Boulder Valley Comprehensive Plan
University of Colorado Boulder, South Campus

Site Suitability Analysis

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BOULDER VALLEY COMPREHENSIVE PLAN

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Introduction / Executive Summary

This report is intended to inform potential changes to Boulder Valley Comprehensive Plan (BVCP) land use designations for the CU South site and subsequent annexation, initial zoning, and agreements between the City of Boulder and University of Colorado Boulder (CU Boulder). Discussions surrounding changes to land use designations for CU South were tabled during previous updates to the BVCP until the completion of the South Boulder Creek Flood Mitigation Study. With the flood mitigation study approved by City Council in 2015, city staff reinitiated discussions about CU South as a part of the 2015 BVCP update. This report includes a high-level analysis of conservation suitability, multimodal transportation, and utility services, and concludes by offering initial insights into conservation and development of CU South.

A conservation suitability analysis was conducted by environmental planning agency Biohabitats (Denver, CO) to identify ecological characterizations, suitability mapping, and preliminary sketches of viewshed and connectivity considerations. The results suggest that the eastern perimeter and the southern wetlands have the highest ecological value and sensitivity to disturbance or development. The central portion of the property and the western edge have lower conservation values, making them less sensitive to disturbance or development.

A supporting transportation multi-modal analysis was conducted by Fox Tuttle Hernandez Transportation Group, a local transportation consultant agency. This analysis recommends keeping the primary vehicular access to the site on South Loop Drive and secondary access along Tantra Drive in the future. Other recommendations include incorporating the northern end of South Loop Drive as a mobility hub, improving existing trails to create multi-use paths and providing new pedestrian connections to adjacent neighborhoods. An additional transportation analysis is being considered by CU Boulder to estimate the amount and type of land uses that could be considered for the site based on multi-modal carrying capacity of surrounding transportation facilities.

Existing City of Boulder water distribution, sewer collection and treatment facilities have adequate capacity to serve some additional development on the site. Other than a potential water main extension, no major off-site improvement requirements for water or sewer are anticipated at this time. Prior to connecting to city services, CU Boulder must provide a utility report identifying usage requirements and the on-site (private) utility design to ensure compliance with city standards.

Interest in the future of the property remains very high. Two community meetings were held to share results of recent studies and gather insights into key issues. Some issues identified include flood mitigation, open space conservation, recreational access, neighborhood impacts and off-site visual impacts, as further described in this report. Community input is being used to inform changes to the land use designations and in developing key issues to be addressed at annexation.

Staff will use information referenced in this report and feedback from decision-making bodies to form a recommendation for changes to the CU South land use designations and a list of issues to be addressed in future agreement(s) between the city and CU Boulder for development and conservation of the site. While conversations among BVCP approval bodies are ongoing, the analysis is starting to indicate that some areas are more suitable for conservation and other uses. Conservation of ecological values and wetlands appear to be most suitable for the southern portion and along the eastern boundary of the site. With 80 acres for regional detention and 30 acres to accommodate fill material, floodwater mitigation will also cover a sizeable portion of the site.

Site Description and History

Site description

Current and Previous Land Use and Planning Area Designations

The property is entirely in Boulder County and in BVCP Planning Area II, which makes it eligible for annexation (Map 1: Vicinity). The site currently has the following three BVCP land use designations on portions of the property – Low Density Residential (LR, 49.36 AC), Medium Density Residential (MR, 66.75 AC), and Open Space-Other (OS-O, 193.25 AC)(Map 2: Existing Land Use Designations). During the 2000 and 2005 updates to the BVCP, the city decided not to consider changing the land use designations until after completing the South Boulder Creek Flood Mitigation Study. With the flood mitigation study approved by City Council in 2015, city staff reinitiated discussions about CU South as a part of the 2015 BVCP update.

The most recent changes to the land use and planning area designation of the CU South property were made during the 2000-major update. At that time the area II boundary that runs along the eastern edge of CU South had been redrawn changing a small northern portion of the site from Medium Density Residential (MR) to Open Space-Acquired (OS-A).

Size and location

CU South is comprised of six parcels totaling 308 acres, all owned by CU Boulder and is commonly called "CU South" or "CU-Boulder South." Located south of Table Mesa Drive west of U.S. 36, the site is part of the gateway for the city of Boulder. The site is within Area II of the BVCP planning area. The site is approximately a mile and a half from the Main and East Campuses and a half-mile from Williams Village. East of the site is city-owned open space and South Boulder Creek.

Site Context

Properties directly west of the site are primarily designated as residential with Tantra Park bisecting the low and medium density residential uses. Properties to the east and south are designated as open space with some existing low density residential and manufactured housing to the south. Some commercial and business areas are near the site, particularly along Table Mesa Drive and South Boulder Road.

The residential neighborhood to the west has a range of housing types including single-family homes, townhomes, and apartment complexes. The lowest intensity of housing immediately adjacent to the site is found in the single-family housing neighborhoods north and south of Tantra Park. The density of the multi-family housing ranges between 12 – 14 units per acre. Tantra Park runs throughout the neighborhood, providing direct access to open space and parks for residents. The commercial area to the north along Table Mesa contains restaurant, offices, and a gas station. West of these residential neighborhoods contain Summit Middle School and Morning Star (retirement complex). The only access to these neighborhoods is off Table Mesa and South Broadway.

Table 2: Net density for development adjacent to CU South.

	Total Dwelling Units	Acreage	du/acre
1. Walden and South Creek Condos	195	14.5	13.4
2. Tantra Lakes and South Creek Condos	349	27.4	12.7
3. Tantra Park SF Homes	65	9.5	6.9
4. Majestic Heights Neighborhood	168	42.4	4.0
5. Mountain Shadows and Somerset Condos	157	13.0	12.1

Note: Calculations reflect the net density of this neighborhood, which include building lots, rights of way and any common areas.

Access and Connection

South Loop Road serves as the primary entrance and only paved road to the site. The only other vehicular access is through a dirt road that intersects with Marshall Road, located on the south-west corner of the site; this road has a gated entry that limits public access. Pedestrian access is available mostly along the western edge of the site where multiple trailheads sit adjacent to neighborhood roads and parks, including Moorhead Circle, Chambers Drive and Tantra Park. A more detailed analysis of the existing and potential options for future access has been completed by Fox Tuttle (Attachment D).

Figure 1: Adjacent neighborhood included in the net density calculations.

History of the property

Transfers

Table 2 below contains a high-level summary of various actions taken by the city and the university related to changes in ownership and use. The following summary is an abbreviated historical account of the CU South property.

Table 2: Recent timeline of key events.

1950s – 80s	• In the mid-1950's, Flatiron Companies purchases the estimated 168-acre property from the Deepe family to continue mining and purchases the remaining CU South property from the Van Vleet family shortly after. • An embankment and channel is constructed in the floodplain of the South Boulder Creek to provide flood protection for sand and gravel mining and to control the flow and minimize any impact on the 100-year flood discharge[1]. • In the early 1980s, construction of the embankment and channel is followed by a sand and gravel mining operation[2]. • Regulatory approvals for floodplain development and sand/gravel mining are approved in 1989 for the Marshall Pit, adjacent to and incorporated into the mining of Phase Four of the Deepe Pit[3]. The floodplain permits approve open pit mining on land south of the embankment and channel.

[1] Boulder County Special Permit #AR-79-4 – Floodplain Construction, South Boulder Creek was approved on February 20, 1980.
[2] Boulder County Special Use Review #SU-81-10 – Deepe Farm Pit was approved on January 11, 1982.
[3] Boulder County Floodplain Development Permits #89-4A and #89-5 were approved on February 29, 1989, in conjunction with Special Use Review #SU-88-19 for sand and gravel mining.

1996	• Flatiron Companies sells the full property to the University of Colorado. • Boulder City Council adopts Resolution Number 758 directing the City Manager and City Attorney to "take all necessary actions and work with the County to support the County taking all necessary actions to ensure that the University follows the goals, policies and land use designations of the BVCP in the development of the Property."
2000	• During 2000 BVCP Major Update, CU Boulder requests Public land use designation for CU South for possible student and faculty/staff housing, research, academic and athletic/recreation uses. • The city decides not to consider changing the land use designations of the site until the "South Boulder Creek Floodplain Study is completed and there are further discussions with the university on the proposed development for the site."
2001	• Boulder City Council adopts Resolution Number 877 which states that City Council "stands willing to purchase the Flatirons Property from a willing seller at a fair price, for open space or flood control management purposes, in fee title or by means or conservation easement; or to contemplate whatever agreement might lead to the maximum practicable preservation of the Flatirons Property as an environmental asset, consistent with the Boulder Valley Comprehensive Plan since 1977."
2002	• CU-Boulder South Conceptual Land Use Assessment for CU South identifies approximately 128 acres of potential building area, 32 acres for either buildings or flood detention, 45 acres for flood storage and 92 acres conserved as buffers, wetlands, ponds or open space.
2003	• The city and CU Boulder begin discussions about future land uses for CU South and develop potential terms for a Memorandum of Agreement.
2006	• During the 2005 BVCP Major Update, a site suitability analysis and changes to land use designations are delayed until the South Boulder Creek Flood Study is complete.
2015	• City Council approves the South Boulder Creek Flood Mitigation Plan. The plan includes regional detention of flood water upstream of U.S. 36 on the CU South campus and along Colorado Department of Transportation right of way. • With the flood mitigation plan adopted, the city reinitiates land use designation changes as part of the 2015 BVCP Major Update.

Previous Reports and Studies

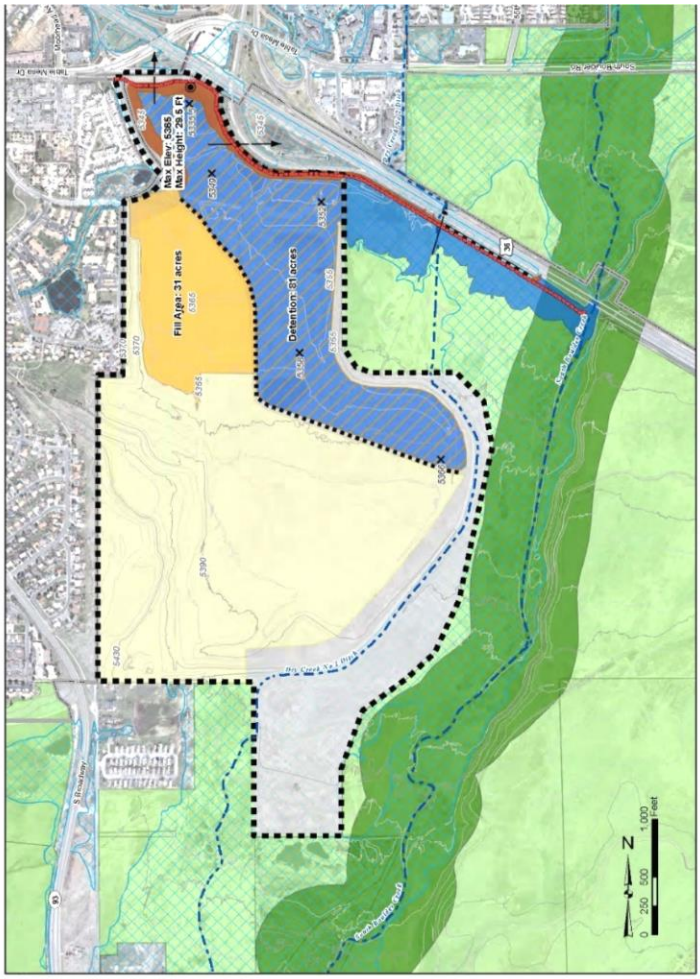
This study takes into account the analysis done by CU Boulder in 2002 ("CU-Boulder South Conceptual Land Use Assessment"), the South Boulder Creek Flood Mitigation project, the Colorado Natural Areas Program Articles of Designation and Management Plan for the adjacent South Boulder Creek State Natural

Area, and the U.S. 36 Environmental Impact Statement that included future options for the U.S 36 and Table Mesa interchange.

South Boulder Creek Flood Mitigation

The city conducted a South Boulder Creek Mitigation Flood Study to develop and evaluate alternative options that may reduce flooding along South Boulder Creek and areas impacted but not directly adjacent to the creek (Map 4: Floodplain). A total of seven flood detention options were presented to City Council on August 4, 2015 in which City Council approved the full mitigation plan with Option D for U.S 36 Regional Detention (Fig. 2). Option D would create a flood control berm on the northern and eastern portions of the CU South site adjacent to U.S 36. This option includes about 80 acres of the CU South site for detention (blue area on map) and about 30 acres for an adjacent fill area (yellow area). The city is currently negotiating a scope of work with an engineering team to prepare preliminary design of the U.S. 36 regional detention facility, though work cannot commence until an agreement between the CU Boulder and CDOT is executed for use of their land. While the city has a place holder for bond funding in 2018, timing is contingent on land holder agreements and the design process. The city anticipates that the detention facility will take approximately two years to construct.

Figure 2: Option D for U.S. Regional Detention.



Potential Range of Uses

While CU Boulder does not currently have plans to develop the site, the university has indicated interest in continuing the current recreational uses and exploring additional academic facilities. Some short-term plans include:

- Floodwater mitigation through implementation of the South Boulder Creek Flood Mitigation Study;
- Recreational and athletic fields;
- Adding restrooms and showers for athletes and restrooms and drinking fountains for spectators to sporting events;

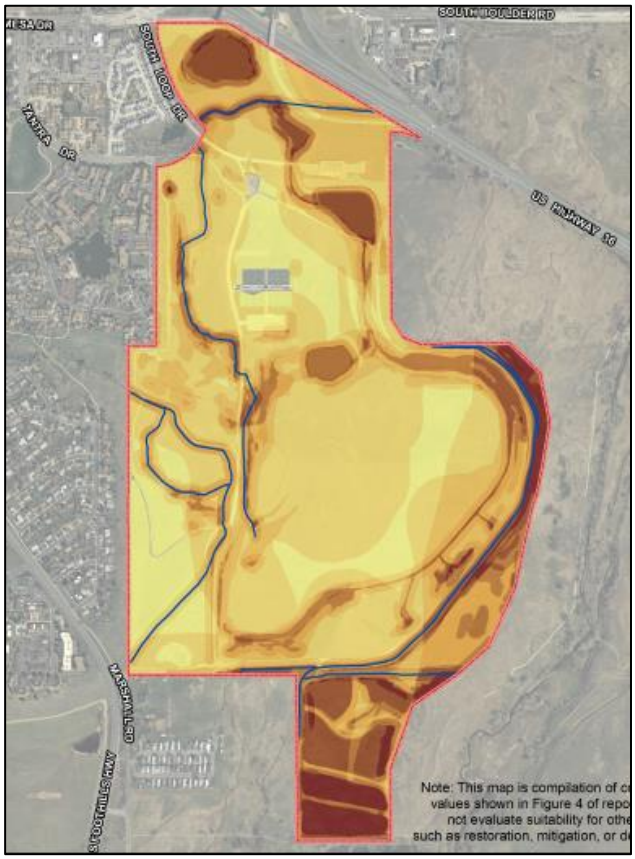
The university is also exploring several longer-term plans for CU South, such as:

- Affordable, workforce housing for faculty and staff (after studies to determine how much and what types);
- Graduate student housing and/or upper division undergraduate housing incorporated into academic villages;
- Academic, instructional and research facilities; and
- Outdoor research.

CU Boulder has also deemed that the following uses will not be pursued:

- A football stadium;
- Towers like Williams Village;
- A full build out of all 308 acres. More than half of CU South is wetlands, natural areas, ponds or potential floodwater mitigation areas which will not be developed for building sites
- First-year freshman housing;
- A bypass public roadway connecting Highway 93 and Highway 36; and

Figure 3: Site Conservation Suitability Analysis.



Site Analysis

Conservation Suitability Analysis

Biohabitats conducted a conservation suitability analysis to provide a framework for maintaining a landscape capable of integrating multiple land use objectives including flood control, protecting ecological values and identifying areas more suitable for development. The primary outcomes of the analysis are an ecological characterization, suitability mapping, and preliminary sketches of viewshed and connectivity considerations.

Ecological Characterization

Biohabitats identified and examined resources on the site for inclusion in the conservation suitability map. Key ecological factors included in the analysis were:

- Water resources (Floodplains, drainage)
- Wetlands
- Plant communities
- Species of concern
- Habitat connectivity to adjoining properties
- Wildlife observations
- Landscape features and character

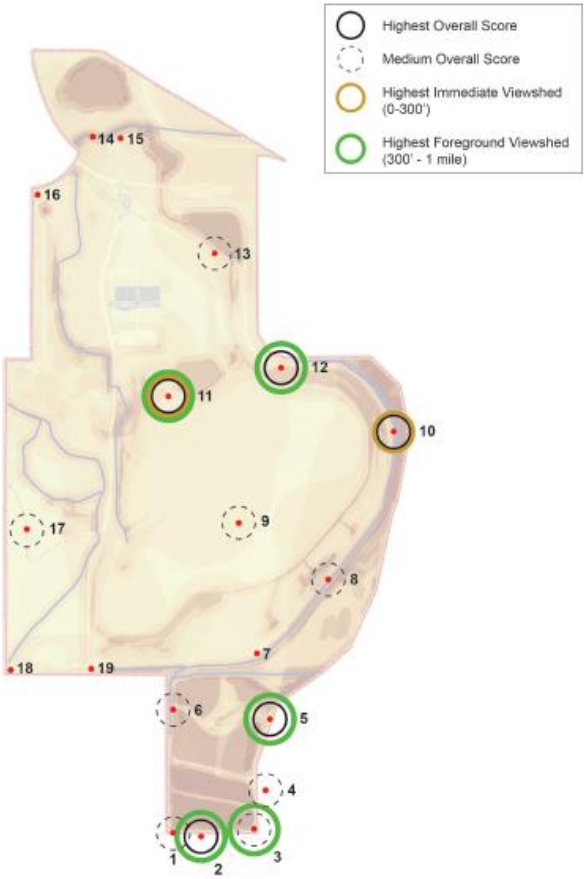
Conservation Suitability Mapping

Using the ecological characterization data, a conservation suitability map was then created to display areas with the highest density of sensitive ecological features. The analysis suggests that the eastern perimeter and the southern wetlands have the highest sensitivity to disturbance or development. The central portion of the property and the western edge have lower rankings for conservation values making them less sensitive to disturbance or development (Fig. 3).

Habitat Connectivity

Biohabitats identified the general connectivity between the CU Boulder site and nearby areas containing native plant associations and the Preble's meadow jumping mouse habitat. The highest potential areas for conservation and connectivity are to the south and east to the protected land owned by Open Space and Mountain Parks.

Figure 4: Preliminary Viewshed Analysis.



Viewshed – On Site

Biohabitats conducted an analysis that considers ecological value through the lens of aesthetics and experience from within the site. Following a landscape character viewshed analysis, a rapid assessment was conducted to examine the quality of the landscape character among several viewpoints throughout the site. Each viewpoint considered the general landscape character, attractiveness and views of natural resources. Each viewpoint was then scored and mapped (Fig. 4). Areas with a high conservation value generally also received a high viewshed score, particularly areas in the central and southern portions of the site.

Viewshed – Off Site

City staff also conducted a viewshed inventory from areas outside and around the perimeter of the site looking inward. The analysis found the higher value view corridors along westbound U.S. 36 and from the southwestern border of the site (Attachment C).

Passive Recreation

Work by Fox Tuttle Hernandez Inc., public comments, site visits and observations by city staff were used to develop a picture of current patterns of community use of the site for passive recreation. Dominant activities are walking, dog-walking and running. Under an agreement with the university and when conditions are appropriate, the Boulder Nordic Club grooms trails for cross country skiing. Most visitor activities take place on dirt roads and social trails (Map 3: Trails).

Although CU requests that dogs be leashed on the site, most dogs are not leashed and the university does not enforce dog leashing. Unleashed dogs are typically either on or near the trails; however, it is not uncommon to see dogs ranging through the open areas or swimming in the ponds.

A portion (0.12 mile) of the South Boulder Creek Trail, constructed and maintained by OSMP, crosses the south end of the CU South property on an easement granted by the university to the city. CU South is also accessible from the US36 Bikeway that connects with the South Boulder Creek trail on city open space where the highway crosses over South Boulder Creek. If Option D of the South Boulder Creek Flood Mitigation Study is constructed as currently conceived, the US36 Bikeway will be reconstructed on the top of the proposed flood berm. The city has not identified any social trails in the OSMP land between the South Boulder Creek trail and CU South.

Transportation: Multi-modal Analysis

Existing transportation infrastructure and proposed changes

The analysis performed by Fox Tuttle has looked at the existing and potential multi-modal access to CU South. The city's Bicycle System Plan illustrates several new pathway connections between the site and the adjacent neighborhoods to the west, as well as a proposed highway underpass. The plan also looked to improve the existing "social paths" in the CU South property to become multi-use paths. These connections are believed to help support the bicycle and pedestrian access to and through the site, and provide access to the transit network as it evolves.

The US 36 Environmental Impact Statement (EIS) considered alternatives for reconstructing the US 36/Table Mesa Drive/ Foothills Parkway interchange. The interchange reconfiguration option ultimately chosen by CDOT, the University of Colorado, City of Boulder, and Boulder County was the interchange design that retained the existing intersection of South Loop Drive, and Table Mesa Drive to provide direct access to CU South. This preferred alternative is predicted to have impacts on the configuration of the interchange ramps and the relationship between U.S. 36 ramps, transit stops in the area, and future bus routes.

