



STUDY SESSION MEMORANDUM

TO: Mayor and Members of City Council

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DATE: February 25, 2020

SUBJECT: South Boulder Creek Conceptual Alternatives Analysis Update

EXECUTIVE SUMMARY

In July 2019, City Council directed Utilities staff to further refine the South Boulder Creek Flood mitigation project to evaluate varying levels of flood protection and the respective effect on developable land located on the property owned by the University of Colorado and known as the CU South Campus (referred to hereinafter as CU South).

Previous engineering evaluations had produced mitigation alternatives that addressed flooding impacts associated with the 100-yr flood event (Option 1) and the 500-yr flood event (Option 2). Based on council's direction, a conceptual design based on a 200-yr flood event was developed and is referred to herein as Option 3. The purpose of this memo and the Feb. 25, 2020, study session is to provide council an overview of the conceptual design and the tradeoffs associated with the various levels of flood protection according to the following criteria: people and structures protected, volume of detention, impacts to CU Boulder property, impacts to City of Boulder Open Space and Mountain Parks land (OSMP land), and project cost comparison among other things.

Key findings to date suggest that costs and ground disturbance (project footprint) increase considerably as the level of flood protection increases beyond the 100-year flood option.

The feasibility of the 500-year option may be questionable considering the combination of financial implications, environmental impacts and engineering considerations.

QUESTIONS FOR COUNCIL

1. What additional project information is needed from staff in order for council to reach a decision in May on which design and level of flood protection can proceed?
2. What feedback from the public and city boards would be helpful for council to reach a May decision on the level of flood protection?
3. Considering the recent amendment to the university's annexation application regarding future housing on the CU South property, is council interested in exploring additional process checkpoints for continued development of flood mitigation design?

BACKGROUND

General - The South Boulder Creek Flood Mitigation Project builds upon several previous studies, community input, board recommendations and council decisions from 2003 to the present.

Significant flooding has occurred on South Boulder Creek in 1938, the 1950's (1951, 1952 and 1957), 1969 and 2013. US36 overtopped during the flooding in 1969 and 2013. The 2013 flood was estimated at between a 50-yr and 100-yr flood event in South Boulder Creek. The flooding in 2013 accounted for some of the greatest property damage in the City of Boulder -- approximately \$38 million.

The current South Boulder Creek Flood Mitigation Project began in 2003 when the City of Boulder initiated a floodplain remapping study for the South Boulder Creek floodplain that was adopted by the City in 2008 and FEMA in 2010. This study quantified and formally recognized the risk from overtopping of US36 during a large flood event.

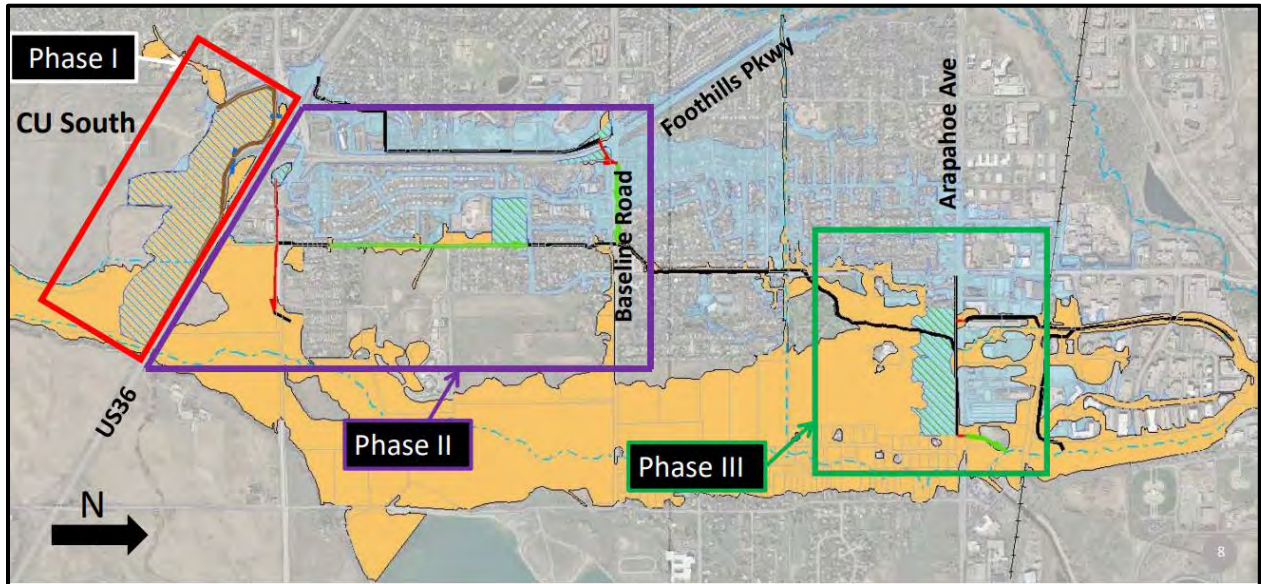
More than 660 structures, 1,600 dwelling units and 3,500 people are located within the South Boulder Creek 100-yr regulatory floodplain north of US36. In addition, portions of US36, Foothills Parkway, Table Mesa Dr./South Boulder Road - all designated by the City of Boulder as [critical emergency response routes](#) - are predicted to be flooded during a 100-yr flood event.

Master Planning - On [Aug. 4, 2015](#) City Council unanimously accepted the recommendations from the South Boulder Creek Major Drainageway Plan (SBC Master Plan), which recommended flood mitigation in three phases:

- 1) Regional stormwater detention at US36;
- 2) West Valley improvements, including stormwater detention at or near Manhattan Middle School and at Foothills Parkways and Baseline Road, and enlarging the capacity of Dry Creek No. 2 Ditch (subject to ditch company approval); and
- 3) Stormwater detention at Flatirons Golf Course.

Regional detention at US36 on the CU South property was selected to be the first phase because of the large downstream flood benefits.

Figure 1: South Boulder Creek Master Plan Phases



CU Boulder purchased the CU South site in 1996 from Flatiron Companies following several decades of mining. There was significant community interest in the site at the time of the purchase, and that community interest continues to this day. During the 2000 Boulder Valley Comprehensive Plan Update (BVCP), and again in 2006, CU Boulder requested changes to the land use designations for the site in anticipation of future student and faculty/staff housing, research, academic and athletic/recreation uses. The city deferred any changes to land use designations for CU South until a flood mitigation study for South Boulder Creek could be completed and there could be further discussions with the university on the proposed development of the site.

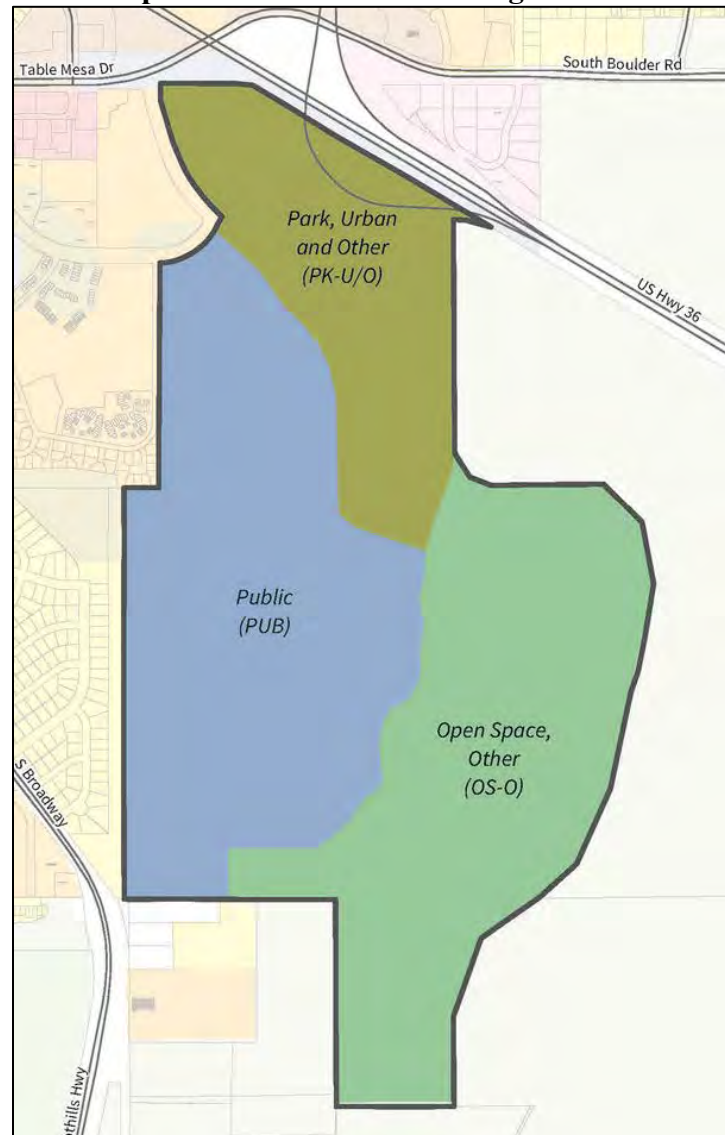
With the SBC Master Plan completed, the city engaged the university and community in a two-year process to update the BVCP that ultimately resulted in changes to the land use designations on the site in 2017.

The BVCP public process identified some public hesitation regarding changing land use designations without the understanding of the future proposed site development. In response, the city and CU Boulder worked collaboratively with the community to develop the [CU South Guiding Principles](#) (**Attachment A**). The Guiding Principles were incorporated into the BVCP to guide agreements between the city and university that will specify future uses, services, utilities and planning for CU South. **Table 1** provides a summary of the BVCP CU South Guiding Principles intended land uses. **Figure 2** provides a map of the CU South Campus – BVCP Land Use designations.

Table 1: CU South Guiding Principles – Intended Uses

Land Use	Summary of Intended Uses
Public (129 acres)	<ul style="list-style-type: none">• Housing will be the predominant use• Academic facilities at a scale smaller than East Campus facilities
Park, Urban and Other (65 acres)	<ul style="list-style-type: none">• Flood mitigation area• Passive and active recreation activities, where appropriate• Conserve and/or restore areas with high ecological value
Open Space – Other (118 acres)	
<i>Area within the 100-yr floodplain (outside of existing levee)</i>	<ul style="list-style-type: none">• Minimize disturbance• Open space and restoration• Recreation opportunities that don't conflict with ecological values
<i>Area Protected by Levee (generally west of existing levee)</i>	<ul style="list-style-type: none">• Compensatory mitigation for impacts elsewhere on the site• Restore high ecological value areas• Recreation in lower ecological value areas• Limited structural build, such as community gardens, recreation, solar gardens, etc.

Figure 2: CU South Campus - BVCP Land Use Designations



Conceptual Design - Upon approval of the BVCP update, the project team, which included City of Boulder staff and its engineering consultants, began a conceptual design and alternatives analysis to achieve project goals for regional detention at US36 based on the CU South Guiding Principles. As a result, the project team developed and evaluated three flood detention concepts:

- **Master Plan Concept** – Option D with and without the CU levee
- **Variant 1** – Designed to avoid impacts to Viele Channel with and without the CU levee
- **Variant 2** – Designed to store flood waters on OSMP land along South Boulder Creek (without CU levee only)

On [Aug. 21, 2018](#) City Council directed staff to proceed with the next step of preliminary design and landowner negotiations for the flood mitigation concept Variant 1 500-yr.

Landowner Negotiations – The Utilities Division of the City of Boulder Public Works Department does not have any interest in the underlying property at CU South. In order for the Variant I concept to proceed, the project will need various forms of approval from landowners, including an annexation agreement with CU Boulder, a right-of-way permit from the Colorado Department of Transportation, a disposal from the City of Boulder Open Space and Mountain Parks Department as well as an agreement from the Dry Creek #2 Ditch Company.

CU Boulder submitted an annexation application on Feb. 4, 2019, that included numerous requirements, including 129 acres of land designated Public (i.e. developable) and 30 acres of appropriately graded land available for recreational/athletic fields (initially planned for the Park, Urban and Other land use area). The application further stated that any diminishment of land intended for development must be proportionally replaced with land currently designated as Open Space–Other (OS_O) or, pending university approval, paid for at fair market value. Also, the application states that the university may construct recreational/athletic fields in the OS_O area if unable to construct them in the Park, Urban and Other area due to the flood mitigation project.

CU Boulder subsequently submitted amendments to its annexation application on Jan. 21, 2020 that included changes to several topics. Most notably, the amended application states that the university will need to determine if, and to what degree, housing remains suitable and feasible behind the dam for any version of the Variant 1. To date, the city’s design has proceeded based on the premise that the site would be feasible for university housing at least for 100-year flood mitigation.

City staff has also continued to work with other landowners to establish project acceptability criteria, including preliminary discussions with CDOT related to right-of-way permitting. As part of this process the Colorado Department of Transportation (CDOT) issued a position letter related to the project on [Sept. 9, 2019](#) stating that any “floodwall concept” be located outside of CDOT existing right of way, that flood restriction features not be attached to the US-36 SBC bridge and that CDOT was impartial to any of the city’s flood mitigation “variants.”

The CDOT position clarification means that the proposed floodwall along US36 would have to be constructed on City of Boulder Open Space and Mountain Parks (OSMP) property. Regional detention facilities alternatives had previously anticipated the floodwall would be constructed entirely in the existing US36 right-of-way, thus limiting impacts to OSMP property. The previous approach would have resulted in more simplified environmental project permitting, as the US36 right-of-way had previously been permitted for the CDOT US36 Expansion project. This proposed floodwall, to be located on OSMP property, would result in both temporary and permanent impacts to existing City of Boulder Open Space.

City staff provided an update to the Open Space Board of Trustees (OSBT) at their August 14, 2019 meeting to discuss potential impacts of the floodwall being constructed on OSMP property. These impacts have been estimated at an additional five acres in addition to inundation impacts from the project. During its Sept. 11, 2019 meeting, the OSBT developed feedback on these impacts and the proposed flood mitigation project. Key elements of the OSBT feedback included the following:

- That construction of a floodwall or other flood mitigation structures on city open space requires a disposal because flood mitigation to protect development is not a city charter open space purpose;
- Information requirements that the board would first need to consider a disposal motion;
- Concerns about the feasibility of in-kind mitigation for the quality of natural resources likely to be impacted by the proposed project; and
- Specific recommendations for ways to lessen the ecological impact of the proposed project.

The OSBT feedback was provided to city council in an information packet , which has also been included in this memo as **Attachment B**.

As currently proposed, the floodwall and inundated area would cross the Dry Creek #2 Ditch. Staff have had preliminary discussions with the ditch company and have provided periodic updates as the project has progressed. For the project to proceed, the city would need to mitigate impacts to the ditch, which is typically addressed through an agreement between the parties.

ANALYSIS (FLOOD MITIGATION)

Based on July 2019 City Council direction, flood mitigation analysis has focused on land use tradeoffs associated with varying levels of flood protection from 100-yr to 500-yr storm events. The updated analysis is centered on the Variant 1 design concept and the BVCP guiding principles, including provision of 129 acres of developable land on the CU South property and the requirement that no enclosed academic space, offices or residential structures be located in an area protected by levee or FEMA 500-yr floodplain. To meet the latter requirement, all conceptual design was performed under the expectation that the existing CU levee would be removed.

In order to meet the requirement of 129 acres of developable land for the university, council recognized that CU South land use designations would potentially need to change and requested that staff examine options for trading or swapping OS-O designated land for Public (PUB) designated land. An O-SO land swap is required when the inundation created by the flood detention leaves less than 129 acres of “dry,” developable PUB designated land.

Three options with differing levels of flood protection have been evaluated in the analysis as listed below:

- 1) Option 1 - Flood detention associated with the 100-yr storm event
- 2) Option 2 - Flood detention associated with the 500-yr storm event
- 3) Option 3 - Flood detention associated with the 200-yr storm event

In order for an option to be feasible, several overarching design criteria needed to be met as follows:

- Flood mitigation structures must prevent US36 from overtopping for the design storm;
- Existing regulatory floodplains upstream and downstream of the project would not be adversely impacted (no upstream or downstream rise in water surface due to project development);
- Flow conditions (depth and velocity) would not be adversely impacted at the US36 bridge crossing of South Boulder Creek;
- Regulatory permitting agency reviews have a reasonable chance of approval; and
- Project related groundwater impacts are mitigated to maintain existing conditions.

All three options would include an earthen embankment along the northwest portion of the CU South property, a structural floodwall on OSMP property adjacent to the US36 right-of-way, an outlet tunnel or pipes below US36, and detention excavation on the PK-U/O designated land. The embankment height would need to increase proportionally with the flood wall height for all three options and would need to be designed for the maximum theoretical hydrologic event called the “Probable Maximum Flood.” As the design flood event increases, the height and length (length subject to CDOT permitting in the next design phase) of the floodwall would need to increase as would the amount of excavation and the size of the outlet works pipes.

Option 1 (100-yr storm event) - Modeling results for Option 1 indicate that 34 acres of earthen fill would be required within the detention area of the PUB designated land to maintain 129 acres for university development in accordance with the BVCP but no land swap for OS-O would be necessary.

Existing peak flows under the US36 bridge at South Boulder Creek could be maintained with an outlet structure consisting of two 60-inch diameter pipes. Option 1 could potentially have the shortest floodwall of the three options (potentially a couple hundred feet shorter) and thus would have least impacts to Preble’s Meadow Jumping Mouse critical habitat in the vicinity of the South Boulder Creek at the US 36 bridge. **Figure 3** shows the Option 1 conceptual overview.

Option 2 (500-yr) - Modeling results for Option 2 indicate that 76 acres of earthen fill would be required to maintain 129 acres for the university. Due to the larger inundation area associated with the 500-yr flood volume, earthen fill would need to be located further to the south than for the 100-yr flood option. The 500-yr option would inundate approximately 34 acres of land designated as PUB, which would require an OS-O land

swap. The fill would need to be placed on a combination of OS-O and PUB designated land.

Hydraulic modeling work to date has not been able to establish acceptable flow conditions at the US36 bridge at South Boulder Creek for Option 2, which puts the feasibility of this option in question. If Option 2 is selected, additional analysis would be required to evaluate whether the hydraulic design criteria for the US36 bridge could be met. Option 2 would likely have the longest floodwall of the three options, and thus would have the most impacts to Preble's Meadow Jumping Mouse critical habitat in the vicinity of the South Boulder Creek at the US 36 bridge. **Figure 4** shows the Option 2 conceptual overview.

Option 3 (200-yr) - Option 3 represents a 200-yr level of flood protection. The hydrology for the 200-yr flood event was estimated using a scaling approach, which is sufficient for conceptual design. However, if the 200-yr event is selected for design, the hydrology (the engineering associated with the storm event) and hydraulics model would need to be further refined.

Option 3 is similar to Option 2 in that the detention volume required for flood protection inundates PUB designated land. Modeling results indicate 76 acres of land would need earthen fill placement for Option 3 to maintain 129 acres for the university. For Option 3, this inundation area is approximately 17 acres compared to the 36 acres of PUB inundation for Option 2. The 129 acres of developable property for Option 2 would also require an OS-O land swap and could be accomplished through a combination earthen fill placed within the detention area, OS-O and PUB designated land. Option 3 would require three 60" outlet pipes. Option 3 would likely have a longer floodwall than Option 1, but a shorter wall than Option 2. Therefore, the impacts to the Preble's Meadow Jumping Mouse critical habitat would likely be greater than Option 1 but less than Option 2. **Figure 5** shows the Option 3 conceptual overview.

Figure 3: Option 1 (100-yr) Conceptual Plan View

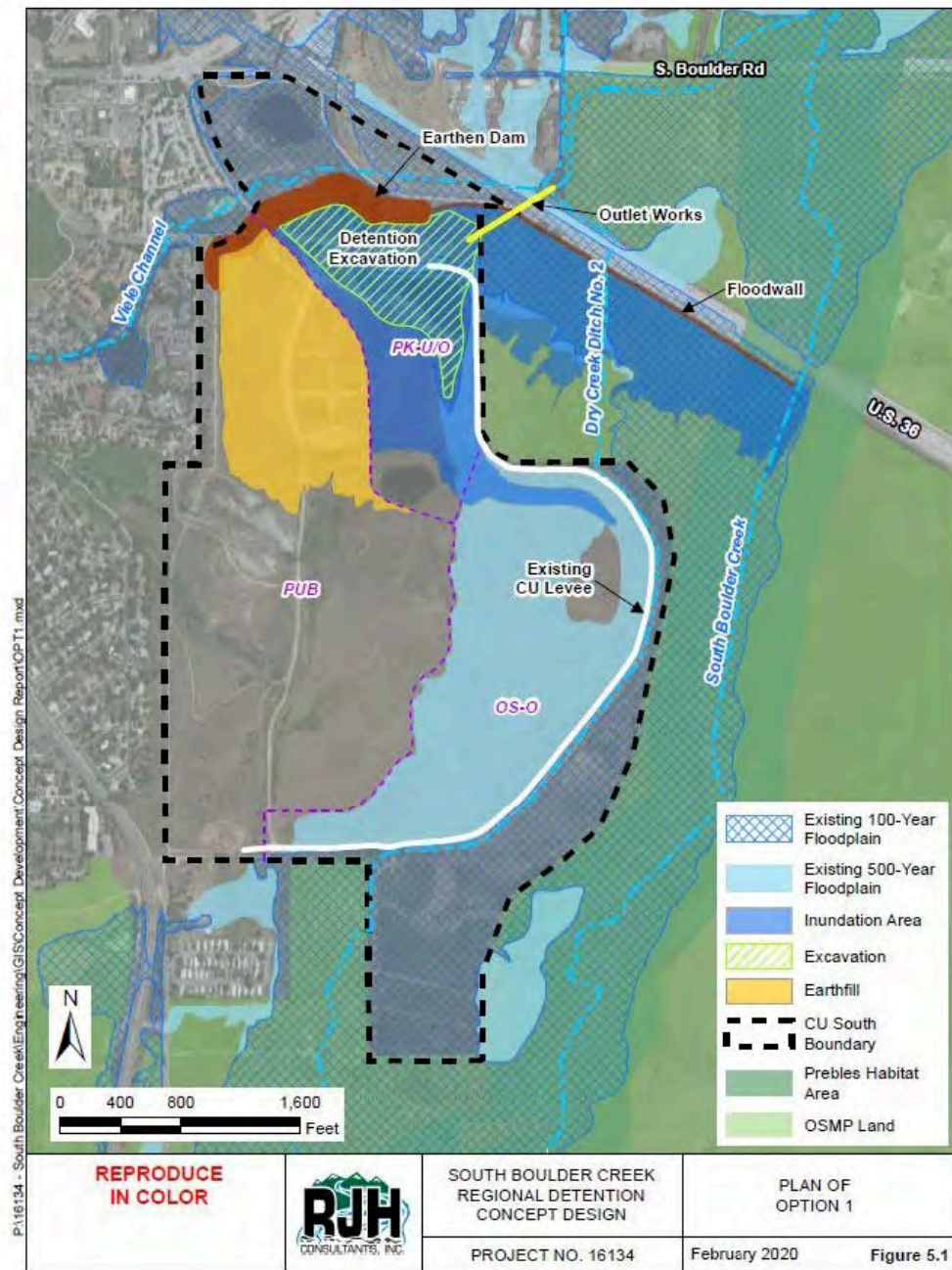


Figure 4: Option 2 (500-yr) Conceptual Plan View

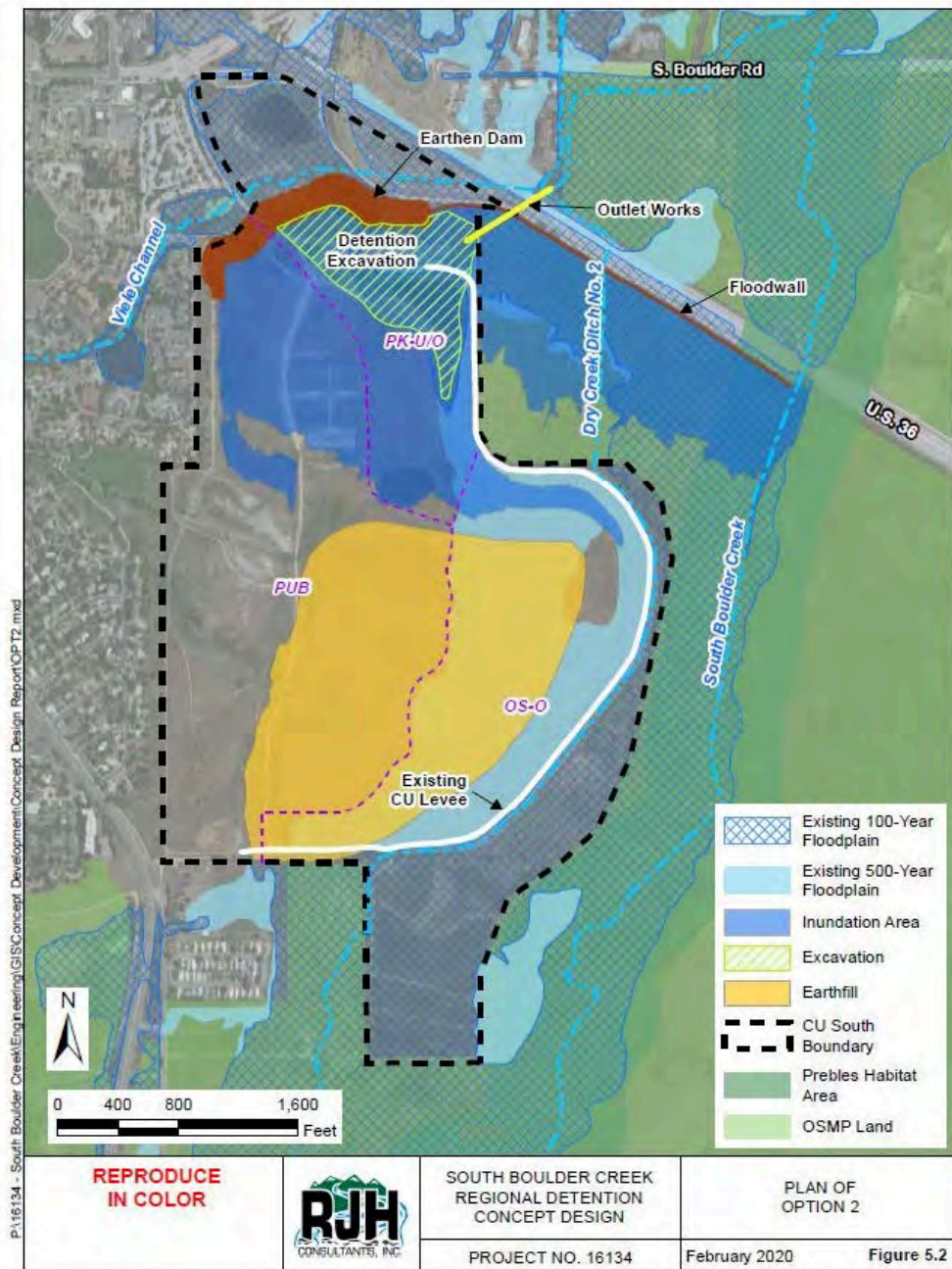
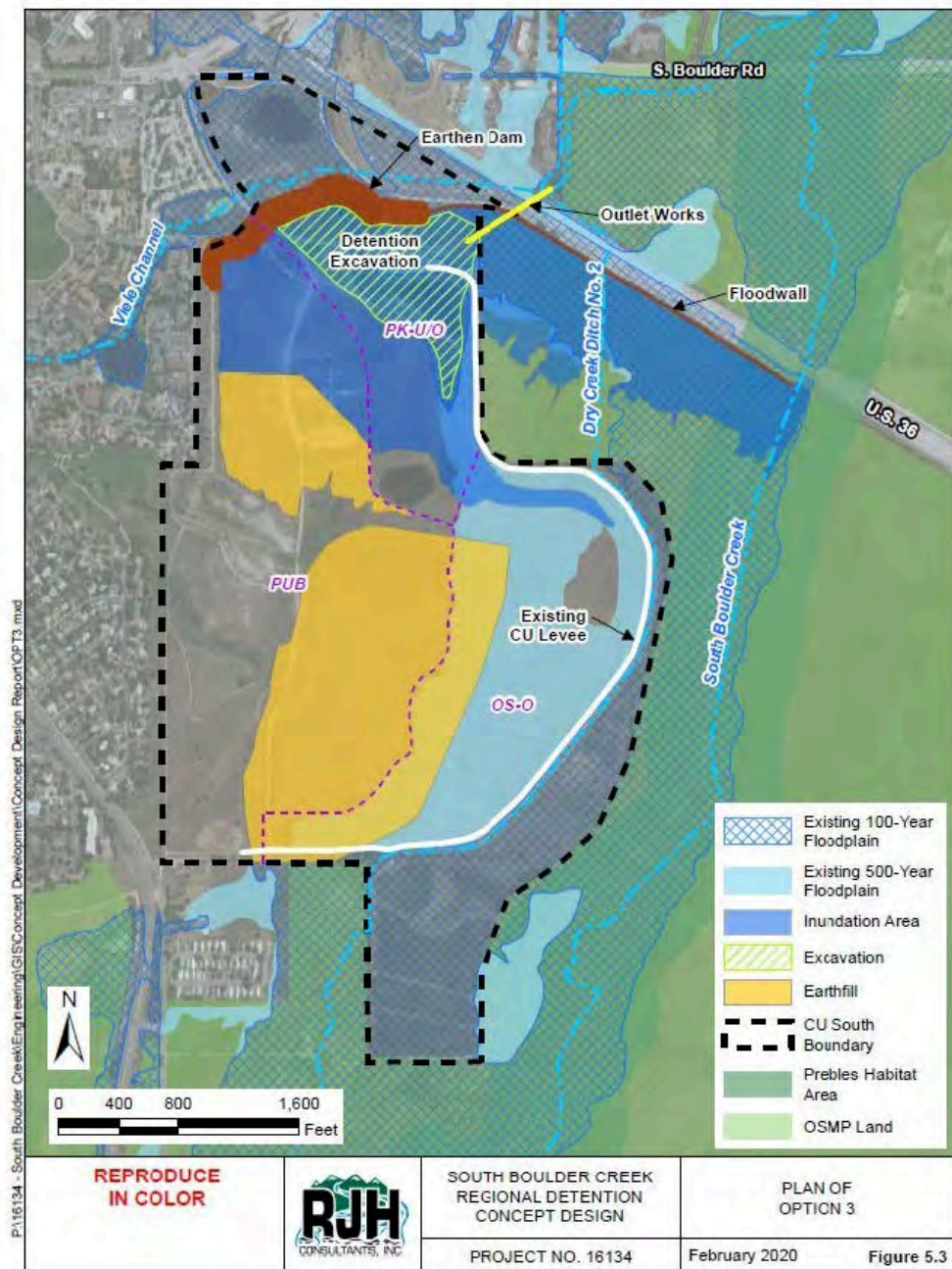


Figure 5: Option 3 (200-yr) Conceptual Plan View



Environmental Impacts

The environmental impacts for the current project configurations estimate a 90-foot wide construction footprint south of the floodwall on OSMP property and impacts from relocating the floodwall to outside of the existing US36 CDOT right-of-way. Temporary environmental impacts would be similar for all three options and would occur on OSMP property for construction of the floodwall.

Environmental impacts are key to project feasibility. Reducing or eliminating environmental impacts align with the BVCP Guiding Principles of protecting and where possible restoring wildlife habitat, grasslands, wetlands and streams within the 100-yr floodplain and in the Area Protected by Levee.

Table 2 provides a summary of the environmental impacts, including the wetlands and open water impacts that will be evaluated by the USACE.

Table 2: Potential Environmental Impacts

Project Alternative	Wetlands (acres)	Open Water (acres)	Total Open Water and Wetlands (acres)	Total Threatened and Endangered Species Habitat (acres)
Option 1 (100-yr)	4.8	2.6	7.4	0.9
Option 2 (500-yr)	7.1	2.6	9.7	5.0
Option 3 (200-yr)	8.9	2.6	11.5 ¹	5.0

Note: Table 2 figures are rounded to the nearest 1/10th of an acre

Cost Estimate

A cost estimate was developed for each option. The cost estimates are considered a Level 4 estimate, which is typically used when a design is at a conceptual level.

The costs estimate are divided into three parts as follows:

1. Regional Flood Detention Facility.
2. Earth fill necessary to provide the university with 129 acres suitable for future development.
3. CU Costs (CU Tennis Courts, South Loop Drive, Warehouse, Utilities Connections, Recreation Fields).

The flood detention facility and earth fill costs were prepared by the city's consultant and CU costs were estimated based on discussions between city and CU staff.

Table 3 provides cost estimates for the three proposed options. The total estimated cost includes the direct costs of constructing the flood mitigation structure, and the additional earth fill cost to provide 129 acres of PUB land use area. These line items are delineated because earth fill is not required for the flood mitigation protection, but necessary to offset the flood inundation acreage. The cost estimates have been updated from the Feb.

¹ Placement of fill is considered an impact in USACE 404 permitting, whereas inundation with water is not considered an impact. Because fill placement is unique to each of the alternatives based on the non-inundated property available, the 200-yr storm has more land available for fill, including more wetlands, thus the larger area of impact.

4, 2020, council presentation as the consultant based on city staff comments on the Concept Design Report.

Table 3: Opinion of Probable Construction Cost

Project Components	Option 1 (100-yr)	Option 2 (500-yr)	Option 3 (200-yr)
Regional Flood Detention	\$41M	\$47M	\$46M
Earth Fill	\$10M	\$34M	\$32M
SubTotal	\$51M	\$81M	\$78M
CU Impacts ⁽¹⁾	\$15M	\$15M	\$15M
Total	\$66M	\$96M	\$93M

Note: Table 3 figures have been rounded to the nearest million dollars

- 1. Estimated costs/impacts will be refined as the flood mitigation project progresses through the design process and finalized through the annexation process*

A full copy of the Concept Design Report has been included in this memo as **Attachment C**.

MATRIX OF OPTIONS

Project evaluation criteria was developed through a public process with input collected at a community open house held on April 23, 2018. These criteria include the following:

- Downstream flood benefits
- Adaptability for climate change
- Total project cost
- Design, permitting and construction schedule
- Long-term operations and maintenance requirements
- Groundwater mitigation complexity
- Riparian connectivity and habitat enhancement opportunities
- Size of dam (length and height)
- Wetlands and open water impacts
- Threatened and endangered species habitat impacts

Each of the current flood mitigation options were scored using the project evaluation criteria as summarized in **Table 4**.

Table 4: Flood Mitigation Evaluation Criteria Matrix

Evaluation Criteria	Option 1 (100-yr)	Option 2 (500-yr)	Option 3 (200-yr)
Downstream flood benefits	Least flood protection	Most flood protection	More flood protection
Adaptability for climate change	Least adaptable	Most adaptable	More adaptable
Total project cost	Least expensive	Most expensive	Most expensive
Design, permitting and construction schedule	Least unknowns	More unknowns	More unknowns
Long-term operations and maintenance requirements	Similar for all options		
Groundwater mitigation complexity	Similar for all options		
Riparian connectivity and habitat enhancement opportunities	Most opportunities	Least opportunities	Less opportunities
Length, height and size of dam	Smallest	Largest	Middle
Wetlands and open water impacts	Least impacts	More impacts	Most impacts
Threatened and Endangered Species habitat impacts	Least impacts	Most impacts	Most impacts

Note: Darker cells show more alignment with Project Evaluation Criteria.

The current flood mitigation analysis identified the following key results:

1. Flood protection above the 100-yr level has inundation impacts to the 129 acres of Public land use area identified as part of the CU South Guiding Principles and requires additional land above the 80 acres that is being donated to the City by CU Boulder and does not fully meet the CU South Guiding Principles.
2. To offset inundation impacts by trading land in the OS-O land use area requires a significant amount of earth fill which has significant impacts on the cost of the project.
3. The earth fill for elevating PUB land use area above the 500-yr floodplain is not required for the functionality of the flood mitigation project.
4. The outlet works can be modified to maintain existing flow conditions at the US36 Bridge for the 100-yr and 200-yr designs.
5. Option 1 (100-yr) provides the least environmental impacts and greatest opportunity for riparian connectivity.

In addition to the Evaluation Criteria Matrix a proposed list of project tradeoffs was developed by the project team to help summarize the current project information and highlight differences between each of the flood mitigation options. **Table 5** provides a summary of the project tradeoffs for each option.

Table 5: Projects Tradeoffs Summary

Project Criteria	Option 1 (100-yr)	Option 2 (500-yr)	Option 3 (200-yr)
Downstream Flood Benefits ⁽¹⁾	Meets LOS ⁽²⁾	Largest	Larger
People	2,300	4,100	3,600
Structures	260	730	600
Dwelling Units	1,100	1,900	1,700
Total Project Cost	\$66M	\$96M	\$93M
Regional Flood Detention	\$41M	\$47M	\$46M
Soil Fill	\$10M	\$34M	\$32M
Impacts to CU Property ⁽³⁾	\$15M	\$15M	\$15M
Size of Dam	Smallest	Largest	Larger
Length of Floodwall	2,710 ft. ⁽⁴⁾	2,810 ft.	2,810 ft.
Height of Floodwall (max)	8.8 ft.	10.6 ft.	9.5 ft.
Estimated Project Footprint	64 acres	107 acres	106 acres
Embankment/Floodwall	10 acres	11 acres	10 acres
Fill Area	34 acres	76 acres	76 acres
Excavation Area	19 acres	19 acres	19 acres
Outlet	<1 acre	<1 acre	<1 acre
Environmental Impacts	Smallest	Larger	Largest
Wetlands	4.8	7.1	8.9
Threatened and Endangered Species	0.9	5.0	5.0
Open Water	2.6	2.6	2.6
Impacts to OSMP property	Least	Most	More
Direct Impacts	5 acres	5 acres	5 acres
Inundation Impacts	Least	Most	More
OS-O Opportunities	Most	Least	More
Environmental Mitigation Costs	Least	Most	More
Impacts to CU Property⁽⁵⁾	Similar	Similar	Similar
CU Tennis Courts	<i>Estimated \$15M total</i>		
South Loop Drive			
Warehouse			
Utilities Connections			
Recreation Fields (30 acres)	In Progress	In Progress	In Progress
Project Feasibility⁽⁶⁾	Least Unknowns	Most Unknowns	More Unknowns

Notes: Darker cells indicate more favorable alignment with the multiple project objectives.

1. People, structures and dwelling units that will be removed from the 200-yr floodplain have been estimated base on total number of structures located in the 100-yr and 500-yr floodplains.
2. LOS = Level of Service
3. Costs to be negotiated with CU during CU South Annexation process.
4. Option 1 provides the opportunity to shorten the floodwall length by providing more flexibility for the location of the floodwall termination.
5. Estimated costs/impacts will be refined as the flood mitigation project progress through the design process and finalized through the annexation process.

6. *CU, CDOT and OSMP acceptability are still unknown until the final impacts of the project can be presented and additional design details developed.*

FINANCIAL IMPLICATIONS

The proposed South Boulder Creek Flood Mitigation project has significant financial implications for the community and the Stormwater and Flood Management Utility. The flood mitigation project is currently estimated at a cost ranging between approximately \$66M and \$96M for the three different options identified. These figures represent preliminary cost estimates for project alternatives that would address flooding associated with the 100-yr, 200-yr, and 500-yr storm events respectively and will be further refined during future design phases.

One of the primary goals of the Stormwater & Flood Management Utility is to improve life and safety issues throughout the community. The most effective approach to address life and safety is to focus on those structures located in the areas of greatest danger. The city acknowledges three discreet flood mapping zones related to flood risk and advances projects that remove structures located in the most dangerous zones first. In order of most critical, the three designed flood zones include the High Hazard Zone, the 100-yr regulatory floodplain, and the 500-yr floodplain. Options 2 and 3 would represent a significant investment to remove homes from less vulnerable flood zones and would protect against storm events that statistically have a lower probability of occurring.

Large Utilities capital projects are funded through revenue bonds, which typically have a 20-year term. Issuing large capital bonds requires that monthly service fees are increased to pay for the corresponding debt service. It is estimated that the Stormwater and Flood Management Utility rates would have to be increased in the range of 50% to 70% in a future year to fund the South Boulder Creek Flood Mitigation project. The flood mitigation project would not likely be in the construction phase until 2024 at the earliest, which would require costs to be escalated to account for inflation. In addition, given the large size of anticipated bonds, further work will be done with the City's financial advisors to better understand total bonding capacity within the Stormwater and Flood Management fund. **Attachment D** includes an overview of the City of Boulder's Flood Management Program.

ANALYSIS (ANNEXATION CONSIDERATIONS)

The property requires annexation to be brought into the city limits as a condition for conveying land necessary for the flood mitigation project. [CU Boulder has indicated](#) that annexation of the entire CU South site is necessary prior to conveying land for flood mitigation to “effectively carry out [the university's] stewardship responsibilities and to partner with the city to incorporate the community's needs into [the university's] planning process.”

Land may be considered for annexation to the City if the annexation complies with state annexation statutes and policies of the BVCP. If annexed, zoning will be established according to land use designation in the Land Use Designation Map of the Boulder Valley and an annexation agreement would detail development allowances for the site.

The city's annexation policies are located within Policy 1.16 of the BVCP. Per Annexation Policy 1.16.d:

In order to reduce the negative impacts of new development in the Boulder Valley, the city will annex Area II land with significant development or redevelopment potential only if the annexation provides a special opportunity or benefit to the city. For annexation consideration, emphasis will be given to the benefits achieved from the creation of permanently affordable housing. Provision of the following may also be considered a special opportunity or benefit: receiving sites for transferable development rights (TDRs), reduction of future employment projections, land and/or facilities for public purposes over and above that required by the City's land use regulations, environmental preservation or other amenities determined by the City to be a special opportunity or benefit. Parcels that are proposed for annexation that are already developed and which are seeking no greater density or building size would not be required to assume and provide that same level of community benefit as vacant parcels unless and until such time as an application for greater development is submitted.

The CU South Guiding Principles, included in Chapter 5 of the BVCP, contemplate university housing as the predominant use on CU South.

CU Boulder's annexation application (Feb. 4, 2019) states that the university must retain, in perpetuity, its development rights to a minimum of 129 acres and that any diminishment of that area either (1) be proportionally replaced with land currently designated Open Space – Other (OS-O) under the BVCP, (2) the city shall compensate the university in cash for the fair market value of the applicable area, or (3) provide land agreeable to the University in another location. The Variant 1, 500-yr flood mitigation option inundates roughly 36 acres of land designated Public in the BVCP (i.e., developable). In response, on March 28, 2019, city staff proposed several options that the city and university could jointly explore, including:

- Option 1: Receive an opinion of value for possible city purchase of land before it is annexed into the city.

CU Response (May 20, 2019): We do not see a purchase of an additional 30-36 acres of land as a viable option for the city due to City Council's agreement on February 5 that the price of \$65 million plus for the deeper version of Variant I 500 that staff presented was too expensive. We currently estimate the value for developable land in South Boulder as between \$1 and \$2 million per acre, resulting in a total price ranging between \$30 and \$72 million. Including the cost of the additional land would again put the cost of Variant I 500 at \$65 million plus.

Option 2: Explore land available off site for CU to use for development purposes. Please summarize the university's criteria for selecting off-site locations. Council members have expressed interest in exploring the Planning Reserve in north Boulder as a potential off-site location. Indicate if the Planning Reserve may or may not meet the university's selection criteria.

CU Response (May 20, 2019): In our estimation, there is no reasonably proximate, developable and comparable land available which can be offered by the city in exchange. The suggested property in Planning Reserve III north of the city is not proximate, not comparable, not developable and not currently annexable under the BVCP.

- Option 3: Determine necessary changes to the university's development program to allow for university needs to be met within a smaller Development Tract (i.e., the 93 – 99 acres of "Public" land not impacted by the flood mitigation project). For example, the city and university could explore additional density within the smaller Development Tract in ways that meets the university's needs and still addresses applicable guiding principles (e.g. viewshed protection, etc.).

CU Response (May 20, 2019): As stated in our application and in prior communications, the university requires a full 129 acres for development out of our 308 acres. The university currently has no concept plan for development, nor do we believe it is feasible or possible to increase density without amending the existing Boulder Valley Comprehensive Plan.

As summarized in this memo, in January 2020 city staff received the results of a study examining design changes to the flood mitigation project that would provide the university the 129 acres of land necessary for development. CU Boulder submitted a revised annexation application on Jan. 21, 2020, that stated:

Should the City select a flood mitigation project that places an east-west dam across the entire north-end of the property, thereby isolating the developable property from Table Mesa and the local community, the university will need to determine if, and to what degree, housing remains suitable and feasible behind the dam.

In separate correspondence dated Jan. 16, 2020, CU Boulder clarified that the university's position that any level of Variant 1 "would result in a developable site severed from the community and therefore it can no longer commit to building housing on the site. The letter further states that if the city proposes and the university agrees to swap acreage in the Public area for acreage in the OS-O area, the university will retain the right to build in the 500-yr floodplain within the OS-O area that was exchanged, if any.

The city has historically supported increasing on-campus housing capacity and consequently city staff views housing elements of the Guiding Principles as one of the central community benefits proposed with this annexation. A non-residential

development program may exacerbate the city's "jobs:housing" imbalance (**Attachment E**, see Policy 1.10). While additional research, academic and other university services would bring positive benefits, it may also increase in-commuting and housing pressures in off-campus neighborhoods. More information is needed to more fully assess the potential impacts and mitigation strategies.

Ultimately, council will need to determine if the remaining community benefits package (potentially without housing) is acceptable for an annexation of this size (the largest undeveloped property currently eligible for annexation). The community benefits offered with the annexation are summarized as follows:

- Potential increase in on-campus university housing;
- A quarter of the site (80 acres) conveyed to the city, in fee simple, for the construction of the flood mitigation project and open space mitigation;
- Potential conveyance of land to the city's open space program and an option to purchase water rights to Dry Creek Ditch #2;
- Opportunities to review and comment on future development plans;
- Recreational trails and facilities open to the public;
- Potential opportunity to locate a joint public safety facility for use by CU Boulder Police and city Fire-Rescue; and
- Development limitations and standards for building height, site design, prohibited uses (e.g., football stadium, large research buildings) and neighborhood compatibility.

An annexation agreement could include contingencies for both residential and non-residential uses, should council find the university's new position acceptable.

On Feb. 4, 2020, council members expressed interest in exploring locations for CU Boulder to achieve its future housing and other goals in lieu of locating them on CU South. Council showed particular interest in examining city-owned land in Area III - Planning Reserve, on the northeast edge of the city, as a possible "land swap" opportunity with the university.

Staff is exploring options related to council's request and will be sharing more information as it becomes available during or before the Feb. 25 study session. University staff may also provide an initial response to this concept prior to the study session.

Area III – Planning Reserve Background

The Area III-Planning Reserve is a portion of Area III for which the city and county have agreed to maintain the option of future Service Area expansion - *see BVCP Section 1.12 (pg. 26)*. The BVCP further states (*Section 2.07.b, pg. 38-39*) that "[t]he location and characteristics of this land make it potentially suitable for new urban development based on the apparent lack of sensitive environmental areas, hazard areas, significant agricultural lands, the feasibility of efficient urban service extension and contiguity to the existing Service Area which maintains a compact community."

The process to consider service area expansions in the Area III-Planning Reserve is described in Exhibit B to the Boulder Valley Comprehensive Development Plan Intergovernmental Agreement, between the city and Boulder County, (pg. 158) stating that the “City of Boulder will complete a baseline urban services study of the Area III - Planning Reserve prior to considering a service area expansion.” (Emphasis added.) The city may consider a service area expansion only after acceptance of the baseline urban services study by City Council. If the City Council wanted to consider a service area expansion into the Planning Reserve in the context of the 2025 BVCP Major Update, then council would need to complete a baseline urban services study prior to 2025. **Attachment F** diagrams the process for considering and taking action regarding a service area expansion into the Area III-Planning Reserve.

NEXT STEPS

City staff and City Council will discuss the project at the February 25 study session and staff will summarize the conceptual design as well as provide status updates on groundwater modeling and geotechnical investigations.

The CU South Process Subcommittee (Mayor Weaver and Council Member Friend) will be advising staff on the planning and implementation of community engagement work in the coming months. The committee guided staff in the development an engagement plan that is modeled after the city’s engagement framework (**Attachment G**). The approach for engagement through May includes the following:

- City Boards Input including: Water Resources Advisory Board, Open Space Board of Trustees and the Planning Board;
- Focus group meetings;
- Small group meetings;
- An open house event.
- City Council public hearing to select a preferred flood mitigation option and if needed, consider amendments to the Boulder Valley Comprehensive Plan.

The scope and approach for this work may shift as a result of council’s discussion on Feb. 25, 2020.

ATTACHMENTS

Attachment A: CU South Guiding Principles

Attachment B: Open Space Board of Trustees Feedback

Attachment C: Concept Design Report: South Boulder Creek Regional Detention

Attachment D: City of Boulder Flood Management Overview

Attachment E: BVCP Policy Analysis

Attachment F: Planning Service Process Flowchart

Attachment G: Engagement Plan

Attachment H: Select Annexation Application Materials (all materials available [here](#))

Boulder Valley Comprehensive Plan (BVCP) University of Colorado Boulder, South Campus - Guiding Principles

The guiding principles are intended to guide an intergovernmental agreement or multiple agreements between the City of Boulder and University of Colorado that will specify future uses, services, utilities, and planning of the University of Colorado (CU) Boulder South Campus ("CU South") property.

Introduction

CU South is a 308-acre property located in south Boulder at the city's south entry of US 36. Its eastern and southern boundaries adjoin city owned Open Space including the floodplain and riparian habitat of South Boulder Creek; its western boundaries adjoin City of Boulder residential subdivisions. The CU South property provides physical and visual linkages between the city residential neighborhoods and park lands and acquired Open Space helping to define the city's urban edge.

General Principles

1. **Flood mitigation.** Protecting City of Boulder and Boulder County residents from future flooding events is a primary driver.
2. **Collaboration.** Further collaboration and joint planning between the city, CU, county and the community will continue to be emphasized.
3. **Public Participation.** The city will work with CU to include the community and public effectively throughout the planning, annexation and development process.
4. **Access.** Access will continue to be allowed on the site consistent with public access provided on other CU campuses.
5. **Agreement topics.** These guiding principles will guide next steps toward an annexation agreement between the city and university and (over the longer term) a master plan for CU South. The topics addressed (i.e., transportation, city utilities, infrastructure planning, site development standards, massing and total amount of development, and protection of open space values, floodplain, wetland and other environmental topics) should lead to more specific standards and metrics and identifies community benefits as part of annexation agreements.
6. **Other options.** These principles are not intended to prevent the city and CU from exploring other options or geographic areas for CU to achieve its housing, program, and facility goals in lieu of locating them at the CU South property.
7. **Land Use Designation Changes.** The Land use designation map may be amended to enable the city and CU to implement a shared vision for the site. The standard process detailed in the BVCP will guide any future land use designation changes.

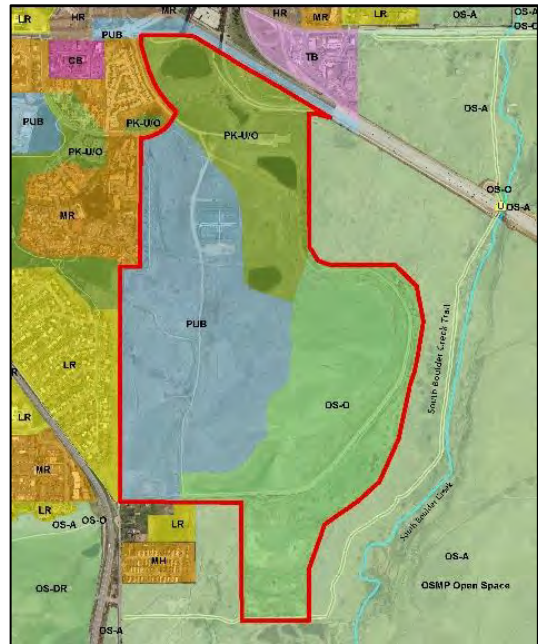


Figure 1: Existing Land use designations

8. **Annexation Timing.** Preliminary engineering design and studies pertaining to flood mitigation, the CU levee, and habitat and wildlife will be completed expeditiously and will be used to inform the annexation agreement.

Principles for the Area designated as Open Space-Other (OS-O)

(See Figure 1: OS-O Designation.)

Area within 100-year Floodplain

(See Figure 2: 100-year Floodplain)

1. **Protect Open Space.** Minimize disturbance to protect this area given its potential for high open space value and presence of sensitive species. Maintain and create recreation opportunities that do not significantly conflict with ecological values. Trail connections to open space trails would follow a typical city public process. Where appropriate, support open space-related educational and research opportunities. Specific real property ownership, easements, and/or agreements will be established during annexation.
2. **Resource restoration.** Seek opportunities for ecological restoration and improvement. Not all of the site is currently high value for wetland function and floodplain connection due to past land uses, but could be enhanced to benefit the site itself as well as adjacent city natural areas. The city seeks to partner with CU to incorporate open space values and restoration values.
3. **South Boulder Creek.** Protect and when possible restore wildlife habitat, grasslands, wetlands and streams to improve the delivery of open space values except for park and recreational facilities designed to be located within the floodplain.
4. **Collaborate with city and county on open space.** The city and county will partner with CU to incorporate open space values, maximize conservation, education and recreational opportunities and leverage city and county resources.



Figure 2: Conceptual Flood Mapping

Area Protected by Levee System/Area of Greater Open Space and Ecological Value

(See Figure 2: Area Being Protected by a Levee System)

1. **Compensatory mitigation:** Floodplain functions, including wetlands and flood mitigation, may be restored as part of compensatory mitigation for impacts elsewhere on site.
2. **Open space, restoration and recreation:** In this area, the city will conduct further analysis of the impacts of removing the levee on flood mitigation design, evaluate potential ecological values and recreation opportunities and seek to collaborate with CU to protect and improve the delivery of open space, restore high ecological value areas and/or provide areas for recreation in lower ecological value areas. The city and CU will work together to achieve greater open space

acreage as part of either larger city open space conservation areas or limited-structural build, such as community gardens, recreation, solar gardens, etc.

3. **Levee system.** The city will seek to work with CU to evaluate removal of the levee, including potential improved delivery of open space values, ecological restoration or enhancement benefits. CU will remain responsible for maintaining certification of the existing flood control levee on the site through the Federal Emergency Management Agency (FEMA), including but not limited to any operation, maintenance or replacement.
4. **No enclosed academic space, offices, or residential structures in the Area Protected by Levee or FEMA 500-year floodplain.** Such buildings would be constructed outside of this area. See Site Design principles below.

