reducing sewage flows, natural gas use, and electricity use. For example, using less water in the shower reduces the amount of water input into the sewer system and reduces the amount of energy required to heat the water.

OVERVIEW AND BACKGROUND

This technical report provides a project level analysis of the Land Exchange Alternative (defined below) for inclusion in the Otay Ranch Village 14 and Planning Areas 16/19 Environmental Impact Report (EIR). The regional location is shown in Figure 1.

The Land Exchange Alternative is located within Otay Ranch Village 14 and Planning Areas 16 and 19 in the Proctor Valley parcel of Otay Ranch as shown on Figure 2. Village 14 and Planning Areas 16 and 19 are part of the larger Otay Ranch, an approximately 23,000-acre

master-planned community in southern San Diego County designed as a series of villages and planning areas.

The Land Exchange Alternative proposes 1,530 homes within a development footprint that is limited to Proctor Valley Village 14. The majority of Planning Areas 16 and 19 would be converted to MSCP and Otay Ranch RMP Preserve and would not be developed.

The following describes the major components and characteristics of the Land Exchange Alternative.

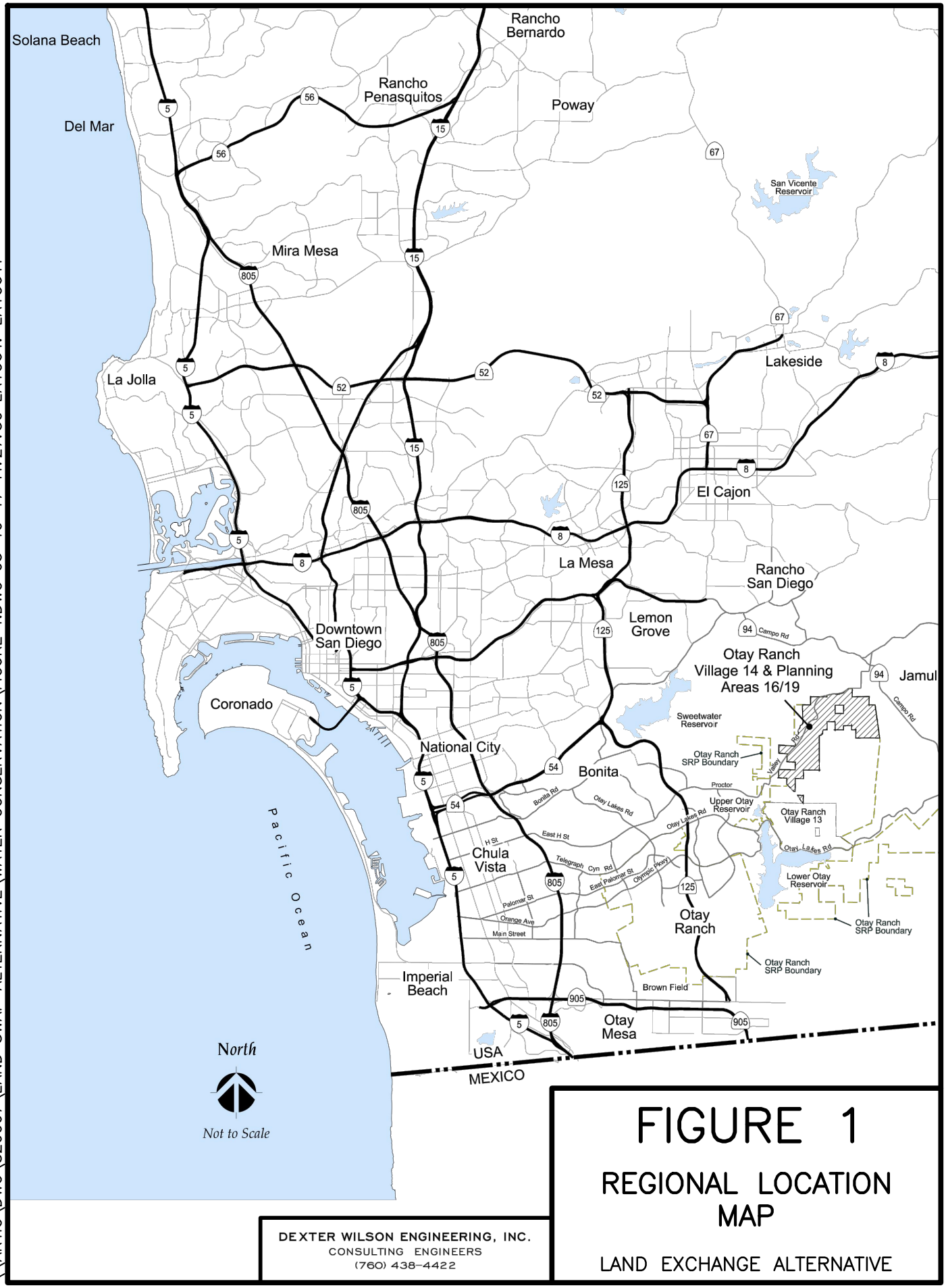

FIGURE 1

REGIONAL LOCATION MAP

LAND EXCHANGE ALTERNATIVE

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\\ARTIC\DWG\820007\LAND SWAP ALTERNATIVE\WATER CONSERVATION\FIGURE 2.DWG 05-10-17 11:30:20 LAYOUT: LAYOUT