Perimeter Access

Five roadways were examined for potential access to the CU South site. The analysis recommends keeping the primary vehicular access to the site on South Loop Drive and secondary access along Tantra Drive in the future. South Loop Drive is currently the only paved access to the site's 12 tennis courts and a gravel loop trailhead. The study recommends that as the property develops the drive should be upgraded to a "complete street" to accommodate bus, bicycle, pedestrian and automobile traffic. Tantra Drive is a 50-foot wide, two-lane street that appears to be a logical secondary access, as the eastern terminus of Tantra Drive was constructed as if it were intended to extend to CU South. Speed mitigation through the school access area will be important to address if Tantra Drive is used to provide vehicular access.

Access to the site from the south-west (off CO 93) can also be considered in the future, though it is not ideal. Creating this new access will likely require a State Highway Access Permit and variances from the Access Code geometric requirements. Ultimately, a circuitous or non-direct alignment would be necessary to discourage outside traffic from cutting through the CU South property to avoid the Table Mesa/Broadway connection. Moorhead Circle and Marshall Road were both found to be undesirable for perimeter access.

The analysis conducted by Fox Tuttle represents a first step in identifying critical multi-modal transportation considerations that will need to examined at the time of annexation. Because the future uses on the property remain unknown, the analysis did not recommend specific traffic mitigation strategies. However, the city recognizes the potential impacts to an already congested network and will take that into consideration during any land use designation or subsequent annexation decisions. An additional transportation analysis is being considered by CU Boulder to estimate the amount and type of land uses that

could be considered for the site based on multi-modal carrying capacity of surrounding transportation facilities.

Utility Service

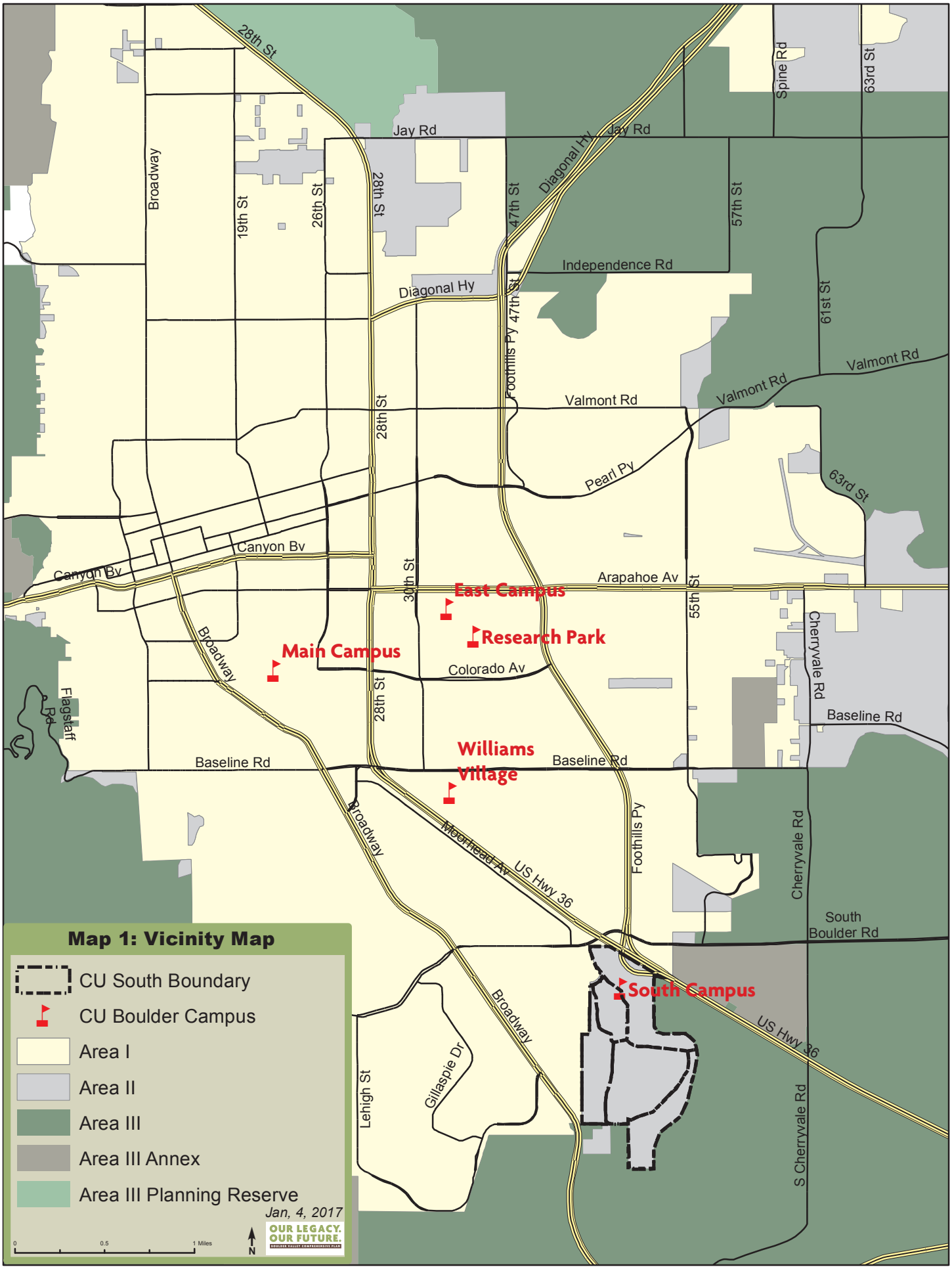
Existing water distribution, sewer collection and treatment facilities have adequate capacity to serve some additional development. The city's ability to provide service to CU South will depend largely on the specific utility needs of the project and the timing of development, neither of which are defined at this time. For this analysis, city staff assumed that the scale of future development on the CU South site would be comparable to other CU Boulder properties. The city currently has existing water mains along Table Mesa Drive (24" diameter), Moorhead Circle (12" diameter) and Broadway (16" diameter). Connections would be needed to two or more of these mains to provide service, with the Broadway main requiring an extension to the CU South site.

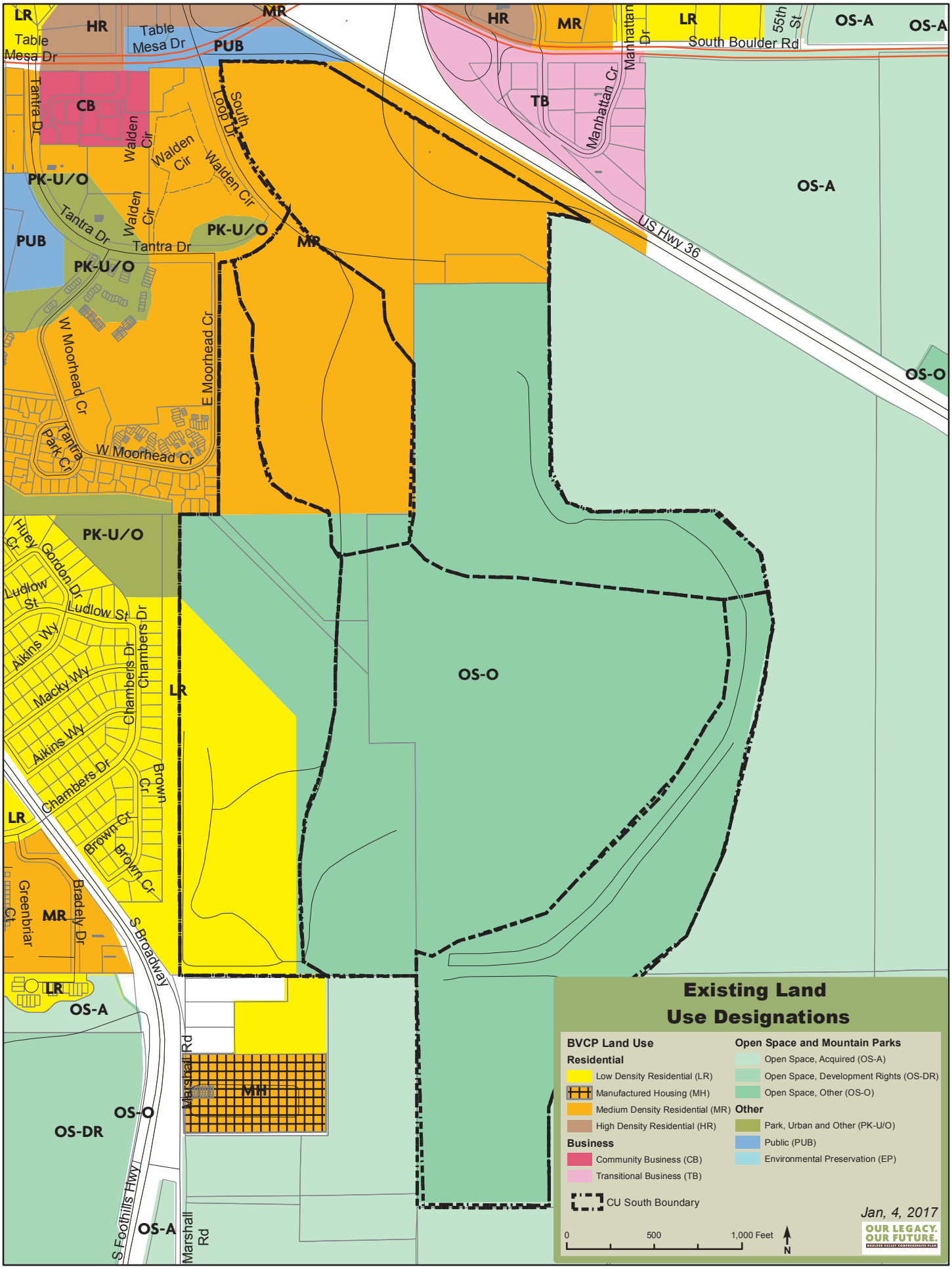
A major sewer main (27" diameter) abuts the southern and eastern edge of the property and should have adequate capacity to support development on the site. Stormwater flows will be examined at the time of development, particularly relating to minimizing stormwater contributions to irrigation ditches.

Other than the extension of the Broadway water main, no major off-site improvement requirements for water or sewer are anticipated at this time. Prior to connecting to city services, CU Boulder must provide a utility report identifying usage requirements and the on-site (private) utility design to ensure compliance with city standards and determine city fees.

Initial Conclusion

Staff will use information referenced in this report and feedback from decision-making bodies to form a recommendation for changes to the CU South land use designations and a list of issues to be addressed in future agreement(s) between the city and CU Boulder for development and conservation of the site. While conversations among BVCP approval bodies are ongoing, the analysis is starting to indicate that some areas are more suitable for conservation and other uses (Map 5: Key Considerations). Conservation of ecological values and wetlands appear to be most suitable for the southern portion and along the eastern boundary of the site. Additional discussions, including a recommendation by the Open Space Board of Trustees, is needed to refine these potential conservation areas and identify other portions of the site that should also be preserved. With 80 acres of regional detention and 30 acres to accommodate fill material, floodwater mitigation will also cover a sizable portion of the site. After considering conservation and floodwater mitigation, other portions of the site may be suitable for development or conservation.


Map 1: Vicinity Map
CU South Boundary
CU Boulder Campus
Area I
Area II
Area III
Area III Annex
Area III Planning Reserve
Jan, 4, 2017
0
0.5
1 Miles
N
OUR LEGACY. OUR FUTURE.
East Campus
Research Park
Main Campus
Williams Village
South Campus
28th St
Jay Rd
Broadway
19th St
26th St
28th St
47th St
Diagonal Hy
Jay Rd
Spine Rd
63rd St
57th St
Independence Rd
Diagonal Hy
Foothills Py 47th St
61st St
Valmont Rd
Valmont Rd
Valmont Rd
28th St
Pearl Py
63rd St
Canyon Bv
Canyon Bv
30th St
Arapahoe Av
55th St
Cherryvale Rd
Broadway
Colorado Av
28th St
Flagstaff Rd
Baseline Rd
Baseline Rd
Baseline Rd
Broadway
Moorhead Av
US Hwy 36
Foothills Py
Cherryvale Rd
South Boulder Rd
Broadway
US Hwy 36
Lehigh St
Gillaspie Dr
S Cherryvale Rd


LR
HR
Table Mesa Dr
Table Mesa Dr
MR
PUB
HR
MR
Manhattan Dr
LR
55th St
OS-A
OS-A
South Boulder Rd
Tantra Dr
CB
Walden Cir
Walden Cir
Walden Cir
South Loop Dr
TB
Manhattan Cr
OS-A
PK-U/O
Walden Cir
Tantra Dr
PK-U/O
PUB
Tantra Dr
MR
US Hwy 36
PK-U/O
W Moorhead Cr
E Moorhead Cr
OS-O
Tantra Park Cr
W Moorhead Cr
PK-U/O
Huey Cr
Gordon Dr
Ludlow St
Ludlow St
Aikins Wy
Chambers Dr
Chambers Dr
Macky Wy
LR
OS-O
Aikins Wy
Chambers Dr
Brown Cr
LR
Brown Cr
Brown Cr
Greenbriar Ct
MR
Bradely Dr
S Broadway
LR
OS-A
Marshall Rd
MH
OS-O
OS-DR
S Foothills Hwy
OS-A
Marshall Rd
Existing Land Use Designations
BVCP Land Use
Residential
Low Density Residential (LR)
Manufactured Housing (MH)
Medium Density Residential (MR)
High Density Residential (HR)
Business
Community Business (CB)
Transitional Business (TB)
CU South Boundary
Open Space and Mountain Parks
Open Space, Acquired (OS-A)
Open Space, Development Rights (OS-DR)
Open Space, Other (OS-O)
Other
Park, Urban and Other (PK-U/O)
Public (PUB)
Environmental Preservation (EP)
Jan, 4, 2017
0
500
1,000 Feet
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Map 3: Trails
Underpass
US 36 Bikeway
CU South Boundary
Existing CU South Informal Trail
South Boulder Creek
Hiking Trail
Multi-Use Trail
Paved Path
Streams
OSMP Ownership
OSMP Conservation Easement
0
500
1,000 Feet
N
Jan, 4, 2017
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CU South
OSMP Land
US Hwy 36
US 36 Bikeway
South Boulder Creek Trail
South Boulder Creek
South Boulder Rd
55th St
Tantra Dr
Hanover Av
Darley Av
Whitney Pl
W Moorhead Cr
E Moorhead Cr
Huey
Gordon Cr
Gordon Dr
Ludlow St
Ludlow St St
Aikins Wy
Macky Wy
Chambers Dr
Greenbriar Ct
Greenbriar Bv
S Broadway
Marshall Rd
S Foothills Hwy
Manhattan Dr
Manhattan Cr
Ontario Pl
Ontario Ct
Illini Wy
Iroquois Dr
Seminole Dr
S Boulder Cr
S 44th St
S 45th St
S 46th St
S Lashley Ln
Toedtli Dr
Grinnell Av
Squires Ct
Tantra Park Cr
City trail easement along CU South

Map 4: Floodplain
CU South
City 100 Year Flood Plain
South Boulder Creek
Multi-Use Trail
0
500
1,000 Feet
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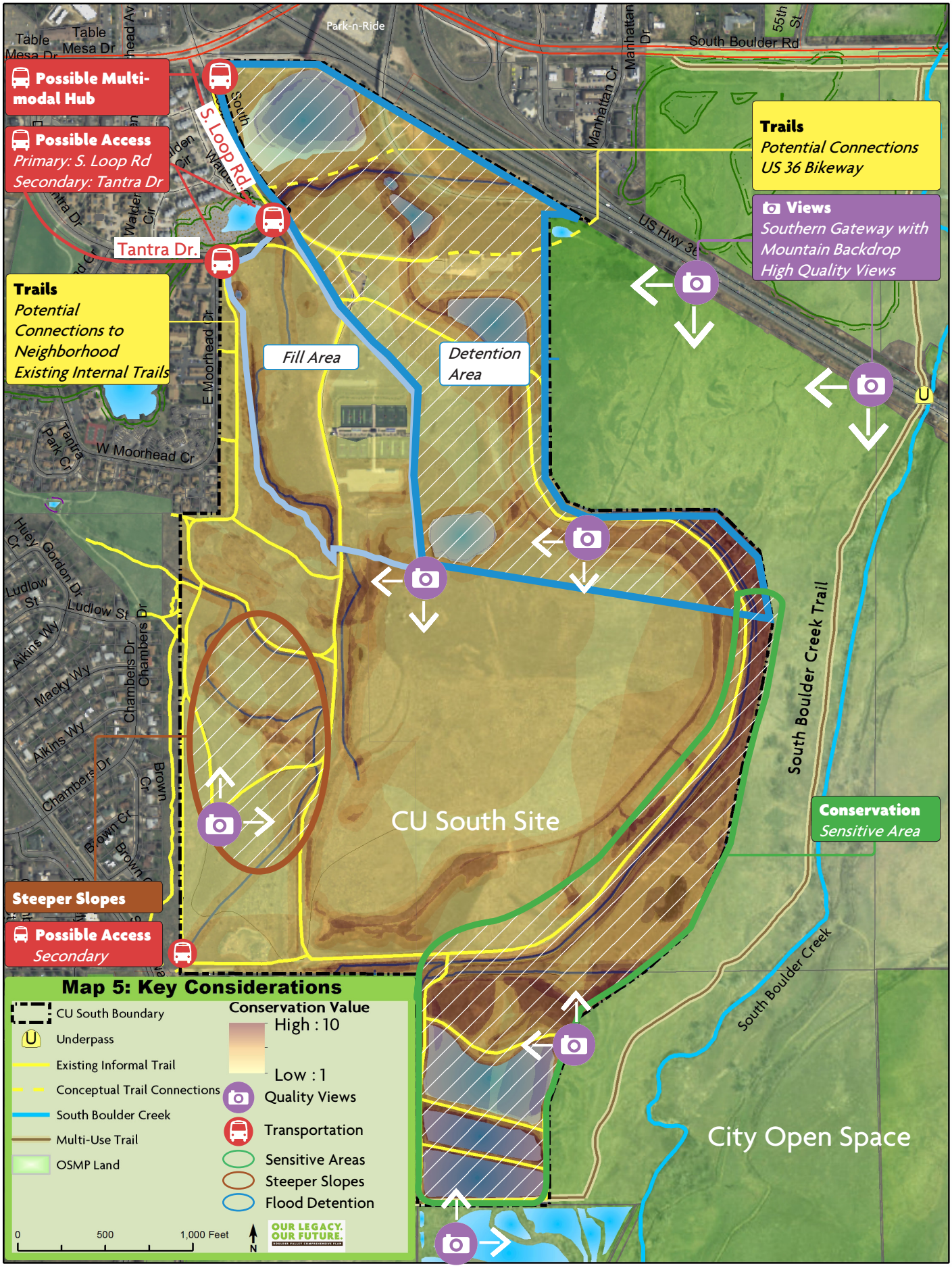
BOULDER VALLEY COMPREHENSIVE PLAN
N
Jan, 4, 2017
Existing Levee
South Boulder Creek Trail
South Boulder Creek
US Hwy 36
South Boulder Rd
Table Mesa Dr
Thunderbird Dr
Apache Rd
Pima Ct
Illini Wy
Iroquois Dr
Manhattan Dr
Ontario Pl
Ontario Ct
55th St
Minnesota Ct
S Boulder Ct
Walden Cir
Walden Loop Dr
Tantra Dr
Tantra Park Cr
W Moorhead Cr
E Moorhead Cr
Darley Av
S 46th St
Squires Cr
Huey Cr
Gordon Dr
Ludlow St
Aikins Wy
Macky Wy
Chambers Dr
Brown Cr
Toedtli Dr
Broadway
Greenbriar Bv
Greenbriar Ct
Bradley Dr
S Broadway
Marshall Rd
S Foothills Hwy


Possible Multi-modal Hub
Possible Access
Primary: S. Loop Rd
Secondary: Tantra Dr
Tantra Dr.
S. Loop Rd
Trails
Potential Connections to Neighborhood
Existing Internal Trails
Fill Area
Detention Area
Trails
Potential Connections
US 36 Bikeway
Views
Southern Gateway with Mountain Backdrop
High Quality Views
US Hwy 36
South Boulder Rd
Park-n-Ride
Manhattan Dr
Manhattan Cr
55th St
E Moorhead Dr
W Moorhead Cr
Tantra Park Cr
Huey Gordon Dr
Ludlow St
Aikins Wy
Macky Wy
Chambers Dr
Brown Ct
CU South Site
South Boulder Creek Trail
Conservation
Sensitive Area
Steeper Slopes
Possible Access
Secondary
South Boulder Creek
City Open Space
Map 5: Key Considerations
CU South Boundary
Underpass
Existing Informal Trail
Conceptual Trail Connections
South Boulder Creek
Multi-Use Trail
OSMP Land
Conservation Value
High : 10
Low : 1
Quality Views
Transportation
Sensitive Areas
Steeper Slopes
Flood Detention
0
500
1,000 Feet
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Jan. 4, 2017

ADDENDUM #1

PROJECT: Preliminary Conservation Suitability Analysis for University of Colorado South Campus

COMPILED BY: City of Boulder, Planning, Housing and Sustainability

DATE: January 11, 2017

The correction herein shall be made to the Preliminary Conservation Suitability Analysis for University of Colorado South Campus.

1. Page 13, second paragraph shall be amended as follows:

   Currently there are limited data on groundwater characteristics on the property. ~~CU is planning to conduct a detailed groundwater investigation in the upcoming year, however,~~ As part of flood mitigation work, the city would conduct a detailed groundwater investigation and its study results can help confirm some of the following initial observations of groundwater flow patterns.

