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# Water Resources Report

The Shops Filing 2 at Meridian Ranch

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## ***INTRODUCTION***

### ***Purpose***

This document addresses the water resources for the Meridian Service Metropolitan District (MSMD) as it relates to the Meridian Ranch development as it relates to the proposed final plat submittal of The Shops Filing 2 at Meridian Ranch. MSMD is the entity responsible to finance construction and ensure the continuing operation and maintenance of the water system improvements. MSMD has been providing treated water to the Meridian Ranch development since 2003. Treatment of the water consists of disinfection of the water as required for all community water systems in addition to addressing iron, manganese and turbidity commonly found in Denver basin ground water wells. Monthly reporting is provided to the CDOHE as required, to date there have been no failed tests.

### ***Description of the Service Area***

Meridian Ranch encompasses 2,620 acres of proposed residential, commercial, and business development. It is located approximately 12 miles northeast of downtown Colorado Springs, three miles north of the town of Falcon and immediately north of the Woodmen Hills development. The development is located within Township 12 South, Range 64 West, Sections 19-21 and 28-30 and consists of a mixture of residential, commercial, school, and open space/park uses. The water system that serves Meridian Ranch is classified as a “community water system,” and meets the applicable requirements of the Colorado Department of Health.

Meridian Ranch is situated in the Upper Black Squirrel Creek Designated Groundwater Basin which is managed by the Upper Black Squirrel Creek Groundwater Management District. MSMD currently services Meridian Ranch, the Falcon High School, Meridian Ranch Elementary School, The Shops commercial center, Falcon Regional Park, and portions of Latigo Trails as an out of district user.

## ***QUANTITY OF WATER***

Using the land use information derived from the proposed Shops Filing 2 final plat and the existing development with Meridian Ranch, a permanent resident and employment forecast for the Meridian Ranch Development may be obtained for the ultimate build-out of the project. By applying the El Paso County unit water demand factors to the land use forecasts, the quantity of water required for the development may be forecast for the proposed project and the ultimate development.

**Table 1 - Land Use/Population**

Land Use	Master Plan 5,292 SFEs Total				Existing/Approved Projects: Meridian Ranch Filings 1 - 11 Estates 2 & 3, Latigo Trails 2A, 7, & 8 Stonebridge Filing 1 - 4, The Vistas Filing 1 Windingwalk, RHR 1-3, ERHR 1 & 2				Proposed: The Shops Filing 2				Projected Total			
	Units/ Acres	Pop.	Emp.	Equiv. Pop.	Units/ Acres	Pop.	Emp.	Equiv. Pop.	Units/ Acres	Pop.	Emp.	Equiv. Pop.	Units/ Acres	Pop.	Emp.	Equiv. Pop.
Single Family Residential <sup>1</sup>	5,292	14,553	-	14,553	4,671	13,340	-	13,340	-	-	-	-	4,671	12,845	-	12,845
School <sup>2</sup>	113	4,000	380	4,380	83	2,740	260	3,000	-	-	-	-	83	2,740	260	3,000
Commercial <sup>3</sup>	15	-	94	94	8	-	47	47	2	-	10	10	10	-	57	57
Civic	23	-	36	36	14	-	21	21	-	-	-	-	14	-	21	21
Park/Open Space	545	-	-	-	38	-	-	-	-	-	-	-	38	-	-	-
Golf Course	174	-	12	12	174	-	12	12	-	-	-	-	174	-	12	12
<b>TOTAL</b>		18,553	522	19,075		16,080	340	16,420		-	10	10		15,585	350	15,935

<sup>1</sup> Maximum of 5,000 single family dwelling units plus 292 units from Latigo Trails. 2.75 persons/single family dwelling unit per El Paso County Falcon-Peyton Master Plan, Chapter 2.3.3 Population Projections

<sup>2</sup>Falcon Schools: High school current enrollment - 1,350, planned expansion - 1,750, Meridian Ranch Elem. enrollment – 650, Future middle school & elem. – 1,575. Staffing based on 9.5% staff-student ratio. (Source: Falcon School District).

