

Tres Birds Workshop

Red Mountain Ranch

Parcel 1: Water Demand Study

Reference:

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1. Water Demand Study

Within the Red Mountain Ranch (RMR) development, water is required for use in buildings and throughout the project site. To assess the overall water demand and across Parcel 1, and to balance that demand with water supply, a water budget has been developed to encompass both indoor building demands and outdoor site demands.

1.1 Building Demand Assumptions

1.1.1 Parcel 1 Buildings

Within the residential buildings, water usage is driven by estimated fixture and appliance demands, which have been defined based on the anticipated residential occupancy. The occupancy planned for Parcel 1 is outlined in the table below.

Occupancy Assumptions - Parcel 1				
Unit	Number of Units	Occupants/Unit	Number of Occupants	Percent of Occupants
Townhouse	42	3	126	51%
Duplex	12	5	60	24%
Single Family	12	5	60	24%
Total Residential	66	-	246	100%

Based on this anticipated residential occupancy and using Leadership in Energy and Environmental Design (LEED) methodology, water demand in the buildings is defined by fixture type including flush fixtures (toilets), flow fixtures (faucets in sinks and showers), and appliances (laundry machines and dishwashers). For all fixtures and appliances, low flow fixtures are highly recommended to reduce water demand in a region threatened by future water scarcity in the face of climate change. The baseline flow rates for these features were informed by LEED and US Environmental Protection Agency (EPA) guidance on standard values for industry baselines. The recommended flow rates exceed Colorado WaterSense targets and aim to achieve over 30% reduction against the baseline rates, within reasonable parameters based on industry practice and available products. All eligible appliances shall be ENERGY STAR® rated.

Fixture Flow Rate Assumptions - Parcel 1				
Fixture	Type	Baseline	Colorado WaterSense Rule	Recommended Flow Rates
Toilets (Dual Flush)	Flush	1.60	1.28	1.10
Urinals	Flush	1.00	0.50	0.13
Lavatory Faucets	Flow	2.20	0.50	0.35
Kitchen Sinks	Flow	2.20	1.80	1.50
Showerheads	Flow	2.50	2.00	1.75
Washing Machines	Appliance	18.80	ENERGY STAR	14.80
Dishwashers	Appliance	5.00	ENERGY STAR	3.50

Note: Units for flush fixtures = gallons/flush, units for flow fixtures = gallons/minute, units for appliances = gallons/load

These assumptions result in an anticipated potable water use per capita of 33 gallons per person per day or 8,100 gallons per day for all of Parcel 1.

1.2 Site Demand Assumptions

Throughout the site, non-potable water is required for permanent landscape irrigation for trees and communal turf areas, as well as the water necessary to supplement the evaporated volume from the wet pond on site. Additionally, a community garden planned on the northeast end of Parcel 1 requires potable water between rain events. All outdoor water demands are active only from April through October and shall cease in winter months.

The irrigation strategy developed for the landscape limits irrigation demands by avoiding permanent irrigation of native seed areas. Additionally, the area of turf is minimized by providing a centralized lawn between duplexes and town homes to be shared by residents, rather than a lawn for each individual unit. Therefore, on Parcel 1, only 37% of the landscaped open space will have permanent irrigation. On Parcel 2, due to its smaller footprint, 59% of the landscaped open space will have permanent irrigation.

Where parts of the landscape are permanently irrigated, drip irrigation is prioritized to maximize water efficiency, and spray irrigation is used only where necessary. The efficiency of each type of irrigation is estimated as follows:

- Drip = 90% water efficiency
- Spray = 65% water efficiency

1.2.1 Parcel 1 Irrigation

For Parcel 1, irrigation demand assumptions are defined in the following table.