City of Boulder, Planning Housing & Sustainability

Preliminary Conservation Suitability Analysis For University Of Colorado South Campus

November 2016

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Biohabitats
SOUTHERN ROCKY MOUNTAIN BIOREGION

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1 Introduction

This report provides a preliminary conservation suitability analysis of the University of Colorado South Campus property ("CU South") with respect to protecting sensitive areas and identifying suitable development and conservation envelopes based on current natural resource conditions, opportunities, and constraints. The overarching goal of this analysis is to inform the CU South planning process – including land use change as part of Boulder Valley Comprehensive Plan – by providing an understanding of ecological patterns that have developed in the area over time. The results of the analysis are intended to provide a framework for maintaining a multifunctional landscape that can integrate multiple land use objectives including improving flood control, protecting ecological values, and identifying compatible development locations.

1.1 Purpose and Scope

With upcoming plans to implement the 2015 South Boulder Creek Major Drainageway Flood Mitigation Plan and desire to change land use to accommodate eventual development by the University of Colorado, the City of Boulder authorized a site suitability analysis for the property to serve as a guide to inform discussions regarding future uses on the property. The suitability analysis was conducted as part of the major update to the Boulder Valley Comprehensive Plan (BVCP) that will include updates to the land use designations for the parcel. The imperative articulated by the BVCP below guided the consideration of priorities in the current site suitability study:

…conserve and preserve environmental resources including its unique or distinctive natural features, biodiversity, and ecosystems through protection and restoration in recognition of the irreplaceable character of such resources and their importance to the quality of life.

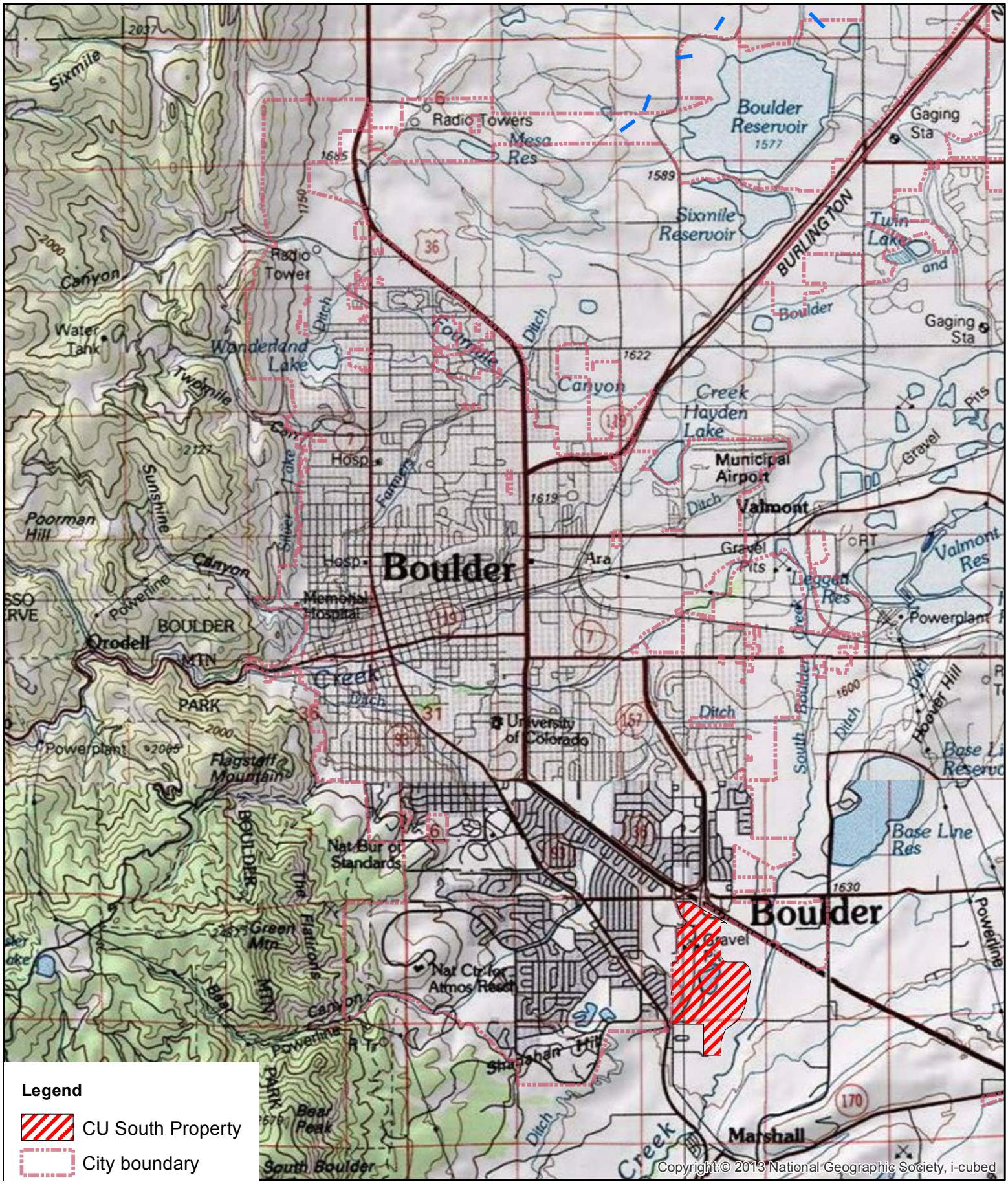
In addition to interfacing with the BVCP, the suitability analysis is intended to inform considerations of annexing the property to the City of Boulder including:

- Findings on differential suitability across the site for development and conservation, and
- A framework, specific to CU South, for future annexation and agreements between the city and the University of Colorado (CU).

Biohabitats' scope of work for the current effort included: attending a kick-off meeting on June 3, 2016, with city staff; reviewing available background information provided by the city; conducting a desktop analysis; completing a field assessment; meeting with city staff from Public Works and Open Space and Mountain Parks (OSMP) to gather additional information on pending flood control planning and sensitive species; selecting primary criteria for conservation suitability and preparing a Geographic Information Systems (GIS) analysis; developing conceptual diagrams for secondary criteria associated with views and connectivity to offsite areas associated with conservation suitability, and; participation in a public meeting in September 2016. The current effort does not include an evaluation of potential mitigation and restoration strategies.

1.2 Site Background

The subject property is owned by the University of Colorado ("CU") and consists of a 316-acre parcel located immediately south of the juncture of U.S. Highway 36, Table Mesa Dr./South Boulder Road, and Foothills Parkway (Figure 1). The parcel was historically farmed and grazed



Legend

CU South Property

City boundary

0 1 2 Miles

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Figure 1
Site Location
CU South Property

until sand and gravel mining replaced agricultural uses, removing aggregate material from the majority of the property. In 1996, Flatiron Companies sold the property to CU.

Major features of CU South include a flood control berm that parallels the eastern boundary and northern edge of the southern “panhandle” (refer to Figure 3). The western portion of the property is characterized by a steep topographic gradient that forms a terrace. The northern half of the property has 4 ponds interspersed with development, including tennis courts, maintenance buildings, parking lots, and roads. The interior of the property is could be characterized as a basin dominated by non-native grasslands.

Current Land Uses

Currently the site is used by the CU tennis and cross-country programs with 12 tennis courts and upgraded running courses.The public also makes regular use of the trails for exercise, off-leash opportunities for dogs, and wildlife viewing. These uses align with the 2001-2008 Campus Master Plan, which originally mandated that the South Campus be used only for athletic and recreational pursuits. Future uses by CU are uncertain.

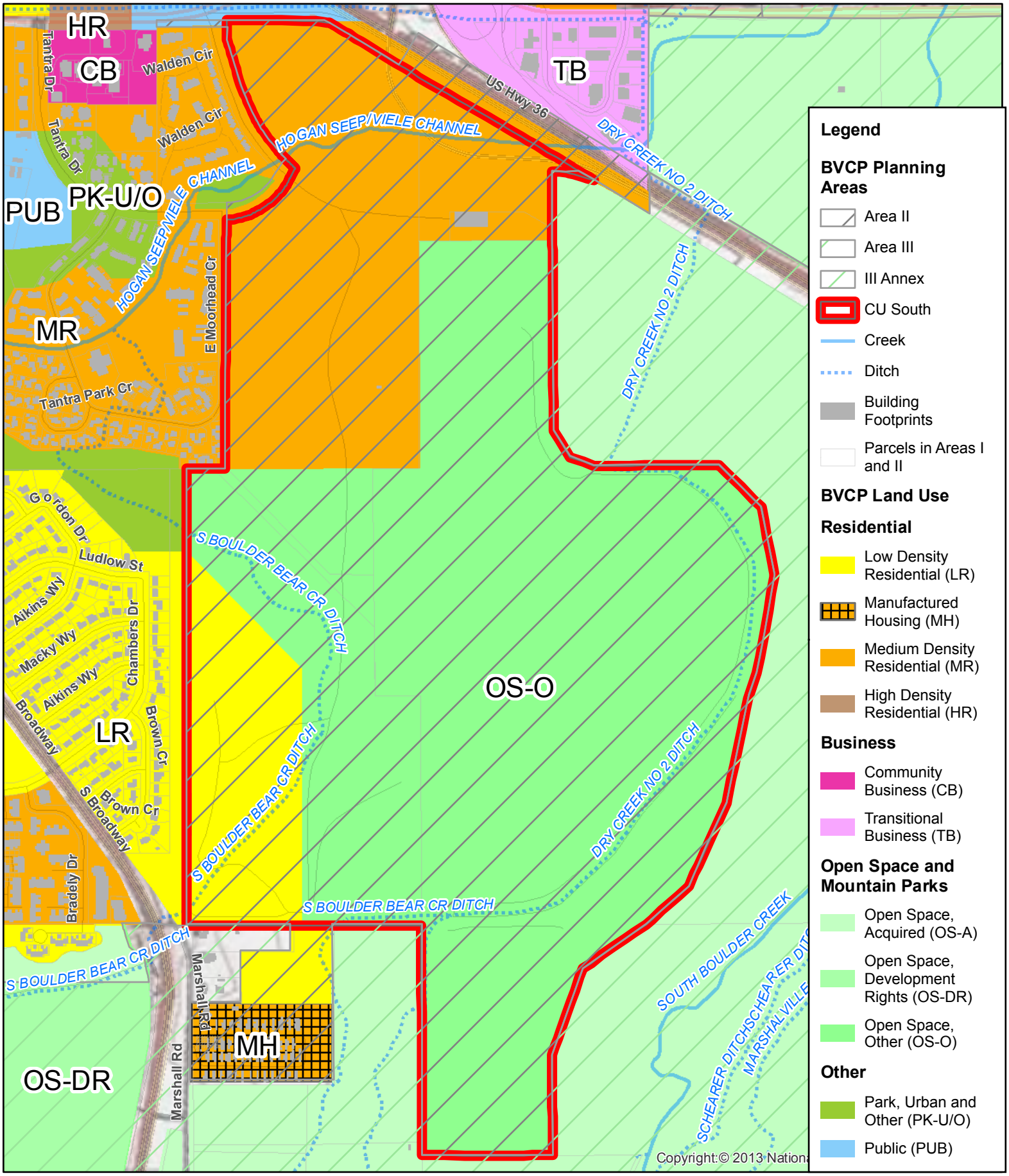
Primary vehicular access to the property is at the northwest corner via South Loop Drive off of Table Mesa Drive. A less direct approach is at the southwest corner from Marshall Road. Pedestrian users can also access the property from a dirt road on the west side that leads onto the property from the intersection of Tantra Drive and East Moorhead Circle.

To the north of the property, there is a Regional Transportation District transit station and parking garage at Table Mesa as well as the intersection of three major roads. Low- and medium-density residential development borders the west side. City of Boulder Open Space lies to the south and east of the property and includes South Boulder Creek.

Under the current BVCP, the majority of CU South is designated as Open Space-Other (193.25 acres) and other portions of the property are designated for Medium-Density Residential (66.75 acres) (MR, 6-14 dwelling units/acre) and Low-Density Residential (49.36 acres) (LR, 2-6 dwelling units/acre) (Figure 2).

2 Methods

The overall approach for this suitability analysis was to map ecologically functional zones of the site as determined by biotic communities and hydrology and, using a GIS-based scoring system, overlay these with other natural features to create a base map showing a range of sensitive natural resource areas. The primary criteria include existing native plant communities, wetlands and buffers, aquatic habitat, and identified habitat zones for rare species. Ecological connectivity to offsite properties and views within and beyond the property are secondary criteria addressed separately. Utilities, roads, and planned flood improvements were not evaluated in the base map; however, future updates to the sensitivity analyses are expected to be needed to incorporate these constraints and considerations. Additional details about methods are described below.



Miles
0 0.15 0.3

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Figure 2
Land Uses
CU South Property

2.1 Data Collection and Field Assessment

Prior to field work, available site data and background information were collected and reviewed. These included but were not limited to GIS data provided by the city, the South Boulder Creek Flood Mitigation Study, previous evaluations of the site, zoning designations, transportation studies, and information on sensitive species such as Preble's meadow jumping mouse (*Zapus hudsonius preblei*).

Previous Studies

CU South has been the subject of numerous prior studies. These include the Boulder Valley Comprehensive Plan parcel report (1995), a Conceptual Land Use Assessment (Shapins Associates, Inc., 2002), a wetland delineation report (ERO Resources, 2013), the South Boulder Creek Major Drainageway and Flood Mitigation Plan (2015), and a transportation analysis (Fox Tuttle Hernandez Transportation Group, 2016). The property was also part of the U.S. 36 Mobility Project analysis (OSMP, undated).

Noteworthy among these studies is the 2002 Conceptual Land Use Assessment, which organized its findings into themes of transportation, potential building areas, flood storage, and natural areas. The Land Use Assessment also documented utility lines and transportation opportunities, thus providing a baseline for the current site suitability analysis.

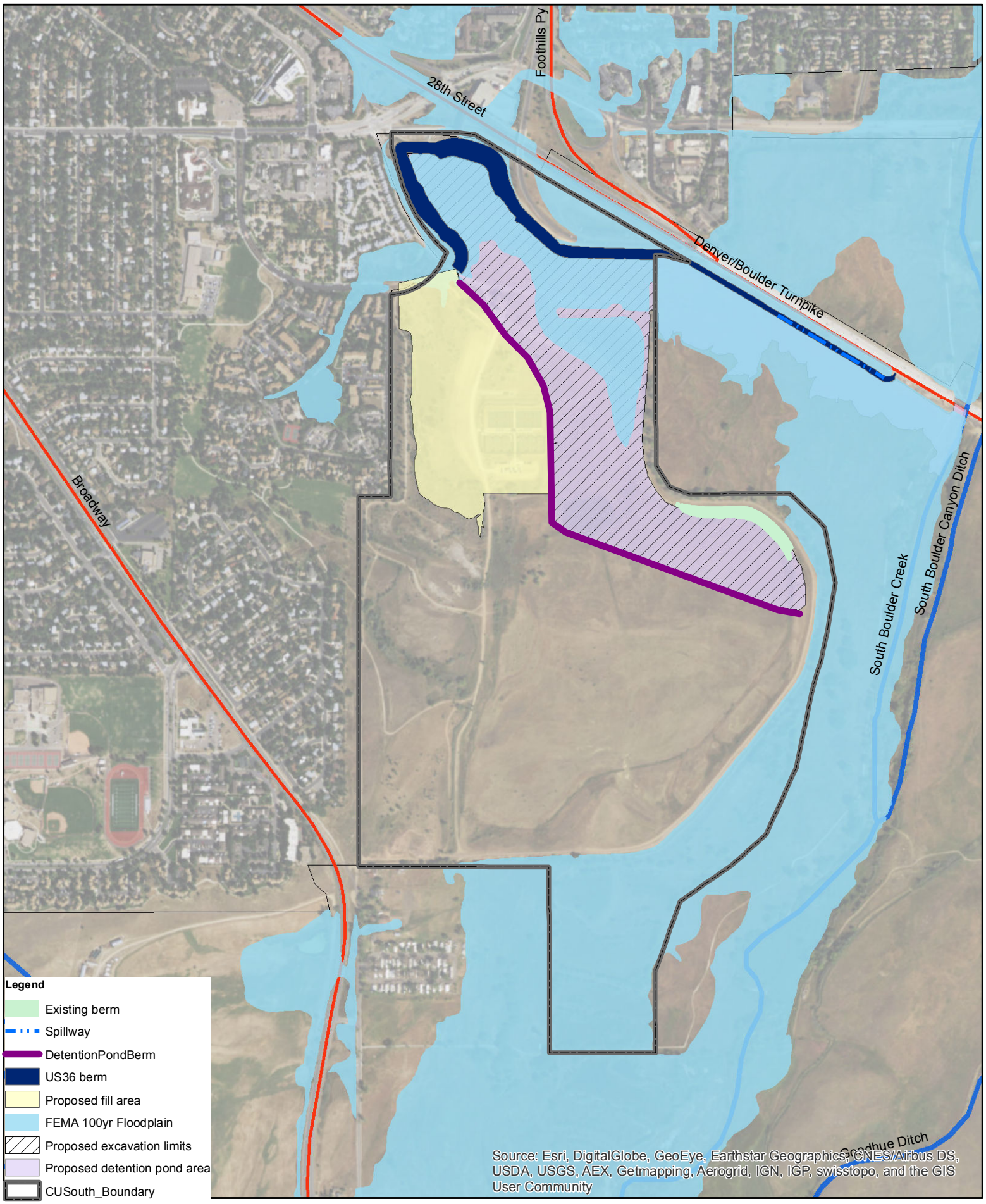
A memorandum prepared by city staff for City Council in September 2014 summarized environmental considerations during the review of the South Boulder Creek Major Drainageway Mitigation Plan. The memorandum provided context on ecological values relevant to the project area including:

- Wetlands
- Preble's meadow jumping mouse (*Zapus hudsonius preblei*)
- Ute ladies'-tresses orchid (*Spiranthes diluvialis*)
- Northern leopard frog (*Rana pipiens*)
- Native fish and ground-nesting birds, and
- The South Boulder Creek State Natural Area (SBCSNA)

Additionally, the 2015 South Boulder Creek Major Drainageway and Flood Mitigation Plan will be highly influential on future development scenarios of the property. The preferred Alternative D will entail construction of a berm along US 36, excavation of 81 acres in the northeast portion of the CU South property to create a detention pond, and fill of approximately 31 acres of the northwestern portion of the CU South property to 5370 feet a.s.l. (Figure 3). Of the seven alternatives considered, Alternative D minimized impacts to sensitive species from nearby OSMP properties and minimized impacts to sensitive environmental resources.

Field Assessment

Field base maps were prepared using aerial photographs and available geospatial information. The purpose of the field assessment was to verify and supplement the available information to reflect existing water resources; plant communities (0.25-acre minimum) and their conditions as reflected by dominant species; connectivity to adjoining habitat; elements of concern such as hazards, erosion, waste, and/or disturbance; landscape features and character; and uses and impacts of adjoining properties. The site visit was conducted on June 21, 2016 by Claudia Browne, Water Resources Specialist and Conservation Planner, and Susan Sherrod, Ph.D., Certified Ecologist. Dr. Sherrod returned for a second visit on June 27, 2016. In August 2016, OSMP staff also conducted a high-level review of site conditions to evaluate potential habitat for



0 500 1,000 Feet

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Figure 3
Flood Mitigation
Alternative D Features
CU South Campus

the Northern leopard frog and other native amphibians, Ute ladies'-tresses orchid, and native neotropical migratory and grassland-breeding bird species.

In addition to observing the above-noted features, viewshed observations were collected by Biohabitats, and photographs were taken at locations across the site to document scenic features on-site as well as views outward from the property. In a follow-up effort, City of Boulder planning staff collected additional panoramic photographs from the eastern boundary to address views from off-site across the property.

2.2 Conservation Suitability Analysis

A range of possible information sources and data layers were considered for inclusion in GIS the conservation suitability analysis including the items listed below:

- Water resources (floodplains, drainageways, lakes)
- Wetlands and buffers
- Plant communities
- Species of concern
- Habitat connectivity to adjoining properties
- Wildlife observations
- Landscape features in topography & geology

(Note that other factors such as transportation, access, and utilities are being considered separately.)

Biohabitats considered and tested a range of possible ways to group the data layers into primary or secondary criteria, to aggregate information into potential "neighborhoods" for views, to include offsite data, and to weight layers. Consistent use of data layers from previous evaluations conducted by the city for the floodplain study was also a consideration. Table 1 and the model diagram in Figure 4 show the layers that were included as primary criteria in the analysis.

To complete the GIS analysis, the layers of primary criteria (Table 1, Fig. 4) were compiled into a geodatabase and organized into feature datasets by analysis step. The first step of analysis required clipping data to the property extents to ensure each feature represented the same area of interest. All data were assigned the same projected coordinate system, NAD 1983 HARN State Plane Colorado North FIPS 0501, to ensure spatial accuracy and alignment.

The second step of analysis involved the creation of buffers for hydrology features such as streams, lakes and wetlands. A 50-foot buffer was created around the previously delineated wetlands (ERO, 2013). This distance was selected to be conservative in the absence of wetland functional assessments, which are used by the city to determine if a 25- or 50 foot buffer is appropriate. A 5-foot buffer was also applied to stream centerlines to convert the GIS polyline to a polygon and to mimic estimated stream width. After applying buffers, "Score" fields were created in all the files in short integer format and assigned a value of 1 (for present), with the exception of the plant community layer where non-native plant communities received a 1 but native plant communities were assigned 2 to reflect their higher habitat value. Before converting data from vector to raster format, a union between each individual feature and the site boundary was required to create a cohesive layer representing all potential values throughout the site. When converted to raster format, areas where features do not exist were scored as 0 (and where features were present were a 1 or 2 as described above).

