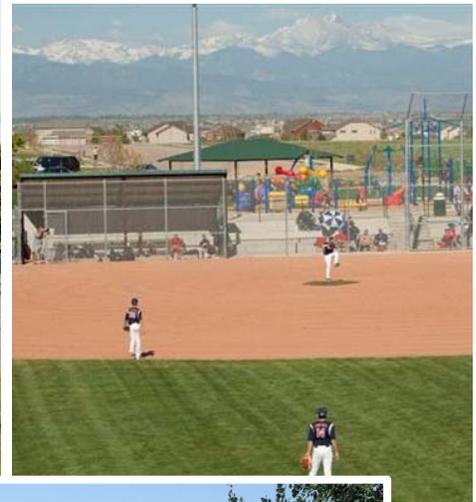




## TOWN OF FIRESTONE

### 2015 NON-POTABLE WATER RIGHTS MASTER PLAN



*clear* **WATER** *solutions*  
water rights • planning • engineering

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## EXECUTIVE SUMMARY

The Town of Firestone is a wonderful community located approximately 30 miles north of Denver along the Colorado Front Range as shown in **Figure 1**. Firestone is in a desirable location with affordable housing and easy access to Interstate 25, which is why the Town experienced rapid growth prior to and since the last recession. When the economy recovered, the price of the Town's sole source of water, Colorado-Big Thompson (C-BT), skyrocketed. Current-day price for C-BT is approximately \$26,500 per unit or nearly \$38,000 per acre-foot. Firestone's current water dedication policy only allows for C-BT to be dedicated to meet the raw water requirement, although it does allow developers to bring 75% water and 25% cash. Due to the high demand and high cost of C-BT water, development in Firestone has slowed.

Firestone has been strategically pursuing alternatives for potable water. Additionally, the Town is faced with the need to get creative on how best to utilize its existing water supplies. The Town continues to implement sound water conservation practices and keeps its State-approved Municipal Water Efficiency Plan updated. The Town also seeks grant money as needed to implement water-savings activities.

Since C-BT is currently the Town's only source of water, the Town is delivering C-BT for all outdoor irrigation. There is a great opportunity for the Town to convert this outdoor irrigation to instead be irrigated with non-potable water, which will free up the Town's C-BT for potable needs and also help to diversify the Town's water right portfolio.

### **Non-Potable Water Rights Master Plan Objective**

The purpose of this Non-Potable Water Rights Master Plan is to provide Town decision makers with information and recommendations related to water rights and storage acquisition to serve its existing and future non-potable needs. To the extent wells can be drilled to serve irrigation demands at parks, this will be evaluated as well. Converting Town irrigation, particularly the large parks and open space areas, to untreated water is wise-water management. Current average water use estimates are approximately 0.5 acre-feet per single family equivalent. This means that two houses can be built for every one acre-foot of irrigation water that is converted from C-BT to some other water source.

### **Key Findings**

- Firestone provides water to approximately 221 acres of existing park and open space areas (includes both Firestone Owned Property and Privately Owned Property), which equates to 442 acre-feet of water.

- In the future, Firestone will provide water to an additional 273 acres of park and open space areas (includes both Firestone Owned Property and Privately Owned Property), which equates to 546 acre-feet of water.
- Firestone should acquire water and storage rights to convert the 988 acre-feet of existing and future irrigation demand from irrigation with CBT water to irrigation with non-potable water.
- It is estimated Firestone needs a total of 2,000 acre-feet of non-potable storage.
- Should Firestone build its own or participate in a regional water treatment plant in the future, some of the acquired non-potable water rights could be strategically converted to potable use.

Following is a list of recommended next steps. The intent of this list is to provide the key decision makers an easy reference point upon which to guide the Town by keeping the decision makers on the same page. This chapter should be referenced periodically to ensure the proper steps are taken for successful implementation.

1. **Complete Hokestra purchase.** Firestone is currently in negotiations with Weld County for a portion of the Hokestra Pit. The Town will seek to purchase Cell 2 with an option to purchase Cell 4 once it is mined. Cell 2 is clay lined and will provide 453 acre-feet of storage. Cell 4 has been lined with a slurry wall, but has not been mined yet. Cell 4 will provide approximately 200 acre-feet of additional storage for Firestone.
2. **Apply for CWCB loan.** The Town should apply for a CWCB low-interest loan to purchase this storage, the water rights to divert to the storage, and the infrastructure needed to fill the storage.
3. **Meet with Little Thompson Water District to explore if a potential joint pump station on the St. Vrain River makes sense for both parties.** Little Thompson Water District will be supplying the Brookfield subdivision with Windy Gap water. The proposed water supply includes an exchange back from the St. Vrain Sanitation District WWTP. This exchange of fully consumable water will likely require a pump station. Firestone will need a pump station to fill Hokestra Pit storage.
4. **File for a junior storage right on Hokestra Pit.** It will be important that the Town file for a junior storage right on Hokestra Pit in 2015 or 2016. A junior water right will allow diversion and storage within the pit. Stored water can be leased to third parties to generate revenue until the non-potable system is online.
5. **Evaluate additional storage options.** The Town should evaluate additional opportunities as options to purchase storage become available. The Town may consider the potential storage options presented in **Appendix C** if additional storage is needed in the future.
6. **Meet with owners of potential water rights.** The Town should initiate meetings with various owners of water and storage rights.

7. **Consider wells in non-potable system.** The Town should proceed with investigating the design and feasibility of a non-potable system utilizing wells. As the non-potable system is designed, the Town should consider drilling shallow wells strategically around the Town for irrigation as it makes sense. Test wells should be drilled and a pump test completed to determine if a well at certain locations can produce the needed volume to sustain irrigation at that park or open space area.
8. **Complete non-potable system design.** With the completion of this plan, the Town's non-potable water infrastructure plan should be updated. The infrastructure plan update can evaluate how the recommended water rights, Hokestra Pit storage, proposed storage at Central Park, and potential well irrigation can work in a comprehensive non-potable system.
9. **Develop agreement with St. Vrain Sanitation District.** Should any of these supplies be strategically converted to potable use in the future, the Town will want the right to control and use any fully consumable effluent it generates from its water supplies. This fully consumable effluent can be used for augmentation of well pumping, to meet return flow obligations from use of a changed water right, exchanged upstream into Hokestra Pit storage for subsequent use, or exchanged for different water supplies with other water users. An agreement with St. Vrain Sanitation District to recapture the Town's future reusable effluent is vital to the Town's long-term plan.
10. **Target acquisition of Tier 1 and Tier 2 water rights in Table 6 (Chapter 3).** As lands historically irrigated with any of these water rights annex into the Town, this water should be considered to meet a portion of the raw water requirement. Further, the town should continue to budget and actively acquire these water rights as the negotiations and deals make sense. Before water rights are taken in by the Town, a historical use analysis should be completed to ensure the Town is obtaining a good water right. Many times water rights were used inefficiently in the past and buyers do not get what they paid for. Sound due diligence will be important in these transactions. Further, historical location of use in relation to the Town's other water infrastructure and calling rights on the river will be important to ensure that the Town can replace return flows adequately.
11. **Engage a water broker or expert to find available water.** The Town should engage a water broker or expert to search for Tier 1 and Tier 2 water rights for sale.
12. **Conduct a water quality investigation.** Prior to any conversion of non-potable water rights to potential potable water use, a study on water quality, the level of treatment required, and a fully devised plan for proper disposal of brine should be completed, including costs and feasibility.

# TABLE OF CONTENTS

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<b>EXECUTIVE SUMMARY .....</b>	<b>ES-1</b>
<b>CHAPTER 1 – INTRODUCTION .....</b>	<b>1</b>
TOWN'S WATER SOURCES .....	1
<b>CHAPTER 2 – PARK AND OPEN SPACE DEMAND .....</b>	<b>4</b>
<b>CHAPTER 3 – POTENTIAL SOURCES OF SUPPLY .....</b>	<b>9</b>
POTENTIAL SOURCES OF NEW WATER SUPPLY .....	9
BOULDER AND WELD COUNTY DITCH .....	9
CARR AND TYLER DITCH .....	10
LOWER BOULDER DITCH .....	10
<b>CHAPTER 4 – STORAGE ALTERNATIVES .....</b>	<b>21</b>
HOKESTRA PIT – STORAGE .....	21
POTENTIAL STORAGE .....	22
<b>CHAPTER 5 – GROUNDWATER AND WELL IRRIGATION .....</b>	<b>23</b>
SHALLOW GROUNDWATER WELLS .....	23
DEEP GROUNDWATER WELLS .....	23
<b>CHAPTER 6 – CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>25</b>

## LIST OF TABLES

---

Table 1: Irrigation Estimates for Firestone Owned - Existing Parks and Open Space Areas .....	6
Table 2: Irrigation Estimates for Privately Owned - Existing Parks and Open Space Areas .....	7
Table 3: Irrigation Estimates for Town Owned and Privately Owned Future Parks and Open Space Areas .....	8
Table 4: Baseline Land and Reservoir Company Storage Right ....	11
Table 5: Coal Ridge Ownership Summary .....	13
Table 6: Recommended Water Rights .....	20
Table 7: Hokestra Pit Storage Information .....	22

## CHAPTER 1 – INTRODUCTION

The Town of Firestone is a wonderful community located approximately 30 miles north of Denver along the Colorado Front Range as shown in **Figure 1**. Firestone is in a desirable location with affordable housing and easy access to Interstate 25, which is why the Town experienced rapid growth prior to and since the last recession. When the economy recovered, the price of the Town's sole source of water, Colorado-Big Thompson (C-BT), skyrocketed. Current-day price for C-BT is approximately \$26,500 per unit or nearly \$38,000 per acre-foot. Firestone's current water dedication policy only allows for C-BT to be dedicated to meet the raw water requirement, although it does allow developers to bring 75% water and 25% cash. Due to the high demand and high cost of C-BT water, development in Firestone has slowed.

Firestone has been strategically pursuing alternatives for potable water. Additionally, the Town is faced with the need to get creative on how best to utilize its existing water supplies. The Town continues to implement sound water conservation practices and keeps its State-approved Municipal Water Efficiency Plan updated. The Town also seeks grant money as needed to implement water-savings activities.

Since C-BT is currently the Town's only source of water, the Town is delivering C-BT for all outdoor irrigation. There is a great opportunity for the Town to convert this outdoor irrigation to instead be irrigated with non-potable water, which will free up the Town's C-BT for potable needs and also help to diversify the Town's water right portfolio.

The purpose of this Non-Potable Water Rights Master Plan is to provide Town decision makers with information and recommendations related to water rights and storage acquisition to serve its existing and future non-potable needs. To the extent wells can be drilled to serve irrigation demands at parks, this will be evaluated as well. Converting Town irrigation, particularly the large parks and open space areas, to untreated water is wise-water management. Current average water use estimates are approximately 0.5 acre-feet per single family equivalent. This means that two houses can be built for everyone one acre-foot of irrigation water that is converted from C-BT to some other water source.

### TOWN'S WATER SOURCES

#### Colorado-Big Thompson

The Town currently owns 5,095 C-BT units. The Town has acquired this water through its raw water dedication policy over the years. Since 1974, water dedication was one C-BT unit per dwelling unit. In the early 2000's, the Town modified the policy and changed multi-family dedication to one-half C-BT unit per dwelling unit. In 2010, Firestone adopted Ordinance 762 that created a

graduated dedication for single-family dwelling unit's based on lot size. In 2014, the Town adopted Ordinance 861 that changes the multi-family dedication requirement. A copy of Ordinance 762 and Ordinance 861 is available in **Appendix A** of this report.

Over the years, Firestone has received C-BT water through dedication and is now capped per Northern Colorado Water Conservancy District (Northern Water) regulations. Resolution D-962-02-95 from Northern Water outlines limitations on ownership issues and is summarized as follows:

*For municipalities and domestic water purveyors, the limitation on unit ownership will be calculated and determined as the lesser of the following:*

1. *(Demand x 2) – (Average Yield of Native Supplies) = Max. No. of C-BT Units Allowed to be Owned*

*or*

2. *(Demand) – (Firm Yield of Native Water Supplies) = Max. Volume of Firm Yield C-BT Water Allowed to be Owned*

*The maximum number of C-BT units allowed to be owned shall be determined by dividing the volume of C-BT water allowed to be owned by 0.5 for variable-quota contracts and 0.7 for fixed-quota contracts.*

*Demand is based on a 10-year average of per-tap usage times the total number of taps currently supplied and taps committed to supply in the future.*

This Resolution was established to preserve the C-BT system and prevent speculative purchases of its water. The C-BT system was originally designed as a supplemental supply to native water rights with agriculture as the primary user. The quota was set based on water demand. In a dry year when water demands were high, the quota would be set higher, up to 100%. In a wet year, when native supplies were plentiful and demands are low, the quota would be set lower, e.g., 50%. The years 2002 and 2003 were an exception when, for the first time in the system's history, the quota was set based on limited supply.

Because Firestone has exceeded its C-BT ownership per the above Resolution, the Town is capped and cannot purchase additional C-BT supplies through the open market. Therefore, the Town must rely on C-BT acquisition through dedication from new development. Because the Town is capped, it has to get creative in efficiently and wisely utilizing the C-BT water it does own.

## Northern Integrated Supply Project (NISP)

NISP is a regional water supply project coordinated by Northern Water on behalf of Firestone and 14 other Northern Front Range water providers. The goal is to provide participating water providers with approximately 40,000 acre-feet of new, reliable water supply each year. The Town originally signed up to participate in 1,000 acre-feet from NISP. Northern Water began the National Environmental Policy Act (NEPA) permitting process with 40,000 acre-feet, which consisted of both yield and firming storage. The viability of the firming storage component was challenged, and at that stage of the process, the NISP project was converted to solely a yield project versus a yield plus firming storage project. The volume of water originally requested by all participants was 31,000 acre-feet. By this time, Northern Water was deep into the permitting process for 40,000 acre-feet. Accordingly, Northern Water asked participants if they would increase their participation by a pro rata amount to keep the project at 40,000 acre-feet. Thus, Firestone's participation in NISP has increased to 1,300 acre-feet.

Over the long-term, both C-BT and NISP should be used to serve Firestone's potable water demand and not used for park and open space irrigation. These sources are expensive and can be treated at the Carter Lake Filter Plant by Central Weld County Water District for potable use.

## CHAPTER 2 – PARK AND OPEN SPACE DEMAND

The Parks and Open Space areas in Firestone consist mainly of turf grass and are currently being irrigated with C-BT water. **Figure 2** provides an overview of the parks discussed in this chapter. Park and Open Space areas are broken up into four main categories:

1. **Firestone Owned - Existing:** This category includes existing Town parks, areas surrounding Town government buildings, street right-of-ways, and other areas that the Town currently owns and maintains. This category totals an estimated 106 irrigated acres equating to approximately 212 acre-feet of water needed each year.
2. **Firestone Owned - Future:** This category is what the Town anticipates for the future in essentially the same grouping as the above category. It is estimated that this category will add an additional 233 irrigated acres equating to 465 acre-feet of additional water needed each year.
3. **Privately Owned - Existing:** This category includes areas typically managed by a home owners association (HOA) or a business park. These areas may include greenbelts, breezeways, small parks within the HOA, or other turf areas that are privately owned and maintained. Also included in this category are turf areas surrounding the various schools within Firestone's Town limits. This category totals an estimated 115 irrigated acres equating to approximately 229 acre-feet of water needed each year.
4. **Privately Owned - Future:** This category is what is anticipated in the future for privately owned and maintained turf areas. It is estimated that this category will add an additional 41 irrigated acres equating to 81 acre-feet of additional water needed each year.

The primary source for the original delineation of the various categories came from the shape files (ArcGIS) provided by Mr. Theo Abkes, Firestone's Public Works Director. The original shape files were already categorized into two categories: Firestone Owned and Privately Owned. After initially analyzing the original shape files within a map of Firestone's surrounding area, we conducted a site tour of the various parks and open spaces with Mr. Abkes. This park tour helped clarify which areas were currently being irrigated (existing) and which areas were potentially to be irrigated at a later date (future). During that park tour, additional clarification was made on each area to verify if it was Firestone owned or privately owned. Changes and updates were made to the shape files accordingly. Mr. Abkes also indicated some additional potential areas that could be delineated for non-potable irrigation. Examples of these areas were mostly the various schools within Firestone's town limits, but other areas included some businesses and other open spaces. New shape files were created to delineate

the newly suggested areas. Additional information was provided by Firestone in the form of a table that listed irrigated areas and if those areas were maintained by Firestone and an HOA. For each area the following was provided: 1) the number of dedicated shares of C-BT water, 2) estimated acreage, and 3) the number of C-BT used in 2014. This additional information was incorporated into the processing of the shape files and park tour.

Utilizing aerial imagery, some larger delineated areas (typically parks) were re-delineated to better represent the actual irrigated areas. Larger unirrigated areas (i.e., basketball courts, playground areas, parking lots, etc.) were eliminated in this process. For existing irrigated areas (both Firestone owned and privately owned areas) the total delineated acreages were considered to be 100% irrigated. For future irrigation, an estimate was made regarding how much of the total delineated area would be irrigated. Delineations for future irrigated areas fell under three categories with the corresponding irrigation percentages:

1. For future Greenbelts, we assumed that 100% of the total delineated acreage was irrigated.
2. For future Parks, open spaces, and land tracks, we assumed that 50% of the total delineated acreage was irrigated.
3. For future Residential and Commercial areas, we assumed that 30% of the total delineated acreage was irrigated.

Mr. Abkes also helped to clarify and confirm some of the new delineations as well as some questions about the original delineations.

**Table 1 – Table 3** list all the parks and open spaces, the existing acreages, estimated irrigated acreages, and the estimated irrigation requirements. Irrigation requirements are calculated using 2.0 acre-feet/acre as per an average of Colorado Irrigation Guide (1988) and Colorado's Net Irrigation Requirements (1995).

**Appendix B** includes a recent satellite or aerial image of each designated park or open space area listed in **Table 1 – Table 3**. The "Map No." column corresponds with the map number in **Appendix B**.

The total irrigation requirement at build-out is estimated at 988 acre-feet for the Town. Currently, approximately 442 acre-feet of C-BT water is being utilized for the Town's irrigation needs, and under current policies, the future 546 acre-feet will be as well. As mentioned previously, it is wise-water management to not use high-priced C-BT for irrigation. This is an important reason for the Town to acquire other supplies to meet this need.

**Table 1: Irrigation Estimates for Firestone Owned - Existing Parks and Open Space Areas**

Park or Open Space Name	Total Existing Acreage	Estimated Irrigation Percentage	Total Irrigated Existing Acreage	Estimated Irrigation Requirements 2.0 ac-ft/acre (ac-ft)	Shape Letter Designation	Map No.
<b>Firestone Owned - Existing</b>						
Adams Bank Entry	0.43	100%	0.43	0.86	AB-F	39
Aisik's Meadow	4.00	100%	4.00	8.00	AM-F	11
Booth Farms	9.69	100%	9.69	19.38	BF-F	30
Detention Pond at 4th St and Buchanan Ave	0.14	100%	0.14	0.28	DP-F	45
Firestone Center	1.33	100%	1.33	2.66	FC-F	1
Firestone City Centre	1.25	100%	1.25	2.50	FCC-F	27
Firestone Sports Field Site	11.35	100%	11.35	22.70	FSF-F	13
Harney Park	4.18	100%	4.18	8.36	HP-F	15
Hart Park	6.66	100%	6.66	13.32	HtP-F	47
High Plains Marketplace	2.58	100%	2.58	5.16	HPM-F	16
Jacob H Firestone	2.44	100%	2.44	4.88	JF-F	48
Miners Park	2.09	100%	2.09	4.18	MP-F	49
Mountain Shadows	1.00	100%	1.00	2.00	MS-F	3
Mountain Shadows Park	12.91	100%	12.91	25.83	MSP-F	4
Oak Meadows	1.97	100%	1.97	3.94	OM-F	9
Onorato Park	0.45	100%	0.45	0.90	OP-F	50
Patterson Park	3.53	100%	3.53	7.06	PtP-F	17
Prairie Ridge Park	3.81	100%	3.81	7.62	PRP-F	19
Safeway	3.59	100%	3.59	7.18	SW-F	41
Sagebrush	0.46	100%	0.46	0.92	SB-F	22
Sagebrush Park	6.50	100%	6.50	13.01	SBP-F	21
Settlers Park	11.91	100%	11.91	23.82	SP-F	10
St Vrain Ranch	2.35	100%	2.35	4.70	SVR-F	23
Stoneridge	6.75	100%	6.75	13.50	SR-F	35
Stoneridge Park	4.32	100%	4.32	8.64	SRP-F	34
Town Hall	0.42	100%	0.42	0.84	TH-F	42
<b>Total Firestone Owned - Existing</b>	<b>106.12</b>		<b>106.12</b>	<b>212.24</b>		

**Table 2: Irrigation Estimates for Privately Owned - Existing Parks and Open Space Areas**

Park or Open Space Name	Total Existing Acreage	Estimated Irrigation Percentage	Total Irrigated Existing Acreage	Estimated Irrigation Requirements 2.0 ac-ft/acre (ac-ft)	Shape Letter Designation	Map No.
<b>Privately Owned - Existing</b>						
Booth Farms	9.55	100%	9.55	19.10	BF-H	30
Centennial Elem School	6.57	100%	6.57	13.14	CES-H	31
Coal Ridge Middle School	19.46	100%	19.46	38.92	CRMS-H	12
Del Camino Junction Business Park	13.65	100%	13.65	27.30	DCBP-H	6
Eagle Crest Mobile Home Park	5.77	100%	5.77	11.54	EC-H	26
Firestone City Centre	0.20	100%	0.20	0.40	FCC-H	27
High Plains Marketplace	1.73	100%	1.73	3.46	HPM-H	16
Home Depot	0.20	100%	0.20	0.40	HD-H	28
Imagine Charter School	2.89	100%	2.89	5.78	ICS-H	2
Monarch Est	8.20	100%	8.20	16.40	ME-H	29
Mountain Shadows	0.20	100%	0.20	0.40	MS-H	3
Oak Meadows	2.69	100%	2.69	5.38	OM-H	9
Overlook At Firestone	2.18	100%	2.18	4.36	OAF-H	51
Prairie Ridge Elem School	5.81	100%	5.81	11.62	PRES-H	18
Ridge Crest	7.67	100%	7.67	15.34	RC-H	20
Saddleback Heights	1.58	100%	1.58	3.16	SH-H	38
Sagebrush	5.78	100%	5.78	11.56	SB-H	22
Shores	2.50	100%	2.50	5.00	Shs-H	5
St Vrain Ranch	1.99	100%	1.99	3.97	SVR-H	23
Stoneridge	16.03	100%	16.03	32.06	SR-H	35
<b>Total Privately Owned - Existing</b>	<b>114.65</b>		<b>114.65</b>	<b>229.29</b>		
<b>Total Existing</b>	<b>220.76</b>		<b>220.76</b>	<b>441.53</b>		

**Table 3: Irrigation Estimates for Town Owned and Privately Owned Future Parks and Open Space Areas**

Park or Open Space Name	Total Existing Acreage	Estimated Irrigation Percentage	Total Irrigated Existing Acreage	Estimated Irrigation Requirements 2.0 ac-ft/acre (ac-ft)	Shape Letter Designation	Map No.
<b>Firestone Owned - Future</b>						
Firestone Central Park	262.00	50%	131.00	262.00	FCP-F	36
Firestone Trail	86.67	50%	43.33	86.67	FT-F	8, 14, 37, 40
Firestone Villas	13.56	50%	6.78	13.56	FV-F	46
Future Park	4.94	50%	2.47	4.94	FP-F	47
Mountain Shadows	2.07	100%	2.07	4.14	MS-F	3
Neighbors Point	29.21	30%	8.76	17.53	NP-F	32
Saddleback Heights	2.70	50%	1.35	2.70	SH-F	38
Unnamed (Booth Farms Minor)	32.41	30%	9.72	19.45	UN(B)-F	24
Unnamed (Firestone Trail NE of Town Limits)	52.77	50%	26.38	52.77	UN(FT)-F	43, 44, 52
Unnamed (Neighbors)	1.57	50%	0.79	1.57	UN(N)-F	33
<b>Total Firestone Owned - Future</b>	<b>487.90</b>		<b>232.66</b>	<b>465.32</b>		
<b>Privately Owned - Future</b>						
American Furniture Warehouse	6.52	30%	1.96	3.91	AFW-H	25
Booth Farms	0.13	100%	0.13	0.26	BF-H	30
Firestone Center	2.99	30%	0.90	1.79	FC-H	1
Firestone City Centre	2.07	100%	2.07	4.14	FCC-H	27
Firestone Meadows	2.64	100%	2.64	5.28	FM-H	7
Grant Brothers Minor	2.88	30%	0.86	1.73	GBM-H	25
Home Depot	0.53	100%	0.53	1.06	HD-H	28
Monarch Est	2.76	100%	2.76	5.52	ME-H	29
Mountain Shadows	2.49	100%	2.49	4.98	MS-H	3
Neighbors Point	0.65	100%	0.65	1.30	NP-H	32
Oak Meadows	6.23	50%	3.11	6.23	OM-H	9
Overlook At Firestone	0.12	100%	0.12	0.24	OAF-H	51
Sagebrush	6.56	100%	6.56	13.12	SB-H	22
Shores	6.21	30%	1.86	3.73	Shs-H	5
St Vrain Ranch	3.17	100%	3.17	6.34	SVR-H	23
Stoneridge	10.69	100%	10.69	21.38	SR-H	35
<b>Total Privately Owned - Future</b>	<b>56.64</b>		<b>40.50</b>	<b>81.01</b>		
<b>Total Future</b>	<b>544.54</b>		<b>273.17</b>	<b>546.33</b>		

## CHAPTER 3 – POTENTIAL SOURCES OF SUPPLY

### POTENTIAL SOURCES OF NEW WATER SUPPLY

There are regional sources of water supply that potentially are available to meet Firestone's near and long-term non-potable water demands. The obvious sources to consider are the native water supplies that have been historically used for irrigated agriculture in the areas surrounding Firestone. Some of these sources of supply are relatively senior and were used on lands within the Town growth boundary. In certain situations, it may be possible to irrigate parks, open space areas, and possibly even residential and commercial landscapes with these sources of water supply. Use of this water for irrigation would reduce the amount of water required from the potable water system, thereby extending the life of the Town's potable supplies. **Figure 3** shows a map of the sources of supply potentially available to Firestone.

The sources of water analyzed in this plan may potentially suit Firestone's needs, but some may not be feasible due to location, costs, or a variety of other reasons. Until the Town constructs a local water treatment plant, these rights cannot be used for potable uses. However, the potential sources of water investigated can be used for non-potable irrigation of parks and open space areas either directly or by augmentation of a new well source. Should the Town build a water treatment plant or participate in a regional water treatment plant in the future, these sources could potentially be converted to potable use, which is a great safeguard against purchasing any unneeded water.

Senior water rights should be considered for irrigation first. Senior water rights with a firm dry-year yield can be relied upon as a substitute to potable water for irrigation. More junior water rights can also be considered, so long as there is a storage component to add surety to its delivery.

Groundwater is another source to consider for non-potable uses. Available groundwater may include tributary groundwater as well as non-tributary groundwater. We explore these potential water sources later in this report.

### BOULDER AND WELD COUNTY DITCH

The Boulder and Weld County Ditch is located southwest of Town. Its headgate diverts from Boulder Creek in Section 15, Township 1N, Range 69W in the 6<sup>th</sup> P.M., Boulder County, Colorado. The ditch has 20 shares and diverts under two priorities, 4-1-1863 and 5-1-1871. We were not able to find any change cases for this water right at this time.

#### Advantages

- This is a fairly senior water right.

### Disadvantages

- Since the water right has not been changed, there is no precedent data out there as far as deliveries and consumptive use.
- The Town does not want to be the first applicant to change this water right through Water Court.

### Recommendation

Boulder and Weld County Ditch shares should be considered only on a case-by-case basis as opportunities arise. Due to its location and the fact that the water has not been changed through Water Court, Boulder and Weld will be less feasible for the Town to acquire and use.

### **CARR AND TYLER DITCH**

The decreed headgate location of the Carr and Tyler Ditch is on the north bank of Idaho Slough (aka Idaho Creek) in Section 29, Township 2N, Range 68W in the 6<sup>th</sup> P.M., Weld County, Colorado. The Carr and Tyler Ditch was originally decreed in Case No. CA1287 with a priority date of June 1, 1864 for 33.73 cfs. Its average yield is 3.1 acre-feet per percentage interest in the Ditch and the average consumptive use is approximately 1.3 acre-feet per percentage interest.

### Advantages

- This is a good water right that is suitable for non-potable use.

### Disadvantages

- None of the lands within Town limits were historically irrigated by Carr and Tyler Ditch, so use for non-potable irrigation will require a change of use in Water Court.

### Recommendation

The Town should pursue purchase of this water right. However, until there is infrastructure in place to get this water right to Town, the water would likely be changed and stored for well augmentation use.