Downtown San Diego
Coronado
National City
Chula Vista
Imperial Beach
Bonita
Lemon Grove
Spring Valley
Jamul
Planning Areas 16+19
Village 14
Otay Ranch Inverted "L"
Salt Creek Golf Course
Bella Lago
Rolling Hills Ranch
Proctor Valley Rd
Eastlake Middle School
Eastlake Plus. Park
Eastlake Design Dist.
Eastlake
Otay Ranch Birch Parcel
Village 13
Village 15
Village 5
Village 1
Village 6
Village 7
Village 2 West
Village 2
Village 3
Village 4
Village 8
Village 9
Village10
Village11
PA 12
PA 18
Future University
Otay Landfill
Olympian HS
Eastlake HS
Eastlake Golf Course
Rancho del Rey Middle School
Otay Ranch HS
Bonita Golf Course
Aquatica Waterpark
Sleep Train Amphitheater
Planning Area 20
Brown Field
Otay Mesa
Otay SRP Bndry
Lower Otay Reservoir
Olympic Training Center
5 Miles
Campo Rd
Otay Lakes Rd
Bonita Rd
East H St
H St
Telegraph Cyn
East Palomar St
Palomar St
Orange Ave
Main Street
Olympic Pkwy
Pacific Ocean
0.5 km 1.5 km 2.5 km 3.5 km

North

LEGEND

Retail
- Regional
- Big Box
- Local

Secondary School (7-12)

Otay SRP Boundary

FIGURE 2

AERIAL LOCATION MAP

LAND EXCHANGE ALTERNATIVE

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DEFINITIONS

"Land Exchange Area" Defined

As indicated above, the "Land Exchange Area" is located within Otay Ranch Village 14 and Planning Areas 16 and 19 as depicted in Figure 3. The total Land Exchange Area covers approximately 2,387 acres, of which the Applicant owns 1,294 acres, the State owns approximately 1,053 acres, and 39.9 acres are Offsites. Within the Land Exchange Area, there are 1,003 acres in Village 14 and 1,345 acres in Planning Areas 16 and 19. Offsites include Proctor Valley Road and related utilities in the south and central portions of Otay Ranch Village 14. The State's ownership is included in order to process a General Plan Amendment to remove existing approved Otay Ranch GDP/SRP County General Plan development land uses and convert these acres to MSCP/Otay Ranch RMP Preserve.

"Land Exchange Alternative" Defined

The Land Exchange limits development to Otay Ranch Village 14 and converts the majority of development approved by the Otay Ranch GPD/SRP in Planning Areas 16 and 19 to MSCP and Otay Ranch RMP Preserve. The Land Exchange Alternative assumes the completion of a land exchange agreement with the State of California and a simultaneous boundary adjustment to the MSCP and RMP Preserve systems.

Specifically, the "Land Exchange Alternative" proposes to:

- Exchange 278 acres owned by the State in Village 14 for 278 acres owned by the Applicant in Planning Area 16.

- Amend MSCP and Otay Ranch RMP Preserve boundaries via a boundary adjustment where approximately 169.8 acres in Planning Areas 16/19 are converted to Otay Ranch RMP Preserve and 142.3 acres in Village 14 are converted to Otay Ranch Preserve and 43.6 acres in Village 14 are converted to development footprint for a net increase in Otay Ranch RMP Preserve of 268.5 acres.

After implementation, the Land Exchange Alternative land plan is depicted in Figure 4. The Land Exchange Alternative contemplates a Specific Plan, General Plan Amendments, EIR, Rezone, Tentative Map, the Otay Ranch RMP Amendment, and County MSCP Subarea Plan South County Segment Boundary Adjustment.

Table 1

Otay Ranch Land Exchange Alternative

Site Utilization Plan - Land Use Summary

January 29, 2018

Proctor Valley Village 14		**Acres**	**Units**	**Density**
Residential Uses				
Single Family Residential				
R-1	SF-2	28.9	112	3.9
R-2	SF-2	37.1	72	1.9
R-3	SF-1	41.7	67	1.6
R-4	SF-2	14.3	57	4.0
R-5	SF-2	33.9	109	3.2
R-6	SF-2	30.6	75	2.4
R-7	SF-2	32.1	91	2.8
R-8	SF-2	20.1	47	2.3
R-9	SF-1	41.5	74	1.8
R-10	Age Restricted SF-1	42.5	127	3.0
R-11	Age Restricted SF-1	34.4	156	4.5
R-12	SF-2	12.3	44	3.6
R-13	SF-1	36.4	66	1.8
R-14	SF-2	26.9	60	2.2
R-15	SF-1	38.5	59	1.5
R-16	SF-3	31.7	191	6.0
Single Family Subtotal		503.1	1,407	2.8
Multi-Family & Mixed Use				
MF-1		4.6	69	15.2
MU-1 *(2)*		3.5	54	15.5
MF & Mixed Use Subtotal		8.0	123	15.3
Residential Subtotal *(3)*		**511.2**	**1,530**	**3.0**
Non-Residential Uses				
Public Parks				
P-1	Village Green	3.9		
P-2	Overlook Park	4.2		
P-3	South Park	2.9		
P-4	Scenic Park	2.5		
Public Parks Subtotal		**13.5**		
Private Parks				
PP-1	South	0.8		
PP-2	Central	1.0		
PP-3	Senior Activity Center	1.8		
PP-4	North	1.4		
PP-5	Village Core	1.9		
Private Parks/Recreation Subtotal		6.9		
Public Uses				
Public Safety		2.3		
Elementary School		8.3		
Public Uses Subtotal		10.6		
Open Space & Preserve				
Internal Open Space *(4)*		33.4		
Preserve		403.9		
Open Space & Preserve Subtotal		437.3		
Circulation Subtotal *(5)*		23.1		
Non-Residential Uses Subtotal		**491.4**		
Proctor Valley Village 14 Subtotal		**1,002.6**	**1,530**	**1.5**
Planning Area 16/19 Preserve				
Circulation in Preserve *(6)*		16.4		
Preserve		276.3		
Exchange to State for preserve		278.0		
Existing State Ownership (portion)		774.1		
Planning Area 16/19 Preserve Subtotal		**1,344.8**		
Proctor Valley Village and Preserve Grand Total		**2,347.3**	**1,530**	**0.7**

NOTES

(1) Additional offsites excluded from the acreage above include:

Proctor Valley Road Offsite Central & South	40.2
Offsite Sewer to Salt Creek Interceptor	

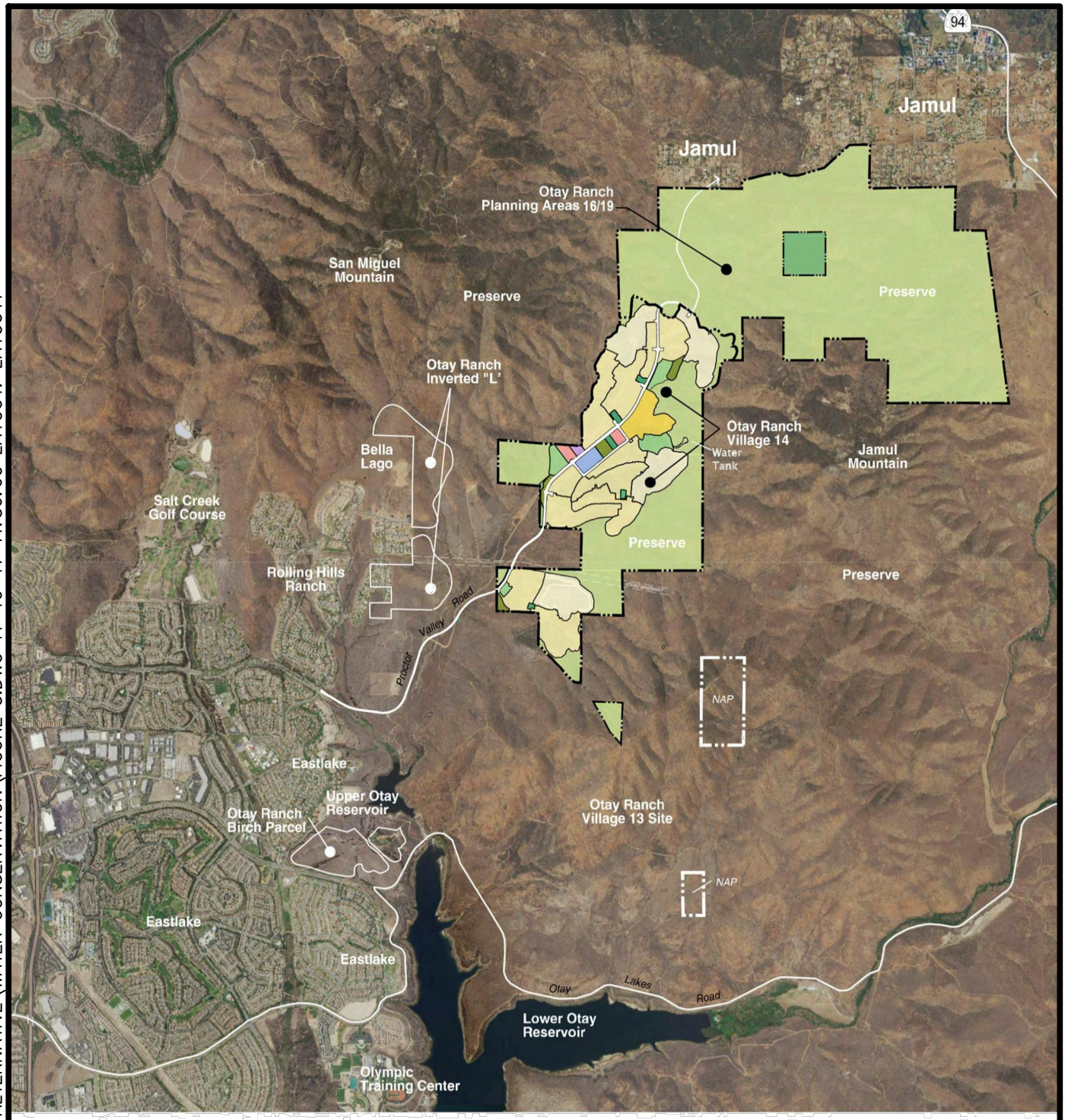
(2) Mixed Use acreage includes 15,000 sf of commerical use

(3) Residential acreage includes 153.2 acres of fuel mod and internal open space slopes and 2.6 acres of private pocket parks.

(4) Open Space included 11.3 acres of basins and HOA open space lots not included in the residential acreage.