Principles for the Area Designated as Public (PUB) or Park, Urban and Other (PK-U/O)

Flood Mitigation Area

(See Figure 1: Public Designation, and Figure 2: Flood Mitigation)

1. **Analyze, design, and implement Flood Mitigation Phase 1.** Protect life and property by coordinating with the University of Colorado to implement the South Boulder Creek Flood Mitigation Study subject to final design (Phase 1). Consider mitigating flood risk to the highest standard practicable while balancing associated environmental, social and financial impacts.
 - a. As part of the flood mitigation design process, the city will evaluate the flood storage and attenuation (water retention with slow release) value of the site, with and without the levee in place. The study will look at both flash flood and long-duration storm events.
 - b. Specific real property ownership, easements, and/or agreements will be established during annexation for the area necessary for floodwater improvements and other uses (plus or minus some land area). Prior to a final agreement related to the flood mitigation land area, the city will conduct a groundwater assessment which verifies the feasibility and provides the basis for design and construction of implementing measures to convey groundwater through the dam in a manner that substantially replicates existing flow patterns.
 - c. The site will provide adequate areas for construction, maintenance, and operation of city flood control dams, appurtenances, and associated flood storage including freeboard to reduce flood risks.
 - d. Explore opportunities for passive and active recreation activities, or other uses compatible with the floodwater mitigation system and where possible, conserve and/or restore areas within the flood mitigation facilities with high ecological value and mitigate impacts.
 - e. The city recognizes that storm events larger than a 100-year event can occur and may be more probable in the future due to the impacts of a changing climate. In designing the South Boulder Creek Phase 1 flood mitigation facility, the city's goal is to mitigate to at least a 100-year flood, and the city will consider larger events, including the 500-year flood as adopted by FEMA and a probable maximum flood as determined by the State Engineer. The mitigation facility will be designed to accommodate larger events per the requirements of the State Engineer.
 - f. Property interests for flood control purposes are anticipated to be provided to the city as part of the annexation agreement.

Land Use Mix

1. **Housing for university needs.** Housing on the site will meet the needs of university faculty, staff and non-freshmen students in order to address the fact that Boulder housing is currently unaffordable to faculty, staff and students. Providing workforce and non-freshmen housing will contribute positively to the community's housing affordability goals and aid the university in its recruitment and retention. Housing should be mutually beneficial to the community and university and integrated with needs of the community rather than built as isolated enclaves.
2. **Residential units and non-residential space.**
 - a. Housing will be the predominant use of the site for areas not used for flood mitigation (i.e., with a target of 1,100 residential units and the final number guided by transportation performance and other site constraints), although the site may include a mix of residential and non-residential and facilities. The site will emphasize housing units over nonresidential space (jobs) to help balance jobs and housing in the community.
 - b. Except for recreation facilities, development will be phased such that non-residential space will be phased after a significant amount of housing is built. Later phases will be dependent on demonstrating that initial phases achieve objectives of mitigating impacts.
 - c. The overall non-residential space footprint will be minimized and support and benefit the convenience of the residents, employees, and visitors to residential and recreational uses of the property.
 - d. The exact amount, types and location of residential and non-residential space will be refined to minimize impacts as a long-term master plan is developed and as transportation analysis is conducted.
 - e. Academic facilities will include space for research and/or education pertaining to natural environment such as ecological restoration, floodplains, and related topics.

Use restrictions. The site will not include large-scale sport venues (i.e., football stadium), high rise buildings (maintaining substantial consistency with the city's height limits), large research complexes such as those on east campus, roadway bypass between Highway 93 and Highway 36, or first year student housing.

Site Design

1. **Model of quality and innovation.**
 - a. The site will be a model for innovation and high quality, energy efficient buildings, and site design that minimizes environmental impacts. Innovation will span a range of areas (e.g., how food and waste processes are addressed, outdoor lighting, sustainable materials, stormwater, etc.).
 - b. It will model future resilience and sustainability for design, construction, and maintenance strategies. Development will meet the equivalent of the U.S. Green Building Council's Gold or Platinum LEED standards or other applicable sustainability standards for residential development.
2. **Clustered, village design.**
 - a. Residential development will be of high quality and contextually appropriate to neighboring properties.

- b. Development will be compact, clustered in a village style. Any non-residential buildings will be human scaled.
- 3. Environmental standards.**
 - a. Usable open space that meets the active and passive recreational needs of the residents, employees, and visitors will be maintained within developed areas.
 - b. Wetlands will be maintained, preserved, protected, restored, and enhanced in a manner consistent with the city's Land Use Code.
 - c. Development on slopes at or exceeding 15 percent will be minimized in a manner consistent with the city's Land Use Code.
 - d. All enclosed academic structures, offices, or residential uses will be constructed outside of the FEMA 500-year floodplain.
 - e. Stormwater impacts of new development will be mitigated based on established criteria for minor and major storm events and applicable stormwater quality requirements. Preservation or restoration of existing undeveloped areas will be considered to attenuate peak runoff from the site and to mitigate stormwater quality impacts.
- 4. Building mass, height and views.**
 - a. Buildings will be designed and sited in a manner to protect views and contribute positively to the character of the city's "gateway". Building heights will maintain general consistency with the city's height limits with buildings varying in height and visual interest. Building heights will transition gently from the open space and to neighborhoods to the west.
 - b. Building location, massing and height will protect and complement views of the mountain backdrop, particularly the viewsheds from the US 36 bike path, the South Boulder Creek Trail, US 36 and SH 93.

Urban Services and Utilities

- 1. **Urban Services.** Future agreements between the city and university will be contingent on the ability of the city to provide Adequate Urban Facilities and Services and university's contribution to cover the cost of the necessary services and utilities on site and to address off site impacts to systems.

Transportation

- 1. **Performance based transportation to avoid impacts.** The transportation needs generated by future development at the site will not unduly impact the transportation networks that serve the property. Impacts to local and regional networks will be mitigated through implementation of performance based standards. The city and CU will complete additional planning and transportation analysis to further develop performance based standards including but not limited to maximum amount of parking, trip budgets, transit use, pedestrian and trail connections, and access to transit passes. Planning considerations will be addressed collaboratively by the city and CU and will include innovative and long-range technologies, including electric vehicles, autonomous vehicles, etc., as well as possible joint options with City-funded transit.
- 2. **Multi-Modal hub and connections.** Implement a multi-modal mobility hub and transit connections between the CU South Boulder property and other Boulder campus locations to manage employee and resident access and mobility.

3. **Connected multimodal systems.** Incorporate connected and safe pedestrian, bike and transit systems through CU South integrated into the broader city and regional bicycle and pedestrian network, including safe street crossings, trailhead(s), soft surface recreation trails, and a trail link(s) to the South Boulder Creek Trail in coordination with OSMP. When creating and maintaining recreational opportunities such as trail connections through the property, do so with consideration for likely and potential impacts to adjacent open space, and for mitigation of those impacts, as appropriate.
4. **Protect Neighborhoods from Transportation Impacts.** The street design will minimize impacts into nearby residential neighborhoods, such as Tantra Park, Basemar, Martin Acres and High View.
5. **No bypass.** Discourage any outside traffic from cutting through the property to avoid impacts to the Table Mesa Drive/Broadway connection.
6. **Emergency connectivity.** Limited ingress and egress via local connections may be provided for emergency, life safety situations. Develop an Emergency Service and Evacuation Plan to address emergencies and use of emergency access and connections.

Update to Policy 1.05, as Recommended by Planning Board on May 25, 2017 and Approved by City County on July 11, 2017

(see blue text added.)

With three campus locations in Boulder and serving over 30,000 students, the university is integrated into the city's fabric and benefits the community socially, economically and culturally. The city will aim to coordinate with the university and engage with the community to exchange information and plan for future uses and activities on the Main campus, East Campus, CU South, and Williams Village area, especially where changes may affect surrounding areas or have regional implications. The city will address regional implications by seeking input, advice or partnerships from other governmental entities including RTD, CDOT and Boulder County. The city aims to work with CU cooperatively to address critical needs of flood safety, student and workforce housing, and transportation and other infrastructure. Intergovernmental agreements between the agencies can provide clarity about roles and responsibilities on such issues of mutual concern building on collaborative planning process and guiding principles. [In its negotiations of an annexation agreement for CU South, the city will use the guiding principles as shown in Ch V. Subcommunity and Area Planning, CU South Boulder Campus.](#)

Update to Chapter IV, Land Use Map Descriptions (PK-U/O), as Approved by City Council on July 11, 2017

(see blue text added.)

Park, Urban and Other (PK-U/O)

Characteristics and Uses: PK-U/O includes public lands used for a variety of active and passive recreational purposes [or flood control purposes](#). Urban parks provided by the city include pocket parks, neighborhood parks, community parks and city parks as defined in the *Parks and Recreation Master Plan*. The specific characteristics of each park depend on the type of park, size, topography and neighborhood preferences.

On July 16, City Council directed staff to continue work on the floodwall concept along the US36 CDOT right-of-way and requested the city's Open Space Board of Trustees feedback related to additional OSMP impacts that such a floodwall to be constructed on and underneath OSMP lands may have. The Open Space Board of Trustees conducted a [study session on August 14, 2019](#) and [a public hearing and deliberation on September 11, 2019](#) to develop feedback to City Council on the South Boulder Creek Flood Mitigation Project.

The following draft motion was passed unanimously at the September 11, 2019 meeting (subject to approval of minutes on October 9, 2019):

Tom Isaacson moved that the Open Space Board of Trustees communicate to City Council the following feedback regarding the South Boulder Creek Flood Mitigation Project. Curt Brown seconded. This motion passed four to zero; Hal Hallstein was absent for this meeting.

- 1. What is OSBT's view on whether the construction of a floodwall or other flood mitigation structures on Open Space (the proposal) would require a disposal?**

Yes, because flood control to protect development in a floodplain is not an Open Space Charter purpose, among other reasons, this would require a disposal. If council has a different view, we would request the opportunity to discuss the matter, as it raises important questions regarding the Board's Charter responsibilities.

- 2. Does OSBT believe that its responsibilities inherently preclude it from making a disposal for "the proposal," even if the mitigation plan is expected to be highly effective?**

Tom Isaacson, Curt Brown, and Dave Kuntz would answer this question "no." Karen Hollweg believes the question cannot be answered.

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- 3. For OSBT to consider a disposal motion what information would OSBT first need?**

- a. A side-by-side analysis and comparison of the benefits and costs of the revised Variant I (that uses OSMP land, instead of CDOT land, for the floodwall) and an upstream option which would capture enough flow upstream and west of the CU-South property to eliminate the need for a floodwall to bedrock on OSMP land. That upstream variation would creatively and strategically place minimally invasive structures to guide the flood flows in one or more places west of Hwy 93 to Hwy 36.
- b. The engineering plans and modeling analyses to show that the historic underground flow will be maintained in the OSMP State Natural Area (especially in the 90 acres near Hwy 36) in wet, dry, and flood years, including the maintenance and operation of any structures proposed for doing this in perpetuity.
- c. Explanation of how the proposed flood mitigation structures will be designed and constructed to minimize impacts to OSMP lands and critical habitat.
- d. Identified mitigation of impacts to high quality ecosystems and listed species informed by conversations with the USFWS and USACE to determine ways of avoiding or minimizing adverse impacts to OSMP resources and listed species.

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4. If the answer to #2 is other than “yes”:

- A. What are the key elements of a mitigation plan that OSBT believes could support its approval of the revised Variant I?

The items identified in [the July 11, 2018 memo OSBT recommendation of mitigation measures](#) plus additional measures to offset the new impacts of construction of any flood mitigation structures on Open Space.

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- B. Are there any metrics/criteria that OSBT would recommend for evaluating such a mitigation plan?

1. Curt Brown, Karen Hollweg and Dave Kuntz would recommend a standard of net Open Space benefit; Tom Isaacson would not require that Open Space be net better off as a result of the mitigation plan
2. Approval of the mitigation plan by USFWS and USACE

-

C. Does OSBT have any feedback on the likely feasibility/effectiveness of such a mitigation plan in achieving its goals?

In-kind mitigation (creation of similar habitats elsewhere for these specific listed species) for loss of this type of riparian and wet meadow habitats has proven to be extremely difficult and to date has not been possible for spiranthes in particular. Sufficiency of out-of-kind mitigation is a complex judgment that will require input from both city/OSMP staff and FWS/USACE.

-

5. Does OSBT have any feedback on potential means of avoidance, i.e., ways to lessen the ecological impact of the revised Variant I project?
 - a. A dam design that places most or all of the foundation underneath and downstream of the main flood wall.
 - b. A foundation design that is inherently less obstructive to GW movement, e.g., a pier/caisson design rather than a typical cutoff wall to bedrock.
 - c. A robust groundwater maintenance and monitoring system.
 - d. A design for the dam and monitoring system that put most or all inspection access behind the structure.
 - e. A construction process specifically designed to minimize upstream OSMP impacts, e.g., excavating, transporting, staging and constructing from within the floodwall footprint or the downstream side.
 - f. For other project designs similar approaches should be considered.

-

6. Does OSBT have any feedback regarding the value (from an Open Space perspective) of pursuing a version of Variant I with less-than-500-year flood protection?

- a. The maximum depth and area of OSMP land that is ever inundated would be reduced. However, these reductions will be occurring for the lowest probability events, so those gains will be modest.
 - b. The amount of OS-O land that the University may desire for development would be reduced, potentially freeing up some additional OS-O land for mitigation. However, this land is the highest and driest of the OS-O and therefore may be of more value as buffer lands rather than compensatory habitat.
-

7. Does OSBT have any feedback regarding the value (from an Open Space perspective) of pursuing a version of an upstream option with less-than-500-year flood protection?

Reducing the level of flood protection should also be considered for an upstream design.

-

8. With respect to regulatory permitting, i.e., by regulatory agencies in response to the submission of a mitigation plan:

OSBT believes that obtaining regulatory approval presents a significant challenge and it is valuable to begin discussions with regulatory agencies sooner rather than later.

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9. Does OSBT have any feedback on whether to pursue further evaluation of Variant II (whether 100 or 500) at this time?

OSBT does not recommend pursuing Variant II at this time.

Approved as Amended 8/8/18
OPEN SPACE BOARD OF TRUSTEES
Action Minutes
Meeting Date July 11, 2018

Video recording of this meeting can be found on the City of Boulder's Channel 8 Website. (Video start times are listed below next to each agenda item.)

BOARD MEMBERS PRESENT

Tom Isaacson Curt Brown Andria Bilich Karen Hollweg

STAFF MEMBERS PRESENT

Dan Burke	Steve Armstead	John Potter	Mark Davison
Jim Reeder	Mark Gershman	Lauren Kilcoyne	Chelsea Taylor
Phil Yates	Leah Case	Alyssa Frideres	Juliet Bonnell
Deryn Wagner	Don D'Amico	Eric Collins	Kent Coghill
Brian Anacker			

GUESTS

Curt Bauer, Public Works Engineering Project Manager
Matt Wempe, Regional Trails Planner, Boulder County Transportation
Jeff Arthur, Director of Public Works for Utilities
Molly Scarborough, Public Works Senior Project Coordinator
Frances Draper, University of Colorado

CALL TO ORDER

The meeting was called to order at 6:02 p.m.

AGENDA ITEM 1 – Approval of the Minutes (1:00)

Karen Hollweg requested that a sentence be added under Agenda Item 4, “the Board requested that staff cross reference CIP items so that they could be sorted by program area and large projects in addition to staff responsibilities to make OSMP operations more transparent for the public.”

Curt Brown moved that the Open Space Board of Trustees approve the minutes from June 13, 2018 as amended. Andria Bilich seconded. This motion passed four to zero; Kevin Bracy Knight was absent.

Curt Brown moved that the Open Space Board of Trustees approve the minutes from the joint WRAB/OSBT meeting on June 25, 2018. Karen Hollweg seconded. This motion passed three to zero; Kevin Bracy Knight was absent during the June 11 meeting and Andria Bilich was not present at the June 25 meeting.

AGENDA ITEM 2 – Public Participation for Items not on the Agenda (3:02)

Buzz Burrell, Boulder, said the process in regard to the Master Plan has gotten better. Suggested using a science-based approach. Science is a common language; be rational and positive in that knowing you can do something good.

AGENDA ITEM 3 – Matters from the Department (6:10)

Mark Gershman, Environmental Planner Supervisor, gave an update on the Rocky Mountain Greenways: Soil Sampling/Analysis Plan.

Dan Burke, Open Space and Mountain Parks (OSMP) Interim Director, gave an update on the raptor closure on the 3rd Flatiron; late season nesting will require staff to extend closure for up to 14 extra days.

AGENDA ITEM 4 – Longmont to Boulder Trail – Jay Road Connection (11:30)

Kacey French, Planner, and Matt Wempe, Regional Trails Planner, presented this item.

Public Comment

None.

Motion

Tom Isaacson moved the Open Space Board of Trustees to approve the use of a section of the OSMP McKenzie property, to complete the LOBO Trail – Jay Road Connection. Curt Brown seconded. This motion passed four to zero; Kevin Bracy Knight was absent.

AGENDA ITEM 5 – South Boulder Creek Flood Mitigation Project Concept Evaluation (25:31)

Don D’Amico, Ecological Systems Supervisor and Curt Bauer, Public Works Engineering Project Manager, presented this item.

Public Comment

Kay Forsythe, Boulder, said she appreciates the protection of Open Space; right now, however the people who live and work at Frasier Meadows feel like the endangered species. People were lucky in 2013 that no one lost their lives. She asked the Board to present to City Council a variety of options for flood mitigation.

Don Cote, Boulder, showed a video from the flood in 2013 at Frasier Meadows. He said they would like to have peace and security in their remaining years. Please consider a balance in protecting Open Space as well as the security of human lives.

Crif Crawford, showed a video from the flood in 2013. He said this flood completely destroyed the entire first floor of Frasier Meadows. Over 50 patients had to be moved either by wheelchair, walker, or by being carried or led by staff or Frasier residents. Although no lives were lost during the flood, the trauma of the event severely affected the lives of patients and staff.

Gordon McCurry, Boulder, said he has been studying the South Boulder Creek flood area for many years, and showed a revised option for Variant 2. He asked the Board to consider this option and recommend it to City Council.

Pat Billig, Boulder, said the Trustees role is to protect resources. She said she is concerned about the terms in Attachment A as they are all dependent on CU South, which the City of Boulder does not own. She said OSMP is not here to adapt to engineering concerns; it should be the other way around. Please explore alternatives.

Ruth Wright, Boulder, said she hopes the Board will not retreat from 500-year flood criteria. Why are the options shown proposing building on Open Space lands; please minimize or eliminate the impact on these precious lands. She said she hopes the Board will send the city and consultants this message and insist they do it right.

Jonathan Carroll, Boulder, showed a video from the 2013 flood. Urged the Board to consider any and all options deemed acceptable and continue moving forward.

Jeff Rifkin, Boulder, said Variant 2, with the modifications proposed by Gordon, is the obvious choice. This would eliminate the hazards to neighborhoods as well as protect maximum amount of Open Space land.

Steven Telleen, Boulder, said he supports Variant 2 with the modifications proposed by Gordon. Any flood mitigation should be based on current best practice. High hazard dams and approaches have regularly failed over the last hundred years. What works is using strategies to basically slow and divert the flood waters; this relieves some of the pressure and puts water back. From an ecological perspective, flooding is natural and healthy for natural riparian areas.

Ray Bridge, Boulder County Audubon Society, said thank you to staff for efforts on evaluating the actual effects on Open Space. He urged the Board to recommend to City Council the modifications that Gordon proposed for Variant 2. He noted that no data has been provided to evaluate any of the designs; need to look at potential impacts on Open Space.

Kathie Joyner, Boulder, said the responsibility to preserve and protect Open Space lands that OSBT holds, makes this Board an important piece of the South Boulder Creek flood mitigation project. After years of study, confident that staff have provided several viable options. The more quickly we move to the preliminary design phase, the better. She asked the Board to recommend as many options as possible to council so they will have the maximum flexibility in their conversations.

Jim McMillan, Save South Boulder, said he supports the study of the upstream option that was sent to the Board on behalf of their group. We should be exploiting natural features that exist there today while maintaining wetlands. He noted that he has yet to hear about environmental change as part of these conversations. He encouraged the Board to take a science-based decision and support continuing the study. Do not make decisions without data.

Margaret LeCompte, Save South Boulder, said they stand for effective flood mitigation. Why would we study mitigation options where there are critically protected lands; the options suggested are expensive and expose risks to habitat as well as threaten the lives of South Boulder residents. She said she believes that neither the Master Plan or proposed Variants have any chance of being implemented. The Board needs to think outside of the box; please consider Gordon's proposed plan.

Ken Beitel, Boulder, said there are amazing wetlands and wildlife in the proposed area; he urged the Board to support Gordon's proposed upstream option instead. This option allows for more area for flood water retention as well as lessening the threat to those downstream. Having an independent contractor may also be favored as the perception is city staff are trying to move the process along too quickly.

Edie Stevens, Friends of Boulder Open Space (FOBOS), said as members of the Open Space Board you are entrusted with the preservation of endangered species. Citizens are ultimately responsible for the preservation or the destruction of this area. Hope we will work together and will protect both people as well as the biodiversity. Think globally, act locally.

Mike Chiropoulos, Save South Boulder, said the goal should be for a maximum benefits approach; for lives, for CU and for Open Space. You should only build where it is high, and it is dry, and it is appropriate. Reclaim, restore, re-wild this corridor.

Catherine Sundvall, Boulder, said she learned how to create a living sponge which allowed her to turn her property into a wetland-type area with rain gardens and habitat. Do not look at an option that would increase water through dry ditch #2. Recommend looking into options using gravel pits and retention ponds to create solutions.

Ellen Franconi, Boulder, when CU purchased that land there was concern about what they would do; could not believe they might build housing units. Didn't understand the term for Variances. Curious if one of those options limit building on this land.

Jacklyn Ramaley, Boulder, said she is concerned with Variant 2 and the potential devastating impacts to Open Space. Open Space is committed to managing this property with the goal to preserve and protect. Consider lasting environmental impacts and decisions being made today. She said to please consider all upstream alternatives that could possible reduce downstream and potential damage. Natural eco systems are very difficult to restore and expensive.

Rachel Friend, Boulder, said flash flooding in South Boulder Creek is an urgent health and safety issue. Please move forward with as many options as possible, and no more modifications or delays.

Suzanne DeLucia, Boulder, said whatever decision is made needs to provide maximum protection for residents. Decisions made in haste may cause more damage in the long run. No additional carrying capacity in South Boulder Creek; she urged the board to consider Gordon's option.

Pete Ornstein, Boulder, expressed his support for Variant 2. Dry Creek Ditch 2 is incapable of handling increased water, especially from a flash flood. He said he supports the 500-year variant on Variant 2; it appears to be cost effective and a good way to address climate issues. He added he supports Gordon's option for upstream flood control.

Molly Davis, Boulder, said the 2013 flood caused severe damage to her land and property. That being said, the role of the Trustees is to work for the common good and protection of Open Space. The job is to protect the natural resources.

Ben Binder, Boulder, said city staff is minimizing the restrictions on the US36 underpass. Why not use gravel pits for detention; tremendous amount of opportunity in this area. so many problems with Alternative D. He expressed his support for Gordon's proposed option.

Ted Ross, Boulder Water Keeper, said current options presented are not ideal. Voice of watershed is saying step back, think about it, and maybe look at it again. The Charter is clear however, need to protect Open Space.

Leonard May, Boulder, emphasized that both proposed variances would use a major area of Open Space land. He said he believes that it is important to recommend to City Council that any further design work must evaluate impacts on Open Space land. As Trustees' your responsibility is to protect land purchased with Open Space funds.

Amy Siemel, Boulder, said a designated state natural area is very special. Tall grass area contains sensitive habitat and flood water on this meadow could be disastrous. Once precious land is gone, its gone. Adopt variant 2 provided data proves this is the best option. Revisions: Take flood waters from further upstream. Detain flood water on OS-O. take opportunity to reduce scope of high hazard dam.

Laura Tyler, Boulder, said the deadline on this project is the next flood. Move as many options forward as fast as you can.

Harlin Savage, Save South Boulder, said Open Space is one of the things loved most about Boulder and the strong conservation effort that most of us share. Please consider how the choice of a flood mitigation

concept will affect neighbors. She asked the Board to consider the upstream solution proposed which would shift water to old gravel pit. Allow flood waters to move in a more natural way.

Michael Tomlinson, Boulder Rights of Nature, Boulder Water Keeper, said the University behavior has been an insult to the citizens and the university community. In 100 years, the way we are treating these other species will be thought about how we thought about racism previously. Look at the upstream model by Gordon and please use gravel puts.

Linda Jourgensen, Boulder, said she re-read the Open Space Charter recently and saw nothing in there regarding flood control issues. There is a precedent that should not be set; to allow flood control on state land that we promised to protect.

Lynn Segal, Boulder, said she is interested in Gordon's upstream solution.

Motions

Karen Hollweg moved the Open Space Board of Trustees recommend that City Council advance one or both of the following South Boulder Creek flood mitigation 100 or 500-year concepts to preliminary design: 1) Variant 1 and/or 2) Variant 2. These recommendations are conditioned on the terms shown in Attachment A, as revised. Curt Brown seconded. This motion passed four to zero; Kevin Bracy Knight was absent.

Revised Attachment A

Attachment A: Recommended Concept Advancement Terms

Variant 1 and Variant 2 (100-Year or 500-Year Facility) Concepts

The following terms are recommended in order to advance all concepts.

- 1. Remove the CU levee and restore underlying land as part of project design at project cost.*
- 2. OSMF and Public Works staff continue to work collaboratively to avoid and minimize city open space impacts (e.g., flooding, structures, vegetative damage, introduction of potentially damaging species) throughout preliminary design and construction.*
- 3. OSMF and Public Works staff develop additional information through preliminary design, to both staffs' satisfaction, on projected sedimentation, groundwater flow, debris accumulation, and required vegetative maintenance on city open space in order to identify and clarify additional mitigation and compensation measures.*
- 4. OSMF and Public Works staff conduct a review and assessment of 30%, 60%, and 90% design plans to ensure that all open space concerns are getting addressed and return to OSBT for their input at each stage before advancement through preliminary design to construction.*
- 5. Criticality of Groundwater Conveyance: All proposed flood control variants include a floodwall along US-36 with a foundation to bedrock, as required by the State Engineer. This wall, however designed, has the potential to intercept the flow of ground water that supports critical wet meadow ecosystems above and below the highway. These ecosystems provide habitat for two listed species and are one of the rarest ecotypes in Boulder County and the state.*

Impacts to wet meadows from short-term, infrequent inundation can be compensated by enhancement of adjacent lands. However, permanent degradation of the wet meadow ecosystem due to disruption of the underlying groundwater regime cannot be compensated or offset by anything other than additional mature wet meadows, which simply cannot be created using the higher, mined lands of CU South. Creation of new wet meadow habitat, particularly in an arid region, has proven so far to be impossible to accomplish at any price and over long time frames. Compensation for this risk is simply not possible; hence, it must be avoided.

Therefore, just as the mechanical outlet works are essential to the functioning of this flood control project, so also must the proposed groundwater conveyance system work fully for as long as the floodwall is in place. As with the outlet works, it must be tested, operated, maintained and as necessary replaced to ensure its full functioning continuously in perpetuity. The project plan, SOP, and long-term budget must be developed to achieve this goal, based upon previous experience with similar systems.

6. In order that the project results in clear net benefits for open space, acquire portions of CU South OS-O property and water rights in Dry Creek Ditch #2 for permanent OSMP ownership and management, as follows:

a. Convey approximately 40 acres of land to the west and north of the CU levee as part of the project.

b. Provide project funding to restore three acres for each additional acre of OSMP land subject to ponding under the 100-year storm event with the constructed project, not to exceed \$100,000 per acre. Based upon current project estimates:

Variant 1: 17.4 acres restored at approximately \$1.74 million.

For Variant 2: 47 acres restored at approximately \$4.7 million.

c. Incorporate realignment of the Dry Creek Ditch #2 west of the restoration area to the extent practical and acceptable to the ditch board and CU and convey sufficient water rights in Dry Creek Ditch #2 to support the restoration goals in 6b;

7. In order to consolidate management of the South Boulder Creek floodplain lands, acquire and convey to OSMP the 44 acres of CU South lands between the existing CU levee and OSMP lands to the east and south, with subsequent management and any restoration to be funded by OSMP.

8. Public Works Department supports OSMP efforts through annexation to convey and/or permanently protect CU South's remaining OS-O acreage to the west and north of the CU levee for long-term protection and possible restoration (approximately 35 acres).

9. Develop and implement a Monitoring and Maintenance Agreement between OSMP and Public Works to address long-term needs to keep the project functional and within design parameters.

Two additional mitigation elements would be implemented under Variant 2

10. Modify or realign the city's sanitary sewer that runs along South Boulder Creek to allow for OSMP projects to open up the floodplain, as part of preliminary design and construction.

11. Provide for enhanced wildlife passage under US36 beyond current concepts as part of preliminary design and construction.

Karen Hollweg moved that the Open Space Board of Trustees state that, while both variants have impacts to Open Space, the preferred option is Variant 1 based on Open Space values. Variant 2 is less desirable because it would impact Open Space and Mountain Parks resources of higher significance and on a more frequent and long-term basis. Curt Brown seconded. This motion passed four to zero; Kevin Bracy Knight was absent.

Karen Hollweg moved that the Open Space Board of Trustees recommend that City Council request development of an upstream storage concept design that could work separately or in concert with Variant 1 and/or 2. Principal objectives would include enabling the flood wall along US 36 to be removed, reducing the sedimentation and inundation impacts on Open Space and Mountain Parks lands, avoiding the need for a flow restriction at the US 36 bridge, minimizing other impacts on Open Space and Mountain Parks lands, and taking account of the project's permit-ability. Curt Brown seconded. This motion passed four to zero; Kevin Bracy Knight was absent.

Andria Bilich moved that the Open Space Board of Trustees state that, "the Open Space Board of Trustees has a significant interest in the future of the OS-O portion of the CU South property and how this area may impact existing city open space and how this acreage may further city open space purposes and services. Therefore, OSBT requests that City Council seek OSBT input, at such a time deemed appropriate during annexation negotiations with CU, regarding decisions affecting the future of any of the land on CU South property with OS-O land use designation. Curt Brown seconded. This motion passed four to zero; Kevin Bracy Knight was absent.

Curt Brown moved that the Open Space Board of Trustees make the following statement regarding Groundwater Conveyance: Critical wet meadow habitat upstream and downstream of US-36 depends upon uninterrupted groundwater flow. Loss of this rare ecotype due to groundwater disruption would not be acceptable under the OSMP Charter. To date, creation of new, compensatory, wet meadow habitat, particularly in an arid region, has proven impossible to accomplish at any price and over long time frames. Therefore, full and continuous functioning of a robust groundwater conveyance system in perpetuity is a critical component of any flood control variant, as detailed in Attachment A. We also judge that this clear commitment to successful operation of the groundwater conveyance system in perpetuity will be critical to obtaining environmental permitting for the project. Andria Bilich seconded. This motion passed four to zero; Kevin Bracy Knight was absent.

Tom Isaacson moved that the Open Space Board of Trustees make the following statement, "The proposed flood mitigation concepts raise important and potentially complex disposal issues under section 177 of the City Charter, with respect to storage of flood waters on Open Space land, the construction of flood detention facilities, or both. Those issues include (1) whether the concept

would require a disposal, (2) whether a disposal should be approved, and (3) the detailed terms of any such disposal. OSBT believes that the disposal issues are best addressed after the number of concepts has been narrowed and the preferred concept(s) have been more fully designed and specified. In the event that one or more concepts proceed to preliminary design, OSBT intends to work with city staff to identify the point in the process at which such concept(s) have been sufficiently designed and specified such that OSBT can then make a fully-informed decision on any disposal questions. Karen Hollweg seconded. This motion passed four to zero; Kevin Bracy Knight was absent.

AGENDA ITEM 6 – Consideration of a motion to recommend five focus areas that will guide the Open Space and Mountain Parks Master Plan (4:52:00)

Deryn Wagner, Senior Planner, presented this item.

Public Comment

None.

Motion

Andria Bilich moved the Open Space Board of Trustees to recommend to City Council to approve the following five focus areas that will guide the development of the OSMP Master Plan: Ecosystem Health and Resilience; Responsible Recreation and Enjoyment; Agriculture - Today and Tomorrow; Community Connection, Education and Inclusion; and Financial Sustainability. Curt Brown seconded. This motion passed four to zero; Kevin Bracy Knight was absent.


AGENDA ITEM 7 – Matters from the Board

None.

ADJOURNMENT – The business meeting adjourned at 11:15 p.m.

These minutes were prepared by Leah Case.

9-12-18
DATE

APPROVED BY:

Tom Isaacson
Board Chair



*GEOTECHNICAL AND
WATER RESOURCES ENGINEERING*

CONCEPT DESIGN REPORT

SOUTH BOULDER CREEK REGIONAL DETENTION PROJECT

BOULDER COUNTY, COLORADO

Submitted to
City of Boulder
1777 Broadway
Boulder, Colorado 80301

Submitted by
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February 2020
Project 16134

Robert J. Huzjak, P.E.
Project Manager

TABLE OF CONTENTS

TABLE OF CONTENTS	1
SECTION 1 – INTRODUCTION	1
1.1 PURPOSE AND OBJECTIVES	1
1.2 BACKGROUND	1
1.3 SCOPE OF SERVICES	2
1.4 PROJECT PERSONNEL	3
SECTION 2 – EXISTING CONDITIONS	5
2.1 GENERAL	5
2.2 UNIVERSITY OF COLORADO BOULDER SOUTH CAMPUS.....	5
2.3 OPEN SPACE AND MOUNTAIN PARKS PROPERTY	6
2.4 COLORADO DEPARTMENT OF TRANSPORTATION RIGHT-OF-WAY.....	7
2.5 SOUTH BOULDER CREEK.....	7
SECTION 3 – PREVIOUS STUDIES AND REPORTS	9
3.1 GENERAL	9
3.2 FLOOD MAPPING STUDY.....	9
3.3 MASTER PLANS	10
3.4 BOULDER VALLEY COMPREHENSIVE PLAN UPDATE.....	11
3.5 CONDITIONAL LETTER OF MAP REVISION AND LETTER OF MAP REVISION.....	12
SECTION 4 – DATA COLLECTION	13
4.1 GENERAL	13
4.2 TOPOGRAPHIC SURVEY.....	13
4.3 GEOTECHNICAL INVESTIGATION.....	13
4.4 ENVIRONMENTAL SURVEY.....	14
SECTION 5 – ALTERNATIVES	15
5.1 BACKGROUND	15
5.2 KEY CONSIDERATIONS IMPACTING ALTERNATIVE DEVELOPMENT	18
5.3 PRIMARY PROJECT COMPONENTS	20

5.3.1	Earthen Embankment on CU Boulder South Campus	20
5.3.2	Structural Floodwall along US36	21
5.3.3	Groundwater Conveyance System	22
5.3.4	Modifications to Existing Culverts below US36	23
5.3.5	Detention Excavation on CU Boulder South Campus	23
5.3.6	Outlet Works below US36	24
5.3.7	Reconstruction of South Loop Drive	25
5.3.8	Fill on CU Boulder South Campus	25
5.3.9	Removal of CU Levee	25
5.3.10	Environmental Mitigation	25
5.4	ALTERNATIVES	26
5.4.1	General	26
5.4.2	Option 1 (100-Year)	26
5.4.3	Option 2 (500-Year)	27
5.4.4	Option 3 (Approx. 200-Year)	29
5.5	EVALUATIONS	30
5.5.1	General	30
5.5.2	IDF Modeling	31
5.5.3	Hydraulic Modeling	32
5.5.4	Environmental Impacts	40
SECTION 6 – OPINION OF PROBABLE PROJECT COSTS		43
6.1	GENERAL	43
6.2	BASIS OF COST OPINION	45
SECTION 7 – CONCEPT SELECTION CRITERIA		49
7.1	GENERAL	49
7.2	BASELINE CRITERIA	49
7.3	PROJECT EVALUATION CRITERIA	49
SECTION 8 – NEXT STEPS		53
SECTION 9 – REFERENCES		54

LIST OF TABLES

Table 5.1	Option 1 Key Elevations (100-Year)
Table 5.2	Option 2 Key Elevations (500-Year)
Table 5.3	Option 3 Key Elevations (Approx. 200-Year)
Table 5.4	IDF Results
Table 5.5	Peak Flows at US36
Table 5.6	Option 1 Hydraulic Modeling Results (100-Year)
Table 5.7	Option 2 Hydraulic Modeling Results (500-Year)
Table 5.8	Peak Flows in South Boulder Creek at Eldorado Canyon
Table 5.9	Baseline Hydraulic Modeling Results (Approx. 200-Year)
Table 5.10	Fill Distribution Results
Table 5.11	Option 3 Hydraulic Modeling Results (Approx. 200-Year)
Table 5.12	Potential Permanent Environmental Impacts
Table 5.13	Potential Temporary Environmental Impacts
Table 6.1	Opinion of Probable Project Costs
Table 7.1	Evaluation Criteria Matrix

LIST OF FIGURES

Figure 2.1	Site Vicinity Map
Figure 2.2	Existing Conditions Site Plan
Figure 2.3	CU Boulder South Campus and Land Use Designations
Figure 2.4	Plan of Facilities along US36 ROW
Figure 4.1	Plan of Limit of Survey
Figure 4.2	Plan of Geotechnical Borings
Figure 5.1	Schematic Plan of Option 1
Figure 5.2	Schematic Plan of Option 2
Figure 5.3	Schematic Plan of Option 3
Figure 5.4	Typical Section – Earthen Embankment
Figure 5.5	Floodwall and Groundwater Conveyance System
Figure 5.6	Outlet Works Profile
Figure 5.7	Plan of Option 1
Figure 5.8	Plan of Option 2 Sheet 1 of 2
Figure 5.9	Plan of Option 2 Sheet 2 of 2
Figure 5.10	Option 2 Sections
Figure 5.11	Plan of Option 3 Sheet 1 of 2
Figure 5.12	Plan of Option 3 Sheet 2 of 2
Figure 5.13	Option 3 Sections
Figure 5.14	Effective Model Conversion Results

Figure 5.15	Option 1 – Hydrographs through US36 Bridge (100-Year)
Figure 5.16	Option 1 – Hydrographs at South Boulder Road (100-Year)
Figure 5.17	Option 1 – Differences in Maximum Water Surface Elevations (100-Year)
Figure 5.18	Option 2 – Hydrographs through US36 Bridge (500-Year)
Figure 5.19	Option 2 – Hydrographs at South Boulder Road (500-Year)
Figure 5.20	Option 2 – Differences in Maximum Water Surface Elevations (500-Year)
Figure 5.21	Baseline – Hydrographs through US36 Bridge (Approx. 200-Year)
Figure 5.22	Baseline – Hydrographs at South Boulder Road (Approx. 200-Year)
Figure 5.23	Baseline – Differences in Maximum Water Surface Elevations (Approx. 200-Year)
Figure 5.24	Plan of Option 3 Northern PUB Fill Configurations
Figure 5.25	Option 3 – Hydrographs through US36 Bridge (Approx. 200-Year)
Figure 5.26	Option 3 – Hydrographs at South Boulder Road (Approx. 200-Year)
Figure 5.27	Option 3 – Differences in Maximum Water Surface Elevations (Approx. 200-Year)

LIST OF GRAPHS

Graph 5.1 Hydrographs at Eldorado Canyon

APPENDICES

Appendix A Cost Opinion Information

LIST OF ABBREVIATIONS

Abbreviation	Term
Ac-Ft	Acre-Feet
BCS	Base Construction Subtotal
BVCP	Boulder Valley Comprehensive Plan
CDOT	Colorado Department of Transportation
City	City of Boulder
CLOMR	Conditional Letter of Map Revision
CORVUS	CORVUS Environmental Consulting, LLC
CU	University of Colorado
CWA	Clean Water Act
DCS	Direct Construction Subtotal
DHI	DHI Water and Environment, Inc.

Abbreviation	Term
El.	Elevation
EM100	100-Year Effective Model
EM500	500-Year Effective Model
ESA	Endangered Species Act
EPA	Environmental Protection Agency
ERO	ERO Resources
FEMA	Federal Emergency Management Agency
Flatirons	Flatirons, Inc.
HDR	HDR, Inc.
HMR	Hydrometeorological Report
H:V	Horizontal to Vertical
IDF	Inflow Design Flood
LEDPA	Least Environmentally Damaging Practicable Alternative
LOMR	Letter of Map Revision
MHFD	Mile High Flood District
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
OPPC	Opinion of Probable Project Cost
OSBT	Open Space Board of Trustees
OSMP	Open Space and Mountain Parks
OS-O	Open Space – Other
PK-U/O	Park, Urban, and Other
PMJM	Preble's meadow jumping mouse
PMP	Probable Maximum Precipitation
Project	South Boulder Creek Regional Detention
PUB	Public
PVC	Polyvinyl chloride
RCBC	Reinforced Concrete Box Culverts
RCP	Reinforced Concrete Pipes
Report	Concept Design Report
RJH	RJH Consultants, Inc.
ROW	Right-of-Way
Rules and Regulations	Rules and Regulations for Dam Safety and Dam Construction
SBC	South Boulder Creek
SEO	Colorado Office of the State Engineer
T&E	Threatened and Endangered
ULTO	Ute-ladies'-tresses orchid

Abbreviation	Term
US36	U.S. Highway 36
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
V1-500	Variant 1, 500-Year
WOTUS	Waters of the United States
WRAB	Water Resources Advisory Board
WSE	Water Surface Elevation

SECTION 1 – INTRODUCTION

1.1 Purpose and Objectives

RJH Consultants, Inc. (RJH) was retained by the City of Boulder (City) and Mile High Flood District (MHFD) to provide engineering services for the South Boulder Creek (SBC) Regional Detention (Project). The initial phase of work for the Project consists of developing concept-level alternatives to facilitate the City's selection of a preferred alternative to advance into preliminary design.

The primary objectives of the concept design include:

- Develop approximate sizes and general layouts for possible alternatives.
- Identify potential environmental permitting issues that could impact selection of a preferred alternative.
- Identify concept selection criteria.
- Populate concept selection criteria for each alternative.
- Develop a cost opinion suitable to compare alternative costs.

The purpose of this Concept Design Report (Report) is to present the methodology, results, and conclusions of the concept design. The concept design presented in this Report is based on engineering judgment, our previous experience on similar projects, hydrologic and hydraulic modeling, our current understanding of subsurface and groundwater conditions based on initial site investigations, and limited engineering analyses of Project components. The information in this Report is expected to be refined and modified during the preliminary design phase.

1.2 Background

Over the past 80 years, SBC has flooded significantly six times. SBC has limited channel capacity upstream of U.S. Highway 36 (US36), and US36 overtops during large storm events. Overtopping stormwater flows north and west to a low point on the University of Colorado's (CU) Boulder South campus parcel near US36 and Table Mesa Drive. In sufficiently large flood events, stormwater overtops US36 and floods extensively through a portion of the City known as the West Valley that includes portions of the Frasier Meadows, Keewaydin Meadows, and East Boulder neighborhoods. SBC flooded in 1938, 1950, 1969, and 2013.

The City initiated a floodplain remapping study in 2003 that formally recognized flood risks from the overtopping of US36. This study was adopted by the City in 2008 and accepted by the Federal Emergency Management Agency (FEMA) in 2010. Following the floodplain remapping study, the City partnered with MHFD in 2009 to initiate a flood mitigation master plan to identify options to mitigate flooding from SBC. The plan recommended improvements in three phases:

1. Regional stormwater detention at US36.
2. Improvements in the West Valley.
3. Stormwater detention at Flatirons Golf Course.

Six planning-level layouts were developed for the regional stormwater detention facility at US36. The preferred layout (Option D) included an earthen embankment along the north portion of the CU Boulder South campus, a floodwall in the Colorado Department of Transportation (CDOT) right-of-way (ROW), and fill and excavation on the CU Boulder South campus. The SBC Flood Mitigation Master Plan was accepted by City Council in 2015.

Following the 2015 Master Plan and acceptance of the Option D concept, the CU Boulder South campus' potential future was extensively and publicly discussed as part of the 2015 Boulder Valley Comprehensive Plan (BVCP) update (City of Boulder and Boulder County, 2017). Acceptance of the BVCP update in July 2017 changed the land use designations for approximately 80 acres of the CU Boulder South campus to facilitate construction of the regional stormwater detention facility at US36. The BVCP CU Boulder South Guiding Principles also provided direction to consider mitigating flood risk to the highest practicable standard while balancing environmental, social, and financial impacts.

The City and MHFD retained RJH to provide engineering services for conceptual and preliminary design of the regional stormwater detention facility at US36 (Phase I). The City requested that RJH refine the preferred Master Plan alternative (Option D) to accommodate considerations from the BVCP update and evaluate additional concepts that could reasonably be implemented in the vicinity of the US36 regional detention facility site to reduce the risk for overtopping of US36 during a major flood event while also addressing other parameters established during the master planning process.

1.3 Scope of Services

RJH performed the following services for the concept design phase of the Project:

1. Managed and coordinated the work performed by RJH and our subconsultants.
2. Prepared invoices and a monthly written progress report.
3. Collected, reviewed, and evaluated previous reports developed by others.
4. Performed topographic surveying, and identified property boundaries and easement limits.
5. Developed a base map for use in design.
6. Performed subsurface investigations to begin collecting baseline groundwater data and improve our understanding of general subsurface conditions.
7. Performed hydrologic analyses to develop the Inflow Design Flood (IDF) hydrograph in accordance with Colorado Office of the State Engineer (SEO) *Rules and Regulations for Dam Safety and Dam Construction* (SEO, 2007) (Rules and Regulations).
8. Modified the effective FEMA regulatory model using the MIKE FLOOD program to incorporate the detention facility at US36 and performed flood routing to support sizing of Project facilities.
9. Developed and evaluated concept-level layouts for Project configurations for the proposed detention facility.
10. Performed wetlands mapping and concept-level evaluations on impacts to open water and threatened and endangered (T&E) species habitat.
11. Developed quantity estimates for primary materials required to construct the Project components.
12. Prepared an ASTM E 2516-11 Class 4 (i.e., high-level, non-budgetary) opinion of probable project cost (OPPC) for each alternative.
13. Prepared concept-level figures to illustrate the Project configurations.
14. Conducted Phase I geotechnical investigations.
15. Supported and participated in City public meetings related to the Project.

1.4 Project Personnel

The work described in this Report was completed by RJH as the prime consultant with assistance from the following subconsultants (collectively referred to as the RJH Team):

Hydraulic Modeling:	DHI Water and Environment, Inc. (DHI)
Environmental Permitting:	CORVUS Environmental Consulting, LLC (CORVUS)

Surveying: Flatirons, Inc. (Flatirons)

The following RJH team personnel are responsible for the work contained in this Report:

Project Manager:	Robert Huzjak, P.E. (RJH)
Project Engineer:	Eric Hahn, P.E. (RJH)
Lead Geotechnical Engineer:	Adam Prochaska, Ph.D., P.E., P.G. ⁽¹⁾ (RJH)
Lead Hydraulic Modeler:	Ian Dubinski, Ph.D. (DHI)
Lead Environmental Scientist:	Timothy DeMasters (CORVUS)
Staff Engineers:	Jacquelyn Hagbery, P.G. ⁽¹⁾ , E.I. (RJH)
	Samantha Guillies, E.I. (RJH)
Technical Advisor:	Stephen Blake, P.E. (DHI)

Note 1: Licensed in states other than Colorado.

The work described in this Report was overseen and coordinated by the City and MHFD. The City and MHFD team include the following personnel:

City Project Manager:	Brandon Coleman, P.E.
Project Advisor:	Douglas Sullivan, P.E.
Dam Safety Advisor:	Kevin Clark, P.E.
MHFD Advisor:	James Watt, P.E.
Director of Public Works	Joseph Taddeucci, P.E.

SECTION 2 – EXISTING CONDITIONS

2.1 General

The RJH Team reviewed existing data and performed site reconnaissance to better understand and define the existing site conditions. Existing land uses, constraints, and site conditions are expected to have a significant impact on development of the Project.

The Project site is located in southeast Boulder County, Colorado, adjacent to City limits. The Project site is generally located south of US36, west of SBC, and east of several residential communities. Property owners include CU, Open Space and Mountain Parks (OSMP), and CDOT. A site vicinity map is presented on Figure 2.1 and a site plan is presented on Figure 2.2.

2.2 University of Colorado Boulder South Campus

The CU Boulder South campus is a 308-acre property located south of US36, east of several residential communities, and west of OSMP property. The CU Boulder South campus currently includes a tennis complex, a maintenance building with an asphalt parking lot, and a series of pedestrian trails. The pedestrian trails experience significant use from the public throughout the year. The tennis complex is used seasonally by the CU athletic department.

A plan of CU Boulder South campus and BVCP land use designations is presented on Figure 2.3.

Gravel mining operations were performed on the CU Boulder South campus property before it was acquired by CU. The gravel mining created a large excavation that is about 10 to 15 feet below the original ground surface. Gravel mining operations also created a series of below-grade ponds that fill with groundwater. Water levels in these ponds fluctuate with groundwater levels.

An earthen levee extends along the south and east boundaries of the CU Boulder South campus. The levee is approximately 7,500 feet long and varies in height with a maximum height of about 14 feet. The levee was constructed in 1980 and consists primarily of clayey sand materials. The levee was raised in 1998 and certified by FEMA in 2000. The levee was raised again in 2009 based on updated hydraulic modeling and subsequently recertified by FEMA (Leonard Rice, 2009). A pedestrian trail extends

along the crest of the levee. The dry-side slope is covered with grasses and other vegetation. The wet-side slope is covered by riprap slope protection. Dry Creek Ditch No. 2 extends along the upstream toe of the levee. A drainage channel extends along the dry-side of the levee. This channel was constructed to collect surface water runoff from behind the levee and convey the runoff to an outfall at Viele Channel.

Viele Channel extends through the northwest portion of the CU Boulder South campus. Viele Channel is tributary to SBC and has a basin area of approximately 1 square mile upstream of the CU Boulder South campus. A majority of the Viele Channel watershed consists of residential land use. Flow in Viele Channel is conveyed beneath the US36 east-bound on-ramp through three 72-inch diameter culverts and subsequently beneath US36 through three 60-inch diameter culverts.

South Loop Drive is the primary means of vehicle access to the CU Boulder South campus. South Loop Drive is a 24-foot-wide, paved road that extends from Table Mesa Drive to the existing CU maintenance building and gravel parking lot. South Loop Drive is owned and maintained by CU.

As part of the 2017 update to the BVCP, the land use designations for the CU Boulder South campus were amended to provide the following designations:

- **Open Space – Other (OS-O):** This area generally corresponds with the regulatory 500-year floodplain on the east portion of the CU Boulder South campus (approximately 119 acres). The intent of this land is that it would be maintained primarily as open space for floodplain functionality, recreation, and ecological benefits.
- **Public (PUB):** This area is located on the west portion of the CU Boulder South campus (approximately 129 acres). This land will be developed in the future as part of development of the CU Boulder South campus.
- **Park, Urban, and Other (PK-U/O):** This area is located on the north portion of the CU Boulder South campus (approximately 65 acres) and generally corresponds with Option D presented in the 2015 Master Plan. This land has been designated for flood mitigation facilities and allows for active and passive recreational uses.

2.3 Open Space and Mountain Parks Property

OSMP property is located on both sides of US36, west of SBC, and east of the CU Boulder South campus. The OSMP property contains extensive wetlands and federally

listed T&E species habitat for the Preble's meadow jumping mouse (PMJM) and Ute-ladies'-tresses orchid (ULTO).

Viele Channel extends through the west edge of OSMP property, north of US36. In this reach, Viele Channel consists of a trapezoidal channel with thick vegetation. Numerous other ditches and small drainage channels extend through the OSMP property, including Dry Creek Ditch No. 2. A gravel pedestrian trail extends north-south through the property and experiences significant use from the public. The property is also used for cattle grazing seasonally and portions are irrigated for hay production.

2.4 Colorado Department of Transportation Right-of-Way

The CDOT Right-of-Way (ROW) extends parallel to and on both sides of US36. Along the south ROW, a small drainage ditch is located in the ROW along the shoulder of the road. The drainage ditch collects surface water runoff from east-bound lanes on US36. A concrete multi-use trail is also located in the south ROW. The multi-use trail experiences significant use from the public. Additionally, multiple buried utilities are located throughout the ROW.

A series of culverts extend from the CDOT ROW beneath US36. These include dual 4-foot by 10-foot reinforced concrete box culverts (RCBC) that function as a wildlife crossing, a 4-foot by 6-foot RCBC to convey Dry Creek Ditch No. 2 flows, three 60-inch-diameter reinforced concrete pipes (RCP) to convey Viele Channel flows, and multiple smaller RCPs for site drainage.

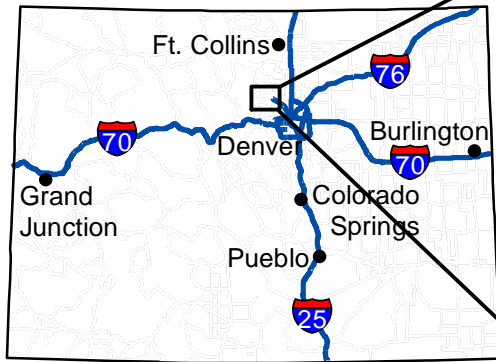
SBC extends beneath US36 through a multi-span bridge. The bridge was widened in 2014 as part of the US36 widening project. The bridge has three spans that total approximately 115 feet with a row of concrete bridge piers on each creek bank about 47 feet apart. The concrete multi-use trail extends below the bridge to the west of SBC. A plan of facilities along the US36 ROW is presented on Figure 2.4.

2.5 South Boulder Creek

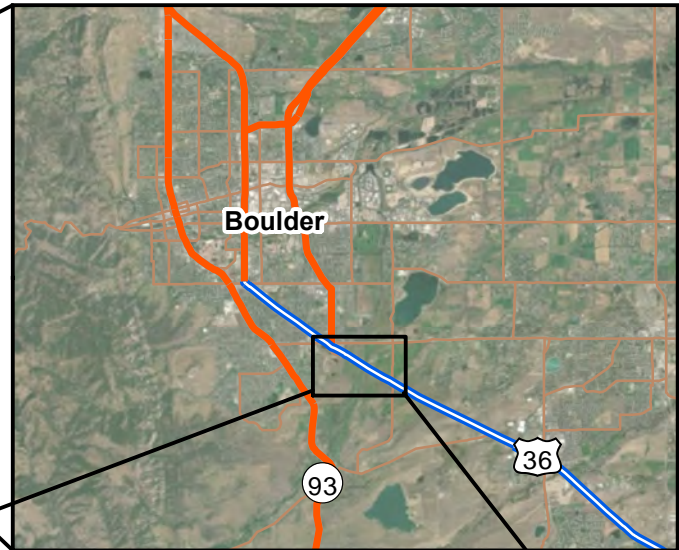
SBC is a major drainageway that extends from its headwaters in the mountains through Eldorado Canyon and subsequently southeast of the City before discharging to Boulder Creek. The SBC watershed encompasses approximately 136 square miles. Gross Reservoir is located on SBC upstream of Eldorado Canyon and is a water supply reservoir owned and operated by Denver Water. No reservoir volume is allocated for flood control in Gross Reservoir, but the reservoir provides significant temporary flood

storage above the spillway crest. Approximately 90 square miles of the SBC watershed is located upstream of Gross Reservoir.