Landscape Demand Assumptions - Parcel 1		
Typology	Vegetated Area (SF)	Permanent Irrigation Strategy
Proposed Tree Coverage	130,448	Drip to trees
Proposed Turf	14,272	Spray over turf
Proposed Drainage Swale Native Seed	27,418	No irrigation - fed by stormwater
Proposed Landscape Native Seed	218,461	No irrigation - fed by stormwater
Total Irrigated Area (SF)	144,720	
Total Irrigated Area (Acres)	3.3	

In addition to irrigation demands, one permanent wet pond is planned on the north end of Parcel 1, which shall be supplemented by water sourced from the Eagle River to balance water released through evaporation. During the peak months, this will total 50,000 gallons of raw water.

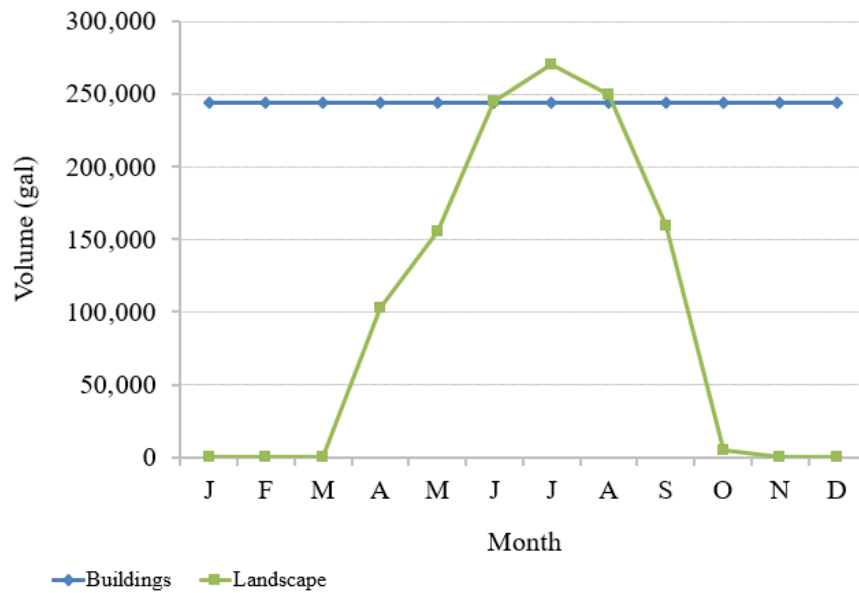
These assumptions result in a total landscape water demand of 8,740 gallons per day across Parcel 1 during the peak irrigation month. The peak demand is anticipated during the month of July due to low rainfall and high evaporation rates based on historical climate data.

1.3 Overall Demand

1.3.1 Parcel 1 Demand

Overall, the Parcel 1 residential buildings demand 2,940,100 gallons per year (9.0 acre-feet) and the landscape water demands 1,188,000 gallons per year (3.6 acre-feet). On a monthly basis, this is distributed as shown in the figure below. Demand peaks during the summer because irrigation is only applied between April and October.

Water Demand - Parcel 1



1.4 Water Rights

Building water demands shall be met by water sourced through the municipal potable water supply from the Town of Eagle. Physically, potable water will be sourced from an existing municipal connection at Nogal Road, as described in the Utility Service Plan Narrative, and raw water will be sourced from the Eagle River. Legally, rights to access these water sources require dedication to the town. The water rights available to Red Mountain Ranch were quantified based on historical consumptive use and an EQR assessment conducted in 2019. The total amount of water rights Red Mountain Ranch shall dedicate to the Town of Eagle upon annexation for Planning Areas 1-6 is 101.55 acre-feet annually, including 8.13 acre-feet of raw water for irrigation.