<sup>3</sup>Commercial building area equals 18% of gross commercial area. One employee/1250 sq. ft. of commercial area.

<sup>4</sup>Civic building area equals 30% of gross civic area. One employee/2200 sq. ft. of civic area.

### **Water Demand**

Unit water demands are based industry standard factors and MSMD historic water demand figures. Demand is first calculated in acre feet per year (AFY) to determine the water supply needs. This value is then factored to determine the average daily demand (ADD) in gallons per minute (GPM). This figure is used to project the maximum day and peak hour demands as well as to estimate revenues and operating costs. The maximum daily demand and the peak hour demand have been determined by applying the accepted peaking factors of 2.5 and 4.0 to the ADD respectively. The MDD is used to determine the storage needs and the PHD is used for modeling the system delivery pressures and to size the distribution mains.

The potable water demand is based on 0.31 acre-feet per year (includes outside irrigation) for single family residential home sites, 25 gallons per day for students and staff at the school sites and 45 gallons per day per person for all other uses. The irrigation demand for irrigation is based on 0.0566 acre-feet per year for every 1,000 square feet of irrigated landscape. The irrigation demand for the open space is based on five percent of irrigated land and the commercial/business at ten percent of irrigated land at 0.0566 acre-feet per year for every 1,000 square feet.

Table 2 - Water Demand

Land Use	Master Plan 5,292 SFEs Total				Existing/Approved Projects				Proposed:			
	AFY	ADD	MDD	PHD	AFY	ADD	MDD	PHD	AFY	ADD	MDD	PHD
	<i>gpm</i>	<i>gpm</i>	<i>gpm</i>	<i>gpm</i>	<i>gpm</i>	<i>gpm</i>	<i>gpm</i>	<i>gpm</i>	<i>gpm</i>	<i>gpm</i>	<i>gpm</i>	<i>gpm</i>
<i>Potable</i>												
Single Family Residential <sup>1</sup>	1641	1,017	2,542	4,068	1,448	898	2,244	3,591	-	-	-	-
School	123	76	190	304	84	52	130	208	-	-	-	-
Commercial	5	3	7	12	2	1	4	6	0.5	0.3	0.8	1.3
Business	2	1	3	5	1	1	2	3	-	-	-	-
Paint Brush Hills Metro <sup>3</sup>	85	-	-	-	85	-	-	-	-	-	-	-
Golf Course	1	0.4	1	2	1	0.4	1	2	-	-	-	-
<b>Subtotal</b>	<b>1855</b>	<b>1,097</b>	<b>2,744</b>	<b>4,390</b>	<b>1,621</b>	<b>952</b>	<b>2,381</b>	<b>3,809</b>	<b>0.5</b>	<b>0.3</b>	<b>0.8</b>	<b>1.3</b>
<i>Irrigation</i>												
Single Family Residential	0	-	-	-	-	-	-	-	-	-	-	-
School	97	60	150	240	89	55	139	222	-	-	-	-
Commercial	4	2	6	9	2	1	3	5	0.6	0.4	0.9	1.5
Business	6	4	9	14	3	2	5	8	-	-	-	-
Park/Open Space	67	42	104	167	5	3	8	13	-	-	-	-
Falcon Regional Park <sup>2</sup>	25	15	39	62	-	-	-	-	-	-	-	-
Golf Course <sup>3</sup>	-	-	-	-	-	-	-	-	-	-	-	-
<b>Subtotal</b>	<b>198</b>	<b>123</b>	<b>308</b>	<b>492</b>	<b>100</b>	<b>62</b>	<b>155</b>	<b>248</b>	<b>0.6</b>	<b>0.4</b>	<b>0.9</b>	<b>1.5</b>
<b>Total</b>	<b>2054</b>	<b>1,220</b>	<b>3,051</b>	<b>4,882</b>	<b>1,721</b>	<b>1,014</b>	<b>2,535</b>	<b>4,057</b>	<b>1.1</b>	<b>0.7</b>	<b>1.7</b>	<b>2.7</b>

<sup>1</sup> Single Family Residential water demand is based on 0.31 AFY. This amount includes both domestic indoor use and outside irrigation.