### **LOWER BOULDER DITCH**

The New Consolidated Lower Boulder Reservoir and Ditch Company owns the Lower Boulder Ditch. Its headgate is on the south bank of Boulder Creek in the SW  $\frac{1}{4}$ , SW  $\frac{1}{4}$ , Section 16, Township 1N, Range 69W in the 6<sup>th</sup> P.M., Boulder County, Colorado. Lower Boulder Ditch was the very first ditch to file for water on Boulder Creek. Lower Boulder has been expanded and lengthened over the years. Today it is 32 miles long and flows out past Frederick to the edge of Firestone. Lower Boulder Ditch Company

built Baseline Reservoir, starting construction in 1911. They also fill several reservoirs in Weld County. Lower Boulder water is valuable, since it is the #1 priority, and many cities have bought shares and transferred them to municipal use.

The Lower Boulder Ditch has both preferred shares and common shares. The preferred shares are very senior. The ditch has 199.9767 preferred shares and 197.7793 common shares. Its most senior priorities (appropriation dates) are October 1, 1859 (Priority No.1) for 25.0 cubic feet per second (cfs), and June 1, 1870 (Priority No. 32) for 97.0 cfs. On average, the preferred shares deliver 34.5 acre-feet per share and the common shares delivery 11.5 acre-feet per share. Average consumptive use for the preferred shares are 19.8 acre-feet per share and the consumptive use for the common shares are 6.6 acre-feet per share.

The New Consolidated Lower Boulder Ditch Company owns 460 units of C-BT, which it uses to supplement deliveries for its common shares. Pursuant to the Articles of Incorporation and By-laws of the New Consolidated Lower Boulder Reservoir and Ditch Company, holders of preferred capital stock are entitled to receive all of the water available under the October 1, 1859 priority and the first 23.0 cfs of the water available under the June 1, 1870, priority. Holders of common shares receive all water available in the ditch in excess of 48.0 cfs, but less than 96 cfs. Flows in excess of 96.0 cfs are distributed between all shareholders based on pro-rata stock ownership. The New Consolidated Lower Boulder Reservoir and Ditch Company also owns shares of capital stock issued by the Baseline Land and Reservoir Company and, therefore, its shareholders receive water stored in Baseline Reservoir.

Baseline Land and Reservoir Company

The Baseline Land and Reservoir Company owns Baseline Reservoir, and the storage priorities decreed to the reservoir are listed in **Table 4**:

**Table 4: Baseline Land and Reservoir Company Storage Right**

Date of Decree	Priority Date	Amount (ac-ft)
06-21-1926	11-04-1904	2,930
01-09-1935	11-29-1922	1,672
09-28-1953	12-31-1929	1,395 (1)
09-28-1953	11-30-1935	847

(1) Refill priority

The Lower Boulder Ditch turns into the Coal Ridge Ditch, which traverses the southern part of Town near Saddleback Golf Course. Lower Boulder preferred shares are a good water supply option that should be considered to meet the Town’s future non-potable water needs. Lower Boulder can be used for non-potable uses as it is a very senior water right. Furthermore, should the Town ever construct a local water treatment plant, Lower Boulder would provide a reliable potable water supply.

### Advantages

- Lower Boulder preferred shares are very senior.
- The ditch runs near the Town limits and is capable of being delivered within Town limits through the Coal Ridge Ditch.

### Disadvantages

- Use for non-potable irrigation on lands not historically irrigated with the water right will require a change of use in Water Court.

### Recommendation

Due to the convenient location of the Lower Boulder Ditch and its seniority, the Town should actively pursue purchase of this water right. The Town should also allow this water right to be dedicated to meet development raw water requirements on a case-by-case basis.

## **COAL RIDGE DITCH**

The New Coal Ridge Ditch Company (Coal Ridge) water right shares the Lower Boulder Ditch. Deliveries associated with the Coal Ridge water right are measured in Section 25, Township 2N, Range 68W in the 6<sup>th</sup> P.M., Weld County, Colorado. Coal Ridge owns multiple shares of several ditch companies including the following: 48.67 of 199.9767 preferred shares and 6 out of 197.7793 common capital stock of Lower Boulder Ditch Company, 5/38<sup>th</sup> interest of Dry Creek Davidson Ditch, 5 of 44 shares of Enterprise Ditch, all rights decreed to Central Ditch, and all rights decreed to South Ditch. There are 2,116 shares in the Coal Ridge Ditch. Coal Ridge also owns 114 shares of 553 shares of the capital stock issued and outstanding in the Baseline Land and Reservoir Company.

### Dry Creek Davidson Ditch

The Dry Creek Davidson Ditch (Dry Creek Ditch) has an appropriation date of May 1, 1863 (Priority No. 7) for 2.6 cfs representing the Coal Ridge interest. Dry Creek Ditch shares the Lower Boulder Ditch headgate.

### Enterprise Ditch Company

The Enterprise Ditch has an appropriation date of February 1, 1865 from South Boulder Creek (Priority No. 12) for 3.872 cfs representing the Coal Ridge interest. Enterprise Ditch shares the Lower Boulder Ditch headgate.

### Central Ditch

All rights decreed to the Central Ditch are from South Boulder Creek. The Central Ditch was decreed in the District Court in Boulder County in Civil Action No. 1282 on June 2, 1882 for 14.36 cfs for irrigation purposes with an appropriation date of May 15, 1866 (Priority No. 16). In Civil Action No. 6524 by decree dated July 22, 1913, the point of diversion for the Central Ditch was changed to the Lower Boulder Ditch headgate and the rate of flow was decreased to 2.667 cfs.

### South Ditch

All rights decreed to the South Ditch are from South Boulder Creek. The South Ditch was decreed by the District Court in Boulder County in Civil Action No. 1282 on June 2, 1882 for 9.16 cfs for irrigation purposes with an appropriation date of June 1, 1866 (Priority No.19). In Civil Action No. 6524 by decree dated July 22, 1913, the point of diversion for the South Ditch was changed to the Lower Boulder Ditch headgate and the rate of flow was reduced to 1.0 cfs.

**Table 5** summarizes the ditch shares owned by Coal Ridge.

**Table 5: Coal Ridge Ownership Summary**

Name of Ditch Company	Date of Decree	Priority Date	Max. Flow Rate (cfs)	Coal Ridge Ownership
Lower Boulder Preferred	06-02-1882	10-01-1859	25.0	48.67/200
	06-02-1882	06-01-1870	23.0 (1)	48.67/200
Lower Boulder Common	06-02-1882	06-01-1870	48.0	6/200
Lower Boulder Preferred/Common	06-02-1882	06-01-1870	26.0 (2)	54.67/400
Dry Creek Davidson	06-02-1882	05-01-1863	2.6	5/38 <sup>ths</sup> interest
Enterprise Ditch	06-02-1882	02-01-1865	3.872	5/44
Central Ditch	06-02-1882	05-15-1866	2.667	All
South Ditch	06-02-1882	06-01-1866	1.0	All

(1) Preferred shareholders receive the first 23.0 cfs under the June 1, 1870 priority.

(2) Preferred and common shareholders share equally the last 26.0 cfs of the June 1, 1870 priority.

Per Case No. 90CW108, in which 35 shares of Coal Ridge were changed, the applicants received a maximum allowable delivery of approximately 2.3 acre-feet per share. A consumptive use amount could not be determined from Case No. 90CW108. The Coal Ridge Ditch is essentially an extension of the Lower Boulder Ditch and traverses the southern part of Town near Saddleback Golf Course.

### Advantages

- Since a portion of Coal Ridge diverts under the Lower Boulder priority, it is senior and suitable for non-potable irrigation.
- Because the Town has lands historically irrigated under the ditch, some acquisition can occur with annexation.

### Disadvantages

- Use for non-potable irrigation on lands above the ditch will require a change of use in Water Court.

### Recommendation

The Coal Ridge Ditch is a good water right for non-potable irrigation for the Town. The ditch runs along the southern portion of Town, so most areas can be gravity fed. The Town should actively pursue purchase of this water right. The Town should also allow this water right to be dedicated to meet development raw water requirements on a case-by-case basis, particularly for lands within Town that were historically irrigated with this water.

## **DELEHANT DITCH**

The Delehant Ditch (a.k.a. Tom Delehant Ditch) decree describes the headgate location as being on the south bank of Idaho Slough (aka Idaho Creek) in Section 29, Township 2N, Range 68W of the 6th P.M., Weld County, Colorado. The Delehant Ditch was originally decreed in Case No. CA1291 with a priority date of May 1, 1865 for 37.12 cfs. In Case No. 84CW204, a total of 27.12 cfs was abandoned resulting in a net amount of 10.0 cfs. Its average yield is 3.35 acre-feet per percentage interest in the Ditch and the average consumptive use is approximately 1.36 acre-feet per percentage interest.

### Advantages

- This is a good water right that is suitable for non-potable use.

### Disadvantages

- None of the lands within Town limits were historically irrigated by Delehant Ditch, so use for non-potable irrigation will require a change of use in Water Court.

### Recommendation

The Town should pursue purchase of this water right. However, until there is infrastructure in place to get this water right to Town, the water would likely be changed and stored for well augmentation use.

## **GODDING, PLUMB AND DAILEY DITCH**

The Plumb and Dailey Ditch Company maintains, operates, and owns the water rights to the Godding, Plumb, and Dailey Ditch. The headgate of the Godding, Plumb and Dailey Ditch diverts from Boulder Creek in Section 31, Township 2N, Range 68W of the 6th P.M., Weld County, Colorado. The Godding, Plumb and Dailey Ditch was originally decreed in Case No. CA1275 with priority dates of March 3, 1861 and April 1, 1865 for 30.438 cfs.

The Plumb and Dailey Ditch Company is a relatively small irrigation company with only 40 shares owned by fewer than two dozen people/entities. The Godding, Plumb and Dailey Ditch historically irrigated land on the west side of Boulder Creek. To date, no change cases have been done for Godding, Plumb and Dailey shares so the average yield and consumptive use are not known at this time.

### Advantages

- This is a good water right that is suitable for non-potable use.
- This water right has a senior priority date.

### Disadvantages

- None of the lands within Town limits were historically irrigated by Godding, Plumb and Dailey Ditch, so use for non-potable irrigation will require a change of use in Water Court.
- The Town does not want to be the first applicant to change this water right through Water Court.

### Recommendation

The Town should pursue purchase of this water right. However, until there is infrastructure in place to get this water right to Town, the water would likely be changed and stored for well augmentation use.

## **HIGHLAND SOUTH SIDE DITCH (AKA GODDING DITCH)**

The Godding Ditch Company owns the Highland South Side Ditch (aka Godding Ditch). The Godding Ditch has an appropriation date of June 1, 1865 for 99.7 cfs and an appropriation date of June 1, 1868 for 52.5 cfs from Boulder Creek. The headgate location is in the NE  $\frac{1}{4}$ , NW  $\frac{1}{4}$ , SW  $\frac{1}{4}$  Section 21, Township 2N, Range 68W of the 6th P.M., Weld County, Colorado. There are 183 shares of stock in the Godding Ditch Company. Godding Ditch has an average delivery of 27.2 acre-feet per share. In Case No. 01CW255, in which 23 shares of Godding Ditch shares were changed, the average annual consumptive use was determined to be approximately 7.3 acre-feet per share.

The Godding Ditch enters the western edge of Firestone near Sable Avenue and flows toward the middle of Town before turning due north. Most of the lands within Firestone are located above the ditch, and thus not historically irrigated with this water. Potential irrigation of future lands within Firestone with Godding Ditch will require pumping and a change of use in Water Court.

#### Advantages

- Godding Ditch is at a good location for direct use for non-potable irrigation.

#### Disadvantages

- Use for non-potable irrigation will require a change of use in Water Court since most of the lands within Town limits are above the ditch and thus not historically irrigated with Godding Ditch water.

#### Recommendation

The Town should actively pursue purchase of this water right. The Town should also allow this water right to be dedicated to meet development raw water requirements on a case-by-case basis, particularly for lands within Town that were historically irrigated with this water.

### **HOUCK NO. 2 DITCH**

Houck No. 2 Ditch was previously decreed June 2, 1882 with an appropriation date of April 1, 1861 for 7.16 cfs from Boulder Creek for irrigation purposes. The decreed headgate location is where Idaho Slough (a.k.a. Idaho Creek) leaves Boulder Creek. Idaho Creek leaves Boulder Creek in the SE ¼, Section 30, Township 2N, Range 68W, 6th P.M., Weld County, Colorado. The Houck No. 2 Ditch historically irrigated up to 500 acres of land in Sections 20, 21, and 29, Township 2N, Range 68W of the 6<sup>th</sup> P.M., Weld County, Colorado.

Currently, the Houck No. 2 Ditch is owned exclusively by one owner and they are applying for a change of water right and plan for augmentation in Division No. 1 Water Court. Based on the Water Court application, the Houck No. 2 water right yields 255 acre-feet per year with a consumptive use of approximately 129 acre-feet per year.

#### Advantages

- The owner has storage along with the Houck No. 2 water right.
- This is a very senior water right.

### Disadvantages

- None of the lands within Town limits were historically irrigated by Houck No. 2 Ditch, so use for non-potable irrigation will require a change of use in Water Court.

### Recommendation

The Town should pursue purchase of this water right. However, until there is infrastructure in place to get this water right to Town, the water would likely be changed and stored for well augmentation use.

## **LAST CHANCE DITCH**

The Last Chance Ditch is located north of Town. Its headgate diverts from the St. Vrain River in Section 3, Township 2N, Range 68W in the 6<sup>th</sup> P.M., Weld County, Colorado. The ditch has 20 shares and diverts under two priorities, 3-15-1872 and 6-30-1878. Its average yield is 462 acre-feet per share. We were unable to locate any Water Court change cases for this water right.

### Advantages

- The ditch is at a good location.

### Disadvantages

- Since the water right has not been changed, there is no precedent data out there as far as deliveries and consumptive use.
- The Town does not want to be the first applicant to change this water right through Water Court.

### Recommendation

The Town should actively pursue the purchase of this water right. The ditch is well situated to fill Hokestra Pit storage, which is discussed in the next chapter.

## **LUPTON BOTTOM DITCH**

The Lupton Bottom Ditch originates in the South Platte River Basin. Its headgate is located in Section 19, Township 1N, Range 66W in the 6<sup>th</sup> P.M., Weld County, Colorado. The ditch has 82.5 shares and diverts under three priorities, 5-15-1863, 3-10-1871 and 9-15-1873. The majority of Lupton Bottom Ditch Company stock is owned by the Lupton Meadow Ditch Company, which owns 43 out of the 82.5 Lupton Bottom Ditch shares, or approximately a 52.1 percent interest. Its average delivery is 220.2 acre-feet per share with an average annual consumptive use of approximately 54 acre-feet per share.

### Advantages

- This is a senior water right.

### Disadvantages

- None of the lands within Town limits were historically irrigated by Lupton Bottom Ditch, so use for non-potable irrigation will require a change of use in Water Court.
- The ditch is not at a good location for non-potable use for the Town.

### Recommendation

Lupton Bottom Ditch should not be considered at this time due to its location and distance from Firestone. As shares of Lupton Bottom shift from agriculture to municipal use, either directly or for augmentation, there is uncertainty of receiving full yields at the end of the system. Firestone has better options for new water supplies for non-potable irrigation.

## **PANAMA RESERVOIR 1**

The Panama Reservoir 1 was decreed in Case No. 6672 on June 21, 1926 with an appropriation date of May 31, 1904 for 7,000 acre-feet and in Case No. 12111 on September 28, 1953 with an appropriation date of December 31, 1929 for 7000 acre-feet for refilling Panama Reservoir 1, both for irrigation use. In Case No. 84CW204, 2,011 acre-feet of the original 7,000 acre-feet was abandoned. The reservoir is located in portions of Sections 35 and 36, Township 2N, Range 69W of the 6th P.M., Boulder County, Colorado.

Panama Reservoir 1 was originally operated by the Boulder and Weld Reservoir Company. In October 2010, the Boulder and Weld Reservoir Company and the Six Mile #2 Reservoir Company merged with the Boulder and White Rock Ditch and Reservoir Company, which at the time owned roughly 90 percent of the stock in the two Reservoir Companies.

In Case No. 01CW255, a portion of two water rights (Boulder and Weld Reservoir shares and Six Mile No. 2 Reservoir shares) that are stored in Panama Reservoir 1 were changed. The average annual consumptive use of the Boulder and Weld Reservoir shares totaled 0.65 acre-feet per share and the average annual consumptive use of the Six Mile No. 2 Reservoir shares totaled 0.47 acre-feet per share.

### Advantages

- Reservoir rights could offer some benefits with the storage component and timing of use.

### Disadvantages

- None of the lands within Town limits were historically irrigated by Panama Reservoir 1, so use for non-potable irrigation will require a change of use in Water Court.
- The location of the water right may prove problematic.

### Recommendation

Panama Reservoir 1 should not be considered at this time. The location of Panama Reservoir 1 makes the other water right alternatives more appealing.

## **RURAL DITCH**

The Rural Ditch was decreed in Case No. 1336 on June 2, 1882 with an appropriation date of May 10, 1862 (Priority No. 12) for 22.75 cfs and an appropriation date of March 10, 1863 (Priority No. 15) for 175.54 cfs from Boulder Creek. For the 1863 water right, 115.29 cfs of the 175.54 cfs was abandoned by decree in Case No. 84CW412. The decreed use is irrigation. The ditch diverts water from Boulder Creek at a point on the east bank of the creek in the NE ¼ of Section 20, Township 2N, Range 68W, 6th P.M., Weld County, Colorado. Water is carried in the ditch to Idaho Creek, a branch of Boulder Creek, and re-diverted at a point on the east bank of Idaho Creek in the SE ¼ of Section 16, Township 2N, Range 68W, in the 6th P.M., Weld County, Colorado. The general course of the ditch is northeasterly. There are 50 shares of stock in the Rural Ditch Company. Rural Ditch water averages approximately 100 acre-feet of delivery per share with an estimated 50 acre-feet per share consumptive use credit.

The Rural Ditch runs along the northern edge of Firestone's growth boundary. Most of the lands within Firestone are located above the ditch, and thus not historically irrigated with this water. Potential irrigation of future lands within Firestone with Rural Ditch will require pumping and a change of use in Water Court.

### Advantages

- Rural Ditch water is senior.
- The ditch is located close to Town.

### Disadvantages

- Use for non-potable irrigation will require a change of use in Water Court since most of the lands within Town limits are above the ditch and thus not historically irrigated with Rural Ditch water.

### Recommendation

The Town should actively pursue purchase of this water right. The ditch is well situated to fill Hokestra Pit storage, which is discussed in the next chapter. The Town should also allow this water right to be dedicated to meet development raw water requirements on a case-by-case basis.

## RECOMMENDED WATER SUPPLIES

Of the water rights listed prior to this summary, the only options that are not recommended for further pursuit for the Town of Firestone are the Lupton Bottom Ditch and Panama Reservoir 1. **Table 6** lists water rights recommended for purchase or potential dedication to meet raw water requirements for new developments. The recommended water rights are separated into three tiers that consider seniority, location and other factors: 1) Tier 1 water rights should be actively pursued, 2) Tier 2 water rights should be considered on a case-by-case basis and at a minimum meet with any water right owner of these rights, and Tier 3 water rights are not recommended at this time.

**Table 6: Recommended Water Rights**

Name of Water Right	Estimated Delivery (ac-ft/share or % interest)	Estimated Consumptive Use Credit (ac-ft/share or % interest)
<b>Tier 1</b>		
Coal Ridge Ditch	2.3	-
Highland South Side Ditch (aka Godding Ditch)	27.2	7.3
Last Chance Ditch	-	-
Lower Boulder Ditch - Preferred	34.5	19.8
Lower Boulder Ditch – Common	11.5	6.6
Rural Ditch	100	50
<b>Tier 2</b>		
Carr and Tyler Ditch	3.1	1.3
Delehant Ditch	3.35	1.36
Godding, Plumb and Dailey Ditch	59.33	-
Boulder and Weld County Ditch	-	-
Houck No. 2 Ditch	255	129
<b>Tier 3</b>		
Lupton Bottom Ditch	220.0	52.1
Panama Reservoir 1	128.8	128.8

## CHAPTER 4 – STORAGE ALTERNATIVES

Acquiring storage will allow the Town the flexibility to take delivery of the water supply when it is available and store it for later use in times of need. If the storage is properly located, releases of stored water rights can be used for augmentation of wells used to irrigate parks directly. The estimated build-out demand for park and open space irrigation is 988 acre-feet. The seniority of water rights factors largely into the amount of non-potable storage needed to meet this demand. For junior water rights, three to five times the demand may be the storage volume needed to provide reliability for irrigation. Senior water rights may only need 1.5 to two times the demand. Since Firestone currently does not own any non-potable water supplies, this factor is difficult to determine. For planning purposes, we suggest a little over two times the demand, or 2,000 acre-feet of non-potable storage for the Town.

The Town's future Central Park has proposed on-site storage. In the previous non-potable planning effort, it was envisioned that storage at Central Park would serve as a hub to daisy-chain together a Town-wide non-potable system. Although storage at Central Park will likely exist and serve a portion of the storage need, non-potable storage along the river will provide a better alternative to meet the broader need for several reasons:

1. Central Park will likely become the primary park amenity for the Town of Firestone. Because of this, it will be better to keep on-site storage as full as possible and have the fluctuating reservoir down along the river.
2. Storage on the river provides access to many more water rights. Once stored, releases can be made to augment well irrigation at parks or a pipeline could potentially be built to Town for direct non-potable irrigation.
3. In the future, Firestone will be generating fully consumable wastewater at the St. Vrain Sanitation Wastewater Treatment Plant (WWTP). Storage along the river will allow exchange and storage of this fully consumable water, which can be captured and reused.

### HOKESTRA PIT – STORAGE

The Hokestra Pit is located in the N ½ of Section 2, Township 2N, Range 68W and the S ½ of Section 35, Township 3N, Range 68W of the 6<sup>th</sup> P.M. in Weld County, Colorado. The site is generally located northeast of the intersection of Interstate 25 and Highway 119 near Firestone. **Figure 4** is a vicinity map of the Hokestra Pit. Hokestra Pit is currently owned and operated by Weld County for gravel mining operations. The Hokestra Pit operation consists of twelve cells that were created as part of the mining operations on the property. **Table 6** outlines each cell and some basic information about each one. The cell numbers correspond to the same numbers on the vicinity map.

**Table 7: Hokestra Pit Storage Information**

Cell	Surface Area (acres)	Volume (ac-ft)	Notes
1	8.4	-	Utilized for Weld County’s Southwest Services Center, unlined, not available for storage
2	35.0	453	Clay Liner approved: October 7, 2014
3	9.9	~120	Unmined: South Slurry wall liner approved: October 7, 2014
4	20.9	~200	Unmined: North Slurry wall liner approved: October 7, 2014
5	12.6	253	Combined volume – Cells 5 and 6
6	10.8		
7	10.0	-	Unlined, not available for storage
8	4.3	-	
9	2.1	-	
10	5.5	-	
11	3.9	-	
12	12.5	-	

If the Town acquires 653 acre-feet of storage at the Hokestra Pit, it will still need approximately 1,400 acre-feet of additional non-potable storage in the future. We researched gravel pits in the area. We did not contact the gravel pit owners to determine if the sites are or will be lined for storage, nor did we determine if any of these sites are available for purchase. Once Hokestra Pit is acquired and the Town begins to acquire water rights, the Town can evaluate when the additional storage will be needed. The information provided in this report is a resource of potential gravel pits and contacts to pursue in the future.

**POTENTIAL STORAGE**

**Appendix C** includes a map and list of potential storage reservoirs that may be available to Firestone. A 2013 NAIP aerial image of Weld County available through the USDA-FSA-Aerial Photography Office was used to identify reservoirs and gravel pits located along the St. Vrain River between I-25 and the St. Vrain-South Platte confluence. GIS shapefiles available through the Colorado Decision Support Systems (CDSS) were then used to obtain general information on diversions, augmentation stations, gravel pits, and reservoirs. Further information on gravel pits and DRMS permits was obtained from a GIS shapefile available through the Colorado Division of Reclamation Mining and Safety. Property ownership was determined from a property mapping application available through the Weld County Office of the Assessor. Phone numbers were determined through existing contacts, general Google searches, or through the 411.info website. Not all of the listed phone numbers and contacts have been verified.

## CHAPTER 5 – GROUNDWATER AND WELL IRRIGATION

### SHALLOW GROUNDWATER WELLS

From the standpoint of flexibility, shallow groundwater wells are ideal for non-potable irrigation. Wells can be operated on demand and are not tied to the seasonal fluctuations of surface water rights. The downside to well use is power costs from pumping and the need for augmentation. Augmentation is the one-for-one replacement back to the stream for every gallon of water that is pumped and consumptively used. This augmentation can be accomplished with the purchase of native water supplies and storage along the river.

**Figure 2** shows groundwater wells in the vicinity of the Town. Many of the identified wells are labeled with volume rates and water levels to give a general idea of what the Town might expect if it decide to utilize wells for parks and open space irrigation.

As the non-potable system is designed, the Town should consider drilling shallow wells strategically around the Town for irrigation as it makes sense. Test wells can be drilled and pump tests completed to determine if wells at certain locations can produce the needed volumes to sustain irrigation at those parks or open space areas.

### DEEP GROUNDWATER WELLS

The deep groundwater underlying the Town is limited in both production rate and total volume. Most of the groundwater is classified as not non-tributary (NNT). NNT water is hydraulically connected to the river system, but well pumping impacts from pumping NNT water are much more delayed than with tributary water. NNT augmentation obligations from well pumping may extend hundreds of years into the future from pumping today.

All groundwater below Firestone originates in the Laramie-Fox Hills aquifer. The central and northern edge of Town limits has NNT water approximately 300 feet below the ground surface. Pumping NNT water is not feasible due to the cost of pumping the deep water and the long-term impacts to the river system. In addition, drilling wells into these deep sources is expensive.

There is a limited amount of NT groundwater located on the eastern and southern edges of Town limits. The small amount of NT water is borne from the Laramie-Fox Hills aquifer and is located approximately 500 feet below the ground surface. NT water is different than NNT in that it is hydraulically separated from the surface water system. NT water can be used up to 98% extinction without augmentation. The State allocates NT water based on surface land ownership and a 100-year aquifer life. Because the aquifer does not recharge naturally, it is a finite resource.

### Advantages

- Irrigation from wells provides operational flexibility.
- NT groundwater can be used to 98% extinction without augmentation.

### Disadvantages

- NNT water requires augmentation for hundreds of years into the future for pumping today.
- NT and NNT sources are deep, and the cost to drill wells into these formations is expensive.
- Both sources have limited production capability in this area, yielding 15-20 gallons per minute (gpm) per well on average and a maximum of 50 gpm per well.
- Pumping these sources of water is expensive for non-potable irrigation.
- NT groundwater is a finite water source, so it should only be used as a supplemental supply.

### Recommendation

NNT groundwater will never be a good option for the Town due to the augmentation obligations and should not be considered. NT groundwater is a potential option for non-potable irrigation, although the Town has much better options at this time. NT water is deep and can be expensive to pump for irrigation. NT and NNT wells should not be considered at this time.

## CHAPTER 6 – CONCLUSIONS AND RECOMMENDATIONS

It is important for the Town Board and staff to have a clear understanding of the direction it will take regarding its non-potable water supplies. The conclusions and recommendations in this chapter will provide the needed steps that should be completed for successful implementation of this Non-Potable Water Rights Master Plan. The Town Board and staff can be confident that the recommendations proposed in this plan will help position the Town well to meet existing and future non-potable demands, while expanding and diversifying the Town's water portfolio. In addition, should a regional treatment plant be constructed, many of these supplies could be strategically converted to potable use.