SBC has limited channel capacity through the Project site and overflows the main channel during large storm events. The US36 embankment directs overflowing flood waters north and west to a low point located at the northwest corner of the CU Boulder South campus near US36 and Table Mesa Drive. Flood waters pond in this area before overtopping US36 and flooding extensively through a portion of the City known as the West Valley. The West Valley generally follows the alignment of Foothills Parkway and consists of a mixture of residential and commercial structures. Flooding of the West Valley occurred in 1969 and 2013. The 2013 flood event on SBC was estimated to be between about a 75- to 100-year event (Wright Water Engineers, 2014).



**PROJECT VICINITY MAP
(NOT TO SCALE)**



**PROJECT LOCATION MAP
(NOT TO SCALE)**



**SITE LOCATION MAP
(NOT TO SCALE)**

P:\16134 - South Boulder Creek\Engineering\GIS\Concept Development\Concept Design Report\Site Vicinity Map.mxd



SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

SITE VICINITY
MAP

S. Boulder Rd

Viele Channel

Dry Creek Ditch No. 2

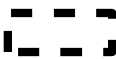



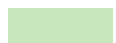
U.S. 36

South Boulder Creek

CU Levee



0 400 800 1,600
Feet

-  CU South Boundary
-  Existing 100-Year Floodplain
-  Existing 500-Year Floodplain
-  Prebles Habitat Area
-  OSMP Land

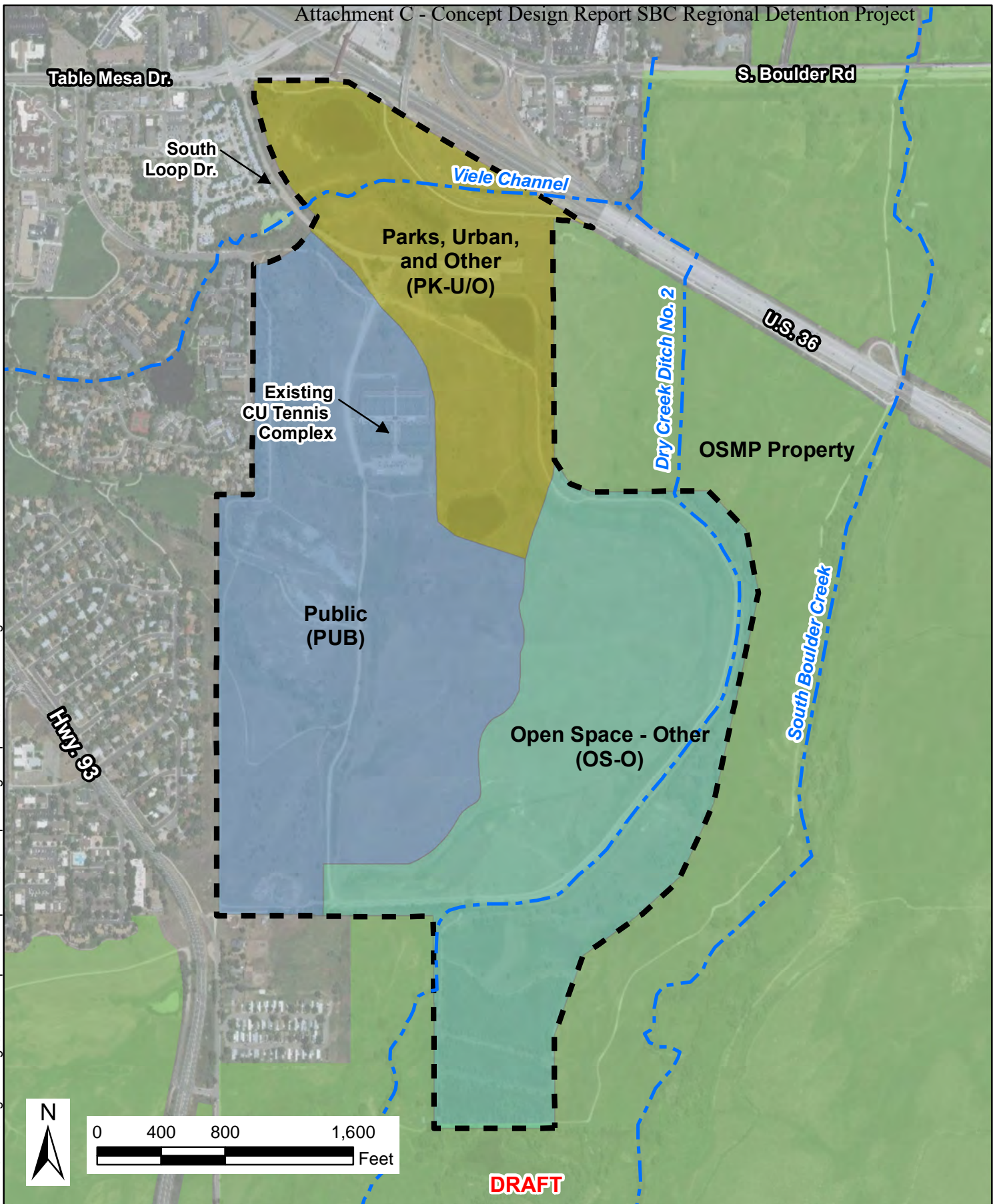
DRAFT

**REPRODUCE
IN COLOR**



SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

EXISTING CONDITIONS
SITE PLAN

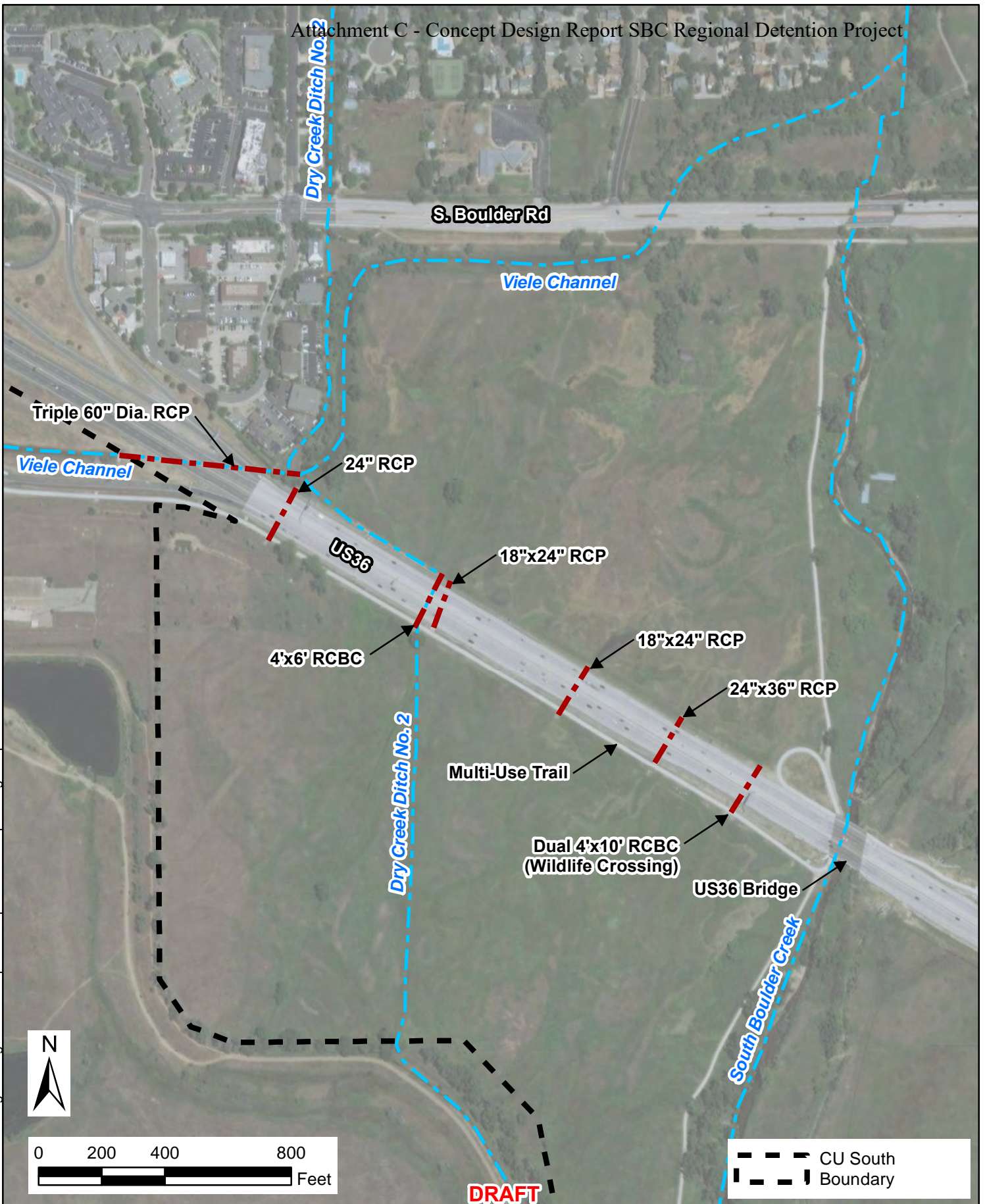


**REPRODUCE
IN COLOR**



SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

CU SOUTH CAMPUS
AND LAND USE
DESIGNATIONS



**REPRODUCE
IN COLOR**



SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

PLAN OF
FACILITIES ALONG
US36 ROW

SECTION 3 – PREVIOUS STUDIES AND REPORTS

3.1 General

Numerous planning and engineering studies of SBC and surrounding areas have been performed over the last several decades for the City, MHFD, and others. The RJH Team collected and reviewed previous studies including flood mapping studies, hydrology reports, and major drainageway master plans. A summary of relevant previous studies is provided below.

3.2 Flood Mapping Study

HDR, Inc. (HDR) completed a comprehensive flood mapping study that serves as the basis for the FEMA regulatory floodplain. The HDR study consisted of three reports:

- *South Boulder Creek Climatology/Hydrology Report* (HDR, 2007).
- *South Boulder Creek Hydraulic Modeling Report* (HDR, 2008).
- *South Boulder Creek Risk Assessment Report* (HDR, 2009).

The *South Boulder Creek Climatology/Hydrology Report* evaluated basin-specific design storms for both the general storm (i.e., long-duration) and thunderstorm (i.e., high-intensity, short-duration) precipitation events for return frequencies ranging from 2 to 500 years. Various combinations of spatial orientations were evaluated to identify critical precipitation events. In general, storms containing the created main stem peak flows were determined to occur in the lower watershed (i.e., downstream of Gross Reservoir).

Rainfall-runoff analyses were performed using a MIKE 11 model, which is part of DHI's MIKE FLOOD proprietary software program. MIKE 11 is a dynamic, one-dimensional hydrologic model. The watershed was divided into 27 sub-basins and hydrologic characteristics were developed for each sub-basin.

Hydraulic modeling was performed using a combination of MIKE 11 and MIKE 21 models. MIKE 11 was used to model the channel and hydraulic structures along the mainstem of SBC and major tributaries. MIKE 21 was used to model overbank and floodplain areas. The following blockages were used in the FEMA regulatory model at relevant structures:

- US36 bridge at SBC: 10-foot-wide obstructions at both bridge piers (approximately 20 percent blocked).

- Dry Creek Ditch No. 2 culvert at US36: 35 percent blocked.
- Viele Channel culvert at US36: 0 percent blocked.

Topographic information was developed from photogrammetry obtained by the City in 2003. A 4-meter grid was used to develop the FEMA regulatory model.

3.3 Master Plans

Several comprehensive master plans have been developed to identify and evaluate flood mitigation concepts along SBC. These include:

- Taggart Engineering Associates, *South Boulder Creek Major Drainageway Planning Phase A Report* (Taggart, 2001).
- CH2M, *Final South Boulder Creek Major Drainageway Plan – Alternative Analysis Report* (CH2M, 2015).

The 2015 Master Plan superseded the 2001 Master Plan. The primary purpose of the 2015 Master Plan was to identify alternatives to address flood issues in the West Valley. Flood studies prior to 1996 did not identify a flood threat in the West Valley from SBC, and the West Valley was subsequently developed without consideration for a large flood event. As part of the 2015 Master Plan, 15 initial alternatives were developed to mitigate downstream flooding and meet other Project criteria including preserving OSMP property, reducing environmental impacts and disruptions to the public, etc. The alternatives were conservatively sized using peak flow rates from the regulatory MIKE FLOOD model and a simplified hydraulic modeling approach using the Environmental Protection Agency's (EPA) Storm Water Management Model.

Nine of the 15 alternatives were identified as "Best Alternative Plans." Hydraulic modeling was performed to develop sizes and configurations for each alternative using a modified version of the regulatory MIKE FLOOD model. The model was modified to accommodate shorter model run durations. The modified model was developed by reducing the topographic grid resolution from 4 meters to 8 meters and truncating modeling extents as practicable. Based on recommendations from WRAB and OSMP staff, the nine "Best Alternative Plans" were subsequently reduced to five. The five preferred alternate plans from the Master Plan included:

- Status Quo.
- High-Hazard Zone Mitigation.
- Regional Detention Facility at US36.

- Distributed Regional Detention.
- Bear Canyon Creek Pipeline.

These five alternate plans were evaluated for multiple considerations including benefit-cost, water quality, environmental impacts, T&E species impacts, OSMP impacts, and social impacts. The Regional Detention Facility at US36 with downstream improvements was selected as the recommended alternative. The recommendation included implementing the project in the following phases:

- Phase I – Regional Detention Facility at US36.
- Phase II – West Valley Improvements.
- Phase III – Stormwater Detention Facility at Flatirons Golf Course.

Six planning-level layouts were then developed for the regional detention facility at US36 to reduce impacts to OSMP property and ensure compatibility with the US36 widening project (CH2M, 2015). The preferred layout (Option D) included an earthen embankment along the north portion of the CU Boulder South campus, a floodwall in the CDOT ROW, and fill and excavation on the CU Boulder South campus. The combination of excavation and fill on the CU Boulder South campus was selected to reduce impacts to OSMP and CU Boulder South campus property. The floodwall in the CDOT ROW was required because space constraints in the ROW would prohibit the construction of an earthen embankment.

3.4 Boulder Valley Comprehensive Plan Update

Following the 2015 Master Plan and acceptance of the Option D concept, the CU Boulder South campus' potential future was extensively and publicly discussed as part of the 2015 BVCP update. This input ultimately led to the creation of CU Boulder South Guiding Principles approved by the City Planning Board, City Council, Boulder County Planning Commission, Boulder County Board of County Commissioners, and CU.

Acceptance of the BVCP update in July 2017 changed the land use designations for approximately 80 acres of the CU Boulder South campus to facilitate construction of the regional stormwater detention facility at US36. The BVCP CU Boulder South Guiding Principles also provided direction to consider mitigating flood risk to the highest practicable standard while balancing associated environmental, social, and financial impacts. These guiding principles included:

- Developing and evaluating detention storage alternatives that consider removal of the existing CU levee.
- Developing and evaluating detention storage alternatives based on a long-duration storm event and a 500-year FEMA storm event, in addition to the 100-year FEMA storm event.
- Conducting groundwater assessments to collect information necessary to verify feasibility and for design of any necessary conveyance systems.
- Seeking opportunities for ecological restoration and improvement.

3.5 Conditional Letter of Map Revision and Letter of Map Revision

A Conditional Letter of Map Revision (CLOMR) was prepared by Plenary Roads and Michael Baker Jr., Inc. to document changes in the SBC floodplain resulting from the US36 widening project. Typically, a CLOMR is performed using the same modeling approach and software as the effective regulatory study. However, modeling for this CLOMR was performed using a one-dimensional HEC-RAS model instead of the MIKE FLOOD model, which is the effective regulatory model. The change in modeling approach and software was discussed and approved by the City, Boulder County, MHFD, and FEMA. Manning's n values and blockage percentages of key structures were generally unchanged from the effective model. A series of lateral structures were used in the HEC-RAS model to account for the transfer of flow between reaches to replicate two-dimensional effects. The CLOMR did not evaluate any impacts associated with the Project.

The proposed conditions model included the following changes:

- Widening US36 and reconstructing it to have a center crown.
- Widening the US36 bridge over the main channel of SBC.
- Adding an elevated bikeway parallel to US36.
- Adding two wildlife crossing culverts under US36. These culverts were modeled as 35 percent blocked.

Based on CLOMR modeling, base flood elevations would increase in some areas and decrease in other areas. Most increases would occur upstream of US36 along the portion of flow that overtops the SBC main channel and flows west along the US36 embankment. The maximum increase in this area is 0.21 feet, which would occur to the east of the Dry Creek Ditch No. 2 culvert. The model was subsequently updated following construction and a Letter of Map Revision (LOMR) was issued by FEMA in 2017.

SECTION 4 – DATA COLLECTION

4.1 General

Various types of data collection will be required throughout the Project to advance the design. During the concept design, the RJH Team performed topographic surveying, a preliminary geotechnical investigation program, and an environmental survey. A description of data collection performed is provided below.

4.2 Topographic Survey

Flatirons performed topographic surveying in winter 2018 to develop a base map. Topographic surveying was performed using a combination of aerial survey equipment and conventional (i.e., field) survey equipment to develop a base map of the Project site. The limits of the survey are presented on Figure 4.1. Topography used for the base map for areas outside the limits of survey was obtained from City LiDAR data developed in 2013 prior to the 2013 flooding.

4.3 Geotechnical Investigation

An initial geotechnical investigation (i.e., Phase I) was performed concurrently with the concept design. The objectives of the initial geotechnical investigation included:

- Advancing the generalized understanding of geologic, geotechnical, and hydrogeological conditions at and around the site.
- Evaluating foundation conditions along the floodwall alignment.
- Evaluating available on-site borrow materials.
- Obtaining data to develop and calibrate a preliminary baseline groundwater model of the SBC alluvial valley.

The initial geotechnical investigation included advancing geotechnical borings at 26 locations throughout the SBC valley and performing geotechnical laboratory tests on collected subsurface materials. Monitoring wells were installed in 24 of the borings to provide long-term monitoring of groundwater levels. A plan of boring locations is presented on Figure 4.2.

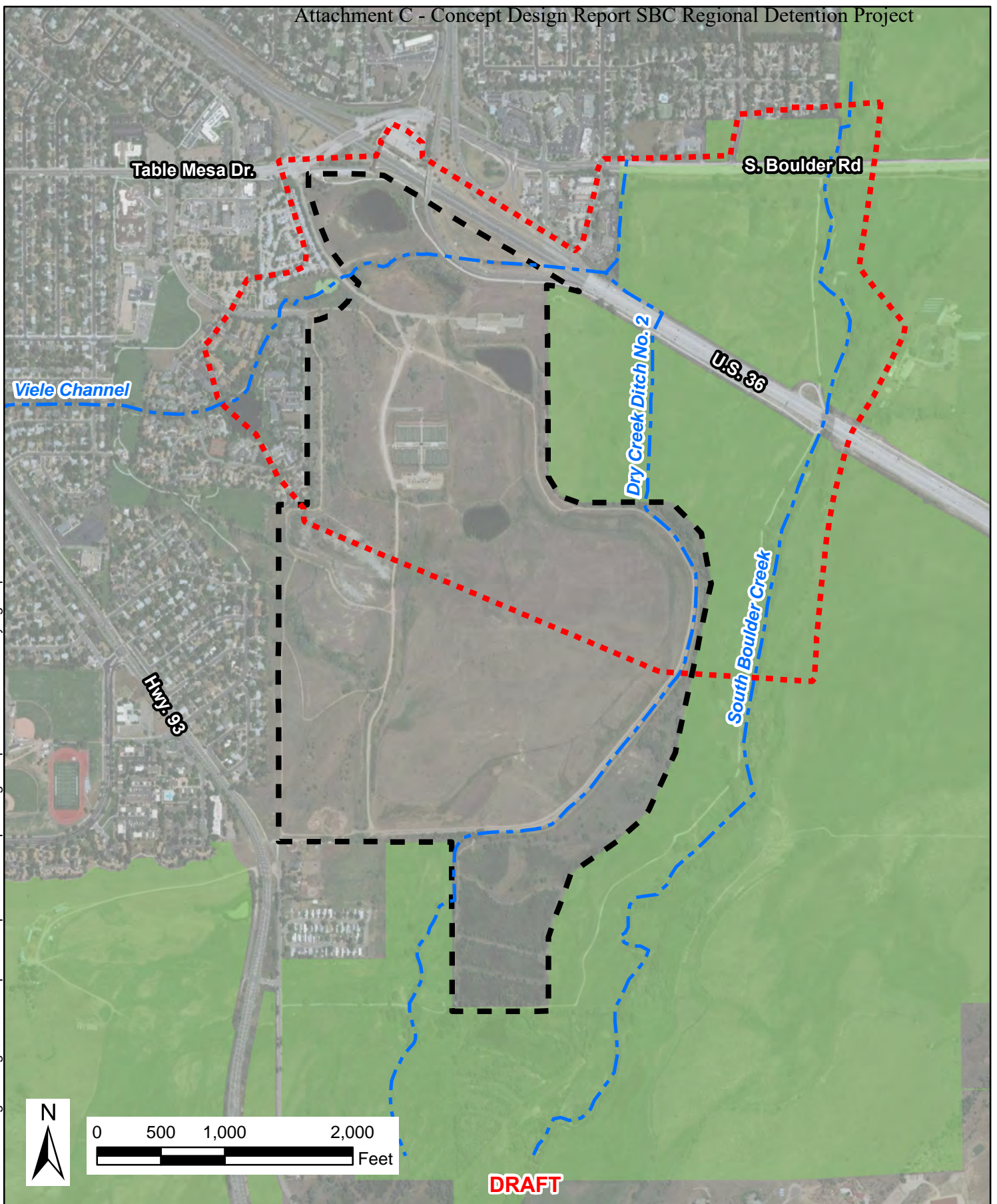
A summary of data collected and laboratory test results is presented in the *Phase I Geotechnical Data Report – South Boulder Creek Regional Detention* (RJH, 2019). Additional geotechnical investigations will be performed in subsequent stages of Project development as appropriate to advance the design.

4.4 Environmental Survey

CORVUS performed an environmental survey between September 11 and October 14, 2019 that included delineating Waters of the United States (WOTUS) and assessing potential habitat for T&E species listed under the Endangered Species Act (ESA). The WOTUS delineation included identifying channels, ditches, open water, and wetlands abutting or adjacent to such features. The wetland determination followed methods described in the U.S. Army Corps of Engineers (USACE) *Wetlands Delineation Manual* (USACE 1987) and, where applicable, in accordance with the methods identified in the Regional Supplement to the USACE Wetland Delineation Manual: Great Plains Region (Supplement) (USACE 2010). As part of preparation for this field work, CORVUS reviewed readily available information, including U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory, U.S. Geological Survey National Hydrography Dataset, Natural Resources Conservation Service (NRCS) soil mapping, previous wetland mapping on the CU Boulder South campus performed by ERO Resources (ERO), and Google Earth aerial imagery.

Using methods described in the Supplement, CORVUS collected data on vegetation, soil, and hydrology characteristics that are used as the basis for wetland boundary determinations. CORVUS identified plant species observed in the study area using Flora of Colorado (Ackerfield 2015), with nomenclature following the National Wetland Plant List (Lichvar et al. 2016). Wetland indicator status of each species was determined based upon the National Wetland Plant List. If a species is not listed in the National Wetland Plant List, then nomenclature follows PLANTS Database (USDA, NRCS 2019).

Data on wetland boundaries and the ordinary high-water mark were gathered in the field with a global positioning system unit and were digitized into ArcGIS shapefiles using high-resolution aerial photography. All wetland and waters boundaries are considered preliminary until approved by the USACE.

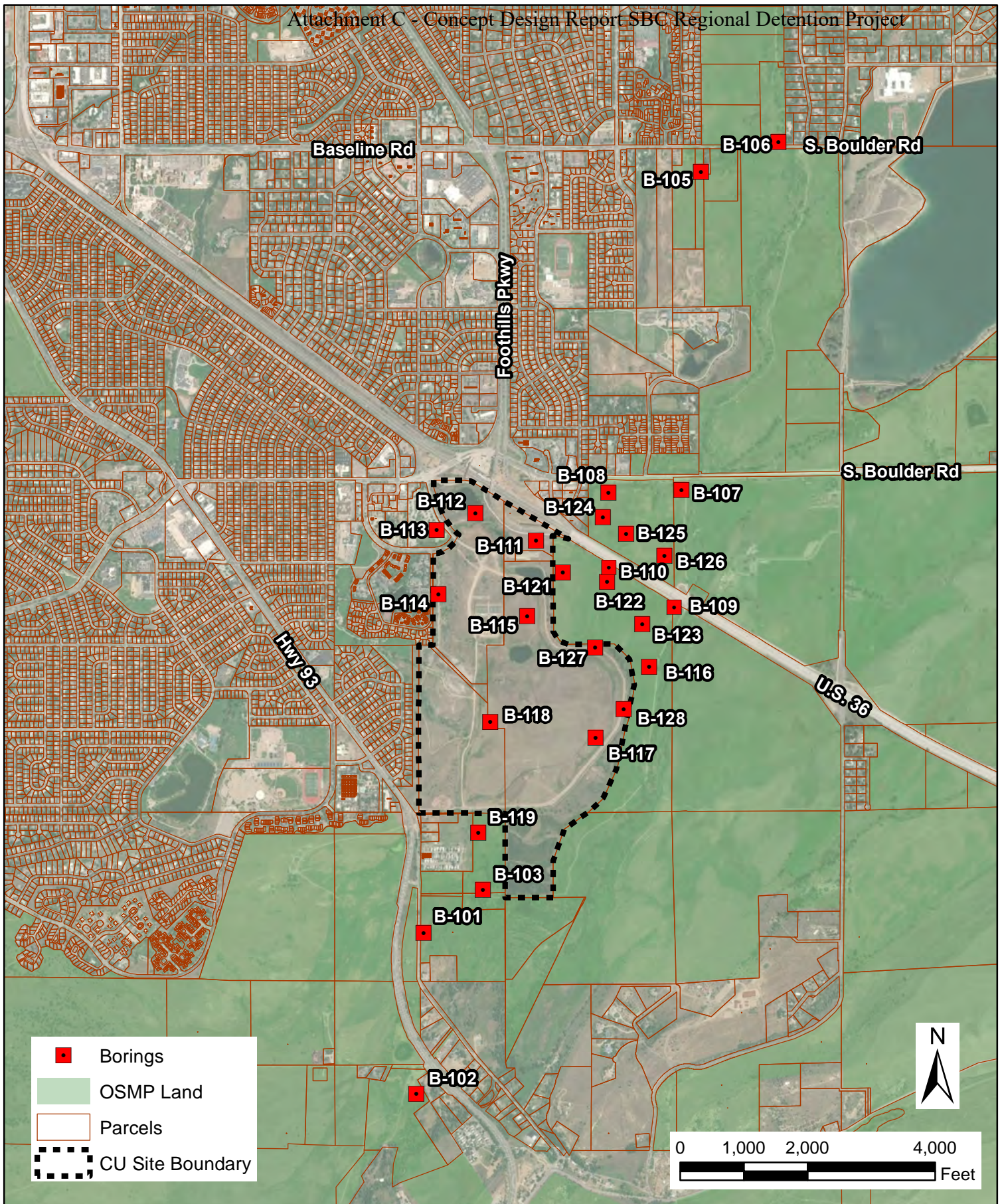


- - - - Limit of Survey
- CU Site Boundary
- OSMP Land



SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

PLAN OF
LIMIT OF SURVEY



SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

PLAN OF
GEOTECHNICAL BORINGS

SECTION 5 – ALTERNATIVES

5.1 Background

The RJH Team, the City, and MHFD (collectively referred to as the Project Team) identified a series of key issues that would impact development of the Project based on our collective understanding of Project objectives, constraints, site conditions, public input, and City staff input. Based on these key issues, the Project Team initially identified and evaluated three general concept-level alternatives for the detention facility at US36. The initial concept-level alternatives included:

- **Master Plan:** This alternative built upon Option D presented in the 2015 Master Plan and included an earthen embankment along the northwest portion of the CU Boulder South campus, a structural floodwall in the CDOT ROW, a 60-inch-diameter outlet tunnel below US36, and detention excavation on the PK-U/O land use area.
- **Variant 1:** This alternative was similar to the Master Plan; however, the alignment of the earthen embankment was shifted to the south of Viele Channel. This alignment would allow Viele Channel to flow unobstructed in its existing configuration.
- **Variant 2:** This alternative consisted of constructing a flow control structure across SBC at the US36 bridge, an earthen embankment near the existing CU levee, and a structural floodwall in the CDOT ROW. The reservoir footprint would be primarily located on OSMP property instead of the CU Boulder South campus.

These three alternatives were evaluated for both the 100-year and 500-year flood events. The evaluation included developing concept-level layouts and cost opinions.

On August 7, 2018, the Project Team presented the results of the initial evaluation to City Council. On August 21, 2018, City Council directed the Project Team to proceed with preliminary design for the Variant 1, 500-year (V1-500) configuration and to concurrently evaluate ways to reduce flood detention on the PUB land use area because approximately 36 acres of the PUB land use would be inundated in this configuration. City Council requested that the Project Team return on September 20, 2018 to present high-level (i.e., feasibility-level) concepts of modifications to the V1-500 configuration to meet direction provided by City Council.

On September 20, 2018, the Project Team presented three high-level concepts to modify the V1-500 configuration to reduce the flood detention on the PUB land use area. Concept-level layouts and cost opinions were not developed. These high-level concepts included:

- Enlarging the detention excavation on the PK-U/O land use area.
- Adding fill on the OS-O land use area and changing the land use designation to PUB.
- Constructing a supplemental upstream storage reservoir on the CU Boulder South Campus property.

On September 20, 2018, City Council directed the Project Team to perform a concept-level evaluation of enlarging the detention excavation on the PK-U/O land use area. This included developing concept-level layouts and cost opinions. The results of this evaluation were presented to City Council on February 5, 2019. At this meeting, City Council directed the Project Team to abandon the enlarged excavation concept and continue to advance preliminary design of the initial V1-500 configuration.

Subsequent to the February 5, 2019 City Council meeting, CU provided a letter to the City stating that inundating 36 acres of the PUB land use area would be unacceptable. In addition, CDOT stated that above-ground portions of the Project must be built generally outside of the existing US36 ROW. This would require shifting the floodwall to OSMP property. Also, CDOT stated that the Project could not impact the existing US36 bridge at SBC. This would generally prohibit a) physical modifications to the bridge and b) increases in hydraulic conditions (i.e., flow rates and velocities) through the bridge.

On July 16, 2019, City Council provided the following direction to the Project Team:

- Evaluate changes in the design storm in conjunction with proposed changes to the existing land use designations on the CU Boulder South Campus to maintain 129 acres of buildable area for CU.
- Continue to advance preliminary design of the initial V1-500 configuration.

Based on direction provided by City Council and clarification from CDOT, the Project Team identified the following potential modifications to the initial V1-500 configuration:

- Decreasing the magnitude of the design event to less than the 500-year event.
- Placing fill on other portions of the CU Boulder South campus site to provide buildable area above the 500-year floodplain for CU.

- Increasing the capacity of the outlet tunnel. Increases in capacity would be limited by Viele Channel capacity, downstream flooding impacts, and pipe cover requirements.

The Project Team identified additional concept-level alternatives to evaluate based on combinations of these potential modifications. The alternatives are modifications of the initial V1-500 configuration and are described below.

- **Option 1:** This option would be designed for the 100-year event and would include an earthen embankment along the northwest portion of the CU Boulder South campus, a structural floodwall on OSMP property along the US36 ROW, an outlet tunnel below US36, and detention excavation on the PK-U/O land use area. Earthfill would be placed on the northern PUB land use area so that it would not be inundated during the design event. A plan of Option 1 is presented on Figure 5.1.
- **Option 2:** This option would be designed for the 500-year event and would include an earthen embankment along the northwest portion of the CU Boulder South campus, a structural floodwall on OSMP property along the US36 ROW, an outlet tunnel below US36, and detention excavation on the PK-U/O land use area. Earthfill would be placed on the OS-O land use to mitigate the portion of the northern PUB land use that would be inundated during a 500-year event. This fill could not be placed on the northern PUB land use area like Option 1 because it would reduce the detention storage to an unacceptable level for the design event. A plan of Option 2 is presented on Figure 5.2.
- **Option 3:** This option would be designed for an event between the 100-year and 500-year events and would include an earthen embankment along the northwest portion of the CU Boulder South campus, a structural floodwall on OSMP property along the US36 ROW, an outlet tunnel below US36, and detention excavation on the PK-U/O land use area. Earthfill would be placed on a combination of the northern PUB land use and OS-O land use. The entirety of this fill could not be placed on the northern PUB land use area like Option 1 because it would reduce the detention storage to an unacceptable level for the design event. A plan of Option 3 is presented on Figure 5.3.

A discussion of key issues, primary Project components, and evaluations is provided in the following sections.

5.2 Key Considerations Impacting Alternative Development

Key considerations that influenced the development and evaluation of the alternatives include:

- The Project should prevent overtopping of US36 from the design flood event. Both the short-duration, high-intensity, and long-duration design events should be considered.
- The Project cannot negatively impact existing floodplains at any upstream or downstream locations for the selected design event.
- Future impacts to regional hydrology and flooding along SBC from changes in the basin, climate change, etc. are unknown at this time. The ability to modify Project facilities in the future to accommodate a larger flood event may be desirable.
- Project facilities will temporarily detain flood water. The City does not own water rights to the flood water and detained flood water will need to be released back to SBC within 120 hours for flood events greater than the 5-year event in accordance with Colorado Revised Statute 37-92-602(8).
- Above-ground Project facilities must be built outside of the existing CDOT ROW along US36, but at- or below-ground portions of Project facilities (i.e., foundations, drains, etc.) could be installed within the existing CDOT ROW.
- Impacts to the existing US36 bridge at SBC are not acceptable to CDOT. This presently prohibits a) physical modifications to the bridge and b) increases in hydraulic conditions (i.e., flow rates and velocities) through the bridge.
- The BVCP update changed the land use designations for the CU Boulder South campus to facilitate a flood mitigation project. The selected Project configuration should be consistent with revised BVCP land use designations. Variations in land use from the BVCP update would likely require approval from the City Planning Board, City Council, Boulder County Planning Commission, Boulder County Board of County Commissioners, and CU.
- The BVCP update prohibits the construction of habitable structures on the CU Boulder South campus in the area protected by the existing levee. As a result, the existing levee does not provide flood mitigation benefits to CU. It may be desirable to remove the existing levee to potentially a) provide increased riparian connectivity between SBC and existing wetlands on the west side of the levee, and b) accommodate ecological restoration or enhancement.

- The BVCP land use update provided approximately 129 acres of buildable area for CU (i.e., PUB land use area). The Project needs to maintain this amount of buildable area for CU, but CU has stated that it may be acceptable to modify the configuration of buildable area. South Loop Drive is a public road and the primary access route to the CU Boulder South campus. Project alignments that cross South Loop Drive would require modifications to the road.
- Construction will require a detour of the multi-use trail, possibly impact the US36 east-bound shoulder, and create visual and noise disruptions to nearby residences and OSMP users. Reducing the duration of construction to the extent reasonably practicable without negatively impacting Project operations or design criteria is desirable.
- Project facilities will likely include a jurisdictional, high-hazard and extreme hydrologic hazard dam as defined by the SEO. The Project should be designed in accordance with SEO design criteria, and the design will be reviewed and approved by the SEO.
- The SEO requires that extreme hydrologic hazard dams have a spillway capable of conveying the IDF, which is based on the Probable Maximum Flood event.
- Viele Channel and other local off-site drainages flow through the site. Project facilities should allow off-site flows to be conveyed through or around the site without causing additional upstream or downstream flood impacts along these drainages.
- Several irrigation ditches including Dry Creek Ditch No. 2 flow through the Project site and are used to irrigate OSMP property. Maintaining irrigation flows on OSMP property is required.
- Jurisdictional wetlands are located throughout the site. Impacts to jurisdictional habitat would require environmental permitting and mitigation. Reducing impacts to wetlands is desirable.
- Habitat for two federally T&E species (i.e., PMJM and ULTO) is located throughout the site. Impacts to T&E species habitat would require environmental permitting and mitigation. Reducing impacts to T&E species habitat is desirable.
- Groundwater at the site is thought to sustain wetlands on both sides of US36. Groundwater will need to be conveyed through Project facilities in a manner that substantially replicates existing flow patterns to prevent upstream groundwater mounding, potential adverse impacts (i.e., flooding of basements), and drying up downstream wetlands.

- The Project will be funded by the City and MHFD. Reducing costs to extent reasonably practicable without negatively impacting Project operations or design criteria is desirable.
- Project facilities will be visible from US36, CU Boulder South campus, OSMP trails, and nearby residences. Project facilities should be aesthetically pleasing and integrate into the surrounding infrastructure and landscape.

5.3 Primary Project Components

Primary components required to develop the Project were identified for each alternative. Project components vary from heavy civil features (i.e., dams, excavation, fill, etc.) to hydraulic structures (i.e., spillway, pipelines, outlet works, etc.) to site modifications. A description of primary Project components is provided below.

5.3.1 *Earthen Embankment on CU Boulder South Campus*

The earthen embankment would generally be located in the northern portion of the CU Boulder South campus. Based on its proximity to US36 and nearby residences, the earthen embankment would most likely be classified by the SEO as a high-hazard and extreme hydrologic hazard dam. The crest elevation of the earthen embankment for each alternative configuration was established to provide 1-foot of freeboard above the routed IDF water surface elevation (WSE).

The earthen embankment would consist of a homogeneous earthfill embankment with internal filters and drains. The earthfill would have sufficiently low permeability to prevent excessive seepage during transient reservoir loading. Earthen materials required to construct the dam could be obtained from a) on-site detention excavation, b) on-site borrow from designated areas on the CU Boulder South campus, c) excavated levee materials, and d) materials imported from an off-site location. Based on preliminary data collection, the on-site soils at the CU Boulder South Campus and the levee fill appear to predominantly consist of clayey sand and gravel with about 20 to 30 percent fines. In our opinion, borrow material obtained from these on-site sources is expected to perform suitably as embankment fill. Internal filter and drain zones would be included within the embankment to safely manage seepage through the embankment fill. The filter and drain zones are anticipated to consist of specially graded sand and gravel. It might be possible to process filter and drain material from native alluvial soils present on-site, otherwise these materials will need to be imported from off-site commercial sources.

The upstream and downstream dam slopes would ideally be constructed at a 4 horizontal (H) to 1 vertical (V) slope to reduce long-term maintenance and provide improved aesthetics. The embankment crest would be 18 feet wide in accordance with SEO Rules and Regulations. This should provide sufficient width for vehicle access.

Additional analyses will be required as the design progresses to identify if a barrier wall would be required below the earthen embankments to manage seepage. If a barrier wall is required to manage seepage when the reservoir is storing water, it would likely consist of a soil-bentonite barrier wall below the centerline of the earthen embankment alignment. To construct the barrier wall, a narrow trench would first be excavated and filled with bentonite slurry to provide temporary support during construction. The excavated material would then be mixed on-site with dry bentonite powder and additional bentonite slurry to produce backfill material with the desired engineering properties. This material would then be placed back into the trench excavation to displace the bentonite slurry and provide the permanent seepage barrier. The barrier wall would connect to the earthen embankment fill at the ground surface and the underlying Pierre Shale bedrock to provide a continuous low-permeable seepage barrier along the dam alignment.

A typical section of the earthen embankment is presented on Figure 5.4.

5.3.2 Structural Floodwall along US36

A structural floodwall would be required instead of an earthen embankment along the US36 corridor to limit impacts to OSMP property and the CDOT ROW. The floodwall would extend from near the west side of the US36 bridge to the east side of the CU Boulder South campus where it would connect to the earthen embankment. The earthen embankment and floodwall would collectively comprise the high-hazard, jurisdictional dam.

The top elevation of the floodwall for each option was established at the reservoir WSE for a selected design event.

The floodwall would consist of a reinforced concrete wall with below-ground seepage control. Seepage control would be required to prevent excessive seepage through the floodwall foundation when the reservoir is full or partially full. Foundation soils along the floodwall are anticipated to contain cobbles and boulders, which would likely preclude installation of driven seepage control (e.g., sheet piles). The seepage control system would likely consist of a continuous secant pile wall, which consists of a row of concrete-filled drilled shafts (i.e., caissons) that slightly overlap each other. The secant

pile wall would extend to bedrock and provide structural support for the wall and a low-permeable barrier to foundation seepage beneath the wall.

The floodwall would also function as a spillway to convey the IDF and storm events that exceed the design event. A reinforced concrete apron would be required on the downstream side of the floodwall to dissipate energy and control erosion from overtopping flows. Spillway flows would be discharged from the concrete apron to US36 and flow north through both the SBC floodplain and West Valley. Flood inundation limits for the IDF would be similar with and without the project. A typical section of the floodwall is presented on Figure 5.5.

The above-ground portions of the floodwall (i.e., concrete wall) would be located on OSMP property directly adjacent to the CDOT ROW. At- and below-grade portions of the floodwall (i.e., spillway apron, foundation, seepage control) would be located on both OSMP property and the CDOT ROW.

The multi-use trail extends parallel to US36 through the CDOT ROW and will need to be demolished to accommodate construction of the floodwall and then reconstructed. The multi-use trail could potentially be reconstructed on either side of the floodwall. Locating the multi-use trail upstream of the floodwall may provide a more desirable experience for trail users by screening visual and acoustics impacts from US36, but would impact additional OSMP property. However, if the multi-use trail is located downstream of the floodwall, it could potentially be incorporated into the spillway apron to provide cost savings.

Various architectural treatments could be considered to the floodwall for improved aesthetics in future stages of design. Some options include concrete staining or stamping, architectural trellises to facilitate plant growth, curvilinear alignment, etc.

5.3.3 Groundwater Conveyance System

A groundwater conveyance system would be required to allow groundwater to pass through the floodwall foundation during routine operating conditions when the reservoir is empty. Conveyance of normal groundwater flows is critical to maintain the existing hydrogeologic regime, and prevent upstream groundwater mounding and lower downstream groundwater, which could impact wetlands.

The intent of the groundwater conveyance system is to convey natural aquifer flows past the floodwall without causing a hydraulic restriction. Two general categories of

groundwater conveyance systems could be used: passive and active. A passive system uses gravity to convey groundwater through the system while an active system uses mechanical pumps in addition to gravity. Passive systems are easier to operate and maintain, and we intend to use a passive system.

The passive groundwater conveyance system would consist of a collection trench upstream of the secant pile wall, a distribution trench downstream of the secant wall, and piping and valves within and between the two trenches. These trenches would be filled with permeable material and similar applications are commonly used to convey groundwater.

The upstream trench would be used to collect groundwater. The collected groundwater would be conveyed through a series of conveyance pipes spaced at regular intervals through the wall to the downstream trench for distribution. Manholes would be located at the upstream and downstream ends of the conveyance pipes for access and maintenance.

The system would be designed to have a flow capacity that exceeds that of the alluvial aquifer intercepted by the floodwall seepage barrier. During operation of the system, the regulating valves would be operated as needed to generally match the natural groundwater levels between the upstream and downstream monitoring wells. A detail of the groundwater conveyance system concept is presented on Figure 5.5.

5.3.4 *Modifications to Existing Culverts below US36*

The existing culverts below US36 will need to connect to the floodwall to facilitate flow conveyance. The Project will likely increase the potential maximum hydraulic head on each culvert. Modifications would likely be required to accommodate the increased hydraulic head, which at minimum could likely include installing energy dissipation facilities at the downstream end of the culverts. Based on simplified culvert hydraulics performed by RJH for the increased hydraulic head, we estimate that velocities through the culverts would be less than 25 feet per second, which should be acceptable for RCP that has been properly installed.

5.3.5 *Detention Excavation on CU Boulder South Campus*

To ensure that the Project does not cause additional flooding on the main stem of SBC downstream of US36, the Project must be configured to maintain or reduce flows downstream of South Boulder Road for the selected design event. To accomplish this, detention storage is required below the existing ground. The detention storage would be

achieved by excavation on the PK-U/O land use area. The largest reasonable excavation that can be achieved without steep side slopes and retaining walls is approximately 45 acre-feet (ac-ft). Excavated materials would likely be used in construction of the earthen embankment. The bottom of the excavation was set at Elevation (El.) 5343 to facilitate drainage to Viele Channel on the north side of US36.

Since the excavation would be below existing groundwater elevations, a barrier wall is needed to keep the excavation from filling with groundwater, which would render it ineffective for detention storage. The barrier wall would be similar to the barrier wall described above for the earthen embankment.

A grouted boulder rundown would be required along the northeast side of the excavation to convey overtopping flood flows from SBC into the excavation.

5.3.6 Outlet Works below US36

The lower portion of the reservoir pool would not freely drain back to SBC. An outlet works pipe would be required to meet SEO dam safety requirements and to allow the entire reservoir to be drained to meet water rights requirements. The outlet works pipe would extend from the detention excavation on the CU Boulder South campus to Viele Channel north of US36. This would require approximately 600 feet of tunneling below US36. A profile of the outlet works is presented on Figure 5.6.

Tunneling is anticipated to consist of a micro-tunneling operation where a cutterhead advances through the ground, and the outlet works pipe would be installed immediately behind the cutterhead to case the excavation. The invert of the outlet works will vary from El. 5343 to El. 5340 and is expected to be located within alluvial soils. Difficulties that would need to be considered when designing the tunneling operation include: a) high groundwater levels and high-permeable soils, b) likely cobbles and boulders within the soil, c) elevation of bedrock, and d) the presence of US36 above the tunnel alignment, which restricts allowable ground movement and would complicate access to the cutterhead if difficulties arise during tunneling.

Appropriate sizing of the outlet works pipe is crucial. The outlet works would need to be large enough to drain the reservoir in 120 hours and prevent the detention area from filling at the beginning of the flood while not increasing downstream flooding.

5.3.7 Reconstruction of South Loop Drive

The alignment of the earthen embankment would obstruct South Loop Drive. South Loop Drive would need to be reconstructed to extend above the earthen embankment. This would involve constructing an earthen ramp on both sides of the earthen embankment.

5.3.8 Fill on CU Boulder South Campus

Placing earthfill on a portion of the CU Boulder South campus would be required for all of the options to provide CU with 129 acres of buildable area. Similar to the embankment, earthen materials required to construct the earthfill could be obtained from a) on-site detention excavation, b) on-site borrow from designated areas on the CU Boulder South campus, c) excavated levee materials, and d) materials imported from an off-site location. The location and configuration of the earthfill would vary for each option. The top of the earthfill would be placed at the 500-year WSE in accordance with the BVCP update, which requires all buildings on the CU Boulder South Campus to be located outside of the 500-year floodplain.

5.3.9 Removal of CU Levee

As previously discussed, the existing CU levee does not provide flood mitigation benefits outside of the CU Boulder South property. Removing the levee would likely provide increased riparian connectivity between SBC and existing wetlands on the west side of the levee, and accommodate ecological restoration or enhancement. Excavated levee materials would likely be used in construction of the earthen embankment. Portions or the entirety of the existing levee could be removed.

5.3.10 Environmental Mitigation

Impacts to resources regulated under the Clean Water Act (CWA), City Wetland Permit Process, and the ESA must be mitigated as part of implementing any alternative. For this reason, compensatory mitigation will be necessary for permanent impacts to wetlands and habitat of PMJM and ULTO. The USACE typically requires wetland mitigation on a per-acre basis at a one-to-one (1:1) ratio. Additional mitigation acreage above that needed for the CWA Section 404 Permit will be needed to comply with the City's Stream, Wetland, and Water Body Regulations, which requires mitigation at a ratio between 2:1 and 2.5:1 for permanent wetland impacts, depending on the quality of the wetland. PMJM habitat is also mitigated on a per-acre basis and is typically

mitigated at least at a 1.5:1 ratio. Additionally, impacts to critical habitat must be mitigated within the critical habitat unit within which impacts occur. Critical Habitat Unit 5 is along SBC from just downstream of Eldorado Springs to about Baseline Road. Impacts to ULTO would consist of creating or enhancing orchid habitat at a ratio determined by the USFWS.

Compensatory mitigation for wetland and PMJM and ULTO habitat impacts is a challenging undertaking because of the many ecological parameters such as soils, hydrology, and plant communities that must be correctly established to provide successful mitigation. On-site and off-site mitigation opportunities would be evaluated in consultation with regulators.

5.4 Alternatives

5.4.1 General

Various combinations of the primary Project components described above comprise each alternative. Additional descriptions for each alternative are provided below.

5.4.2 Option 1 (100-Year)

Option 1 includes the following primary Project components:

- Earthen embankment along the northern portion of the CU Boulder South campus. The embankment concept and location would generally be the same as the original V1-500 configuration, but the embankment would be shorter/smaller based on the reduced design event and increased outlet capacity.
- Floodwall in OSMP property along the edge of the existing CDOT ROW along US36. The floodwall concept is the same as the original V1-500 concept but could be shorter in height based on the reduced design event and increased outlet capacity, and would be moved to the OSMP property.
- Groundwater conveyance system. This would remain unchanged from the original V1-500 configuration.
- Modifications to existing culverts below US36. This would remain unchanged from the original V1-500 configuration.
- Detention excavation on the CU Boulder South campus with a perimeter soil-bentonite barrier wall. This would remain unchanged from the original V1-500 configuration.

- Dual 60-inch-diameter outlet tunnels below US36. The outlet tunnel concept would generally remain unchanged from the original V1-500 configuration but the capacity would be increased from a single 60-inch-diameter pipe to dual 60-inch-diameter pipes.
- Earthfill on 34 acres of the CU Boulder South northern PUB land use area to raise the ground above the 500-year floodplain. Fill on the northern PUB land use area was not included in the original V1-500 configuration. The top of fill on the PUB land use area would be set at the 500-year WSE in SBC and transition to existing ground at a 3H:1V slope along the northern and eastern edges of the fill.
- Environmental mitigation. The environmental mitigation concept would remain unchanged from the original V1-500 configuration. However, the amount of environmental mitigation would increase because the floodwall is on OSMP property.
- Reconstruction of South Loop Drive. This would generally remain unchanged from the original V1-500 configuration.

Key elevations for Option 1 (100-Year) are based on preliminary hydraulic modeling performed by DHI and are presented in Table 5.1.

TABLE 5.1
OPTION 1 KEY ELEVATIONS (100-YEAR)

Maximum Normal WSE (ft)	IDF WSE (ft)	Top of Floodwall (ft)	Dam Crest El. (ft)
5363.8	5370.8	5363.8	5371.8

A plan of the Option 1 (100-Year) configuration is presented on Figure 5.7

5.4.3 Option 2 (500-Year)

Option 2 includes the following primary Project components:

- Earthen embankment along the northern portion of the CU Boulder South campus. The embankment concept and location would generally be the same as the original V1-500 configuration, but the embankment would be shorter/smaller based on the increased outlet capacity.

- Floodwall in OSMP property along the edge of the existing CDOT ROW along US36. The floodwall concept is the same as the original V1-500 concept but could be shorter based on the increased outlet capacity and would be moved to the OSMP property.
- Groundwater conveyance system. This would remain unchanged from the original V1-500 configuration.
- Modifications to existing culverts below US36. This would remain unchanged from the original V1-500 configuration.
- Detention excavation on the CU Boulder South campus with perimeter soil-bentonite barrier wall. This would remain unchanged from the original V1-500 configuration.
- Triple 60-inch-diameter outlet tunnels below US36. The outlet tunnel concept would generally remain unchanged from the original V1-500 configuration but the capacity would be increased from a single 60-inch-diameter pipe to triple 60-inch-diameter pipes.
- Earthfill on 34 acres of the OS-O land use area to mitigate the portion of the northern PUB land use that would be inundated by the 500-year event. The fill would be placed so that the top of the fill at the southern end is at the 500-year WSE in SBC. The fill would then slope northeast at a 2-percent slope. This quantity of fill is required to avoid the fill operating as a levee, which is prohibited by the BVCP. Placing this fill on the OS-O land use area would also require placing fill on 42 acres of adjacent southern PUB land use area. The fill on the southern PUB land use area is required so that this area is also not protected by a levee.
- Environmental mitigation. The environmental mitigation concept would remain unchanged from the original V1-500 configuration, but additional area of environmental mitigation is required based on relocating the floodwall to OSMP property and placing fill on the OS-O land use area.
- Reconstruction of South Loop Drive. This would remain unchanged from the original V1-500 configuration.

Key elevations for Option 2 (500-Year) are based on preliminary hydraulic modeling performed by DHI and are presented in Table 5.2.

TABLE 5.2
OPTION 2 KEY ELEVATIONS (500-YEAR)

Maximum Normal WSE (ft)	IDF WSE (ft)	Top of Floodwall (ft)	Dam Crest El. (ft)
5365.6	5372.6	5365.6	5373.6

A plan of the Option 2 (500-Year) configuration is presented on Figures 5.8 and 5.9. Option 2 (500-Year) sections through the CU Boulder South earthfill are presented on Figure 5.10.

5.4.4 Option 3 (Approx. 200-Year)

Option 3 (Approx. 200-Year) includes the following primary Project components:

- Earthen embankment along the northern portion of the CU Boulder South campus. The embankment concept and location would generally be the same as the original V1-500 configuration, but the embankment would be shorter/smaller based on the reduced design event and increased outlet capacity.
- Floodwall in OSMP property along the edge of the existing CDOT ROW along US36. The floodwall concept is the same as the original V1-500 concept but could be shorter in height based on the reduced design event and increased outlet capacity, and would be moved to the OSMP property.
- Groundwater conveyance system. This would remain unchanged from the original V1-500 configuration.
- Modifications to existing culverts below US36. This would remain unchanged from the original V1-500 configuration.
- Detention excavation on the CU Boulder South campus with perimeter soil-bentonite barrier wall. This would remain unchanged from the original V1-500 configuration.
- Triple 60-inch-diameter outlet tunnels below US36. The outlet tunnel concept would generally remain unchanged from the original V1-500 configuration, but two additional 60-inch-diameter pipes would be added.
- Fill placed on 17 acres of the CU Boulder South campus northern PUB land use area. Fill on the PUB land use area was not included in the original V1-500 configuration.

- Fill placed on 17 acres of the CU Boulder South campus OS-O land use area. Similar to Option 2, the fill would be placed so that the top of the fill at the southern end is at the 500-year WSE in SBC. The fill would then slope northeast at a 2-percent slope. This quantity of fill is required to avoid the fill operating as a levee, which is prohibited by the BVCP. Placing this fill on the OS-O land use area would also require placing fill on 42 acres of adjacent southern PUB land use area. The fill on the southern PUB land use area is required so that this area is also not protected by a levee. Fill on the OS-O land use area was not included in the original V1-500 configuration.
- Environmental mitigation. The environmental mitigation concept would remain unchanged from the original V1-500 configuration, but additional area of environmental mitigation is required based on relocating the floodwall to OSMP property and placing fill on the OS-O land use area.
- Reconstruction of South Loop Drive. This would remain unchanged from the original V1-500 configuration.