(5) Proctor Valley Road Onsite in Village 14 only

(6) Proctor Valley Road north in Planning Area 16 is in Preserve



LAND EXCHANGE ALTERNATIVE

FIGURE 3

PLANNING AREA MAP

LAND EXCHANGE ALTERNATIVE

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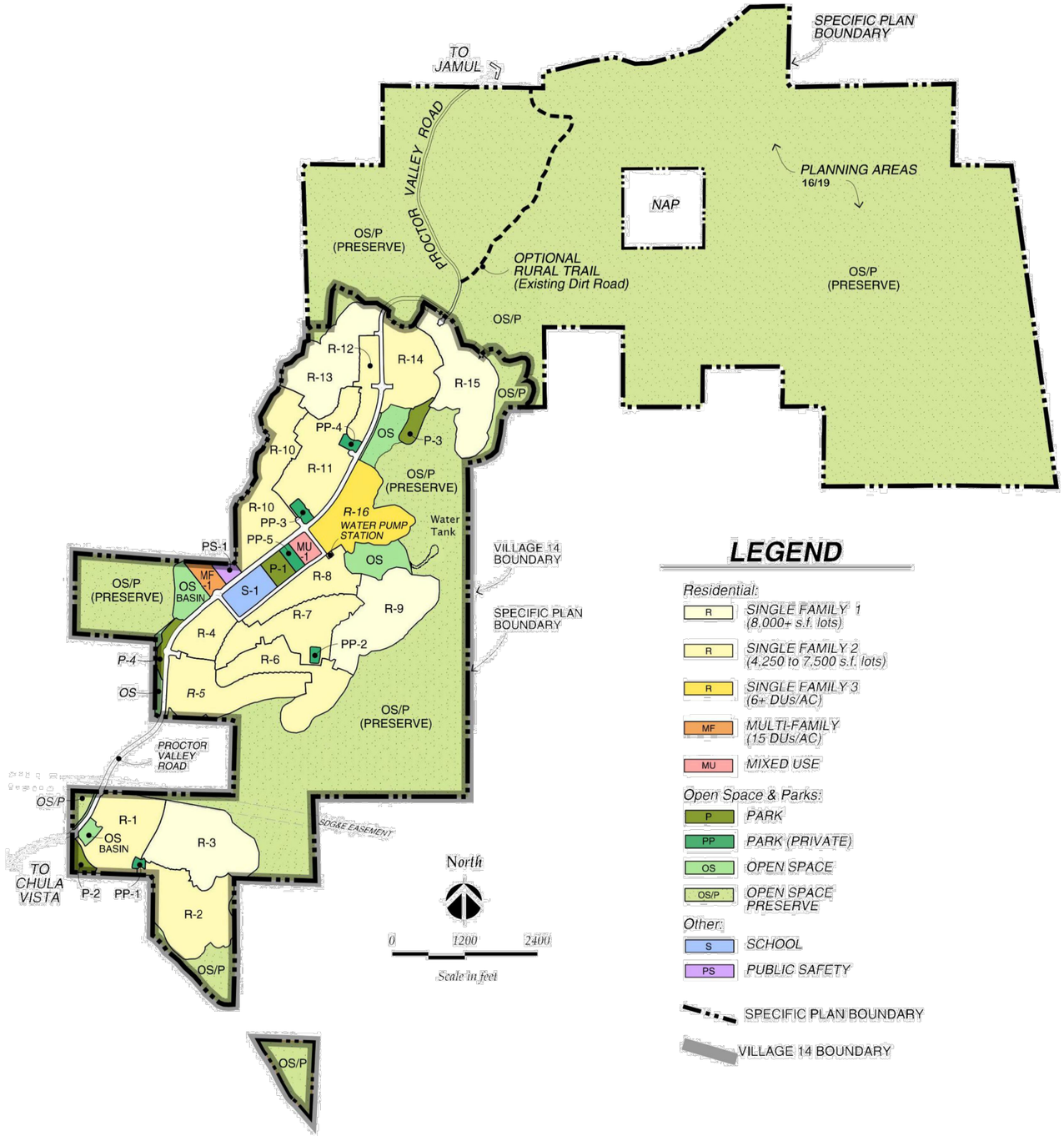
\\ARTIC\DWG\820007\LAND SWAP ALTERNATIVE\WATER CONSERVATION\FIGURE 3.DWG 11-10-17 11:36:60 LAYOUT: LAYOUT1



LEGEND

Residential:

- R — SINGLE FAMILY 1 (8,000+ s.f. lots)
- R — SINGLE FAMILY 2 (4,250 to 7,500 s.f. lots)
- R — SINGLE FAMILY 3 (6+ DUs/AC)
- MF — MULTI-FAMILY (15 DUs/AC)
- MU — MIXED USE

Open Space & Parks:

- P — PARK
- PP — PARK (PRIVATE)
- OS — OPEN SPACE
- OS/P — OPEN SPACE PRESERVE

Other:

- S — SCHOOL
- PS — PUBLIC SAFETY
- SPECIFIC PLAN BOUNDARY
- VILLAGE 14 BOUNDARY

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FIGURE 4

OVERALL LAND USE PLAN

LAND EXCHANGE ALTERNATIVE

"Village 14" Defined

"Village 14" as referred to herein is a discrete subset of the Land Exchange and reflects that portion located exclusively within Village 14 as depicted in Figure 5. The majority of the technical reports focus on Village 14 as this is where the development is planned.