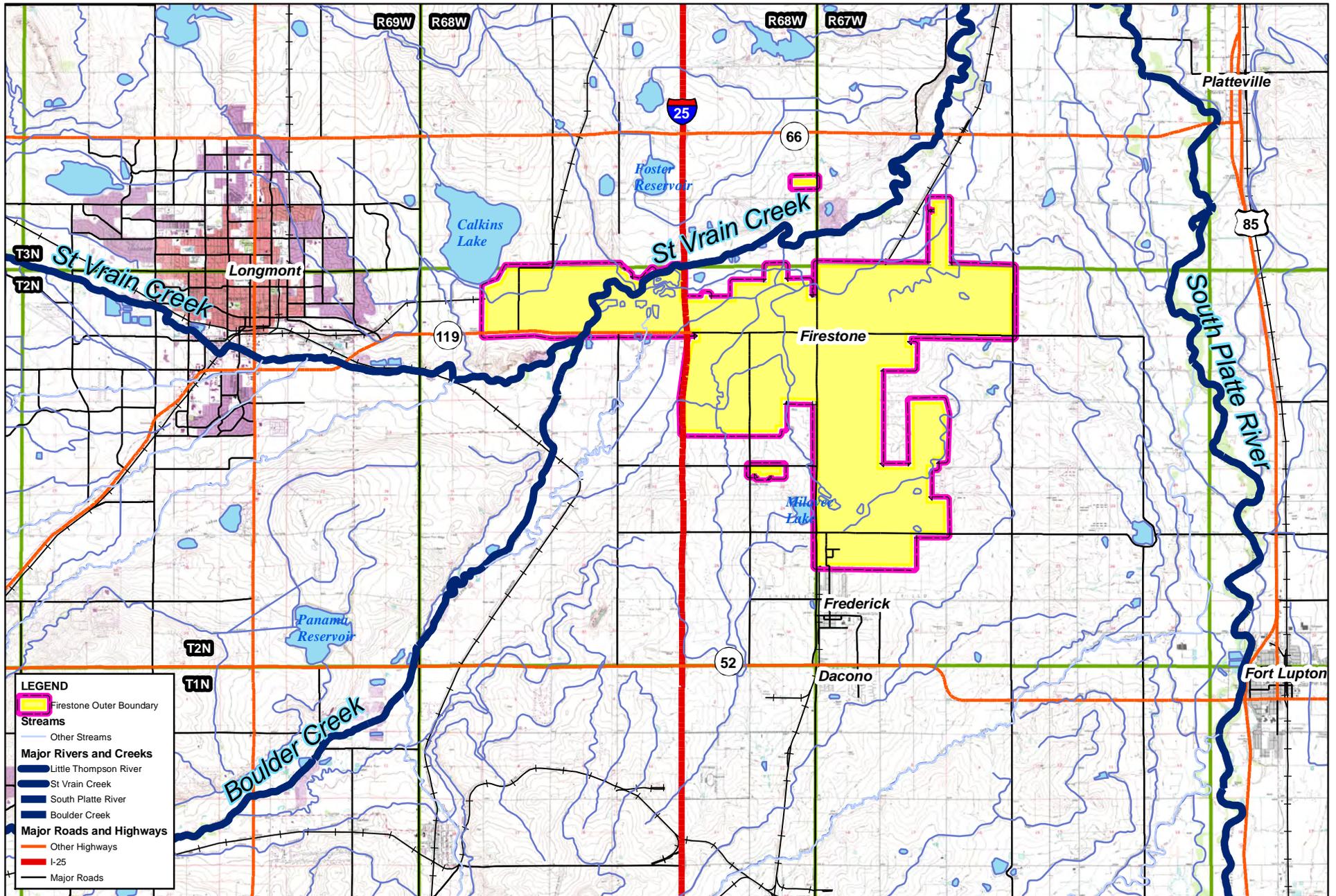
Following is a list of recommended next steps. The intent of this list is to provide the key decision makers an easy reference point upon which to guide the Town by keeping the decision makers on the same page. This chapter should be referenced periodically to ensure the proper steps are taken for successful implementation.

1. **Complete Hokestra purchase.** Firestone is currently in negotiations with Weld County for a portion of the Hokestra Pit. The Town will seek to purchase Cell 2 with an option to purchase Cell 4 once it is mined. Cell 2 is clay lined and will provide 453 acre-feet of storage. Cell 4 has been lined with a slurry wall, but has not been mined yet. Cell 4 will provide approximately 200 acre-feet of additional storage for Firestone.
2. **Apply for CWCB loan.** The Town should apply for a CWCB low-interest loan to purchase this storage, the water rights to divert to the storage, and the infrastructure needed to fill the storage.
3. **Meet with Little Thompson Water District to explore if a potential joint pump station on the St. Vrain River makes sense for both parties.** Little Thompson Water District will be supplying the Brookfield subdivision with Windy Gap water. The proposed water supply includes an exchange back from the St. Vrain Sanitation District WWTP. This exchange of fully consumable water will likely require a pump station. Firestone will need a pump station to fill Hokestra Pit storage.
4. **File for a junior storage right on Hokestra Pit.** It will be important that the Town file for a junior storage right on Hokestra Pit in 2015 or 2016. A junior water right will allow diversion and storage within the pit. Stored water can be leased to third parties to generate revenue until the non-potable system is online.

5. **Evaluate additional storage options.** The Town should evaluate additional storage opportunities as options to purchase storage become available. The Town may consider the potential storage options presented in **Appendix C** if additional storage is needed in the future.
6. **Meet with owners of potential water rights.** The Town should initiate meetings with various owners of water and storage rights.
7. **Consider wells in non-potable system.** The Town should proceed with investigating the design and feasibility of a non-potable system utilizing wells. As the non-potable system is designed, the Town should consider drilling shallow wells strategically around the Town for irrigation as it makes sense. Test wells should be drilled and a pump test completed to determine if a well at certain locations can produce the needed volume to sustain irrigation at that park or open space area.
8. **Complete non-potable system design.** With the completion of this plan, the Town's non-potable water infrastructure plan should be updated. The infrastructure plan update can evaluate how the recommended water rights, Hokestra Pit storage, proposed storage at Central Park, and potential well irrigation can work in a comprehensive non-potable system.
9. **Develop agreement with St. Vrain Sanitation District.** Should any of these supplies be strategically converted to potable use in the future, the Town will want the right to control and use any fully consumable effluent it generates from its water supplies. This fully consumable effluent can be used for augmentation of well pumping, to meet return flow obligations from use of a changed water right, exchanged upstream into Hokestra Pit storage for subsequent use, or exchanged for different water supplies with other water users. An agreement with St. Vrain Sanitation District to recapture the Town's future reusable effluent is vital to the Town's long-term plan.
10. **Target acquisition of Tier 1 and Tier 2 water rights in Table 6 (Chapter 3).** As lands historically irrigated with any of these water rights annex into the Town, this water should be considered to meet a portion of the raw water requirement. Further, the town should continue to budget and actively acquire these water rights as the negotiations and deals make sense. Before water rights are taken in by the Town, a historical use analysis should be completed to ensure the Town is obtaining a good water right. Many times water rights were used inefficiently in the past and buyers do not get what they paid for. Sound due diligence will be important in these transactions. Further, historical location of use in relation to the Town's other water infrastructure and calling rights on the river will be important to ensure that the Town can replace return flows adequately.
11. **Engage a water broker or expert to find available water.** The Town should engage a water broker or expert to search for Tier 1 and Tier 2 water rights for sale.

12. **Conduct a water quality investigation.** Prior to any conversion of non-potable water rights to potential potable water use, a study on water quality, the level of treatment required and a fully devised plan for proper disposal of brine should be completed, including costs and feasibility.





**LEGEND**

- Firestone Outer Boundary
- Streams**

  - Other Streams
  - Major Rivers and Creeks

    - Little Thompson River
    - St Vrain Creek
    - South Platte River
    - Boulder Creek

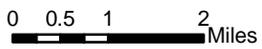
- Major Roads and Highways**

  - Other Highways
  - I-25
  - Major Roads

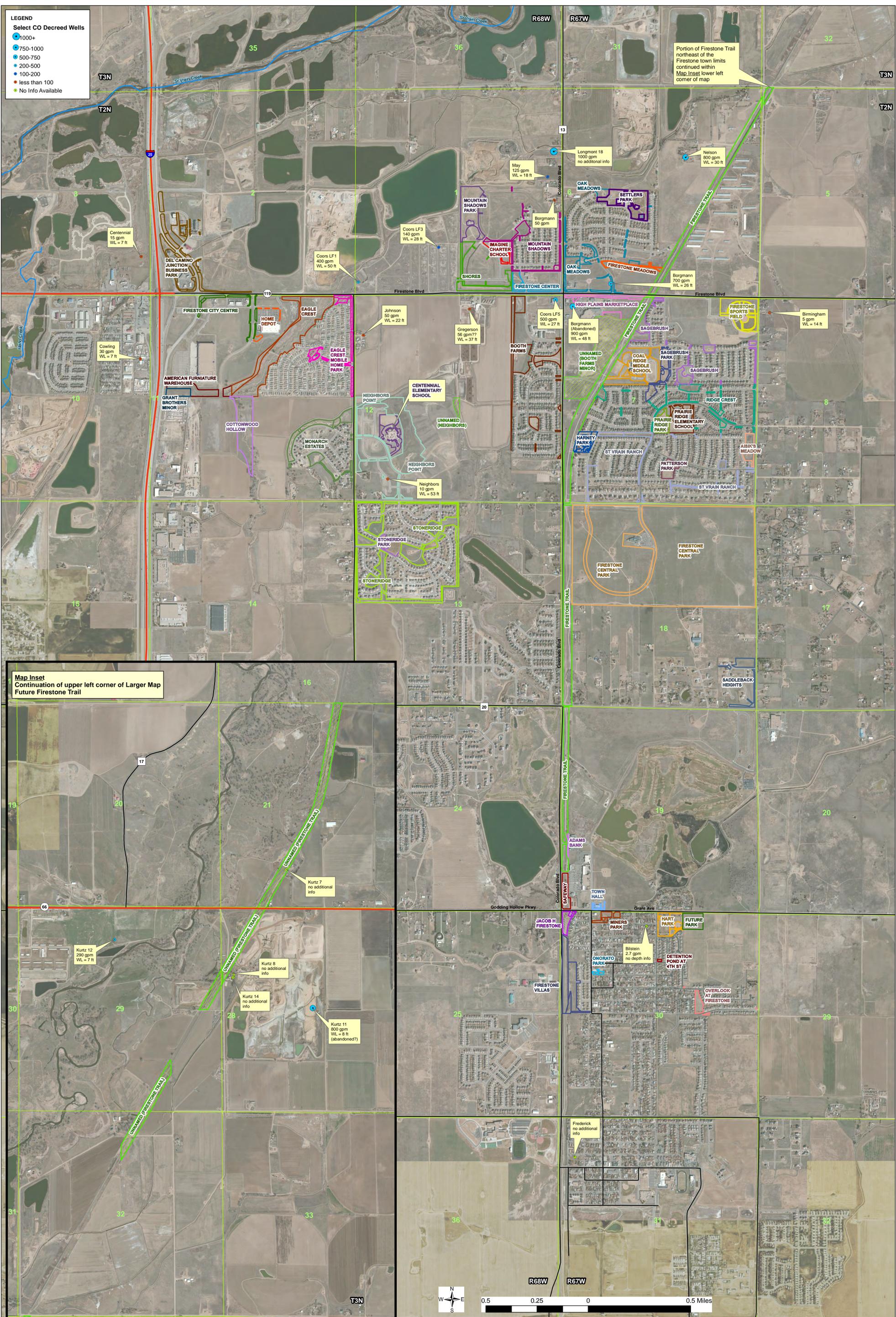
Date: 08-12-2015  
 Drawn By: NEA  
 Scale: As Shown  
 Job No: 15-100

**FIRESTONE, NON-POTABLE  
 MASTER PLAN**

**Figure 1**  
 Town of Firestone  
 General Location



- LEGEND**  
**Select CO Decreed Wells**
- 1000+
  - 750-1000
  - 500-750
  - 200-500
  - 100-200
  - less than 100
  - No Info Available



Portion of Firestone Trail northeast of the Firestone town limits continued within Map Inset lower left corner of map

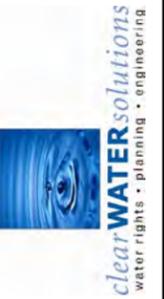
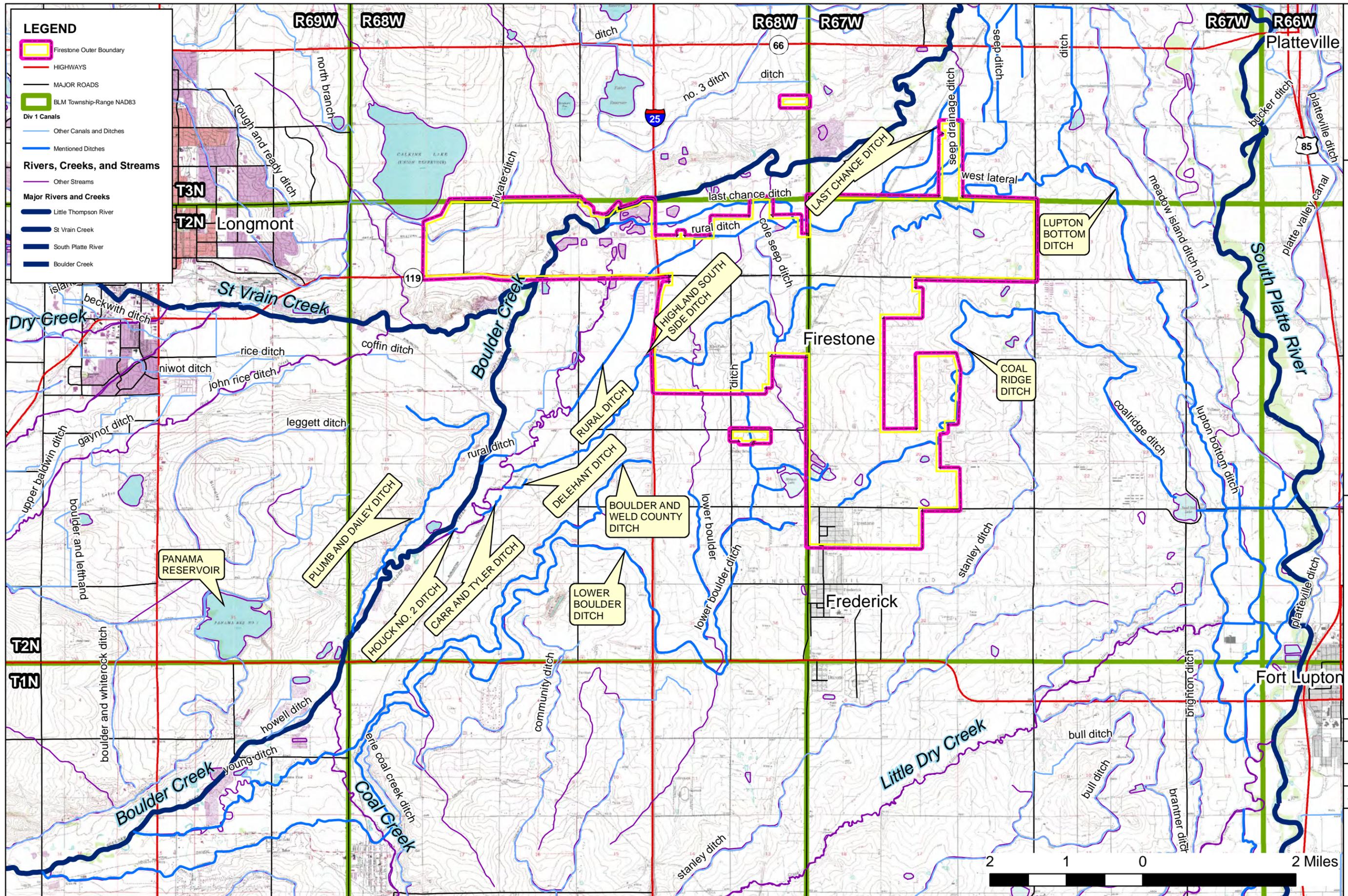
**Map Inset**  
 Continuation of upper left corner of Larger Map  
 Future Firestone Trail

Date: 08-11-2015  
 Drawn By: NEA  
 Scale: As Shown  
 Job No: 15-100

**FIRESTONE NON-POTABLE MASTER PLAN**

**Figure 2**  
 Parks and Opens Spaces and  
 Nearby Groundwater Wells

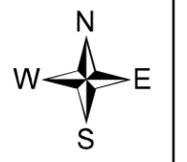


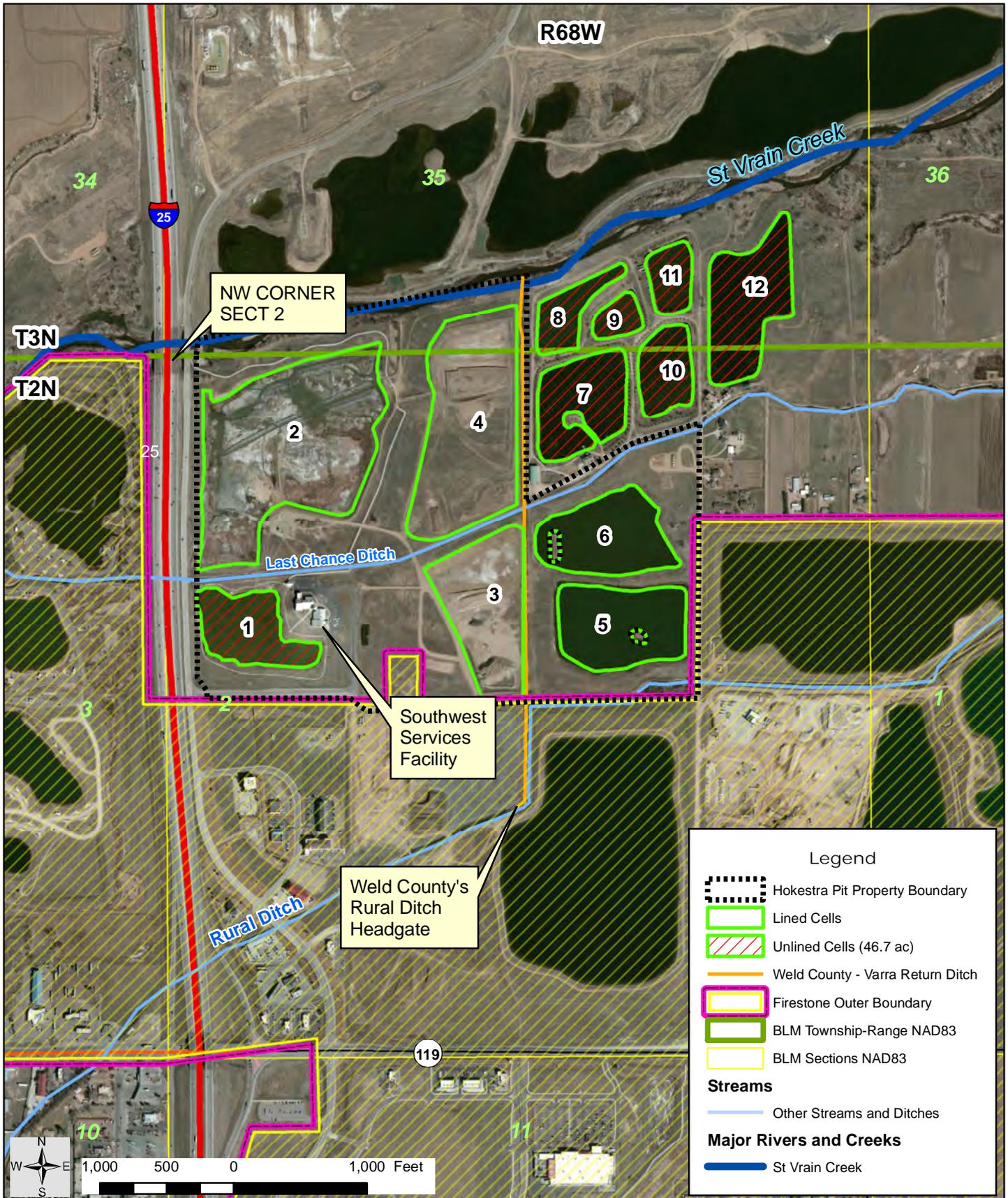


**Figure 3**  
Local Ditches and  
Sources of Supply

FIRESTONE NON-POTABLE  
MASTER PLAN

Date: 07-24-2015  
 Drawn By: NEA  
 Scale: As Shown  
 Job No: 15-100





Date: 07-23-2015  
 Drawn By: MLH/NEA  
 Scale: As Shown  
 Job No: 15-100

**Figure 4**  
**FIRESTONE, NON-POTABLE MASTER PLAN**  
 Hokestra Pit Location Map



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**APPENDIX A**  
*Ordinances*

ORDINANCE NO. 762

AN ORDINANCE AMENDING SECTIONS 1.08.050(A)(1) AND 13.08.010(B)(1) OF THE FIRESTONE MUNICIPAL CODE REGARDING RAW WATER DEDICATION REQUIREMENTS FOR NEW SINGLE-FAMILY DWELLINGS

WHEREAS, Sections 1.08.050(A) and 13.08.010(B) of the Firestone Municipal Code currently require that there be dedicated to the Town one acre-foot unit of Colorado Big Thompson ("CBT") water for every living unit in a single-family dwelling, in the manner further provided in said Sections; and

WHEREAS, such raw water dedication requirements currently do not include a consideration of the size of the lot upon which the dwelling is located; and

WHEREAS, the Town has completed an evaluation of its raw water dedication requirements taking into account actual water usage and residential lot sizes; and

WHEREAS, based on such evaluation, the Town finds that its raw water dedication requirements for single-family dwellings should be based on lot sizes, as larger lots have increased actual water demand and usage; and

WHEREAS, the Board of Trustees desires to amend Sections 1.08.050(A)(1) and 13.08.010(B)(1) of the Firestone Municipal Code to base its raw water dedication requirements for single-family dwellings on lot size;

**NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF TRUSTEES OF THE TOWN OF FIRESTONE, COLORADO:**

**Section 1.** Subsection 1.08.050(A)(1) of the Firestone Municipal Code is hereby amended to read as follows (words to be added are underlined; words to be deleted are ~~stricken through~~):

**1.08.050 Water.**

Unless otherwise provided by the Board of Trustees, the Town and the petitioner shall agree in writing, prior to final adoption of an annexation ordinance, to the transfer of the following minimum water rights to the Town:

**A. Residential.**

1. The landowner, its successors or assigns in interest shall dedicate to the Town one for each single-family residential dwelling lot the number of acre-foot units of Colorado Big Thompson ("CBT") water ~~for every living unit in~~

~~a single family dwelling~~, as set forth in the following table, and as set forth in paragraph 6, below.:

<u>Lot Size (ft<sup>2</sup>)</u>	<u>Required Dedication – CBT Units</u>
<u>0-10,000</u>	<u>1.00</u>
<u>10,001-12,500</u>	<u>1.25</u>
<u>12,501-15,000</u>	<u>1.50</u>
<u>15,001-17,500</u>	<u>1.75</u>
<u>17,501-20,500</u>	<u>2.00</u>
<u>20,501-23,000</u>	<u>2.25</u>
<u>23,001-25,500</u>	<u>2.50</u>
<u>25,501-28,000</u>	<u>2.75</u>
<u>28,001-30,500</u>	<u>3.00</u>
<u>30,501-33,000</u>	<u>3.25</u>
<u>33,001-35,500</u>	<u>3.50</u>
<u>35,501-38,000</u>	<u>3.75</u>
<u>38,001-41,000</u>	<u>4.00</u>
<u>41,001-43,500</u>	<u>4.25</u>

For lots that are 15,000 square feet or larger, the Town may in its sole discretion agree to reduce the water dedication requirements by an appropriate amount where: (a) irrigated areas on the lot will be limited to a maximum square footage that does not exceed a specified square footage or specified percentage of the lot area; (b) the corresponding final plat and final development plan contain restrictions on the square footage of irrigated areas, and associated restrictions on water use; (c) the associated covenants contain restrictions on the square footage of irrigated areas; and (d) such restrictions and covenants run in favor of and are enforceable by the Town, with the Town’s enforcement rights to include, without limitation, the discontinuance of water service or installation of flow restriction devices at the expense of the landowner in the event of noncompliance.

**Section 2.** Subsection 13.08.010(B)(1) of the Firestone Municipal Code is hereby amended to read as follows (words to be added are underlined; words to be deleted are ~~stricken through~~):

**13.08.010 Water connection charges.**

B. In addition to the charges set forth in Subsection A above, there shall be transferred to the town the following:

1. ~~One~~ For each single-family residential dwelling lot, the number of acre-foot units of Colorado Big Thompson (“CBT”) water for each single-family

dwelling and as set forth in the following table, and as set forth in paragraph 6 below:

<u>Lot Size (ft<sup>2</sup>)</u>	<u>CBT Share Dedication</u>
<u>0-10,000</u>	<u>1.00</u>
<u>10,001-12,500</u>	<u>1.25</u>
<u>12,501-15,000</u>	<u>1.50</u>
<u>15,001-17,500</u>	<u>1.75</u>
<u>17,501-20,500</u>	<u>2.00</u>
<u>20,501-23,000</u>	<u>2.25</u>
<u>23,001-25,500</u>	<u>2.50</u>
<u>25,501-28,000</u>	<u>2.75</u>
<u>28,001-30,500</u>	<u>3.00</u>
<u>30,501-33,000</u>	<u>3.25</u>
<u>33,001-35,500</u>	<u>3.50</u>
<u>35,501-38,000</u>	<u>3.75</u>
<u>38,001-41,000</u>	<u>4.00</u>
<u>41,001-43,500</u>	<u>4.25</u>

For lots that are 15,000 square feet or larger, the Town may in its sole discretion agree to reduce the water dedication requirements by an appropriate amount where: (a) irrigated areas on the lot will be limited to a maximum square footage that does not exceed a specified square footage or specified percentage of the lot area; (b) the corresponding final plat and final development plan contain restrictions on the square footage of irrigated areas, and associated restrictions on water use; (c) the associated covenants contain restrictions on the square footage of irrigated areas; and (d) such restrictions and covenants run in favor of and are enforceable by the Town, with the Town's enforcement rights to include, without limitation, the discontinuance of water service or installation of flow restriction devices at the expense of the landowner in the event of noncompliance.

1.5. One-half acre-foot of CBT water for each living unit in a duplex, triplex, fourplex or larger building used for multi-family dwellings, as set forth in Paragraph 6, below.

**Section 3.** The amendments to the Firestone Municipal Code set forth herein shall take effect and be in force thirty (30) days after publication of this ordinance and shall apply to all single-family residential dwelling lots developed after such date; provided, however, that the requirements hereof shall not apply to: (a) any such lot within a subdivision approved by Board of Trustees resolution prior to the effective date hereof, provided the plat for such lot is finalized and presented for recording in compliance with applicable deadlines and requirements, and the water dedication for such lot is made in accordance with the water dedication requirements in effect at the time of approval of such resolution; or (b) any such lot that received a tap permit prior to the effective date

hereof, provided such tap is used in compliance with the deadlines set forth in the Firestone Municipal Code; or (c) any such lot for which other water dedication requirements are specifically set forth in a written agreement that is in full force and effect and binding upon the Town; or (d) any such lot for which "vested rights" for development under other water dedication requirements have been acquired through legal estoppel against the Town.

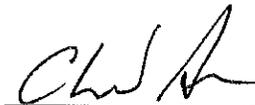
**Section 4.** If any portion of this ordinance is held to be invalid for any reason, such decision shall not affect the validity of the remaining portions of this ordinance. The Board of Trustees hereby declares that it would have passed this ordinance and each part hereof irrespective of the fact that any one part be declared invalid.

**Section 5.** The repeal or modification of any provision of the Municipal Code of the Town of Firestone by this ordinance shall not release, extinguish, alter, modify, or change in whole or in part any penalty, forfeiture, or liability, either civil or criminal, which shall have been incurred under such provision, and each provision shall be treated and held as still remaining in force for the purpose of sustaining any and all proper actions, suits, proceedings, and prosecutions for the enforcement of the penalty, forfeiture, or liability, as well as for the purpose of sustaining any judgment, decree, or order which can or may be rendered, entered, or made in such actions, suits, proceedings, or prosecutions.

**Section 6.** All other ordinances or portions thereof inconsistent or conflicting with this ordinance or any portion hereof are hereby repealed to the extent of such inconsistency or conflict.

INTRODUCED, READ, ADOPTED, APPROVED, AND ORDERED PUBLISHED IN FULL this 9<sup>th</sup> day of September, 2010.