Key elevations for Option 3 (Approx. 200-Year) are based on preliminary hydraulic modeling performed by DHI and are presented in Table 5.3.

TABLE 5.3
OPTION 3 KEY ELEVATIONS (APPROX. 200-YEAR)

Maximum Normal WSE (ft)	IDF WSE (ft)	Top of Floodwall (ft)	Dam Crest El. (ft)
5364.5	5371.5	5364.5	5372.5

A plan of the Option 3 (Approx. 200-Year) configuration is presented on Figures 5.11 to 5.12. Option 3 (Approx. 200-Year) sections through the CU Boulder South earthfill are presented on Figure 5.13.

5.5 Evaluations

5.5.1 General

Development of the alternatives included performing the following evaluations:

- Simplified hydrologic modeling to develop an estimate of the IDF.
- Hydraulic modeling to develop sizes and configurations for each alternative.

- Concept-level evaluations of environmental impacts.

Information on the evaluations is presented below.

5.5.2 IDF Modeling

RJH performed simplified hydrologic modeling to develop an estimate of the IDF for initial spillway sizing. The simplified hydrologic modeling was performed using the 2007 SEO Rules and Regulations and will need to be updated in preliminary design using the 2020 SEO Rules and Regulations. Using the 2007 SEO Rules and Regulations for a high-hazard dam, the IDF is based on 90-percent of the Probable Maximum Precipitation (PMP). PMP depths were obtained using the National Oceanic and Atmospheric Administration (NOAA) Hydrometeorologic Report (HMR) No. 51 (NOAA, 1978). For future updates to the hydrologic analysis, we will utilize the SEO's new Regional Extreme Precipitation Study tool, which has now superseded HMR No. 51.

To provide consistency with previous hydrologic modeling, we obtained sub-basins from the *South Boulder Creek Climatology/Hydrology Report* (HDR, 2007). Hydrologic parameters (i.e., precipitation losses, lag times, etc.) for each sub-basin were estimated in accordance with the *Hydrologic Basin Parameter Response Estimation Guidelines* (SEO, 2009). A USACE HEC-HMS model was developed to identify IDF hydrographs. RJH evaluated both the general storm and local storm (i.e., thunderstorm) for two spatial distributions: an event occurring over the entire SBC watershed and an event occurring over the lower portion of the watershed (i.e., downstream of Gross Reservoir). Results of the simplified IDF evaluation are presented in Table 5.4.

TABLE 5.4
IDF RESULTS

Storm	Entire Basin		Lower Basin	
	Flow (cfs) ⁽¹⁾	Volume (ac-ft)	Flow (cfs) ⁽¹⁾	Volume (ac-ft)
General	65,800	68,500	61,100	39,600
Local	63,300	25,700	85,700	14,100

Note:

1. cfs = cubic feet per second

Runoff volumes for each event significantly exceed detention volumes for the flood mitigation facility. Therefore, peak flow rate will control spillway sizing. Spillway

routing was performed using the local storm for an event on the lower portion of the basin (i.e., 85,000 cfs event).

5.5.3 Hydraulic Modeling

5.5.3.1 General

DHI performed hydraulic modeling to evaluate impacts of the proposed Project configurations on downstream flood depths and extents. The current FEMA 100-year Effective Model (EM100) and 500-year Effective Model (EM500) covering the Project site are the SBC Effective Model series built using the MIKE FLOOD program. Digital copies of EM100 and EM500 models were obtained by DHI from the MHFD in October 2017.

The EM100 and EM500 models obtained from the MHFD are in the Version 2009 SP1 of the MIKE FLOOD software modeling package. DHI upgraded the EM100 and EM500 models from Version 2009 SP1 to Version 2017 SP1 to incorporate software updates that include computational speed increases that allow for running multiple scenarios much more efficiently.

The computed maximum water depths for each software version and the differences between them for EM100 are shown in Figure 5.14. The mean difference in maximum flow depth between Version 2009 SP1 and Version 2017 SP1 for EM100 is 0.01 foot with a standard deviation of 0.09 foot. Less than 0.1-percent of the inundated areas have a difference greater than 1 foot and less than 3.5 percent have a difference greater than 0.1 foot. These differences are considered sufficiently small and the RJH Team concluded that modeling to support the concept design phase should be performed with the MIKE FLOOD Version 2017 SP1. Additional work would be required in future stages of design to convert this model to a full corrective effective model using the current software version.

The current 100-year and 500-year design flood events for SBC through the City are from the Flood Mapping Study as documented in the *South Boulder Creek Climatology/Hydrology Report* (HDR 2007). Both the 100-year and 500-year design flood events are generated by a short-duration, high-intensity thunderstorm (i.e., the 100-year Thunderstorm and 500-year Thunderstorm). The simulated peak flows for each of these design flood events when a) approaching the Project site and b) passing under the US36 bridge for EM100 and EM500 updated to version 2017 SP1 are presented in Table 5.5. Initial simulations using the 100-year General Storm showed lower flood inundation extents and depths than the 100-year Thunderstorm, indicating that the Thunderstorm is

the governing design storm for flood extents and depth relative to these events. Therefore, the General Storm was not included in this concept design evaluation.

**TABLE 5.5
PEAK FLOWS AT US36**

Design Flood Event	Simulated Peak Flow Approaching US36 (cfs)⁽¹⁾	Simulated Peak Flow Passing Under US36 Bridge (cfs)⁽²⁾
100-Year General Storm	2,936	--
100-Year Thunderstorm (EM100)	6,901	3,997
500-Year Thunderstorm (EM500)	11,203	5,419

Notes:

1. This is the combined flow in the SBC channel and floodplain including nearby Dry Creek Ditch No. 2.
2. Flow split upstream at the US36 bridge diverts a portion of approaching flow to west where it overtops US36.

Hydraulic modeling was performed for each of the three options. The embankment was modeled in MIKE FLOOD using a series of “no-flow” cells. The floodwall was modeled by setting cells along the floodwall alignment to an elevation representing the top of the floodwall. These cells can convey flow in the model and were used to model the overtopping component of the floodwall. Topography of the detention excavation was inserted into the MIKE FLOOD model replacing the existing topography in that footprint. The outlet works pipe was represented as a culvert structure in the MIKE FLOOD model connecting the interior of the detention facility to an outlet in Viele Channel downstream of US36.

The linked cells for the section of the Dry Creek Ditch No. 2 MIKE 11 channel reach were modified into single linked reach to represent the floodwall bisection of Dry Creek Ditch No. 2 along US36. This will still allow flow exchange across Dry Creek Ditch No. 2 across the floodplain but also allow flow to leave Dry Creek Ditch No. 2 through the culvert underneath US36.

5.5.3.2 Option 1 (100-Year)

Hydraulic modeling was performed for the 100-year Thunderstorm Event for Option 1 for three outlet capacities. The outlet capacity would likely be provided by using multiple 60-inch-diameter pipes because of cover limitations. However, the modeling was performed for single 60-inch, 84-inch, and 108-inch-diameter pipes to simplify modeling input. The 84-inch-diameter pipe would provide an effective flow area similar to dual 60-inch-diameter pipes, and the 108-inch-diameter pipe would provide a similar flow area to triple 60-inch-

diameter pipes. The modeling also includes approximately 34 acres of new fill on the northern PUB land use in the CU Boulder South campus. Key hydraulic modeling results are presented in Table 5.6. Hydrographs through the US36 bridge and at South Boulder Road are presented on Figures 5.15 and 5.16, respectively. A plan of differences in maximum WSEs compared to EM100 is presented on Figure 5.17.

TABLE 5.6
OPTION 1 HYDRAULIC MODELING RESULTS (100-YEAR)

Configuration	Max WSE at US36 Bridge (ft)	Max WSE in Pond (ft)	Peak Flow US36 Bridge (cfs)⁽²⁾	Peak Flow S. Boulder Rd. (cfs)	Peak Outlet Flow (cfs)	Increase Downstream Flooding (Yes/No)⁽¹⁾
Existing Conditions	5362.0	N/A	4,000	5,550	N/A	N/A
60-Inch-Diameter	5362.6	5364.4	4,330	4,930	360	No
84-Inch-Diameter (~2 – 60" Diameter)	5362.2	5363.8	4,120	5,100	760	No
108-Inch-Diameter (~3 – 60" Diameter)	5361.9	5363.0	3,780	5,270	1,280	Yes

Note:

- Increases attributed to minor modeling fluctuations were not considered. Minor modeling fluctuations was generally considered to consist of rises less than 0.1 feet in areas where rises could not be reasonably explained.

The 108-inch-diameter outlet would reduce peak flows through the US36 bridge by about 5 percent compared to existing conditions. However, the 108-inch-diameter outlet may increase flooding in the Keewaydin neighborhood (i.e., between Foothills Parkway and SBC). Since one of the Project goals is to prevent increases in downstream flooding during the design event, we dismissed the 108-inch-diameter outlet for this concept evaluation.

The 60- and 84-inch-diameter outlets would increase peak flows through the US36 bridge by 8 and 3 percent, respectively. Neither outlet size would cause additional flooding downstream of South Boulder Road or in the Keewaydin neighborhood. Based on the hydraulic modeling results and engineering judgment, RJH selected dual 60-inch-diameter outlet pipes for Option 1 to maintain existing peak flows through the US36 bridge. The selection of dual 60-inch-diameter outlet pipes will be confirmed with hydraulic modeling in future stages of design if this alternative is advanced.

5.5.3.3 Option 2 (500-Year)

Hydraulic modeling was performed for the 500-year Thunderstorm Event for Option 2 for two outlet sizes: 60- and 108-inch-diameter pipes. As previously discussed, the 108-inch-diameter pipe would provide a similar flow area to triple 60-inch-diameter pipes. The modeling also includes new fill on the southern PUB and OS-O land uses on the CU Boulder South campus. The 34 acres of fill on the northern PUB land use from Option 1 has been removed. Key hydraulic modeling results are presented in Table 5.7.

Hydrographs below the US36 bridge and at South Boulder Road are presented on Figures 5.18 and 5.19, respectively. A plan of differences in maximum WSEs compared to EM500 is presented on Figure 5.20.

TABLE 5.7
OPTION 2 HYDRAULIC MODELING RESULTS (500-YEAR)

Configuration	Max WSE at US36 Bridge (ft)	Max WSE in Pond (ft)	Peak Flow US36 Bridge (cfs)	Peak Flow S. Boulder Rd. (cfs)	Peak Outlet Flow (cfs)	Increase Downstream Flooding (Yes/No) ⁽¹⁾
Existing Conditions	5363.6	N/A	5,420	9,320	N/A	N/A
60-Inch-Diameter	5364.2	5366.7	6,500	7,010	380	No
108-Inch-Diameter (~3 – 60" Diameter)	5363.8	5365.6	5,740	8,070	1,380	No

Note:

- Increases attributed to minor modeling fluctuations were not considered. Minor modeling fluctuations was generally considered to consist of rises less than 0.1 feet in areas where rises could not be reasonably explained.

The 60-inch-diameter outlet would result in increases in flow through the US36 bridge (i.e., 20 percent) and would likely not be acceptable to CDOT. For this reason, the 60-inch-diameter outlet was dismissed.

The 108-inch-diameter outlet would increase peak flows through the US36 bridge by about 6 percent but would not cause additional flooding downstream of South Boulder Road. It is possible that the increases in flow through the bridge may not cause negative impacts (i.e., scour) or that negative impacts could be mitigated by installing scour protection through the bridge. Additional analyses would be required to identify if mitigation is needed. It is also possible that a small increase in outlet capacity could maintain peak flows through the bridge without causing incremental increases in downstream flooding. This will be further evaluated with hydraulic modeling in future stages of design if this alternative is advanced.

Based on the results of the 108-inch diameter outlet modeling, we did not evaluate an 84-inch diameter outlet because it is apparent that flow through the US36 bridge would be significantly increased above EM500. RJH selected triple 60-inch-diameter outlet pipes for Option 2 (500-Year) for this concept-level evaluation.

The fill placed on the OS-O land use area resulted in minor rises (i.e., < 0.01 foot) in WSEs in upstream areas. In the RJH Team's experience, these rises are typically model "fluctuations" associated with complex, two-dimensional hydraulic models, and we anticipate these issues could be resolved in the next stage of design through refinements in the modeling.

Additional analyses would be required to evaluate the performance of Option 2 (500-Year) for a 100-year flood event.

5.5.3.4 Option 3 (Approx. 200-Year)

5.5.3.4.1: Hydrology

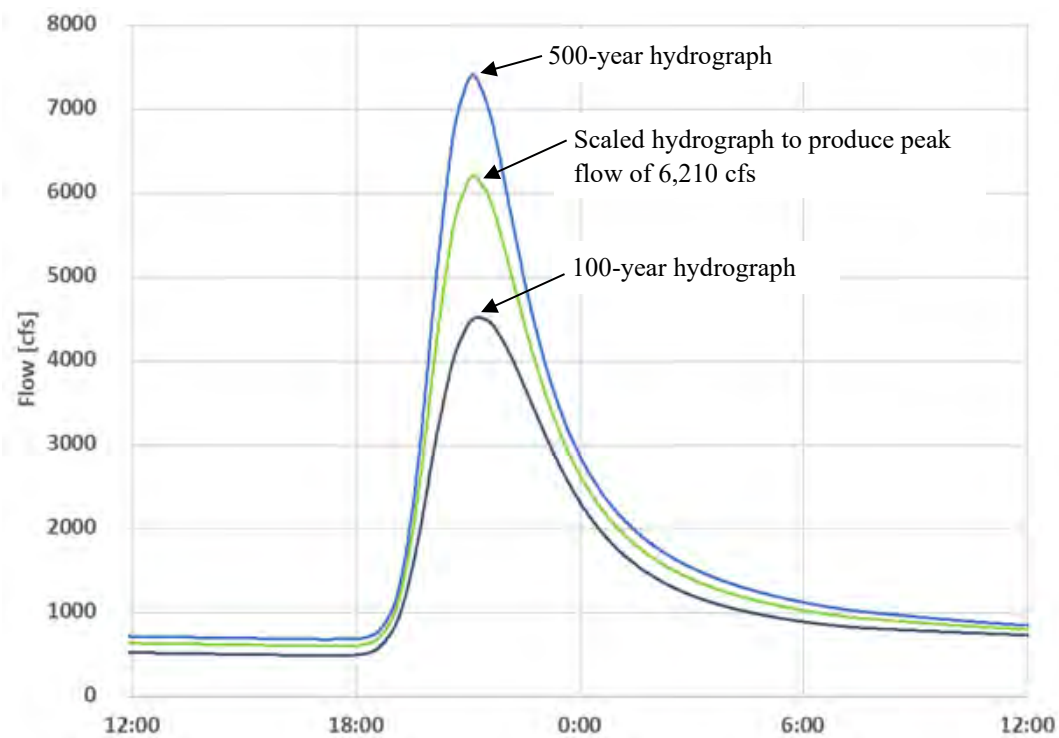
A primary objective of Option 3 (Approx. 200-Year) is to reduce the design event from the 500-year event to an event between the 100-year and 500-year events. The existing MIKE FLOOD model that was used as the basis for performing the hydraulic modeling is a combination hydrologic/hydraulic model but only includes the 100-year and 500-year events. A previous hydrology study was performed (HDR, 2007) that includes hydrologic modeling for the 200-year event completed in the MIKE 11 hydrologic model. However, it would require a significant amount of effort to incorporate the 200-year hydrology results from the MIKE 11 model into the existing MIKE FLOOD model. Therefore, a simplified approach was used to approximate the 200-year inflow for this alternative evaluation.

To simplify this process for the purposes of advancing this concept option, the 500-year hydrograph along the main stem of SBC at Eldorado Canyon in the existing MIKE FLOOD model was scaled down to match peak flow results generated from the MIKE 11 hydrology model for SBC at Eldorado Canyon. MIKE 11 peak flow results at Eldorado Canyon are presented in Table 5.8. MIKE FLOOD hydrographs at Eldorado Canyon are presented in Graph 5.1 below. Other hydrographs along the main stem of SBC in the MIKE FLOOD model were scaled down similarly to the Eldorado Canyon hydrographs. Hydrographs for local basins (i.e., basins not on the main stem of SBC) were based on hydrographs used in the 2015 Master Plan, and range from more frequent events (i.e., 5-

to 10-year events) up to the 100-year event. The hydrographs for the local basins were not changed to be consistent with previous studies.

TABLE 5.8
PEAK FLOWS IN SOUTH BOULDER CREEK AT ELDORADO CANYON

Event	Peak Flow (cfs)
100-year	4,520
200-year	6,210
500-year	7,400



Graph 5.1 – Hydrographs at Eldorado Canyon

While the scaled hydrographs are based in part on 200-year hydrologic modeling results, they do not represent the 200-year event as reliably as hydrographs developed using rainfall-runoff modeling for the 100-year and 500-year events. For this reason, the Project Team decided to use the term “approximate 200-year event” herein to describe this event.

5.5.3.4.2: Baseline (Approx. 200-Year)

Hydraulic modeling was initially performed for the intermediate-year event for a 60-inch-diameter outlet and with fill on approximately 34 acres on the northern PUB land use in the CU Boulder South campus similar to Option 1. Key hydraulic modeling results are presented in Table 5.9. Hydrographs below the US36 bridge and at South Boulder Road are presented on Figures 5.21 and 5.22, respectively. A plan of differences in maximum WSEs compared to the effective model is presented on Figure 5.23.

TABLE 5.9
BASELINE HYDRAULIC MODELING RESULTS (APPROX. 200-YEAR)

Configuration	Max WSE in Pond (ft)	Peak Flow US36 Bridge (cfs)	Peak Flow S. Boulder Rd. (cfs)	Peak Outlet Flow (cfs)	Increase Downstream Flooding (Yes/No) ⁽¹⁾
Existing Conditions	N/A	4,580	6,710	N/A	N/A
60-Inch-Diameter	5366.0	6,360	7,300	375	Yes

Notes:

- Increases attributed to minor modeling fluctuations were not considered. Minor modeling fluctuations was generally considered to consist of rises less than 0.1 feet in areas where rises could not be reasonably explained.

This configuration would result in increases in flows through the US36 bridge (i.e., 40 percent), at South Boulder Road (i.e., 9 percent), and at other downstream locations compared to existing conditions. These increases in flows are primarily caused by the loss of flood detention storage resulting from placing fill on 34 acres on the northern PUB land use area. A portion of this area would be required for flood storage during the intermediate event. In our opinion, increasing the outlet capacity for this configuration would not be sufficient to prevent incremental increases in downstream flooding compared to the existing conditions. For this reason, we dismissed the Baseline configuration for the approximate 200-year.

5.5.3.4.3: Option 3 (Approx. 200-Year)

Based on the Baseline hydraulic modeling results, the Project Team decided to reduce the area of fill on the northern PUB land use area and add fill to the OS-O land use area to maintain 129 acres of buildable area for CU. Placing fill on the northern PUB land use is more desirable because placing fill on the OS-O land use area would restrict future environmental restoration/mitigation activities on this land use.

RJH performed a simplified analysis to identify an approximate preferred fill distribution. Placing fill on the northern PUB land use area will provide additional buildable area for CU but would also reduce the amount of flood storage in this area. These are competing considerations – as one of these considerations is improved, the other is worsened. The preferred fill distribution will provide the best combination of providing buildable area for CU while limiting reductions in flood storage.

RJH evaluated three fill distributions. A plan of the fill distributions on the northern PUB land use area is shown on Figure 5.24. For each distribution, we calculated a) the percent of full buildable area that would be retained and b) the percent of full flood storage that would be retained. We defined the preferred fill distribution as the distribution where the sum of these two percentages is the highest. Results of this evaluation are presented in Table 5.10. Based on this evaluation, the preferred fill distribution would be approximately 50 percent on the northern PUB land use and 50 percent on the OS-O land use. This configuration was used for the hydraulic modeling.

TABLE 5.10
FILL DISTRIBUTION RESULTS

Fill Configuration	Buildable Area on PUB (ac)	(A) Percent of Full Buildable Area on PUB	Flood Storage (ac-ft)	(B) Percent of Full Flood Storage	(C) = (A) + (B) Percent Buildable Area + Percent Flood Storage
Zero Fill on northern PUB	0	0	210	100	100
25 Percent of Fill on northern PUB	9	25	199	95	120
50 Percent of Fill on northern PUB	17	50	165	78	128
70 Percent of Fill on northern PUB	24	70	113	54	124

Hydraulic modeling was performed for the intermediate event for three outlet sizes: 60-, 84-, and 108-inch-diameter pipes with the fill distribution described above. Key hydraulic modeling results are presented in Table 5.11. Hydrographs below the US36 bridge and at South Boulder Road are presented on Figures 5.25 and 5.26, respectively. A plan of differences in maximum WSEs compared to the effective model is presented on Figure 5.27.

TABLE 5.11
OPTION 3 HYDRAULIC MODELING RESULTS (APPROX. 200-YEAR)

Configuration	Max WSE at US38 Bridge (ft)	Max WSE in Pond (ft)	Peak Flow US36 Bridge (cfs)	Peak Flow S. Boulder Rd. (cfs)	Peak Outlet Flow (cfs)	Increase Downstream Flooding (Yes/No) ⁽¹⁾
Existing Conditions	5362.8	N/A	4,580	6,710	N/A	N/A
60-inch-diameter	5363.7	5365.5	5,650	6,950	370	Yes
84-inch-diameter (~2 – 60" Diameter)	5363.4	5365.0	5,230	6,100	790	Yes
108-inch-diameter (~3 – 60" Diameter)	5363.0	5364.5	4,730	6,350	1,340	No

Notes:

- Increases attributed to minor modeling fluctuations were not considered. Minor modeling fluctuations was generally considered to consist of rises less than 0.1 feet in areas where rises could not be reasonably explained.

All of the outlet sizes would increase peak flows through the US36 bridge compared to existing conditions. The 108-inch-diameter outlet would increase peak flows the least (i.e., 3 percent), and it is possible that this level of increase may not result in negative impacts to the bridge or could be mitigated with scour protection at the bridge. The 60-inch-diameter outlet would increase peak flows at South Boulder Road compared to existing conditions and is not acceptable. The 84-inch-diameter outlet would reduce the peak flow at South Boulder Road but would result in incremental rises in downstream WSEs up to about 0.1 foot along the main stem of SBC because of timing issues with downstream tributary hydrographs. For this reason, the 84-inch-diameter outlet is not acceptable. RJH selected three 60-inch-diameter outlet pipes for Option 3 (Approx. 200-Year).

Additional analyses would be required to evaluate the performance of Option 3 (Approx. 200-Year) for a 100-year flood event.

5.5.4 Environmental Impacts

5.5.4.1: Evaluation

Potential impacts were identified based on a) the CORVUS 2019 environmental survey for areas within the environmental survey limits and b) a combination of a 2014 environmental survey by ERO and high-resolution aerial photography for areas outside of the CORVUS 2019 survey limits.

A summary of potential permanent environmental impacts is provided in Table 5.12. A summary of potential temporary environmental impacts is provided in Table 5.13. The temporary impacts would result from construction activities on OSMP property for construction of the floodwall and would likely need to be mitigated. We considered that an approximate 90-foot-wide strip of land south of the floodwall would be disturbed during construction.

TABLE 5.12
POTENTIAL PERMANENT ENVIRONMENTAL IMPACTS

Configuration	Wetlands (ac)	Open Water (ac)	Total Open Water and Wetlands⁽¹⁾ (ac)	Total T&E Habitat⁽¹⁾ (ac)
Option 1	4.80	2.58	7.38	0.88
Option 2	7.11	2.57	9.68	5.01
Option 3	8.92	2.58	11.50	5.00

Notes:

1. Some areas of wetlands and T&E habitat may overlap.

TABLE 5.13
POTENTIAL TEMPORARY ENVIRONMENTAL IMPACTS

Configuration	Wetlands (ac)	Open Water (ac)	Total Open Water and Wetlands⁽¹⁾ (ac)	Total T&E Habitat⁽¹⁾ (ac)
Option 1	2.56	0.02	2.96	5.52
Option 2	2.56	0.02	2.96	5.52
Option 3	2.56	0.02	2.96	5.52

Notes:

1. Some areas of wetlands and T&E habitat may overlap.

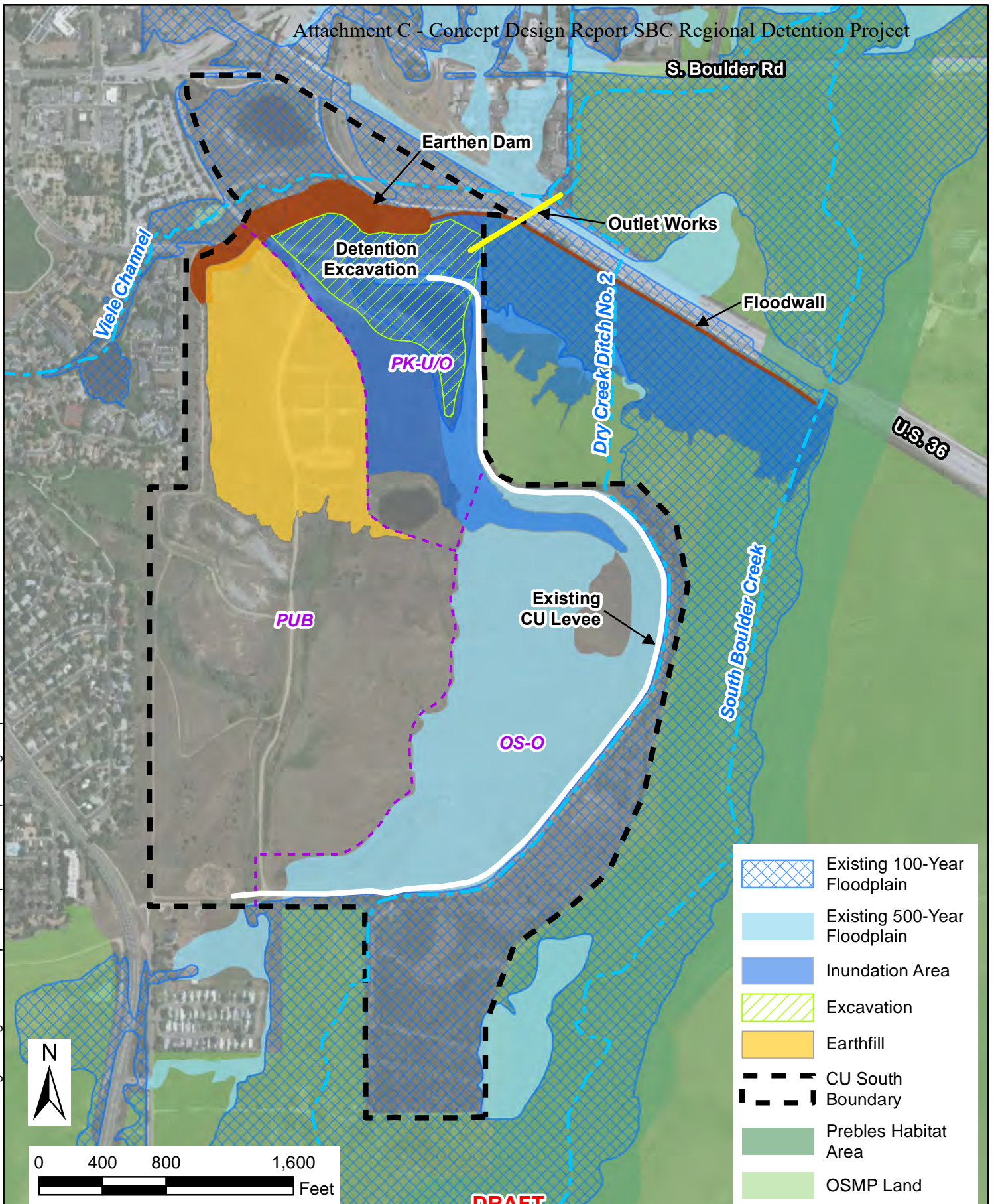
Environmental impacts shown in Table 5.12 do not include impacts associated with removal of the CU levee. The current concept is to remove the functionality of the levee and provide riparian connectivity to SBC by selectively removing portions of the levee without impacting wetlands, open water, or T&E species habitat. Therefore, levee removal has been assumed to not contribute to environmental impacts for any of the alternatives and is not a differentiating consideration for the concept design phase.

Potential permanent impacts to open water and wetlands vary from about 7.4 to 11.5 acres with Option 3 having the most impacts. Potential permanent impacts to T&E species habitat vary from about 0.9 to 5.0 acres with Options 2 and 3 having the most impacts. Impacts to potential ULTO habitat would occur in herbaceous wetlands in the

CU Boulder South property. Impacts to PMJM habitat would only occur along the main stem of SBC and are not anticipated.

5.5.4.2: Permitting Feasibility

Prior to impacting wetlands and open water, the City will need to obtain CWA Section 404 authorization from the USACE. As part of its review of the Section 404 permit, the USACE is required to evaluate alternatives to the proposed project that will achieve the project's purpose. The USACE will not issue a permit if a practicable alternative exists that would have less adverse impact on the aquatic ecosystem (i.e., the Least Environmentally Damaging Practicable Alternative (LEDPA)). Typically, the project alternative with the least impacts to wetlands and open water is designated by the USACE as the LEDPA. Based on the environmental impacts evaluation, Option 1 has the fewest environmental impacts, but a direct comparison is not appropriate because the options are based on different design events and therefore have a different Project purpose. Additional alternatives may need to be evaluated after the City has selected a preferred design event to identify the LEDPA.

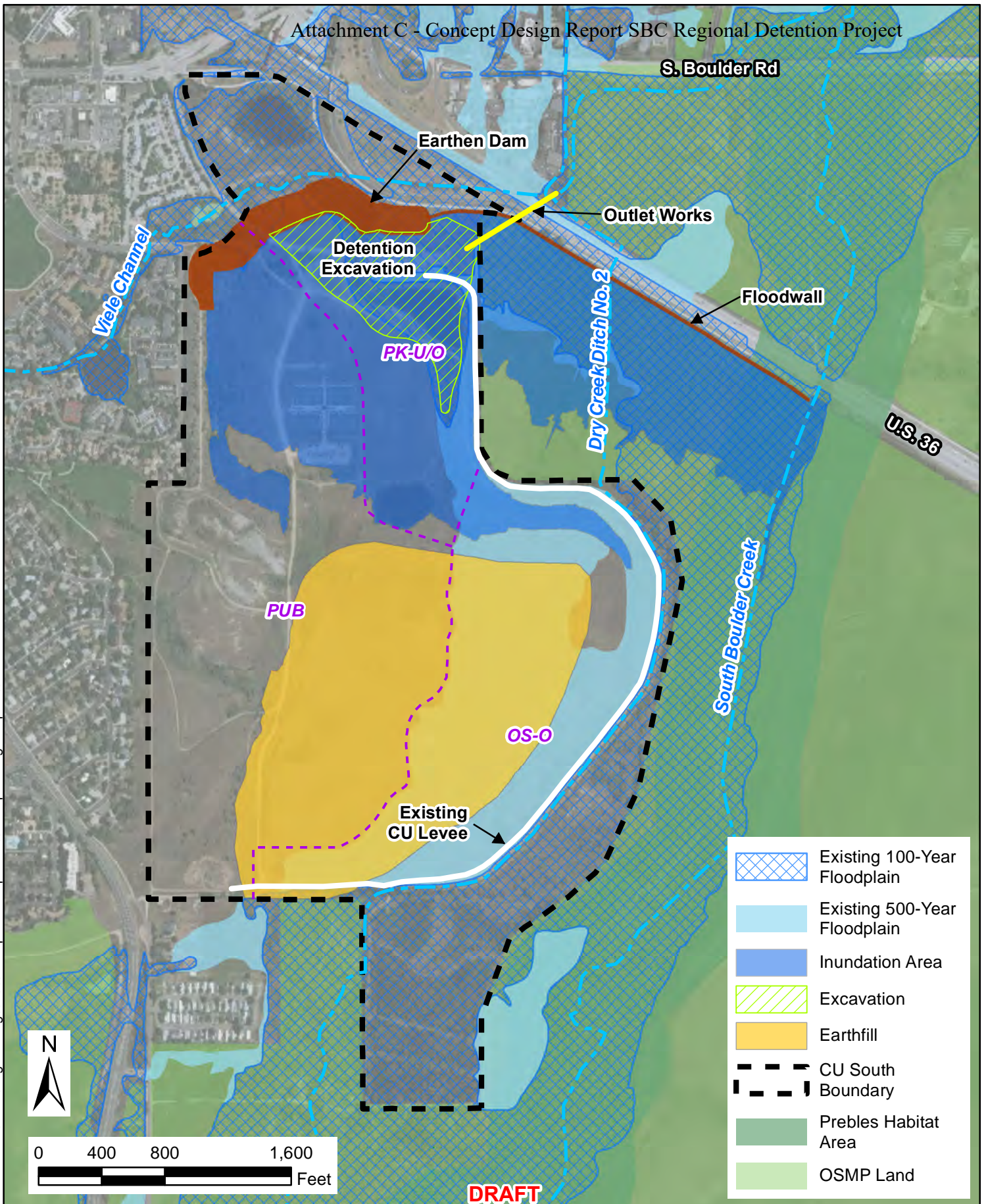


**REPRODUCE
IN COLOR**



SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

PLAN OF
OPTION 1

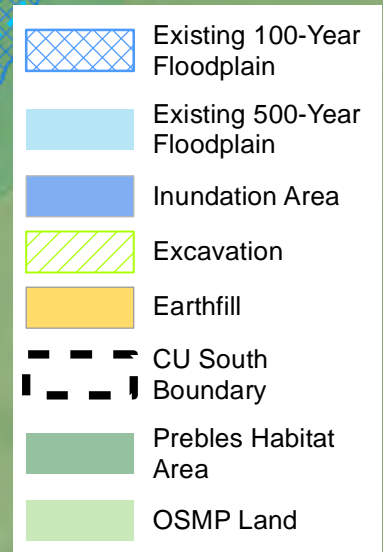
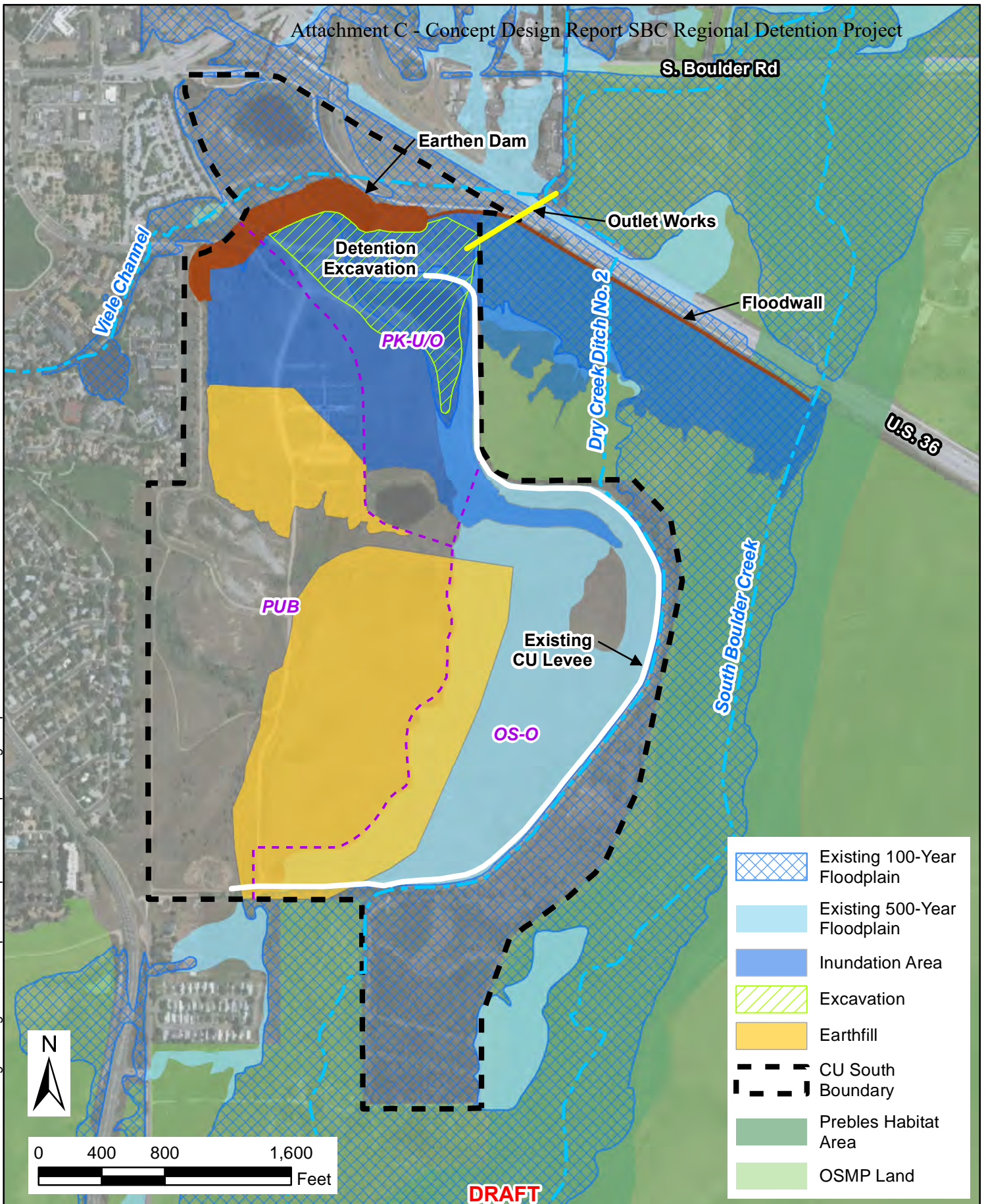


**REPRODUCE
IN COLOR**



**SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN**

**PLAN OF
OPTION 2**

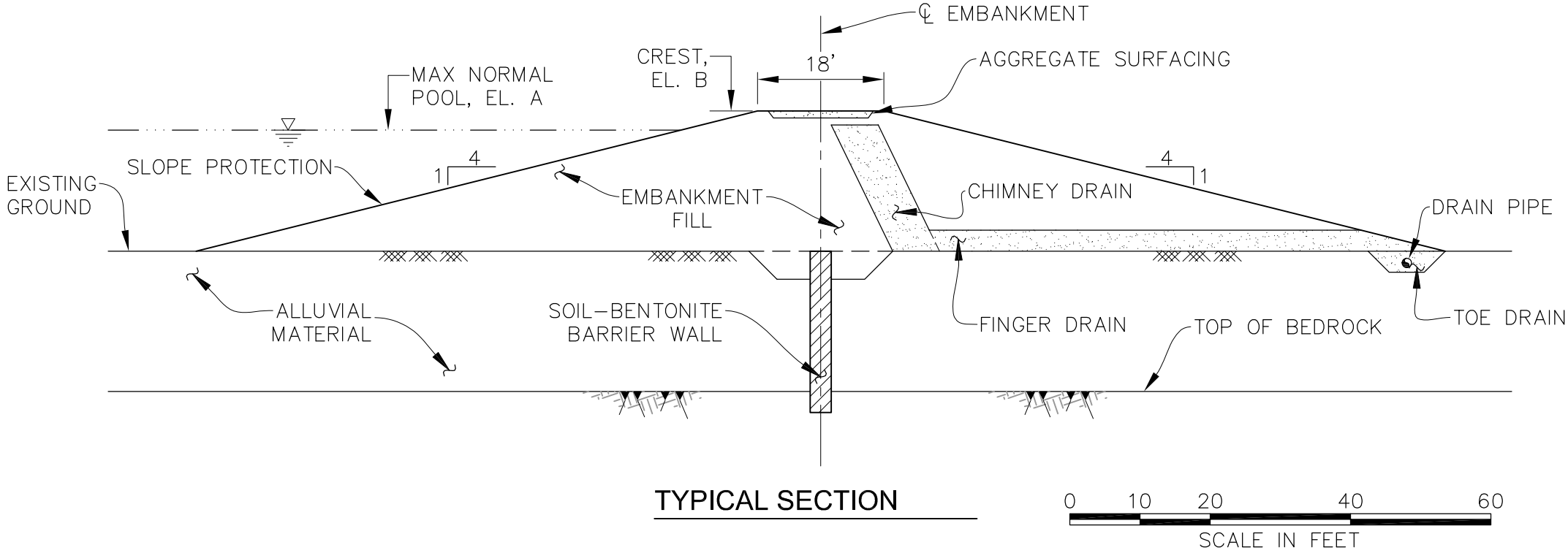


**REPRODUCE
IN COLOR**



SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

PLAN OF
OPTION 3



CONFIGURATION	ELEV. A	ELEV. B
OPTION 1	5363.8	5371.8
OPTION 2	5365.6	5373.6
OPTION 3	5364.5	5372.5

NOT FOR CONSTRUCTION



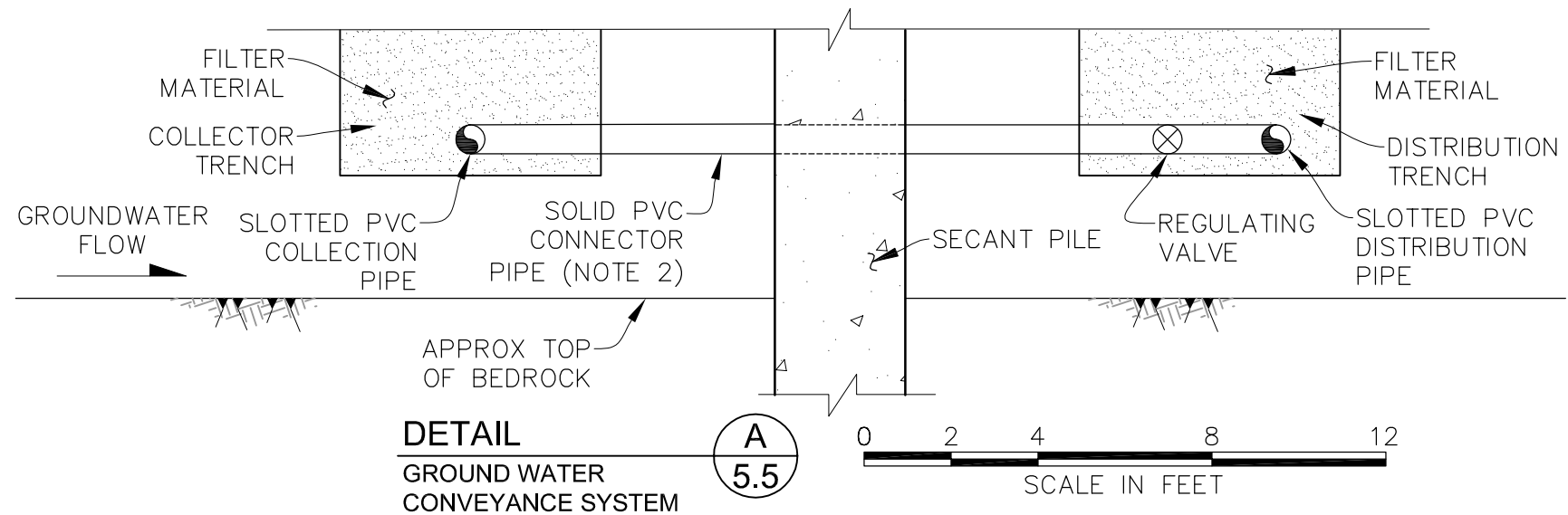
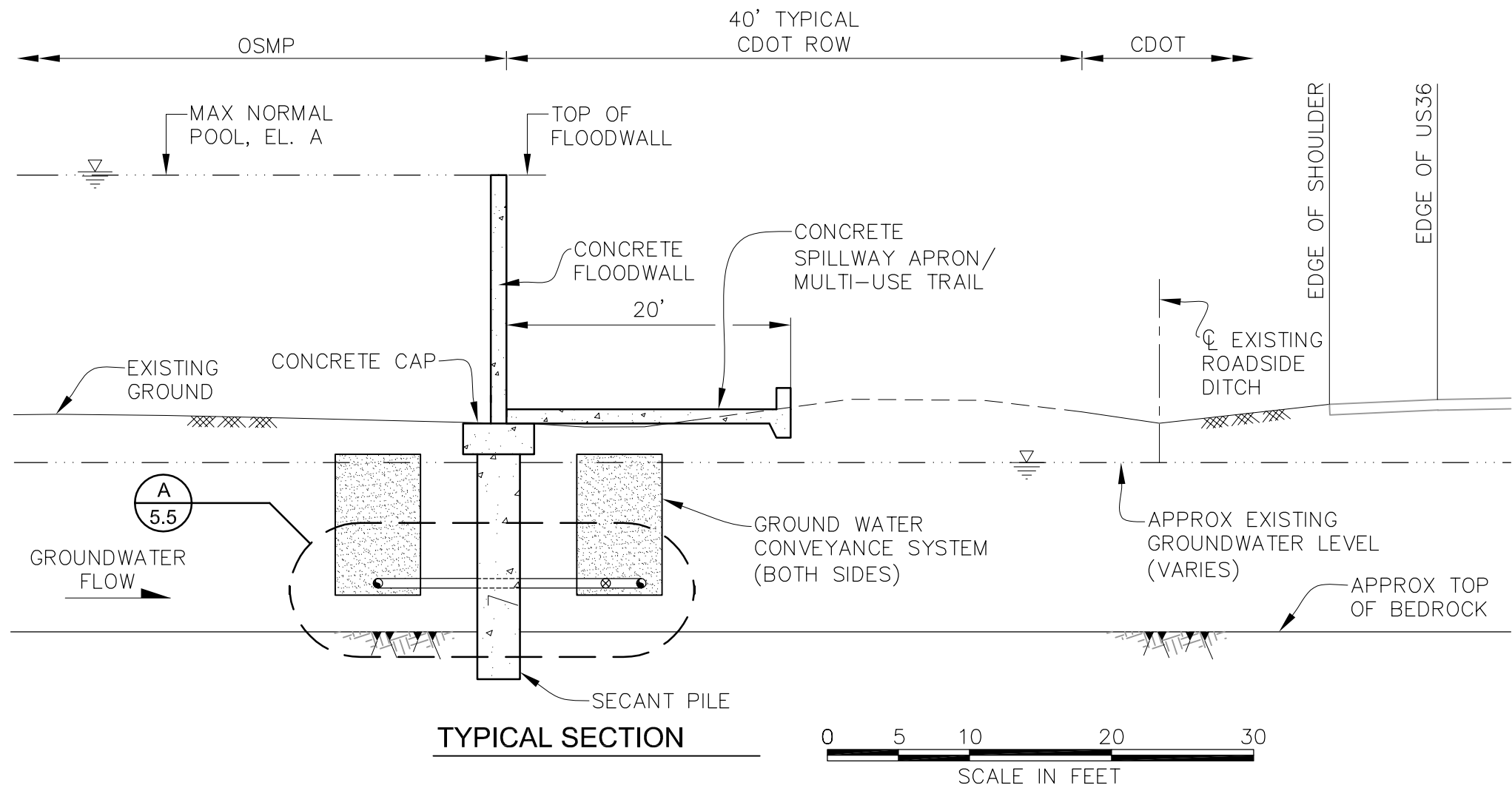
SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

PROJECT NO. 16134

TYPICAL SECTIONS -
EARTHEN
EMBANKMENT

February 2020

Figure 5.4



NOT FOR CONSTRUCTION

NOTES:

1. REINFORCEMENT NOT SHOWN FOR CONCRETE STRUCTURES.
2. SIZE AND SPACING TO BE IDENTIFIED DURING PRELIMINARY DESIGN.



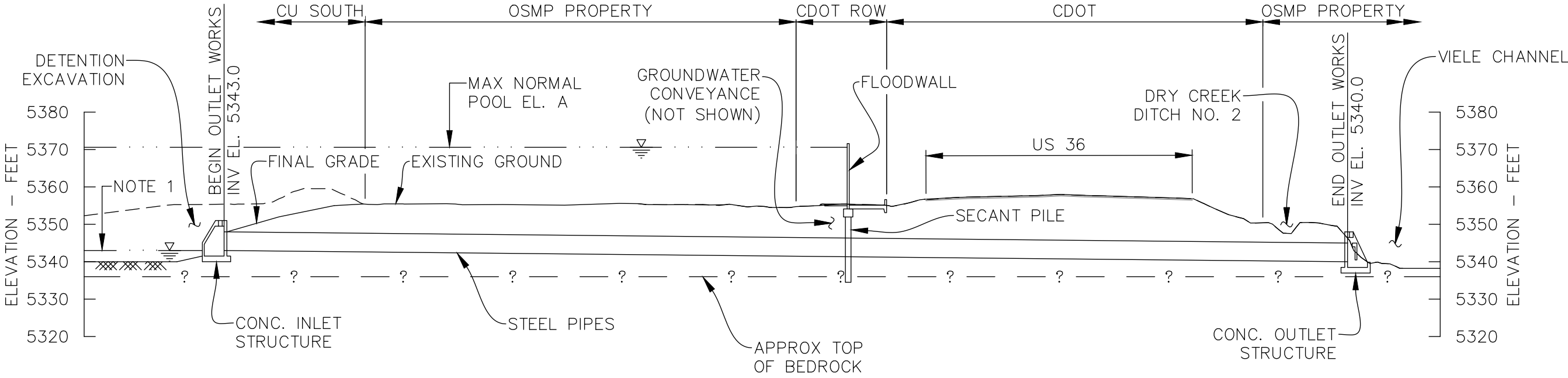
SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

PROJECT NO. 16134

FLOODWALL AND
GROUNDWATER
CONVEYANCE SYSTEM

February 2020

Figure 5.5

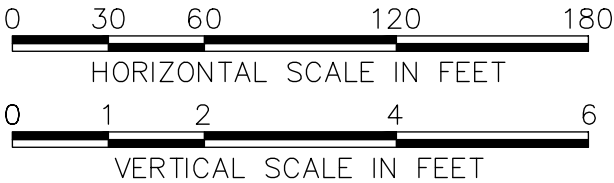


NOTES:

- 1. MIN. NORMAL POOL ELEVATION 5343.0.