<sup>2</sup> Perpetual lease to Paint Brush Hills Metropolitan District

## *Water Supply*

The service area is located in the Upper Black Squirrel Creek Groundwater Management District and the water bearing formations in descending stratigraphic order are the Dawson, Denver, Arapahoe, and Laramie Fox Hills. These four aquifers are collectively known as the Denver Basin aquifers and are found approximately at depths of 500, 1,400, 1,900, and 2,500 feet below the ground surface. Table 3 Water Supply shows the maximum annual yield of water currently approved by the Colorado Ground Water Commission for use within the Meridian Service Metropolitan District.

The Meridian Ranch development has water rights and appropriation for the Denver Basin groundwater, renewable alluvial ground water and additional Denver Basin water rights from adjacent metropolitan districts as part of either a financial or annexation agreement.

MSMD is currently extracting groundwater from nine onsite well sites, one off-site well, located within the Latigo Trails development, and three well sites from the offsite area known as Guthrie Ranch.

MSMD also owns water rights that have yet to be developed, the below table provides the information for those decrees.

MSMD has joined Cherokee Metropolitan District to submit for review a proposed placement plan to the State for a renewable water source. The replacement plan is currently in process.

## *Water System Improvements*

The water system that serves Meridian Ranch is classified as a “community water system” and meets all the applicable requirements of the Colorado Department of Health (CDH).

The water system uses groundwater as its primary source of supply. Filtration and disinfection facilities have been constructed at a central location to ensure good water quality. Elevation differences that exist throughout the property require that the system is divided into two pressure zones to ensure that the water is delivered at no less than 40 psi during peak hour flow and at no more than 120 psi during periods of low use. Storage facilities and distribution piping are provided to ensure that the residual pressure requirements are achieved both during peak hour demands and during maximum day demands with a superimposed fire flow of 1500 gpm for the residential areas and up to 3500 gpm for commercial areas. The upper pressure zone (Zone 1) is a closed loop distribution system served by pumps that provide the required pressures; these are located in the same location as the filtration and disinfection facilities. The lower pressure zone (Zone 2) is a conventional gravity system served by storage tanks to provide the required pressures.

MSMD currently provides water service to 112 Latigo Trails home sites as out of district users. Latigo Trails is located north of and adjacent to Meridian Ranch. The water used to provide this service comes from a Laramie Fox Hills well under permit no. 46406-F.

Table 3 Water Supply

Well No.	Permit No.	Appropriation	State Maximum Annual Appropriation (100-yr) (AFY)	El Paso County Maximum Annual Appropriation (300-yr) (AFY)
<b>Meridian Ranch</b>				
DA-1	60140-F	157-BD	31.9	10.6
FUTURE DAWSON		157-BD	820.0	273.3
D-3	64496-F	156-BD	1171.0	390.3
A-1	56516-F	155-BD	942.0	314.0
A-2	56517-F	155-BD		
A-4	59680-F	155-BD		
A-5	84844-F	155-BD		
A-9	59681-F	155-BD		
LFH-1	56513-F	154-BD	755.0	251.7
LFH-2	56514-F	154-BD		
LFH-3	56515-F	154-BD		
LFH-4	59678-F	154-BD		
LFH-5	84845-F	154-BD		
LFH-6	82766-F	154-BD		
LFH-7	84558-F	154-BD		
LFH-8	84559-F	154-BD		
LFH-9	59679-F	154-BD		
<b>TOTAL</b>	<b>Meridian Ranch</b>		<b>3719.9 AFY</b>	<b>1239.9 AFY</b>
<b>Guthrie Ranch</b>				
G LFH-1 <sup>3</sup>	61234-F <sup>2</sup>	228-BD	289.8	96.6
G LFH-2 <sup>3</sup>	61235-F <sup>2</sup>			
G A-1 <sup>3</sup>	61236-F <sup>1</sup>	229-BD	240.6	80.2
G A-2 <sup>3</sup>	61237-F <sup>1</sup>			
G No. 1 <sup>4</sup>	612-RFP-R	Permit Date 8/26/03	170.0	170.0
G No. 2 <sup>4</sup>	27554-FP-R	Permit Date 7/28/05	30.0	30.0
<b>TOTAL</b>	<b>Guthrie Ranch</b>		<b>730.4 AFY</b>	<b>376.8 AFY</b>
<b>Latigo Trails</b>				
FUTURE ARAPAHOE		568-BD	124.6	41.5
FUTURE DENVER		569-BD	369.6	123.2
DA-2	74410-F	570-BD	130.0	43.3
DA-3	74409-F			
FUTURE DAWSON				
LFH-1	46406-F	Permit Date 8/07/06	453.0	151.0
<b>TOTAL</b>	<b>Latigo Trails</b>		<b>1301.1 AFY</b>	<b>433.6 AFY</b>
<b>Hart Ranch</b>				
FUTURE LARAMIE FOX <sup>3</sup>		2099-BD	125.0	20.8
FUTURE ARAPAHOE <sup>3</sup>		2100-BD	103.0	17.2
<b>TOTAL</b>	<b>Hart Ranch</b>		<b>228.0 AFY</b>	<b>38.0 AFY</b>
<b>TOTAL WATER AVAILABLE TO MSMD</b>			<b>5979 AFY</b>	<b>2088 AFY</b>