TOWN OF FIRESTONE, COLORADO



Chad Auer, Mayor

ATTEST:

  
Judy Hegwood, Town Clerk



**ORDINANCE NO. 861**

**AN ORDINANCE AMENDING SECTIONS 1.08.050 AND 13.08.010.B OF THE FIRESTONE MUNICIPAL CODE REGARDING RAW WATER DEDICATION REQUIREMENTS FOR MULTI-FAMILY DEVELOPMENT AND REPEALING ORDINANCE NO. 860**

WHEREAS, Sections 1.08.050 and 13.08.010.B of the Firestone Municipal Code set forth requirements for the dedication of water rights to the Town for water service for residential, commercial and industrial developments and irrigation of irrigated landscape areas; and

WHEREAS, the Town's existing policy with respect to water rights dedication requirements does not distinguish between various types of multi-family developments; and

WHEREAS, the Board of Trustees desires to amend the water dedication requirements to establish different requirements for different types of multi-family developments; and

WHEREAS, on December 10, 2014, the Board of Trustees adopted Ordinance No. 860, which amended Section 1.08.050 of the Firestone Municipal Code regarding water dedication requirements and establishing different requirements for different types of multi-family developments; and

WHEREAS, after the Board's adoption of Ordinance No. 860, it came to the Town's attention that the ordinance included an error with respect to the calculation of the dedication requirements; and

WHEREAS, Section 13.08.010.B of the Firestone Municipal Code also sets forth water dedication requirements and Section 13.08.010.B needs to be updated to reflect the changes to the water dedication requirements for different types of multi-family developments; and

WHEREAS, the Board of Trustees by this Ordinance desires to repeal Ordinance No. 860 and to adopt a new ordinance amending Sections 1.08.050 and 13.08.010.B of the Firestone Municipal Code to adopt water dedication requirements for different types of multi-family developments;

**NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF TRUSTEES OF THE TOWN OF FIRESTONE, COLORADO:**

**Section 1.** Subsection 1.08.050.A.2 of the Firestone Municipal Code is hereby amended to read as follows (words to be added are underlined; words to be deleted are ~~stricken through~~):

**1.08.050 Water.**

Unless otherwise provided by the Board of Trustees, the Town and the petitioner shall agree in writing, prior to final adoption of an annexation ordinance, to the transfer of the following minimum water rights to the Town:

**A. Residential.**

2. The landowner, its successors or assigns in interest shall dedicate to the Town ~~one-half acre-foot~~ the units of CBT water for each living unit in a ~~duplex, triplex, fourplex or larger building used for multi-family dwellings~~, as set forth in the following table and in Paragraph 6, below:;

<u>Living Units Per Multi-Family Dwelling</u>	<u>CBT Share Dedication (Per Living Unit)</u>
<u>2 to 4 Units</u>	<u>.54</u>
<u>5 to 12 Units</u>	<u>.49</u>
<u>&gt; 12 Units</u>	<u>.37</u>

**Section 2.** Subsection 13.08.010.B.1.5 of the Firestone Municipal Code is hereby amended to read as follows (words to be added are underlined; words to be deleted are ~~stricken through~~):

**13.08.010. Water connection charges.**

B. In addition to the charges set forth in Subsection A above, there shall be transferred to the Town the following:

1.5. ~~One-half acre-foot of CBT water f~~ For each living unit in a ~~duplex, triplex, fourplex or larger building used for multi-family dwellings~~, the number of acre-foot units of CBT water as set forth in the following table and in Paragraph 6, below:;

<u>Living Units Per Multi-Family Dwelling</u>	<u>CBT Share Dedication (Per Living Unit)</u>
<u>2 to 4 Units</u>	<u>.54</u>
<u>5 to 12 Units</u>	<u>.49</u>
<u>&gt; 12 Units</u>	<u>.37</u>

**Section 3.** If any portion of this ordinance is held to be invalid for any reason, such decision shall not affect the validity of the remaining portions of this ordinance. The Board of Trustees hereby declares that it would have passed this ordinance and each part hereof irrespective of the fact that any one part be declared invalid.

**Section 4.** The repeal or modification of any provision of the Municipal Code of the Town of Firestone by this ordinance shall not release, extinguish, alter, modify, or change in whole or in part any penalty, forfeiture, or liability, either civil or criminal, which shall have been incurred

under such provision, and each provision shall be treated and held as still remaining in force for the purpose of sustaining any and all proper actions, suits, proceedings, and prosecutions for the enforcement of the penalty, forfeiture, or liability, as well as for the purpose of sustaining any judgment, decree, or order which can or may be rendered, entered, or made in such actions, suits, proceedings, or prosecutions.

**Section 5.** Ordinance No. 860 adopted by the Board of Trustees on December 10, 2014 is hereby repealed in its entirety. All other ordinances or portions thereof inconsistent or conflicting with this ordinance or any portion hereof, are hereby repealed to the extent of such inconsistency or conflict.

INTRODUCED, READ, ADOPTED, APPROVED, AND ORDERED PUBLISHED IN FULL this 17th day of December, 2014.

TOWN OF FIRESTONE, COLORADO



Paul Sorensen, Mayor

ATTEST:



Carissa Medina, Town Clerk



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## **APPENDIX B**

*Individual Maps of Parks and Open Spaces*

The “Map No.” column corresponds with the map number in this appendix. Each park or open space irrigated delineation is in a relatively unique color. Within the image is also one or more bright yellow numbers; those numbers represent the Sections where the parks or open spaces are located. Smaller black numbering/lettering represent each delineated shape with its own unique number/letter designation.

### Irrigation Estimates for Firestone Owned - Existing Parks and Open Space Areas

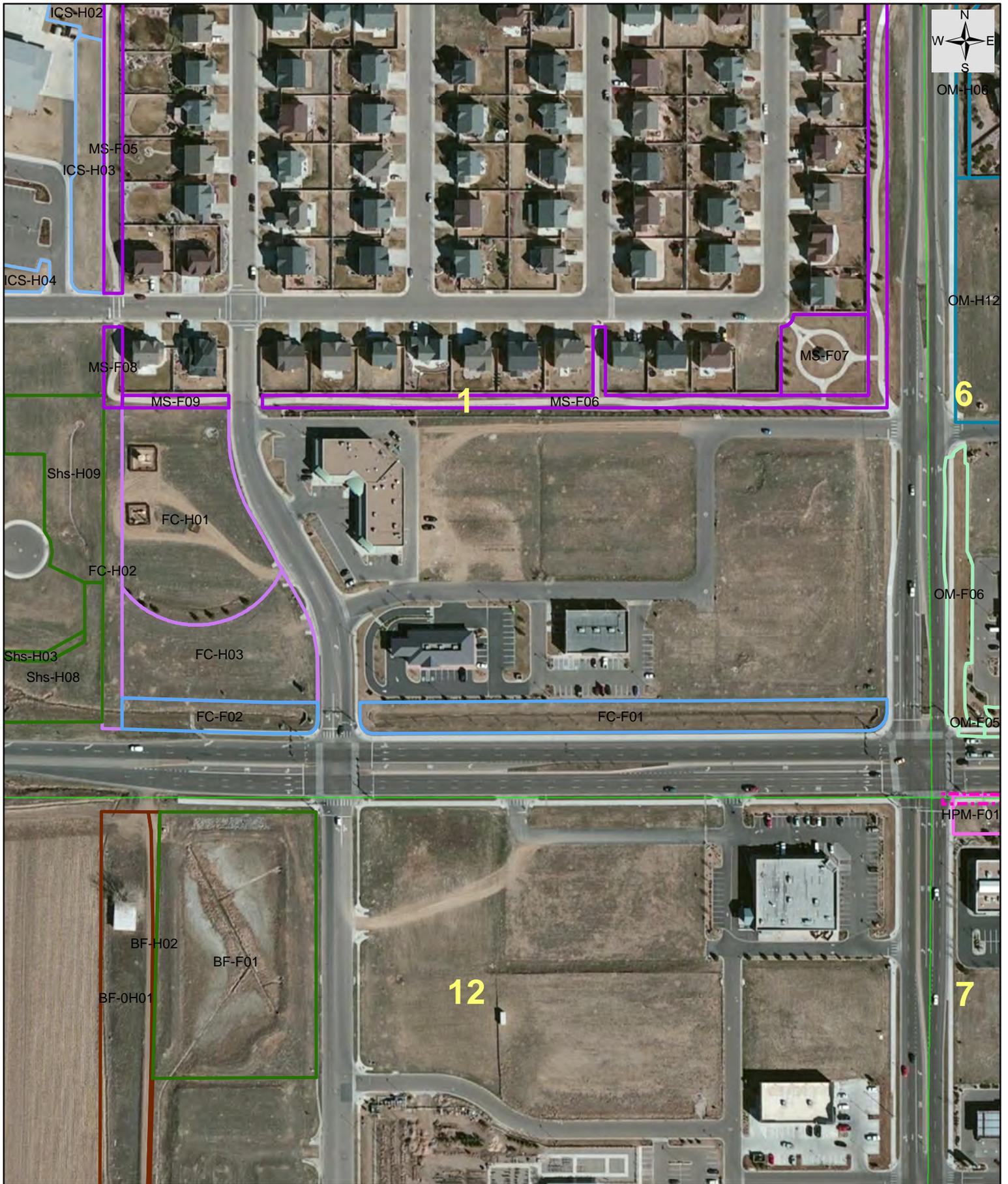
Park or Open Space Name	Total Existing Acreage	Estimated Irrigation Percentage	Total Irrigated Existing Acreage	Estimated Irrigation Requirements 2.0 ac-ft/acre (ac-ft)	Shape Letter Designation	Map No.
<b>Firestone Owned - Existing</b>						
Adams Bank Entry	0.43	100%	0.43	0.86	AB-F	39
Aisik's Meadow	4.00	100%	4.00	8.00	AM-F	11
Booth Farms	9.69	100%	9.69	19.38	BF-F	30
Detention Pond at 4th St and Buchanan Ave	0.14	100%	0.14	0.28	DP-F	45
Firestone Center	1.33	100%	1.33	2.66	FC-F	1
Firestone City Centre	1.25	100%	1.25	2.50	FCC-F	27
Firestone Sports Field Site	11.35	100%	11.35	22.70	FSF-F	13
Harney Park	4.18	100%	4.18	8.36	HP-F	15
Hart Park	6.66	100%	6.66	13.32	HtP-F	47
High Plains Marketplace	2.58	100%	2.58	5.16	HPM-F	16
Jacob H Firestone	2.44	100%	2.44	4.88	JF-F	48
Miners Park	2.09	100%	2.09	4.18	MP-F	49
Mountain Shadows	1.00	100%	1.00	2.00	MS-F	3
Mountain Shadows Park	12.91	100%	12.91	25.83	MSP-F	4
Oak Meadows	1.97	100%	1.97	3.94	OM-F	9
Onorato Park	0.45	100%	0.45	0.90	OP-F	50
Patterson Park	3.53	100%	3.53	7.06	PtP-F	17
Prairie Ridge Park	3.81	100%	3.81	7.62	PRP-F	19
Safeway	3.59	100%	3.59	7.18	SW-F	41
Sagebrush	0.46	100%	0.46	0.92	SB-F	22
Sagebrush Park	6.50	100%	6.50	13.01	SBP-F	21
Settlers Park	11.91	100%	11.91	23.82	SP-F	10
St Vrain Ranch	2.35	100%	2.35	4.70	SVR-F	23
Stoneridge	6.75	100%	6.75	13.50	SR-F	35
Stoneridge Park	4.32	100%	4.32	8.64	SRP-F	34
Town Hall	0.42	100%	0.42	0.84	TH-F	42
<b>Total Firestone Owned - Existing</b>	<b>106.12</b>		<b>106.12</b>	<b>212.24</b>		

### Irrigation Estimates for Privately Owned - Existing Parks and Open Space Areas

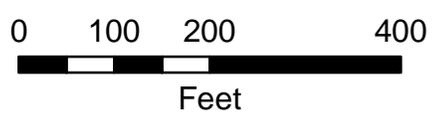
Park or Open Space Name	Total Existing Acreage	Estimated Irrigation Percentage	Total Irrigated Existing Acreage	Estimated Irrigation Requirements 2.0 ac-ft/acre (ac-ft)	Shape Letter Designation	Map No.
<b>Privately Owned - Existing</b>						
Booth Farms	9.55	100%	9.55	19.10	BF-H	30
Centennial Elem School	6.57	100%	6.57	13.14	CES-H	31
Coal Ridge Middle School	19.46	100%	19.46	38.92	CRMS-H	12
Del Camino Junction Business Park	13.65	100%	13.65	27.30	DCBP-H	6
Eagle Crest Mobil Home Park	5.77	100%	5.77	11.54	EC-H	26
Firestone City Centre	0.20	100%	0.20	0.40	FCC-H	27
High Plains Marketplace	1.73	100%	1.73	3.46	HPM-H	16
Home Depot	0.20	100%	0.20	0.40	HD-H	28
Imagine Charter School	2.89	100%	2.89	5.78	ICS-H	2
Monarch Est	8.20	100%	8.20	16.40	ME-H	29
Mountain Shadows	0.20	100%	0.20	0.40	MS-H	3
Oak Meadows	2.69	100%	2.69	5.38	OM-H	9
Overlook At Firestone	2.18	100%	2.18	4.36	OAF-H	51
Prairie Ridge Elem School	5.81	100%	5.81	11.62	PRES-H	18
Ridge Crest	7.67	100%	7.67	15.34	RC-H	20
Saddleback Heights	1.58	100%	1.58	3.16	SH-H	38
Sagebrush	5.78	100%	5.78	11.56	SB-H	22
Shores	2.50	100%	2.50	5.00	Shs-H	5
St Vrain Ranch	1.99	100%	1.99	3.97	SVR-H	23
Stoneridge	16.03	100%	16.03	32.06	SR-H	35
<b>Total Privately Owned - Existing</b>	<b>114.65</b>		<b>114.65</b>	<b>229.29</b>		
<b>Total Existing</b>	<b>220.76</b>		<b>220.76</b>	<b>441.53</b>		

**Irrigation Estimates for Town Owned and Privately or HOA Owned Future Parks and Open Space Areas**

Park or Open Space Name	Total Existing Acreage	Estimated Irrigation Percentage	Total Irrigated Existing Acreage	Estimated Irrigation Requirements 2.0 ac-ft/acre (ac-ft)	Shape Letter Designation	Map No.
<b>Firestone Owned - Future</b>						
Firestone Central Park	262.00	50%	131.00	262.00	FCP-F	36
Firestone Trail	86.67	50%	43.33	86.67	FT-F	8, 14, 37, 40
Firestone Villas	13.56	50%	6.78	13.56	FV-F	46
Future Park	4.94	50%	2.47	4.94	FP-F	47
Mountain Shadows	2.07	100%	2.07	4.14	MS-F	3
Neighbors Point	29.21	30%	8.76	17.53	NP-F	32
Saddleback Heights	2.70	50%	1.35	2.70	SH-F	38
Unnamed (Booth Farms Minor)	32.41	30%	9.72	19.45	UN(B)-F	24
Unnamed (Firestone Trail NE of Town Limits)	52.77	50%	26.38	52.77	UN(FT)-F	43, 44, 52
Unnamed (Neighbors)	1.57	50%	0.79	1.57	UN(N)-F	33
<b>Total Firestone Owned - Future</b>	<b>487.90</b>		<b>232.66</b>	<b>465.32</b>		
<b>Privately Owned - Future</b>						
American Furniture Warehouse	6.52	30%	1.96	3.91	AFW-H	25
Booth Farms	0.13	100%	0.13	0.26	BF-H	30
Firestone Center	2.99	30%	0.90	1.79	FC-H	1
Firestone City Centre	2.07	100%	2.07	4.14	FCC-H	27
Firestone Meadows	2.64	100%	2.64	5.28	FM-H	7
Grant Brothers Minor	2.88	30%	0.86	1.73	GBM-H	25
Home Depot	0.53	100%	0.53	1.06	HD-H	28
Monarch Est	2.76	100%	2.76	5.52	ME-H	29
Mountain Shadows	2.49	100%	2.49	4.98	MS-H	3
Neighbors Point	0.65	100%	0.65	1.30	NP-H	32
Oak Meadows	6.23	50%	3.11	6.23	OM-H	9
Overlook At Firestone	0.12	100%	0.12	0.24	OAF-H	51
Sagebrush	6.56	100%	6.56	13.12	SB-H	22
Shores	6.21	30%	1.86	3.73	Shs-H	5
St Vrain Ranch	3.17	100%	3.17	6.34	SVR-H	23
Stoneridge	10.69	100%	10.69	21.38	SR-H	35
<b>Total Privately Owned - Future</b>	<b>56.64</b>		<b>40.50</b>	<b>81.01</b>		
<b>Total Future</b>	<b>544.54</b>		<b>273.17</b>	<b>546.33</b>		

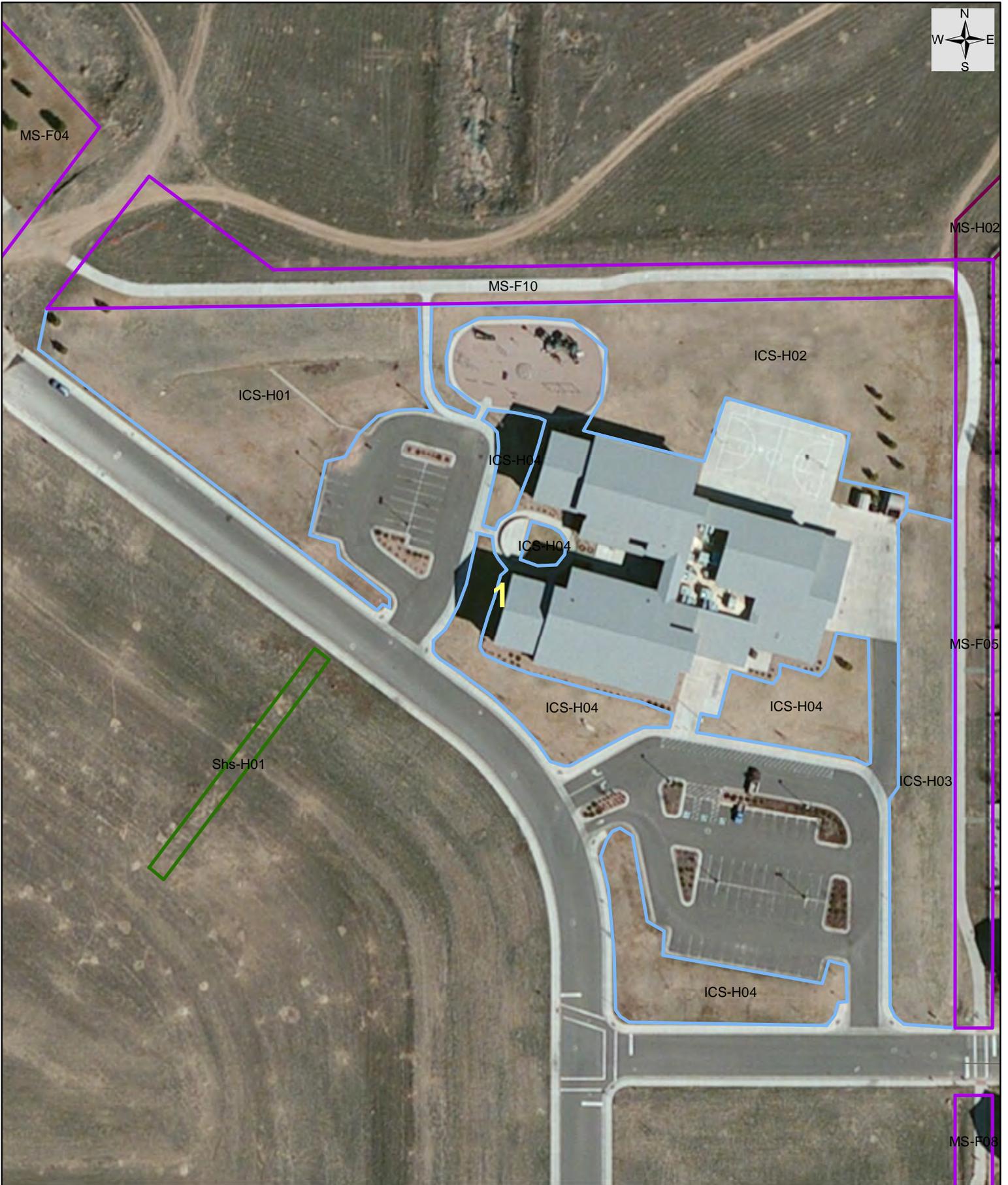


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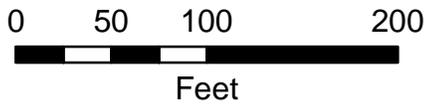


**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 1 of 52  
 clearWATERsolutions  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 • Windsor, CO • 80528 • 970.223.3706



Date: 04-14-2015  
 Drawn By: NEA  
 Scale: As Shown  
 Job No: 14-240



**Delineated Areas**  
 Parks &  
 Open Spaces

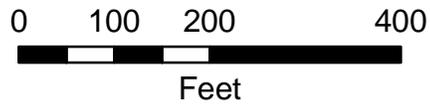


Appendix B  
 Map 2 of 52  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706





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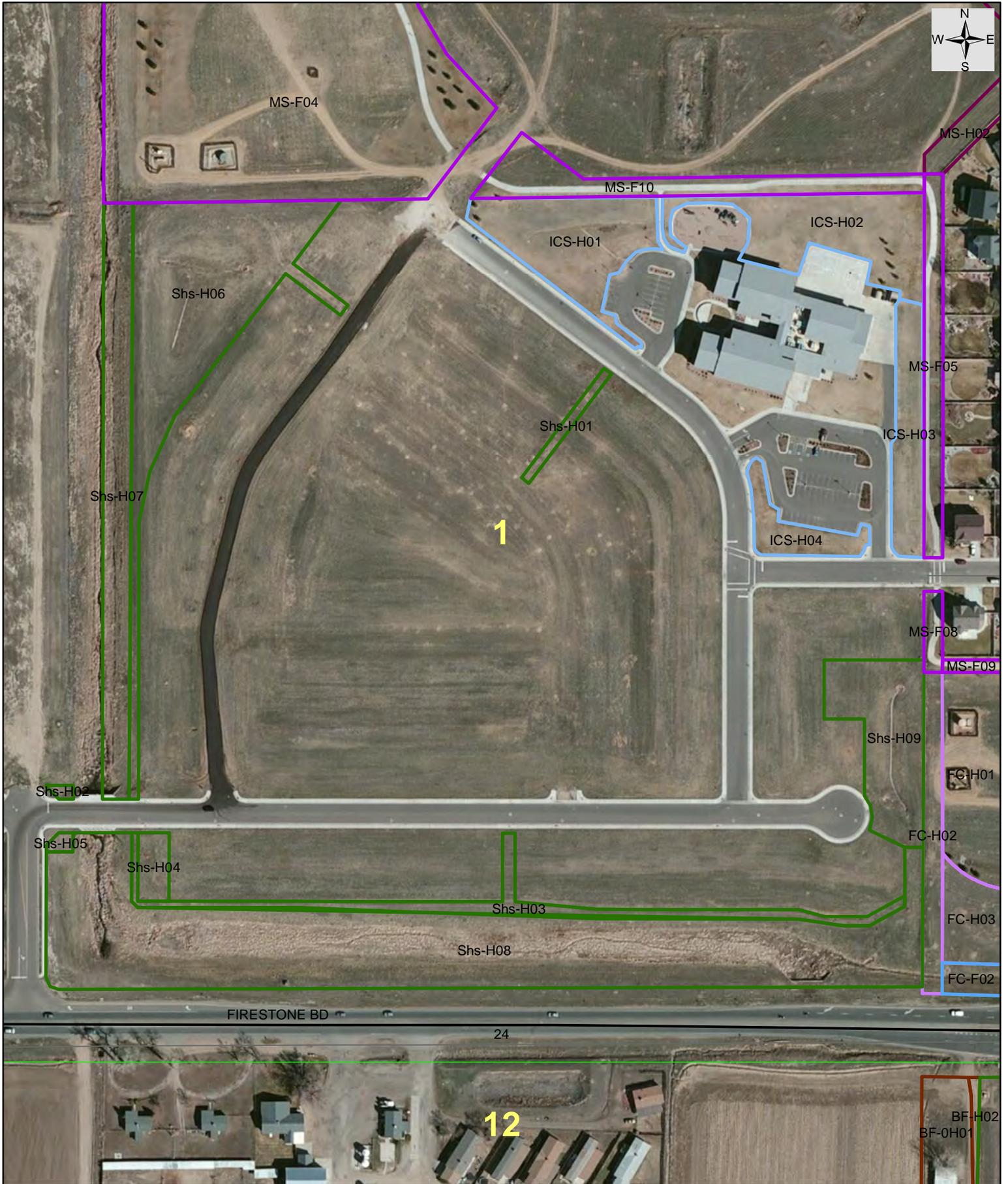


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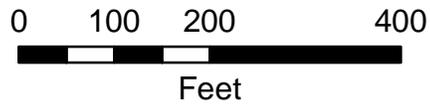
Parks & Open Spaces

Appendix B  
Map 4 of 52

**clearWATERsolutions**  
water rights • planning • engineering  
8010 S. County Road 5, Ste. 105 - Windsor, CO • 80528 • 970.223.3706



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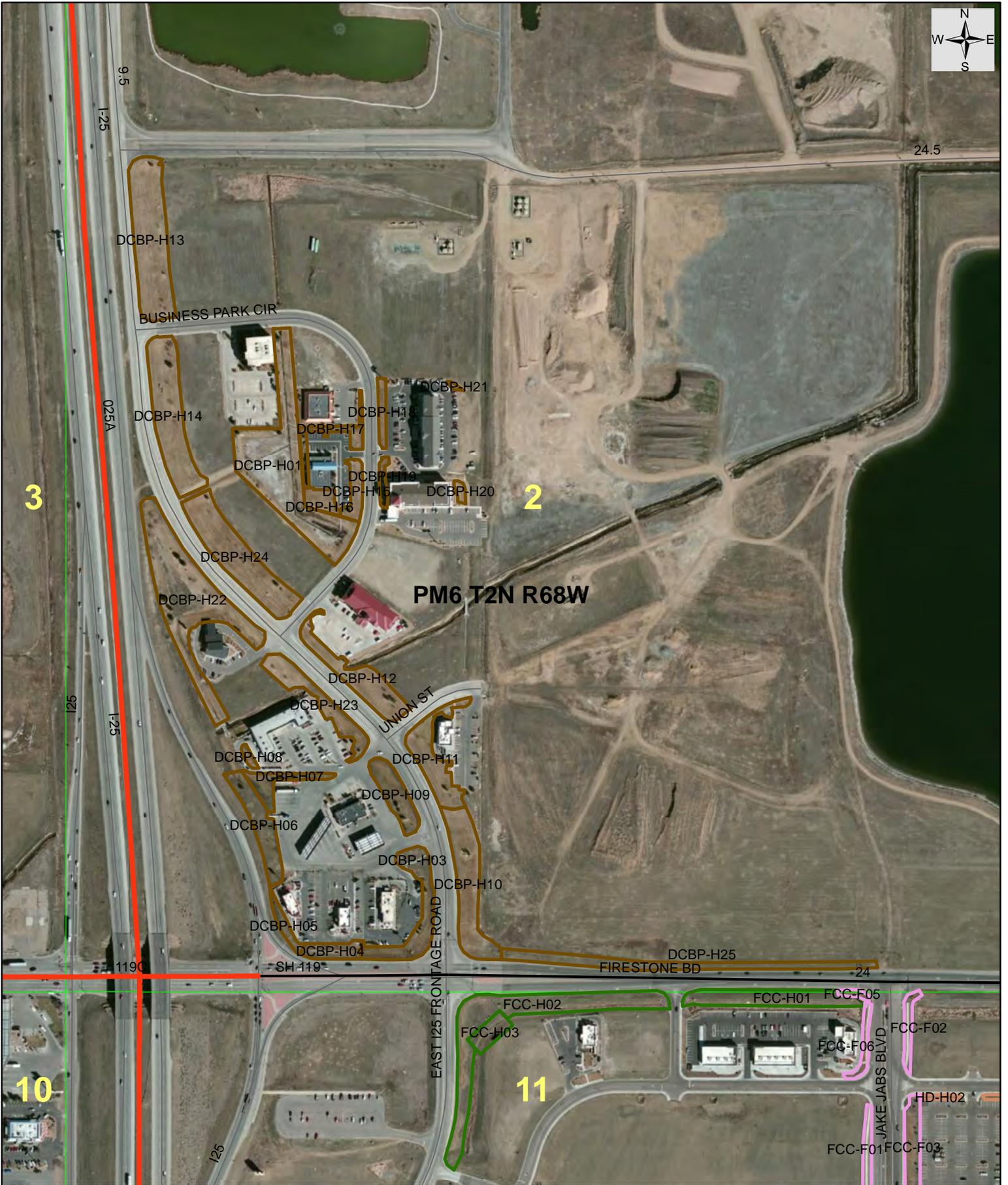


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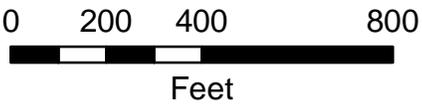
Parks & Open Spaces

Appendix B  
Map 5 of 52

clearWATERsolutions  
water rights • planning • engineering  
8010 S. County Road 5, Ste. 105 - Windsor, CO • 80528 • 970.223.3706