PROFILE
OUTLET WORKS

NOT FOR CONSTRUCTION



SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

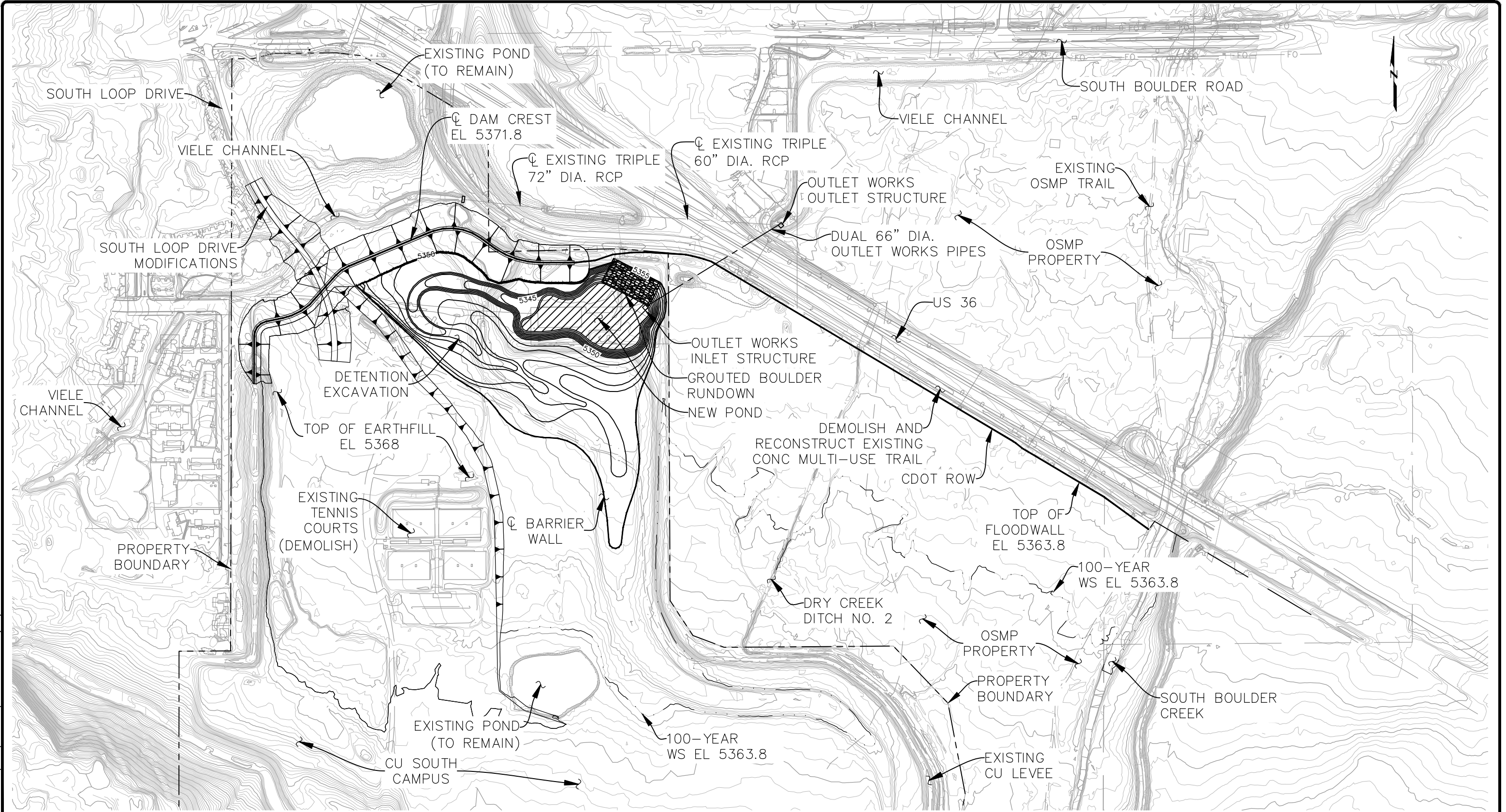
PROJECT NO. 16134

OUTLET WORKS
PROFILE

February 2020

Figure 5.6

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NOT FOR CONSTRUCTION

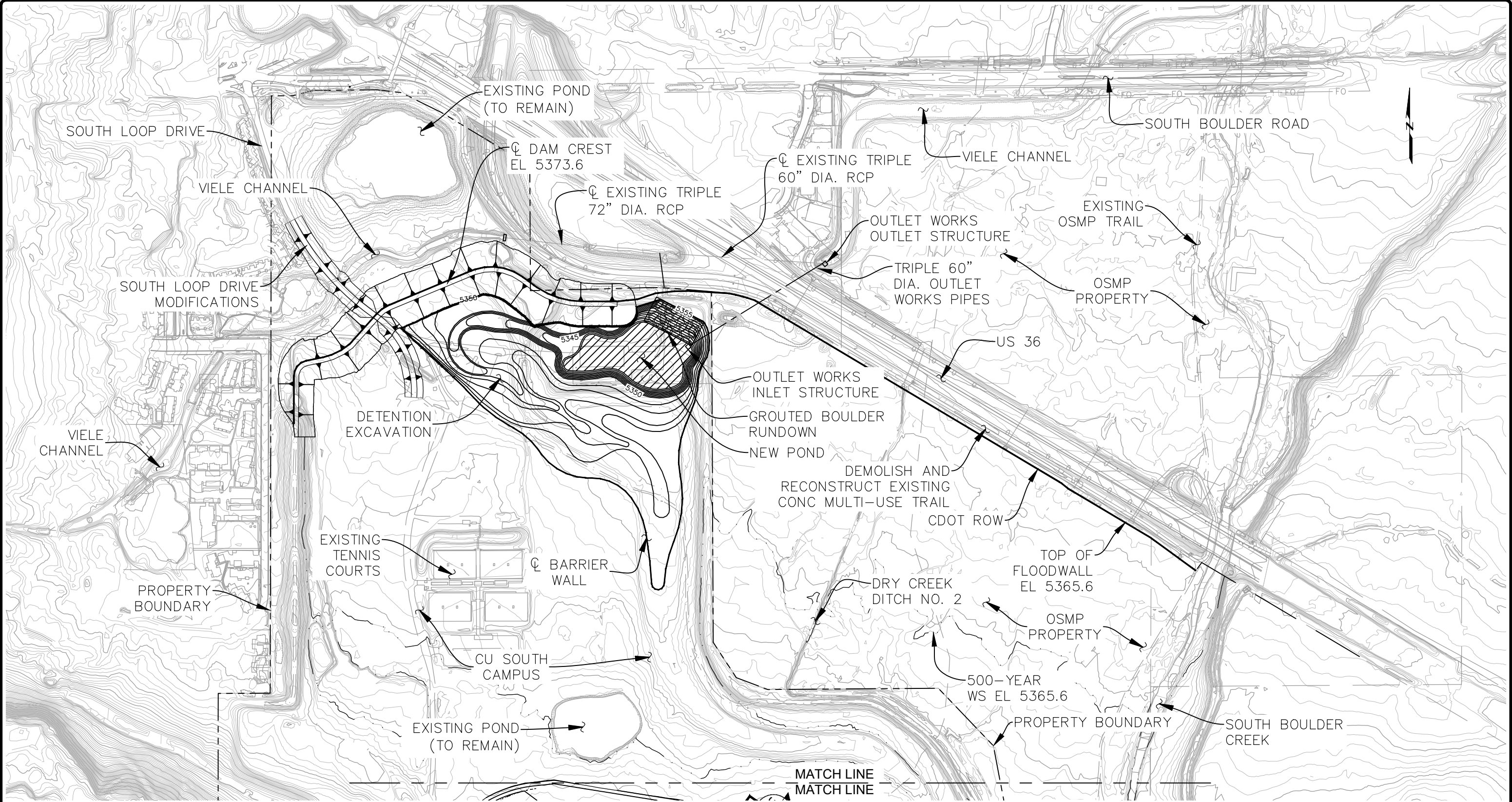


SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

PROJECT NO. 16134

PLAN OF OPTION 1

February 2020 **Figure 5.7**



NOT FOR CONSTRUCTION



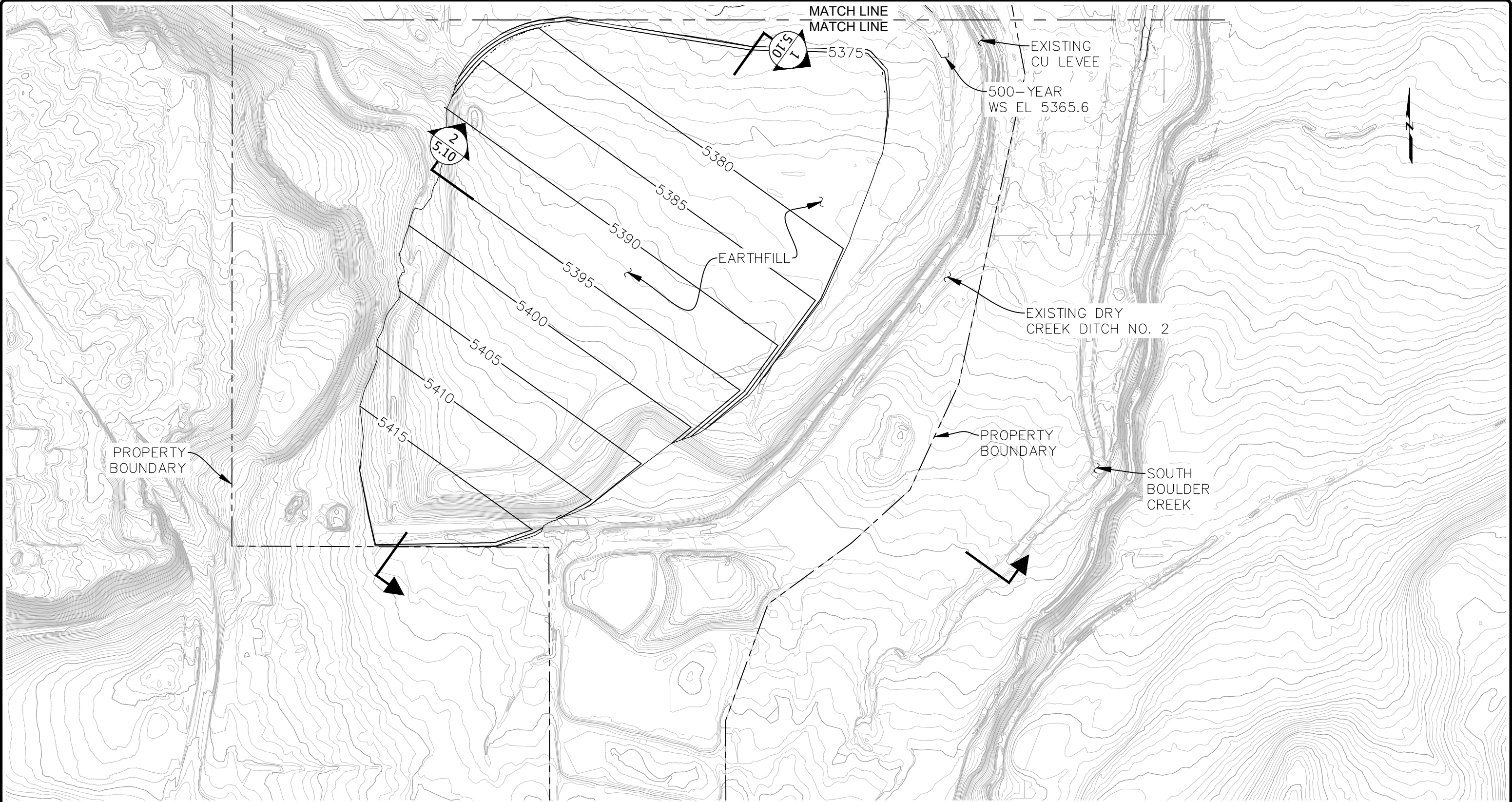
SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

PROJECT NO. 16134

PLAN OF OPTION 2
SHEET 1 OF 2

February 2020

Figure 5.8



NOT FOR CONSTRUCTION



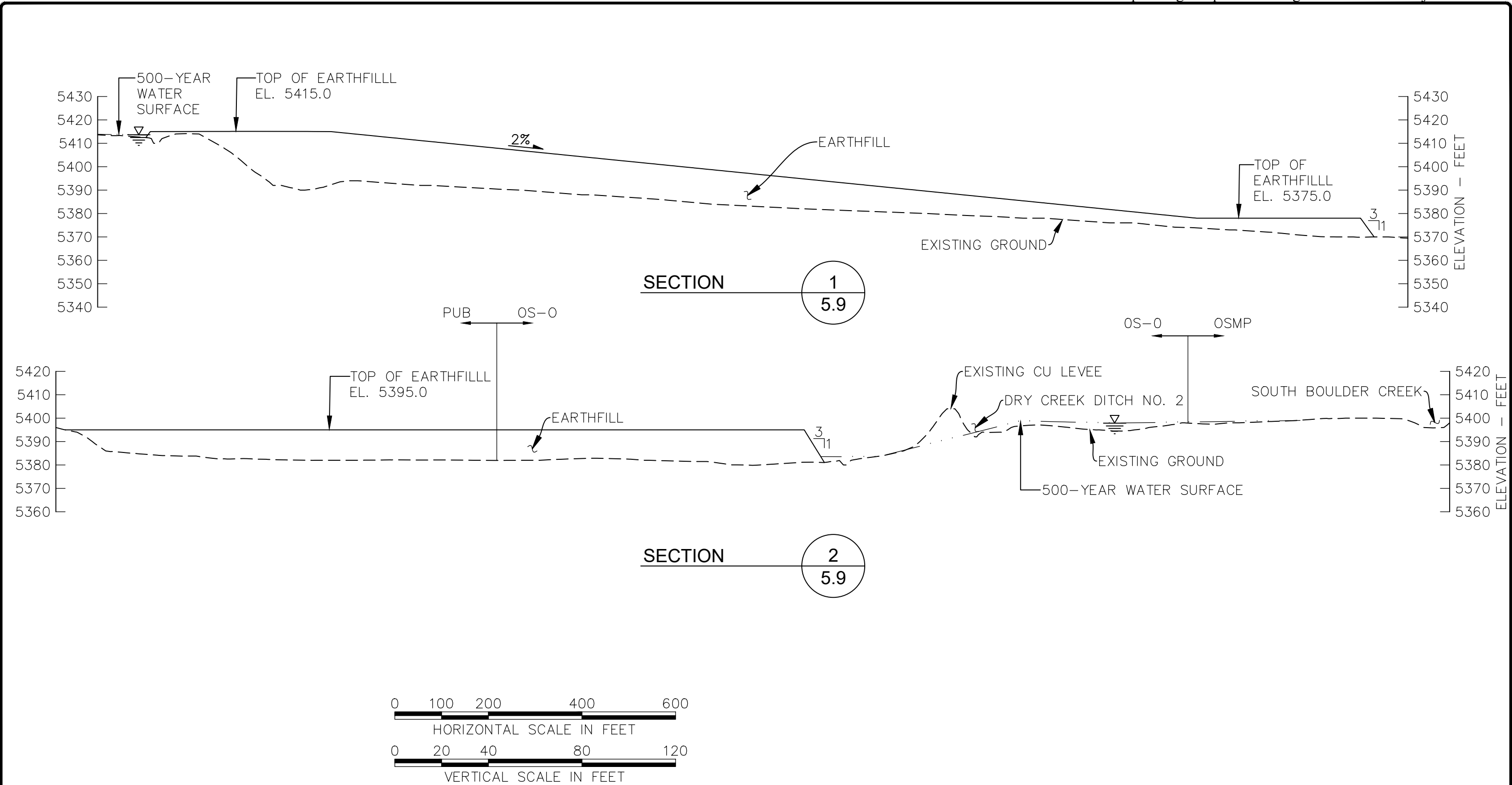
SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

PROJECT NO. 16134

PLAN OF OPTION 2
SHEET 2 OF 2

February 2020

Figure 5.9



NOT FOR CONSTRUCTION



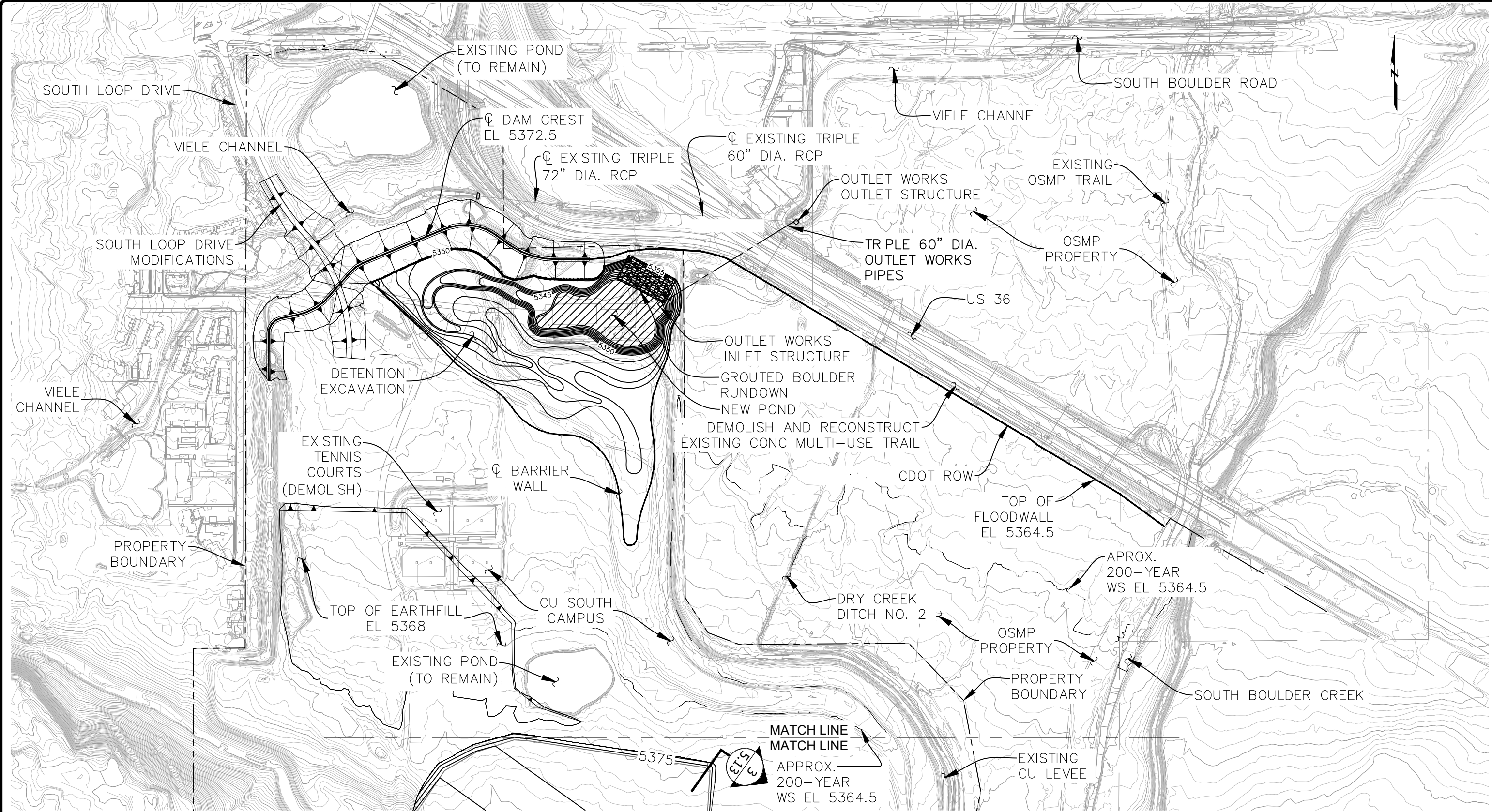
SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

OPTION 2 SECTIONS

PROJECT NO. 16134

February 2020

Figure 5.10



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SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN
PROJECT NO. 16134

PLAN OF OPTION 3
SHEET 1 OF 2
February 2020
Figure 5.11


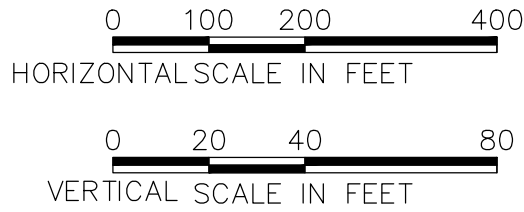
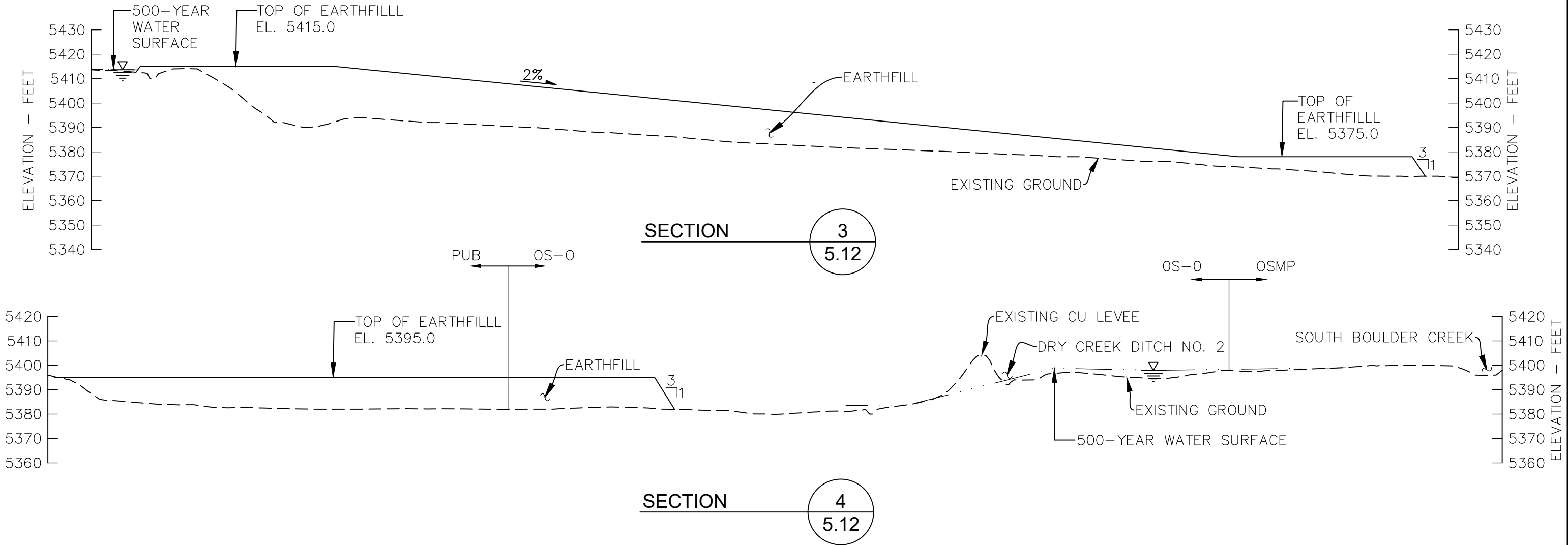


Figure 5.12

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NOT FOR CONSTRUCTION



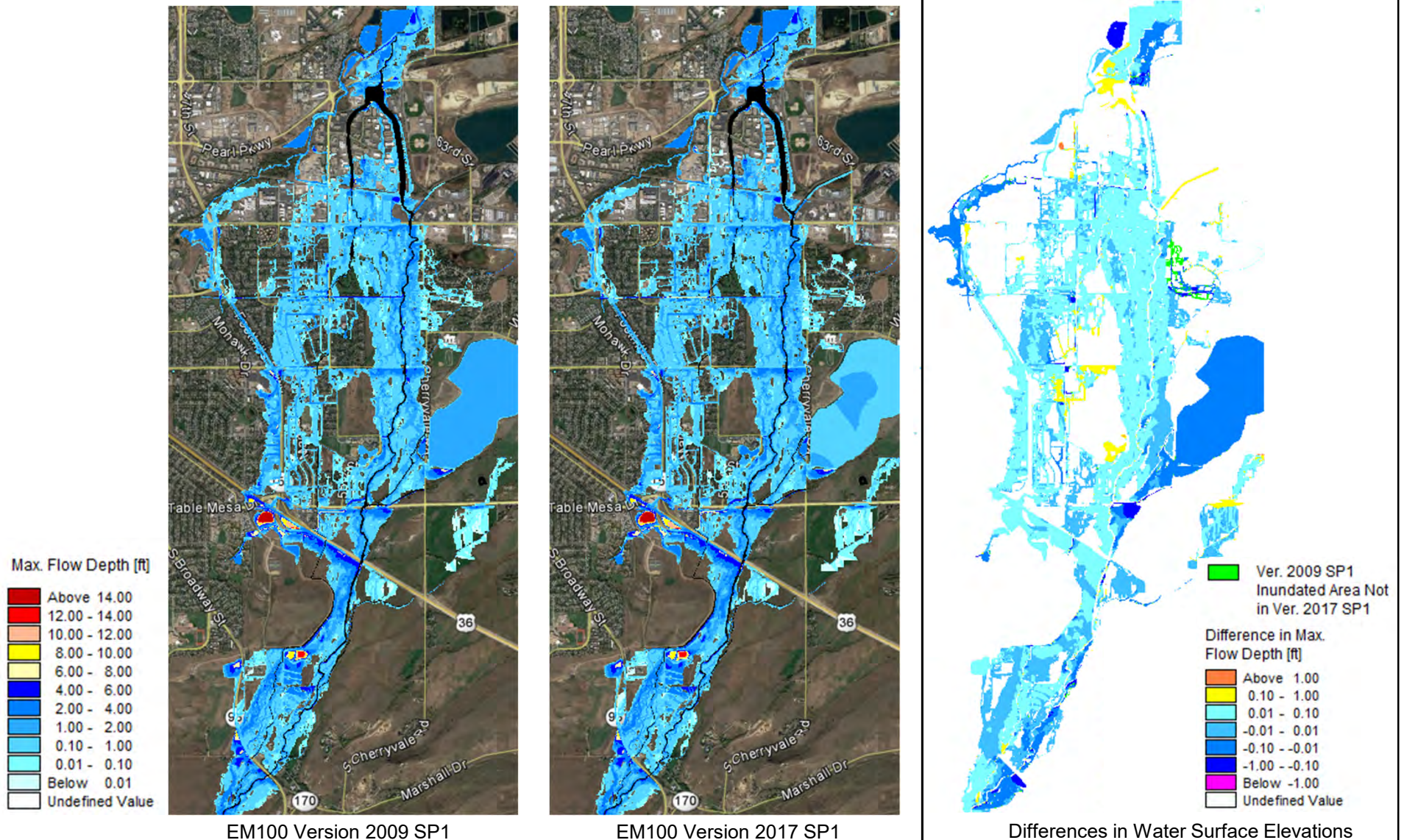
SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

OPTION 3 SECTIONS

PROJECT NO. 16134

February 2020

Figure 5.13

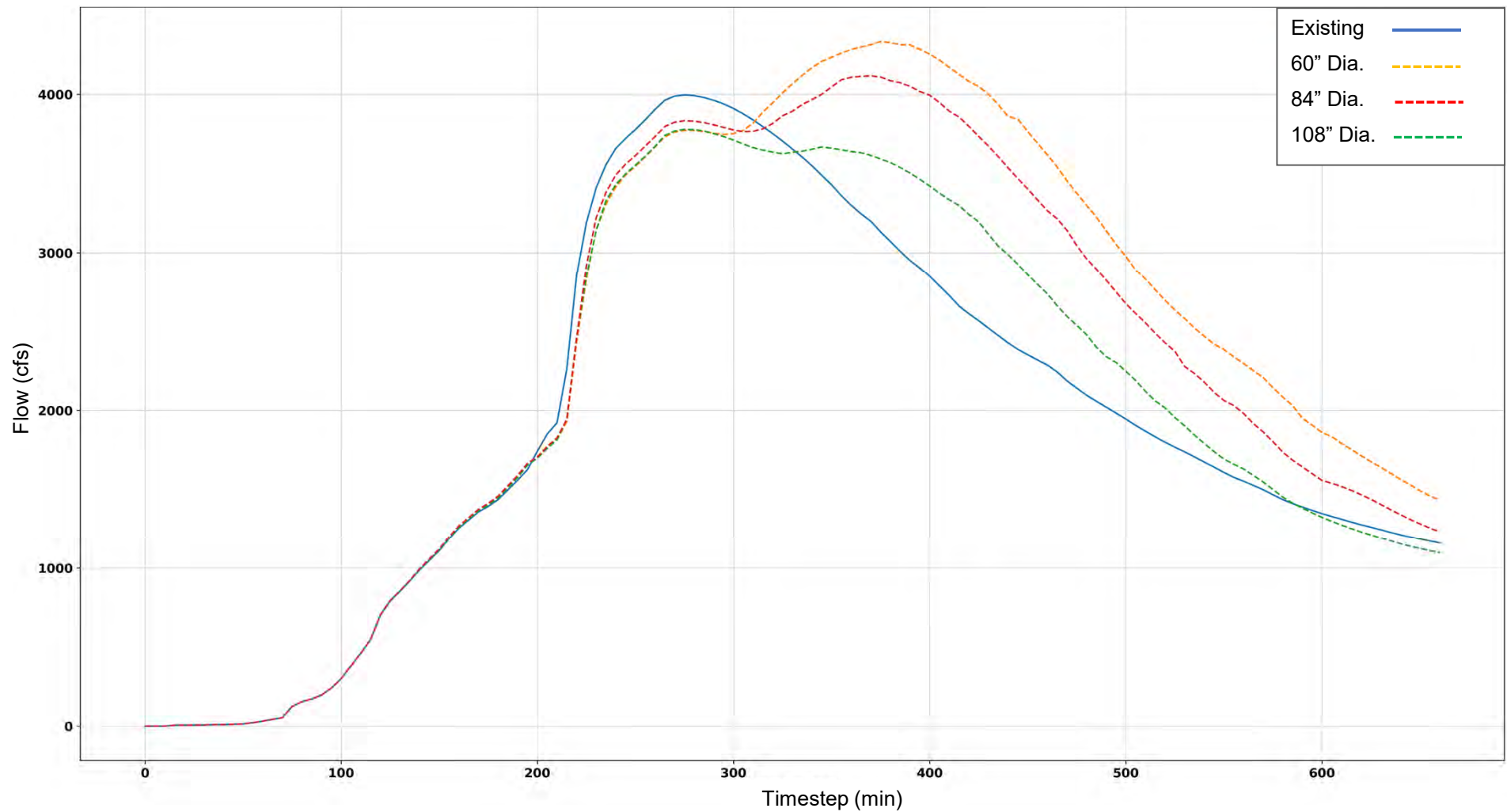


**REPRODUCE
IN COLOR**



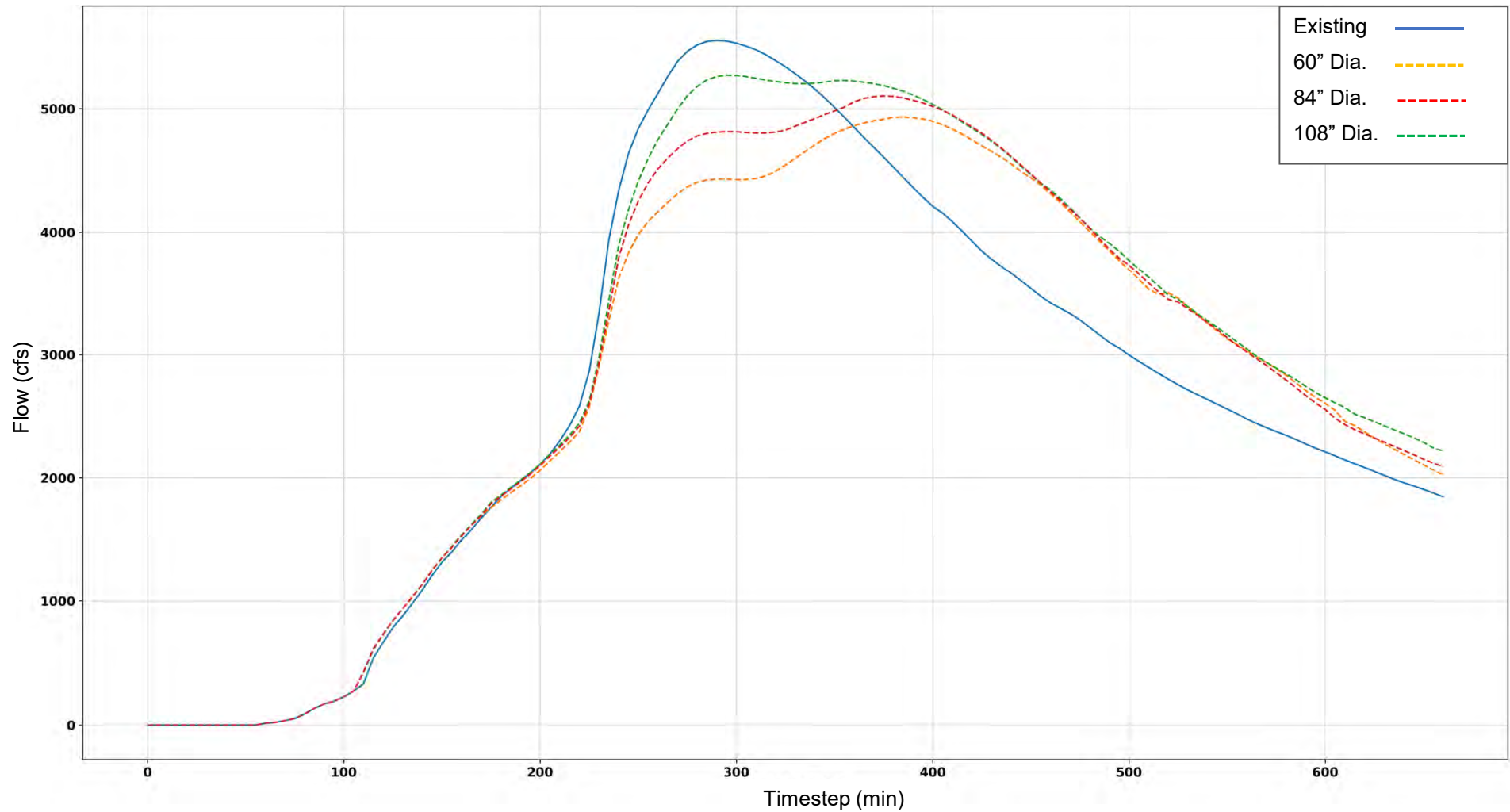
**SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN**

**EFFECTIVE MODEL
CONVERSION RESULTS**



**REPRODUCE
IN COLOR**

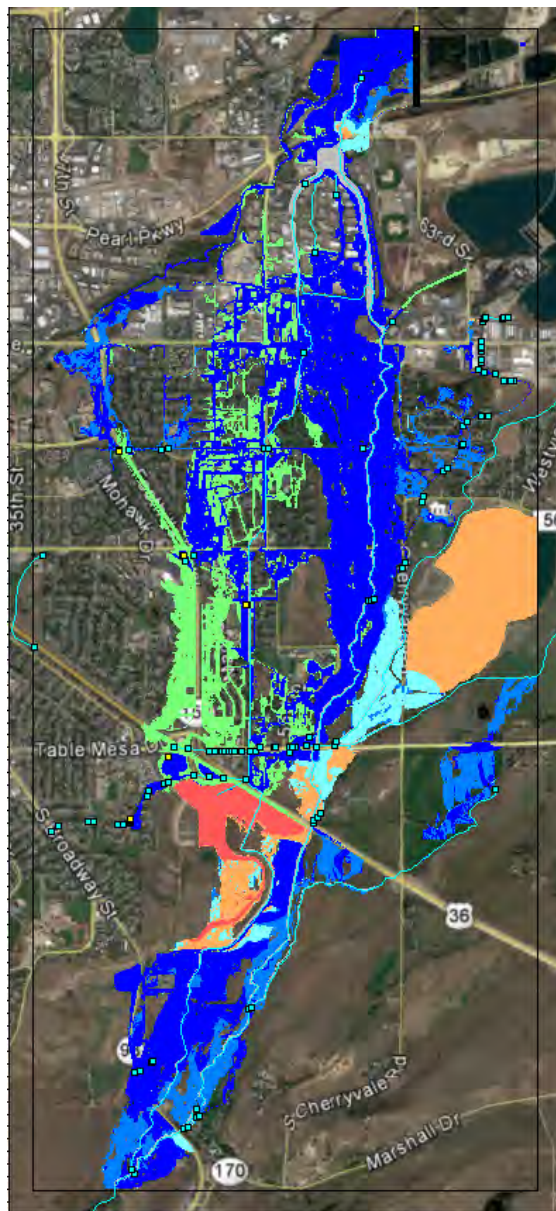




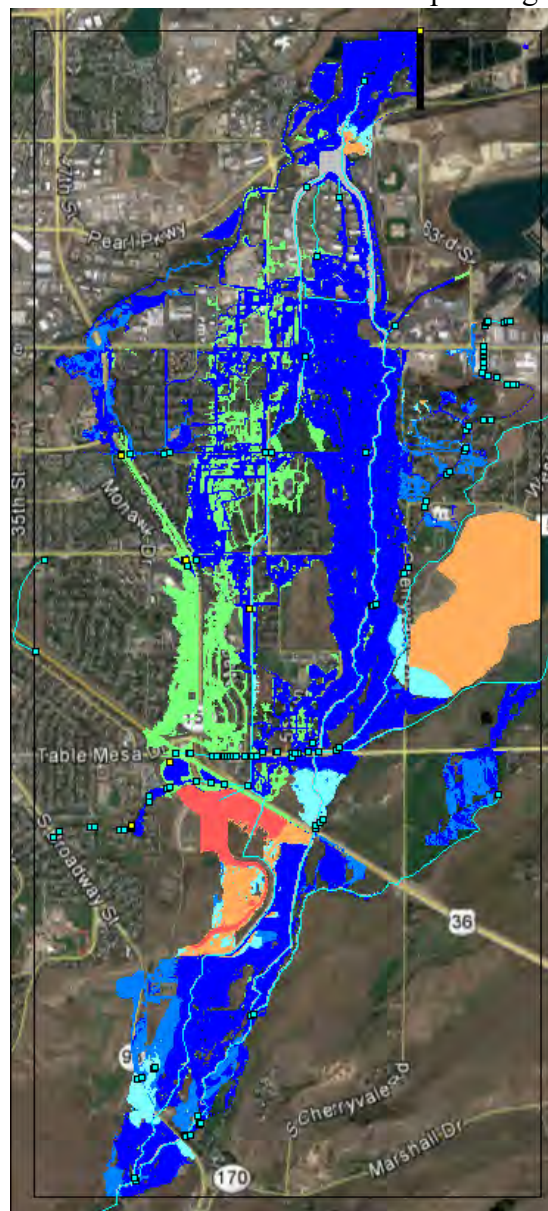
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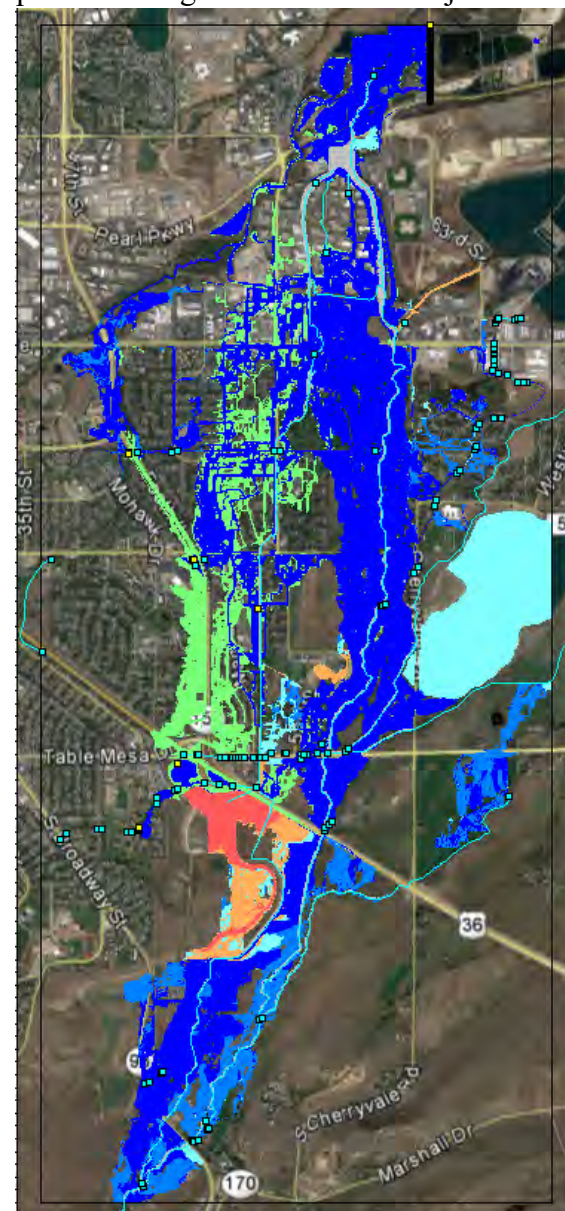
COMPARED TO EFFECTIVE MODEL Attachment C - Concept Design Report SBC Regional Detention Project



60" Dia.

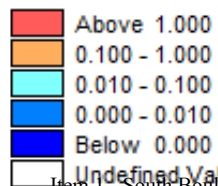


84" Dia.



108" Dia.

Difference in max H [ft]



**REPRODUCE
IN COLOR**



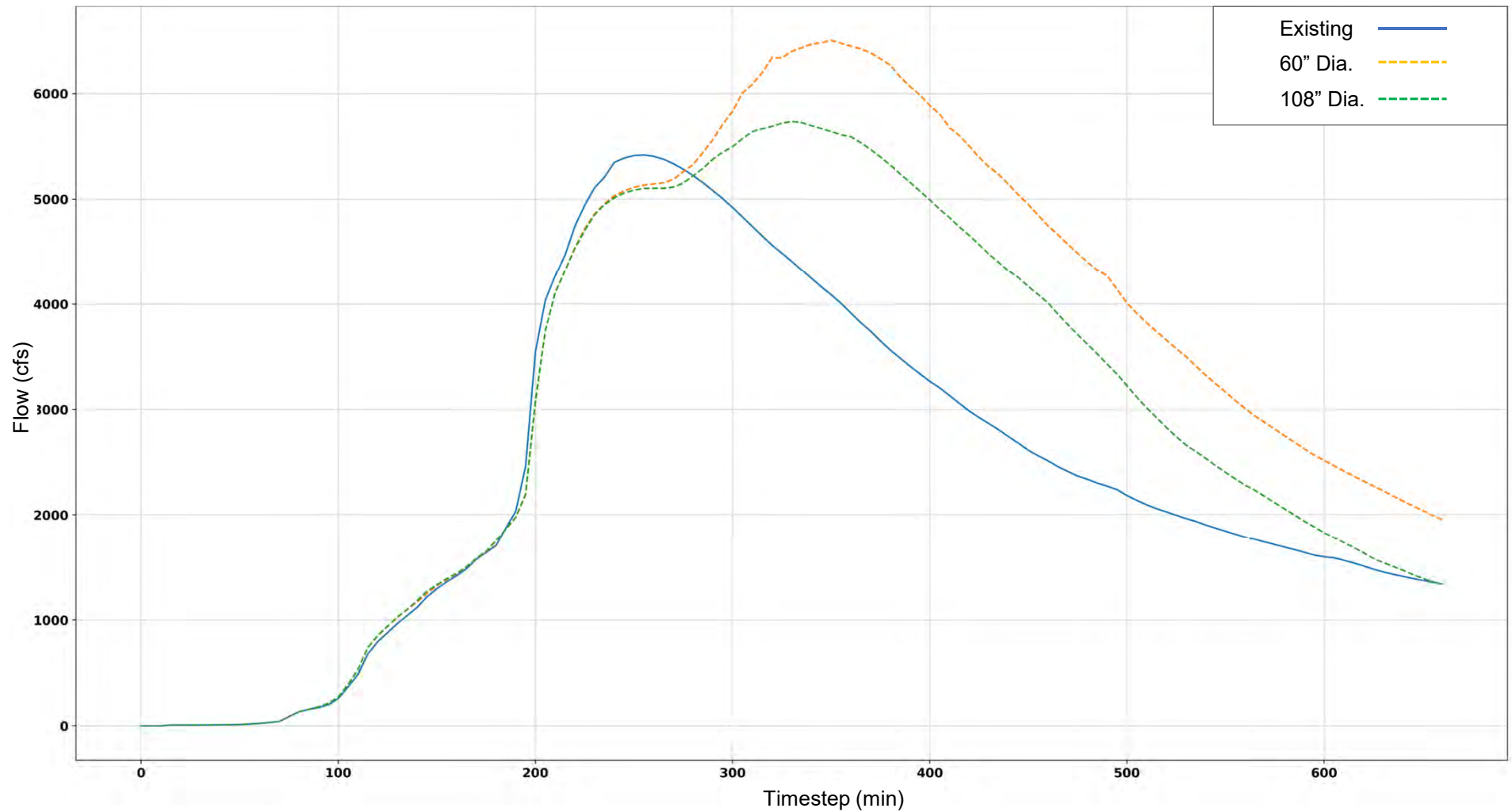
SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

OPTION 1 – DIFFERENCES IN
MAXIMUM WATER SURFACE
ELEVATION (100-YEAR)

PROJECT NO. 16134

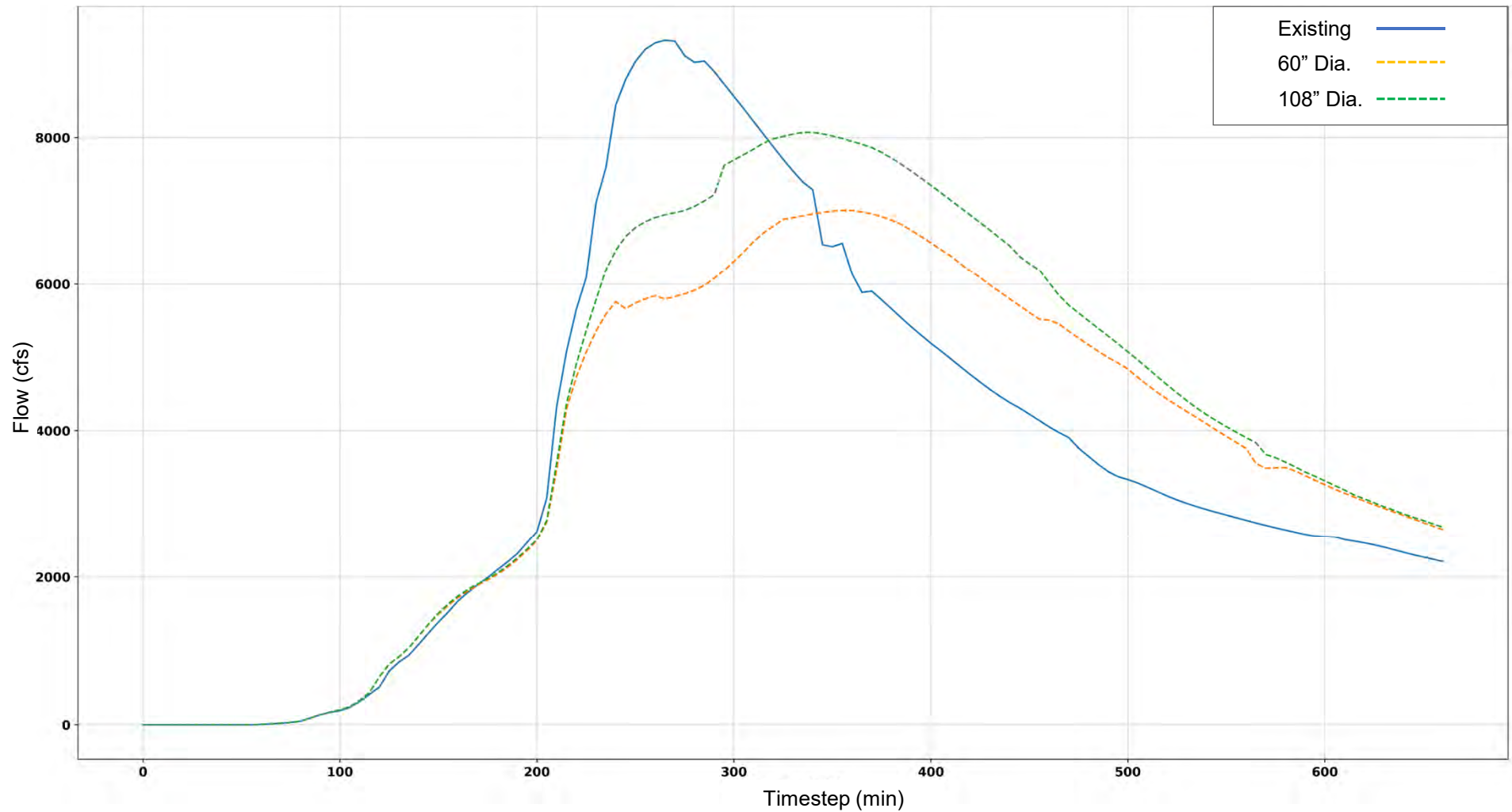
February 2020

Figure 5.17



**REPRODUCE
IN COLOR**

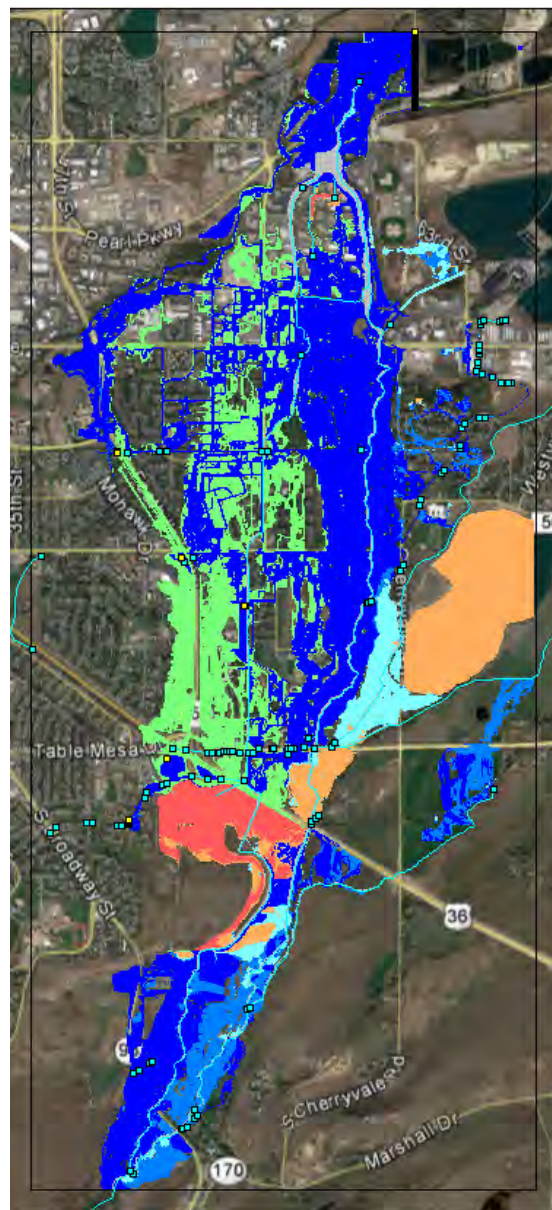




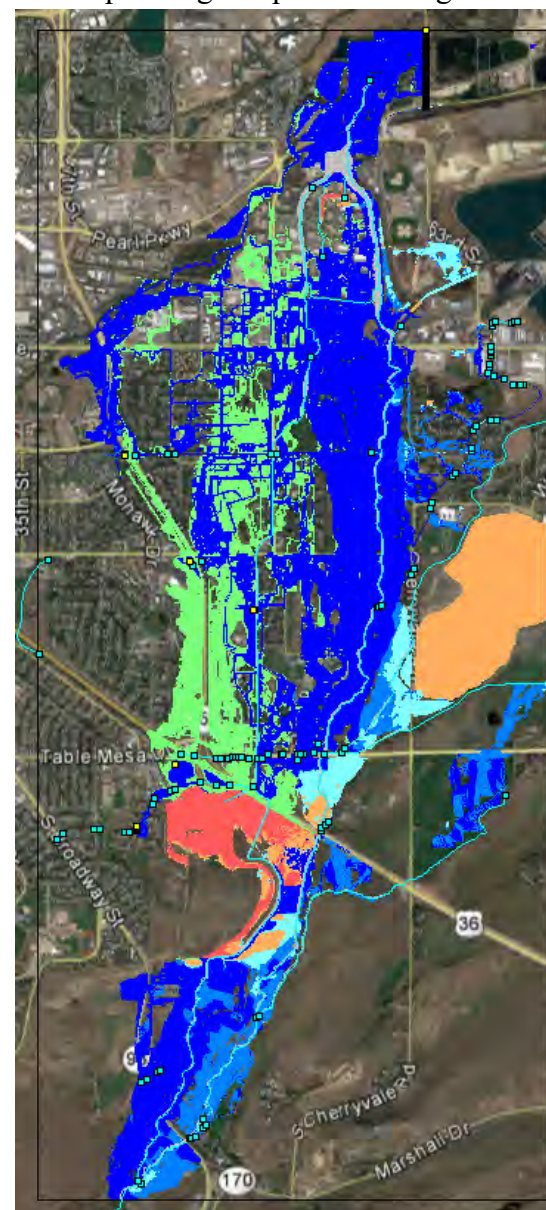
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IN COLOR**



COMPARISON OF EFFECTIVE MODELS Attachment C Concept Design Report SBC Regional Detention Project

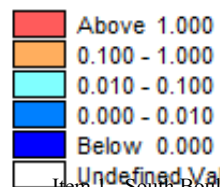


60" Dia.



108" Dia.

Difference in max H [ft]



**REPRODUCE
IN COLOR**



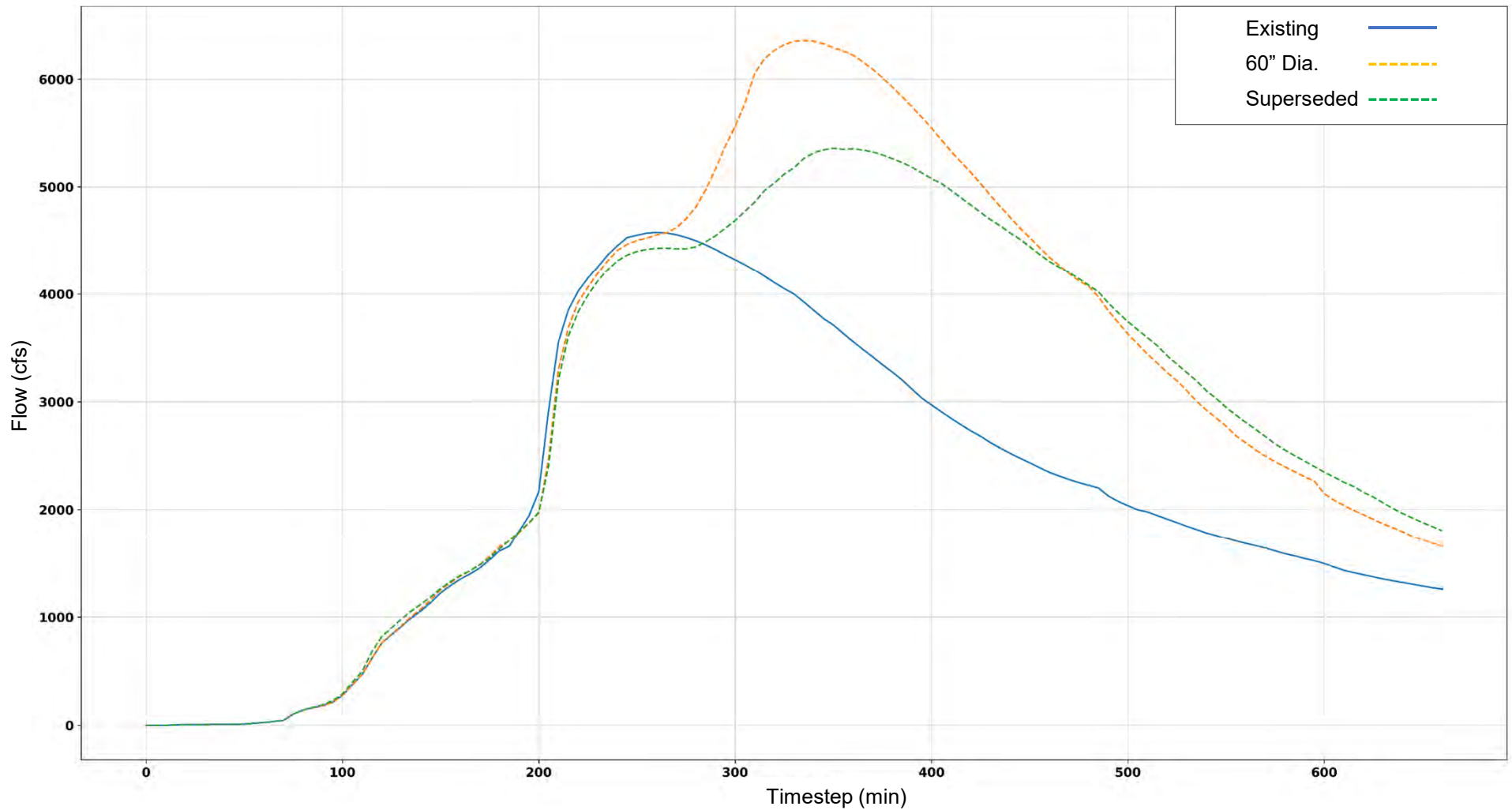
SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

OPTION 2 – DIFFERENCES IN
MAXIMUM WATER SURFACE
ELEVATION (500-YEAR)

PROJECT NO. 16134

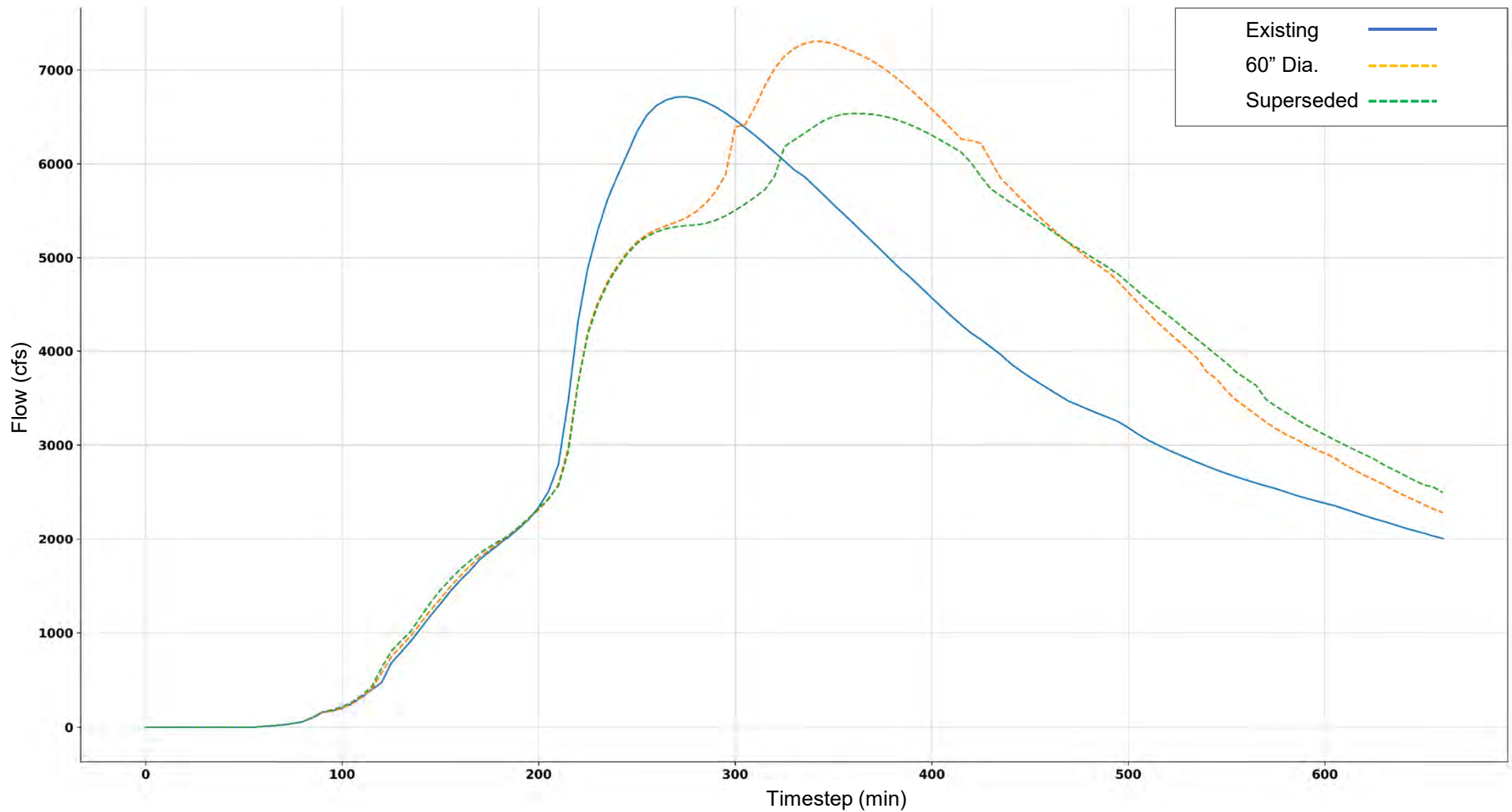
February 2020

Figure 5.20



**REPRODUCE
IN COLOR**





**REPRODUCE
IN COLOR**



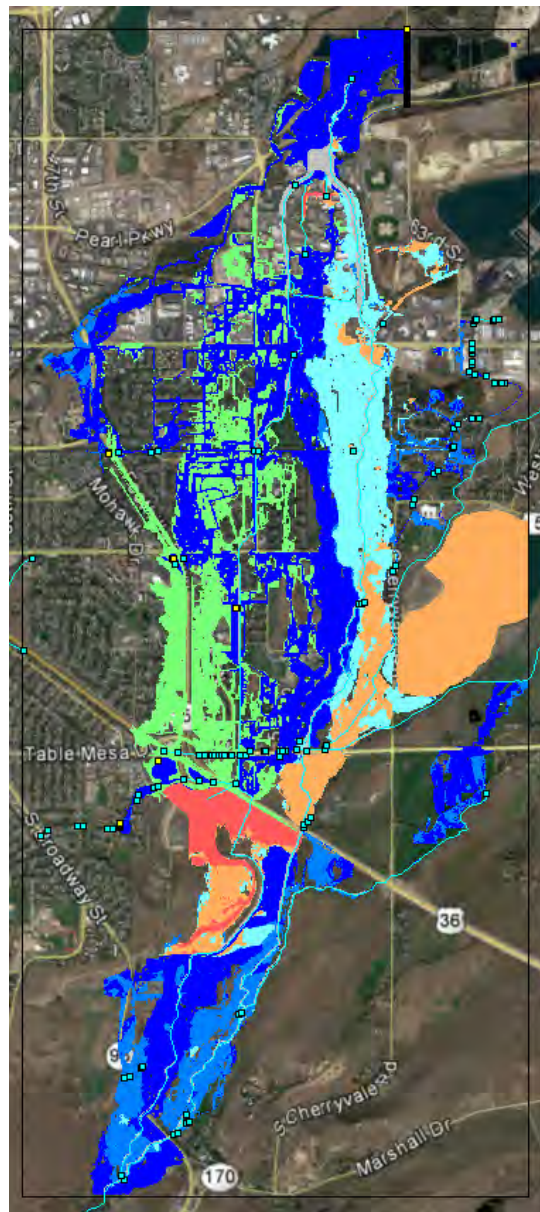
SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

PROJECT NO. 16134

BASELINE- HYDROGRAPHS
AT SOUTH BOULDER ROAD
(APPROX 200-YEAR)

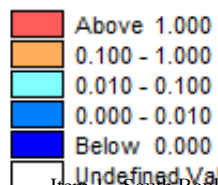
February 2020

Figure 5.22



60" Dia.