Table 1 Conservation Layers and Data Sources

Layer Category	File Name	Data Source
Lakes	Hydrology_Lakes	City data
Streams	Stream line 5 ft buffer	Created from City Hydrology (to allow 50 ft buffer creation)
Wetlands	ERO_Wetland	ERO
Lake buffer	Lake_50ft_Buffer	Created by Biohabitats
Stream buffer	Stream line_50ft_Buffer	Created by Biohabitats
Wetland buffer	ERO_Wetland_50ft_Buffer	Created by Biohabitats
Floodplain	City_100Year_Floodplain	City data
Plant community	Community_Plant_Types_8-1	Created by city from Biohabitats field data
Preble's meadow jumping mouse	PreblesMouseOccuppiedRange02222016	CPWPublicSAMData
White-tailed deer	WTDeerConcentrationArea02222016	CPWPublicSAMData
Rare plant	Spiranthes_Habitat_Field_Review	Created by city from OSMP field data
CU boundary	Project boundary	City data

Figure 4 Model of GIS Analysis for CU South Property

The final step of the process was the execution of a weighted sum overlay using ArcGIS Spatial Analyst tools. This step combines all raster datasets that were created and scored previously by overlaying each feature and summing areas of overlap. The goal of the analysis is to highlight areas with the highest density of sensitive ecological features that will be less suitable for development (see Section 3, Summary of Findings).

2.3 Secondary Analysis

Beyond the primary ecological considerations included in the GIS analysis, secondary considerations that encompass the human experience and user relationships with the ecological features on site may also be used in the analysis. These, too, have a role in determining conservation suitability, as they aim to address the relationship between a user's sense of place and the value of a site as a destination for active and passive recreation. Put another way, the secondary considerations account for ecological value through the lens of aesthetics and experience.

The first part of this secondary analysis was a landscape character viewshed analysis, a rapid assessment of quality of landscape character at a series of viewpoints throughout the site. This was based in part on the USFS Landscape Aesthetics Handbook for Scenery Management (USDA FS 1995). The key elements taken from that guidance document were a general understanding of landscape character (considering ecological systems, existing land use patterns and uses, and scenic integrity), attractiveness, and views of natural resources within different distance zones (immediate foreground: 0-300', foreground: 300'-1/2 mile, middle ground: 1-4 miles, and background: 4 miles to the horizon)[1]. The landscape character viewshed analysis examined locations within the site and also considered views outward from and across the site toward the west.

One of the basic premises of this viewshed analysis of landscape character is that "scenery contributes to a 'sense of place,' a mutually shared image" (USDA FS 1995). Some of the specific landscape characteristics that define the site's sense of place directly associated with ecological resources include: a sense of isolation from development based on the presence or absence of structures or roads, natural character reflecting native and diverse ecosystems, wide and open views to the mountains, views across open water and wetlands, access via trails, and other sensory experiences such as natural versus man-made sounds and availability of shade along trails. Each viewpoint was scored for the presence of these landscape characteristics and then total scores were determined across the site, as well as within each of the 4 distance zones to get a sense of the highest scoring points of view on the site (see Table A-1, attached).

Other secondary suitability criteria that may be integrated include availability and location of trails and recreation opportunities directly associated with the ecological resources on site, restoration potential, presence of other ecological resources associated with geology, steep slope areas that may be sensitive to erosion with future development, and social path connections.

[1] Due to topography and other existing conditions the site is limited in terms of middle ground characteristics.

3 Summary of Findings

The primary outcomes of the site conservation suitability analysis are an ecological characterization, suitability mapping, and preliminary sketches of viewshed and connectivity considerations. The purpose of these findings is to understand high-value ecological areas to help guide future planning decisions. The ecological characterization summarized in Section 3.1 describes how the elements of the site work together to support the natural systems included in the suitability analysis, and the results of the suitability analysis follow in Section 3.2.

3.1 Ecological Characterization

Ecological resources of the CU South property are related to physical resources of the site and landscape context. Key factors such as topography, geology, and water resources interact to control ecosystem characteristics such as plant community type, wildlife use, and the occurrences of sensitive species. Human activities such as water diversions, development, and transportation further influence habitat features via disturbance and management practices.

Geology

Geologic characteristics of the site were considered during this suitability analysis primarily as they relate to hydrology (described in the following subsection). As shown in Figure 5, there are 5 major surficial geologic units mapped on the property. The main portion of the site is underlain by Post Piney Creek and Piney Creek Alluvium (Qp) and Broadway Alluvium (Qb). The Piney Creek alluvium (Holocene, less than 4,000 yrs ago) occurs in a band along the South Boulder Creek corridor, and to the west is the slightly older Broadway alluvium in the northwest and central portion of the site. A small area of Louviers Alluvium (Upper Pleistocene) also occurs in the southwest corner of the property.

Pierre Shale bedrock (Cretaceous Period, 65-144 Mya) outcrops on the southwest side of the site, on the edge of the terrace formation. In the upland areas to the west of the shale, the Slocum Alluvium (Quaternary Period, mid-late Pleistocene, 1.8-2 Mya) is characterized as “10 to 90 ft of moderate reddish-brown, well-stratified, clayey coarse sand with lenticular beds of pebbles and silt” (Moore et al, 2001).[2]

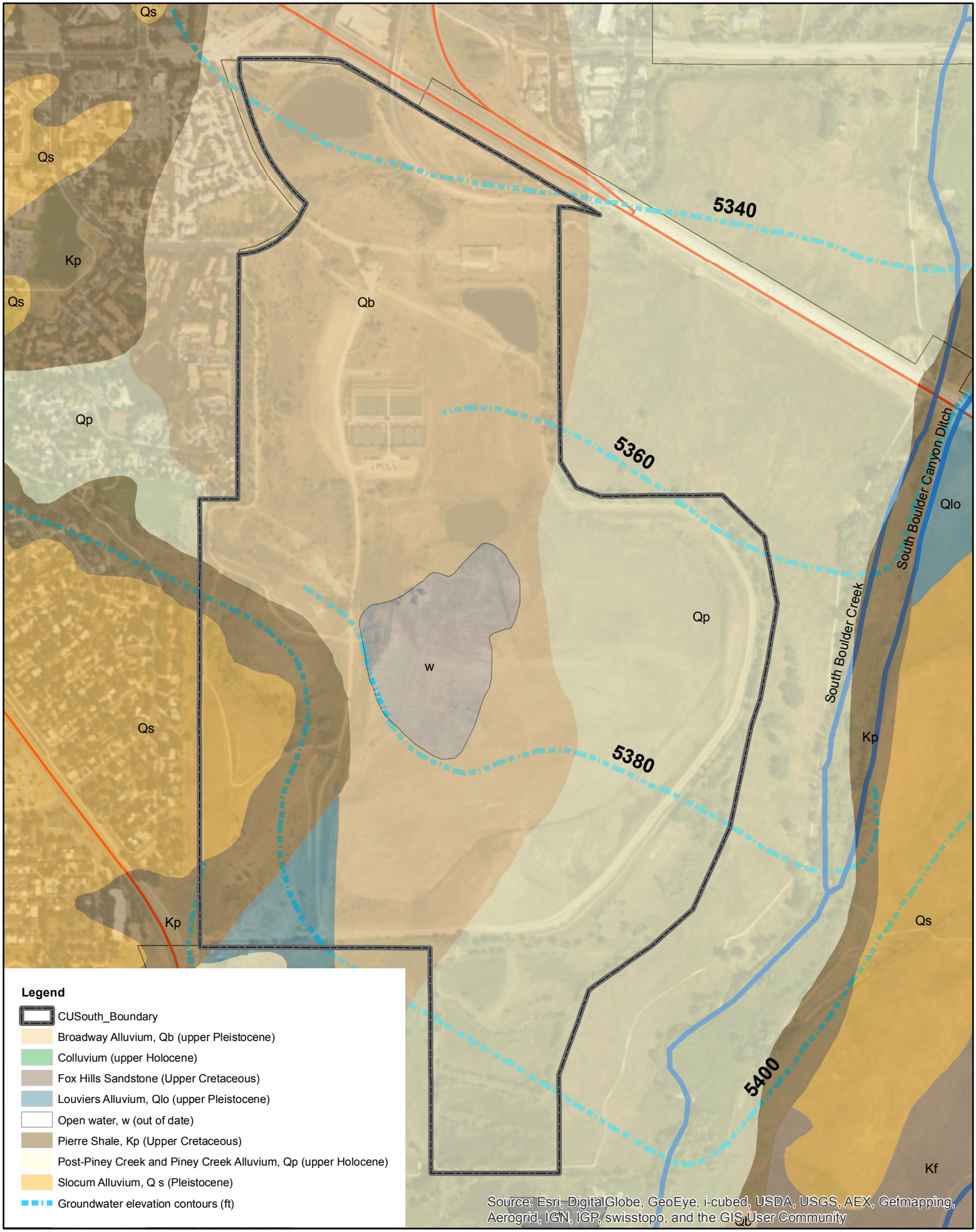
Water Resources

The property is located within about 500 feet of South Boulder Creek, and a portion of the 100-year floodplain is on the property. Dry Creek Ditch No. 2 runs along the interior of the eastern border and Bear Creek Ditch is in the western portion of the property (Figure 6).

Four former gravel pits, now ponds, occur in the northern half of the site. The ponds appear to be fed primarily by groundwater with relatively stable water levels (based on vegetation). Detailed flow information was not reviewed for the ditches; however, wetland communities are supported along most of the channels, indicating sufficient hydrology for this habitat type.

Shallow groundwater occurs beneath most of the property in an unconfined sand and gravel aquifer (sometimes called a water table aquifer). Because groundwater may support baseflow and vegetation in the riparian areas along the creeks, understanding and maintaining groundwater hydrology can be important for long-term viability in these ecosystems. In

[2] Note: an evaluation of soil distribution was not included in the current analysis. The majority of the property has been mined and undergone earthwork and agricultural uses, such that soil descriptions are not expected to be pertinent to the current conditions on the property. Should restoration of portions of the site be desired, historic soil mapping could be viewed for possible insights into opportunity areas based on pre-mining conditions (depending on the date and accuracy of the mapping).



Feet
0 500 1,000

N

Figure 5
Geology and Regional Groundwater
CU South

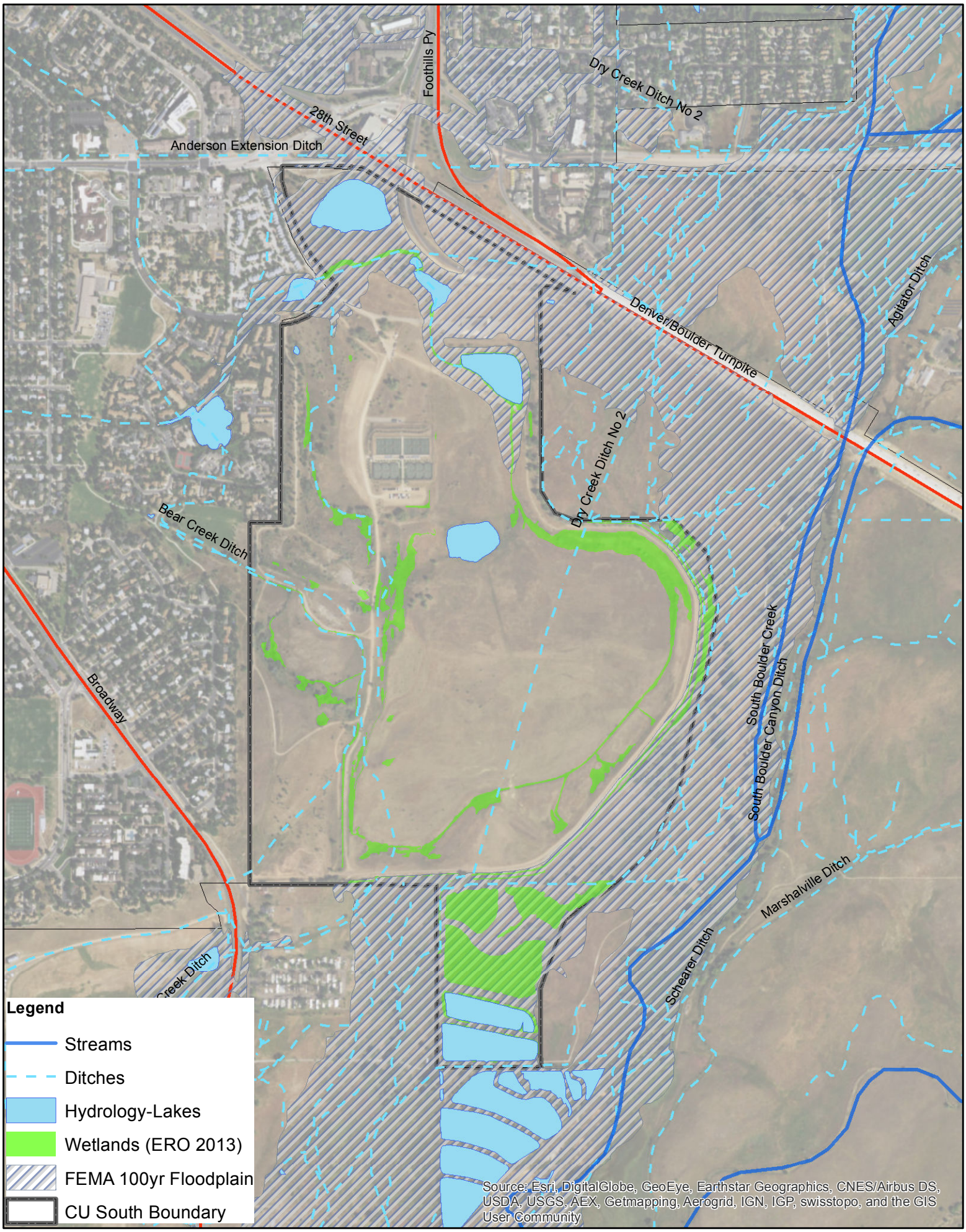


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Figure 6 Water Resources of the Property
CU South

unconfined systems, precipitation infiltrates in upland areas to recharge groundwater, and the groundwater moves through the subsurface generally following topography until it reaches discharge points. Groundwater discharge occurs where the aquifer intersects the ground surface, and water is released into lakes, seeps, or springs that feed streams and wetlands. Water table aquifers will fluctuate up and down with seasonal and annual climate variations. In the Front Range, the water table generally rises in the winter, peaks after spring snowmelt, and decreases steadily throughout the growing season. Droughts and human water management practices associated with new development (e.g., diversion ditches, wells, sump pumps, and storm sewers) can cause significant long-term changes in the water table.

Currently there are limited data on groundwater characteristics on the property. CU is planning to conduct a detailed groundwater investigation in the upcoming year, however, and its study results can help confirm some of the following initial observations of groundwater flow patterns.

- On the CU South property, groundwater generally flows from the southwest to the northeast, with water draining off of the foothill fans and discharging into the alluvial sand and gravel deposits along the creeks.
- As shown on Figure 6, regional groundwater contours in the eastern Piney Creek alluvial deposits depict the direction of flow to be generally perpendicular to South Boulder Creek. This pattern shows that the groundwater and creek interact, exchanging water depending on local differences in water elevations. In other words, there will be periods when groundwater will discharge to the creek and periods when the creek will recharge the nearby alluvial aquifer.
- Groundwater flowing from the uplands in the central and western portions of the property is recharged offsite in the foothills to the west.
- Site observations indicate a small zone of potential groundwater seepage/discharge at the base of the terrace on the western side where the surface deposits meet the underlying Pierre Shale bedrock which is relatively impermeable and acts as a lower boundary to the aquifer.

Note that the presence of perennial (i.e., year-round) water features and areas of shallow/exposed groundwater that can support wetlands and riparian vegetation is generally considered a valuable ecological asset in the semi-arid west where such features are not common.

Plant Communities

Plant community mapping was completed on June 21 and 27, 2016, to evaluate the vegetative component of conservation suitability at CU South (Figure 7). Key objectives of the mapping were to identify boundaries of major community types (at a ¼-acre scale) and to note the condition of each community based on whether dominant species were native or non-native. The OSMP Grassland Ecosystem Management Plan (2010) was used as a reference for defining the CU South plant communities. As shown in Table 2, four native communities were identified: Mixed Grass Prairie Mosaic, Native Riparian, Herbaceous Wetland, and Woody Wetland.[3] In addition, there were non-native communities labeled Non-Native Riparian, Non-Native Upland, and an “Other” category for development, large patches of bare ground, salt flats, and living fences.

[3] Note that ERO Resources (2013) report mapped jurisdictional wetlands in accordance with the 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual . The plant community mapping conducted for this report was based on vegetation only and did not include evaluations of hydric soils or wetland hydrology. Moreover, the current mapping exercise was at a scale of ¼ acre minimum patch size. Thus, the wetlands presented in this report are not an update to the jurisdictional wetland mapping performed in 2013 nor are they intended for regulatory purposes.

Feet
0 500 1,000

Note: 2016 wetland plant community mapping is based on rapid assessment and did not include delineations for regulatory purposes.

Figure 7
Plant Communities of the Property
CU South

Table 2. Plant communities at CU South and observed dominant species

Plant Community	Plant Community Classification Criteria	Basis in OSMP Grassland Ecosystem Management Plan (2010)	Dominant Species Observed in 2016	Major Differences Between Expected and Observed Plant Community Characteristics	Acreage at CU South (% of plant comms.)
Native Riparian	Cottonwoods (plains, lanceleaf, narrowleaf) > 50%; box elder; shrubs, *e.g.*, snowberry, hawthorn, Woods' rose, plum, and grape; native herbaceous understories.	Riparian areas	Plains cottonwood most common, but frequently observed significant cover of Russian-olive. Peach-leaved willow and ash were also observed.	Plains cottonwood more prevalent than other native species. Native understory often not well-developed.	16 ac. (5%)
Herbaceous Wetland	Narrow-leafed cattail, bulrush, sedges, rushes, swamp bluegrass, milkweed, sedges, and grasses (foxtail barley, switchgrass, alkali muhly). Dominant species may include non-natives.	Wetlands (emergent and wet meadows)	Cattails most common site-wide. Also observed American threesquare, sedges, rushes, milkweed, and minor occurrences of teasel, sandbar willow and plains cottonwood saplings.	Extensive monocultures of cattail.	30 ac. (5%)
Woody Wetland	Sandbar willow, peach-leaved willow, leadplant, cattail, arctic rush. Could include minor tamarisk (non-native).	Wetlands (woody)	Native sandbar willow most common; often interspersed with cattail. Sedges, rushes, and occasional peach-leaved willow also observed.	Observations consistent with expectations (note no tamarisk found).	8 ac (3%)
Non-native upland (grassland)	Any of prairie types with >40% non-native pasture grasses, *e.g.*, smooth brome, orchardgrass, quackgrass, bluegrass, non-native wheatgrasses, upland weeds & forbs.	(none)	Dominant species observed were cheatgrass and alfalfa. Smooth brome, bindweed, and yellow salsify also very common, and western wheatgrass was observed.	Observations consistent with expectations.	233 ac (80%)
Non-native Riparian	Non-natives Russian-olive, crack willow	(none)	Russian-olive most common, but Siberian elm and crack willow dominant in some communities. Sandbar willow a frequent associate. Ash also observed.	Native associates were observed.	2 ac (1%)
Mixed Grass Prairie Mosaic	Native species relative cover >60%. Most prevalent native species to include western wheatgrass, blue grama, silver sage, Junegrass, buffalograss, snakeweed, scurfpea.	Mixedgrass Prairie Mosaic	Western wheatgrass, golden banner, yarrow, milkweed. Also Canada thistle.	Grasses not dominant, but rather co-dominant with forbs.	1 ac (<1 %)

High-resolution aerial photographs were used in the field to draw plant communities, and the polygons were then digitized using GIS. The smallest mapping unit for a polygon was approximately ~0.1 acre (~4,000 sq ft). Two or three dominant species were recorded for each polygon, "dominant" determined as covering at least 25% of area within the plant community.

Of the approximately 316 acres mapped at CU South, roughly 20% is comprised of native plant communities. Herbaceous wetland is the largest native plant community with most of these areas occurring in the southern part of the site and around the existing ponds and ditches. Descriptions of each of the plant communities are provided in the following subsections.

Native Riparian

Native riparian communities, comprising 16 acres (5%) of the survey area, are wooded areas with sufficient soil moisture to support trees and shrubs, and at CU South they are most commonly located near a water source such as a ditch or a wetland. Native riparian communities were observed forming a mosaic with the herbaceous wetlands in the southernmost leg of the property (Photograph 1), in the South Boulder Creek floodplain along the eastern boundary, and along the western terrace. Plains cottonwood (*Populus deltoides*) is the dominant species in all native riparian communities of the study area. The most commonly observed associate was non-native Russian-olive (*Elaeagnus angustifolia*). Ash (*Fraxinus pensylvanica*) and peach-leaved willow (*Salix amygdaloides*) are also typical.

Photograph 1. Mosaic of native riparian/herbaceous wetland communities in southernmost portion of CU South property. Native riparian patches are dominated by plains cottonwood.

Herbaceous Wetlands

Herbaceous wetlands cover 30 acres, or approximately 10%, of the survey area. The largest patches are located in the southernmost portion of the property, but they are also characteristic of the inner slope of the berm (Photograph 2) and occur sparsely around the ponds.

Photograph 2. Herbaceous wetland on the inside of the berm; photograph faces east-southeast. Dominant species in this patch are rushes, sedges, and cattail.

Cattail (*Typha* sp.) was the most common dominant species in the herbaceous wetlands, but we also observed both native and non-native rushes (*Juncus* sp.), sedges (*Carex* sp.), milkweed (*Asclepias* sp.), and American threesquare (*Schoenoplectus pungens*). Additionally, there were minor occurrences of teasel (*Dipsacus* sp.), sandbar willow (*Salix exigua*), and plains cottonwood saplings.