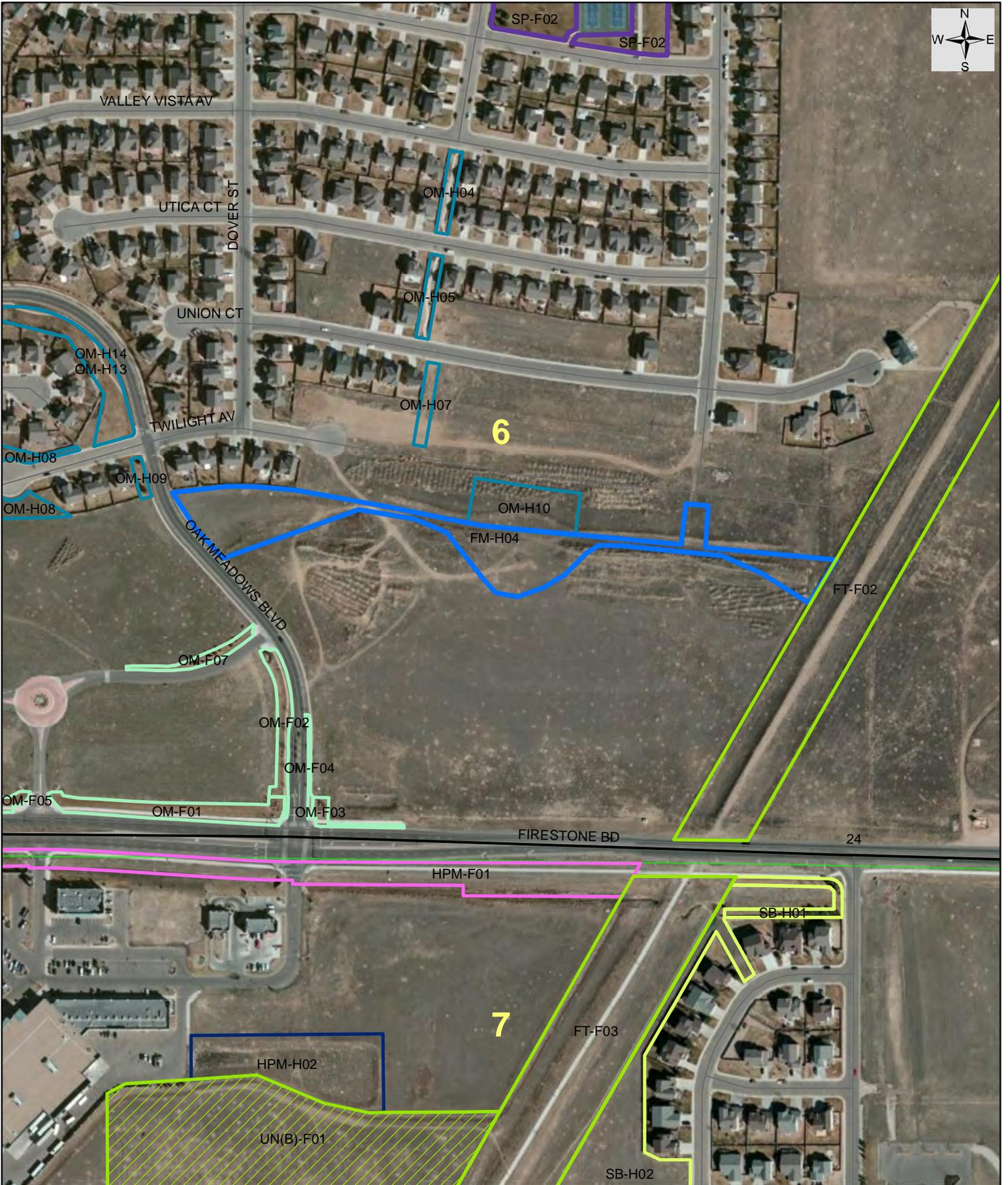


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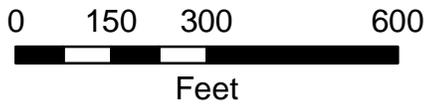


**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 6 of 52  
 clearWATERsolutions  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO • 80528 • 970.223.3706



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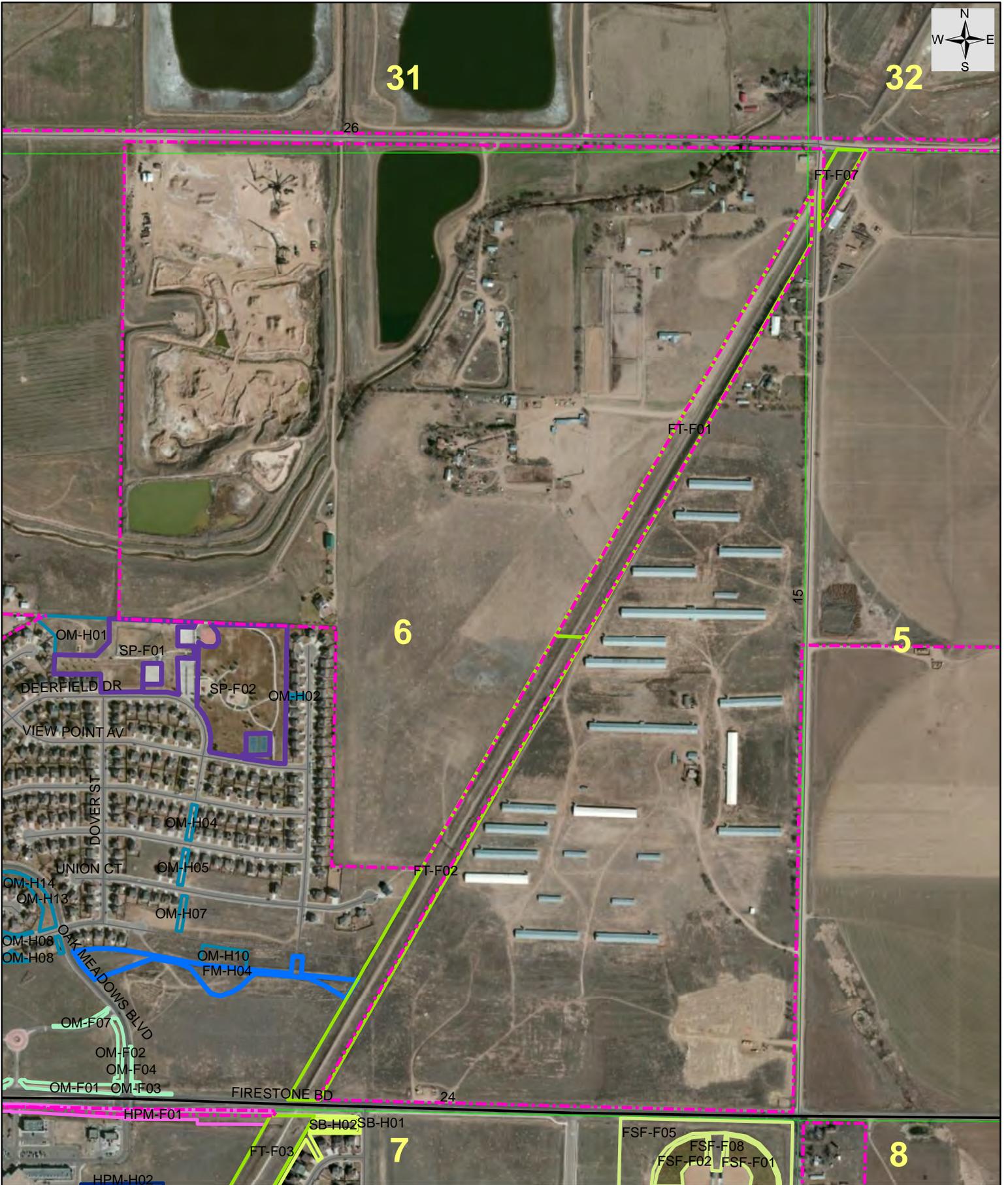


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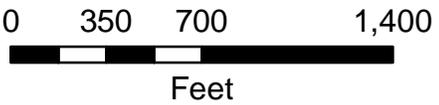
Parks & Open Spaces

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 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706

Appendix B  
 Map 7 of 52



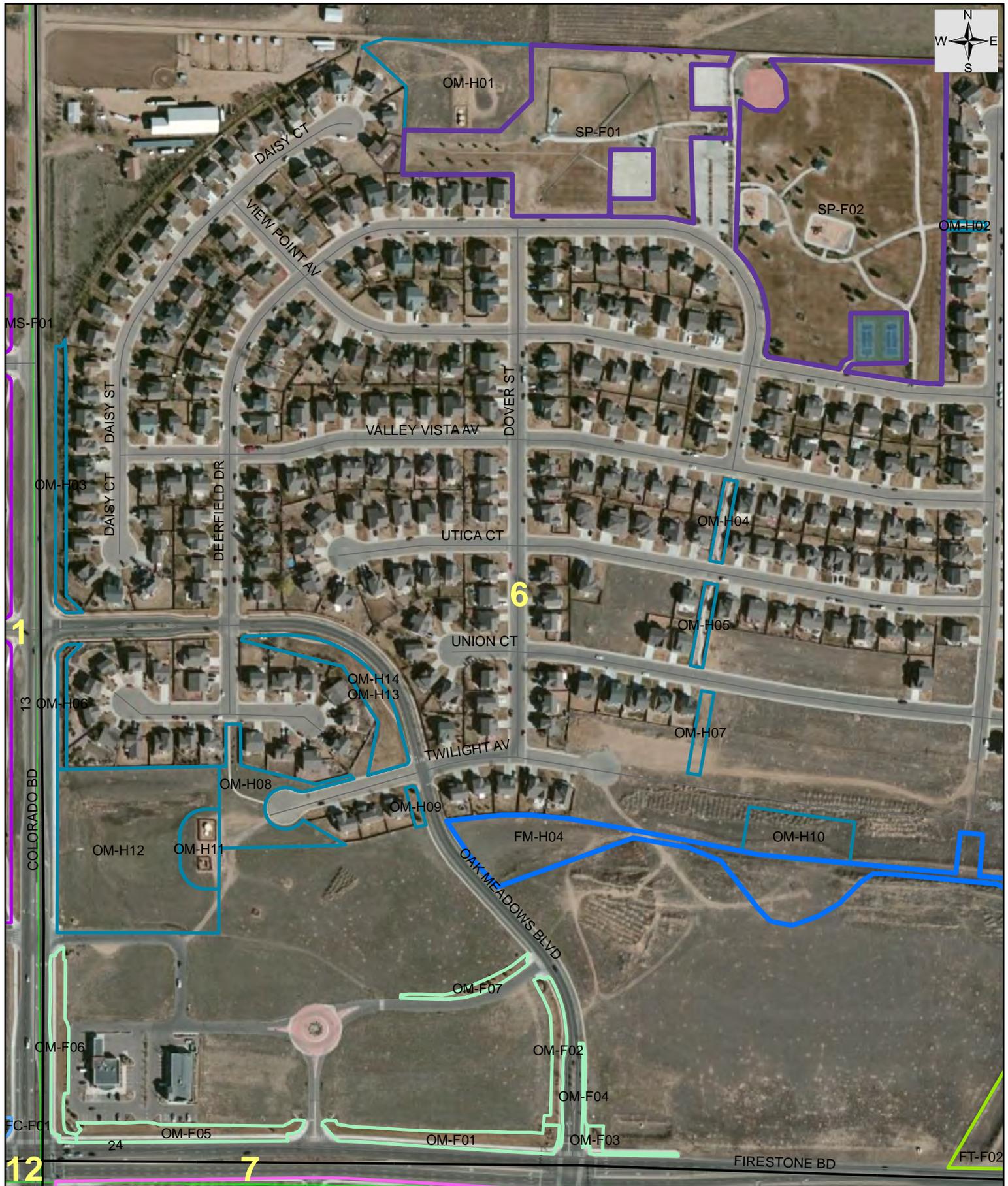
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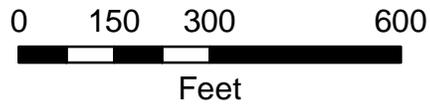
### Delineated Areas Parks & Open Spaces

Appendix B  
Map 8 of 52

clearWATERsolutions  
water rights • planning • engineering  
8010 S. County Road 5, Ste. 105 - Windsor, CO • 80528 • 970.223.3706



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### Delineated Areas

#### Parks & Open Spaces

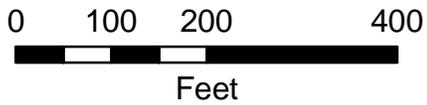


Appendix B  
Map 9 of 52

**clearWATERsolutions**  
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8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



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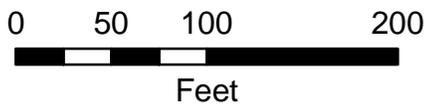


**Delineated Areas**  
 Parks &  
 Open Spaces

clearWATERsolutions  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 • Windsor, CO • 80528 • 970.223.3706

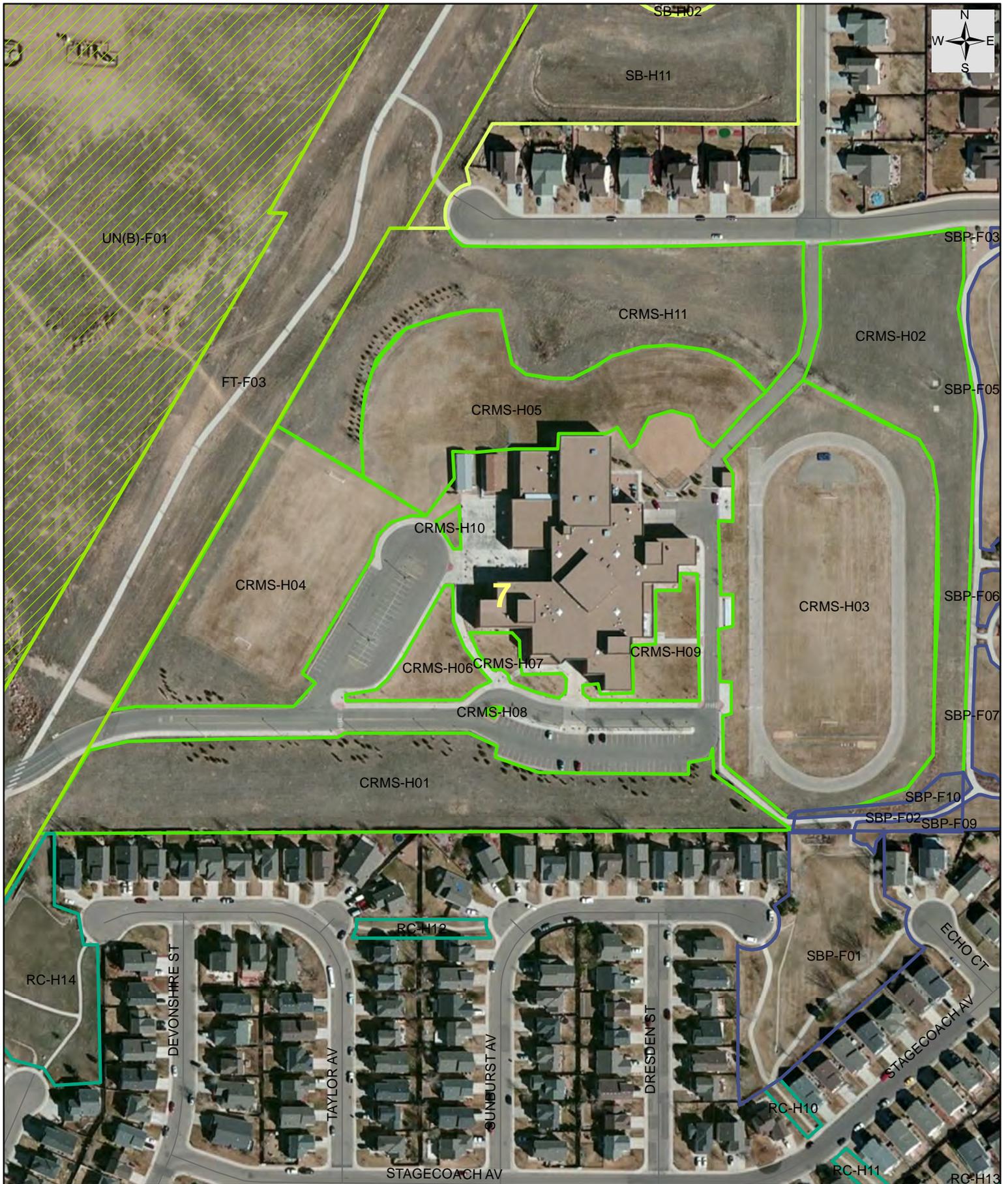


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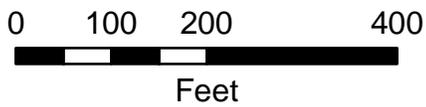


**Delineated Areas**  
 Parks &  
 Open Spaces

clear**WATER**solutions  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



Date: 04-14-2015  
 Drawn By: NEA  
 Scale: As Shown  
 Job No: 14-240



### Delineated Areas

Parks & Open Spaces

Appendix B  
 Map 12 of 52

**clearWATERsolutions**  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



6

5

FIRESTONE BD

24

15



7

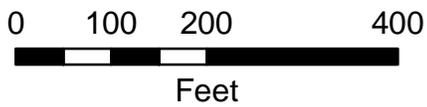
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Job No: 14-240



### Delineated Areas

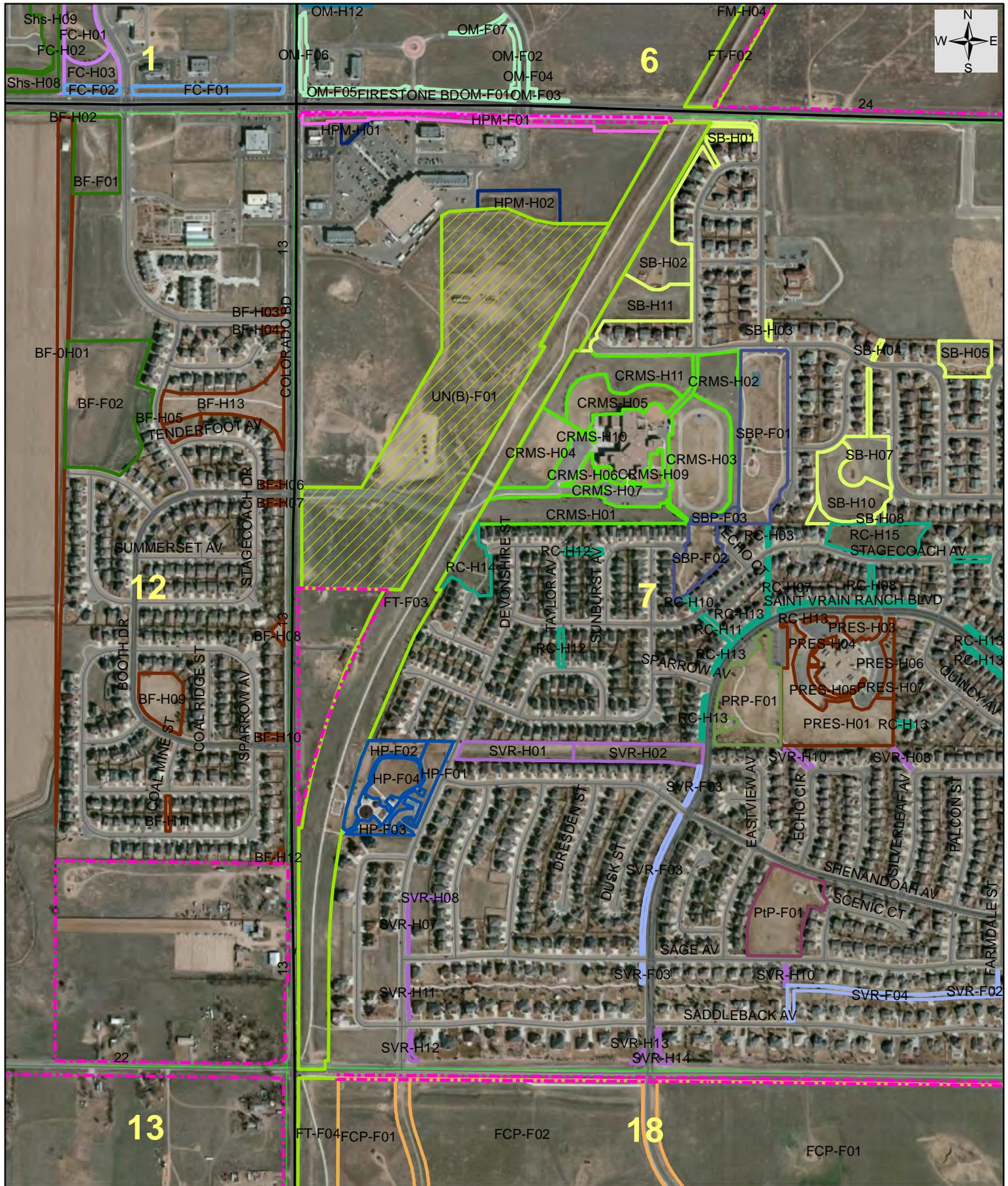
Parks & Open Spaces

clearWATERsolutions

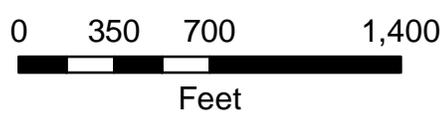
water rights • planning • engineering

8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706

Appendix B  
Map 13 of 52



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Job No:	14-240



## Delineated Areas

### Parks & Open Spaces

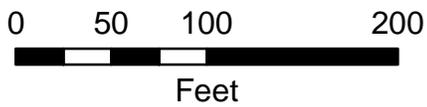


Appendix B  
Map 14 of 52

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8010 S. County Road 5, Ste. 105 • Windsor, CO • 80528 • 970.223.3706



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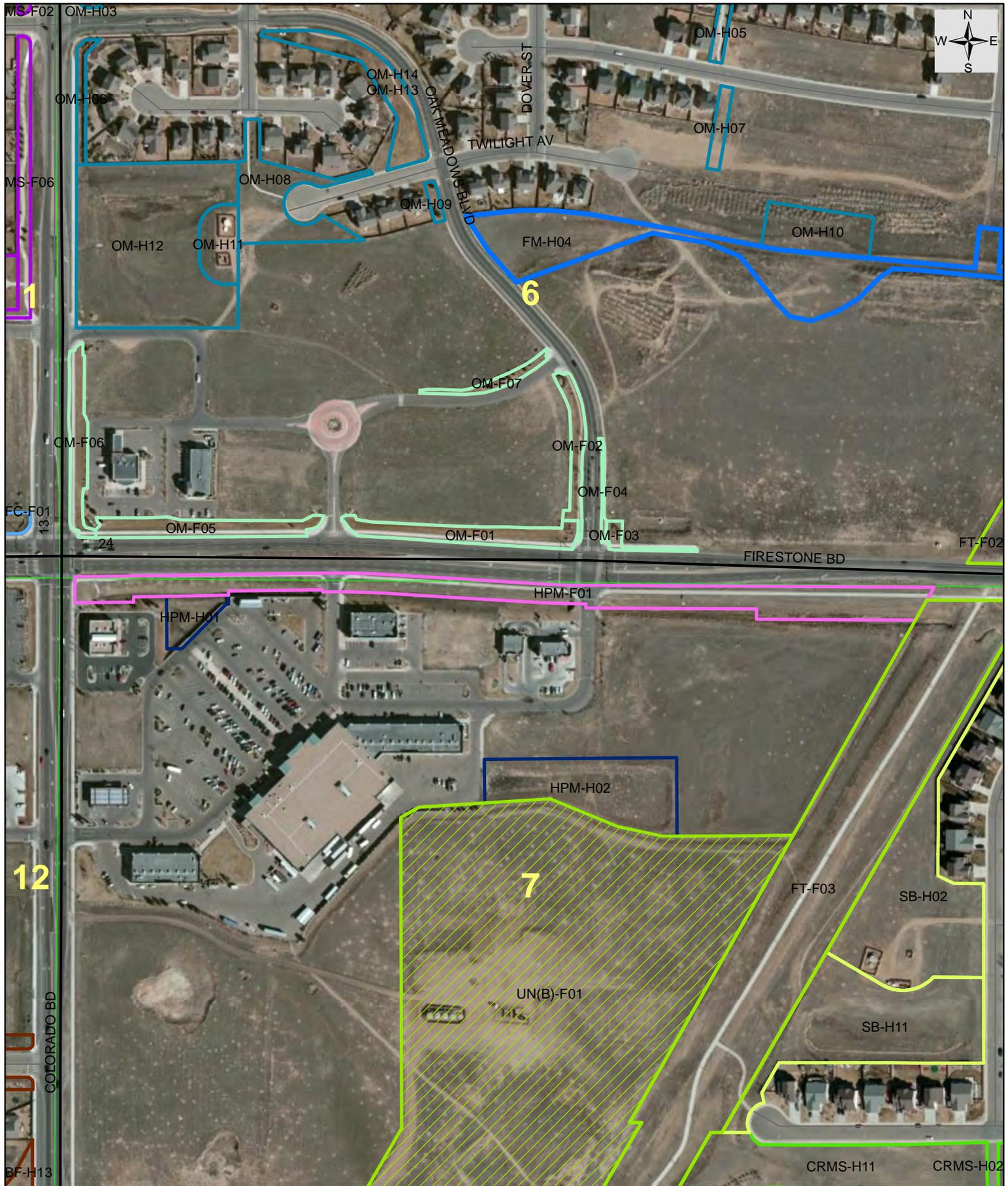


### Delineated Areas

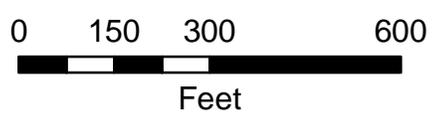
Parks & Open Spaces

Appendix B  
Map 15 of 52

**clearWATERsolutions**  
water rights • planning • engineering  
8010 S. County Road 5, Ste. 105 • Windsor, CO • 80528 • 970.223.3706



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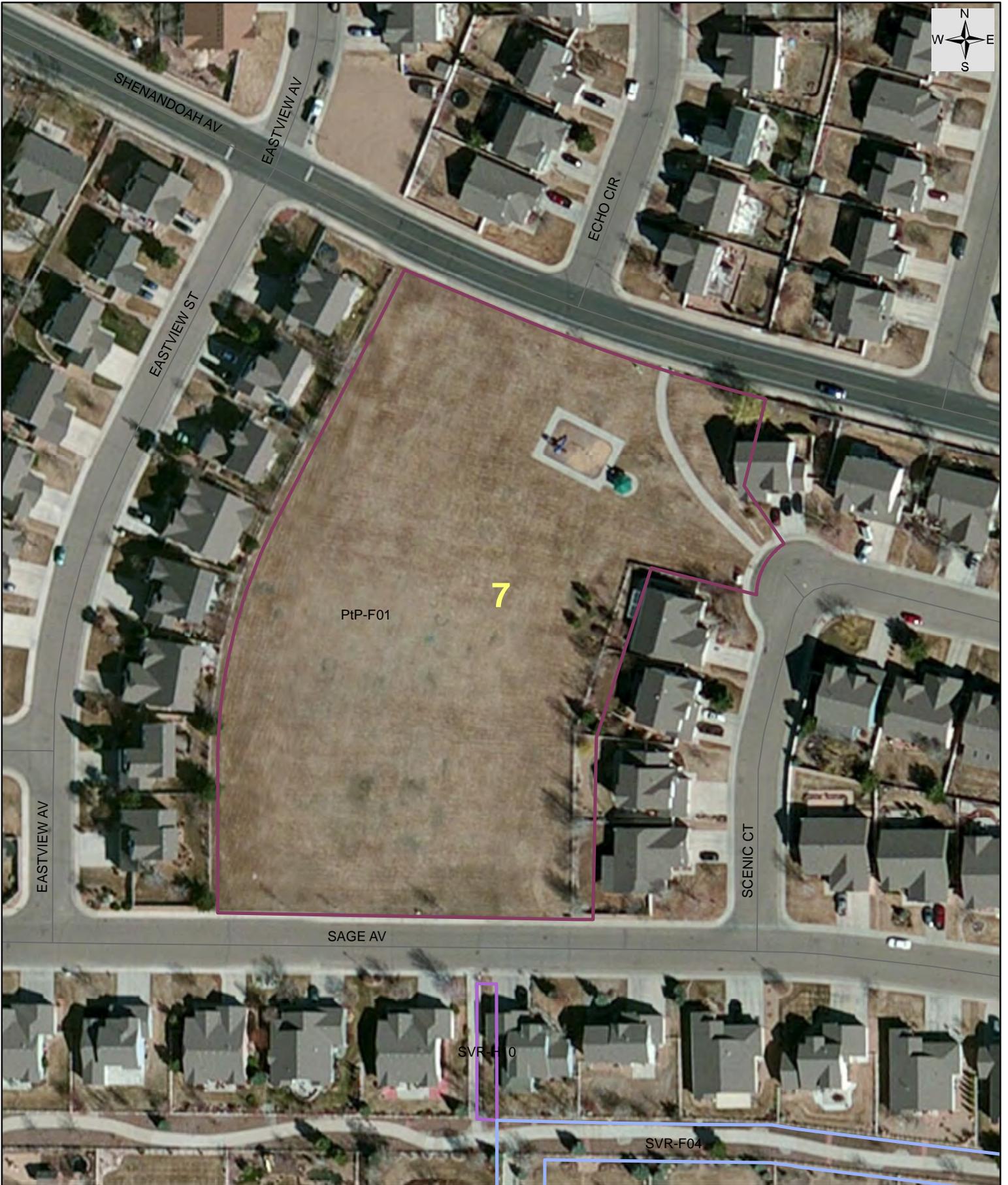