Difference in max H [ft]



**REPRODUCE
IN COLOR**



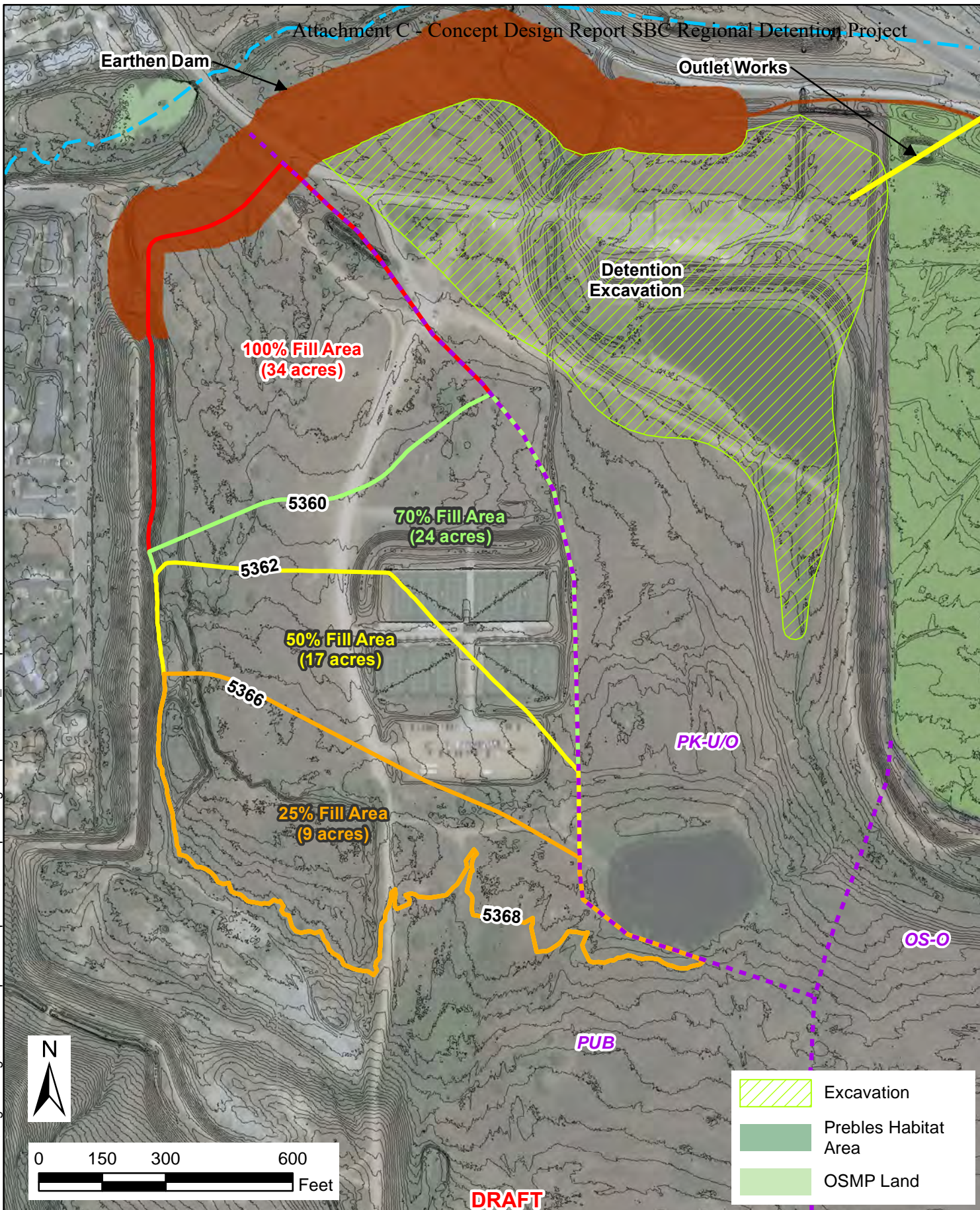
SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

BASELINE- DIFFERENCES IN
MAXIMUM WATER SURFACE
ELEVATION
(APPROX. 200-YEAR)

PROJECT NO. 16134

February 2020

Figure 5.23

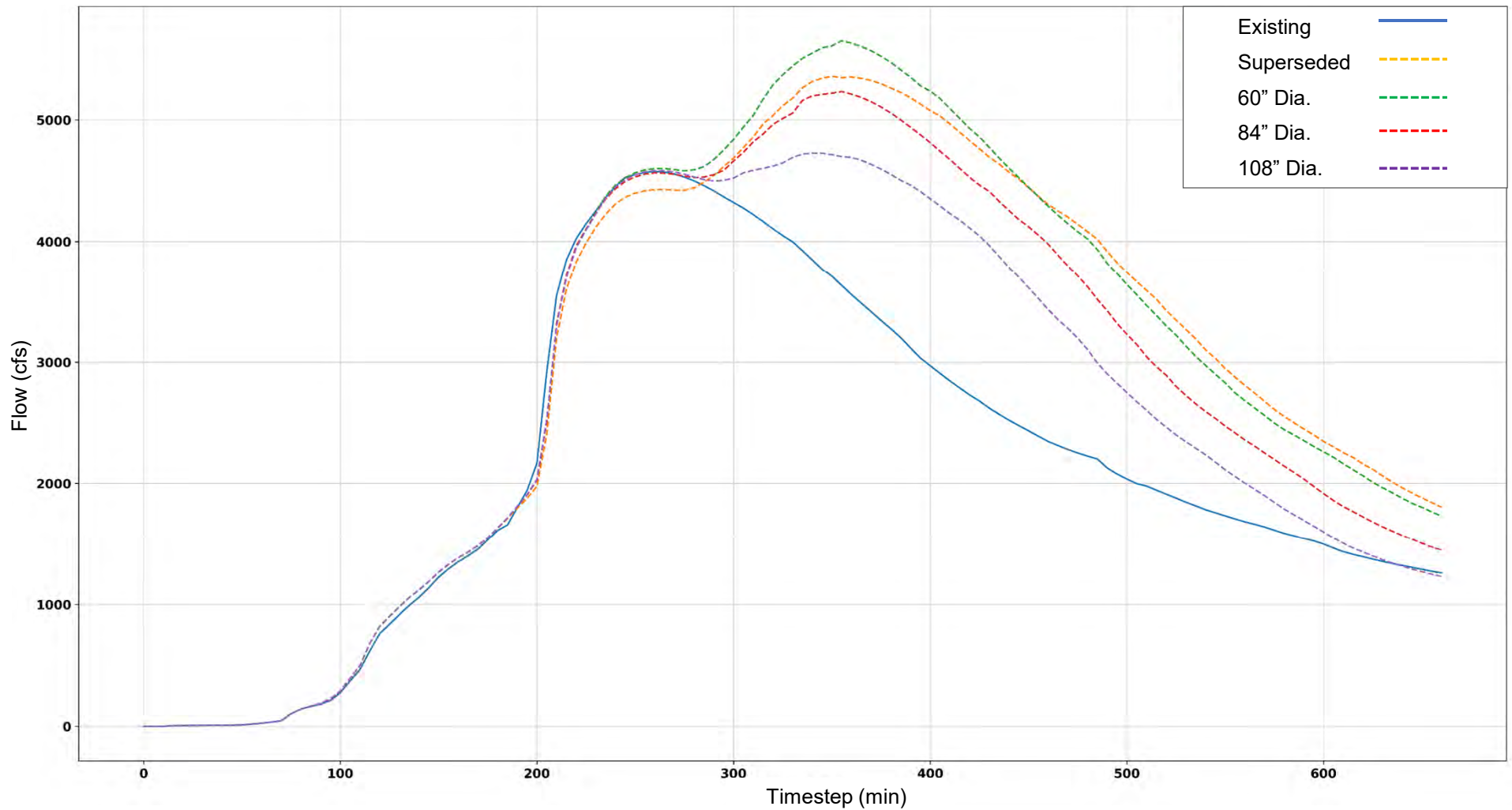


**REPRODUCE
IN COLOR**



SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

PLAN OF OPTION 3
NORTHERN PUB
FILL CONFIGURATIONS

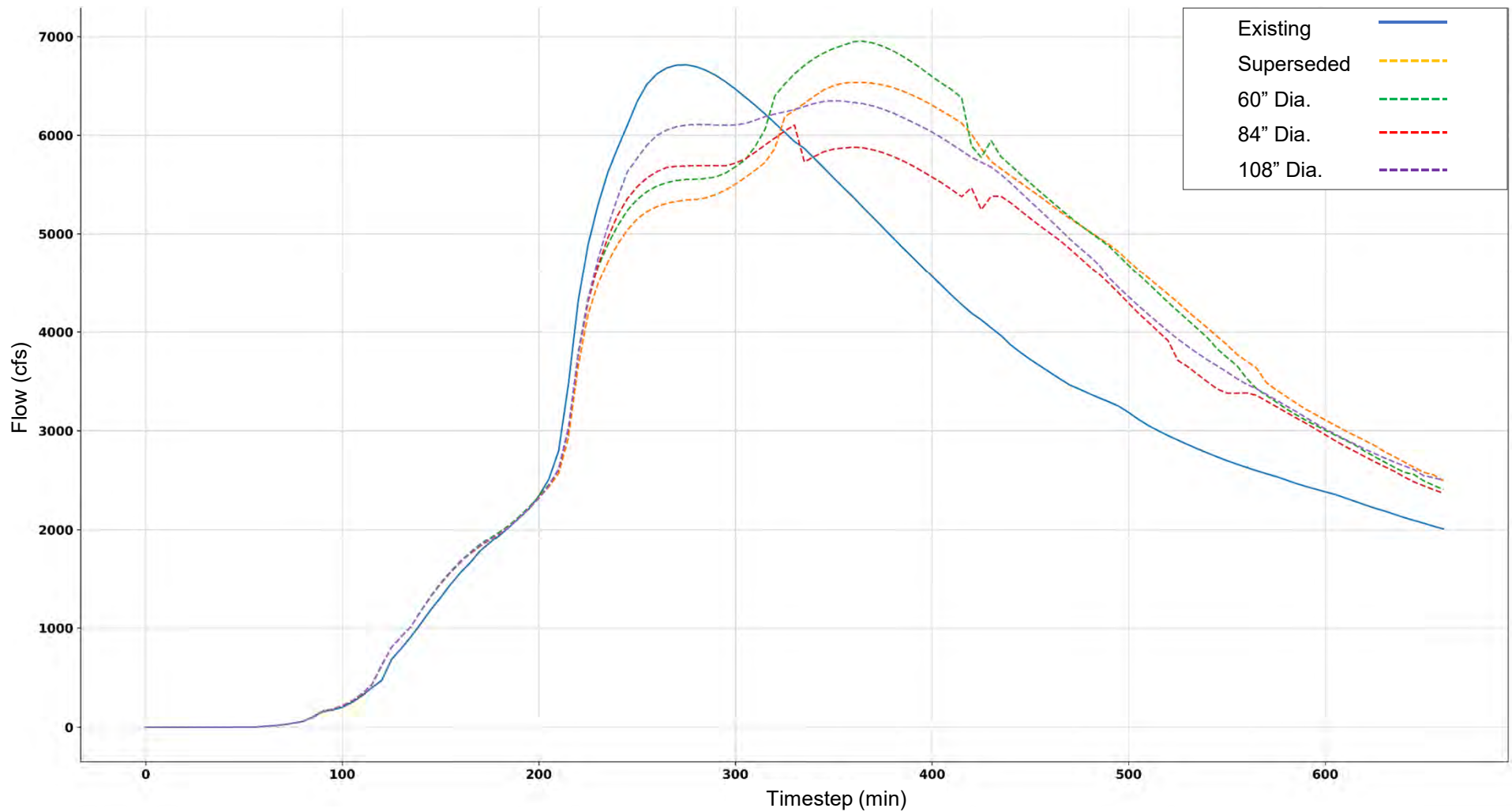


**REPRODUCE
IN COLOR**



SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

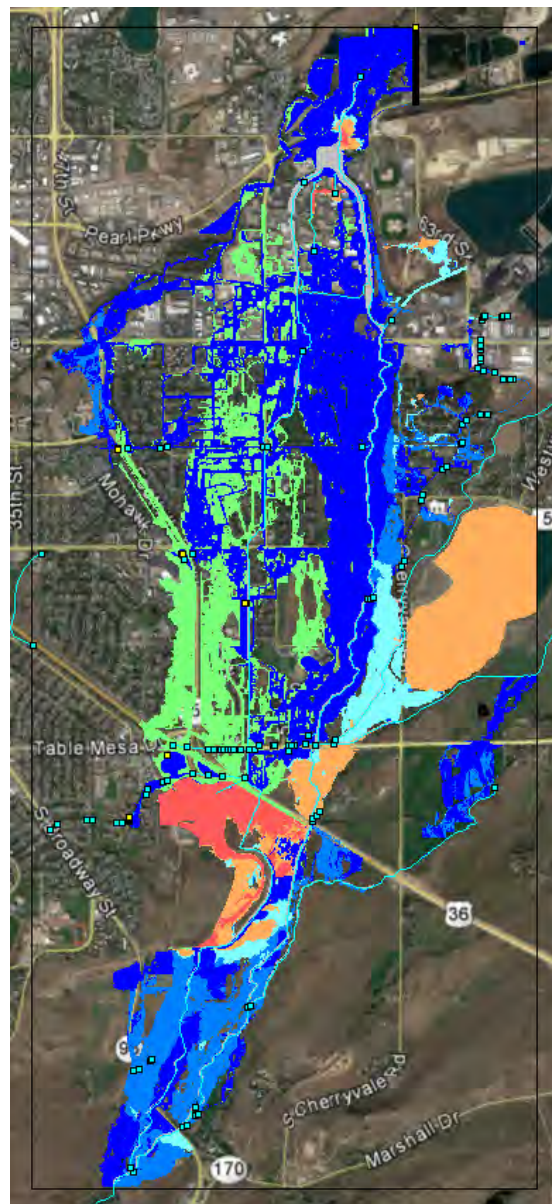
OPTION 3 – HYDROGRAPHS
AT US36 BRIDGE
(APPROX. 200-YEAR)



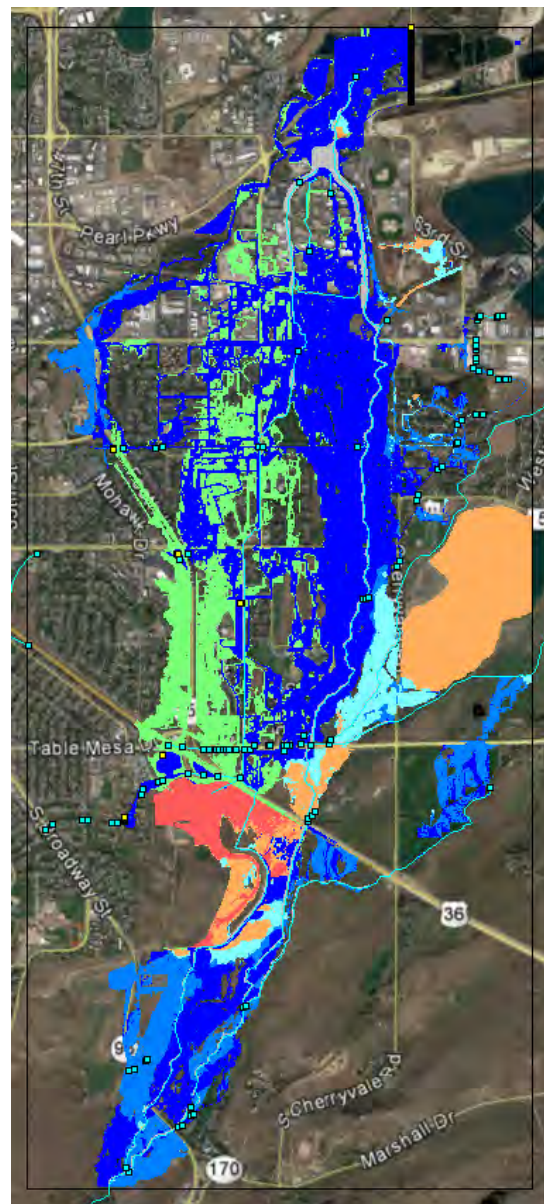
**REPRODUCE
IN COLOR**



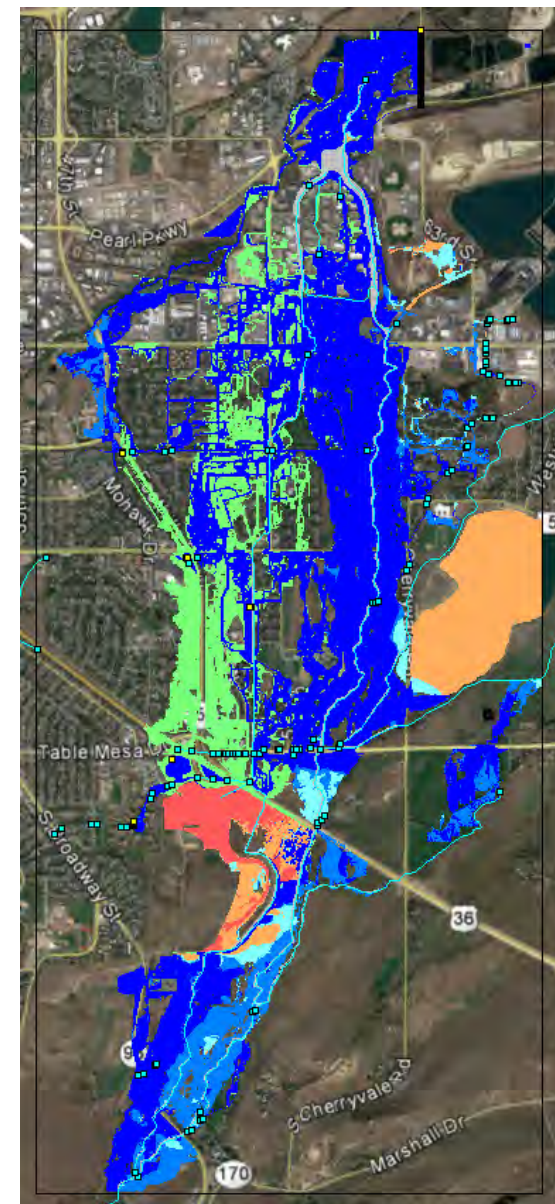
COMPARISON OF EFFECTIVE MODEL DESIGN REPORT SBC REGIONAL DETENTION PROJECT



60" Dia.

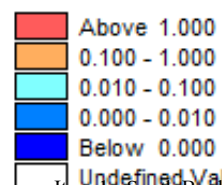


84" Dia.



108" Dia.

Difference in max H [ft]



**REPRODUCE
IN COLOR**



SOUTH BOULDER CREEK
REGIONAL DETENTION
CONCEPT DESIGN

OPTION 3 – DIFFERENCES IN
MAXIMUM WATER SURFACE
ELEVATION
(APPROX. 200-YEAR)

PROJECT NO. 16134

February 2020

Figure 5.27

SECTION 6 – OPINION OF PROBABLE PROJECT COSTS

6.1 General

The RJH Team developed an OPPC for each option. The OPPCs presented in this Report are considered Class 4 estimates as defined by the Association for the Advancement of Cost Estimating and ASTM E2516-11: Standard Classification for Cost Estimate Classification Systems. This class designation is used when the design is less than 15 percent complete. Class 4 estimates are appropriate to use for comparing alternatives, but do not typically provide reliable budgetary estimates.

Cost opinions were developed by estimating quantities of primary elements of the work based on concept-level design and unit costs developed from the following sources:

- Published and non-published bid price data for similar work.
- R.S. Means Heavy Construction Cost Data for 2018.
- Manufacturer's budgetary price quotes.
- Our previous experience and judgment.

Costs in this Report are presented in 2018 dollars to be consistent with previous cost opinions presented to City Council and the public. We subdivided the OPPC into two parts (i.e., regional flood detention facility and earthfill for CU development) because the earthfill for the CU development a) is not required for the regional flood detention facility to function, and b) should have different cost allowances and contingencies because it should be simpler to design and construct, and has fewer unknowns than the regional flood detention facility at this stage of design. Cost allowances for bonds, insurance, construction contingencies, design engineering, construction engineering, environmental permitting, etc. used to develop the OPPCs are presented in Table 6.1.

TABLE 6.1
OPINION OF PROBABLE PROJECT COSTS

Item	Regional Flood Detention Facility	Fill for CU Development
Mobilization/Demobilization	10 Percent of BCS	3 Percent of BCS
Bonds/Insurance	1.5 Percent of BCS	1.5 Percent of BCS
Construction Contingencies	40 Percent of DCS	15 Percent of DCS
Investigations, Surveys, Preliminary and Final Design	12 Percent of DCS	3 Percent of DCS
Construction Engineering	10 Percent of DCS	10 Percent of DCS
Legal Fees	2 Percent of DCS	2 Percent of DCS
CLOMR/LOMR Engineering and Fees	\$600,000	\$0
Environmental Permitting	2 Percent of DCS	2 Percent of DCS

Notes:

1. Base Construction Subtotal (BCS) for each alternative is the sum of construction costs for primary work elements.
2. Direct Construction Subtotal (DCS) is the sum of the BCS, mobilization, demobilization, bonds, and insurance.

A summary of OPPCs for each alternative is presented in Table 6.2. Additional information regarding the cost opinions are provided in Appendix A.

TABLE 6.2
OPINION OF PROBABLE PROJECT COSTS

Configuration	Regional Flood Detention (\$M)	Fill for CU Development (\$M)	Total (\$M)
Option 1 (100-Year)	41.0	9.4	50.4
Option 2 (500-Year)	47.3	34.1	81.4
Option 3 (Approx. 200-Year)	46.9	31.5	78.4

The OPPCs are based on professional opinions and may change as more design details are developed. Actual costs would be affected by a number of factors beyond current control, such as supply and demand for the types of construction required at the time of bidding, the Project vicinity, changes in material supplier costs, changes in labor rates, competitiveness of contractors and suppliers, availability of qualified bidding contractors, changes in applicable regulatory requirements, and changes in design standards. Conditions and factors arising as the Project proceeds from development through bidding and construction may result in construction costs that differ significantly from the estimate provided in this Report.

6.2 Basis of Cost Opinion

Primary considerations used to develop the OPPC are:

- Clearing would consist of removing existing vegetation within the limits of disturbance. Stockpiling would consist of stockpiling topsoil materials on-site for use in site reclamation.
- Demolition of existing CU Boulder South facilities would include the existing maintenance building, asphalt parking lot, and tennis complex. Demolished materials would be disposed at the Front Range Landfill, which is about 25 miles northeast of the site.
- Erosion and sediment control measures would consist of installing silt fence along the perimeter of the anticipated limits of disturbance.
- Dewatering for construction would consist of dewatering the various excavations as needed to construct the work, and would likely include installing wellpoints and other pumping systems. Dewatering costs were identified for general site work, a groundwater conveyance system, and outlet works tunnel.
- The outlet works intake structure would consist of an ungated, low-level reinforced concrete structure.
- The outlet works pipe would consist of a welded steel pipe tunneled through alluvial materials below US36.
- The outlet works outlet structure would consist of a reinforced concrete, U.S. Bureau of Reclamation-type baffle structure.
- The earthen embankment would be constructed using a combination of excavated materials from the detention storage excavation and imported earthfill materials. We have assumed a 50-mile haul cycle for imported earthfill. The upstream and downstream slopes will be 4H:1V.
- The earthfill on the CU Boulder South campus would be constructed using imported earthfill materials.
- The gravel surfacing along the earthen embankment crest would consist of imported aggregate materials.
- The barrier walls along the alignment of the earthen embankment and along the perimeter of the detention excavation would consist of soil-bentonite barrier walls extending from the ground surface into bedrock.

- The earthen embankment filter and drain would be constructed using imported materials.
- The upstream embankment slope protection would consist of grass with an underlying erosion control mat.
- Monitoring instrumentation would include surface monuments, piezometers, and inclinometers.
- Costs associated with excavation for detention are included in fill costs for the earthen embankment.
- The grouted boulder inlet rundown for the detention storage would consist of 24-inch-diameter grouted boulders.
- The spillway energy dissipation apron would consist of a 20-foot-wide, reinforced concrete apron that extends the entire length of the floodwall.
- The floodwall would consist of a reinforced concrete wall with the following wall thicknesses:

Wall Height (ft)	Wall Thickness (inches)
> 15	26
13 – 15	22
11 – 13	18
9 – 11	14
< 9	12

- The floodwall foundation would consist of secant (i.e., fixed end caisson) piles with 25-percent overlap. The piles would extend two feet into bedrock. The piles would be 36-inch-diameter for floodwall heights less than 13 feet and 48-inch-diameter for floodwall heights greater than 13 feet.
- The reinforced secant piles would include a reinforced concrete cap.
- The groundwater conveyance system would consist of two rows of 6-inch-diameter polyvinyl chloride (PVC) slotted pipes parallel to the floodwall with one pipe on each side of the floodwall foundation secant piles. The slotted pipes would be encapsulated with bedding material. Solid 6-inch-diameter PVC pipes would penetrate through the floodwall foundation at about 500-foot intervals to connect the upstream pipe with the downstream pipe. The collection and distribution trenches would consist of imported aggregate materials.
- The temporary detour of the multi-use trail would extend from near the intersection of South Cherryvale Road and US36 north along South Cherryvale

Road approximately 3,400 feet and west along South Boulder Road approximately 7,000 feet to the Regional Transportation District bus stop near South Loop Drive. Costs associated with the temporary detour would include initial setup of signs, daily inspection and maintenance of signs over an 18-month duration, and removal of signs.

- Multi-use trail demolition and reconstruction would include:
 - Demolishing the existing concrete trail.
 - Hauling demolished concrete to Front Range Landfill, which is about 25 miles northeast of the site.
 - Constructing a new 6-inch-thick, 12-foot-wide reinforced concrete trail.
- Environmental mitigation would consist of installing wetland plugs and cottonwood poles, and performing wetland seeding to mitigate wetland areas that are impacted by construction.
- The quantity and extent of levee removal is unknown at this stage of design. Excavated levee materials could be used in the construction of the earthen embankment, which would reduce the amount of imported earthfill and lower overall Project costs. Cost savings associated with levee removal were not considered for the alternative configurations that include levee removal.
- Traffic control on US36 would consist of installing approximately 2,300 linear feet of jersey barriers along the US36 shoulder adjacent to the floodwall work, and maintaining the barriers and signage for an 18-month duration.
- Modifications to South Loop Drive would consist of constructing an earthfill ramp to convey traffic over the earthen embankment and installing asphalt pavement to replace the existing road in-kind.
- Modifications to the existing culverts would consist of installing reinforced concrete baffled outlet structures at the downstream end of the culverts on the north side of US36.
- Site restoration would consist of placing stockpiled topsoil, finish grading, and seeding all disturbed areas.
- Cost associated with the following items or considerations were not included in the OPPC:
 - Land acquisition.
 - Environmental enhancements.

- Grading and other site features for athletic fields for CU Boulder South.
- Reconstruction of the CU Boulder South maintenance building and asphalt parking lot.
- Reconstruction of the CU Boulder South tennis complex.
- Utility relocates in the US36 ROW.
- Landscape architecture features.
- Restricted work hours (potentially limited to 7:30 am to 5:00 pm Monday through Friday).

SECTION 7 – CONCEPT SELECTION CRITERIA

7.1 General

An overall objective of the concept design is to identify one of the concept options to advance into preliminary design. To fulfill this objective, selection criteria were developed to facilitate a comparison of the options for a variety of considerations including technical, operational, environmental, economic, etc. The evaluation included two general categories of criteria:

- **Baseline criteria:** The baseline criteria are minimum Project criteria that each concept option is required to meet. If a concept alternative does not meet all of the baseline criteria, it is not considered a viable alternative.
- **Project evaluation criteria:** Evaluation criteria include technical, operational, environmental, economic, and land owner considerations. Evaluation criteria will vary between the different alternatives and will be used to distinguish the options.

7.2 Baseline Criteria

The baseline criteria are as follows:

- Overtopping of US36 during the selected flood design event must be prevented.
- Is likely permittable by regulatory agencies (FEMA, EPA, USACE and USFWS).
- Must be acceptable to the SEO.
- Landowners (CU, CDOT and OSMP) must be willing to allow construction of the Project.
- Groundwater impacts from the Project must be mitigated to maintain current groundwater conditions.
- Existing regulatory floodplains upstream and downstream of the Project cannot be negatively impacted.

7.3 Project Evaluation Criteria

The Project evaluation criteria were developed collaboratively by the Project Team, and were informed by public input from a community open house on April 23, 2018 and an associated questionnaire. A qualitative explanation was developed for each evaluation criterion for each configuration describing its ability to meet the criterion relative to the

other configurations. Qualitative descriptions were developed collaboratively by the Project Team based on the concept evaluations and layouts. The Project evaluation criteria and descriptions are as follows:

- **Downstream flood benefits.** Option 2 will inherently provide the most downstream flood benefits because it would provide protection for a 500-year event. Option 1 would inherently provide the least downstream flood protection because it would only provide protection up to the 100-year event.
- **Adaptability for climate change.** The ability to modify Project facilities in the future to accommodate potential increases in flood flows associated with climate change is desirable. Future modifications to provide additional flood storage would likely include raising the embankment and floodwall, construction of a flow control structure on South Boulder Creek, and raising the earthfill or constructing a levee to protect CU buildings on the northern PUB land use area. Option 1 is the least adaptable because it would require raising or protecting the most area on the northern PUB land use. Option 2 is the most adaptable because the earthfill on the southern PUB and OS-O land use areas would likely be outside of the raised reservoir pool and may not need to be modified.
- **Total Project cost.** Lower Project costs are desirable and scoring was developed based on the cost opinions presented in Section 6.
- **Design, permitting, and construction schedule.** A short design, permitting, and construction schedule is desirable so that flood protection is provided to downstream residents as soon as reasonably possible. We anticipate that the time to design, permit, and construct all of the configurations would be similar.
- **Long-term operations and maintenance requirements.** Simple long-term operations and maintenance requirements are preferred over more complex requirements. We anticipate that long-term operations and maintenance would be similar for all of the options.
- **Groundwater mitigation complexity.** Construction of any of the concepts would require groundwater flows to move below the dam and floodwall in a similar manner as existing conditions. We anticipate that groundwater conveyance system would be similar for all of the options.
- **Riparian connectivity and habitat enhancement opportunities.** The presence of encroachments into the SBC riparian corridor, including the levee on CU Boulder South, adversely affect the ecological and open space values by constricting flood flows, which results in higher water velocities, and by presenting a barrier or impediment to animal movement in the floodplain.

Increased riparian connectivity and habitat enhancement opportunities are desirable along the SBC riparian corridor. Options that require placing fill on the OS-O land use area would limit riparian connectivity and habitat enhancement opportunities in this area. Option 2 would fill 34 acres on the OS-O land use area, and Option 3 would fill 17 acres on the OS-O land use area. Option 2 was scored as “least opportunities” and Option 3 was scored as “less opportunities.”

- **Length, height, and size of dam.** Smaller dam heights and footprints are preferred to larger dam heights and footprints from an aesthetic and operations maintenance perspective. Option 1 has the smallest footprint and was scored as “smallest,” and Option 2 has the largest footprint and was scored as “largest.”
- **Wetlands and open water impacts.** Direct wetlands and open water impacts are not desirable because they may increase the risk of Project delays or ability to obtain a federal environmental permit. Impacts were measured quantitatively for each configuration based on acres that would be impacted. Option 1 would impact the fewest acres of open water and wetlands and was scored as “least impacts.” Option 2 and Option 3 were scored as “moderate impacts” and “most impacts,” respectively.
- **T&E habitat impacts.** Direct T&E habitat impacts are not desirable because they may increase the risk of Project delays or ability to obtain a federal environmental permit. Impacts were measured quantitatively for each configuration based on acres that would be impacted. Option 1 would impact the fewest acres of T&E habitat and was scored as “least impacts.” Option 2 and Option 3 were scored “most impacts.”

A summary matrix of the evaluation criteria is presented in Table 7.1.

TABLE 7.1
EVALUATION CRITERIA MATRIX

Criteria	Option 1 (100-Year)	Option 2 (500-Year)	Option 3 (Approx. 200-Year)
Downstream Flood Benefits	Least flood protection	Most flood protection	More flood protection
Adaptability for Climate Change	Less adaptable	Most adaptable	More adaptable
Total Project Cost	Least expensive	Most expensive	Most expensive
Design, Permitting, and Construction Schedule	Similar for all of the options		
Long-Term Operations and Maintenance Requirements	Similar for all of the options		
Groundwater Mitigation Complexity	Similar for all of the options		
Riparian Connectivity and Habitat Enhancement Opportunities	Most opportunities	Least opportunities	Less opportunities
Length, Height and Size of Dam	Smallest	Largest	Middle
Direct Wetlands and Open Water Impacts	Least impacts	Moderate impacts	Most Impacts
Direct T&E Habitat Impacts	Least impacts	Most Impacts	Most Impacts

Note:

1. The same rating was assigned for scoring that was effectively similar.

SECTION 8 – NEXT STEPS

Based on direction from City Council and discussions with City staff and MHFD, we have identified the following next steps for the Project.

- Winter/Spring 2020: The Project Team will present the concept-level alternatives presented in this Report to City Council, WRAB, and OSBT. At the end of this process, ideally City Council will assist in selecting a preferred alternative to advance into preliminary design.
- Summer/Fall 2020: Community Engagement around future annexation of CU Boulder South. Staff will proceed with community engagement in accordance with the feedback from the September 20, 2018 City Council meeting.
- Fall 2020/Winter 2021: Updates on the Flood Mitigation Preliminary Design. Staff will provide regular updates to boards and the community regarding Project progress. During the preliminary design phase of the Project, the Project Team will:
 - Continue to collect and evaluate groundwater and geotechnical data.
 - Develop baseline and proposed conditions groundwater models.
 - Design specific elements of the selected concept variation.
 - Revise concept cost estimates.
 - Secure necessary permits and approvals.
 - Secure agreements with property owners.
 - Develop design documents for construction.
- Summer/Fall 2020: Planning Board and City Council meetings regarding CU Boulder South annexation. Planning Board and City Council will consider a draft annexation agreement between the City and CU.
- Following completion of preliminary design and agreements with the property owners, the Project Team will proceed with final design, permitting, and construction of the Project, which combined is anticipated to take approximately 3 to 4 years.

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APPENDIX A

COST OPINION INFORMATION

16134 South Boulder Creek
Project No. 16134



REGIONAL DETENTION FACILITY									
Item No.	Item	Unit	Unit Cost (\$)	OPTION 1 (100-YEAR)		OPTION 2 (500-YEAR)		OPTION 3 (APPROX 200-YEAR)	
				Quantity	Cost (\$)	Quantity	Cost (\$)	Quantity	Cost (\$)
1	Clearing and Topsoil Stockpiling	acre	\$ 3,800	160	\$ 608,000	220	\$ 836,000	220	\$ 836,000
2	Demolition of CU Maintenance Building	LS	\$ 140,000	1	\$ 140,000	1	\$ 140,000	1	\$ 140,000
3	Demolition of CU Tennis Court	LS	\$ 500,000	1	\$ 500,000	1	\$ 500,000	1	\$ 500,000
4	Erosion and Sediment Control	LS	\$ 75,000	1	\$ 75,000	1	\$ 75,000	1	\$ 75,000
5	Temporary Dewatering for Construction	--	--	--	--	--	--	--	--
6	General Site	LS	\$ 120,000	1	\$ 120,000	1	\$ 120,000	1	\$ 120,000
7	Groundwater Conveyance System	LS	\$ 525,000	1	\$ 525,000	1	\$ 525,000	1	\$ 525,000
8	Tunnel	LS	\$ 100,000	1	\$ 100,000	1	\$ 100,000	1	\$ 100,000
9	Outlet Works Intake Structure	LS	\$ 100,000	1	\$ 100,000	1	\$ 100,000	1	\$ 100,000
10	Outlet Works Pipe - Dual 60" Dia.	LF	\$ 9,000	650	\$ 5,850,000	0	\$ -	0	\$ -
11	Outlet Works Pipe - Triple 60" Dia.	LF	\$ 12,000	0	\$ -	650	\$ 7,800,000	650	\$ 7,800,000
12	Outlet Works Outlet Structure	LS	varies	1	\$ 150,000	1	\$ 225,000	1	\$ 225,000
13	Dam Embankment using on-site excavation ⁽¹⁾	CY	\$ 4.00	69,000	\$ 276,000	69,000	\$ 276,000	69,000	\$ 276,000
14	Dam Embankment using imported earthfill	CY	\$ 19.00	46,000	\$ 874,000	66,000	\$ 1,254,000	51,000	\$ 969,000
15	Gravel Surfacing - Dam Crest	CY	\$ 50	760	\$ 38,000	760	\$ 38,000	760	\$ 38,000
16	Subsurface Barrier Wall - Dam	SF	\$ 8.50	26,300	\$ 223,550	26,300	\$ 223,550	26,300	\$ 223,550
17	Subsurface Barrier Wall - Pond Liner	SF	\$ 8.50	37,000	\$ 314,500	37,000	\$ 314,500	37,000	\$ 314,500
18	Dam Embankment Filter and Drain	CY	\$ 50	7,100	\$ 355,000	8,100	\$ 405,000	7,500	\$ 375,000
19	Upstream Embankment Erosion Control Mat	SY	\$ 4.20	15,000	\$ 63,000	18,000	\$ 75,600	16,000	\$ 67,200
20	Dam Embankment Monitoring Instrumentation	LS	\$ 250,000	1	\$ 250,000	1	\$ 250,000	1	\$ 250,000
21	Excavation for Detention ⁽²⁾	CY	\$ -	69,000	\$ -	69,000	\$ -	69,000	\$ -
22	Grouted Boulder Inlet Rundown for Detention	SY	\$ 300	2,000	\$ 600,000	2,000	\$ 600,000	2,000	\$ 600,000
23	Spillway Energy Dissipation Apron	CY	\$ 575	1,800	\$ 1,035,000	1,800	\$ 1,035,000	1,800	\$ 1,035,000
24	Floodwall	CY	\$ 575	675	\$ 388,125	1,000	\$ 575,000	750	\$ 431,250
25	Floodwall Foundation (Secant Piles - 36 in dia.)	VLF	\$ 160	25,600	\$ 4,096,000	25,600	\$ 4,096,000	25,600	\$ 4,096,000
26	Floodwall Foundation Wall Cap	CY	\$ 350	750	\$ 262,500	750	\$ 262,500	750	\$ 262,500
27	Groundwater Conveyance System	LS	\$ 1,600,000	1	\$ 1,600,000	1	\$ 1,600,000	1	\$ 1,600,000
28	Multi-Use Trail Temporary Construction Detour	LS	\$ 110,000	1	\$ 110,000	1	\$ 110,000	1	\$ 110,000
29	Multi-Use Trail Demolition and Reconstruction	LS	\$ 320,000	1	\$ 320,000	1	\$ 320,000	1	\$ 320,000
30	Environmental Mitigation	acre	\$ 130,000	10.3	\$ 1,339,000	12.6	\$ 1,638,000	14.5	\$ 1,885,000
31	CU Levee Removal ⁽³⁾	CY	\$ -	0	\$ -	0	\$ -	0	\$ -
32	US 36 Traffic Control	LS	\$ 220,000	1	\$ 220,000	1	\$ 220,000	1	\$ 220,000
33	South Loop Drive Reconstruction	LS	\$ 500,000	1	\$ 500,000	1	\$ 500,000	1	\$ 500,000
34	Modifications to Existing Culverts	LS	\$ 175,000	1	\$ 175,000	1	\$ 175,000	1	\$ 175,000
35	Site Restoration	acre	\$ 4,000	160	\$ 640,000	220	\$ 880,000	220	\$ 880,000
Base Construction Subtotal (BCS)					\$ 21,847,675		\$ 25,269,150		\$ 25,049,000
Mob/Demob (10% of BCS)					\$ 2,184,768		\$ 2,526,915		\$ 2,504,900
Bonds/Insurance (1.5% of BCS)					\$ 327,715.13		\$ 379,037.25		\$ 375,735
Direct Construction Subtotal (DCS)					\$ 24,360,158		\$ 28,175,102		\$ 27,929,635
Construction Contingencies (40% of DCS)					\$ 9,744,063		\$ 11,270,041		\$ 11,171,854
Investigations, Surveys, Preliminary - Final Design (12% of DCS)					\$ 2,923,219		\$ 3,381,012		\$ 3,351,556
Construction Engineering (10% of DCS)					\$ 2,436,016		\$ 2,817,510		\$ 2,792,964
Legal Fees (2% of DCS)					\$ 487,203		\$ 563,502		\$ 558,593
CLOMR/LOMR Engineering and Fees					\$ 600,000		\$ 600,000		\$ 600,000
Environmental Permitting (2% of DCS)					\$ 487,203		\$ 563,502		\$ 558,593
Opinion of Probable Project Cost, Class 4 (2018)					\$ 41,037,862		\$ 47,370,670		\$ 46,963,194

FILL FOR CU DEVELOPMENT									
Item No.	Item	Unit	Unit Cost (\$)	OPTION 1 (100-YEAR)		OPTION 2 (500-YEAR)		OPTION 3 (APPROX 200-YEAR)	
				Quantity	Cost (\$)	Quantity	Cost (\$)	Quantity	Cost (\$)
1	CU Fill using imported earthfill	CY	\$ 19.00	360,000	\$ 6,840,000	1,300,000	\$ 24,700,000	1,200,000	\$ 22,800,000
Base Construction Subtotal (BCS)					\$ 6,840,000		\$ 24,700,000		\$ 22,800,000
Mob/Demob (3% of BCS)					\$ 205,200		\$ 741,000		\$ 684,000
Bonds/Insurance (1.5% of BCS)					\$ 102,600		\$ 370,500		\$ 342,000
Direct Construction Subtotal (DCS)					\$ 7,147,800		\$ 25,811,500		\$ 23,826,000
Construction Contingencies (15% of DCS)					\$ 1,072,170		\$ 3,871,725		\$ 3,573,900
Investigations, Surveys, Preliminary - Final Design (3% of DCS)					\$ 214,434		\$ 774,345		\$ 714,780
Construction Engineering (10% of DCS)					\$ 714,780		\$ 2,581,150		\$ 2,382,600
Legal Fees (2% of DCS)					\$ 142,956		\$ 516,230		\$ 476,520.00
Environmental Permitting (2% of DCS)					\$ 142,956		\$ 516,230		\$ 476,520.00
Opinion of Probable Project Cost, Class 4 (2018)					\$ 9,435,096		\$ 34,071,180		\$ 31,450,320

Total Opinion of Probable Project Cost, Class 4 (2018)		\$ 50,472,958		\$ 81,441,850		\$ 78,413,514
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Items Not Included:
Land Acquisition
Environmental Enhancements
Rebuild CU Building
Rebuild CU tennis courts
Utility Relocates in US36 ROW
Landscape Architecture Features
Restricted Work Hours

- Notes:
- Upstream and downstream slopes are 4H:1V.
 - Cost for excavation for detention pond included in costs for dam embankment fill.
 - Excavation for levee could vary from 0 to 63,000 cy. We assumed no levee excavation.
 - Class 4 estimates are used when the design is less than 15-percent complete.

City of Boulder Flood Management Program



January 2020

Table of Contents

Introduction.....	3
Flood Risks	3
Wildfires	6
Flood Emergency Preparedness	7
Floodplain Mapping.....	7
Flood Mitigation	9
Property Acquisition	10
Overview of the Mile High Flood District.....	10
Floodplain Regulations	11
Flood Insurance and the Community Rating System (CRS)	12
Flood Recovery	13
Flood Outreach.....	13

Introduction

The City of Boulder has a significant flood risk, primarily due to its location at the mouth of Boulder Canyon and other canyon creeks. The city has a long history of flooding and has developed a comprehensive flood management program designed to identify and mitigate the risks of flooding, minimize loss of life and property damage, and support recovery following a major flood. Major components of the city's flood management program include mapping, mitigation master planning and construction, property acquisition, and flood protection through land use regulations and flood preparedness. This document provides a brief summary of the city's floodplain management program elements, along with a summary of the National Flood Insurance Program.

Flood Risks

The City of Boulder has 16 major drainageways (**Figure 1**). Approximately 13 percent of the city is located within the regulatory 100-year floodplain (**Figure 2**), including approximately 2,000 individual structures.

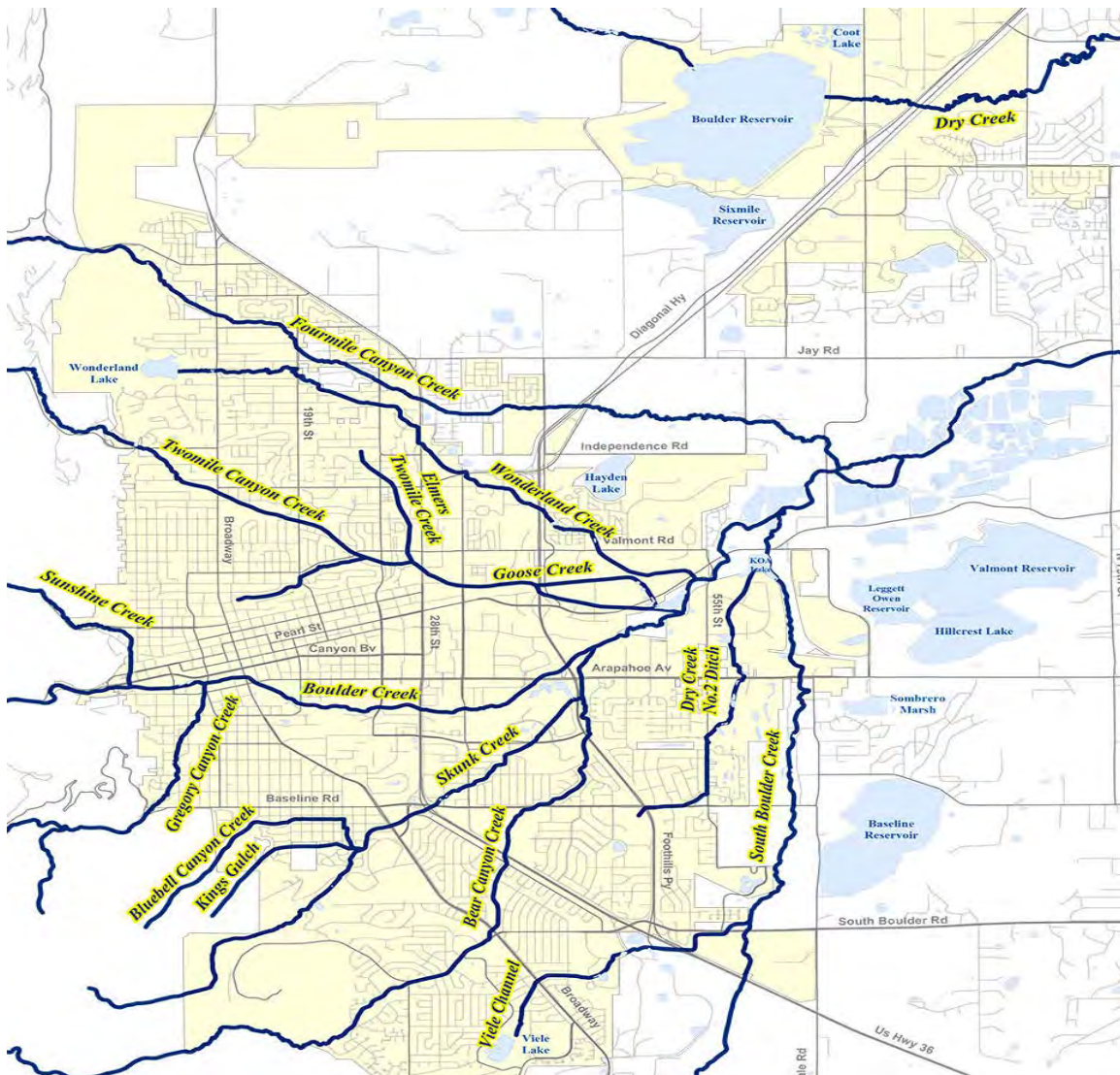


Figure 1: Major Drainageways

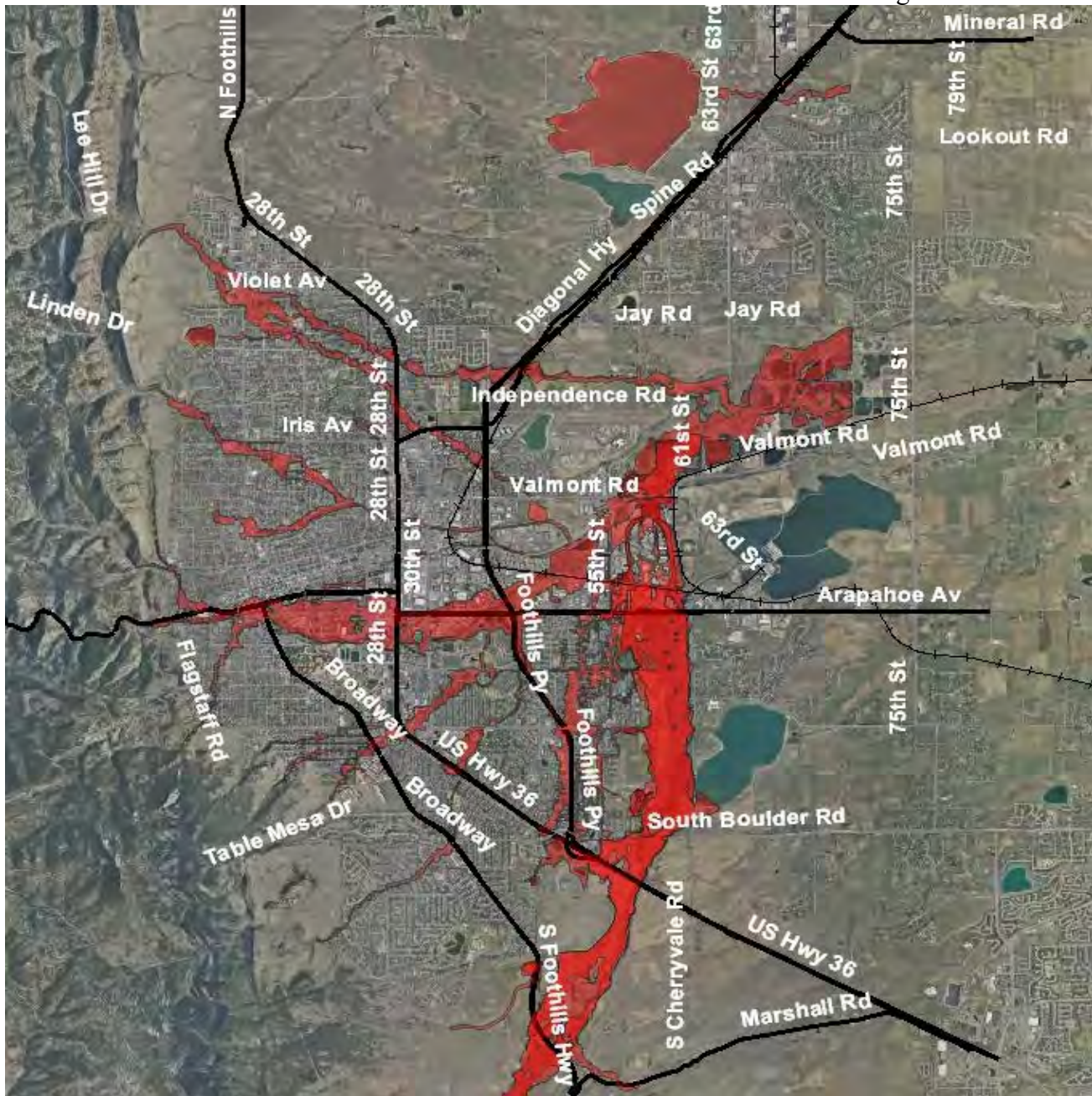


Figure 2: 100-Year Floodplain

The greatest flash flood risk is generally considered to be from April through September, but flooding can occur at any time. Flooding can happen from both long-duration and short-duration storm events. Flash floods along the city's creeks can occur very quickly, with little or no warning. The greatest threat is from thunderstorms that produce high-intensity rainfall in short periods of time.