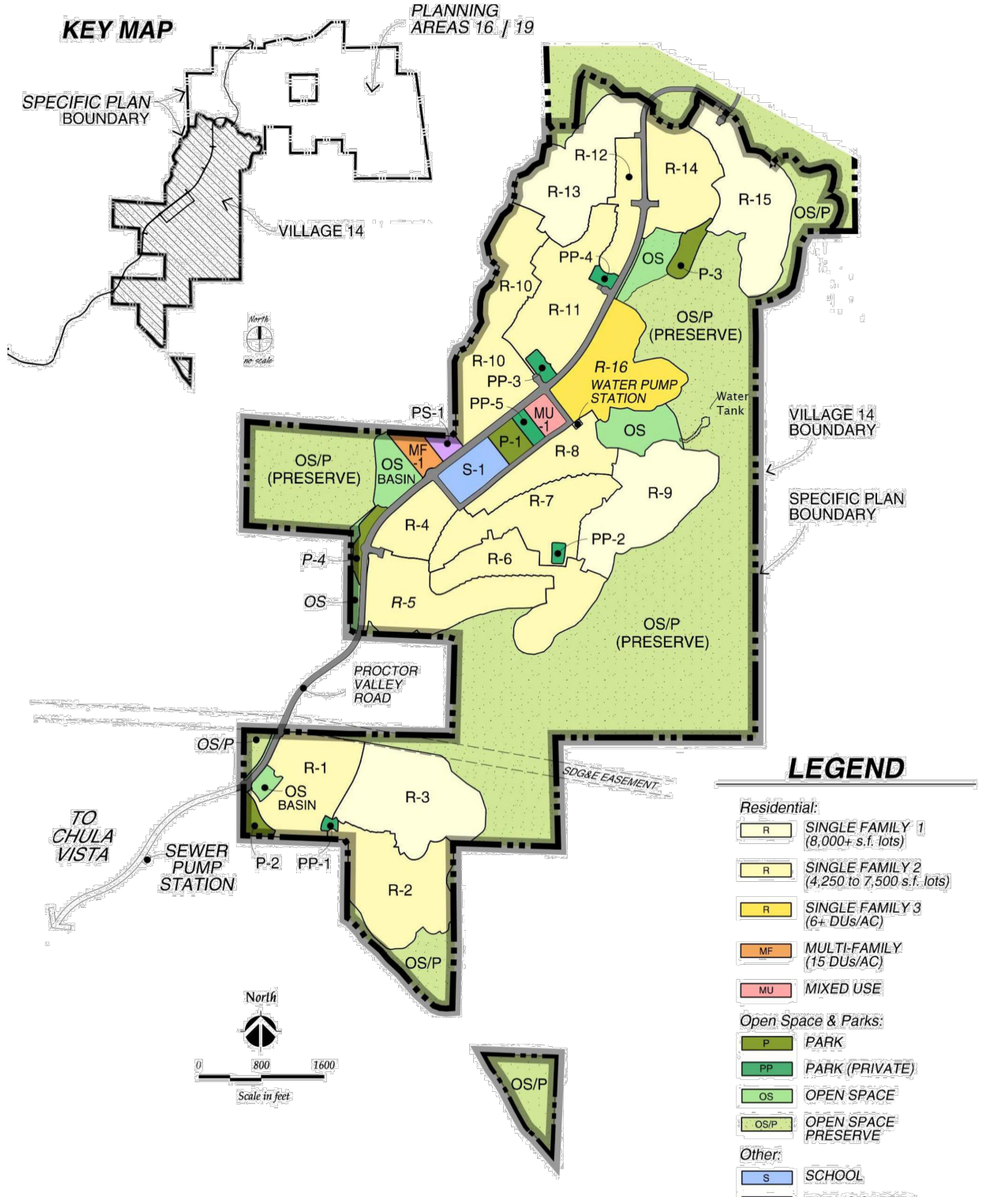
PROPOSED SPECIFIC PLAN

Summary

The adopted Otay SRP requires the preparation of a Site Utilization Plan that describes the land uses. Figures 4 and 5 depict the proposed Site Utilization Plan for the Land Exchange Alternative. Additionally, Table 1 quantifies the land uses.

The Land Exchange Alternative includes approximately 511 acres designated for 1,530 homes, 1,124 of which would be traditional single-family homes, 283 would be single family age-restricted and 123 would be multifamily homes as indicated on Table 1. 18 neighborhoods are planned with approximate densities ranging from 1.5 to 15.0 dwelling units per acre. The age-restricted neighborhoods would be gated, as would four of the single-family neighborhoods situated on the largest lots.

Village 14 in the Land Exchange Alternative is planned around a Village Core, centrally located in the heart of the village. Higher density residential uses will be adjacent to the Village Core with single family residential radiating out in decreasing densities. The Village Core is comprised of the Neighborhood Center which includes an 8-acre elementary school; a 4-acre Village Green (public park); a 3-acre Mixed Use Site with up to 15,000 square feet of commercial/retail uses and 54 multi-family homes; and a 2-acre Village Square Community Facility. The Village Core also includes a 2-acre public safety site for a fire station and sheriff's storefront facility and 69 multi-family townhomes located adjacent to the public safety site.



Land Exchange Alternative

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FIGURE 5

VILLAGE 14 LAND USE PLAN

LAND EXCHANGE ALTERNATIVE

The Land Exchange Alternative is designed around an active lifestyle and wellness recreation theme and includes an extensive park and recreation system including four public parks totaling 13 acres as depicted on Figure 5. The remaining private recreation facilities include three private swim clubs, a senior activity center, the Village Square community facility and numerous pocket parks totaling approximately 9 acres. Approximately 4.6 miles of community pathway are proposed on the Proctor Valley Road. Approximately three miles of Park-to-Park Loop connect to the regional pathway.

After implementing the proposed land exchange agreement, MSCP and RMP Preserve boundary adjustment, and General Plan Amendment, the Land Exchange will include 1,749 acres of land for MSCP and Otay Ranch RMP Preserve, consisting of 404 acres in Proctor Valley Village 14, and 1,345 acres in Planning Areas 16 and 19.

WATER SERVICE AND SUPPLY

The Otay Water District is the local water agency that will supply potable water to the Proctor Valley Village and it relies solely on the San Diego County Water Authority (SDCWA) for its potable water supply. The SDCWA is the largest of 27 member agencies of the Metropolitan Water District of Southern California (MWD), which is the primary importer of potable water to Southern California. The February 2018 Overview of Water Service for the project provides a detailed discussion of water supply to the project.

PROJECTED WATER USE

Potable Water Demand

Water use is affected by, among other things, climate and the type of development. In California, recent trends toward the construction of multi-unit housing, the general reduction in residential lot size, and a number of local agency water conservation programs, are all tending to reduce per capita water consumption.

Potable water demands were projected by taking the total development for each land use and multiplying by water use factors. Table 2 provides the projected potable water demand for the Land Exchange Alternative. This information is from the February 2018 Overview of Water Service for the Otay Ranch Village 14 and Planning Area 16/19 – Land Exchange EIR Alternative. The total estimated potable water use is 0.89 mgd. Potable water use factors

were taken from the Otay Water District 2015 Water Facilities Master Plan Update. No recycled water use is assumed for the project because the City of San Diego does not allow recycled water to be used on properties that are tributary to their reservoirs. Although the City of San Diego does not allow recycled water use on properties tributary to their reservoirs, recycled water could be considered in the future if the City of San Diego changes their policy.