Woody wetlands

Woody wetlands comprise 8 acres (3%) of the survey area. Woody wetlands are found predominantly in the western portion of the property and typically abut native riparian communities.

Photograph 3. Woody wetland complexed with cattails on the west side of CU South. Photograph faces south.

Similar to other woody wetlands of the Boulder County area, the woody wetlands in the survey area are dominated by sandbar willow. Associates commonly include cattail, sedges, and rushes (Photograph 3). Peach-leaved willow was also observed.

Mixed Grass Prairie Mosaic

One patch of Mixed Grass Prairie Mosaic was observed at CU South, on the eastern boundary of the property. This patch was 0.9 acres and located between a patch of native riparian to the west and open space (beyond the property boundary) to the east.

In this sole native-dominated prairie patch observed at CU South, western wheatgrass (*Pascopyrum smithii*) is dominant, yet golden banner (*Thermopsis rhomboidea*), yarrow

(*Achillea* sp.), and milkweed were prevalent. Non-native Canada thistle (*Cirsium arvense*) was also noteworthy.

Non-Native Grassland

Non-native grassland comprises 233 acres (80%) of the property. The magnitude and features of this community reflect its history of disturbance including mining. Dominant species are cheatgrass (*Anisantha tectorum*) and alfalfa (*Medicago sativa*), and associates include bindweed (*Convolvulus arvensis*), yellow salsify (*Tragopogon dubius*), and smooth brome (*Bromopsis inermis*; Photograph 4). Patches of western wheatgrass were also observed.

Non-Native Riparian

Non-native riparian communities were relatively small at CU South covering only 2 acres (1% of survey area). These isolated patches occurred around one of the ponds in the northern portion of the site (Photograph 5), and along the eastern and western boundaries. Russian-olive was the typical dominant, but Siberian elm (*Ulmus pumila*) and crack willow (*Salix fragilis*) were dominant in some of these patches. Sandbar willow is a frequent associate and ash was also observed.

Photograph 5. Non-native riparian community around the shoreline of a pond in the northern portion of CU South. Non-native upland is in the foreground.

Open Water and Other

The remainder of the property consists of open water ponds (see previous water resources description), developed areas including tennis courts and roads, living fences (i.e., rows of non-native trees), and salt flats characterized by narrowleafe trefoil (*Lotus tenuis*). A waste pile of riprap and soil is also found in the southwest corner.

Photograph 4. Non-native grassland at CU South. Dominant species are cheatgrass and alfalfa. White tufts are yellow salsify.

Threatened Species' Habitat

On August 30, 2016, OSMP staff conducted a rapid assessment of CU South for potential habitat for Ute ladies'-tresses orchid (*Spiranthes diluvialis*), a threatened species, as well as actively growing individual *Spiranthes*. Potential habitat was observed primarily in areas that were classified as non-native upland but always adjacent to herbaceous and/or woody wetland Blue lobelia (*Lobelia siphilitica*), a common floral associate of Spiranthes, was also observed in onsite wetland. Due to the location of most wetlands on-site, the eastern and southern portions of the property were emphasized for the survey.

Figure 7 shows the areas identified as potential Ute ladies' tress orchid habitat at CU South based on OSMP's rapid assessment. Four individual *Spiranthes* plants were observed in association with a patch of herbaceous wetland adjacent to the berm close to the southeast edge. As shown on Figure 7, most of the potential habitat is identified in the eastern portion of the property, with additional patches located around the cattail wetlands in the southernmost "panhandle" as well as smaller areas adjacent to the ponds in the northern portion.

Note that this rapid assessment for *Spiranthes* habitat was not intended to meet the qualifications of a full survey for clearance from the Fish and Wildlife Service. For regulatory purpose, a more intensive survey prior to planning and development would be required. Similarly, careful surveys should be conducted for the Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*) prior to site development. The Colorado butterfly plant is also listed as threatened and its habitat requirements are similar to those of *Spiranthes*.

Wildlife Habitat

According to the Species Range Mapping for select mammals by Colorado Parks and Wildlife Department (CPW), most or all of the property is within the overall ranges of mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), bobcat (*Lynx rufus*), and mountain lion (*Puma concolor*), and contains potential Preble's meadow jumping mouse (*Zapus hudsonius preblei*) habitat. Figure 8a shows select ranges for bear and deer and Preble's. Detailed wildlife surveys have not been conducted on the CU South property; however, residents in the area report seeing abundant birds and wildlife such as coyote, fox, and small mammals (and even a moose recently). Other common urban wildlife including a variety of breeding grassland and wetland birds, fish, amphibians, and reptiles are known or are likely to occur on the property, particularly given its location adjacent to OSMP-protected areas and the types of plant communities found on-site.

City OSMP staff provided further input on wildlife habitat features to include in the suitability analysis. Figure 8b shows the designated conservation areas for the Preble's meadow jumping mouse used by OSMP. In August 2016, OSMP staff conducted a high-level rapid survey of aquatic, wetland, and grassland areas to ascertain the presence of suitable habitat for breeding birds, Ute ladies'-tresses orchid, native fish, amphibians, and reptiles. Site observations included:

- Open water habitat provided habitat for native amphibians and reptiles. A single snapping turtle was observed in one pond and woodhouse toad tadpoles in another (the pond close to the tennis courts). OSMP notes from prior knowledge that native western chorus frog and woodhouse toad populations breed in the ditch on the western boundary (northern portion) as well as the herbaceous wetland communities south of the tennis courts.

  The shallow depth of the lakes is a primary factor of their general low quality for wildlife as indicated by algal blooms and prevalence of non-native species such as bullfrog,

Legend

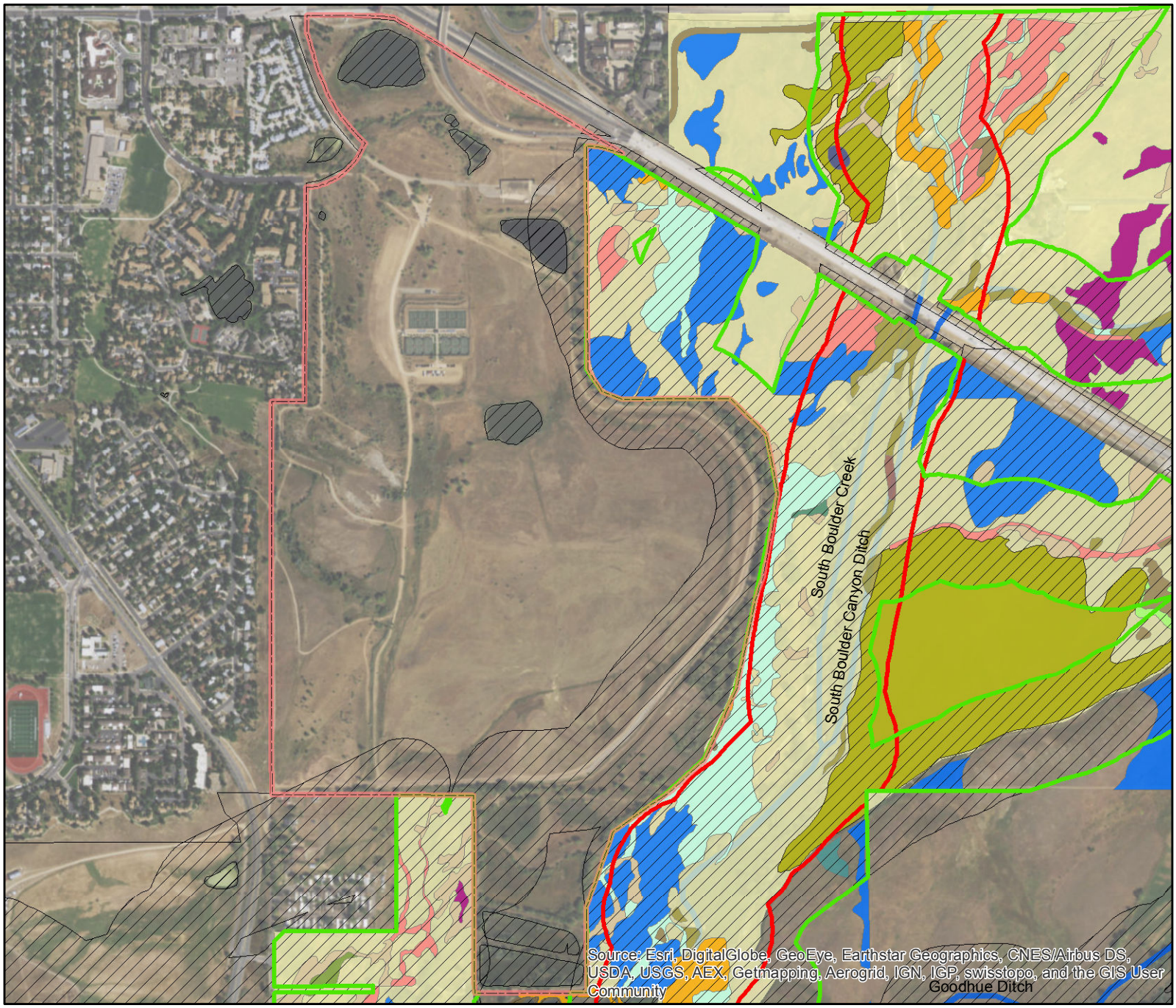
- Black Bear Fall Concentration
- Black Bear Human Conflict Area
- Mule Deer Highway Crossing
- Mule Deer Concentration Area
- White-tailed Deer Concentration Area
- CUSouth_Boundary
- Creeks and Ditches
- HIGHWAYS

The entire site is within the overall habitat ranges for black bear, black-tailed prairie dog, mountain lion, whilte-tailed deer, mule deer (also summer and winter range),Preble's meadow jumping bouse, reptiles and white tailed deer.

Feet
0 500 1,000

N

Figure 8a
Select Wildlife Ranges (regional data)
CU Property
Source :Colorado Parks and Wildlife



Legend

- CUSouth_Boundary
- South Boulder Creek State Natural Area
- Prebles Conservation Zones
- Prebles Critical Habitat
- Prebles Conservation Zones regional

OSMP_TrackedVegAssociations_S1_S3

Associations

- American Mannagrass Herbaceous Vegetation
- Big Bluestem - Prairie Dropseed Western Foothills Herbaceous Vegetation
- Big Bluestem - Yellow Indiangrass Western Great Plains Herbaceous Vegetation
- Big Bluestem Colorado Front Range Xeric Tallgrass Herbaceous Vegetation
- Clustered Field Sedge Herbaceous Vegetation
- Eastern Cottonwood - (Peachleaf Willow) / (Coyote Willow, Sandbar Willow) Woodland
- Nebraska Sedge Herbaceous Vegetation
- Prairie Cordgrass Herbaceous Vegetation
- Threesquare Wet Meadow Herbaceous Vegetation
- Woolly Sedge Herbaceous Vegetation

CNHP_TrackedVegAssociations_S1_S5

Associations

- (Broadleaf / Narrowleaf) Cattail Western Herbaceous Vegetation
- American Mannagrass Herbaceous Vegetation
- Big Bluestem - Prairie Dropseed Western Foothills Herbaceous Vegetation
- Big Bluestem - Yellow Indiangrass Western Great Plains Herbaceous Vegetation
- Clustered Field Sedge Herbaceous Vegetation
- Coyote Willow / Mesic Graminoids Shrubland
- Eastern Cottonwood - (Peachleaf Willow) / (Coyote Willow, Sandbar Willow) Woodland
- Marsh Spikerush Herbaceous Vegetation
- Narrowleaf Cottonwood / Coyote Willow Woodland
- Nebraska Sedge Herbaceous Vegetation
- Prairie Cordgrass Herbaceous Vegetation
- Threesquare Wet Meadow Herbaceous Vegetation
- Western Wheatgrass - Blue Grama Herbaceous Vegetation
- Woolly Sedge Herbaceous Vegetation

0 500 1,000 Feet

Note:Local Preble's data shown here provided by city was used in suitability analysis.

N

Figure 8b
Habitat Connectivity Considerations
CU Property

which were present in multiple locations, in large numbers, and with a diverse age structure. Such robust bullfrog populations would likely prevent the success of native frogs in those areas.

- Potential for the northern leopard frog (*Rana pipiens*), a species of concern, to breed within the CU South property would be highest in years of high water. Such conditions would create open water on the edges of ponds and wetlands, where larvae are deposited. The current year (2016) did not foster these conditions. More intensive surveys may be needed to confirm their presence on the CU South property.
- South Boulder Creek is a known corridor for northern leopard frog migration, and adjacent OSMP property to the south (Fancher Ponds) has supported northern leopard frog breeding for the past four years. Thus, the proximity of the CU South property to known northern leopard frog habitat increases the likelihood of CU South being used for some behaviors and/or life stages.
- Over 100 bird species have been observed at CU South since 2011, over half of which were confirmed to be breeding (a comprehensive list is attached as Table A-2). Many of these, including the American kestrel, western meadowlark, common nighthawk, dickcissel, horned lark, lark sparrow, loggerhead shrike, vesper sparrow, grasshopper sparrow, and blue grosbeak, are included in OSMP's grassland conservation targets. These observations indicate that the available habitat at CU South is of sufficient size and condition to support a diverse assemblage of native species. A subset of examples is:
    - Dickcissel is a sensitive breeding bird whose presence indicates breeding habitat (OSMP 2010).
    - Blue grosbeak indicates breeding habitat effectiveness and diversity (OSMP 2010).
    - Horned lark is a common prairie dog associate whose presence indicates prey (i.e., insect and seed) availability (OSMP 2010).

The above examples focus on grassland species as a basis for including grassland in the suitability analysis. Numerous wetland bird species have also been observed at CU South, but are not discussed in detail here as their habitat was incorporated into the GIS suitability analysis and was already valued as high-quality for the purposes of the assessment.

Habitat Connectivity

As noted previously, sensitive plant and animal habitat areas have been identified on the protected OSMP lands to the east and south of the property by both the Colorado Natural Heritage Program (CNHP), the Colorado State Natural Areas Program, and OSMP. On the adjacent OSMP property, OSMP has identified ecologically significant wetlands as well as habitat for sensitive species including Preble's meadow jumping mouse (*Zapus hudsonius preblei*), Ute ladies' tresses orchid (*Spiranthes diluvialis*), northern leopard frog (*Rana pipiens*), bobolink (*Dolichonyx oryzivorus*), plains topminnow (*Fundulus sciadicus*), and orangespotted sunfish (*Lepomis humilis*).

Preble's meadow jumping mouse and Ute ladies'-tresses orchid are federally threatened under the Endangered Species Act, and the northern leopard frog is considered a Tier 1 species (i.e., of greatest conservation need) by Colorado Parks and Wildlife. In addition, these OSMP properties support the majority of the city's mesic tallgrass prairie, a globally threatened plant community.

Figure 8b shows the designated conservation areas for the Preble's meadow jumping mouse along with the plant communities that are tracked by CNHP and OSMP. Preble's was positively located within ca. 300 meters of the property as recently as 2014. Preble's meadow jumping mouse (Preble's) habitat is a riparian ecosystem characterized by a high cover of shrubs, grasses, and forbs, and adjacent uplands that are used for foraging and hibernation. Typical habitat is found in the foothills of the Front Range ranging from southeastern Wyoming to Colorado Springs. Preble's is primarily nocturnal and a true hibernator, entering hibernation in early fall (Sept-Oct) and emerging in May. Its diet, comprised of insects, seeds, fungus, moss, pollen, and fruit, changes seasonally according to the availabilities of different foods.

For larger mammals and birds, the proximity of the property to adjacent OSMP land provides important habitat connectivity opportunities to the east and south. A potential linkage was noted by one resident who suggested the property serves as a potential connector for the southeast portion of the City between the foothills to South Boulder Creek and the Baseline Reservoir.

3.2 Conservation Suitability Mapping

The preliminary results of the weighted-sum GIS conservation suitability (sensitivity) analysis (described in Section 2.2) are presented in Figure 9. Darker areas reflect a higher number of good quality attributes for conservation. Lighter areas suggest areas that may be better suited for potential restoration, mitigation, or development compatibility. The mapping suggests that the eastern perimeter and southern wetlands have the largest contiguous, higher ranked areas of sensitivity to disturbance or development. The water resources and the wetlands, as well as a mosaic area in the northwest, also are higher value areas based on the GIS analysis. The central portion of the property and western edge have lower rankings for conservation values as indicated by their lighter color.

3.3 Secondary Considerations

Secondary suitability criteria were evaluated including landscape character views and potential habitat connectivity.

Habitat connectivity to adjoining properties

Figure 10 is a sketch depicting connectivity potential between the CU South property and nearby areas containing native plant associations and Preble's meadow jumping mouse habitat. Connectivity potential was based generally on proximity, potential for seed dispersal, and wildlife usage. As indicated in the figure, the highest potential areas for connectivity are to the south and east of the CU property where OSMP-protected areas adjoin the property.

Landscape character viewshed features

Figure 11 presents a conceptual sketch of photopoint values, depicting the areas of the site with view features based on the assessment detailed in Section 2.3 above (further detail in Table A-1, attached). The outline of the point and the color reflect an initial value of key landscape characteristics at these points. This is a preliminary exercise which may need refinement once stakeholder input is gathered.