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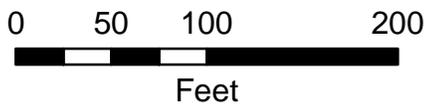
Parks & Open Spaces

Appendix B  
Map 16 of 52

**clearWATERsolutions**  
water rights • planning • engineering  
8010 S. County Road 5, Ste. 105 • Windsor, CO • 80528 • 970.223.3706



Date: 04-14-2015  
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### Delineated Areas

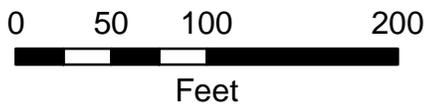
Parks &  
 Open Spaces

Appendix B  
 Map 17 of 52

**clearWATERsolutions**  
 water rights • planning • engineering  
 8010 S. Courty Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



Date: 04-14-2015  
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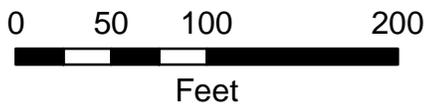


**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 18 of 52  
 clearWATERsolutions  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO • 80528 • 970.223.3706

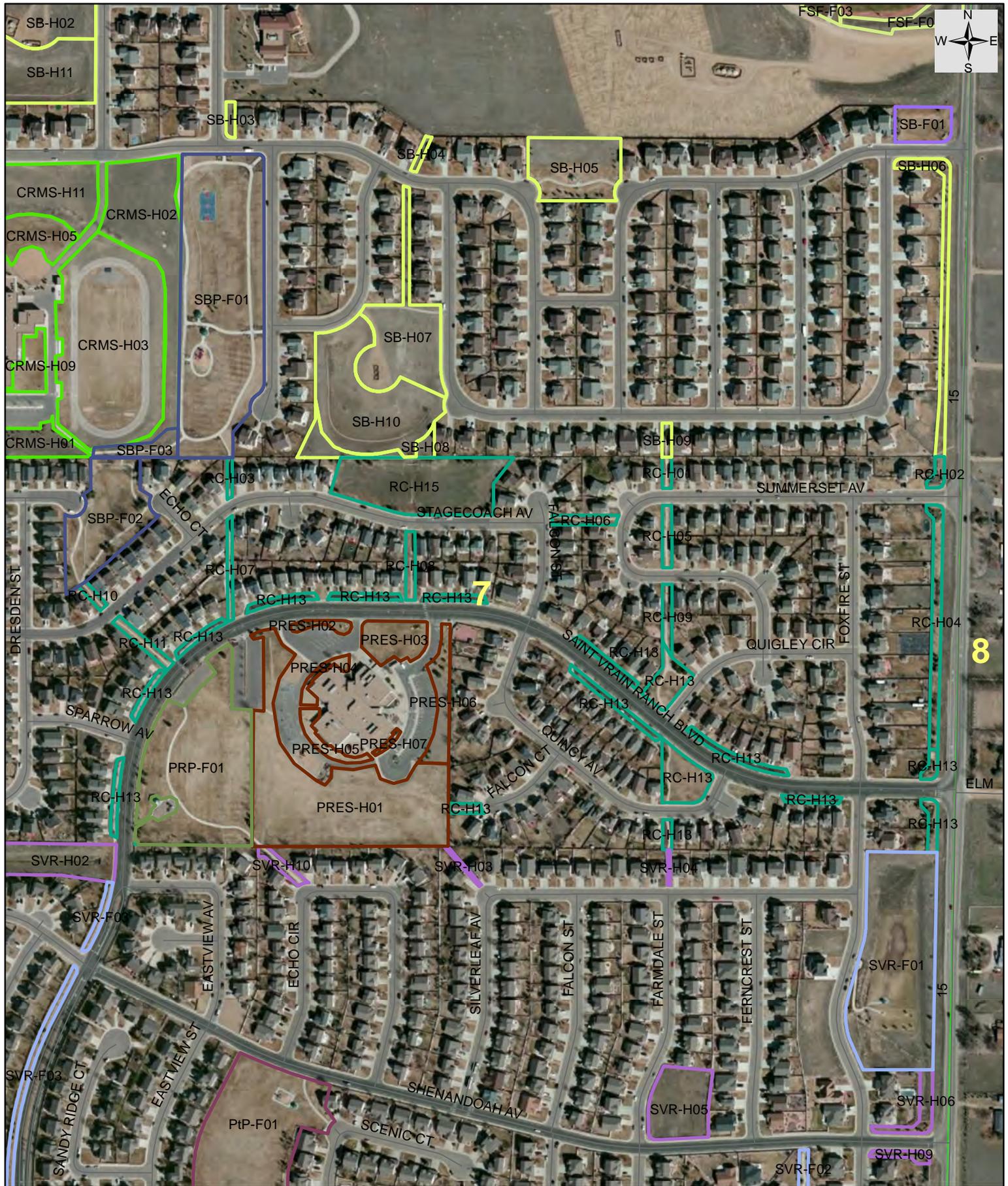


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 Job No: 14-240



**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 19 of 52  
 clearWATERsolutions  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



Date:	04-14-2015
Drawn By:	NEA
Scale:	As Shown
Job No:	14-240

**Delineated Areas**

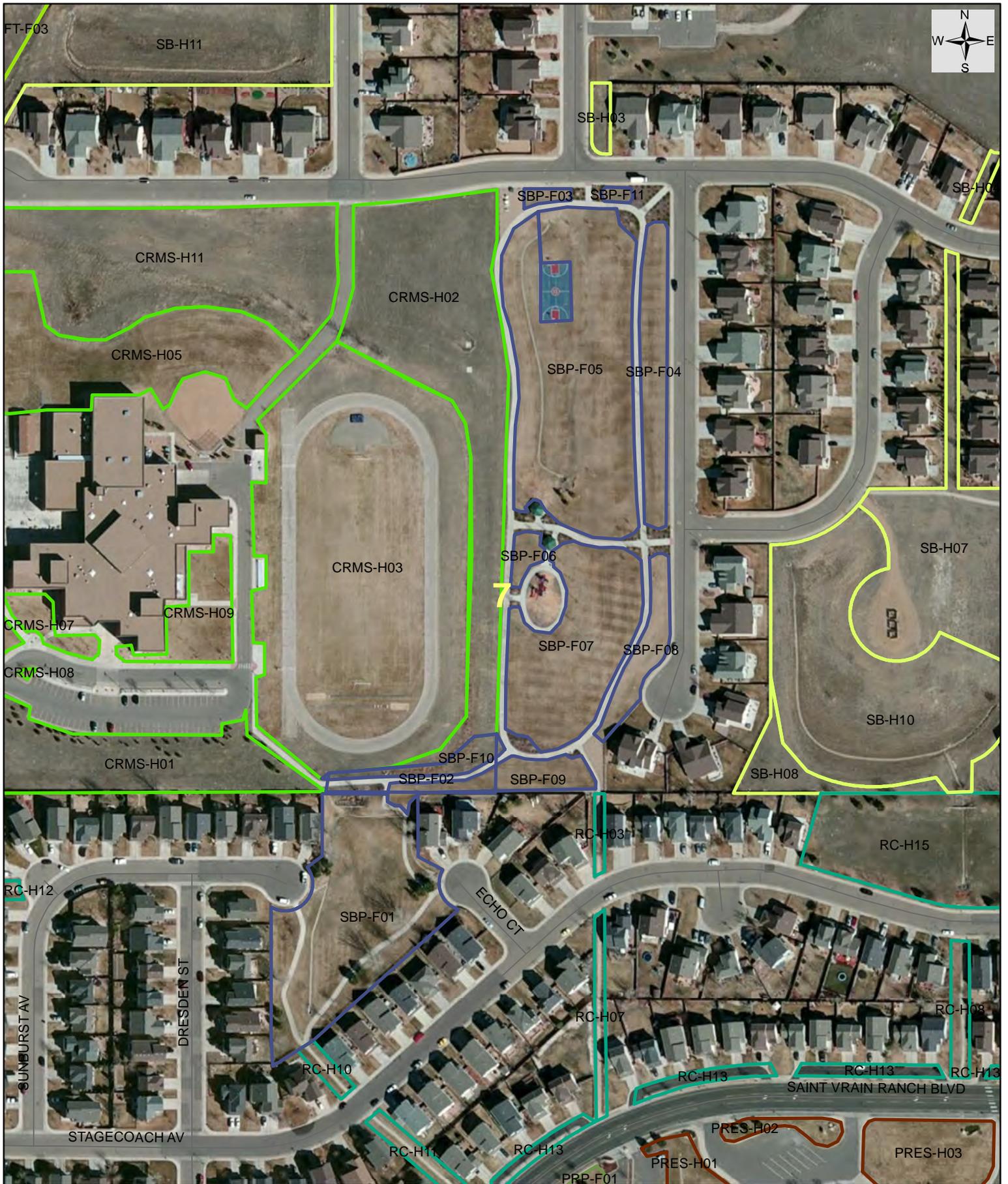
Parks & Open Spaces

0    200    400    800

Feet

Appendix B  
Map 20 of 52

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8010 S. County Road 5, Ste. 105 • Windsor, CO • 80528 • 970.223.3706



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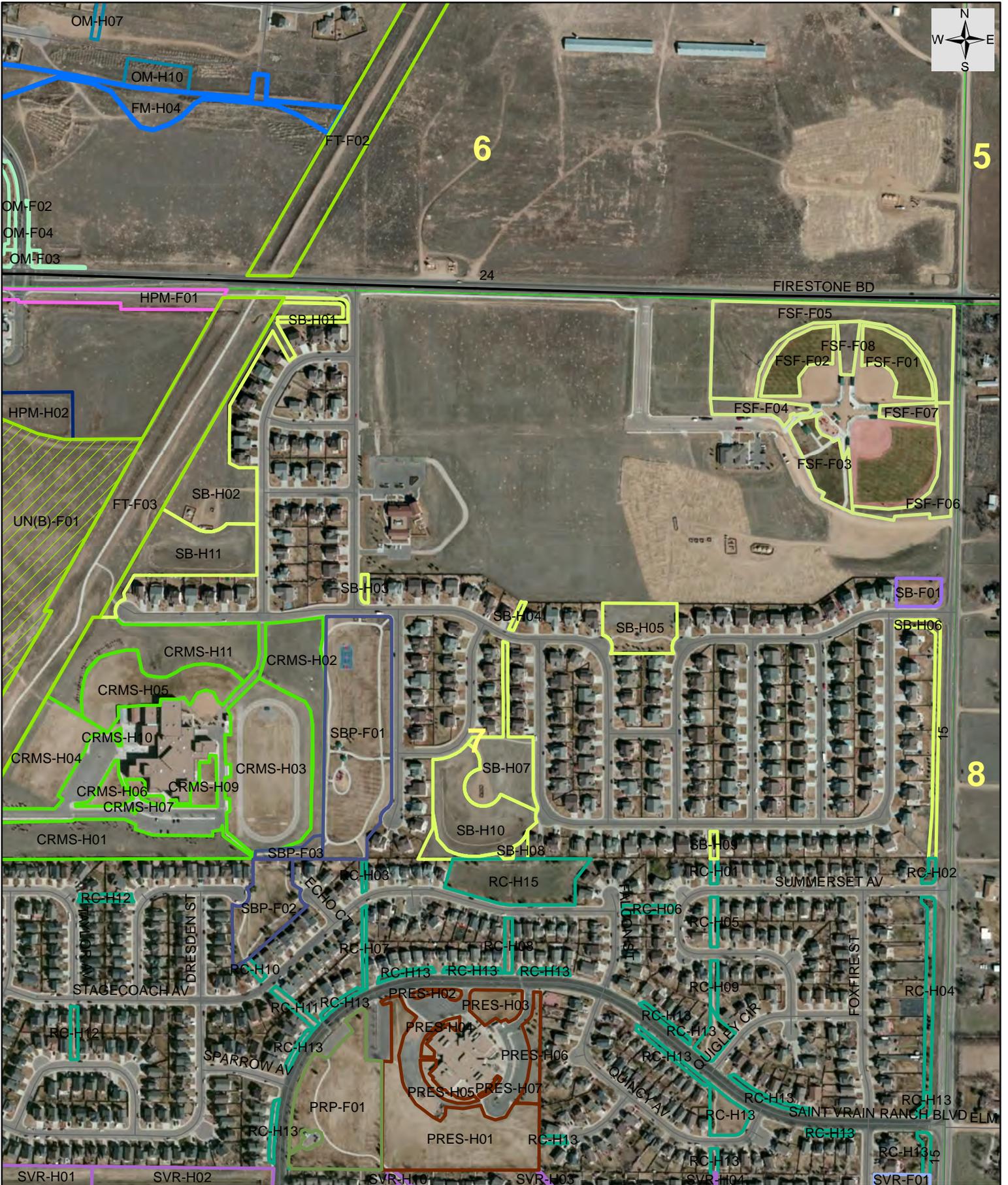
**Delineated Areas**  
 Parks &  
 Open Spaces

0    100    200    400  
 Feet

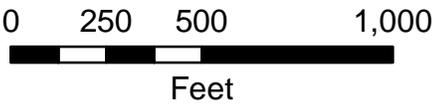
Appendix B  
 Map 21 of 52



water rights • planning • engineering  
 8010 S. Courty Road 5, Ste. 105 • Windsor, CO • 80528 • 970.223.3706



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### Delineated Areas

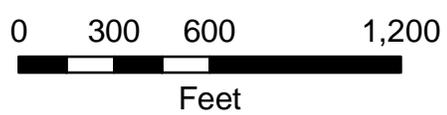
#### Parks & Open Spaces

Appendix B  
Map 22 of 52

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8010 S. County Road 5, Ste. 105 • Windsor, CO • 80528 • 970.223.3706



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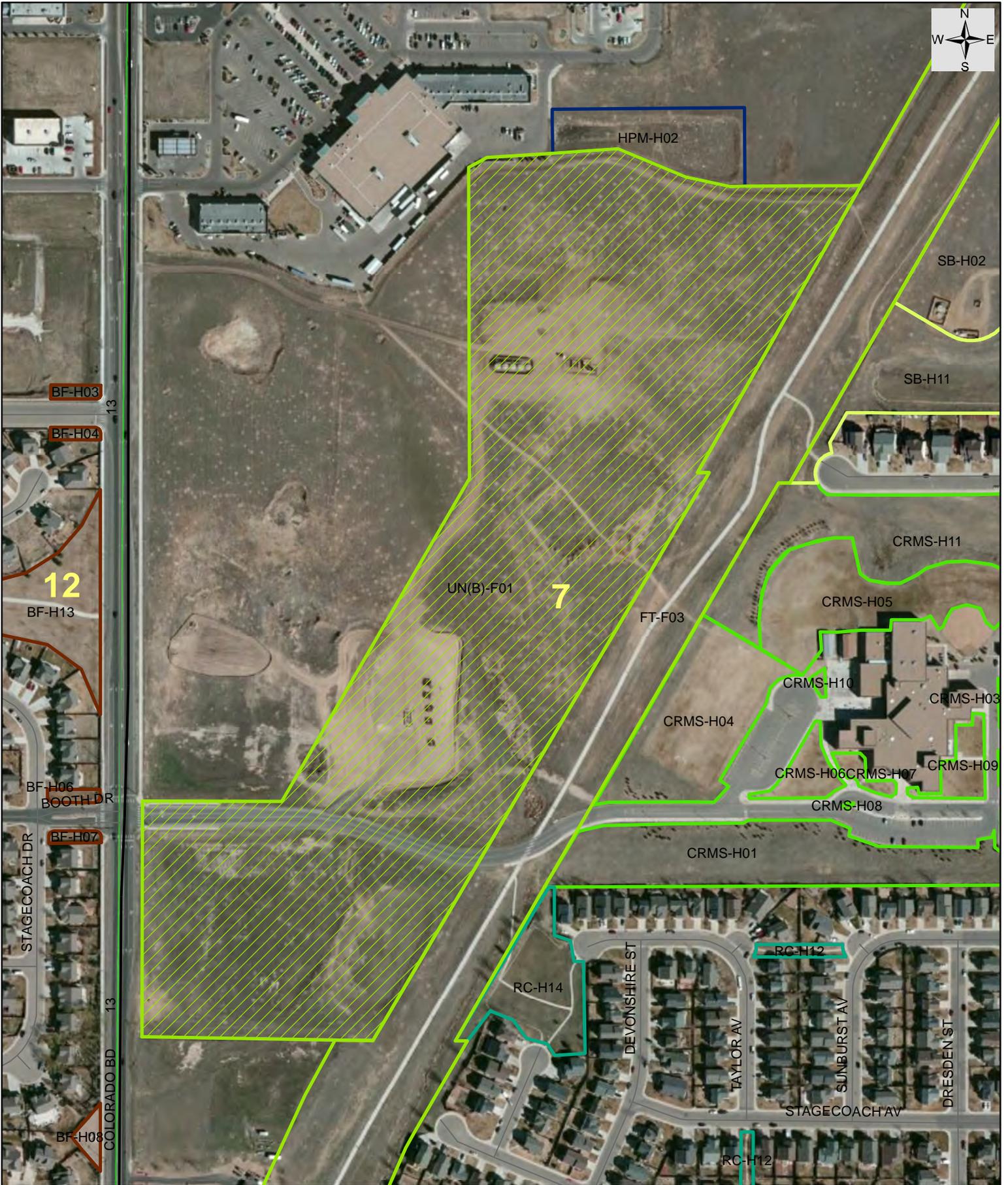


### Delineated Areas

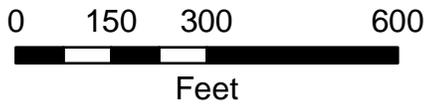
Parks & Open Spaces

Appendix B  
Map 23 of 52

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8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



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**Delineated Areas**  
 Parks &  
 Open Spaces

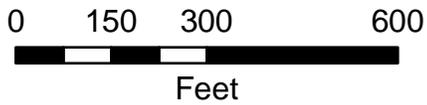
Appendix B  
 Map 24 of 52



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 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 • Windsor, CO • 80528 • 970.223.3706



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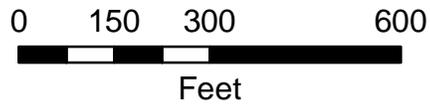


**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 25 of 52  
**clearWATERsolutions**  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



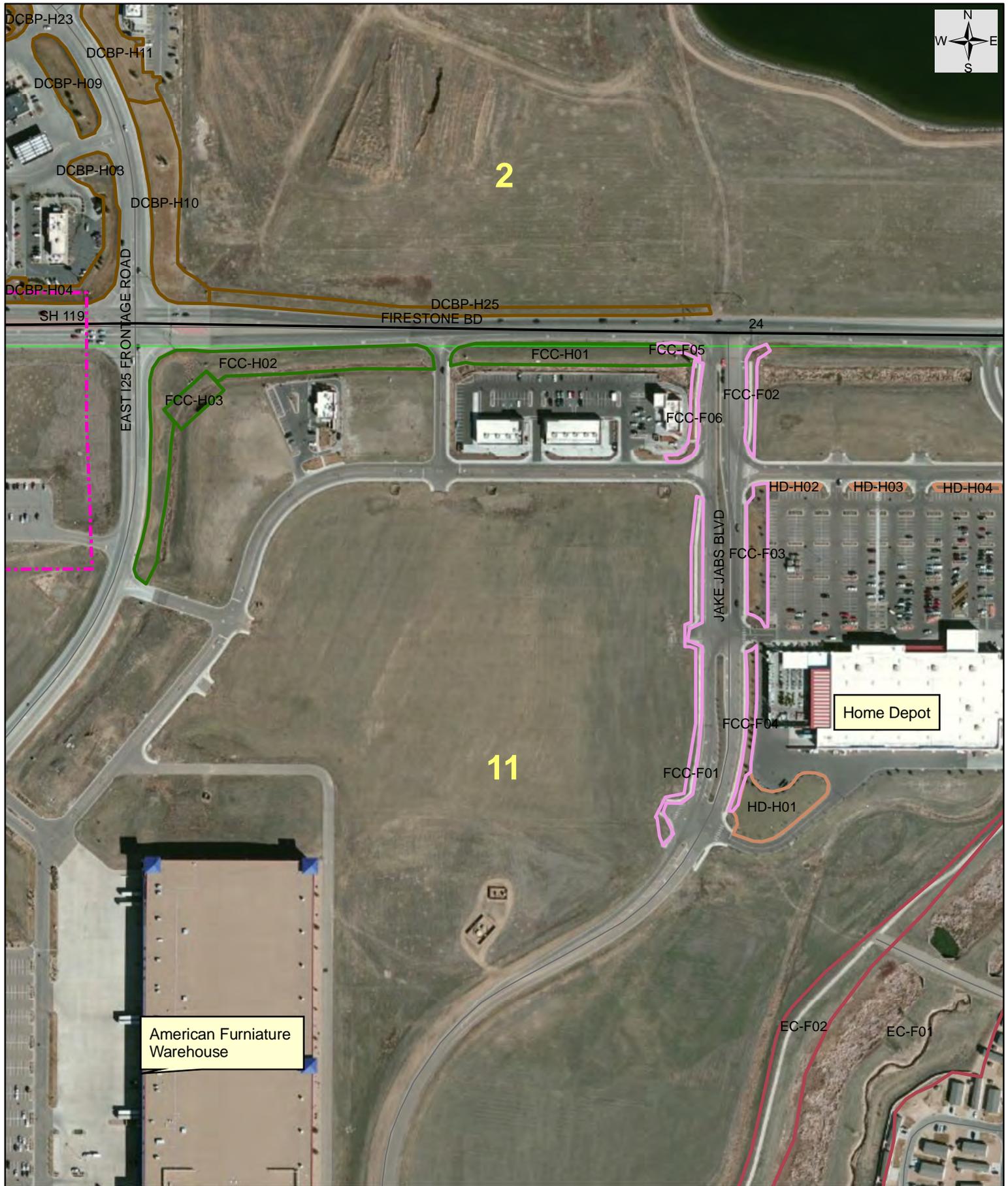
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### Delineated Areas Parks & Open Spaces

Appendix B  
Map 26 of 52

**clearWATERsolutions**  
water rights • planning • engineering  
8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



Date:	04-14-2015
Drawn By:	NEA
Scale:	As Shown
Job No:	14-240

**Delineated Areas**

Parks &  
Open Spaces

0    150    300    600

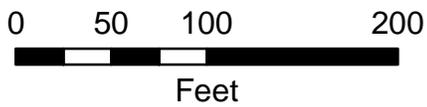
Feet

Appendix B  
Map 27 of 52

**clearWATERsolutions**  
water rights • planning • engineering  
8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



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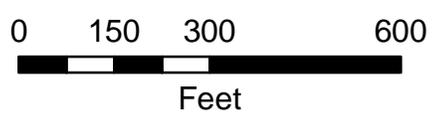


**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 28 of 52  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



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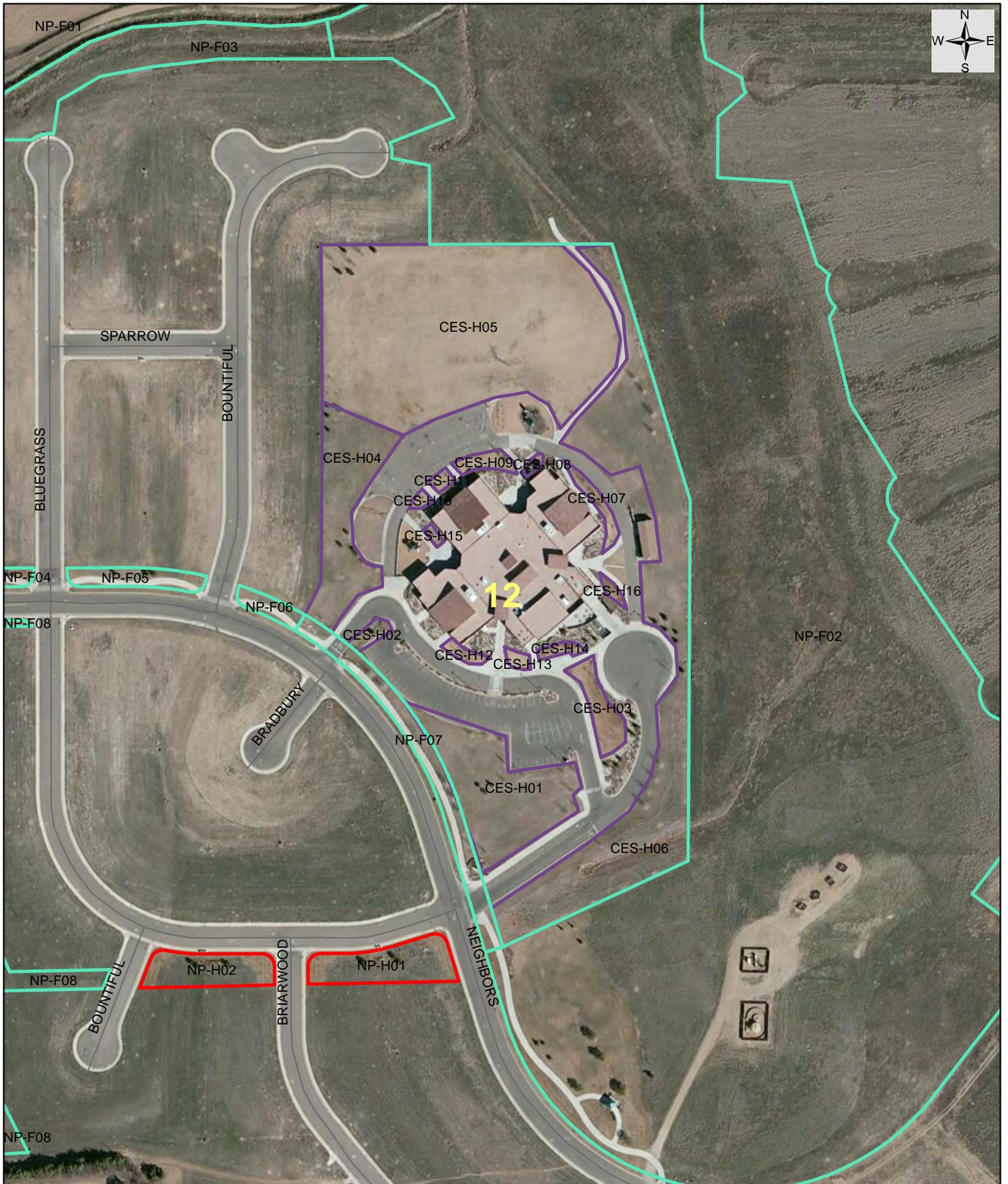


**Delineated Areas**  
Parks & Open Spaces

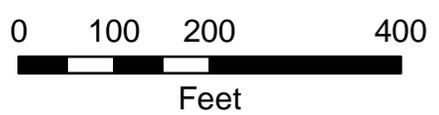
Appendix B  
Map 29 of 52

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8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706





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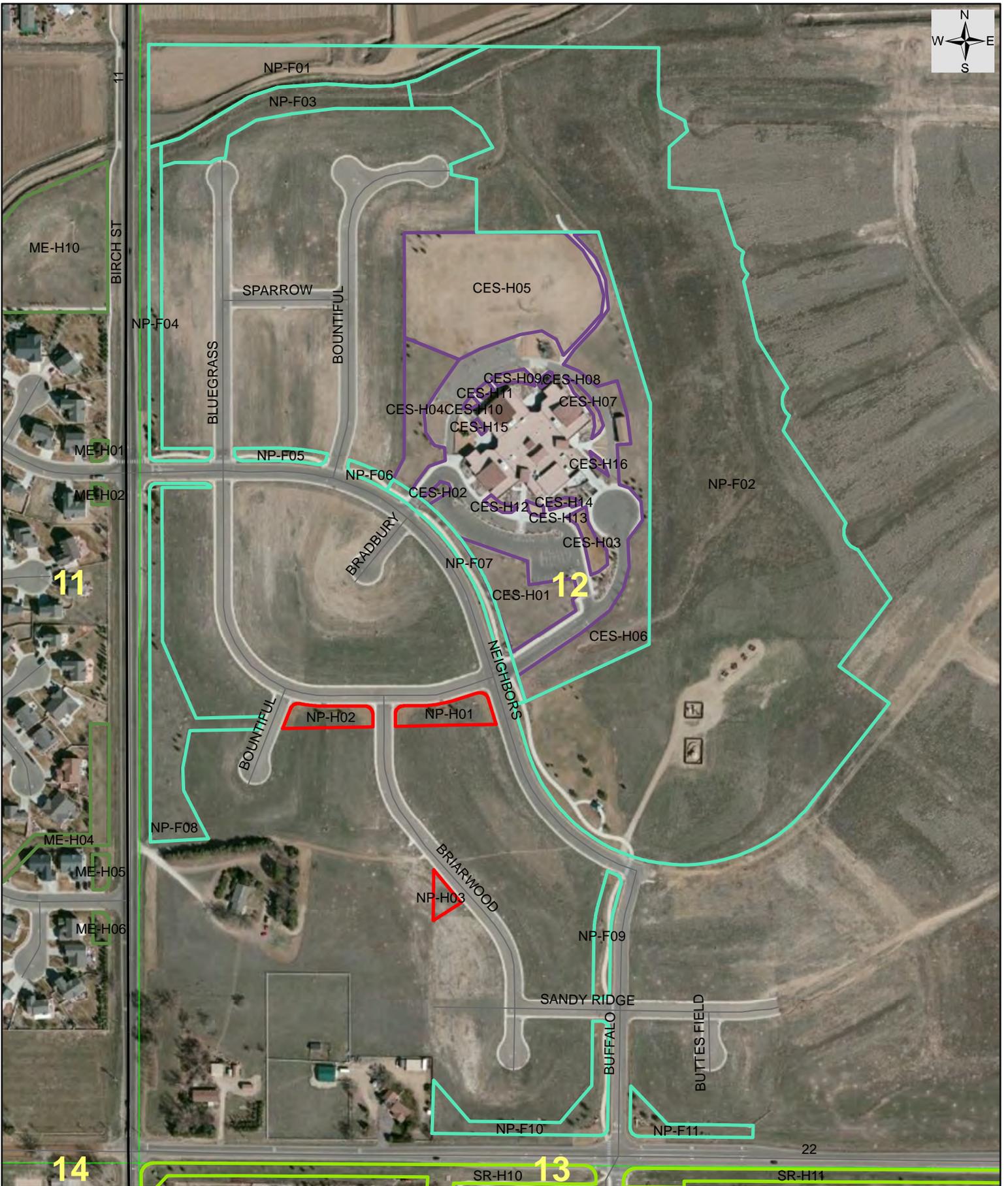