TABLE 2
LAND EXCHANGE ALTERNATIVE
PROJECTED POTABLE WATER DEMANDS

Land Use	Quantity	Unit Demand	Average Day Demands, gpd
SF Residential (1-3 DU/AC)	611 units	700 gpd/unit	427,700
SF Residential (3-10 DU/AC)	796 units	435 gpd/unit	346,260
MF/Mixed Use (>10 DU/AC	123 units	200 gpd/unit	24,600
MU – Commercial	3.6 ac	1,785 gpd/ac	6,425
Parks	20.4 ac	1,900 gpd/ac	38,760
Public Safety	2.3 ac	1,785 gpd/ac	4,105
School	8.3 ac	1,785 gpd/ac	14,815
Slopes	14.5 ac	1,900 gpd/ac	27,550
TOTAL			**890,215**

MANDATED WATER CONSERVATION MEASURES

The State of California and County of San Diego have mandated a number of water conservation measures. Table 3 summarizes the conservation measures that are mandated by the State of California and also provides the requirements of the 2016 California Green Building Standards Code that went into effect January 1, 2017. The County of San Diego implemented the Water Conservation in Landscaping Ordinance in April 2016.

TABLE 3 MANDATED WATER CONSERVATION DEVICES		
Device	**Baseline Requirement**	**2016 Green Building Code Requirements**
Showerheads	2.5 gpm	2.0 gpm
Lavatory Faucets	2.2 gpm	1.2 gpm
Sink Faucets	2.2 gpm	1.8 gpm
Metering Faucets in Public Restrooms	0.25-0.75 gal/cycle	0.25 gal/cycle
Residential Water Closets	1.6 gpf	1.28 gpf
Flushometer Valves	1.6 gpf	1.28 gpf
Commercial Water Closets	1.6 gpf	1.28 gpf
Urinals	1.0 gpf	0.125/0.5 gpf[1]

[1] Wall mounted urinals shall not exceed 0.125 gpf. All other urinals shall not exceed 0.5 gpf.

NON-MANDATED WATER CONSERVATION MEASURES

The following non-mandated water conservation measures are recommended for the Land Exchange Alternative.

Residential Measures

1. Hot Water Pipe Insulation. Hot water pipes shall be insulated and hot and cold water piping shall be separated, resulting in annual savings of 2,400 gallons per residential unit.

2. Pressure Reducing Valves. The maximum service pressure shall be set to 60 psi to reduce any leakage present and prevent excessive flow of water from appliances and fixtures, resulting in annual water savings of 1,800 gallons per residential unit.

3. Water Efficient Dishwashers. Water efficient dishwashers available that carry the Energy Star label shall be installed in residential units, resulting in an estimated annual water savings of 650 gallons per residential unit.

4. Residential Landscaping. Residential landscaping shall comply with the Model Water Efficient Landscape Ordinance, California Code of Regulations Title 23, Division 2, Chapter 2.7 (Section 490 et seq.). By complying with this ordinance, it is estimated by the landscape architect for the project that outdoor water use at single family residences will be reduced by approximately 10 percent. Residential water use can vary widely based on the size of the lots; however, based on OWD factors for the Land Exchange Alternative, estimated water use for a typical single family home is 435 gpd for densities of 3.0 to 10 units per acre and 700 gpd for densities of 1.0 to 3.0 units per acre. With an estimated 50 percent of this water used outdoors, the estimated annual water savings is 7,940 gallons per single family residence where densities are from 3.0 to 10 units per acre and 12,775 gallons per single family residence where densities are from 1.0 to 3.0 units per acre based on these assumptions. While the potential savings can vary based on lot size and product type, these estimates are considered to be representative of average water savings per single family residential unit.

Non-Residential Measures

1. Hot water pipe insulation. Hot water pipe shall be insulated and hot and cold water piping shall be separated.
2. Pressure reducing valves. The maximum service pressure shall be set at 60 psi to reduce any potential leakage present and to prevent excessive flow of water from fixtures and appliances.
3. Landscaping. As discussed in the Water Conservation Implementation section of this report, landscaped areas within the Land Exchange Alternative must comply with Development Regulations, the County's Water Conservation in Landscaping Ordinance, the Fire Protection Plan, and the Preserve Edge plan, as applicable.

In addition to the measures recommended above, a number of other measures have been considered. These include new groundwater supplies, water supply offsets, graywater systems, storm water harvesting, and drainage/site design, which are analyzed below. Of these potential measures, all were considered to be feasible for the Land Exchange Alternative except for new groundwater supplies, as discussed below.

New Groundwater Supply

One way to reduce potable water use is the development of new groundwater wells. Groundwater wells were evaluated for the Land Exchange Alternative, but dismissed due to predicted low yields in this basin and to avoid impacts to existing adjacent properties, particularly in the Jamul area that are supplied by wells.

Water Supply Offsets

In the event that the drought conditions become so severe that OWD declares a Drought Level 3 emergency, it is recommended that the Land Exchange Alternative offset its projected water use by contributing to the cost of or actually constructing offsite improvements. These offsite improvements would be designed to reduce existing potable water use and typically consist of retrofitting older buildings with newer fixtures that are more water efficient, paying fees toward a regional offset/program, or other projects identified by OWD if and when a Drought Level 3 condition occurs. Since the time Executive Order B-29-15 was issued by the Governor on April 1, 2015, statewide water conditions have improved. Mandatory water use reductions that were in effect in 2015 and the early part of 2016 have been lifted and OWD is in a Level 1 drought condition which encourages voluntary cutbacks to water use.

Graywater

Graywater pursuant to California Health and Safety Code Section 17922.12 means untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. Graywater includes wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers. Graywater system requirements are also provided in the 2016 California Plumbing Code, which went into effect on January 1, 2017.