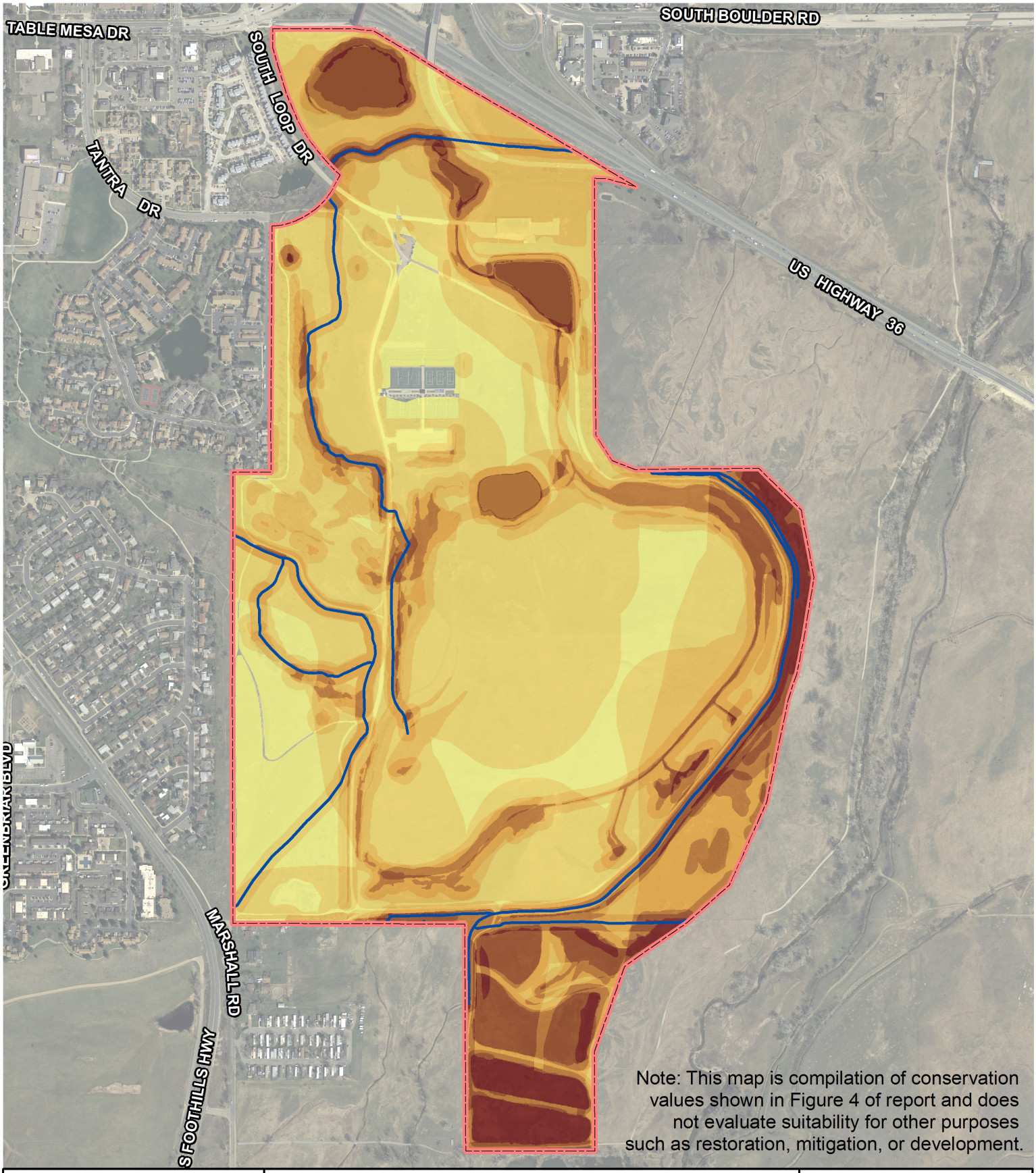


Figure 9
Site Conservation Suitability Analysis
CU South

Legend

CU South Boundary

Streams

Street_Centerlines

Suitability Rating

Score

High : 10

Low : 1

Note: High=greater conservation value, and Low=less conservation value

0 400 800 Feet

N

Biohabitats
SOUTHERN ROCKY MOUNTAIN BIOREGION

November 2016

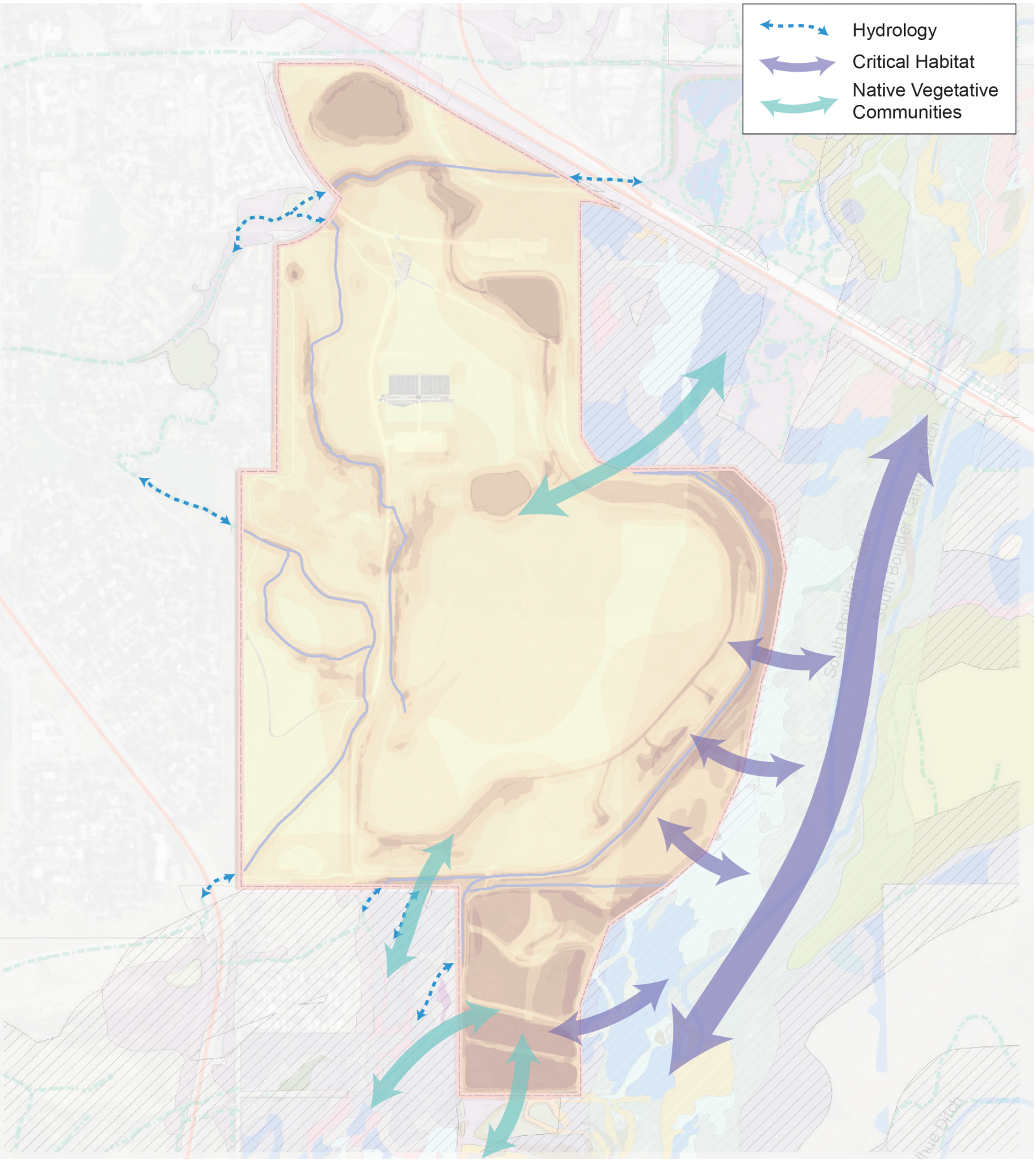


Figure 10
Connectivity: Critical Habitat, Native Vegetative Communities, & Hydrology
November 2016
CU Property

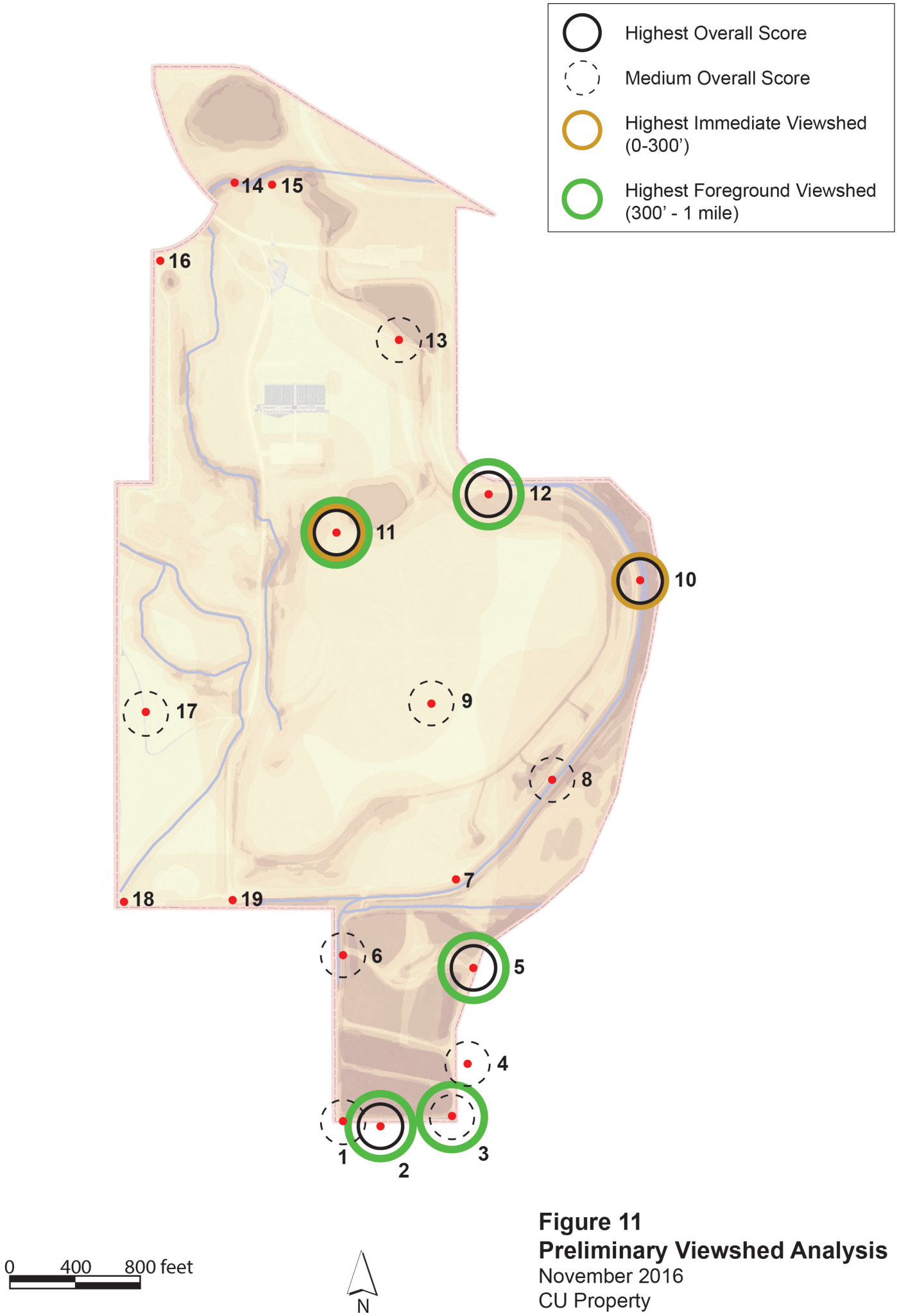


Figure 11
Preliminary Viewshed Analysis
November 2016
CU Property

4 Next steps

The following potential action items are suggested as next steps to refine and finalize this conservation suitability analysis and incorporate the findings into the decision-making process.

Collect and Synthesize Stakeholder Comments
The public and city and Boulder County boards and commissions will have opportunities to review and comment in September. Additionally, city and CU staff may have additional comments and questions for consideration in future analyses.

Revise Conservation Suitability Mapping
Depending on the nature of design alternatives and input from outreach efforts, it may be desirable to re-run the GIS analysis to adjust certain inputs and compare to the original output. For example, adding new criteria such as the potential for wetland mitigation or restoration potential could be useful. Additionally, the current qualitative analyses of habitat connectivity could be made quantitative, for example, by incorporating a layer showing buffers around tracked plant community resources found on adjoining properties (monitored by the Colorado Natural Heritage Program and OSMP). Finally, additional qualitative analyses based on viewsheds may be developed based on stakeholder input.

Integrate Comments and Additional Suitability Analyses for Transportation and Services
Environmental considerations for conservation are only a subset of the issues that the city and CU are evaluating. Other suitability analyses of transportation and city services are being conducted separately.

Collaborate with Flood Control Design Process
The current analysis of the property allows the quantification of acres of the site with various ranking values (1-8) to be tallied. By overlaying the proposed floodplain mitigation features (berm, fill, detention basin), it would be possible to quantify the areas of various ranked areas that will be impacted. Similarly, as the design engineers consider variations of the layout, it will be possible to compare the impacts to select a layout that maintains the most ecological function.

Inform Land Use Changes and Agreements
As noted in the introduction of this report, while the BVCP was updated multiple times between 200-2015, land use designations of CU South did not change during either of those updates. The BVCP is currently being updated and land use designations of the parcel are expected to change in part to accommodate the mitigation for South Boulder Creek flood earthwork on the site and to address CU's long term planning needs and other community goals. This update will be done with input from the City of Boulder, CU, and the public to determine the most appropriate updates to land use designations, and this suitability study can help inform agreements between the city and CU about future development and conservation of the site.

References

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Attachments

Table A-1. List of viewshed features

Immediate View (0-300')	Foreground View (300'-1 mi)	Middle Ground (1-4 mi)	Background (4 mi-horizon)
• Sounds of water • View in shady spot across open sunny area • Accessibility over wetland, e.g., boardwalk crossing • No dirt road visible	• Mixed grassland with shrubs • Two-track road/trail • Native plants/meadow fields • Diverse plant palette • Rural/agricultural fields • Trees line long views • Mature trees • Unimpeded view across open water • Unimpeded view across wetland/seep	• Some distant views visible	• Mountains partially visible on horizon • Unimpeded view of mountains • Wide Views

Table A-2. Bird species observed on the CU South property, 2011-2016.

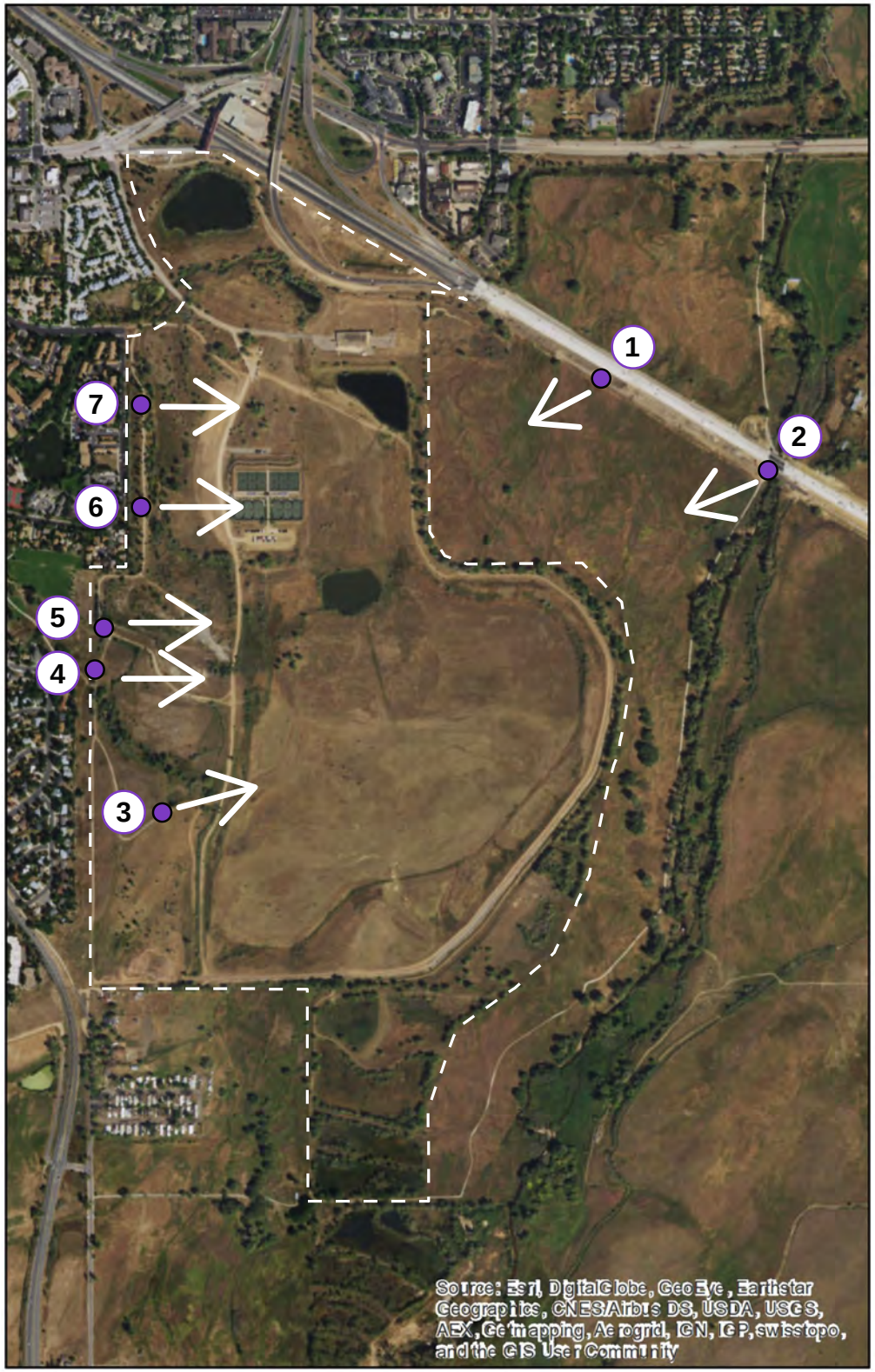
	Status				Habitat Associate			Where observed							
Species	**Resident Breeder**	**Migrant**	**Neotropical Migrant**	**Generalist**	**Wetland**	**Grassland**	**Riparian**	**N. Ponds**	**Non-Native Grassland (N)**	**Non-Native Grassland (S)**	**W. Mosaic**	**Inner Perimeter**	**Outer Perimeter**	**S. Wetlands**	**Status Notes**
American Bittern	X	X			X									X	The Southern Wetlands cattail marshes are a well-known location for American Bitterns if the water level is appropriate
American Crow				X											
American Goldfinch	X			X			X	X	X	X	X	X	X	X	
American Kestrel	X	X				X	X	X	X	X	X	X	X	X	
American Pipit		X													
American Robin	X			X			X	X	X	X	X	X	X	X	
American White Pelican		X													
American Wigeon		X			X			X							
Bank Swallow		X	X		X										
Barn Swallow	X	X	X	X	X	X		X	X	X	X	X	X	X	
Belted Kingfisher					X			X							
Black-billed Magpie	X			X											
Black-capped Chickadee	X			X			X				X	X	X	X	
Black-chinned Hummingbird	X	X	X				X				X	X	X	X	
Black-throated Sparrow		X							X						One sighting 4-22-11
Blue Grosbeak	X	X	X			X			X	X	X	X	X		
Blue Jay	X			X			X				X		X		
Blue-gray Gnatcatcher		X	X				X				X				
Brewer's Sparrow		X				X				X	X				
Broad-tailed Hummingbird		X	X								X				
Brown-headed Cowbird	X	X		X							X		X		
Bufflehead		X			X			X							

	Status				Habitat Associate			Where observed							
Species	**Resident Breeder**	**Migrant**	**Neotropical Migrant**	**Generalist**	**Wetland**	**Grassland**	**Riparian**	**N. Ponds**	**Non-Native Grassland (N)**	**Non-Native Grassland (S)**	**W. Mosaic**	**Inner Perimeter**	**Outer Perimeter**	**S. Wetlands**	**Status Notes**
Bullock's Oriole	X	X	X		X		X	X			X		X	X	
Canada Goose	X	X		X	X			X							
Cassin's Kingbird		X	X							X					
Cedar Waxwing	X	X					X				X		X	X	
Chipping Sparrow		X		X					X	X	X		X		
Cliff Swallow		X		X					X	X	X				
Common Grackle	X	X		X				X	X	X	X	X	X	X	
Common Nighthawk	X	X	X			X			X	X			X		
Common Raven				X											
Common Yellowthroat	X	X	X		X							X	X	X	nest in cattail stands in ditches and ponds
Cooper's Hawk				X			X			X	X		X		
Dark-eyed Junco		X		X				X	X	X	X				
Dickcissel	X	X	X			X				X		X			several singing males in the area in 2012
Downy Woodpecker	X			X							X		X		
Eastern Kingbird	X	X	X					X	X			X	X		
Eurasian Collared-Dove	X			X											
European Starling	X			X											
Gadwall		X			X			X							
Grasshopper Sparrow	X	X	X			X				X					singing males in the southern grassland one summer
Gray Catbird		X	X				X				X				
Gray Flycatcher		X	X								X				one individual in April 2011
Great Blue Heron		X			X			X							
Greater Yellowlegs		X	X		X			X							
Green-tailed Towhee		X	X								X				

	Status				Habitat Associate			Where observed							
Species	**Resident Breeder**	**Migrant**	**Neotropical Migrant**	**Generalist**	**Wetland**	**Grassland**	**Riparian**	**N. Ponds**	**Non-Native Grassland (N)**	**Non-Native Grassland (S)**	**W. Mosaic**	**Inner Perimeter**	**Outer Perimeter**	**S. Wetlands**	**Status Notes**
Harris's Sparrow		X									X				
Hermit Thrush		X	X										X		
Horned Lark		X				X				X					
House Finch	X			X				X	X	X	X	X	X		
House Sparrow	X			X											
House Wren	X	X	X								X		X		
Killdeer	X	X	X		X			X	X	X					
Lark Sparrow	X	X				X			X	X	X				
Lazuli Bunting		X	X									X	X		
Least Flycatcher		X	X								X				
Lesser Goldfinch	X	X	X	X				X	X	X	X		X	X	
Lesser Yellowlegs		X	X		X			X							
Lincoln's Sparrow		X	X								X	X	X	X	
Loggerhead Shrike		X				X				X					
Mallard	X	X			X			X							
Merlin		X									X				
Mountain Bluebird		X							X	X					
Mountain Chickadee		X									X				
Mourning Dove	X	X		X				X	X	X	X	X	X	X	
Northern Flicker	X			X				X			X		X		
Northern Rough-winged Swallow															
Northern Shrike		X									X				
Orange-crowned Warbler		X									X				
Osprey		X						X							

	Status				Habitat Associate			Where observed							
Species	**Resident Breeder**	**Migrant**	**Neotropical Migrant**	**Generalist**	**Wetland**	**Grassland**	**Riparian**	**N. Ponds**	**Non-Native Grassland (N)**	**Non-Native Grassland (S)**	**W. Mosaic**	**Inner Perimeter**	**Outer Perimeter**	**S. Wetlands**	**Status Notes**
Red-tailed Hawk	X	X		X			X	X	X	X	X		X		
Red-winged Blackbird	X	X			X			X			X			X	
Ring-billed Gull		X						X							
Ring-necked Duck		X			X			X							
Rock Pigeon	X			X											
Ruby-crowned Kinglet		X									X				
Savannah Sparrow	X	X	X			X		X		X		X	X	X	
Say's Phoebe	X	X	X					X	X	X	X				
Sharp-shinned Hawk		X									X				
Solitary Sandpiper		X			X			X							
Song Sparrow	X	X			X			X		X	X	X		X	
Sora	X	X			X									X	
Spotted Towhee		X									X				
Swainson's Thrush		X	X										X		
Tree Swallow		X	X					X							
Turkey Vulture		X	X						X	X					
Vesper Sparrow	X	X				X		X	X	X	X	X	X		
Virginia Rail	X	X			X									X	
Warbling Vireo	X	X	X				X						X	X	
Western Kingbird	X	X	X					X	X	X	X	X	X	X	
Western Meadowlark	X	X				X			X	X		X			
Western Tanager		X	X								X		X		
Western Wood-Pewee		X	X								X		X		
White-breasted Nuthatch	X						X				X		X		

	Status				Habitat Associate			Where observed							
Species	**Resident Breeder**	**Migrant**	**Neotropical Migrant**	**Generalist**	**Wetland**	**Grassland**	**Riparian**	**N. Ponds**	**Non-Native Grassland (N)**	**Non-Native Grassland (S)**	**W. Mosaic**	**Inner Perimeter**	**Outer Perimeter**	**S. Wetlands**	**Status Notes**
White-crowned Sparrow		X									X				
White-throated Swift		X							X	X					
Wilson's Snipe	X	X			X			X			X	X		X	
Wilson's Warbler		X	X								X				
Wood Duck		X			X			X							
Yellow Warbler	X	X	X				X				X		X	X	
Yellow-rumped Warbler		X	X					X			X		X		



CU South
Landscape character viewsheds

High Value

1.

2.

3.