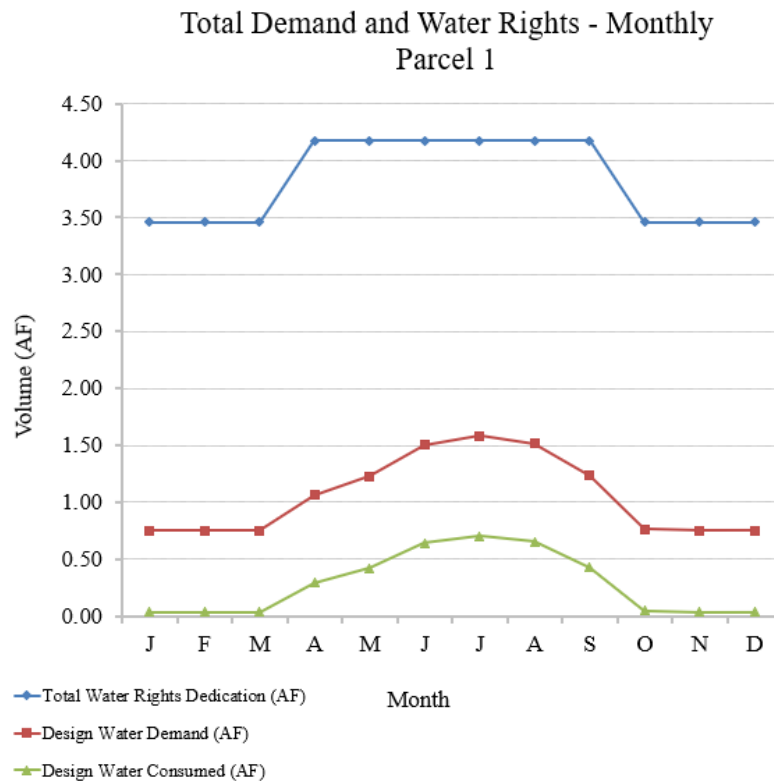
Raw water rights for Parcels 1 and 2 have been prorated based on the values stipulated in the Red Mountain Ranch PUD for Planning Areas 1-2 by the relative area of each parcel. Potable water rights have been estimated based on EQR values published by the Town of Eagle for water and sewer connections.

1.4.1 Parcel 1 Rights

Based on these interpretations, the annual water rights dedication for Parcel 1 total 45.8 acre-feet, made up of 41.5 acre-feet of potable water and 4.3 acre-feet of non-potable water. When distributed throughout the year, these values equate to approximately 3.5 acre-feet per month in the winter months and 4.2 acre-feet per month in the summer months, when irrigation is occurring.

Because water rights are defined by consumption rather than diversion in Colorado, factors have been applied to estimate the amount of water that is considered “consumed” by the building and site uses. Consumption refers to water that is not returned to the river through either the municipal wastewater treatment plant or overland flow after use. It is assumed that 5% of potable water demand in the buildings and 80% of non-potable water demand in the landscape is consumed.

The water consumption is well below the water rights dedication volumes on a monthly and annual basis, as demonstrated in the figure below. This graph shows water rights relative to water demand and water consumed on Parcel 1.



1.5 Site Supply

All irrigation demands shall be met by non-potable raw water. Across Parcel 1, four integrated stormwater-irrigation ponds are proposed to manage runoff and serve as a community amenity. The pond locations are strategically sited to limit earthworks and the amount of infrastructure required to meet site water demands. During and after rain events, swales throughout the site convey runoff to the ponds for stormwater quality and quantity management before controlled release into the Eagle River. During dry periods, the ponds are designed to take in water diverted from the river for irrigation and store it temporarily while the water is distributed for irrigation.

One of the stormwater-irrigation ponds is designed to be permanently wet, with intake from the Eagle River to supply irrigation water while also supplementing water released through evaporation. This is discussed further in the Utility Service Plan Narrative.

1.6 Conclusion

Throughout Red Mountain Ranch, minimizing water demand is an important component of the site development strategy, primarily through efficient fixtures and appliances, low-irrigation landscape design, and using raw water to supply all irrigation demands. Ultimately, Red Mountain Ranch is planned and designed to demand water at a rate that is notably lower than standard developments to protect water as a precious natural resource.