### Delineated Areas

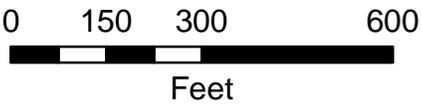
Parks & Open Spaces

Appendix B  
Map 31 of 52

**clearWATERsolutions**  
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8010 S. County Road 5, Ste. 105 - Windsor, CO • 80528 • 970.223.3706



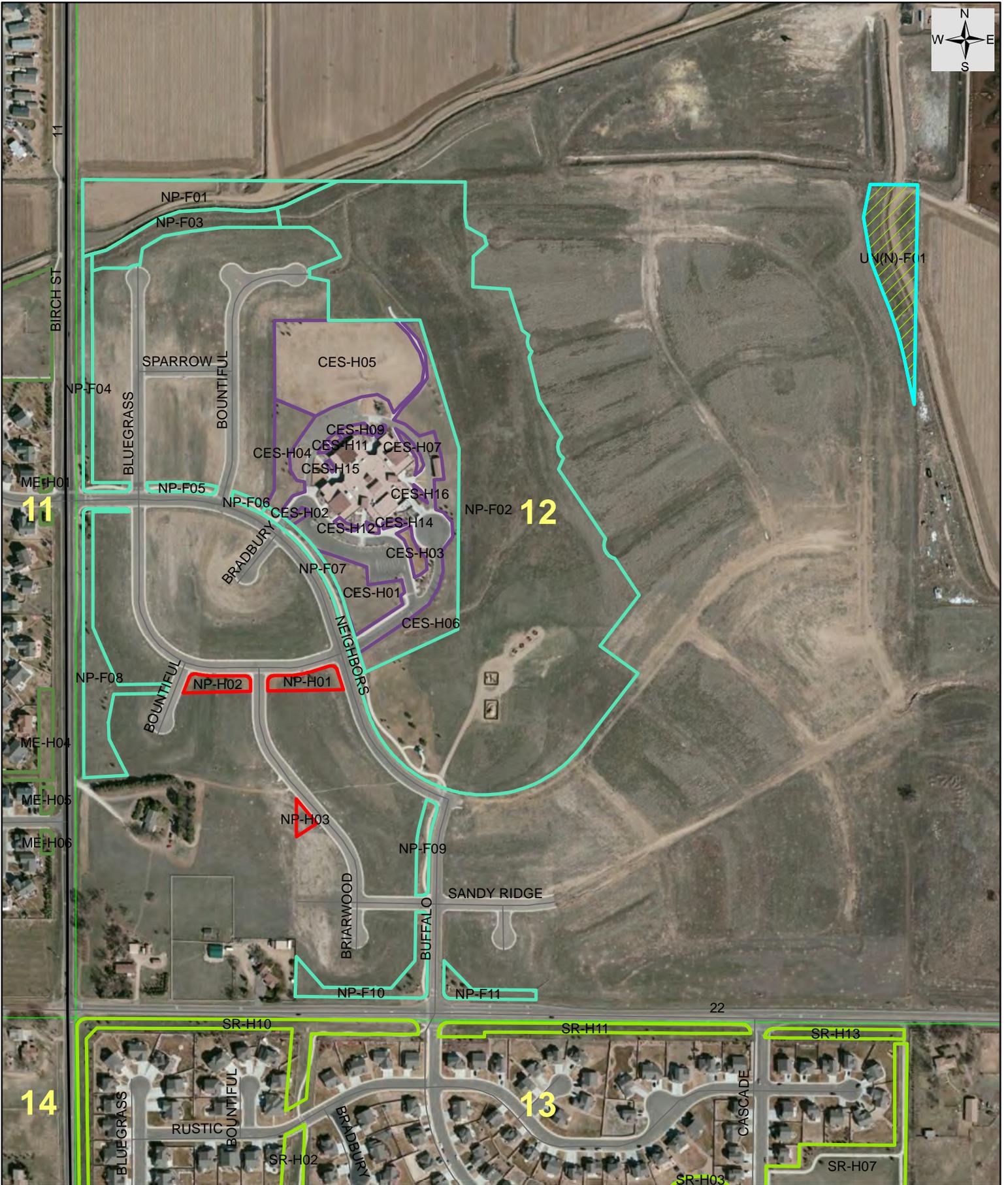
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 Scale: As Shown  
 Job No: 14-240



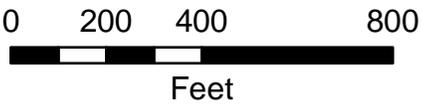
**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 32 of 52

**clearWATERsolutions**  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706

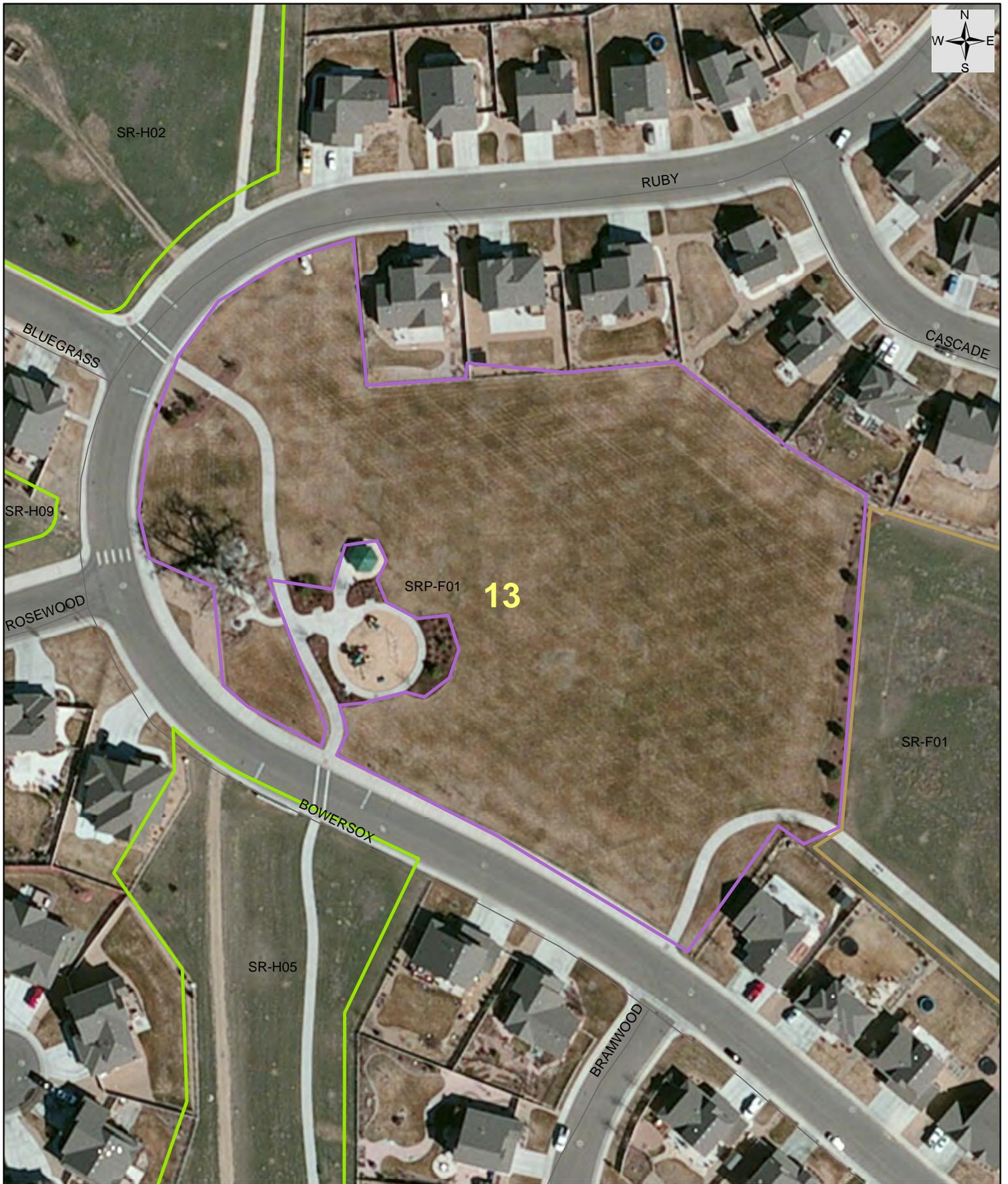


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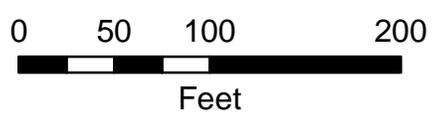


**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 33 of 52  
 clearWATERsolutions  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



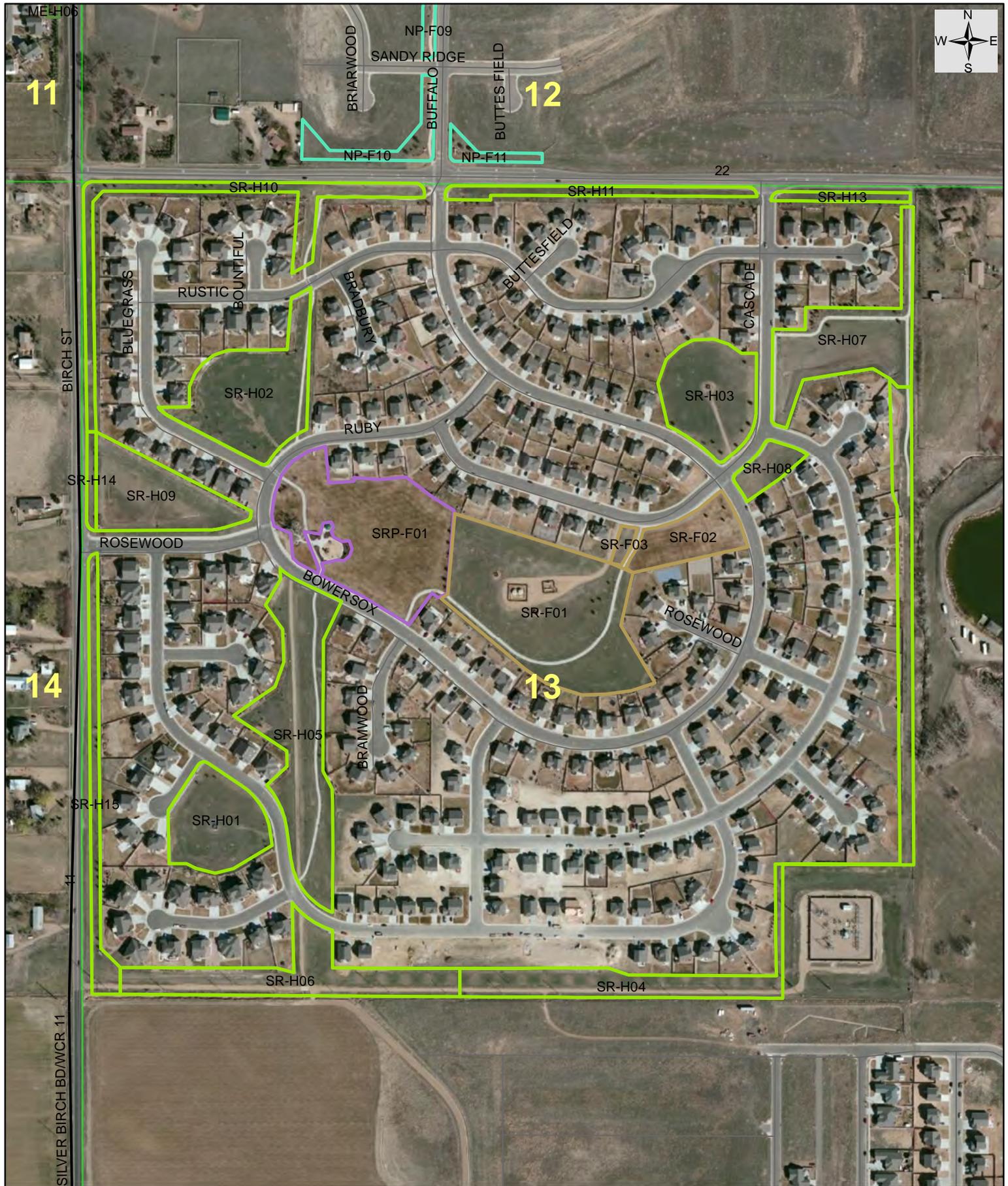
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 Drawn By: NEA  
 Scale: As Shown  
 Job No: 14-240



**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 34 of 52

**clearWATERsolutions**  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 • Windsor, CO • 80528 • 970.223.3706



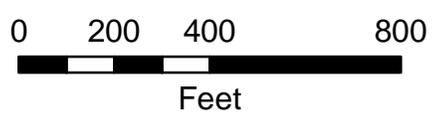
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12

14

13

Date:	04-14-2015
Drawn By:	NEA
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Job No:	14-240

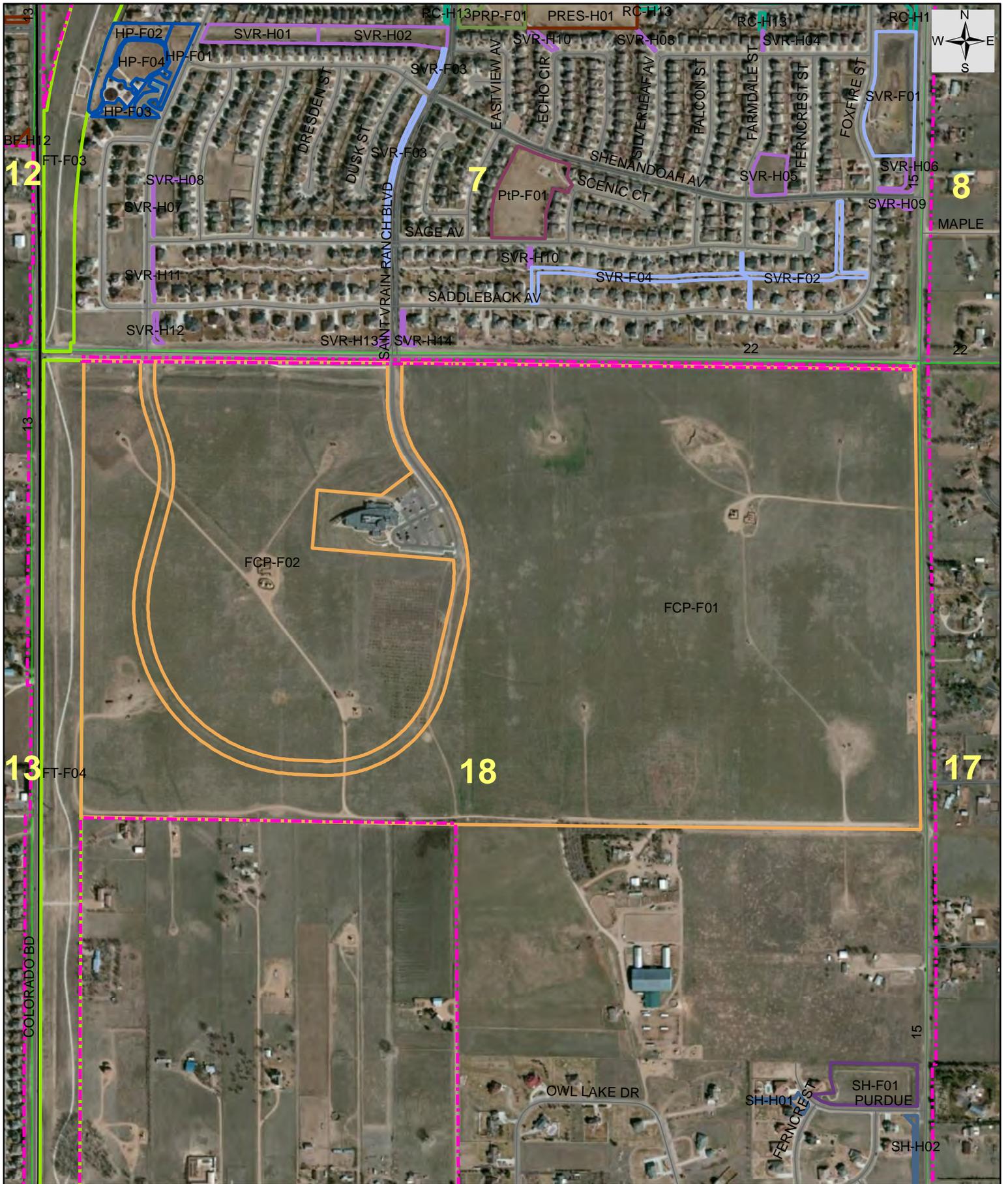


### Delineated Areas

Parks & Open Spaces

Appendix B  
Map 35 of 52

**clearWATERsolutions**  
water rights • planning • engineering  
8010 S. County Road 5, Ste. 105 • Windsor, CO • 80528 • 970.223.3706



Date:	04-14-2015
Drawn By:	NEA
Scale:	As Shown
Job No:	14-240

**Delineated Areas**

Parks & Open Spaces

0

350

700

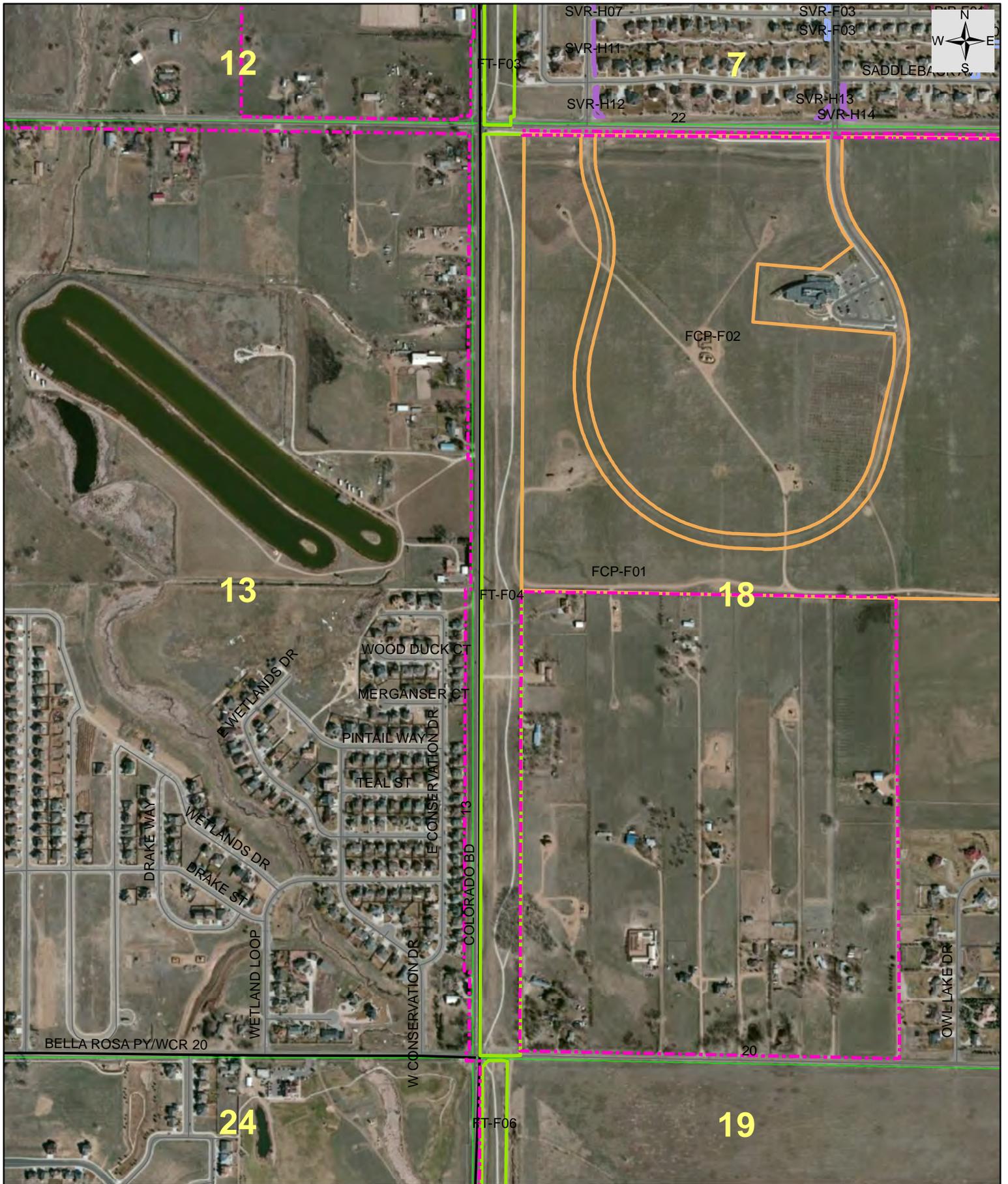
1,400

Feet



Appendix B  
Map 36 of 52

**clearWATERsolutions**  
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8010 S. County Road 5, Ste. 105 - Windsor, CO • 80528 • 970.223.3706



Date:	04-14-2015
Drawn By:	NEA
Scale:	As Shown
Job No:	14-240

**Delineated Areas**

Parks &  
Open Spaces

0

350

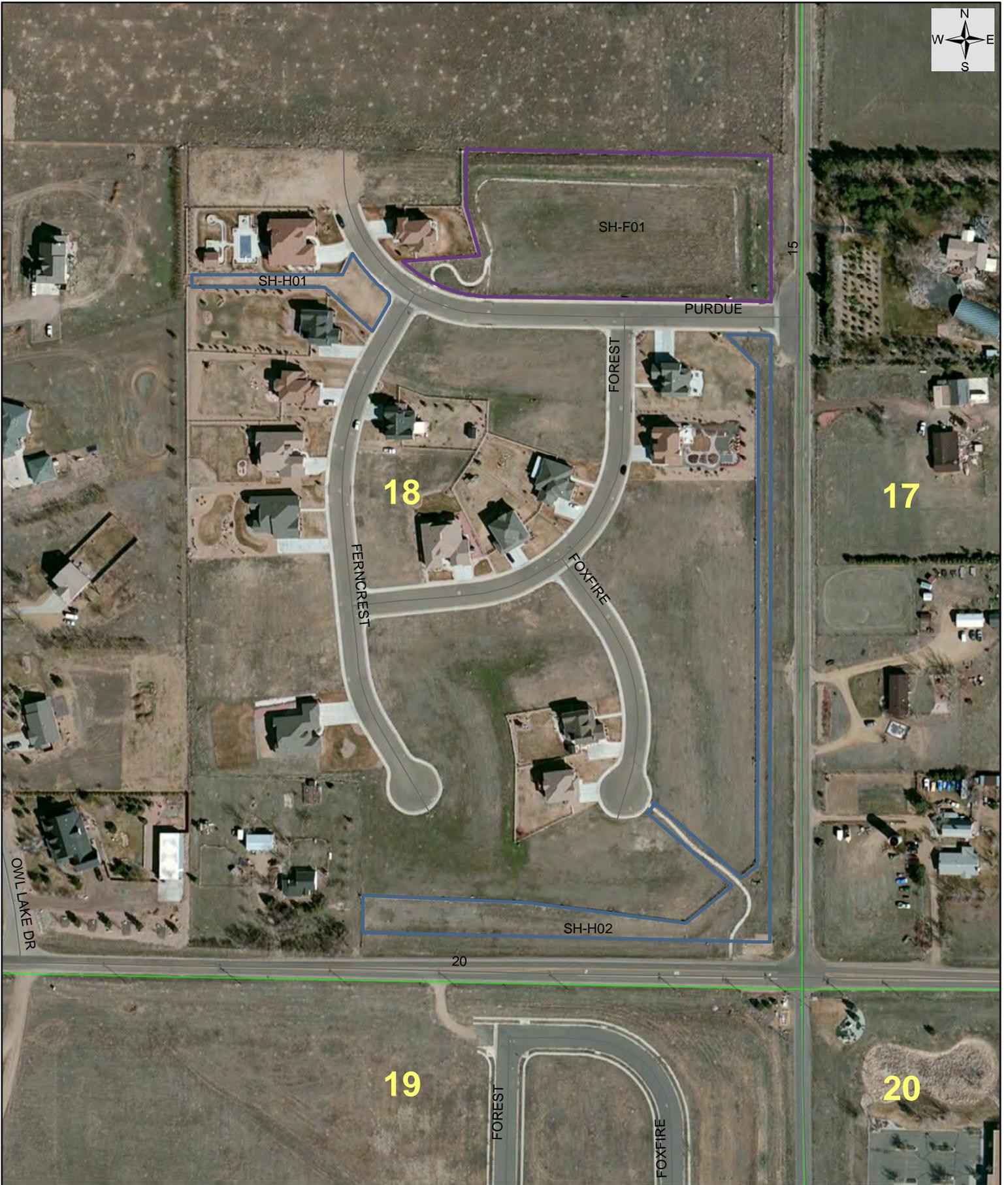
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1,400

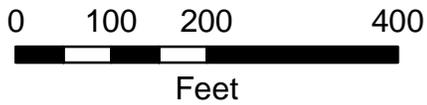
Feet

Appendix B  
Map 37 of 52

**clearWATERsolutions**  
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8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



Date:	04-14-2015
Drawn By:	NEA
Scale:	As Shown
Job No:	14-240



### Delineated Areas

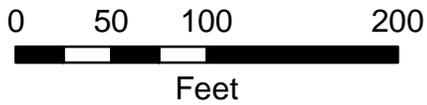
Parks & Open Spaces

Appendix B  
Map 38 of 52

**clearWATERsolutions**  
water rights • planning • engineering  
8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



Date: 04-14-2015  
 Drawn By: NEA  
 Scale: As Shown  
 Job No: 14-240



**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 39 of 52  
**clearWATERsolutions**  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