Mid Value

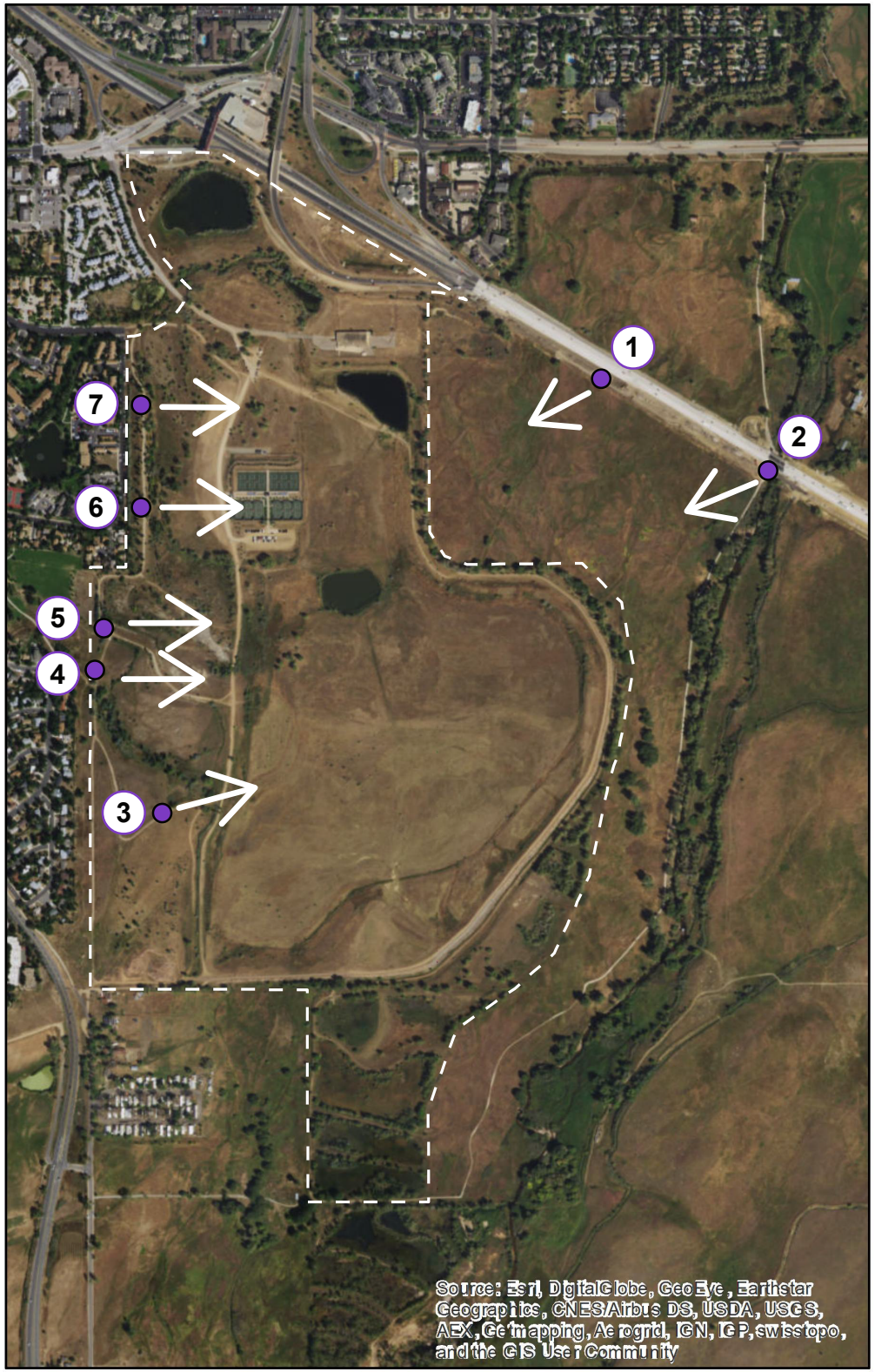
4.

5.

Low Value

6.

7.



CU South
Landscape character viewsheds

Viewpoints from US 36

1.

2.

Majority of the foreground that's visible from US 36 is city-owned open space. The CU South property is located behind the tree line which outlines the property boundary. The residential neighborhood directly west of the site is partially visible from US 36, and is located approximately .6 miles away and elevated 100 ft. higher. Currently, the view of CU South is screened by the existing tree line, as shown in the picture above.

Viewpoint from the western edge

4.

5.

The quality of the views from the western edge of the site are consistent with one another. Wider views and exposure to open space is found on the most elevated parts of the site, located south-east of Tantra Park.

MEMORANDUM

To: Lesli Ellis

From: Bill Fox, PE

Date: September 12, 2016

Project: CU South Site Suitability Analysis - Transportation

Subject: **Multi-modal Access Opportunities and Constraints - DRAFT**

Multi-modal accessibility is an important consideration when evaluating future land uses on the CU South parcel as part of the Boulder Valley Comprehensive Plan Update process. The ability to efficiently access the 316-acre parcel at the southeastern edge of the City of Boulder will help determine appropriate land use type, intensity and location within the property. Figure 1 includes an aerial view of the entire CU South site.

In this context, the Fox Tuttle Hernandez Transportation Group has completed an initial review of multi-modal access potential for the CU South property. In making this review we have:

- Reviewed the site and surrounding land uses;
- Conducted a site inspection of existing roadways, bikeways, and pathways that currently access the site;
- Identified potential for additional roadway, bikeway, and pathway access around the perimeter of the site;
- Reviewed the multi-modal facility plans contained in the City of Boulder's Transportation Master Plan, with a focus on the CU South property;
- Reviewed the US 36 Environmental Impact Statement, with a focus on the Table Mesa Drive/US 36 interchange alternatives that, when implemented, will affect access to the CU parcel;
- Met with City of Boulder Transportation Division staff to review site access issues; and
- Prepared a set of transportation opportunity and constraint sketches on aerial photo base maps.

The results of this multi-modal access evaluation are summarized by topic as follows:

Existing and Potential Roadway Access:

S. Loop Drive

Currently, the only paved roadway access to the CU South property is provided by S. Loop Drive. It accesses the site from the Table Mesa Drive/S. Loop Drive/US36 Eastbound Ramp intersection. This 5-leg signalized intersection is included on **Figure 3** and illustrated in the attached **Photos 1 and 2**. S. Loop Drive is a narrow 2-lane roadway that extends approximately 1/3 mile into the property before terminating at a gravel parking area and an old industrial building **(Photos 3 and 4)**. The parking area serves as access to 12 tennis courts and a gravel trail that loops through the property.

In the future, S. Loop Drive should continue as the primary vehicular access to the CU South property. As the area develops, the roadway should be reconstructed as a "complete street" with multi-modal facilities to accommodate bus, bicycle, pedestrian, and automobile traffic. It is recommended that the northern end of S. Loop Drive be incorporated into a "mobility hub" that connects all modes of travel and provides efficient circulation for RTD and CU buses, with bus, pedestrian and bicycle connectivity to the transit station along US 36 (see discussion below related to the potential US 36 interchange reconfiguration that was identified in the US 36 EIS). The future configuration of the Table Mesa Drive/Loop Drive/US 36 Ramp intersection and adjacent interchange will need to be carefully considered so as to provide safe and efficient access to CU South.

The extent of future storm water detention upstream of US 36 that is implemented will also have a significant impact on the land uses and access roadways in this northwest end of the CU South site. See the discussion below on this topic.

Tantra Drive

Tantra Drive is a 50-foot wide 2-lane street with on-street parking that extends from Table Mesa Drive south and then east to the western edge of the CU property **(see Figure 3, and Photos 5 and 6)**. It currently carries less than 4,000 vehicle trips per day just south of Table Mesa Drive. It provides access to the commercial area south of Table Mesa Drive, abuts the Summit Middle School property where there is a pick-up and drop-off zone, and then provides access to multi-family residential housing. The eastern terminus of Tantra Drive was constructed as if it were intended extend east into the CU site.

The easterly extension of Tantra Drive into the CU property would make a logical secondary roadway access to CU South. Tantra Drive has a cross-section that can comfortably accommodate additional automobile traffic, and it connects to Table Mesa Drive at a signalized intersection.

However, speed mitigation through the school access area will be important, and the adjacent residents along Tantra Drive will likely object to the additional traffic.

Moorhead Circle

At the eastern end of Tantra Drive there is a 90 degree "T" intersection with Moorhead Circle, which extends south along the western edge of the CU property **(see Figures 3 and 4)**. There is multi-family housing along the west edge of Moorhead Circle, and a raised, vegetated berm on the CU property along the east edge of the roadway **(see Photo 8).** Moorhead Circle is 32 feet wide with on-street parking along both sides.

While it would be physically possible to construct a roadway connection from the CU site directly onto Moorhead Circle, the narrow width and residential character on this area would make any new roadway connection undesirable.

Marshall Road

Marshall Road is a narrow paved 2-lane road in Boulder County that parallels CO 93 south of the CU property **(see Figure 5)**. The northern terminus of Marshall Road is located at the southwest corner of the CU site, where it reaches the Boulder city limits **(see Photo 11).** There is a short connection (approximately 140 feet) between Marshall Road and CO 93, located approximately 700 feet south of the northern end of Marshall Road **(see Photo 12).**

While Marshall Road does nearly connect to the CU property, it is not recommended as a future extension into the site as the property develops due to the narrow width, the adjacent residential properties in Boulder County, and the substandard spacing between Marshall Road and CO 93.

Southwestern Access Onto CO 93 (Broadway)

The only other existing vehicular access to the CU property is located at the extreme southwestern corner of the site where there is a dirt roadway that extends east from the northern terminus of Marshall Road and runs along the south edge of the property **(see Photo 10)**. It is not clear if this dirt roadway is on or off of the CU site, but eventually it does connect to the looping gravel roadway (cross-country course) within the CU property.

In the future, there is the potential to extend a new roadway access from the CU property and connect directly onto CO 93 (Broadway) as illustrated on **Figure 5**. CDOT has classified CO 93 as a non-rural arterial (NR-A), and the State Highway Access Code defines the geometric access requirements based on access category. A new roadway connection to CO 93 in this location would require a State Highway Access Permit, and it would also likely require a number of variances from Access Code geometric requirements related to intersection spacing and the design of auxiliary turn lanes, etc. A new access in this location would also need to be designed to overcome the existing topography that slopes downward to the east of the highway.

The amount of traffic that would utilize this new roadway connection will depend on the magnitude and placement of new land uses within CU South. The amount of future traffic using this access will determine the necessary intersection configuration and traffic control (stop sign or signal for example). That said, it is recommended that any internal roadway connection or connections between this new access at the south end of the property, and the Loop Drive access at the north end of the property, be constructed in a circuitous or non-direct alignment to discourage any outside traffic from cutting through the CU South property to avoid the Table Mesa Drive/Broadway connection.

Existing and Potential Bikeway and Pathway Access:

There are a number of gravel or dirt pathways that exist on, around, and through the CU South parcel as illustrated on **Figure 1**. A number of "social path" connections have been created between the CU site and the adjacent residential neighborhoods to the west **(see Photos 7 and 9).** The site also fronts on the US 36 Bikeway to the north, the Broadway path to the southwest **(see Photo 11),** and nearly reaches the South Boulder Creek Trail to the east.

In this context the CU property has excellent pathway and trail access, but there is room for improvement. **Figure 2** is a portion of the City's Bicycle System Plan from the Transportation Plan, and it illustrates a number of pathway connections that have been identified. **Figures 3 – 5** provide a more detailed look at trail connections that could be enhanced to become multi-use paths, and a number of new connections to adjacent neighborhoods and pathways as the site is developed. These connections will help support bicycle and pedestrian access to and through the site, and also provide access to the transit network as it evolves.

Existing and Potential Transit Access:

Existing local and regional RTD buses pass through the adjacent bus stops along Table Mesa Drive and US 36 in close proximity to CU South, including the 206, 209, DASH, AB, and Flatiron Flyer routes. Eventually, as the property develops, there will likely be CU bus service to the site. The challenge will be coordinating the design of the CU site in the Mobility Hub area as it develops, in concert with future modifications to the adjacent US 36 interchange and its ramps, to accommodate the circulation of buses and the connectivity between bus routes to maximize bus transit service to the CU South parcel.

It is anticipated that the design of the internal multi-modal grid within the CU property will facilitate CU and/or local RTD bus circulation as appropriate given land uses and development intensity.

Potential Future Reconfiguration of the Adjacent US 36 Interchange:

The US 36 Environmental Impact Statement (EIS) considered alternatives for reconstructing the US 36/Table Mesa Drive/Foothills Parkway interchange. The Combined Alternative Package (Preferred Alternative) of the EIS describes two interchange reconfiguration "options" that provided distinctly different access to the CU South parcel **(see Figure 6)**. The "Local Streets Option" would close the intersection of Table Mesa Drive and Loop Drive, and access to CU South would be provided by an extension of Tantra Drive into the CU site. The other option would maintain the intersection of Loop Drive onto Table Mesa Drive. These two options would have distinctly different impacts on the accessibility of the CU site and on the adjacent neighborhood as well.

Ultimately, *Section Four, Interchange Design Concepts, Impacts, and Mitigation* of the EIS references a subsequent agreement that was made between CDOT, the University of Colorado, the City of Boulder, and Boulder County that the preferred interchange design at this location will retain the existing intersection of Loop Drive and Table Mesa Drive to provide access to the CU South parcel. That said, the Preferred Alternative would still impact the configuration of the interchange ramps in the area and the relationship between the US 36 ramps, the transit stops along US 36 in this area, and the routes that buses would need to take to access the transit stations.

Figure 6 illustrates the Preferred Alternative interchange layout. It can be seen that buses on Table Mesa Drive would need to circulate on Loop Drive to access the eastbound US 36 transit stop, but would then be routed onto eastbound US 36. This calls out the need to better define local and regional bus access in this area, and supports the concept of making this northwest corner of the CU South parcel a mobility hub that includes efficient connectivity between local and regional RTD bus routes, future CU bus routes, etc.

Impacts of the South Boulder Creek Flood Mitigation Project:

The Final South Boulder Creek Major Drainageway Plan – Alternatives Analysis Report, August 2015, contains a number of alternatives related to storm water detention upstream of US 36 in the CU South parcel. The preferred Alternative D, accepted by council in August 2015, will entail construction of a berm along US 36, excavation of 81 acres in the northeast portion of the CU South property to create a detention pond, and fill of approximately 31 acres of the northwestern portion of the CU South property to 5370 feet a.s.l. (See attached Figure 9-5 Option D from Drainageway Plan). Of the seven alternatives considered, Alternative D minimized impacts to sensitive species from nearby Open Space Mountain Parks (OSMP) properties and minimized impacts to sensitive environmental resources.

Ultimately, the South Boulder Creek flood mitigation will influence the configuration of multi-modal transportation access facilities on the site. In this context, it is recommended that the "mobility hub", referenced above, be located as far north as possible within the CU South parcel to make multimodal travel and connections between modes and to off-site facilities as efficient as possible.

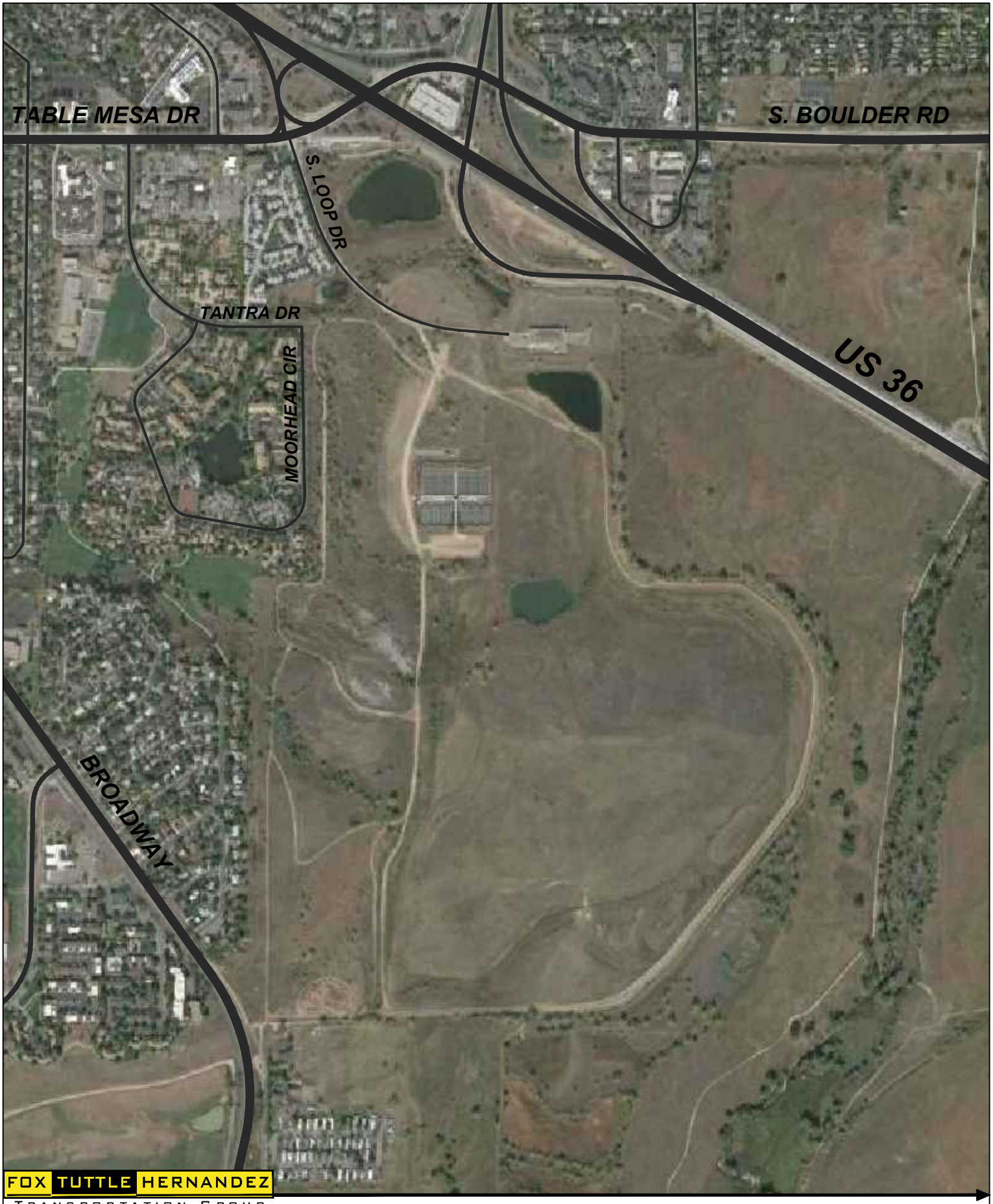
I hope this review of existing and potential multi-modal access to the CU South property is helpful. Please let me know if you have any questions.

In the next phase of this project, as future land use plans are developed for the site, we can assist with quantifying the amount and type of multi-modal transportation demand that may be expected on the various facilities that access the site.

/BF

Attachments:

Figure 1 Study Area Aerial Photo
Figure 2 Boulder Transportation Master Plan - Bicycle Facility Plan (portion)
Figure 3 – 5 Potential Multi-modal Access Improvements
US 36 Interchange Sketch
Site Photos 1 - 12
Storm Water Detention Upstream of US 36, Options D