Graywater systems necessitate additional plumbing onsite at each residence in order to send the wastewater from graywater acceptable sources to the graywater system. The graywater system then distributes the graywater through a subsurface irrigation system. Some of the requirements and considerations for residential gray water systems are summarized as follows:

- All graywater systems shall be designed with a diverter valve to allow flows to be sent to the sewer system

- Water used to wash diapers or similarly soiled garments shall be diverted by the homeowner to the sewer system
- Graywater shall not be allowed to be used for spray irrigation, shall not be allowed to pond, and shall not be allowed to runoff the site
- Human contact with soil irrigated by graywater shall be minimized and avoided where possible
- The discharge of graywater shall be in a subsurface irrigation system that is covered by a minimum of 2 inches of rock, soil, mulch, or a solid shield
- Graywater systems require operation and maintenance by the homeowner to work properly
- Graywater may not be used for irrigation of edible food crops
- The homeowner shall be responsible to ensure that graywater does not include hazardous chemicals

Some agencies, such as the City of Chula Vista, require new homes to be plumbed for graywater collection, but leave it up to the homeowner whether or not to install a graywater system. It is recommended that, where feasible, the Land Exchange Alternative provide the plumbing for residential graywater systems The actual implementation of a graywater system by the homeowner would need to comply with the Uniform Plumbing Code and would require approval from the County of San Diego Building Department.

Rain Water Harvesting

Harvest and use (aka, Rainwater Harvesting) BMPs are LID BMPs that capture and store storm water runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. Harvest and use BMPs include both above-ground and below-ground cisterns. Examples of uses for harvested water include irrigation, toilet and urinal flushing, vehicle washing, evaporative cooling, industrial processes and other non-potable uses.

For a project to be considered "feasible" to implement harvest and use BMPs, there must be enough water demands to utilize the rain water during both dry and wet seasons. The irrigation demand is typically calculated using the Modified Estimated Total Water Usage (ETWU) method. More details on the Modified ETWU can be found in Appendix B.3 in Section B.3.2.2.1 of the Model BMP Design Manual San Diego Region Appendices.

Harvest and use BMPs are sized to drain the cistern in 36 hours following the end of a rainfall event. The size of the BMP tank or cistern is dependent on the calculated water demand and

the systems are designed to capture at least 80% of the average annual (long term) runoff volume. Pre-treatment BMPs are typically included in harvest and use BMP design to maintain the functionality of the cisterns.

Before the Rainwater Capture Act of 2012, residents were required to obtain a permit from the State Water Resources Control Board to collect and use rain water. Cisterns and rain water collection kits no longer require a permit from the state provided they do not exceed certain dimensions or a volume of 5,000 gallons.

It is recommended that the Land Exchange Alternative include rainwater cisterns as an optional BMP that could be installed by the home builder or individual home owner on a case by case basis for irrigation demands.

Drainage/Site Design

Drainages and swales are designed to County of San Diego standards and aren't directly applicable to residential water conservation, other than to collect, clean, and return runoff to natural drainages. Site Low Impact Development (LID) measures which will promote water conservation are included in the design including draining rooftops and impervious areas to landscaped areas and landscaping with native or drought tolerant species.

WATER CONSERVATION ESTIMATED SAVINGS

The estimated water savings for water conservation measures are based on the estimates provided previously in this Plan. The potential water savings varies widely based on land use types. Multi-family residential units, for example, have much less opportunity to implement additional water saving measures than low density single family residential units.

It is recommended that the Land Exchange Alternative incorporate a number of non-mandatory water conservation measures in mixed use attached residential and single-family residential units. Tables 4 and 5 summarize the total estimated water savings for the Land Exchange Alternative based on these recommended measures. Based on 123 multi-family and mixed use attached units and 1,407 single family units within the Land Exchange Alternative project at buildout, implementation of the measures in Tables 4 and 5 would result in estimated average water savings of 57,394 gallons per day for the residential portion of the project. These savings represent approximately 6.4 percent of the total project water use and will help lower per capita water use within OWD.

In addition to the water savings above, water savings from graywater systems and rain water harvesting systems are also anticipated. It is not possible to quantify the savings from these other measures at this level of planning since it is unknown how many of the residential units on the project will implement these measures. Some general findings on the potential water savings associated with these measures are provided below.

The amount of water savings with a graywater system depends on a number of factors including soil type, quantity and types of landscaped areas, homeowners operation and maintenance of the system, and type of graywater system. The potential water savings for graywater systems are up to 100 gpd per household, but most landscape systems are not operated at 100 percent efficiency. A more typical range of actual water savings for a graywater system is 25 to 50 gpd per home.

The amount of water savings associated with rain water harvesting also depends on a number of factors including catchment area, storage capacity, annual rainfall, and the seasonality of rainfall. A 1,500 square foot roof will collect 934 gallons of water during a 1-inch rain event. Based on average rainfall in this area, the resulting potential water capture for re-use would be approximately 10,000 gallons per year. The actual amount of re-use could be substantially lower than this, however, due to the seasonality of rain in the area. On an annual average basis, the typical actual savings would likely be 10 to 15 gpd per household.

TABLE 4
LAND EXCHANGE ALTERNATIVE
MF/MIXED USE PROPOSED WATER CONSERVATION MEASURES

Measure	Location	Yearly Water Savings, gpy/unit	Daily Water Savings, gpd/unit	Percentage of Total Usage[1]	Project Total Water Savings[2], gpd
Hot Water Pipe Insulation	Indoor	2,400	6.58	3.3	809
Pressure Reducing Valves	Indoor	1,800	4.93	2.5	606
Water Efficient Dishwashers	Indoor	650	1.78	0.9	219
TOTAL		**4,850**	**13.29**	**6.7**	**1,634**

[1]Based on 200 gpd/unit average usage.

[2]Based on 123 Multi-Family and Mixed Use Attached Units.