Date:	04-14-2015
Drawn By:	NEA
Scale:	As Shown
Job No:	14-240

**Delineated Areas**

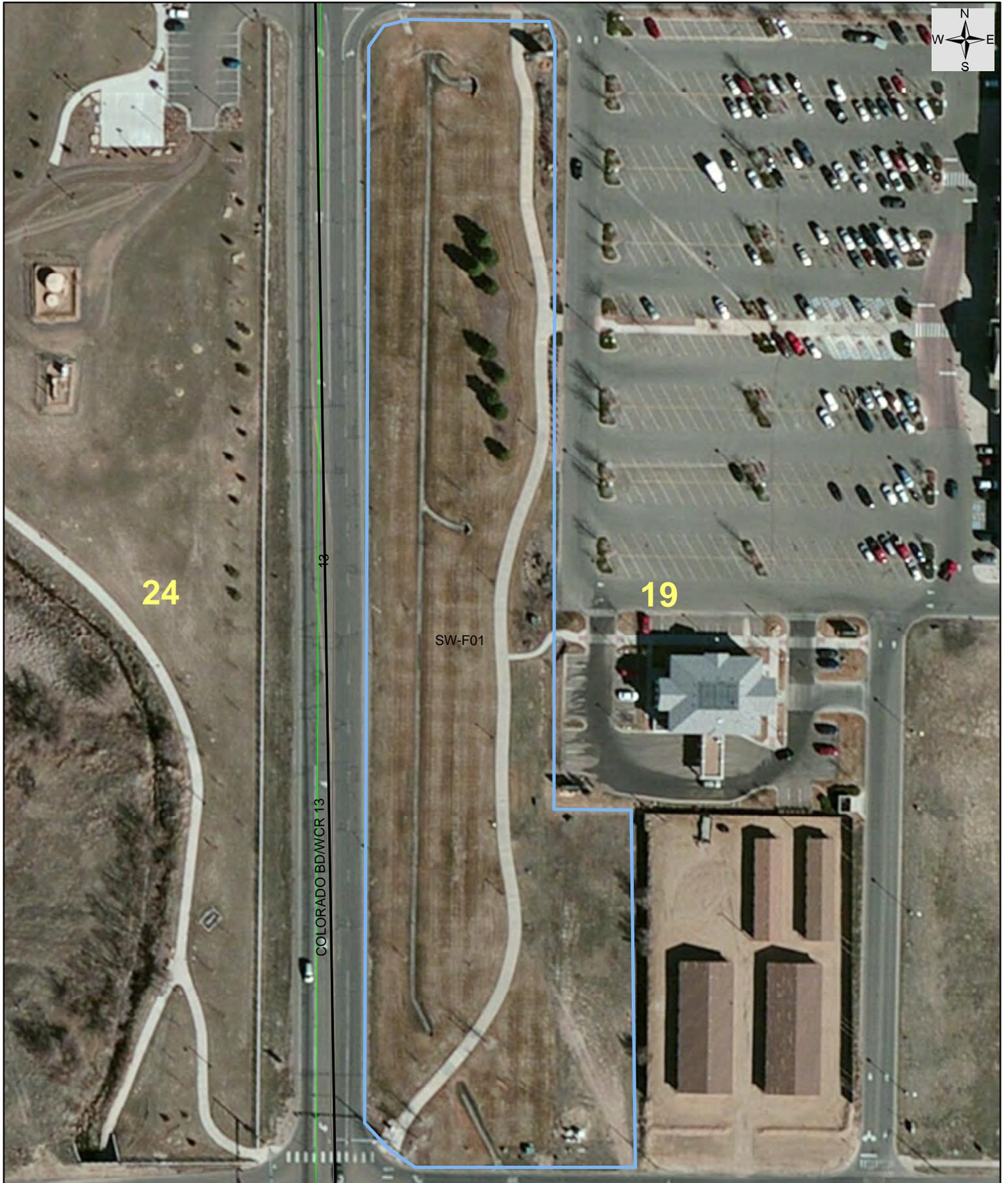
Parks & Open Spaces

0    350    700    1,400

Feet

**clearWATERsolutions**  
water rights • planning • engineering  
8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706

Appendix B  
Map 40 of 52



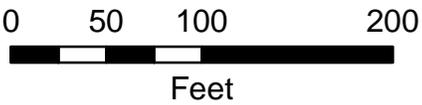
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19

SW-F01

COLORADO BD/WCR 13

Date:	04-14-2015
Drawn By:	NEA
Scale:	As Shown
Job No:	14-240



**Delineated Areas**  
Parks & Open Spaces

Appendix B  
Map 41 of 52

**clearWATERsolutions**  
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8010 S. Courty Road 5, Ste. 105 - Windsor, CO • 86528 • 970.223.3706



Date: 04-14-2015  
 Drawn By: NEA  
 Scale: As Shown  
 Job No: 15-100

**Delineated Areas**

Parks & Open Spaces

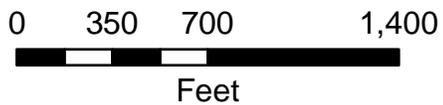
0    50    100    200  
 Feet

Appendix B  
 Map 42 of 52

**clearWATERsolutions**  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



Date:	04-14-2015
Drawn By:	NEA
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Job No:	14-240



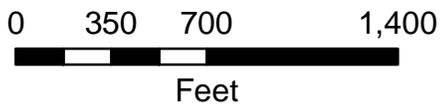
**Delineated Areas**  
Parks &  
Open Spaces

Appendix B  
Map 43 of 52

**clearWATERsolutions**  
water rights • planning • engineering  
8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



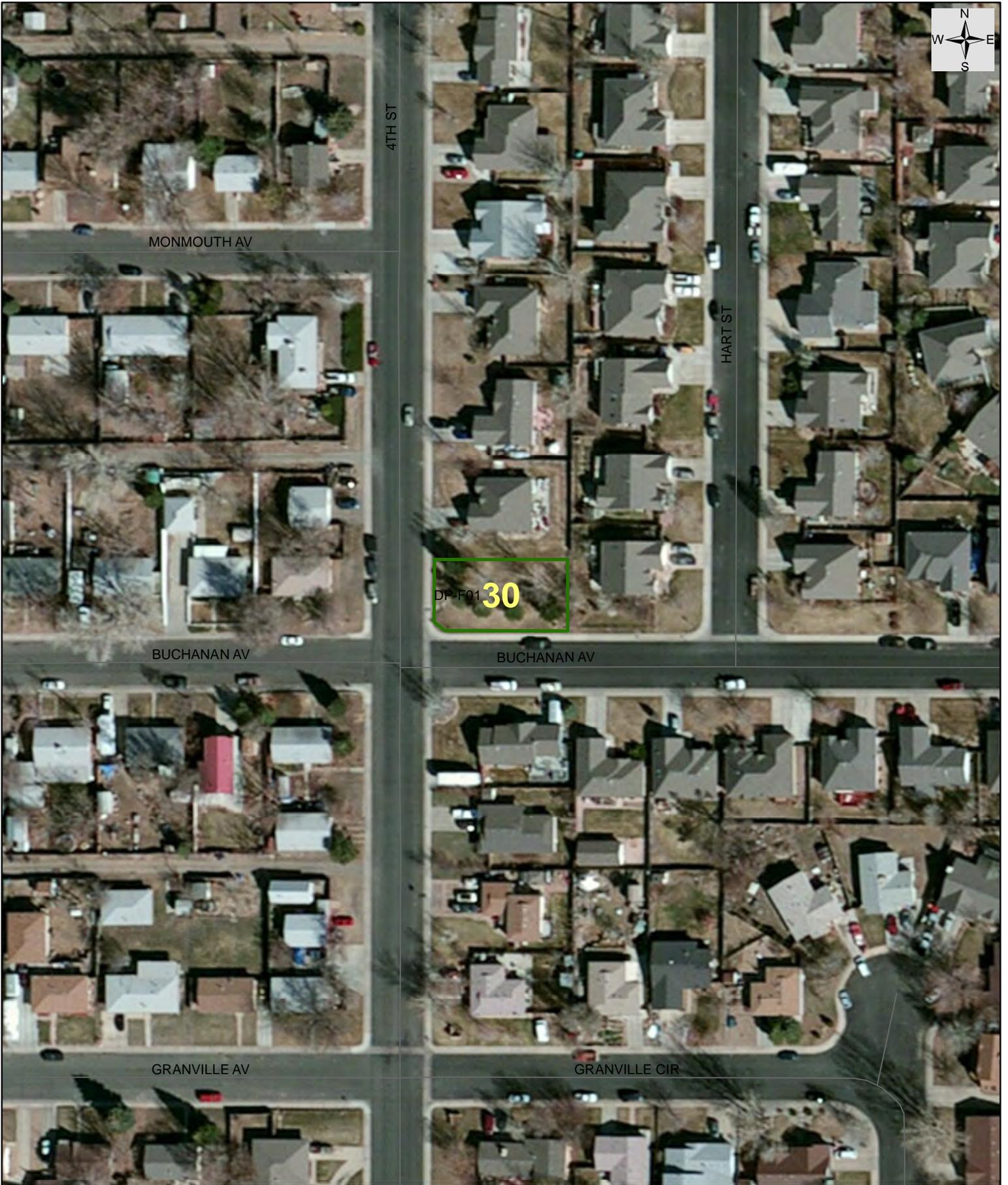
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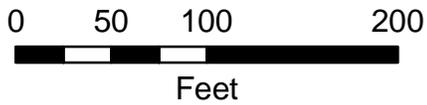
**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 44 of 52

**clearWATERsolutions**  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



Date: 04-14-2015  
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 Job No: 15-100

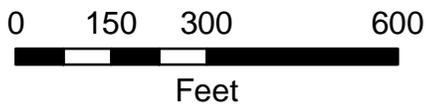


**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 45 of 52  
 clearWATERsolutions  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO • 80528 • 970.223.3706



Date: 04-14-2015  
 Drawn By: NEA  
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 Job No: 14-240



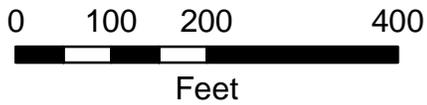
**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 46 of 52

**clearWATERsolutions**  
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 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706

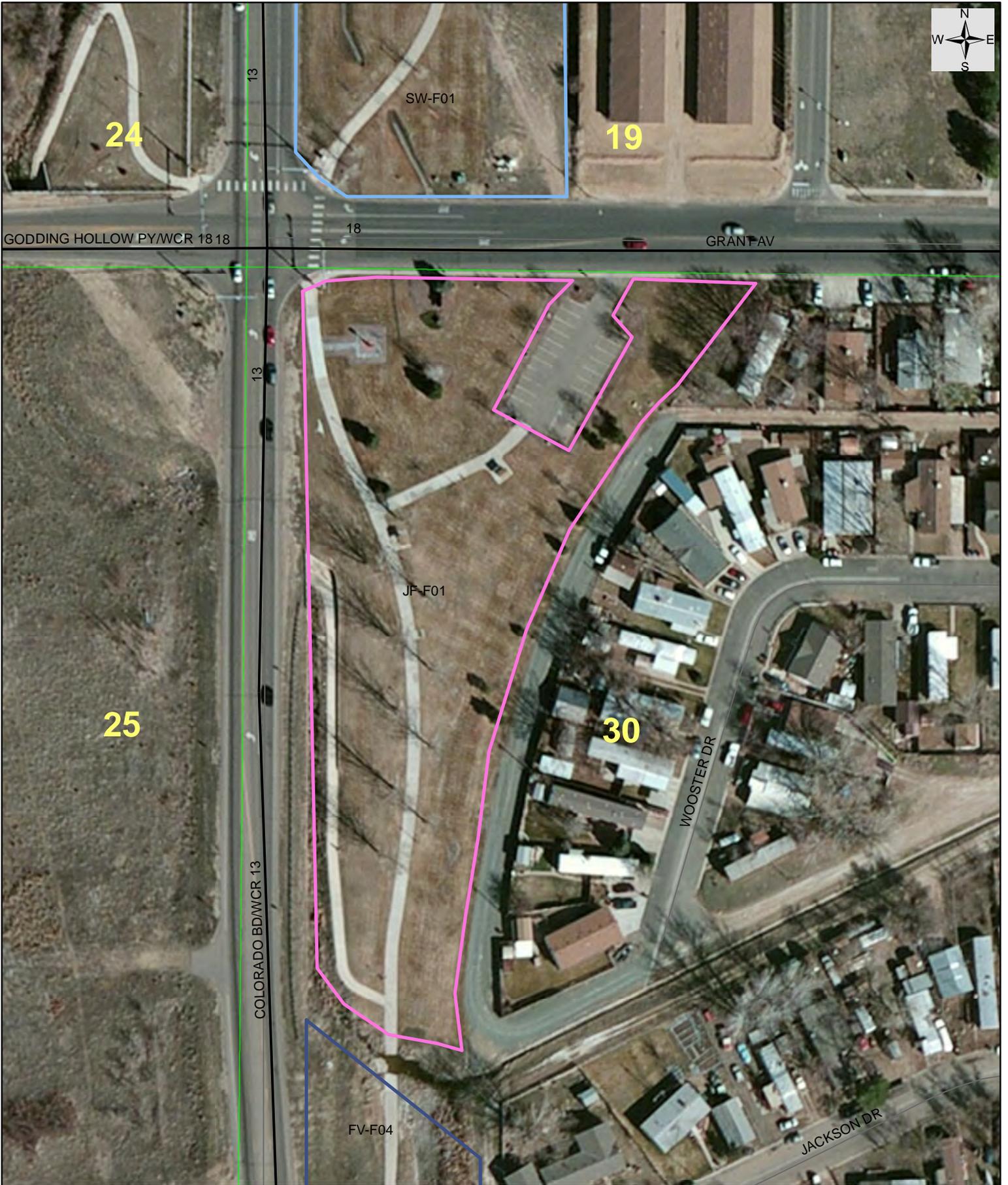


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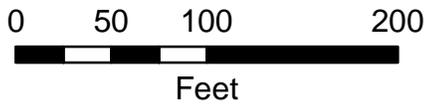


**Delineated Areas**  
 Parks &  
 Open Spaces

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 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



Date: 04-14-2015  
 Drawn By: NEA  
 Scale: As Shown  
 Job No: 14-240



**Delineated Areas**  
 Parks &  
 Open Spaces



Appendix B  
 Map 48 of 52

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 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



19

GRANT AV

18



MP-F02

MP-F01

MP-F03

30

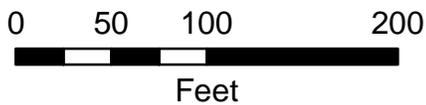
WOOSTER AV

WOOSTER AV

1ST ST

2ND ST

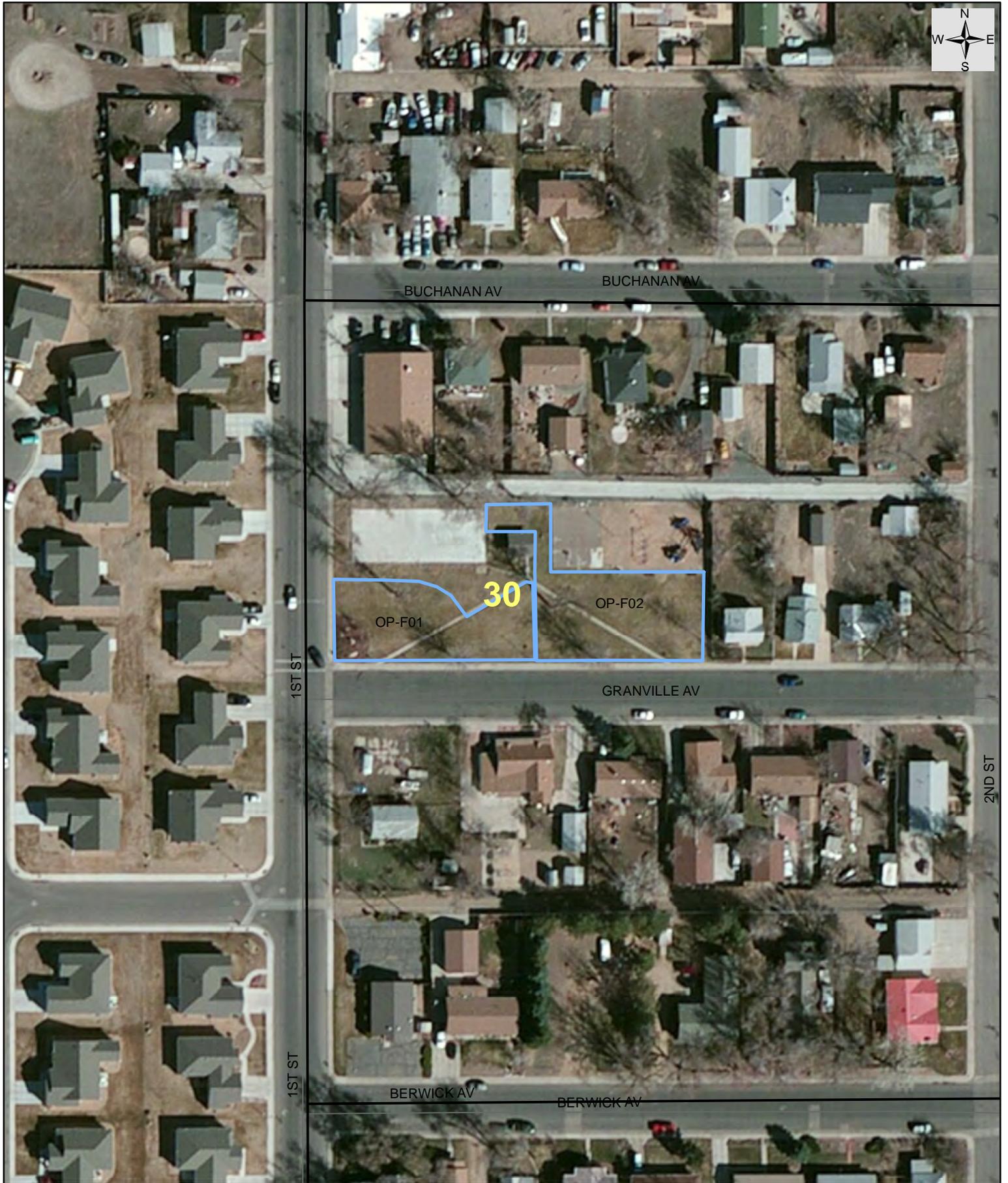
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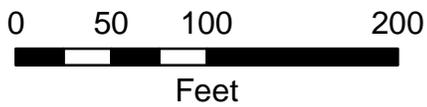
**Delineated Areas**  
Parks &  
Open Spaces

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8010 S. County Road 5, Ste. 105 - Windsor, CO • 80528 • 970.223.3706

Appendix B  
Map 49 of 52



Date: 04-14-2015  
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 Scale: As Shown  
 Job No: 14-240



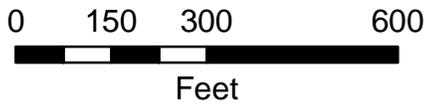
**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 50 of 52

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 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706



Date: 04-14-2015  
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Job No: 14-240

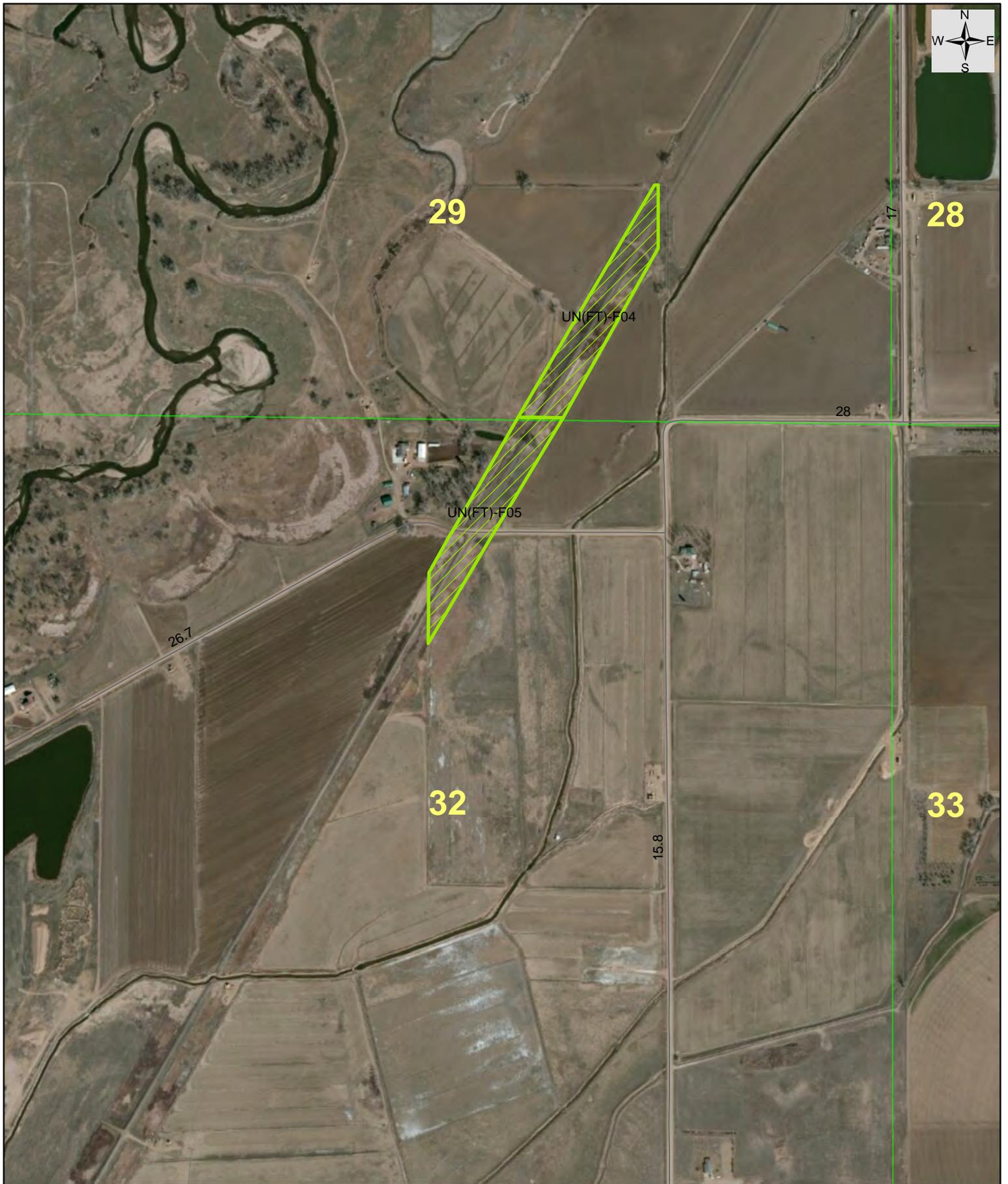


### Delineated Areas

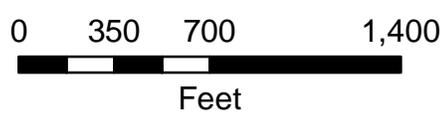
Parks &  
Open Spaces

Appendix B  
Map 51 of 52

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8010 S. County Road 5, Ste. 105 - Windsor, CO • 80528 • 970.223.3706



Date: 04-14-2015  
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 Job No: 14-240

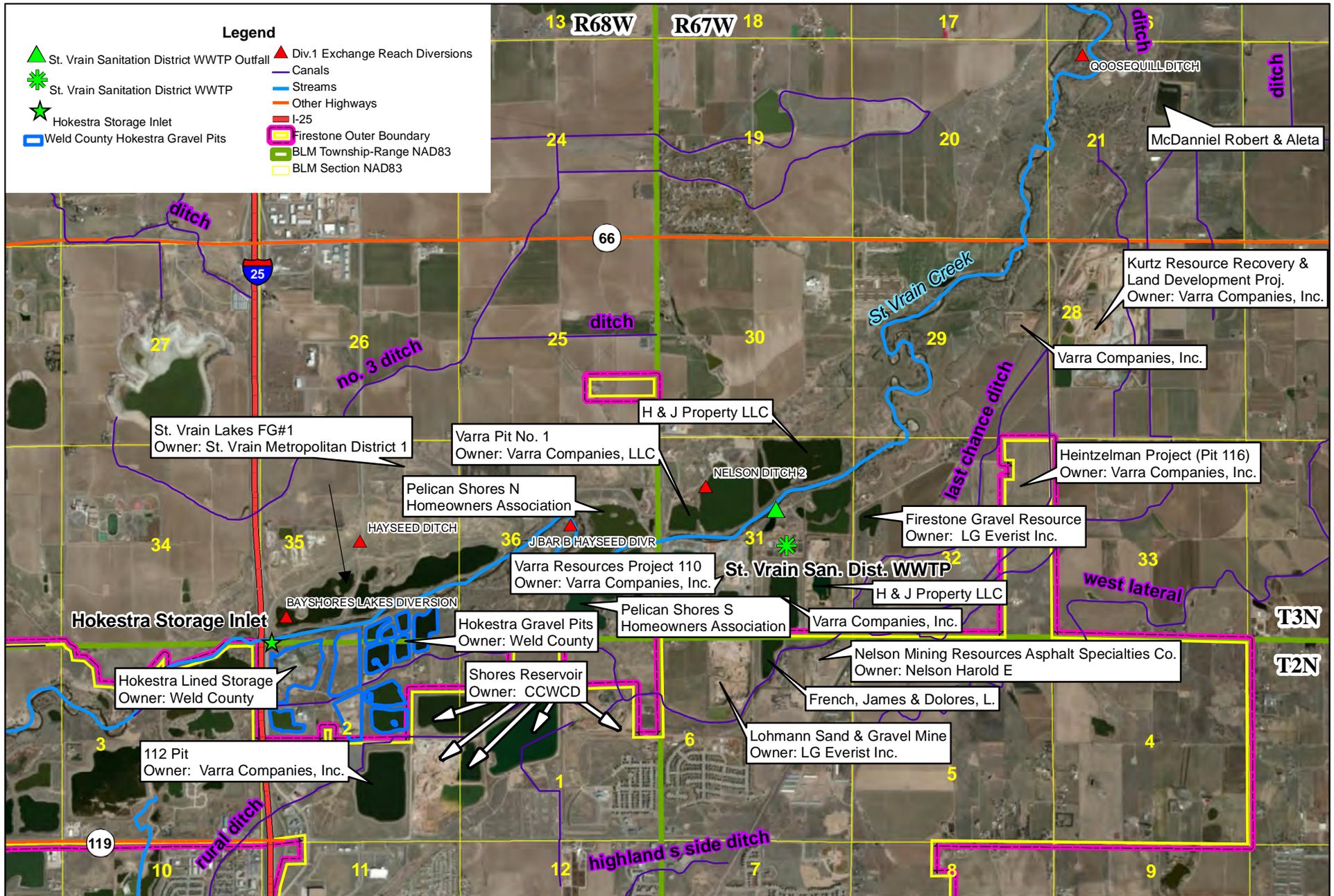


**Delineated Areas**  
 Parks &  
 Open Spaces

Appendix B  
 Map 52 of 52  
 clearWATERsolutions  
 water rights • planning • engineering  
 8010 S. County Road 5, Ste. 105 - Windsor, CO - 80528 - 970.223.3706

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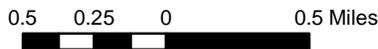
**APPENDIX C**  
*Potential Storage Reservoir Map*



Date: 08-17-2015  
 Drawn By: RVP/NEA  
 Scale: As Shown  
 Job No: 15-100

**FIRESTONE, NON-POTABLE MASTER PLAN**

**Appendix C**  
 Potential Exchange Reach on St. Vrain Creek



**Town of Firestone**  
**Non-Potable Master Plan**  
**Potential Reservoir Storage Locations along the St. Vrain Creek**

Structure or Gravel Pit Name	WDID (where available)	Owner	Contact	Phone #	Decreed Vol. (AF)	Location			
						Quarter	Section	Range	Township
Hokestra Lined Storage		Weld County	Clay Kimmi	970-304-6496		NW	2	68W	2N
Bayshore Lakes	503307	Little Thompson Water District (Anglund)	Jim Hibbard	970-532-2096	1400	SE	35	68W	3N
St. Vrain Lakes FG #1		St. Vrain Metropolitan District 1	Chris Bremmer	303-858-1800		SW & SE	35	68W	3N
112 Pit		Varra Companies, Inc.	Garrett Varra	720-272-2857		SE	2	68W	2N
Hokestra Gravel Pits		Weld County	Clay Kimmi	970-304-6496		NE/SE	2/35	68W/68W	2N/3N
Shores Reservoir		CCWCD	CCWCD	970-330-4540		NE/SE/NW/NE/SE	2/2/1/1/1	68W	2N
Pelican Shores S		Pelican Shores S HOA	Kevin Lucas	303-420-4433		NE	36	68W	3N
Pelican Shores N		Pelican Shores N HOA	Kevin Lucas	303-420-4434		SE	36	68W	3N
Varra Pit No. 1	503310	Varra Companies, Inc.	Garrett Varra	720-272-2857		NW	31	67W	3N
Varra Pit No. 2	503311	Varra Companies, Inc.	Garrett Varra	720-272-2858		NW	31	67W	3N
Dakolios West Res./Varra Resources Project 110	504003	Varra Companies, Inc.	Garrett Varra	720-272-2857	4104	SW	31	67W	3N
Von Ohlen Res./Dakolios East Res.	504002	Varra Companies, Inc.	Garrett Varra	720-272-2858	4300	SE	31	67W	3N
Nelson Pit		Hall-Irwin Corp	Peter Ziemke	970-352-6057		SE	31	67W	3N
H & J Pit		H & J Property LLC/H&J Nelson Management LLC	Harold Nelson	303-776-2336		NE	31	67W	3N
Lohmann Sand & Gravel Mine		LG Everist Inc.	Richard Schneider	303-651-3309		NW	6	67W	2N
French Res.	504090	Dolores L French	James French	303-776-9127	245.4	NE	6	67W	2N
Firestone Gravel Resource		LG Everist Inc.	Richard Schneider	303-651-3309		NW	32	67W	3N
Heintzelman Project (Pit 116)/Varra-Heintzelman Pit		Varra Companies, Inc.	Garrett Varra	720-272-2857		NE	32	67W	3N
Sand Land Inc. Site		Varra Companies, Inc.	Garrett Varra	720-272-2857		NE	29	67W	3N
Kurtz Res./Kurtz Resource Recovery & Land Development Project	504000	Varra Companies, Inc.	Garrett Varra	720-272-2857	7000	NW & SW	28	67W	3N
McDaniel Site		Aleta McDaniel	Aleta McDaniel	720-684-6618		NE	21	67W	3N