FOX TUTTLE HERNANDEZ
TRANSPORTATION GROUP

CU BOULDER SOUTH PARCEL ACCESS STUDY

STUDY AREA

Project #	16029	Original Scale	NTS	Date	7/27/16	Drawn by	CRS	Figure #	1

BICYCLE SYSTEM PLAN

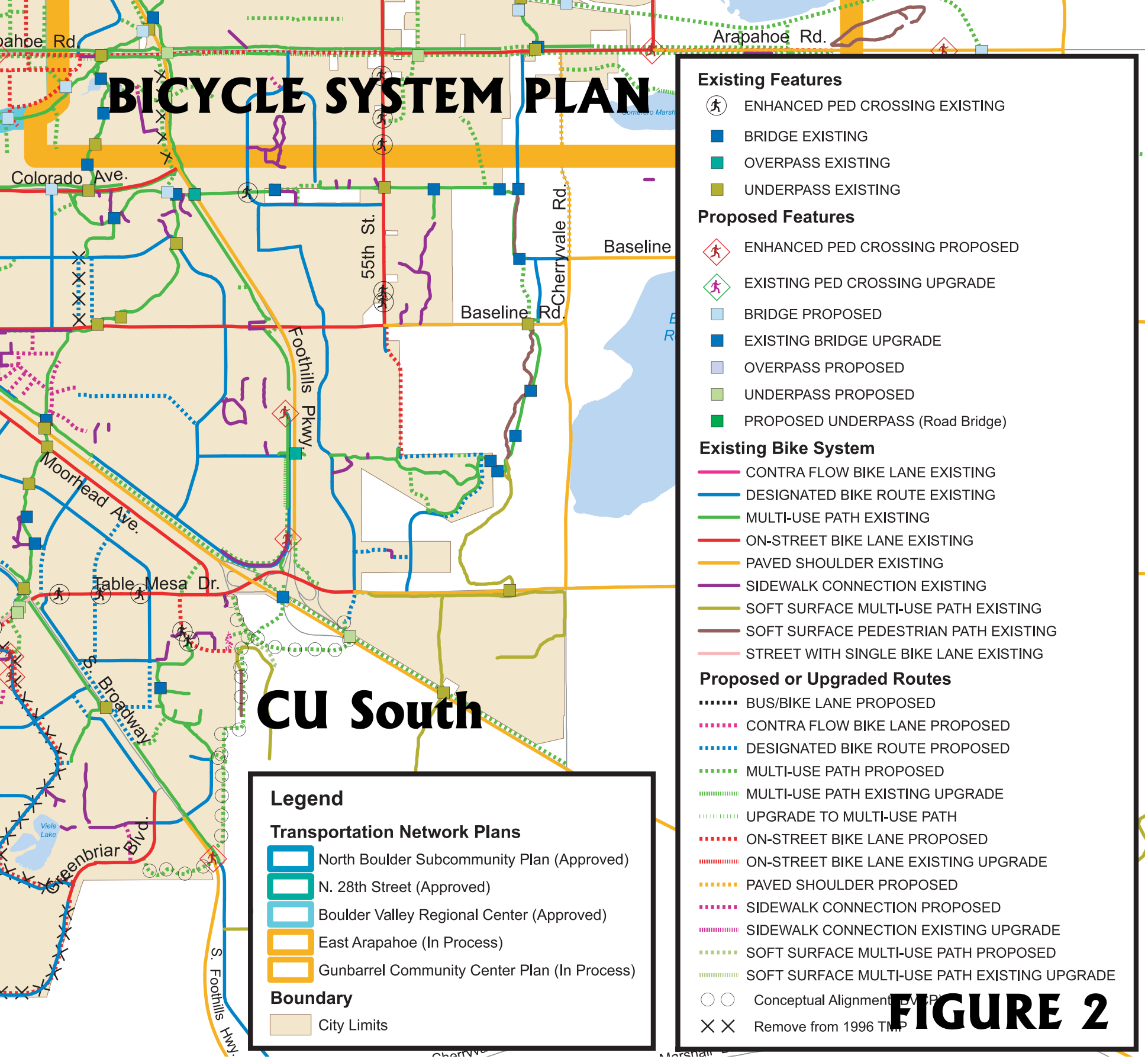
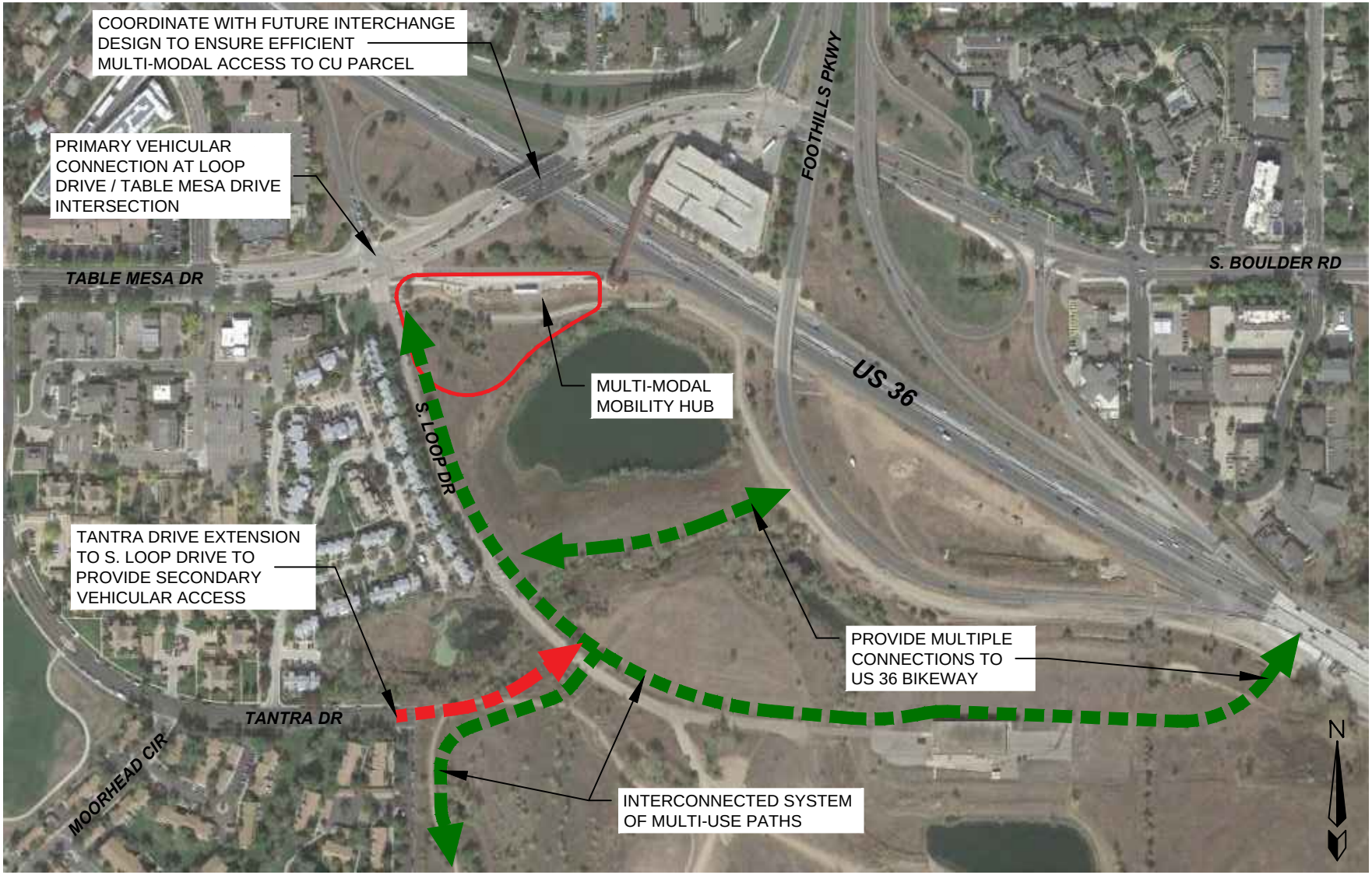


FIGURE 2



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CU BOULDER SOUTH PARCEL ACCESS STUDY

POTENTIAL MULTI-MODAL ACCESS IMPROVEMENTS

FT Project #	16029	Original Scale	NTS	Date	7/27/16	Drawn by	CRS	Figure #	3

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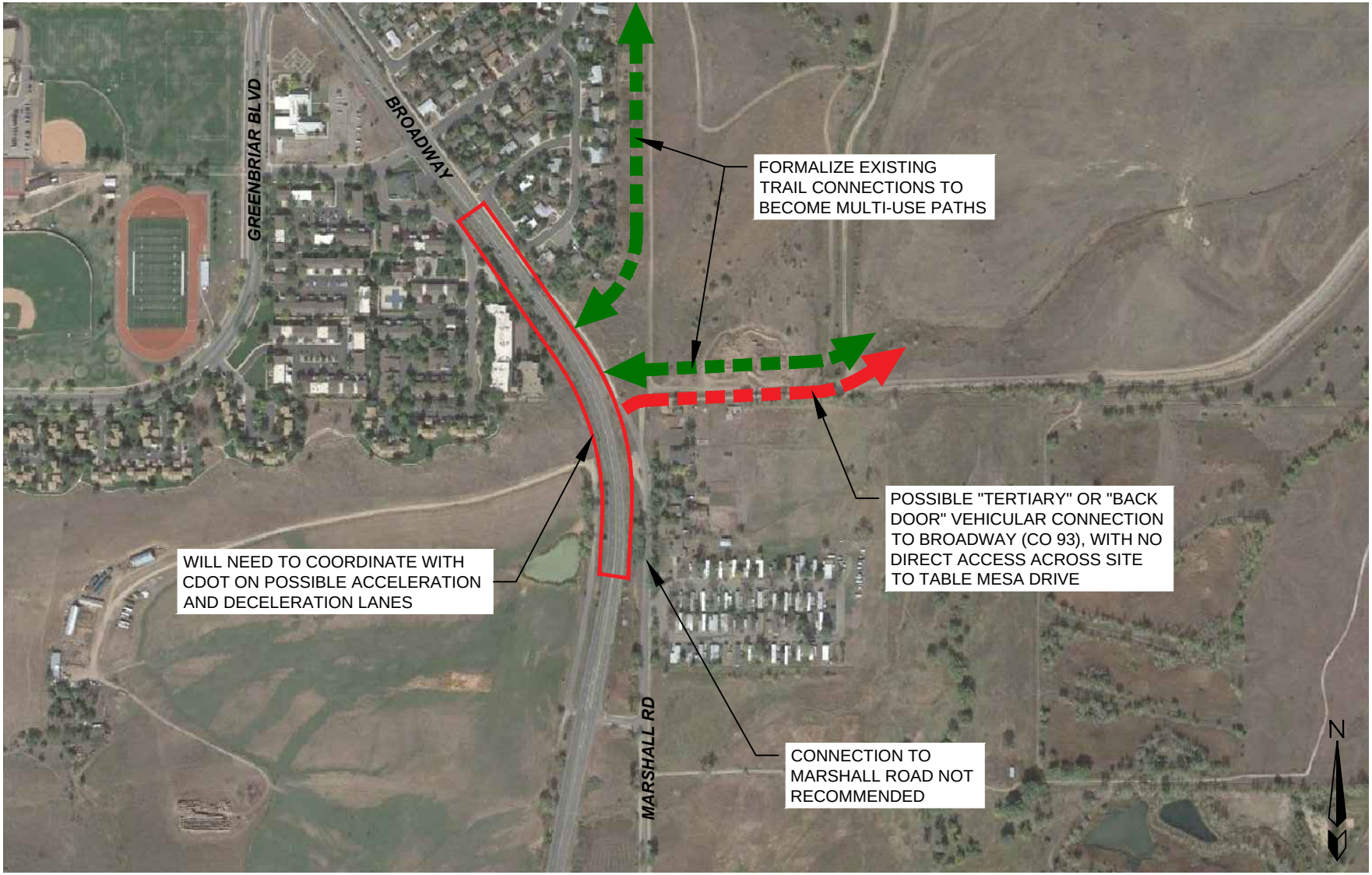
CU BOULDER SOUTH PARCEL ACCESS STUDY

POTENTIAL MULTI-MODAL ACCESS IMPROVEMENTS

FT Project #	16029	Original Scale	NTS	Date	7/27/16	Drawn by	CRS	Figure #	4



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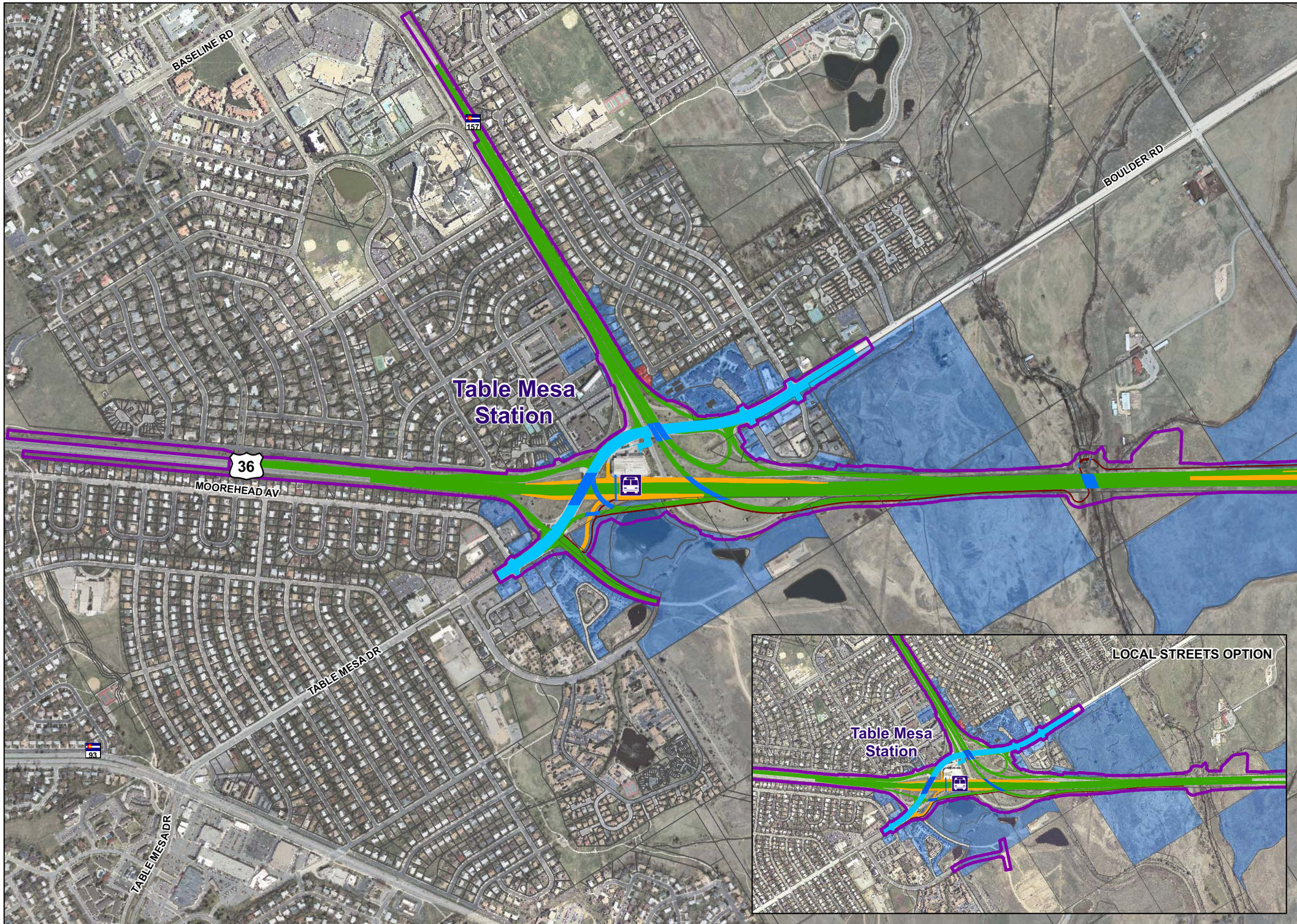
CU BOULDER SOUTH PARCEL ACCESS STUDY

POTENTIAL MULTI-MODAL ACCESS IMPROVEMENTS

FT Project #	16029	Original Scale	NTS	Date	7/27/16	Drawn by	CRS	Figure #	5



1

Legend
Appendix A -
Corridor Reference Maps
Combined Alternative Package
(Preferred Alternative)

- US 36 Combined Alternative Package Footprint
- Arterial Improvements
- Bridges
- Bikeways
- Managed Lanes and Transit Stations
- General-purpose Lanes
- Work by Others
- Partial Property Acquisition
- Full Property Acquisition
- Parcel Boundary
- BRT/Rail Station
- BRT Station

0 250 500
Scale in Feet

US 36 CORRIDOR
Environmental Impact Statement

DOT
DEPARTMENT OF TRANSPORTATION

RTD

Figure 6

Photo 1 Eastbound Table Mesa Drive at Loop Drive

Photo 2 Northbound Loop Drive at Table Mesa Drive

Photo 3 Southbound Loop Drive south of Table Mesa Dr.

Photo 4 Loop Drive within CU South

Photo 5 Westbound Tantra Drive just west of CU South

Photo 6 Eastbound Tantra Drive approaching CU South

Photo 7 Trail from Tantra Drive into CU South

Photo 8 Southbound on Moorhead Circle

Photo 9 Trail from Moorhead Circle into CU South

Photo 10 South property line looking west toward Broadway

Photo 11 North end of Marshall Road along CO 93 (Broadway)

Photo 12 Marshall Road Connection to CO 93

Stormwater Detention Upstream of US36

South Boulder Creek Flood Mitigation Project

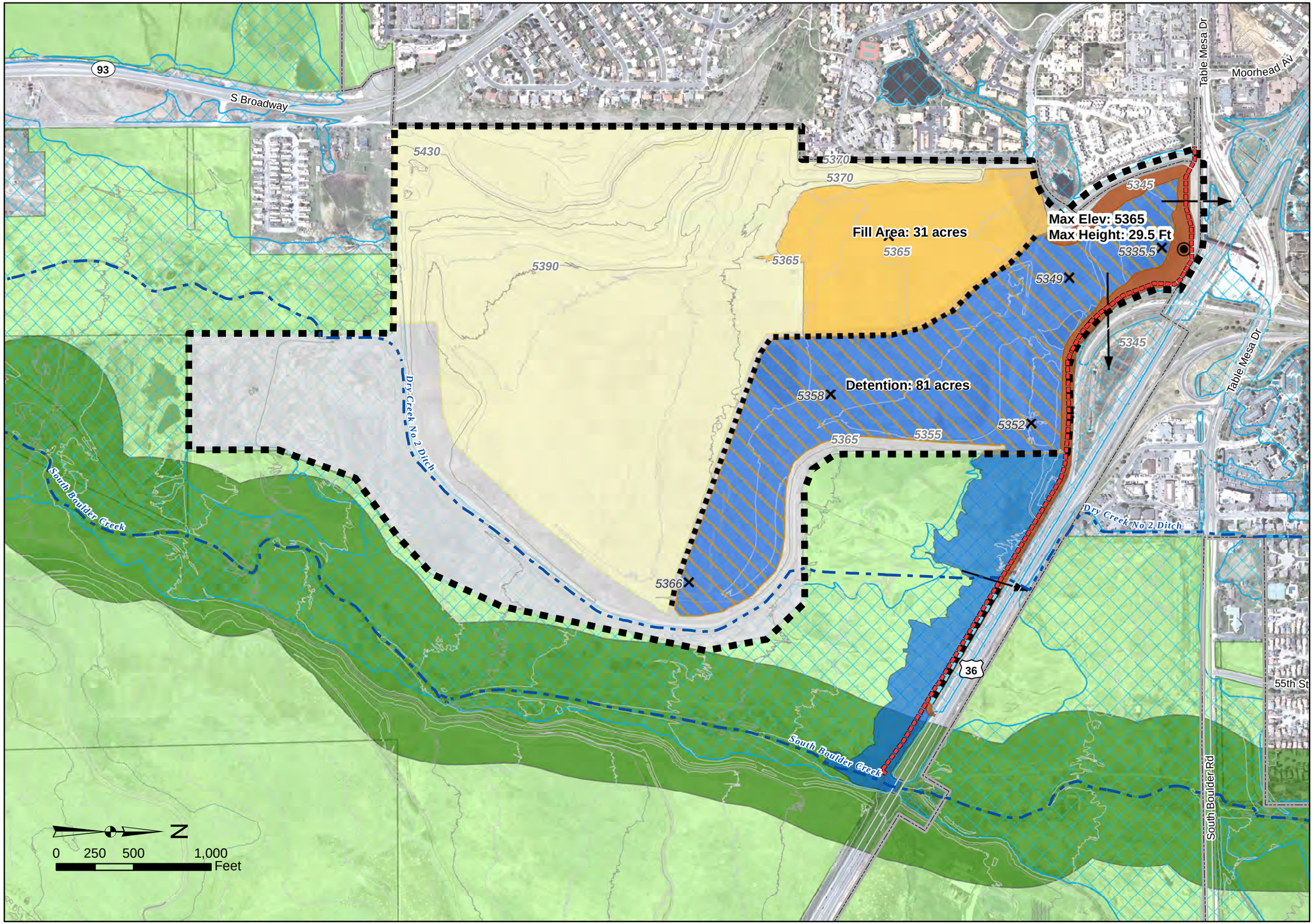


Figure 9-5

Option D

Single Berm
With excavation
With fill
On CU and OSMP property
In CDOT Existing ROW
Max Berm Height 29.5ft

Description	Acres
Total CU Property	302
CU Property Impacted	78
CU Building Potential Impacted	30
OSMP Property Impacted	19

Proposed Conditions

- New Berm
- Pool Contained By Fill or Cut Slope
- Limits of Excavation
- Detention Pond Area
- Fill Area
- Out of 100yr Inundation
- Spot Elevation
- Max Berm Elevation
- Discharge Location
- Spillway

Existing Conditions

- Boulder City Limits
- CDOT Existing ROW
- CU Site Boundary
- OSMP Property
- Prebles Critical Habitat Area
- Effective 100 Year Floodplain
- 5 Foot Contours
- 10 Foot Contours

Attachment E
Public Comment Summary

Earlier this year the City of Boulder began a public dialogue with the community, stakeholders and University of Colorado Boulder about the future of the CU Boulder site. This process is intended to inform changes to the Boulder Valley Comprehensive Plan land use designations and may help inform future annexation and agreements between the city and the CU Boulder relating to future development.

There is a high degree of community interest in the development of CU South. Two community meetings were held to share information and request feedback. Over 200 residents attended a neighborhood meeting on September 26, 2016. The second meeting was held on the CU Boulder east campus on December 5, 2016 and was also well attended, with approximately 125 participants. This second meeting consisted of small group sessions convened around interests and concerns for the property and its future development. A compilation of public comments are available on the project webpage. Several key issues related to open space have surfaced throughout this project, including:

Common Themes of Public Input:

Flood Mitigation

- Flood mitigation appears to be a top priority for many residents, particularly those impacted by the 2013 flood.
- Many comments focused solely on flood mitigation on the CU South site, primarily concerning the public safety risks of future flooding.
- Residents commented that flood protection measures on the CU South site should be expedited.

Open Space Conservation

- There is general agreement that CU Boulder should protect and conserve land for open space on the site.
- Viewsheds and wildlife emerged as important considerations.
- Many residents commented that sensitive environmental areas and portions of the site critical to wildlife habitat should remain undisturbed by future development.

Timing

- Some people are concerned about changing land use designations or approving annexation prior to CU's having completed a master plan for the site because of unknown development impacts.
- Community members concerned about the potential impacts of future floods have urged that the city and university take action on flood mitigation as a priority.

Recreation and Trails

- Most prefer that existing trails remain available to the public regardless of how the site is developed.
- The CU South site offers one of the only flat hiking opportunities in Boulder, which is particularly helpful for children and elderly residents.
- CU South is one of the few cross-country skiing sites in Boulder.
- Many users enjoy allowing dogs to roam off leash and lack of enforcement.

Traffic and Congestion

- A common concern among nearby residents in the Table Mesa area is traffic congestion. Numerous comments describe nearby streets as becoming increasingly congested over the years and therefore may be unable to accommodate more traffic from the CU South site.
- Some residents think that access to the site may be problematic.

Site Uses

- Some residents commented that any level of development on the CU Boulder site is not appropriate and would negatively impact surrounding neighborhoods. Others prefer to have a better understanding of development intentions prior to changing a land use designation.
- Some commented that CU Boulder should consider workforce or faculty housing on the site.
- Because this is a gateway property, there is a general concern about development impacting critical views when entering the city.