<sup>1</sup> Well permit number for well appropriation 229-BD (Total appropriation of 483 AFY).

<sup>2</sup> Well permit number for well appropriation 228- BD (Total appropriation of 580 AFY).

<sup>3</sup> Total appropriation is an equal split of ground water with Woodmen Hills Metropolitan District

<sup>4</sup> Total appropriation is split with WHMD, 69% Meridian Ranch, 31% Woodmen Hills

## ***WATER QUALITY***

Water quality test results for the existing wells are included in

Table 4: Water Quality. These water test results indicate that the groundwater meets or exceeds drinking water standards with the exception of turbidity, fluoride, and iron on a case by case basis. Similar results are anticipated from future wells drilled on the Meridian Ranch site.

The table indicates that treatment is required to reduce the concentration of iron to meet primary standards and turbidity to meet secondary standards before it is distributed to customers. An existing treatment facility has been providing the required treatment since 2003. In addition, disinfection is provided to ensure good bacteriological characteristics. MSMD has been providing monthly reporting to CDOHE with no reprimands.

**Table 4: Water Quality**

Aquifer	Well Capacity (gpm)	Test Results				pH	Turbidity
		Fluoride (mg/l)	Iron (mg/l)	Manganese (mg/l)	Alpha R (pci/l)		
<b>Arapahoe</b>							
A-1	50	2.1	1.50	0.0	0.0	8.93	2.57
A-2	55	2.5	0.0001	0.0001	0.0	8.99	1.01
<b>Laramie Fox Hills</b>							
LFH-1	100	1.2	0.32	0.011	3.8	8.95	4.70
LFH-2	100	0.8	0.26	0.0001	0.0	9.00	1.30
LFH-3	100	1.0	1.10	0.019	0.0	8.85	7.84
<b>Weighted Average</b>	<b>405</b>	<b>1.3</b>	<b>0.60</b>	<b>0.01</b>	<b>0.9</b>	<b>8.94</b>	<b>3.87</b>
<b>Suggested</b>							
Drinking Water Standards		2.4	0.3	0.05	15	8.5	1
Treatment Required		No	No	No	No	Yes	Yes

### ***Water Treatment***

Water quality test results indicate that certain wells exceed standards for iron and fluoride. Even with blending the water produced by the wells, the fluoride and iron still exceed the Drinking Water Standards.

CDH standards require that the water supply be disinfected and that the supplies receive minimum chlorine contact time of 30 minutes prior to first use.

Treatment facilities have been constructed at a central location and each well head is pumped to the central location for treatment. Pressure filters with a pre-chlorination treatment are utilized to reduce the concentration of iron and fluoride and to disinfect the water supply. These units are sized for the maximum sustained pumping rate for the wells included at the well sites and are interlocked to activate/deactivate in conjunction with the well pump motor starters. Treated water is then admitted to the water distribution system following the required 30 minute contact time.