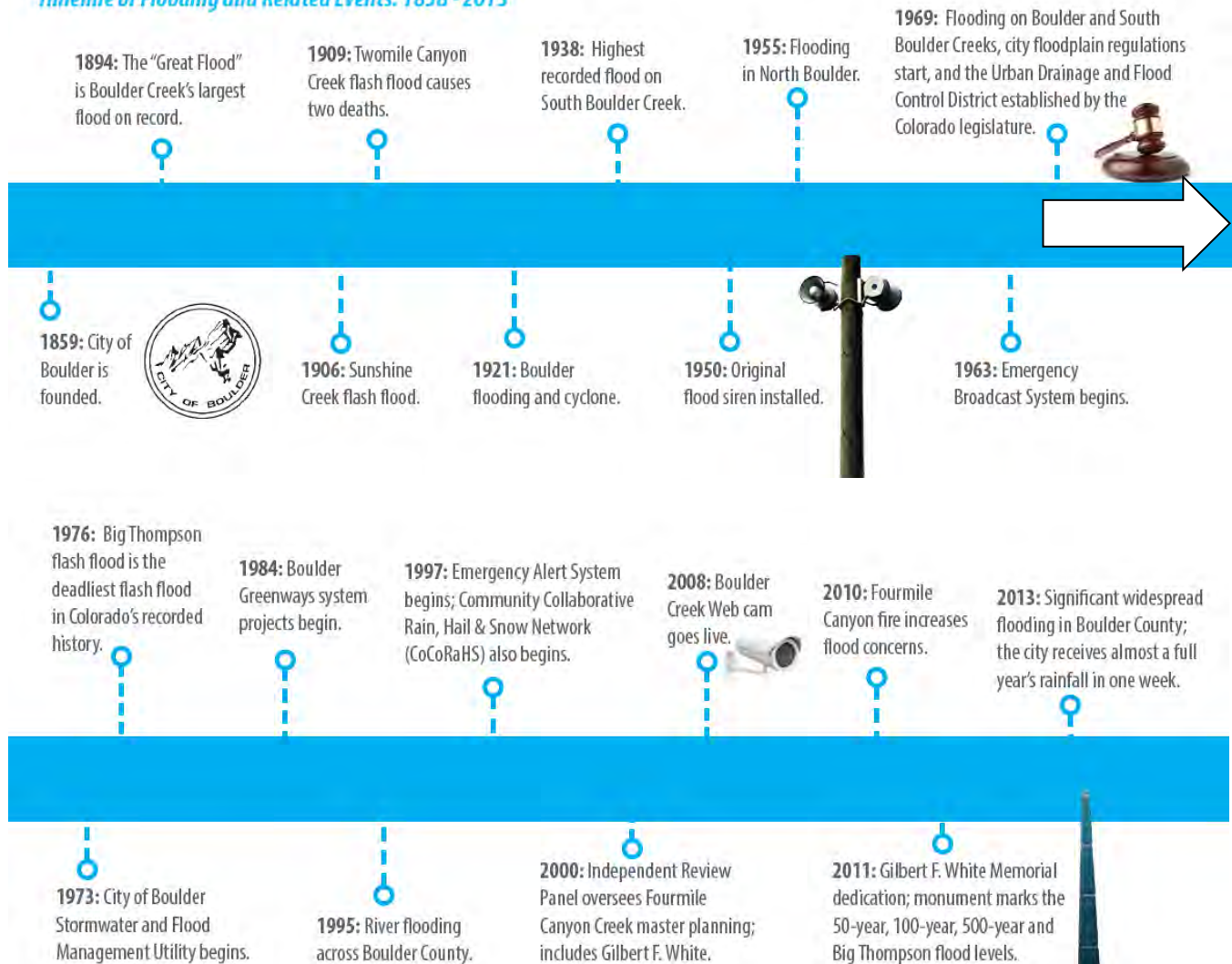
The city has had several floods in the past. The largest flood on record hit Boulder Creek in 1894, greatly impacting the downtown area. Up to six inches of rain fell west of the city, resulting in 100-year flows in Boulder Creek, extensive flooding up to one mile wide and the loss of one life. Boulder Creek flooded again in both 1914 and 1929. South Boulder Creek flooded in 1938 and again in 1969, causing extensive damage in Eldorado Springs and within the city limits. In 1906, Sunshine Creek experienced flash flooding and in 1909, a flash flood on Twomile Canyon Creek resulted in two deaths. In 2007, a flash flood along Bear Canyon Creek resulted in floodwaters overtopping the roadway at Table Mesa

Drive. Fourmile Canyon Creek overtopped its banks in the summer of 2011, producing minor flooding within the city and greater flooding upstream in Boulder County.

In September 2013, the city experienced widespread flooding from a long-duration storm event that produced up to 19 inches of rain over an eight-day period. Private properties and public infrastructure were damaged by this storm event in a variety of ways, including impacts from localized drainage, groundwater and wastewater collection system backups. After the 2013 flood, a rainfall-runoff analysis was completed to estimate peak flows for each drainageway and determine estimated storm frequencies. The table below summarizes the findings of this analysis:

Rainfall-Runoff Analysis September 2013 Flood Disaster (Drainageways listed South to North)		
Rainfall-Runoff Analysis	Location	Estimated Runoff Frequency (Year)
South Boulder Creek	Eldorado Springs	10-25
South Boulder Creek	Highway 93	50-100
South Boulder Creek	South Boulder Road	25 -50
South Boulder Creek	West Valley Overflow	~100
Bear Canyon Creek	Broadway	~20
Bear Canyon Creek	Baseline Road	~20
Bluebell Creek	Chautauqua	~25
Kings Gulch	Chautauqua	~10
Skunk Creek	Baseline Road	~25
Gregory Canyon Creek	Baseline Road	~10-50
Boulder Creek	Broadway	~25
Boulder Creek	75 th St.	25-50
Two-mile Canyon Creek	Broadway	~100
Goose Creek	Folsom	50-100
Wonderland Creek	15 th St.	5 - 10
Fourmile Canyon Creek	Broadway	10-50
Fourmile Canyon Creek	Highway 119	50-100

The flood management program focuses mitigation efforts on the major drainageways. The timeline below outlines major events that have impacted the city's flood management program.

Timeline of Flooding and Related Events: 1858 - 2013**Wildfires**

Wildfires can increase flood risks. The intense heat from a fire destroys vegetation and decreases the permeability of soils, resulting in increased runoff from burn areas. On Sept. 6, 2010, a wildfire started that eventually burned nearly 6,200 acres of the steep, forested Fourmile Canyon area just west of Boulder. Approximately 60 percent of the area was severely or moderately burned. Approximately 80 percent of the burn area is tributary to Fourmile Creek, which is a tributary to Boulder Creek (approximately two miles west of Boulder). Approximately 20 percent of the burn area is located in the Fourmile Canyon Creek watershed. Fourmile Canyon Creek flows through north Boulder and is also tributary to Boulder Creek, with a confluence downstream of the Boulder city limits. As a result of the burn, new hydrologic models were developed for the burn area. These models were calibrated and adjusted over time, based on changing vegetation levels and observed runoff from rainfall events.



Flood Emergency Preparedness

Flood preparedness is a critical element in the city's floodplain management program. The more prepared the community can be with pre-flood readiness, ongoing monitoring, effective warning systems, trained response, and post-flood recovery, the better the chance that the impacts of flooding may be managed.

The [National Weather Service](#) (NWS) is the foremost forecaster of weather events. The NWS operates and maintains a network of weather radar stations, as well as other monitoring and broadcast systems, to provide forecasts and warnings for the protection of life and property.

To supplement the NWS information, the Mile High Flood District, (MHFD, formerly known as the Urban Drainage and Flood Control District) contracts to have 24-hour meteorologist coverage for the Denver metro area during the peak flood season. The MHFD meteorologists forward daily forecasts to the city and the Boulder Office of Emergency Management (OEM). The MHFD also operates and maintains a network of stream and rainfall gauges in and around the city. This information provides [real-time data](#) that is monitored by the Boulder OEM during the flood season.

Due to the very short timeframe in which flooding can occur, there is often limited time available to provide adequate warning or to react. This is particularly true for some of the city's smaller creek systems, which lack stream gauges. In addition, thunderstorm cells can move and intensify very rapidly and often unpredictably. It is therefore critical that people who live and/or work in the city be aware of the flood risk, be prepared for a flood emergency in advance. Flood education, regulations and ordinances are critical components of the city's flood emergency preparedness program.

Floodplain Mapping

Floodplain mapping provides the basis for flood management by identifying the areas subject to the greatest risk of flooding. This information is essential for determining areas where life safety is threatened and property damage is most likely. Floodplain mapping forms the basis for the city's floodplain regulations and the National Flood Insurance Program. The city's floodplain maps need to be periodically updated to reflect changes in the floodplain resulting from land development, flood mitigation improvements, new survey information and new study technologies.

The city delineates and regulates four flood zones:

500-year floodplain: delineates the flood limits resulting from a design storm that has a 0.2 percent chance of occurring in any given year.

100-year floodplain: defined as all land areas subject to inundation by floodwaters in a design storm having a one percent chance of being equaled or exceeded in any given year.

Conveyance zone: represents a preservation zone for passing flood flows along the creek corridor without increasing flood depths, redirecting floodwaters or adversely impacting land areas. The establishment of a conveyance zone recognizes that development activities are expected to occur in the 100-year floodplain but places a limit on these activities to prevent adverse impacts.

High-hazard zone: This area of the floodplain has the greatest risk of loss of life. The area should not be occupied by people during a flood. The high-hazard zone represents areas in the 100-year floodplain

where an unacceptably high hazard to human safety exists and where there is the potential for floodwaters to sweep people off their feet and wash them downstream.

Research was conducted to determine the flood depths and velocities that were most likely to sweep people off their feet. As a result of the research, the high-hazard zone is defined as all areas in the floodplain where the floodwater velocity (in cubic feet per second) multiplied by the floodwater depth (measured in feet) would equal or exceed four, or where the floodwater depth alone would equal or exceed four feet. An example would be a flood depth of three feet with the water moving 1.5 feet per second, which would result in a product number of 4.5, thus placing the area within the high-hazard zone.

The cross-section below (**Figure 3**) illustrates the components of the 100-year floodplain.

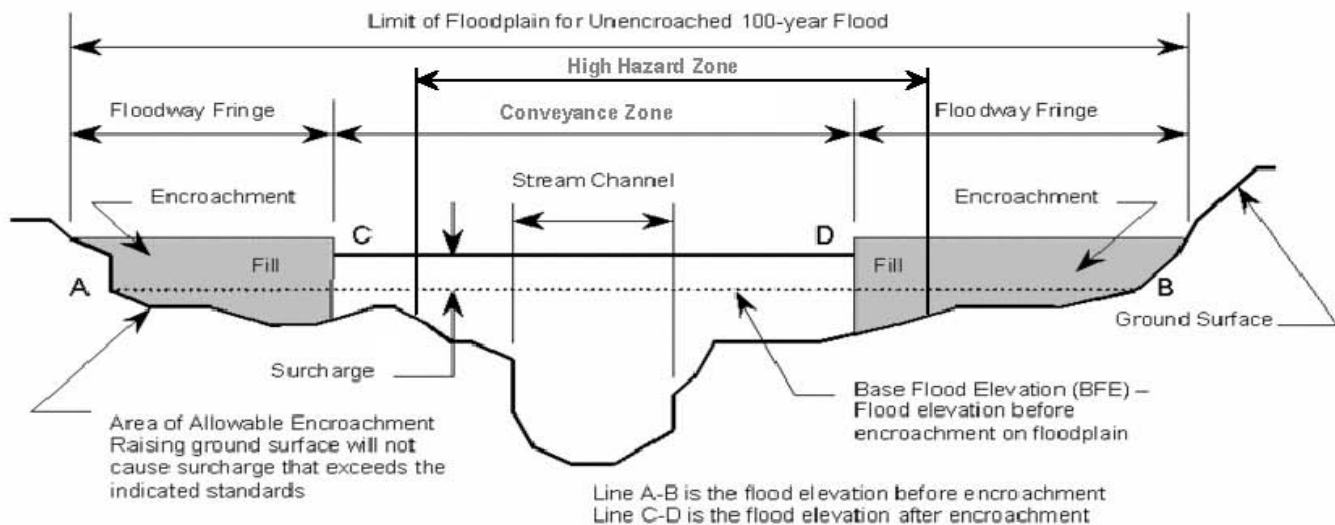
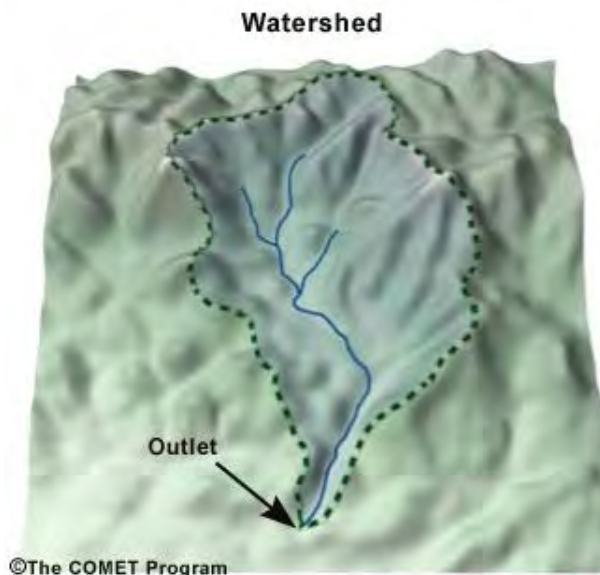
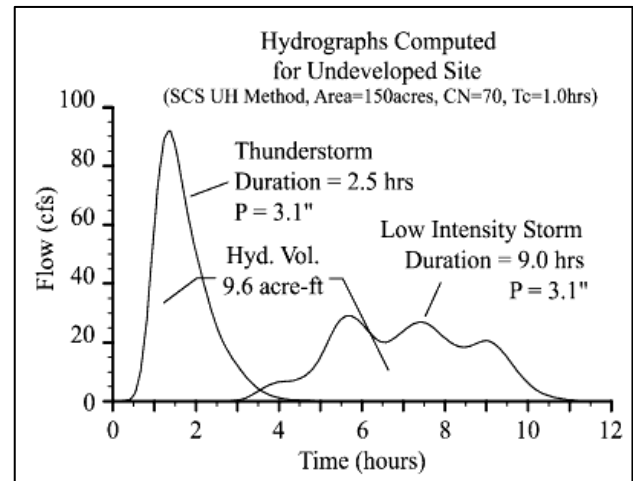


Figure 3: Components of the 100-Year Floodplain



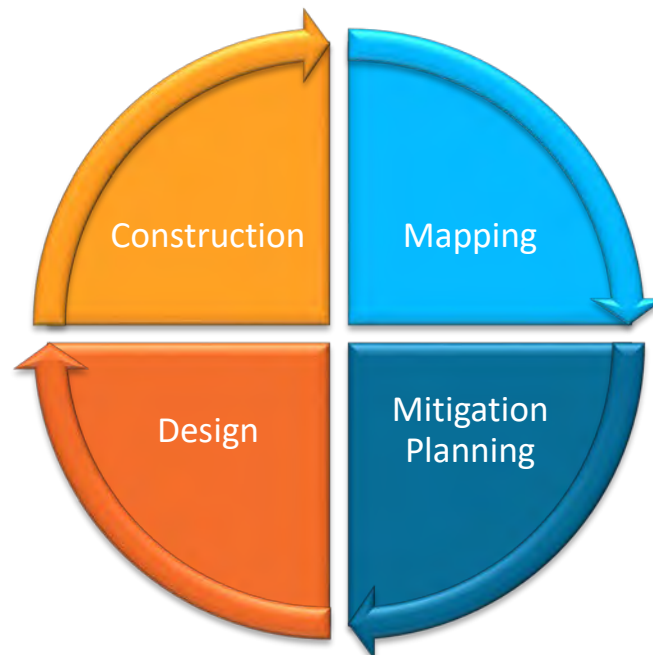
The flood flows used in floodplain mapping studies come from hydrologic analyses using Federal Emergency Management Agency (FEMA), Colorado Water Conservation Board, and Mile High Flood District (MHFD) procedures and parameters. Peak flows are computed for each drainageway. Watershed characteristics such as size, shape, topography, vegetation, amount of pavement and impervious surfaces, and soils characteristics are used to compute the flood hydrographs for various design points in the basin.

The design storm used in the hydrologic analysis (rainfall-runoff) is typically a short-duration (one- or two-hour) storm. Rainfall intensities, used to calculate the peak flows for floodplain mapping, come from the MHFD Drainage Criteria Manual and range from 2.4 to 2.7 inches per hour for the 100-year flood. This design storm emulates a flash flood, which is quite different from the long-duration, less-intense storm that led to the flooding in September 2013. The hydrograph to the right shows the flow rate in a creek over time and provides a comparison of a flash flood with a longer-duration, lower-intensity storm. In both events, 3.1 inches of rain fell, but the shorter-duration and higher-intensity storm produced a much higher peak flow (90 cfs vs. 30 cfs).



Flood Mitigation

The city has been working for many years to reduce the flood threat by implementing major drainageway flood mitigation projects. In 1973, the city established a separate Stormwater and Flood Management Utility to provide a consistent, long-term source of funding for these efforts. Flood mitigation master planning is typically scheduled to follow floodplain mapping updates. A flood mitigation plan identifies and evaluates the benefits and costs of potential improvement projects. Feasible projects from the plan are then programmed into the Capital Improvement Program (CIP) for design and construction. Once a project is constructed, a Letter of Map Revision (LOMR) is completed and submitted to FEMA to update the floodplain mapping to reflect the improvements.



In addition to flood mitigation, the city's floodplain management staff also oversee the city's Greenways Program to integrate multiple objectives along the major drainageways including habitat protection, water quality enhancement, providing trails and recreation, and preserving cultural resources. The Greenways CIP is reviewed by the Greenways Advisory Committee (GAC), which is made up of representatives of six advisory boards:

- Water Resources Advisory Board (WRAB);
- Transportation Advisory Board (TAB);
- Parks and Recreation Advisory Board (PRAB);
- Open Space Board of Trustees (OSBT);
- Environmental Advisory Board (EAB); and
- Planning Board.

The flood mapping, mitigation planning and construction process takes years to complete due to its often controversial nature and the extensive public process. As an example, the South Boulder Creek floodplain mapping study was initiated in 2002 and completed in 2007; the flood mitigation planning was initiated in 2009 and completed in 2015; the design was initiated in 2017 and is anticipated to take several years to complete. Design and construction of improvement projects also is a multi-year process. The Elmer's Twomile Creek Capital Improvement Project was initiated in 2001 and completed in 2010. Given the long implementation phase, it is important to complete floodplain mapping studies prior to moving forward with mitigation projects in order to document the risk of flooding and make property owners aware of the risk.

Property Acquisition

In addition to funding the construction of flood mitigation projects, the Stormwater and Flood Management Utility Capital Improvement Program provides annual funding (\$660,000 in 2020) for property acquisition. This provides funds for the purchase of properties in areas prone to flooding, especially in the city's high-hazard regulatory area. High-risk properties have been identified and prioritized for purchase along each of the city's major drainageways. This program has been "opportunity-based," working with willing sellers and relying on properties that become available on the real estate market. Several purchases have been made over the years. Recent purchases include 2 high-hazard zone properties along Gregory Canyon Creek that will help accommodate future flood mitigation improvements; 744 University was purchased in 2017 and 712 Pleasant was purchased in 2019.

Overview of the Mile High Flood District

The City of Boulder is part of the [Mile High Flood District](#) (MHFD, formerly known as the Urban Drainage and Flood Control District), which was established in 1969 by the Colorado Legislature to assist local governments in the Denver metropolitan area with drainage and flood control issues. The MHFD receives funding for its programs through a mill levy on property taxes within participating communities. The mill levy for Boulder County is 0.608 mills. For example, a house with an assessed value of \$500,000 would pay \$304 per year based on the current mill. The MHFD coordinates four programs: Master Planning; Design, Construction and Maintenance; Floodplain Management; and Information Services and Flood Warning. The Master Planning program assists local agencies with flood mitigation planning efforts. Projects identified through the master plans are then eligible for design, construction and maintenance funding through the MHFD. The Floodplain Management program focuses on assisting local governments with delineating flood risks through floodplain mapping efforts. The Information Services and Flood Warning program is responsible for contracting with a private meteorological service to provide daily forecasts of flood potential and notify local agencies when threatening conditions develop. The MHFD also installs and maintains a system of rainfall and stream flow gauges to help monitor the potential for flooding.

Each year, the City of Boulder requests funding assistance from the MHFD for maintenance and capital improvement projects. The MHFD also provides routine maintenance of designated drainageways, which includes debris removal and mowing. The MHFD provides 100 percent of the funding for maintenance projects and up to 50 percent for capital improvements. Maintenance projects are managed

and coordinated by the MHFD, whereas the city is responsible for the management and oversight of capital projects. The MHFD also provides up to 50 percent of the funding for flood mitigation planning efforts, which are coordinated by the city. Limited funding is also available for floodplain mapping updates, which are also the responsibility of the city. The MHFD is currently providing financial assistance for capital improvement projects for South Boulder Creek, Gregory Canyon Creek and Fourmile Canyon Creek; the flood mitigation planning studies for Upper Goose Creek, Twomile Canyon Creek, Skunk Creek, Bluebell Canyon Creek and King's Gulch; and the floodplain mapping study for Sunshine Canyon Creek.

Floodplain Regulations

Floodplain regulations are land use regulations intended to reduce risks to people and property in areas along drainageways that are prone to flooding. The City of Boulder adopted its first floodplain regulations in 1969, in response to flooding along the Front Range of Colorado.

The city's "Floodplain Regulations" are contained in Chapter 9-3, Boulder Revised Code (B.R.C.) 1981.

100-year floodplain

A floodplain development permit is required for all development activities in the 100-year floodplain. Development within the 100-year floodplain is permitted, subject to the provision of flood protection measures designed to mitigate the risk of property loss or damage. For residential structures, this requires that the lowest floor of any new structure or addition be elevated above the flood protection elevation, which is two feet above the floodwater surface elevation. Basements are not permitted for residential structures in the 100-year floodplain.

For non-residential structures, the lowest floor of any new structure or addition must be elevated above the flood protection elevation or be floodproofed to ensure that the structure is watertight, with walls substantially impermeable to the passage of floodwaters below the flood protection elevation. Floodproofing of structures must be provided in an automatic manner and not require any human intervention to be effective. This is often accomplished through the use of floodgates that will automatically rise during a flooding event, such as the floodgates at the Municipal Building, the St. Julien Hotel or Alfalfa's Market.

New structures in the 100-year floodplain are required to install protection against sewer backups that may occur if the sanitary sewer system becomes surcharged during flood conditions. New parking lots are not permitted in the 100-year floodplain where flood depths would exceed 18 inches, since automobiles are buoyant and become flood debris at these depths. Hazardous materials may not be stored below the flood protection elevation (except for existing gasoline storage tanks that were in place prior to 1989). Mobile homes placed after July 1, 1989, must be elevated on a permanent foundation, and new structures must be oriented to minimize flood flow obstruction.

500-year floodplain

In 2014, the city enacted new floodplain regulations to provide additional flood protection for critical facilities, such as hospitals, police and fire stations, day care facilities and utility treatment facilities in the 500-year floodplain.

Conveyance zone

The conveyance zone represents a preservation zone for passing flood flows along the creek corridor without increasing flood depths, redirecting floodwaters or adversely impacting land areas or properties. The establishment of a conveyance zone recognizes that development activities are expected to occur in

the 100-year floodplain but places a limit on these activities to prevent adverse impacts. Development in the conveyance zone typically requires a private engineering analysis to ensure that flooding conditions are not worsened. Flood mitigation measures are sometimes required to offset the development and keep the floodplain from expanding or floodwaters from getting deeper. Regulations for the 100-year floodplain also apply to the conveyance zone. All regulations apply if an area is located in both the conveyance zone and the high-hazard zone.

High-hazard zone

Development in the high-hazard zone is most restricted, due to life safety concerns. No new structures or additions to existing structures intended for human occupancy are permitted in the high-hazard zone. It is anticipated that many structures within the high-hazard zone will require evacuation during a major flooding event due to structural failure or potential issues with fire, sanitation, electrical hazards, broken utilities, or debris. Additionally, no new parking lots and no changes of use of an existing non-residential structure to a residential use are permitted. Regulations for the 100-year floodplain also apply to the high-hazard zone.

Flood Insurance and the Community Rating System (CRS)

The City of Boulder participates in the [National Flood Insurance Program](#) (NFIP) by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes federal government-backed flood insurance available to homeowners, renters and business owners, whether or not their properties are in a floodplain. Flood insurance covers direct losses caused by surface flooding, including a river overflowing its banks, a lake storm and local drainage problems. The NFIP insures buildings with two types of coverage: structural and contents. Structural coverage is for the walls, floors, insulation, furnace, and other items permanently attached to the structure. Contents insurance is intended to cover personal possessions.

There is a mandatory requirement to purchase flood insurance that applies to all forms of federal or federally-related mortgages for buildings located in the 100-year floodplain. The maximum amount available for a single-family house is \$250,000. While not mandated by law, a lender may also require a flood insurance policy as a condition of a loan for a property in any zone on a Flood Insurance Rate Map.

The NFIP's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements.

Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from community actions that meet the three goals of the CRS:

1. Reduce flood losses;
2. Facilitate accurate insurance rating; and
3. Promote the awareness of flood insurance.

For CRS participating communities, flood insurance premium rates are discounted in increments of five percent: i.e., a Class 9 community would receive a 5 percent premium discount, while a Class 8 community would receive a 10 percent discount. The city joined the CRS in 1992 as a Class 8 community, improved to a Class 7 in 2008 and then to a Class 6 in 2012. The city was awarded a Class 5 rating in 2013 and has maintained that rating. As a result, standard policyholders now receive a 25 percent discount on flood insurance with estimated citywide annual savings of more than \$700,000. As of Jan. 10, 2020, there were 4,353 policies held by City of Boulder residents, with a total insured coverage of \$1,065,934,000 at a total premium cost of \$3,540,676.

Boulder has by far the largest number of flood insurance policies and largest insured property value of any municipality in Colorado. City of Boulder residents and businesses pay over \$3.5 million in total annual flood insurance premiums. Community investment in flood mitigation can reduce the associated risks and related insurance costs.

FLOOD INSURANCE COMPARISON				
Source – Federal Emergency Management Agency, January 2020				
Community	Estimated 2020 Population	Number of Policies	Annual Insurance Premiums	Total Insured Value (thousands \$)
Boulder	109,557	4,353	\$ 3,540,676	\$ 1,056,934
Colorado Springs	493,799	1,438	\$ 1,138,062	\$ 380,455
Denver	732,144	1,179	\$ 1,359,584	\$ 346,823
Arvada	124,170	401	\$ 532,286	\$ 104,539
Longmont	96,068	399	\$ 390,261	\$ 134,705
Lakewood	160,429	385	\$ 385,769	\$ 114,395
Fort Collins	171,266	354	\$ 666,972	\$ 106,076
Centennial	111,336	166	\$ 94,316	\$ 47,380
Loveland	81,895	127	\$ 110,799	\$ 41,626
Westminster	116,308	105	\$ 59,531	\$ 29,337
Greeley	113,065	80	\$ 110,701	\$ 26,381
Thornton	146,825	72	\$ 44,753	\$ 19,911
Pueblo	114,221	68	\$ 47,107	\$ 19,902

Flood Recovery

Flood recovery efforts become a significant component of the city's flood management program following the September 2013 flood, which resulted in sediment and debris in all 16 major drainageways, bank erosion, and damages to creek infrastructure, including drop structures, trash racks, culverts and retaining walls. In addition to restoration and repair work, flood recovery work included documenting damages and flood extents; assisting property owners; analyzing rainfall information; and coordinating with the State of Colorado and FEMA. The FEMA-funded flood recovery work is now complete, with grant close-out expected in 2020.

Flood Outreach

The city reaches out to community members, boards and commissions members and elected officials in a variety of ways to raise awareness of flood risk and provides resources to help them prepare for a flood. The city drafts and maintains the [Community Guide to Flood Safety](#) which is the primary public document for how to prepare, respond and recover from floods. Flood safety information is distributed to every school in the Boulder Valley School District to be sent home with every student. Flood safety classroom programs are offered to elementary school teachers and information is provided to families of fifth grade students who participate in the annual Water Festival. Annual direct mailings to all properties located in the 100-year floodplain are coordinated through the MHFD. Flood awareness door hangers are distributed to University of Colorado off-campus housing neighborhoods and to high-hazard residential properties via the city's volunteer program. Information is distributed via local media, both through press releases and paid advertisements. A utility bill insert is provided annually to 26,000 customers at the beginning flood season. Outdoor emergency sirens are tested monthly during the peak flood season. The city's flood website, www.boulderfloodinfo.net, includes extensive flood information, including the [Community Guide to Flood Safety](#).

Boulder Valley Comprehensive Plan Analysis for
South Boulder Creek Regional Detention Concept Design Report

	BVCP Policy Excerpt	Option 1 (100 year)	Option 2 (500 year)	Option 3 (≈200 year)
CU South Guiding Principles <i>General Principles</i>	<p>Flood mitigation Protecting City of Boulder and Boulder County residents from future flooding events is a primary driver.</p>	City staff continues to recognize that flood mitigation is a primary driver of this project. Other considerations (e.g., open space, transportation and future site development) are generally viewed through the lens of implementing the flood mitigation project.		
CU South Guiding Principles <i>Open Space and Restoration</i>	<p>Open Space & Restoration Minimize disturbance to protect this area... Maintain and create recreation opportunities that do not significantly conflict with ecological values.</p> <p>The city seeks to partner with CU to incorporate open space values and restoration values.</p> <p>(...) The city and CU will work together to achieve greater open space acreage as part of either larger city open space conservation areas or limited-structural build, such as community gardens, recreation, solar gardens, etc.</p> <p>Compensatory mitigation Floodplain functions, including wetlands and flood mitigation, may be restored as part of compensatory mitigation for impacts elsewhere on site.</p>	<p><i>Most Potential</i> The full amount of OS-O land is available for potential restoration and mitigation.</p>	<p><i>Least Potential</i> Earth fill would be placed on 34 acres of land, offering the fewest opportunities for restoration and mitigation.</p>	<p><i>Some Potential</i> Earth fill would be placed on 17 acres of land, leaving approximately 100 acres of OS-O land potentially available for restoration and mitigation.</p>

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South Boulder Creek Regional Detention Concept Design Report

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CU South Guiding Principles <i>Recreational Fields</i>	Explore opportunities for passive and active recreation activities, or other uses compatible with the floodwater mitigation system and where possible, conserve and/or restore areas within the flood mitigation facilities with high ecological value and mitigate impacts.	<i>Some Potential</i> Specific locations and site conditions for recreation fields were not analyzed as part of the flood mitigation study. However, staff finds that this option could possibly accommodate some amount of recreation uses like as ballfields.	<i>Least Potential</i>	<i>Less Potential</i>
CU South Guiding Principles <i>Development Restrictions</i>	No enclosed academic space, offices, or residential structures in the Area Protected by Levee or FEMA 500-year floodplain: Such buildings would be constructed outside of this area.	This option provides the required 129 acres of developable land for CU Boulder without elevating portions of the OS-O land to accommodate future development.	Requires a significant amount of fill (1.2 – 1.3 M cubic yards) to elevate portions of the OS-O land necessary for the university's future development.	
CU South Guiding Principles <i>Flood Mitigation</i>	Flood Mitigation Area Consider mitigating flood risk to the highest standard practicable while balancing associated environmental, social and financial impacts. ...the city's goal is to mitigate to at least a 100-year flood, and the city will consider larger events, including the 500-year flood as adopted by FEMA and a probable maximum flood as determined by the State Engineer.	The city strives to achieve up to a 100-year flood protection in other projects throughout the city. While this option provides less protection than the others, it meets the city's level of services for the Stormwater/Flood Utility.	This option exceeds the level of services for the city's Stormwater/Flood Utility.	This option exceeds the level of services for the city's Stormwater/Flood Utility.

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South Boulder Creek Regional Detention Concept Design Report

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CU South Guiding Principles <i>Land Use Mix</i>	<p>(...) Housing should be mutually beneficial to the community and university and integrated with needs of the community rather than built as isolated enclaves.</p> <p>Housing will be the predominant use of the site for areas not used for flood mitigation (i.e., with a target of 1,100 residential units and the final number guided by transportation performance and other site constraints), although the site may include a mix of residential and non-residential and facilities. The site will emphasize housing units over non-residential space (jobs) to help balance jobs and housing in the community.</p> <p>Except for recreation facilities, development will be phased such that non-residential space will be phased after a significant amount of housing is built. (...)</p> <p>The overall non-residential space footprint will be minimized and support and benefit the convenience of the residents, employees and visitors to residential and recreational uses of the property.</p>	<p>CU Boulder submitted a revised annexation application Jan. 21, 2020 that stated:</p> <p>Should the city select a flood mitigation project that places an east-west dam across the entire north-end of the property, thereby isolating the developable property from Table Mesa and the local community, the university will need to determine if, and to what degree, housing remains suitable and feasible behind the dam. If housing is deemed suitable, the university commits that development on the site will be compact and clustered in a village style. (BVCP GP)</p> <p>In separate correspondence dated Jan. 16, 2020, CU Boulder clarifies the university's position that any level of Variant 1 would result in a developable site severed from the community and therefore can no longer commit to building housing on the site.</p> <p>The city strongly supports increasing on-campus housing capacity and views these guiding principles as one of the central community benefits proposed with this annexation.</p>		

Boulder Valley Comprehensive Plan Analysis for
South Boulder Creek Regional Detention Concept Design Report

	BVCP Policy Excerpt	Option 1 (100 year)	Option 2 (500 year)	Option 3 (≈200 year)
City-CU Boulder Coordination	<p>1.05 Coordination with University of Colorado The city aims to work with CU cooperatively to address critical needs of flood safety, student and workforce housing, and transportation and other infrastructure. (...)</p> <p>In its negotiations of an annexation agreement for CU South, the city will use the guiding principles as shown in Ch V. Subcommunity and Area Planning, CU South Boulder Campus.</p>	The city continues to work with the university on a path forward for both the South Boulder Creek flood mitigation project and the annexation.		
Growth Management	<p>1.10 Jobs: Housing Balance Boulder is a major employment center, with more jobs than housing for people who work here. This has resulted in both positive and negative impacts, including economic prosperity, significant in-commuting and high demand on existing housing. The city will continue to be a major employment center and will seek opportunities to improve the balance of jobs and housing while maintaining a healthy economy. This will be accomplished by encouraging new housing and mixed-use neighborhoods in areas close to where people work, encouraging transit-oriented development in appropriate locations, preserving service commercial uses, converting commercial and industrial uses to residential uses in appropriate locations, improving regional transportation alternatives and mitigating the impacts of traffic congestion.</p>	Each option, per the recently amended annexation application, could result in a net increase in jobs. While additional research, academic and other university services would bring positive benefits, the resulting impacts to public infrastructure, traffic and housing availability may outweigh. More information is needed to more fully assess the potential impacts and necessary mitigation strategies.		

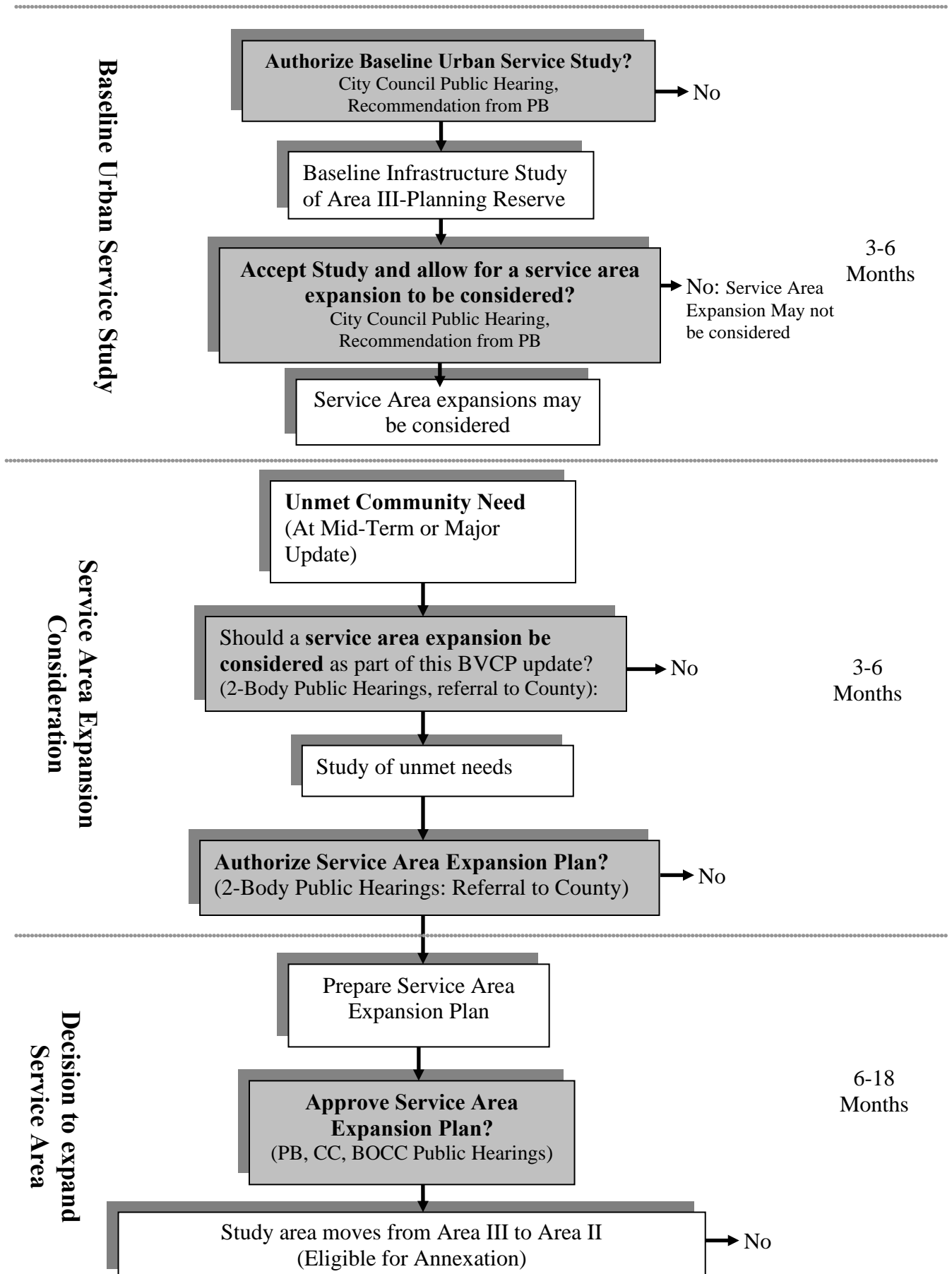
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South Boulder Creek Regional Detention Concept Design Report

	BVCP Policy Excerpt	Option 1 (100 year)	Option 2 (500 year)	Option 3 (≈200 year)
	<p>1.16 Annexation</p> <p>b. Terms of annexation will be based on the amount of development potential as described in (c), (d) and (e) of this policy.</p> <p>d. In order to reduce the negative impacts of new development in the Boulder Valley, the city will annex Area II land with significant development or redevelopment potential only if the annexation provides a special opportunity or benefit to the city. For annexation consideration, emphasis will be given to the benefits achieved from the creation of permanently affordable housing. Provision of the following may also be considered a special opportunity or benefit: receiving sites for transferable development rights (TDRs), reduction of future employment projections, land and/or facilities for public purposes over and above that required by the city's land use regulations, environmental preservation or other amenities determined by the city to be a special opportunity or benefit. Parcels that are proposed for annexation that are already developed and which are seeking no greater density or building size would not be required to assume and provide that same level of community benefit as vacant parcels unless and until such time as an application for greater development is submitted.</p>	<p>CU South is the largest undeveloped property that is currently eligible for annexation and as such, has significant development potential. The most substantial recent change to the annexation proposal involves whether housing will be built on the site. Specifically, the university can no longer commit to constructing housing on CU South "in light of the city council's selection of Variant 1." Rather, the university seeks flexibility to determine appropriate uses at a later date (presumably after annexation occurs). As a result, council will need to determine if the remaining community benefits package is acceptable for an annexation of this size.</p> <p>In its letter dated Jan. 16, 2020, the university describes the community benefits proposed as part of the annexation, such as:</p> <ul style="list-style-type: none"> • A quarter of the site (80 acres) would be conveyed to the city, in fee simple, for the construction of the flood mitigation project and open space mitigation; • Potential conveyance of land to the city's open space program and option to purchase water rights to Dry Creek Ditch #2; • Opportunities to review and comment on future development plans; • Recreational trails and recreational facilities open to the public; • Potential opportunity to locate a joint public safety facility for use by CU Boulder Policy and city Fire and Rescue; and • Development limitations and standards for building height, site design, prohibited uses (e.g., football stadium, large research buildings like the East Campus) and neighborhood compatibility. 		

Boulder Valley Comprehensive Plan Analysis for
South Boulder Creek Regional Detention Concept Design Report

	BVCP Policy Excerpt	Option 1 (100 year)	Option 2 (500 year)	Option 3 (≈200 year)
Natural Environment	1.23 Adjacency of Open Space/Utility Impacts The City and county will consider the impacts of open space management and utility installation on abutting property.	Least amount of impacts to adjacent Open Space land.	Same direct impacts to adjacent open space. Most inundation impacts.	Same direct impacts to adjacent open space. More inundation impacts.
	3.04 Ecosystem Connections and Buffers ...The city and county will work together to preserve, enhance, restore and maintain land identified as critical and having significant ecological value for providing ecosystem connections (e.g., wildlife corridors) and buffers to support the natural movement of native organisms between ecosystems. Connected corridors of habitat may extend through or along the edges of the urban environment and often serve as vital links between natural areas for both wildlife and humans. (...)	Most opportunity for open space conveyance and/or protection	Least opportunities.	Fewer opportunities.
Flood Mitigation	3.25 Larger Flooding Events The city and county recognize that floods larger than the 100-year event will occur, resulting in greater risks and flood damage that will affect even improvements beyond those constructed to current flood protection standards. The city and county will seek to better understand the impact of larger flood events and evaluate context-appropriate, cost-effective policies and floodplain management strategies to address these risks.	Approximately 2,300 people, 260 structures and 1,100 dwelling units are located in the FEMA 100-year South Boulder Creek Flood plain. This option would be the least costly compared to projects providing greater flood protection.	Approximately 4,100 people, 730 structures and 1,900 dwelling units are located in the FEMA 500-year South Boulder Creek Flood plain. This option would be the costliest. It should be noted that this cost significantly increases to accommodate land use changes proposed as part of the project.	This analysis is still be conducted and final numbers will be available for the February 25, 2020 study session.

Process for Service Area Expansion into the Planning Reserve



CU South Annexation Community Engagement Plan

Iterative Draft

CU South Annexation Purpose Statement (accepted by council on Oct. 9, 2018)

The purpose of this process is to define the conditions of annexation for “CU South” under which the University of Colorado’s South Campus would fulfill both the desires of the University system and meet the goals of the City of Boulder. The annexation agreement will be guided by the BVCP CU South Guiding Principles, and a modified annexation process that will provide opportunities to influence the annexation terms through city boards and commissions and the city council meetings.

Introduction

The city completed a flood mitigation master plan for South Boulder Creek ([SBC Master Plan](#)) in 2015, which recommended flood mitigation in three phases. Phase 1 regional detention at US36 on the CU South property was selected to be the first phase because of the large downstream flood benefits. Guided by significant input from the community and governing bodies of the city and county, the [CU South Guiding Principles](#) were adopted as part of the BVCP in 2017. The guiding principles are intended to guide work on an annexation agreement between the city and university to allow for use of a portion of the property for flood mitigation and specify other future uses, services, utilities and planning for CU South.

The CU South annexation is one of several related projects including the South Boulder Creek flood mitigation and ongoing discussions with the Colorado Department of Transportation (CDOT). This engagement plan focuses on the annexation project to ensure that the city’s negotiating position is informed by community input.

Decision on annexation to be made

Who will decision-makers be and how will the decision be made?

- **City Council:** Decision-making body. After considering community input and recommendations from city boards and commissions, City Council will ultimately approve or deny an annexation petition from CU Boulder.
- **Planning Board:** Will provide input throughout the process and make a recommendation to council that will be informed by other boards and commissions.
- **City Boards:** Will provide input throughout the process and when needed, a recommendation to council around their area of focus.
- **CU Boulder:** The university is the property owner and applicant for the annexation application.
- **Boulder County Board of County Commissioners:** Per the CU South Guiding Principles, further collaboration between the city and county will continue to be emphasized. Any changes to the CU South land use designations prior to annexation will include a Call-Up option before the board.

What issues are planned for engagement?

The CU South Guiding Principles set the stage for council discussions and will be used as a guide for decision-making. The term sheet included in the city staff initial review comments indicates the degree of alignment between the city and CU Boulder through the following categories:

- “Yes”: General alignment between the city and CU Boulder;
- “Analysis Needed”: Analysis and negotiation required;
- “Clarification Needed”: Clarification is needed to understand the University’s objective; and
- “No”: City/CU Boulder disagreement.

The goal of this project is to have general alignment on all topics (“green” category). Community engagement efforts will focus on topics that have options and those categorized as “Analysis Needed” or “Clarification Needed”. Topics in which the city and university are aligned will not be scoped for engagement (beyond “Inform”).

Who will be impacted by annexation decision/anticipated interest area?

- **Boulder City Council, Planning Board and Staff** who seek to design and implement a process that keeps the city’s policy goals (such as housing affordability) front and center.
- **City Boards and Commissions** who will advise City Council regarding their area of expertise. At a minimum, the following boards will be involved and provide a recommendation to City Council: Water Resources Advisory Board, Open Space Board of Trustees and the Transportation Advisory Board.
- **CU Boulder** (property owner) will have opportunities to provide input into the city’s engagement efforts and be invited to all engagement events. The university may choose to conduct additional engagement work at its discretion.
- **CU Students** who will reside on the campus and/or use future facilities.
- **Members of the CU Boulder Community** who may have interests in utilizing a future south campus.
- **Residents directly impacted by 2013 flooding**, such as the Frasier Meadows community, who are generally most interested in a long-term solution to area flooding.
- **Residents most interested in technical flood mitigation solutions** and subsequent impacts to other issues such as environmental preservation and restoration.
- **Community organizations** that have shown, or will show, an interest in the project (e.g. PLAN Boulder, Boulder Chamber) either because of concerns about or support for CU annexation and future development of parts of the site.
- **Neighbors immediately adjacent to the site** who want to understand what future development of the site by CU will mean to them and their quality of life.
- **Recreation users** such as joggers, dog walkers, and at times, cross country skiers.
- **The “missing middle”** - community members that have some opinion about the project but little time to engage in a public process.

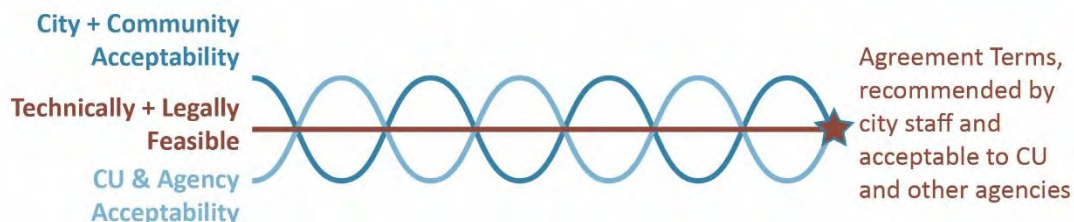
Engagement Objectives

- Engage the community to gather feedback that will inform the position the city will take on potentially more contentious terms for annexation (primarily those marked yellow and red) during negotiations with CU Boulder.
- Ensure that tradeoffs and competing priorities are considered throughout the engagement process. No topic or preference should be considered in a vacuum.
- Respect that this is a negotiation process. Provide regular updates while remaining clear that the city and officials from CU are the negotiating parties.
- Model the city's engagement framework by using the city's decision-making wheel and engagement spectrum. Support transparency and inclusive participation.
- Be urgent about flood mitigation engineering and deliberate about public process.
- Share work products to inform the public, when possible, taking care to illustrate the city's intentions behind proposed solutions and why some ideas were or were not pursued further.

Decision-making Criteria

Decision-making criteria will be developed and used to evaluate topics for an agreement. The draft criteria topics include:

<i>Is the proposed term acceptable to the city?</i>	After hearing input from the community, does the Boulder City Council agree with the approach? Is it consistent with city policies, including the sustainability framework?
<i>Is the proposed term acceptable to the university, CDOT and other agencies?</i>	Do the agencies agree with the approach?
<i>Is the proposed term technically and legally feasible?</i>	Can the conditions included in the proposed topic be developed and enforced through an annexation agreement?



Communications Approach for Group Meetings

City staff frequently meet with community members and groups to provide information, answer questions and listen to their concerns and ideas. Communication goals when meeting with community groups include:

- Facilitate open and honest dialogue with staff, while being mindful to not stifle interest in meeting with staff.
- Ensure that all groups receive the same information from staff.
- No group has more or less information and influence on the process.

- Staff will not share or announce new information at group meetings.
- Be transparent about who we meet with by documenting such meetings through notes on key topics.

Approach to Community Group Meetings

- City will request that the host extend an invitation to “interested parties” to observe or participate. The meeting host may or may not choose to follow through with that request.
- City staff will meet with the group and post high-level notes (meeting takeaways) on city website. Notes will include attendee names.

Project Timeline

Phase 1: Planning Stage (summer/fall 2019)

Step 1: Define issue before embarking

- ✓ Determine the decision-making steps. *Approved by council in October 2018.*
- ✓ Determine decision-making criteria

Step 2: Determine who is affected

- ✓ Determine roles of decision-makers and impacted parties
- ✓ Determine what level of involvement each stakeholder group might expect or desire for each project

Step 3: Create an engagement plan

- ✓ Determine overall engagement objectives

Deliverable:

- ✓ Engagement Plan

Phase 2: Shared Learning (fall 2019)

Step 4: Share a foundation of learning and inquiry

The purpose of this step is to clarify the project purpose and goals, share the engagement plan and inform the public about the ongoing flood mitigation and annexation work.

- ✓ Traditional engagement techniques: webpages, communication to council, community newsletter.

Phase 3: Options Stage

Step 5: Identify (the latest round) of options (Engagement Window 1)

- ☐ Input from city boards, including: Water Resources Advisory Board, Open Space Board of Trustees and the Planning Board;
- ☐ Focus group meetings;
- ☐ Small group meetings;
- ☐ An open house event;
- ☐ City Council public hearing to select a preferred flood mitigation option and if needed, consider amendments to the Boulder Valley Comprehensive Plan.

Step 6: Evaluate Options/Develop Recommendations (Engagement Window 2)

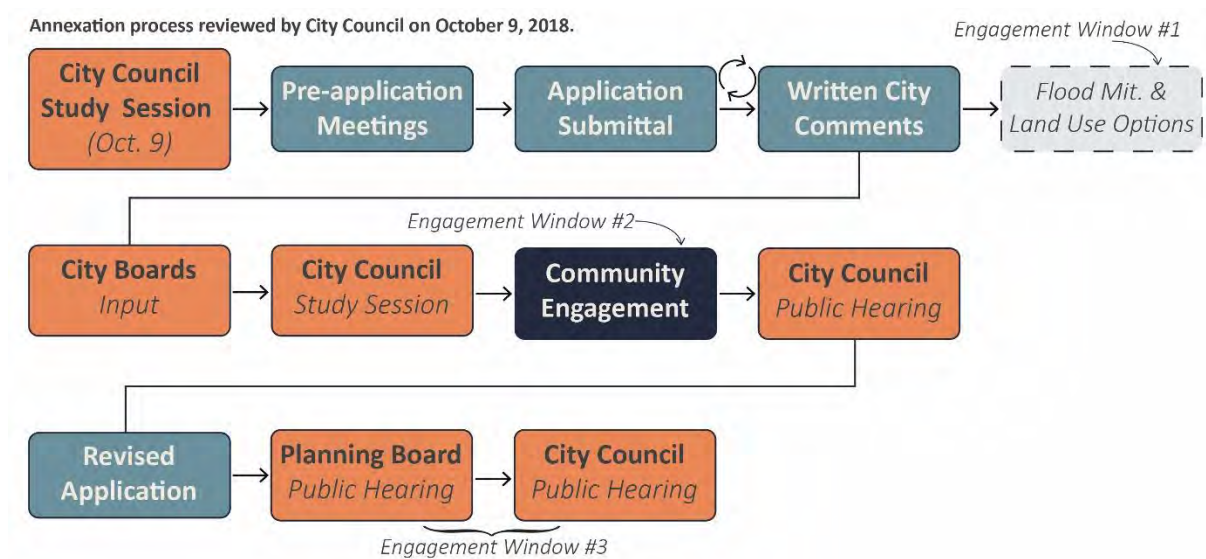
- ☐ Develop a preferred approach for the annexation agreement
- ☐ Engagement window 2
- ☐ Board input
- ☐ Council Public hearing on preferred approach

Phase 4: Make a Decision**Step 7: Make a Decision (Engagement Window 3)**

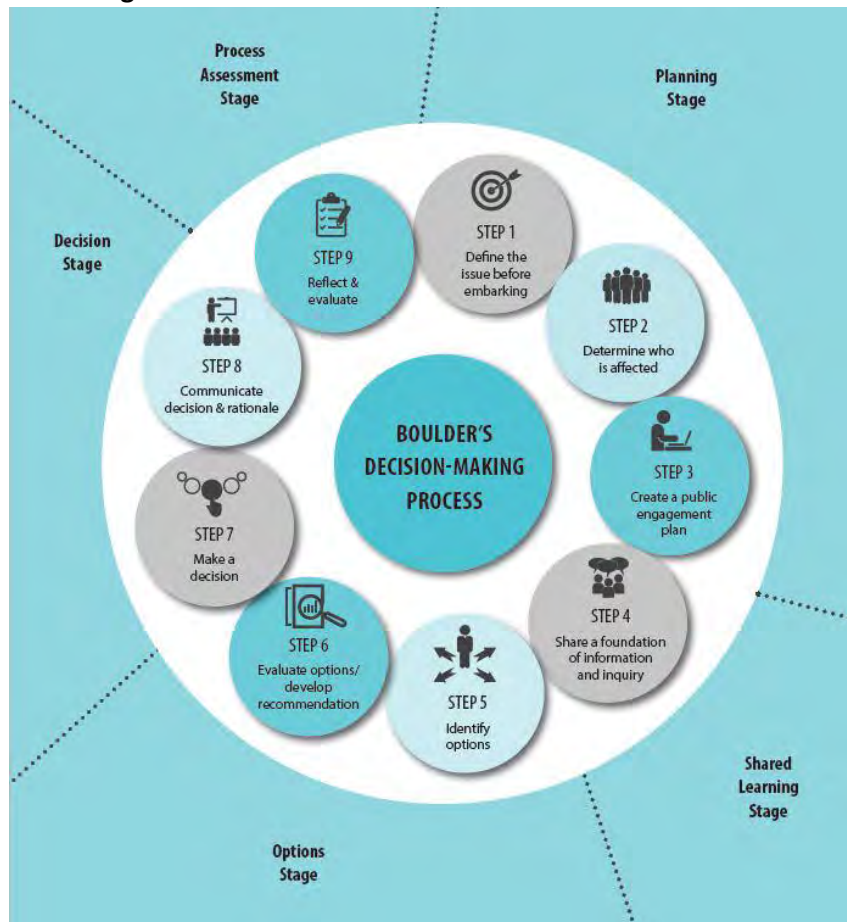
- ☐ Draft an annexation agreement
- ☐ Planning Board Public Hearing (recommendation)
- ☐ City Council Public Hearing (decision)

Step 8: Communicate Decision and Rationale**Phase 5: Process Assessment****Step 9: Reflect and Evaluate**

- ☐ Launch online tool to elicit feedback about the engagement process.