TABLE 5
LAND EXCHANGE ALTERNATIVE
SINGLE-FAMILY RESIDENTIAL WATER CONSERVATION MEASURES

Measure	Location	Yearly Water Savings, gpy/unit	Daily Water Savings, gpd/unit	Percentage of Total Usage[1]	Project Total Water Savings[2], gpd
SF Residential (3.0 – 10 DU/ac)					
Hot Water Pipe Insulation	Indoor	2,400	6.58	1.5	5,238
Pressure Reducing Valves	Indoor	1,800	4.93	1.1	3,924
Water Efficient Dishwashers	Indoor	650	1.78	0.4	1,417
Residential Landscaping	Outdoor	7,940	21.75	5.0	17,310
Subtotal		**12,790**	**35.04**	**8.1**	**27,889**
SF Residential (1.0 – 3.0 DU/ac)					
Hot Water Pipe Insulation	Indoor	2,400	6.58	0.9	4,020
Pressure Reducing Valves	Indoor	1,800	4.93	0.7	3,012
Water Efficient Dishwashers	Indoor	650	1.78	0.3	1,088
Residential Landscaping	Outdoor	12,775	35.00	5.0	21,385
Subtotal		**17,625**	**48.29**	**6.9**	**29,505**
TOTAL					**57,394**

[1]Based on 435 gpd/unit average usage for 3.0 to 10 DU/Ac and 700 gpd/unit for 1.0 to 3.0 DU/Ac.

[2]Based on 796 SF Residential Units (3.0 – 10 DU/Ac) and 611 SF Residential (1.0 – 3.0 DU/Ac).

WATER CONSERVATION IMPLEMENTATION

The Land Exchange Alternative is a primarily residential community with approximately 90 percent of the total projected water use being utilized in residential neighborhoods. As a result, the focus of this Water Conservation Plan is on residential water conservation measures. The Land Exchange Alternative will, however, achieve water conservation in common landscaped areas by complying with the County's Water Conservation in Landscaping Ordinance and taking other steps as detailed further below.

Landscaped areas within the Land Exchange Alternative Area must comply with Development Regulations, the County's Water Conservation in Landscaping Ordinance, the

Fire Protection Plan, and the Preserve Edge Plan, as applicable. Areas that will be subject to County approval at the implementation stage of the project include residential front yard and side yard setback areas, parks, parkway landscaping, HOA maintained irrigated open space areas, the public safety site, and mixed use commercial site.

The HOA will enforce state and county landscape regulations for individual residential landscapes as it relates to the efficient use of water. State law and the County Water Conservation in Landscaping Ordinance requires that prior to issuance of a building permit, any property with 500 square feet of landscape area will need to submit a landscape plan to establish a water budget in setting a maximum applied water allowance as an upper limit for water use and reduce water use to the lowest practical amount. The County has created a streamlined approach to builders applying for building permits for tract homes within a residential subdivision for landscaped areas between 500-2500 sq. ft. The developer shall prepare a Water Use Exhibit for all residential lots within the subdivision using the Prescriptive Compliance Option (PCO) requirements to establish water budgets for each lot. Developer is required to sign the Exhibit acknowledging that they will provide each homeowner with a copy of the water budget and the restrictions upon their landscaping based on the PCO. The Project's HOA will be responsible for verifying that water budgets proposed by an individual homeowner match with what the County approved water budget for their individual lot. If the homeowner chooses to exceed their approved water budget, they will be required to submit plans to the County in order to modify their water budget. Adherence to the PCO requirements will ensure the use of drought tolerant species, however, the Project's HOA, enforced through the CC&Rs and implemented through the HOA's Architectural and Landscape Committee, would be responsible for enforcing the approved documents associated with Village 14, as well as the County Water Conservation in Landscaping Ordinance.

Development Regulations will require residential front yard landscaping to meet County requirements which includes high efficiency irrigation equipment, low water use plants, and limiting natural turf to no more than 25 percent of the outdoor open space. (This standard shall apply unless water conservation technologies, strategies, and/or regulations change from time to time). The Master Homeowners Association, through the Landscape and Architectural Committee, will be responsible to review and approve landscape plans on private lots, including water conservation.

An Approved Plant List for the Land Exchange Alternative, including areas adjacent to the MSCP Preserve is provided in the Village 14 Design Plan. The water conservation approach for these areas includes implementation of drought tolerant landscaping, hydrozones, and efficient and temporary irrigation systems, pursuant to the Fire Protection Plan requirements.

All areas of the Land Exchange Alternative, including common areas of commercial sites, parks and interior HOA maintained slopes will comply with the Water Conservation in Landscaping Ordinance and must comply with the Approved Plant List (refer to Village 14 Design Plan, Attachment A, Approved Plant List).

For all of the residential front yard landscaping installed by individual homebuilders and common areas landscaping installed by the Master Developer or individual homebuilders described above, either the County or the homeowner's association will ensure all required water conservation measures are implemented by reviewing the landscape improvement plans and residential development regulations. This review and approval will ensure that all applicable requirements for water conservation measures in landscape systems are being implemented throughout the Land Exchange Area.

REFERENCES

The following documents were used or relied on as references in preparing this report and are incorporated by this reference:

1. Bahman Sheikh, Water Use Efficiency, Strategies for Proposed Residential Developments, September 2001.

2. County of San Diego Model Water Use Ordinance, 2010.

3. San Diego County Water Authority, *2015 Urban Water Management Plan*.

4. Metropolitan Water District of Southern California. *The Regional Urban Water Management Plan for the Metropolitan Water District of Southern California,* 2015.

5. Otay Water District, Water Facilities Master Plan Update, 2015.

6. Otay Water District 2015 Urban Water Management Plan

7. County of San Diego/ City of Chula Vista. *Otay Ranch General Development Plan/ Sub Regional Plan (GDP/SRP),* adopted October 1993.

8. Dexter Wilson Engineering, Overview of Water Service for Otay Ranch Village 14 and Planning Area 16/19 – Land Exchange EIR Alternative, February 2018.

9. 2016 California Green Building Standards Code.