Boulder's Decision-making Process





February 4, 2019 - Revised January 16, 2020

Dear City Council Members,

Re: Cover Letter to Accompany Annexation Petition Written Statement for CU Boulder South

At the city's request, the University of Colorado Boulder is submitting this application for annexation of its CU Boulder South property in order to facilitate the city's need to expeditiously develop and implement a flood mitigation project on CU Boulder's property. This is well ahead of the schedule under which the university would have otherwise submitted this application, as we have no near-term development plans. We will begin our campus master planning process by the end of 2019 with the plan expected to be complete by the end of 2021. The university is committed to partnering with the city in this effort to achieve the timely construction of the city's flood mitigation project. As a member of the Boulder community, the university joins city council in its ardent interest in advancing the life safety of our south Boulder neighbors. We moved quickly to bring forward this application in order to remove any uncertainty around availability of land for the flood mitigation project and to maximize the opportunity for city council to take swift action to implement the project.

We acknowledge that this is different from the city's typical annexation process and want to ensure that all members of city council and the relevant boards have a clear understanding of the extensive list of development limitations the university has agreed to and the significant benefits we are bringing to the table. The university and the city regularly collaborate on a multitude of projects. In this case, which is clearly unique, the university has gone well above and beyond its normal practices by agreeing to an extraordinary level of limitations on development of university property and providing a future opportunity for the city to review and submit input to the concept design for CU Boulder South.

The University of Colorado Boulder's master planning process is a multiyear process due to the complexity of the university and future planning for the many related departments, colleges, institutes and operational units. During that process we will engage the city and community for input. Once complete at the end of 2021, the Campus Master Plan will require the approval of the Board of Regents and the Colorado Commission on Higher Education. Under our typical process, only then would planning specific to the CU Boulder South site be able to begin.

CU Boulder is committed to the community and its success in the long term. While we are not able to provide a site plan as we enter into the annexation process, we have made every effort in our petition to provide as much clarity around how we will limit construction on the site through the BVCP Guiding Principles and adding further clarification through our letter to Council on October 1, 2018 and this application. We have also offered the opportunity for the city to provide input on the future concept design for CU Boulder South in addition to significant other benefits as listed below.

The university has listened to the community and city council requests and input along the way in these discussions over the past several years. Over time, we have modified and added to the benefits that we will provide to the city, including a few more reflected herein.

Community Benefits - Offered by CU Boulder to the City of Boulder Through Annexation:

CU Boulder has committed the following to the city in recognition of its partnership with the community and of the criticality of the flood mitigation project through the 2015 Boulder Valley Comprehensive Plan (BVCP) and Guiding Principles (BVCP GP) therein as enumerated below. Together with the city, county and community we worked hard to develop the Guiding Principles. We remain committed to the spirit of those principles, **although we will not be able to achieve some BVCP GPs, as noted below, in light of the city council's selection of Variant I.** We look forward to future collaboration around the BVCP GPs for further refinement. This list reflects CU Boulder's commitments under those guidelines.

	CU Commitment to the Community	Value/Benefit to City and Community
1.	The university commits to convey to the city, in fee simple, up to 80 acres of CU Boulder's property for construction of the flood mitigation project, or to be used for open space mitigation related to the project, (rather than the prior commitment to provide access/use of up to 80 acres with conveyance limited to the land under the dam facilities).	<p>\$18,000,000 - As measured by the City's recent purchase of the Hogan Pancost property, at a price of \$250,000 per acre, which CU discounted by 10% to reflect the size adjustment between the two properties</p> <p>The university's conveyance of the land to the city will enable the protection of up to 1900 dwelling units, 730 structures and 4100 people</p>

		under a 500-year flood event, in the only area that allows for this project. (city staff presentation to council in June, 2018)
2.	As long as, per our requirement below, any removal of the berm shall not increase the 100-year or 500-year flood plain now or in the future, without the university's approval, the university has agreed to: (A) allow the city to remove the berm/levee per our letter of July 19, 2018 to city council, and (B) offered to consider selling the dirt to the city at an agreed-to price.	Potential avoidance of trucking costs by the city and neighborhood disruption and road impacts.
3.	The university has agreed to "maintain general consistency with the city's height limits" (BVCP GP) which the university clarified further in its October 1, 2018 letter to mean that CU will abide by a height limit of 55 feet for the construction of buildings on CU Boulder South.	<p>The university is not subject to the city height limits on university property and would typically build to six floors rather than four. We have foregone this value in order to provide value to the community.</p> <p>Value to the community is:</p> <ul style="list-style-type: none"> • Smaller buildings • Less traffic impact • Viewshed protection
4.	The university commits that buildings on the site will be designed and sited to protect and complement the views of the mountain backdrop, particularly the viewsheds from the US 36 bike path, the South Boulder Creek Trail, U.S. 36 and SH 93. (BVCP GP)	Maintains aesthetic values of the community
5.	Should the city select a flood mitigation project that places an east-west dam across the entire north-end of the property, thereby isolating the developable property from Table Mesa and the local community, the university will need to determine if, and to what degree, housing remains suitable and feasible behind the dam. If housing is deemed suitable, the university	The housing, if constructed, will be village style and of high quality, human-scaled and contextually appropriate to neighboring properties.

	commits that development on the site will be compact and clustered in a village style. (BVCP GP)	
6.	<p>As long as the university retains the right to develop no less than 129 acres in the area designated as Public, the university commits that no habitable structures or academic buildings will be built on the site within the FEMA 500-year flood plain.</p> <p>Note: FEMA and City of Boulder requirements allow for construction in 500-year floodplains today.</p>	<p>The university has foregone development in this area and would typically build in a 500-year flood plain.</p> <p>The value to the community is:</p> <ul style="list-style-type: none"> • Fewer buildings • Limits impervious cover • Less traffic • Large open areas on the site • Potential habitat restoration • Retains areas for passive recreation, including trails and links to the South Boulder Creek Trail
9.	<p>Should the city select a flood mitigation project that places an east-west dam across the entire north-end of the property, thereby isolating the developable property from Table Mesa and the local community, the university will need to determine if, and to what degree, housing remains suitable and feasible behind the dam. If housing is deemed suitable, the university commits to prioritize building housing for faculty, staff, graduate students and non-first year students on the site to facilitate our common goal of providing more housing on university property.</p>	<p>An additional estimated 1100 dwelling units could be constructed on the site, resulting in (approximately) a 2.4% increase in the city's housing stock.</p> <p>Value to the community:</p> <ul style="list-style-type: none"> • Increased housing stock in the city • Reduced pressure on existing housing stock • Mitigates rental rate increases in the area • Creates incentive for landlords to improve housing stock

10.	The university commits to provide quality construction that is contextually appropriate to the neighboring properties.	CU is recognized for and committed to providing quality architecture and adhering to strict CU construction standards.
11.	The university commits to development that will model future resiliency and sustainability in the design, construction and maintenance strategies of the property.	<p>Design, construction, and maintenance will be a model of innovation and will support the city's Climate Commitment adopted December 2016.</p> <p>The city and the university are currently partnering on sustainability projects and this project will provide further opportunity to develop that partnership.</p>
12.	The university commits to not build large-scale sports venues (such as a football stadium), high-rise buildings or large research complexes (such as those on its east campus).	Eliminates the possibility of large scale adverse transportation and aesthetic impacts to the adjacent neighborhoods.
13.	The university commits to create connections to open space trails and provide continued free use by the community of new and improved walking trails.	CU contributes to the city's multi-modal trail network, fosters the opportunity for alternative transportation, and ensures continuing public enjoyment of the site.
14.	The university commits that recreational fields it builds on the site will be available to the community for use.	There will be more recreational fields available in the community.
15.	The university commits to partner with the city to do additional transportation analysis to further develop performance-based standards. (BVCP GP)	<p>Commitment to our continued collaborative partnership with the city.</p> <p>Value to the community:</p> <ul style="list-style-type: none"> ● Limits traffic impacts ● Minimize duplication of services

16.	The university commits to work with the city to include innovative and long-range transportation technologies including electric vehicles, autonomous vehicles, etc., as well as possible joint options with city-funded transit. (BVCP GP)	<p>Commitment to our continued collaborative partnership with the city.</p> <p>Value to the community:</p> <ul style="list-style-type: none"> ● Expanded transportation opportunities for the community ● Testing of new technologies ● Leveraged funding opportunities
17.	Should housing be developed on the site, and the density on the site be suitable (financially and functionally) for multi modal investment, the university commits to implement a multimodal hub for transportation.	Reduces potential additional demands on existing transit systems and potential new transit options for all community members.
18.	The university commits to not implement a “bypass” roadway between SH 93 and US 36.	<p>Value to the community:</p> <ul style="list-style-type: none"> ● Fosters neighborhood community feel ● Helps maintain existing traffic patterns ● Reduces potential impacts to both Table Mesa Drive and SH 93
19.	As a state entity, the university is not subject to the city’s development review process. At the city’s request, in an expanded benefit, the university commits to provide the city an opportunity to review plans at the initial CU Boulder South concept design with 60 days to provide input (rather than the prior commitment of 45 days as provided for in the Hotel Conference Center MOU).	Provides the city an unprecedented and unique role in influencing the CU Boulder South development at an earlier design phase.
20.	The university commits to not build first-year student housing nor will fraternities or sororities be located here.	The university houses first-year students on other university properties.

		By creating housing for faculty, staff and graduate students CU Boulder could increase the local housing stock by over 2.4%, reducing pressure on that stock as well as reducing commuter traffic on key arteries.
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CU Boulder Requirements for the Annexation from City of Boulder

We realize that for the city to move forward efficaciously and expeditiously, CU Boulder needs to provide as much specificity in its requirements as possible in order to complete an annexation agreement and remove uncertainty for both entities in what is a significant and impactful decision. In the spirit of cooperation, and with an acknowledgement that time is of the essence with respect to flood mitigation development, we are providing the information city council needs to move forward prudently with the final selection of a flood mitigation project design.

- In consideration for the benefits provided by the University to the City under this annexation agreement, the City agrees to extend all City services; power, water, stormwater, and wastewater, and cover any additional costs caused by the selected flood mitigation project to access those services.
- At the time of annexation and the final construction and completion of the flood mitigation project, the University must retain in perpetuity its development rights to a minimum of 129 acres. The University's 129 acres of developable area of the Property is currently land use designated as "Public" under the BVCP (the "CU Development Tract").
- Any diminishment of the area of the CU Development Tract shall (a) be subject to University's written approval and, at University's option, the diminished area shall be proportionally replaced with land currently designated OS-O under the BVCP (such replacement land shall be subject to University's approval, shall be contiguous with and become a part of the remaining CU Development Tract area, and shall be zoned Public (PUB) by the City). Alternatively, at University's option and approval, City shall compensate University in cash for the fair market value of the applicable area or with land agreeable to the University in another location.
- Upon completion of the construction of the flood mitigation dam and related retention areas, CU Boulder must have no less than 30 appropriately graded acres available for construction of recreational/athletics fields (the "Rec Fields") in the area of the Property designated as PK-UO under the BVCP. The Rec Fields must be situated on the Property in a manner that provides reasonable ingress and egress (including ADA accessibility) for site visitors, teams, service vehicles, as well as proximate space for related facilities such as concessions, restrooms, and storage. If the Rec Fields cannot be located in the flood detention area, the University may construct the Rec Fields on OS-O-designated land, contiguous to the CU Development Tract.
- The city will include CU Boulder in the landscape and aesthetic planning of the Project. The Project design team shall collaborate with the University with respect to Recreational Field placement as well as the potential placement of bleachers on the slopes of the retention structure walls. University shall bear the sole cost and expense of design, development and construction of the Recreational Fields and related structures, as applicable.

- The city will ensure that the flood detention area used for recreational/athletics field development will be engineered to sufficiently drain within a reasonable period of time to ensure that the fields can remain functional after a flood.
- The city will ensure that recreational/athletics fields do not have ongoing water ponding issues not related to a flood event
- As stated, CU Boulder remains open to removal of the CU Boulder berm/levee. If removed, the following requirements must be met:
 - The city will ensure, at its sole expense, that construction and/or operation of the flood mitigation dam and related structures and removal of the berm/levee shall not increase the FEMA 100-year or 500-year floodplain on any of the CU Boulder South property, now or in the future.
 - CU Boulder will be provided the first option to use or sell the berm/levee material if the berm/levee is removed
 - The City will be responsible for securing all federal, state, and other governmental approvals to remove the berm/levee.
- All direct, indirect, and consequential costs of developing and constructing flood mitigation on CU Boulder South (exclusive of the value of the land conveyed to the city) shall be borne by the city, including, but not limited to:
 - Any modification, realignment and/or reconstruction of existing access road(s) to the property resulting from the selected flood mitigation project that go beyond upgrading the road as it exists today.
 - Any utility upgrades necessary as a result of the flood mitigation project (i.e. sewer pump stations, utility boring, etc)
 - Any claims or damages resulting from the failure of the performance and safety of the dam and related structures in the future.
 - Any claims or damages resulting from the removal of the CU Boulder berm/levee in the future.
 - If successful design and development of the Project (a) requires relocation of CU Boulder's tennis facility, in the judgement of the university, (b) materially and adversely affects CU Boulder's use and enjoyment of the tennis courts, or (c) impairs CU Boulder's ability to maintain the courts to NCAA Division I standards, then CU Boulder will have the option to reconstruct the tennis facility on land currently designated OS-O and contiguous to the remaining CU Development Tract area in a location determined by CU Boulder at its sole discretion. Such replacement land shall be subject to University's approval, shall be contiguous with and become a part of the remaining CU Development Tract area, and shall be zoned Public (PUB) by the City. City shall bear all actual costs of CU Boulder's design, development and construction of a comparable replacement tennis facility.

- The City may demolish, at its sole cost and expense, the building currently located in the area of the Property designated as PK-UO under the BVCP. The City agrees to pay CU Boulder the replacement value of the building.
- Any work required to ensure a high level of aesthetic value as agreed to by both the city and CU Boulder for large structures resulting from the flood mitigation project. For instance, an aesthetically pleasing finish on a large flood containment wall facing the area to be developed into housing.
- If any jurisdictional wetlands are damaged or displaced as a result of the flood mitigation needs of the city, it is the responsibility of the city to secure any applicable wetland permits and mitigate the loss of the wetlands
- Any additional land requested by the city or city-related entity for open space or other uses will be purchased by the city only with the university's agreement at a market value cost as determined by third-party appraisal, mediated as needed.
- Restoration of any Open Space-Other land as designated under the BVCP owned by CU Boulder for ecological benefits desired by the city or related entity will be done in partnership with the university with costs borne by the city or related entity.
- If the university agrees, the city may, at its sole cost, realign Dry Creek Ditch #2.
- If the university agrees, the city may acquire or lease the university's water rights in Dry Creek Ditch #2.
- The city will not require a site plan submission for annexation.
- CU Boulder South shall be deemed to be part of the Main Campus of the university and be subject to the Water and Wastewater Service Agreement of January 1997 between the parties.

University of Colorado Boulder Tentative Planning Process:

1. Fall-winter 2019 - Strategic Facilities Visioning initiative wraps up
2. Late 2019 - Campus Master Planning advertised
3. Late 2021 - Campus Master Plan completes and send for approvals
4. 2022 - Pending approvals from Board of Regents and CCHE
5. 2022 - 2023 CU South Master Plan*
6. 2024/25 - Earliest potential building-specific planning commences

* City will be engaged for comment at the appropriate time during this step.

We appreciate the opportunity to work with the city throughout this complex annexation process in a collaborative and transparent manner in an effort to provide extensive community benefit for all.

Kind Regards,

A handwritten signature in cursive script, reading "Frances Draper".

Frances Draper

Vice Chancellor for Strategic Relations and Communications

University of Colorado Boulder

	A	B	C
1		City Response to CU's first Submittal	
2		Alignment Status: "Yes" = General Agreement between city and CU public statements; "Analysis Needed" = analysis and negotiation required; Clarification Needed" = Clarification is needed to understand the University's objective; "No" = City/CU disagreement	
3	Alignment	Application Detail	
4		Key Issue	Level of detail needed for submittal (i.e. site plan)
5		City Policies or Council Direction	No direct guidance in BVCP.
6		CU Statement (Feb. 2, 2019)	The Application includes all items specified as being required therein. Submission of a site plan is not a requirement for annexation and CU Boulder will not submit a site plan with the Application; however, CU Boulder participated in the development of the Guiding Principles, which set forth detailed agreements with respect to future development on the Property. The University is providing additional detail in this Written Statement.
7	N/A	Staff Response to Feb. 2, 2019 CU Statement	Informational Comment During their study session on Oct. 9, 2018, City Council members showed interest in further clarifying aspects identified in the Guiding Principles (e.g. defining a "village concept") and exploring a scenario-based approach outlining standards and design guidelines for different circumstances. See comments below for more information on those topics.
8		CU Response - January 16, 2020	Future discussions on level of detail for submittals will occur after all key issues have been resolved.
9			
10		Key Issue	Submittal and Other Administrative Notes
11		City Policies or Council Direction	N/A
12		CU Statement (Feb. 2, 2019)	N/A
13	N/A	Staff Response to Feb. 2, 2019 CU Statement	Decision-making Authority Pursuant to B.R.C. 9-4-2 Development Review Procedures, the Planning Board will provide a recommendation to City Council regarding the approval or denial of the annexation application, and City Council holds Decision Authority. Case Manager The case manager for this application is: Phil Kleisler, Planner II kleislerp@bouldercolorado.gov 303-441-4497 Annexation Map 1. Legal Description – remove the easements appurtenant to the property and include only the parcel description. 2. Vicinity Map - revise to appear smaller in scale (such as 1" = 200' with notation that full-sized map is on Sheets 2 and 3. 3. Map a. Check each dimension shown on the map to ensure accuracy and that there is no overlapping text, including call on north property line and the label for CDOT (Bk 880, Page 92) which overlaps subtitle. b. Please reduce the size of the map so that the entire parcel appears on Sheet 2. (Perhaps, if the scale were 1" - 400' it would fit). If possible, please remove extra labels/diagrams not needed on the map since it will be shrunk to be an exhibit attached to the annexation ordinance. c. Remove the depiction of the 60' wide easement from the north property line and associated references to deeds and easements. d. Remove references to references to "See TCE" since the title commitment exceptions are not included. e. Remove label to "Right-of-Way Access Restriction Film 763, Rec. 010051, See TCE #20) since there is another label for the CDOT ramp. f. Remove the circle symbols for each survey pin (useful on the survey, but not necessary for this map). g. Remove references to Carl C. Deepe Ditch and Irrigation Lateral. h. Remove reference to "Parcel to Discharge Floodwaters (See TCE #10 and Note #10) Legal Description (8.5 x 11 paper) to attach to ordinance: 1. Remove the references to the easements appurtenant to the property. 2. Revise to ensure accuracy of each dimension to be consistent with the actual measurements as discussed with the surveyor). Addressing City staff proposes that both parties coordinate on assigning appropriate street names and building numbers during the university's Design Development phase. A copy of the City of Boulder address policy is attached for reference. Inactive Applications (9-2-6.e) Notify the case manager in writing if, at any point in the development review process, the applicant is unable to respond to staff comments by providing additional or corrected materials within sixty days. The city manager may extend the sixty-day period if requested by the applicant prior to its expiration and upon the applicant's demonstrating good cause for the additional delay.
14		CU Response - January 16, 2020	The annexation map and Legal Description have been updated and are enclosed.
15			
16		Key Issue	Initial Zoning
17		City Policies or Council Direction	Pursuant to B.R.C. §9-2-18 Zoning of Annexed Land, zoning of annexed land or land in the process of annexation shall be considered an initial zoning and shall be consistent with the goals and land use designations of the Boulder Valley Comprehensive Plan.
18		CU Statement (Feb. 2, 2019)	The University recognizes that the City will be making future decisions regarding the specific boundaries of the City's Flood Mitigation Project. The City's decisions may require the reduction of the University-required minimum 129 acres designated under the BVCP Land Use Designation as Public/Semi-Public for future CU Boulder development on the Property. In addition, CU Boulder recognizes that the existing tennis courts may be adversely impacted by the final Project plan and the anticipated site of recreational fields in the area designated under the BVCP as "PK-UO" may need to be relocated. The City is in the planning phase of the Project and has therefore yet to determine the land area necessary for the Project. Given the future decisions to be made, the University requests the City initially zone the entire property "Public" under the City's Land Use Code in order to provide the flexibility to accommodate changes to the land use boundaries (as established in the BVCP) that may be necessary as a result of changes to the Project plans. Upon finalization of the Project boundaries, the City may, at its discretion, rezone any area used outside of the aggregate 129 acres designated for University development and the 30 acres to be used for recreational fields (unless such fields can be reasonably accommodated within the Project area).

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19	Clarification Needed	Staff Response to Feb. 2, 2019 CU Statement	<p>Identify options for alternative use of 30 – 36 acres of land necessary for flood mitigation that is currently planned for university housing.</p> <p>On Feb. 5, 2019, City Council directed staff to move forward with preliminary design for the original Variant 1, 500-year concept for South Boulder Creek flood mitigation. At the current conceptual level of design, City staff anticipates approximately 30 – 36 acres of land designated Public in the Boulder Valley Comprehensive Plan (BVCP) Land Use Map will be impacted. The amount of acreage needed will be further refined during the preliminary design process. CU Boulder’s application states that the University must retain in perpetuity its development rights to a minimum of 129 acres and that any diminishment of that area either (i) be proportionally replaced with land currently designated Open Space – Other (OS-O) under the BVCP, (ii) the city shall compensate the university in cash for the fair market value of the applicable area, or (iii) provide land agreeable to the University in another location.</p> <p>City staff proposes that we jointly explore the following options to address this issue. Please indicate if any of these options are unacceptable to the university. Options acceptable to both city and university staff will be analyzed further and presented to city boards and City Council for direction in a preferred approach and community engagement.</p> <ul style="list-style-type: none">• Option 1: Receive an opinion of value for possible city purchase of land before it is annexed into the city.• Option 2: Explore land available off site for CU to use for development purposes. Please summarize the university’s criteria for selecting off-site locations. Council members have expressed interest in exploring the Planning Reserve in north Boulder as a potential off-site location. Indicate if the Planning Reserve may or may not meet the university’s selection criteria.• Option 3: Determine necessary changes to the university’s development program to allow for university needs to be met within a smaller Development Tract (i.e. the 93 – 99 acres of “Public” land not impacted by the flood mitigation project). For example, the city and university could explore additional density within the smaller Development Tract in ways that meets the university’s needs and still addresses applicable guiding principles (e.g. viewshed protection, etc.). <p>City staff does not currently support using a portion of the OS-O area for housing, as that concept is not consistent with the Boulder Valley Comprehensive Plan. The other options, including but not limited to those noted above, should be pursued prior to examining the suitability of housing in the OS-O area.</p> <p>Initial Zoning As part of the Major Update to the Boulder Valley Comprehensive Plan (BVCP) in 2017, the site’s Land Use Designations were changed to:</p> <ul style="list-style-type: none">• Public / Semi-Public (128.9 Acres) Characteristics and Location: PUB land use designations encompass a wide range of public and private non-profit uses that provide a community service. They are dispersed throughout the city. Uses: This category includes municipal and public utility services (e.g., the municipal airport, water reservoirs and water and wastewater treatment plants). It also includes: educational facilities (public and private schools and the university); government offices, such as city and county buildings, libraries and the jail; government laboratories; and nonprofit facilities (e.g., cemeteries, places of worship, hospitals, retirement complexes) and may include other uses as allowed by zoning.• Open Space – Other (118.6 Acres) This designation applies to other public and private land designated prior to 1981 that the city and county would like to preserve through various preservation methods, including but not limited to intergovernmental agreements, dedications or acquisitions. By itself, this designation does not ensure open space protection.• Parks, Urban and Other (65.5 Acres) Characteristics and Uses: PK-U/O includes public lands used for a variety of active and passive recreational purposes or flood control purposes. Urban parks provided by the city include neighborhood parks, community parks and city parks, as defined in the Parks and Recreation Master Plan. The specific <p>Key Issue #1 - From letter dated 3/28/19 Option 1: Receive an opinion of value for possible city purchase of land before it is annexed into the city.</p> <p>Per the May 20, 2019 letter to City Council, CU Response: We do not see a purchase of an additional 30-36 acres of land as a viable option for the city due to City Council’s agreement on February 5 that the price of \$65 million plus for the deeper version of Variant I 500 that staff presented was too expensive. We currently estimate the value for developable land in South Boulder as between \$1 and \$2 million per acre, resulting in a total price ranging between \$30 and \$72 million. Including the cost of the additional land would again put the cost of Variant I 500 at \$65 million plus.</p> <ul style="list-style-type: none">• Option 2: Explore land available off site for CU to use for development purposes. Please summarize the university’s criteria for selecting off-site locations. Council members have expressed interest in exploring the Planning Reserve in north Boulder as a potential off-site location. Indicate if the Planning Reserve may or may not meet the university’s selection criteria. <p>Per the May 20, 2019 letter to City Council, CU Response: In our estimation, there is no reasonably proximate, developable and comparable land available which can be offered by the city in exchange.The suggested property in Planning Reserve III north of the city is not proximate, not comparable, not developable and not currently annexable under the BVCP.</p> <ul style="list-style-type: none">• Option 3: Determine necessary changes to the university’s development program to allow for university needs to be met within a smaller Development Tract (i.e. the 93 – 99 acres of “Public” land not impacted by the flood mitigation project). For example, the city and university could explore additional density within the smaller Development Tract in ways that meets the university’s needs and still addresses applicable guiding principles (e.g. viewshed protection, etc.). <p>Per the May 20, 2019 letter to City Council, CU Response: As stated in our application and in prior communications, the university requires a full 129 acres for development out of our 308 acres. The university currently has no concept plan for development.</p>
20		CU Response - January 16, 2020	
21			
22		Key Issue	Payment In-lieu of Taxes
23		City Policies or Council Direction	N/A
24		CU Statement (Feb. 2, 2019)	N/A
25	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	<p>The city proposes that CU Boulder make an annual Payment In-lieu of Taxes (PILOT) after it is annexed into the city. Such an agreement will be negotiated prior to annexation. PILOT agreements are intended to help offset losses in property taxes due to non-taxable land within the city. This agreement would include city services not currently provided by the university (e.g. Fire and Rescue).</p> <p>Key Issue #3 - From letter dated 3/28/19 Establish a Payment In-lieu of Taxes Agreement. The city proposes that CU Boulder make an annual Payment In-lieu of Taxes (PILOT) after it is annexed into the city. Such an agreement will be negotiated prior to annexation. PILOT agreements are intended to help offset losses in property taxes due to non-taxable land within the city. This agreement would include city services not currently provided by the university (e.g. Fire and Rescue).</p> <p>Per the May 20, 2019 letter to City Council, CU Response: The university will not agree to make a payment in-lieu of taxes to the city.</p>
26		CU Response - January 16, 2020	
27			
28	Alignment	Review Process	
29		Key Issue	Establish a review process for the City to review and comments on future development plans
30		City Policies or Council Direction	No direct guidance in BVCP.
		CU Statement (Feb. 2, 2019)	<p>CU Boulder will offer the City and the community the opportunity to provide input to the Campus Master Plan (as defined below).</p> <p>In addition, in response to the feedback received from City Council and City staff, during the Conceptual Design phase (as defined below) prior to CU Boulder’s submission of CU Boulder’s conceptual design documents for development of the Property (“Concept Design”) to the DRB (as defined below) for review and approval, CU Boulder will deliver the Concept Design to the City. The City will have a period of 60 days following its receipt of the Concept Design to review and deliver comments to CU Boulder. Exhibit A (attached hereto) sets forth in greater detail the City’s review process and conforms substantially to the Memorandum of Understanding agreement dated October 11, 2016 between the City and CU Boulder regarding CU Boulder’s hotel and conference center. “Conceptual Design” shall mean a phase of design document development during which the DRB will evaluate the overall development of the Property. The Conceptual Design phase will focus on improvement and site development planning, architectural character, and relationships to surrounding buildings/spaces. For more information on what will be included in the Concept Design provided to the City, please see Exhibit A.</p>
31			
32	Analysis Needed	Staff Response to Feb. 2, 2019	City staff requests a 90-day review period to facilitate review and input from the city’s Planning Board and City Council
33	Item 1 – South Boulder Creek Channel Alternatives Analysis Update	CU Response - January 16, 2020	CU will agree to a 60 day review period.

Attachment H - Annexation Application

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34			
35		Key Issue	Implement the South Boulder Creek Phase I Flood Mitigation Study subject to final design
36		City Policies or Council Direction	The Guiding Principles state that the site will provide adequate areas for construction, maintenance and operation of city flood control dams, appurtenances and associated flood storage, including freeboard to reduce flood risks.
		CU Statement (Feb. 2, 2019)	Subject to Regent approval, and in consideration of City's annexation of CU Boulder South, the University will convey fee simple title in up to 80 acres of the Property (the " Flood Property ") to the City by special warranty deed (the " Deed "). The City agrees to use the land conveyed by the University only for development, construction, operation, maintenance, and redevelopment of the Project; this use limitation shall be memorialized in a restrictive covenant in the Deed that will grant the University a reversionary right to the fee simple title in the Flood Property in the event an uncured breach of such restrictive covenant persists for a period of 365 days following University's delivery to City of written notice of breach. If the recreational fields are not able to be accommodated within the flood mitigation project footprint, the University will retain the right to an easement to allow sufficient access and use of recreational fields in an area that is mutually agreed upon.
			If successful design and development of the Project requires the use of land in excess of 80 acres, then subject to University's reasonable approval and agreement, City may purchase additional land contiguous to the Flood Property at fair market value as determined by a third-party appraisal. This area shall be subject to the same reversionary right detailed in the preceding paragraph.
			If City or a City-related entity wishes to acquire additional portions (for example in OS-O area) of the Property for open space or other uses, then subject to University's approval (determined in its sole discretion) and agreement, City may purchase such land at fair market value as determined by a third-party appraisal.
37			Any conveyance of University-owned land contemplated herein shall be subject to, and limited by, approval by its Board of Regents.
	No	Staff Response to Feb. 2, 2019 CU Statement	<ul style="list-style-type: none">• Further analysis is needed to determine the extent of land in excess of 80 acres that would be needed for the flood mitigation project and the value of that land before providing comments regarding potential purchase of the land. It is currently estimated the Variant 1, 500-year flood mitigation concept (approved by Council on Feb. 5, 2019) would need approximately 90 acres of CU South property for flood mitigation structures and the detention area. However, the amount of acreage needed will be further refined through the preliminary design process.• It is our understanding that CU does not want to be responsible for owning and operating the dam and therefore the city would need to own the land in fee title. City staff is not in agreement with CU Boulder's proposed restrictive covenant granting the University reversionary right to the fee simple title. The State Engineer's Office will require the city show it has permanent responsibility for and access to the flood mitigation structures and detention area and that those rights cannot be revoked at a later date.• On Feb. 5 City Council directed that the next steps of design should focus on the engineering needs of the project and on accommodating future sports fields in the detention area. See later comments regarding location options to address CU's interests in future recreational fields.• See later comments on regarding city interests in acquisition of additional portions of the property for Open Space.• The property is located in the floodplain of South Boulder Creek. Any development within the floodplain is subject to the city's floodplain regulations and will require floodplain development permit(s).
38			
39		CU Response - January 16, 2020	<ul style="list-style-type: none">• <i>See our initial submittal regarding up to 80 acres max with the option for the City to purchase additional acreage specifically for the flood mitigation project. The reversionary right will not be effective unless the city does not use the 80 acres for flood mitigation.</i>• <i>CU shall meet FEMA Floodplain regulations</i>
40			
41		Key Issue	Obtain necessary easements.
42		City Policies or Council Direction	The Guiding Principles state that specific real property ownership, easements, and/or agreements will be established during annexation for the area necessary for floodwater improvements and other uses (plus or minus some land area).
43		CU Statement (Feb. 2, 2019)	The University will provide the necessary rights for the City to achieve its Flood Mitigation Project upon finalization of the Flood Mitigation Project. Real property ownership is addressed above.
44	Yes	Staff Response to Feb. 2, 2019	The City would need conveyance of the flood mitigation project area prior to proceeding with Final Design of the project.
45		CU Response - January 16, 2020	<i>We agree so long as we have a completed annexation agreement without contingencies and CU has agreed to the schematic project design which aligns substantially to the final project design.</i>
46			
47		Key Issue	Avoid excavation within the OS-O area, maintain PUB acreage, and avoid impacts to existing tennis courts.
48		City Policies or Council Direction	On Sept. 20 Council indicated a preference to avoid the area of proposed of excavation shown on OS-O in Variant 1, 500-year, Option A.
		CU Statement (Feb. 2, 2019)	The University must retain in perpetuity its development rights to a minimum of 129 acres. The current land use designation of the University's 129 acres of developable area of the Property is "Public" under the BVCP (the "CU Development Tract"). Any diminishment of the area of the CU Development Tract shall (a) be subject to University's written approval and, at University's option, the diminished area shall be proportionally replaced with land currently designated OS-O under the BVCP (such replacement land shall be subject to University's approval, shall be contiguous with and become a part of the remaining CU Development Tract area, and shall be zoned Public (PUB) by the City). Alternatively, at University's option and approval, City shall compensate University in cash for the fair market value of the applicable area or with land agreeable to the University in another location.
			If successful design and development of the Project (a) requires relocation of CU Boulder's tennis facility, (b) materially and adversely affects CU Boulder's use and enjoyment of the tennis courts, or (c) impairs CU Boulder's ability to maintain the courts to NCAA Division I standards, then CU Boulder will have the option to reconstruct the tennis facility on land currently designated OS-O and contiguous to the remaining CU Development Tract area in a location determined by CU Boulder at its sole discretion. Such replacement land shall be subject to University's approval, shall be contiguous with and become a part of the remaining CU Development Tract area, and shall be zoned Public (PUB) by the City. City shall bear all actual costs of CU Boulder's design, development and construction of a comparable replacement tennis facility.
			The City may demolish, at its sole cost and expense, the building currently located in the area of the Property designated as PK-UO under the BVCP. The City agrees to pay CU Boulder the replacement value of the building.
49			
	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	<ul style="list-style-type: none">• The Variant 1, 500-year concept approved by City Council on Feb. 5, 2019 is estimated to use approximately 36 acres of PUB land for the structures and detention area. The number of acres for flood mitigation structures and detention area in PUB, will be refined through additional modeling by the City's flood mitigation consultants during preliminary design. More information will be provided to CU once that analysis is complete.• The existing tennis courts are located in the area of future detention for the Variant 1, 500-year concept. The City typically prohibits buildings for human occupancy, such as offices, restrooms, and concessions in flood detention areas. Further analysis of the anticipated depth and frequency of inundation where the current tennis courts are located is needed to determine whether the city would allow the existing tennis courts and associated parking to remain in the detention area. If it is required that the tennis courts be moved out of the detention area for the purposes of public safety or functionality of the flood mitigation project, the city will procure an appraisal of the value of the exiting tennis facility. The city will contribute an agreed upon value of the existing tennis facility toward CU's design and construction of a new facility.• If required for the purposes of public safety or functionality of the flood mitigation project, the city will procure an appraisal of the value of the existing storage building. The city and CU will need to develop an agreement regarding the who pays the cost of removal and any required remediation associated with building demolition.• The city seeks further consultation and input on decisions regarding any material changes to OS-O. Additionally, on September 20, 2018, Council stated a preference for implementing the July 11, 2018 OSBT recommendations that the University protect and/or convey the OS-O designated land to the City.
50			
51		CU Response - January 16, 2020	<i>It will be the sole determination of the university if the tennis courts and storage building need to be moved if they fall anywhere within the flood project's detention area. Should the university determine that the tennis courts and storage facilitiity need to be relocated, the city will agree to demolish those facilities at the city's sole cost and then pay to the university the replacement cost of the same.</i>
52			
53		Key Issue	Groundwater monitoring
54		City Policies or Council Direction	Prior to a final agreement related to the flood mitigation land area, the city will conduct a groundwater assessment which verifies the feasibility and provides the basis for design and construction of implementing measures to convey groundwater through the dam in a manner that substantially replicates existing flow patterns.
55		CU Statement (Feb. 2, 2019)	Agreed
56	Yes Item 1 - South Boulder Creek Conceptual Alternatives Analysis Update Page	Staff Response to Feb. 2, 2019 CU Statement	The city will continue to access the groundwater monitoring wells installed on CU South per the terms in the Amendment to Amended and Restated Permission to Enter Property Agreement dated December 11, 2017 and last amended March 26, 2018. Additional subsurface investigations on CU South will be needed during preliminary design of the flood mitigation project. City staff will work with CU staff to update the property agreement for this purpose.

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57		CU Response - January 16, 2020	<i>CU and city have executed an agreement effective December 31, 2019 that grants the city access for additional ground water studies.</i>
58			
59		Key Issue	Aesthetic design of flood mitigation infrastructure
60		City Policies or Council Direction	The project team includes a landscape architecture firm that will help coordinate project landscaping and aesthetics that will be vetted with CU and made available to the public, boards and council.
61		CU Statement (Feb. 2, 2019)	The City will include CU Boulder in the landscape and aesthetic planning of the Project. The Project design team shall collaborate with the University with respect to Recreational Field placement as well as the potential placement of bleachers on the slopes of the retention structure walls. University shall bear the sole cost and expense of design, development and construction of the Recreational Fields and the bleachers, as applicable.
62	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	<ul style="list-style-type: none">• The City typically provides high aesthetic quality of flood mitigation structures in urban areas. The flood mitigation project team includes a landscape architecture firm that will help coordinate project landscaping and aesthetics. The project team will consult with CU staff when conducting aesthetic design of project elements.• City Council on Feb. 5 directed staff to focus on the engineering needs of the flood mitigation project and not focus on accommodating sports fields in the detention area. If following additional modeling and design of the project it is determined that it is feasible to include sports field turf in the detention area without impacting the functionality or cost of the flood mitigation project, then the city would work with CU Boulder staff to determine if there were opportunities for incorporating recreational field placement and bleachers into the design.• Parks and Recreation staff would like to be involved in any design coordination of athletic facilities/fields.• OSMP staff and Open Space Board of Trustees request consultation and input on infrastructure design including decisions regarding any material changes to OS-O if not conveyed to the City.
63		CU Response - January 16, 2020	City shall collaborate with the university in the consideration of placing Recreational Fileds including bleachers and all other sports/turf fields in the detention area.
64			City staff will be permitted to review future CU plans during their allotted 60 day review period as previously stated. If the OS-O is not conveyed to the city, the university retains ownership and does not agree to consult with OS Board of Trustees on infrastructure design including decisions regarding any material changes to OS-O.
65		Key Issue	Determine suitable recreational uses for the area within the flood mitigation detention area.
66		City Policies or Council Direction	Explore opportunities for passive and active recreation activities, or other uses compatible with the floodwater mitigation system and where possible, conserve and/or restore areas within the flood mitigation facilities with high ecological value and mitigate impacts.
67		CU Statement (Feb. 2, 2019)	Upon completion of the construction of the flood mitigation dam and related retention areas, CU Boulder must have no less than 30 appropriately graded acres available for construction of recreational/athletics fields (the " Rec Fields ") in the area of the Property designated as PK-UO under the BVCP. The Rec Fields must be situated on the Property in a manner that provides reasonable ingress and egress (including ADA accessibility) for site visitors, teams, service vehicles, as well as proximate space for related facilities such as concessions, restrooms, and storage. If the Rec Fields cannot be located in the flood detention area, the University may construct the Rec Fields on 30 appropriately graded acres within the OS-O-designated land, contiguous to the CU Development Tract.
68	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	<p>Identify options for addressing CU Boulder's stated interest in 30+ acres of land for university sports fields and potential re-location of tennis courts, if required due to the flood mitigation project.</p> <p>Early analysis indicates that functional ball fields will not be feasible within the detention area of the Variant 1, 500-year design in the PK-U/O land use area because the depth of the additional excavation would limit the ability to properly drain the fields.</p> <p>City staff proposes that we jointly explore the following options to address this issue. Please indicate if any of these options are unacceptable to the university. Options acceptable to both city and university staff will be analyzed further and presented to city boards and City Council for direction in a preferred approach and community engagement.</p> <ul style="list-style-type: none">• Option 1: Determine suitability of the existing tennis courts remaining in the detention area and of using a portion of the flood mitigation detention area in the PK-U/O and PUB land use areas for recreational field turf. Further analysis of the anticipated depth and frequency of inundation where the current tennis courts are located is needed to determine whether the city would allow the existing tennis courts and associated parking to remain in the detention area. If following additional design of the project it is determined that it is feasible to include sports field turf in a portion of the detention area without impacting the functionality or cost of the flood mitigation project, then the city would work with CU Boulder staff to evaluate opportunities for recreational field turf placement. The City typically prohibits buildings for human occupancy, such as offices, restrooms, and concessions in flood detention areas. Parking would likely also be restricted in the detention area, but further analysis of the anticipated depth and frequency of inundation would be needed to make this determination. CU Boulder would be responsible for all costs of construction and recreational field cleanup following a storm event.• Option 2: Determine suitability and acceptability of using a portion of land designated as OS-O in the BVCP for recreation and other uses consistent with the BVCP CU South Guiding Principles. On September 20, 2018, Council stated a preference for implementing the July 11, 2018 OSBT recommendations that the University protect and/or convey the OS-O designated land to the City. However, if not conveyed to the City, if any portion of OS-O is found suitable and allowed for this recreational purpose, OSMP staff and Open Space Board of Trustees request consultation and input on decisions regarding any material changes to OS-O, which could include requirements that the area be permanently restricted to such recreational uses (i.e. no further development permitted such as housing).• Option 3: Explore other potential off-site locations within Boulder in coordination with City Parks and Recreation. Please summarize the university's criteria for selecting off-site locations. Council members have expressed interest in exploring the Planning Reserve in north Boulder as a potential off-site location. Indicate if the Planning Reserve may or may not meet the university's selection criteria.

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			<p>Key Issue #2 - From letter dated 3/28/19</p> <p>Identify options for addressing CU's stated interest in 30+ acres of land for university sports fields and potential re-location of tennis courts, if required due to the flood mitigation project. Early analysis indicates that functional ball fields will not be feasible within the detention area of the Variant 1, 500-year design in the PK-U/O land use area because the depth of the additional excavation would limit the ability to properly drain the fields. CU Boulder's annexation application states that:</p> <p><i>Per the May 20, 2019 letter to City Council, CU Response: Upon completion of the construction of the flood mitigation dam and related retention areas, CU Boulder must have no less than 30 appropriately graded acres available for construction of recreational/athletics fields (the " Rec Fields ") in the area of the Property designated as PK-U/O under the BVCP. The Rec Fields must be situated on the Property in a manner that provides reasonable ingress and egress (including ADA accessibility) for site visitors, teams, service vehicles, as well as proximate space for related facilities such as concessions, restrooms, and storage. If the Rec Fields cannot be located in the flood detention area, the University may construct the Rec Fields on 30 appropriately graded acres within the OS-O-designated land, contiguous to the CU Development Tract.</i></p> <p>Option 1: Determine suitability of the existing tennis courts remaining in the detention area and of using a portion of the flood mitigation detention area in the PK-U/O and PUB land use areas for recreational field turf. Further analysis of the anticipated depth and frequency of inundation where the current tennis courts are located is needed to determine whether the city would allow the existing tennis courts and associated parking to remain in the detention area. If following additional design of the project it is determined that it is feasible to include sports field turf in a portion of the detention area without impacting the functionality or cost of the flood mitigation project, then the city would work with CU Boulder staff to evaluate opportunities for recreational field turf placement. The City typically prohibits buildings for human occupancy, such as offices, restrooms, and concessions in flood detention areas. Parking would likely also be restricted in the detention area, but further analysis of the anticipated depth and frequency of inundation would be needed to make this determination. CU Boulder would be responsible for all costs of construction and recreational field cleanup following a storm event.</p> <p><i>CU Response: It will be the sole determination of the university if the tennis courts and storage building need to be moved if they fall anywhere within the flood project's detention area. Should the university determine that the tennis courts and storage facility need to be relocated, the city will agree to demolish those facilities at the city's sole cost and then pay to the university the replacement cost of the same.</i></p> <p>• Option 2: Determine suitability and acceptability of using a portion of land designated as OS-O in the BVCP for recreation and other uses consistent with the BVCP CU South Guiding Principles. On September 20, 2018, Council stated a preference for implementing the July 11, 2018 OSBT recommendations that the University protect and/or convey the OS-O designated land to the City. However, if not conveyed to the City, if any portion of OS-O is found suitable and allowed for this recreational purpose, OSMP staff and Open Space Board of Trustees request consultation and input on decisions regarding any material changes to OS-O, which could include requirements that the area be permanently restricted to such recreational uses (i.e. no further development permitted such as housing).</p> <p><i>CU Response: Again, the University would agree to construct the Rec Fields on 30 appropriately graded acres within the OS-O-designated land, contiguous to the CU Development Tract.</i></p> <p>• Option 3: Explore other potential off-site locations within Boulder in coordination with City Parks and Recreation. Please summarize the university's criteria for selecting off-site locations. Council members have expressed interest in exploring the Planning Reserve in north Boulder as a potential off-site location. Indicate if the Planning Reserve may or may not meet the university's selection criteria.</p> <p><i>CU Response: As stated above, the Planning Reserve is unacceptable to the university. CU Boulder will consider off site locations for recreational fields that are reasonably proximate and comparable in our sole judgement.</i></p>
69		CU Response - January 16, 2020	
70			
71		Key Issue	Flood detention drainage design for recreational fields
72		City Policies or Council Direction	The city will ensure that the detention area will be designed to meet State water rights drain time requirements. The system will also be designed to drain following a storm event without causing negative downstream floodplain impacts.
		CU Statement (Feb. 2, 2019)	The City will ensure drainage of the detention area is designed appropriately and will conduct routine maintenance and inspections (at the City's expense) to ensure no improper or excess flow discharge occurs during flooding events. The City will ensure that the flood detention area used for recreational/athletics field development will be engineered to sufficiently drain within a reasonable period of time to ensure that the Rec Fields can remain functional after a flood. The City will ensure that Rec Fields do not have ongoing water ponding issues not related to a flood event.
73			
74	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	Hydraulic modeling will be included in preliminary design to ensure draining of the detention area following a storm event will not result in negative impacts to existing floodplains. As described previously, additional analysis is needed to evaluate the ability to include functional recreational fields in the detention area.
75		CU Response - January 16, 2020	<i>The City shall confirm and maintan that sufficient and timely draining of the recreation/athletic fields is engineered and that all fields will remain fully functional after a flood. City engineering will ensure Rec Fields do not have ongoing water ponding issues not related to a flooding event.</i>
76			
77		Key Issue	Site Access (S. Loop Rd, Tantra) Yes
78		City Policies or Council Direction	As part of standard practice, the City mitigates for any damage or modifications to existing structures, including access roads, that results from a flood mitigation project.
		CU Statement (Feb. 2, 2019)	The City will bear any and all costs of modification, realignment and/or reconstruction of existing access roads on the Property, if CU Boulder determines in its reasonable discretion that the design of the Project necessitates such changes.
79			The City shall also be responsible for any repair costs related to damages attributable to flood mitigation causes or caused by the City to any future CU Boulder road or improvements.
	Yes	Staff Response to Feb. 2, 2019 CU Statement	The city is committed to an equitable apportionment of costs associated with the flood mitigation project. This will need to be done through further negotiation and agreement.
80			Flooding events are acts of nature. The city will not agree to blanket indemnifications on the property. The city will work with the CU Boulder to design infrastructure that will be resilient during and after flooding events.
81		CU Response - January 16, 2020	<i>Future agreements shall incorporate language on the City bearing any and all costs for the modification, realignment, and/or reconstruction of existing access roads on the Property, if CU Boulder believes the design of the project necessitates such change.</i>
82			
83		Key Issue	Future claims and damages
84		City Policies or Council Direction	As part of standard practices, and as required by the State Engineer's Office, the City takes responsibility for the performance and safety of its dams and flood mitigation structures.
		CU Statement (Feb. 2, 2019)	The City will bear the costs and responsibilities of any claims or damages resulting from the failure of the design, construction, performance and/or safety of the Project and related structures and appurtenances. City shall be responsible for its negligent acts and omissions.
85			
86	Yes	Staff Response to Feb. 2, 2019 CU Statement	The city will be the permit holder for the project and responsible for compliance with applicable state and federal regulations. Nothing in the annexation agreement will be construed to constitute any waivers in the Colorado Governmental Immunity Act.
87		CU Response - January 16, 2020	<i>Comment noted.</i>
88			
89		Key Issue	Wetland and habitat mitigation for project direct impacts
		City Policies or Council Direction	The project team will secure all necessary environmental permits and mitigate for the project's direct environmental impacts. At the concept design stage, the project team had anticipated restoring habitat on OS-O to fulfill any wetland and habitat mitigation requirements. The Guiding Principles state that in the area protected by the existing CU levee floodplain functions, including wetlands and flood mitigation, may be restored as part of compensatory mitigation for impacts elsewhere on site.
90			
91		CU Statement (Feb. 2, 2019)	If any jurisdictional wetlands are damaged or displaced as a result of the flood mitigation needs of the City, it is the responsibility of the City to secure any applicable wetland permits and mitigate the loss of the wetlands through Section 404 of the Clean Water Act.
	Yes	Staff Response to Feb. 2, 2019 CU Statement	• The City is responsible for obtaining all necessary environmental permits and mitigate for loss of wetlands through Section 404 of the Clean Water Act. • On September 20, 2018, Council stated a preference for implementing the July 11, 2018 OSBT recommendations that the University protect or convey the OS-O land to the City as part of annexation, with the City having responsibility for subsequent management and any restoration, including utilizing this area for wetland and habitat mitigation purposes needed for the flood mitigation project. • In addition to Section 404 permitting, the city expects that CU Boulder will also follow the requirements of the city's wetlands requirements.
92			
93		CU Response - January 16, 2020	<i>After key issues around the annexaton have been resolved, further discussion of the details intended here is warranted.</i>
94			
95	Item 1 - South Boulder Creek Conceptual Alternatives Analysis Update Alignment	Levee Removal	

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96		Key Issue	Remove the existing levee system.
97		City Policies or Council Direction	Remove the existing levee system and restore underlying land to improve riparian connectivity between CU South OS-O area and South Boulder Creek. The existing CU levee does not affect the overall hydrology for the flood mitigation project but armoring of specific land areas inside of the existing CU levee may be required to avoid scour and erosion during a storm event.
		CU Statement (Feb. 2, 2019)	CU Boulder remains open to the removal of the berm/levee by the City per our letter of October 1, 2018 to City Council. If the levee is removed, the following are required: 1) the City will ensure, at its sole cost and expense, that construction and/or operation of the Project and related structures and appurtenances and/or removal of the berm/levee shall not increase the FEMA 100- year or 500-year floodplain, as may be established from time to time, and will not extend or increase any wetland area on any of the Property, now or in the future; 2) CU Boulder will be provided the first option to use or sell the berm/levee material if the berm/levee is removed; and 3) the City will be responsible for securing all federal, state, and other governmental approvals to remove the berm/levee.
98			
	Clarification Needed	Staff Response to Feb. 2, 2019 CU Statement	<ul style="list-style-type: none">• The city will be responsible for securing all federal state, and other governmental approvals as needed for the flood mitigation project.• The City will not intentionally create additional wetlands or expand the floodplain on the "Development Tract," (PUB land use area outside of the flood mitigation detention area) but cannot guarantee the site's wetland and floodplain mapping or designation performed in the future by federal, state or local regulatory agencies.• City only intends to remove the levee if the land including the levee is under City ownership, where the berm material is considered appurtenant to the land. Acquisition of that land could include discussions and negotiations regarding timing for removal, staging, transport and/or potential uses of the fill by both parties.• The city cannot be responsible for future changes to the flood plain that are regulated by FEMA.
99			<i>Future negotiations will include discussion of the ownership rights to the berm/levee material, once the 6 key issues have been resolved.</i>
100		CU Response - January 16, 2020	<i>The City shall be fully responsible for any future increase to the floodplain as a result of the City's Project.</i>
101			
102		Key Issue	Determine use of levee fill material
103		City Policies or Council Direction	Early project cost estimates assumed use of levee fill removal for the project.
104		CU Statement (Feb. 2, 2019)	If the levee/berm is removed, CU Boulder, as the owner of the fill, retains the right to the material, and will either use or sell the material.
	No	Staff Response to Feb. 2, 2019 CU Statement	See city comments regarding acquisition of OS-O land. The City only intends to remove the levee if the land including the levee is under City ownership. The City asserts that the existing CU levee is an appurtenance to the land that would be included in the acquisition of OS-O land and the city would retain the right to use or sell the material, however acquisition of that land could include discussions/negotiations regarding timing for removal, staging, transport and/or potential uses of the fill by both parties.
105			
106		CU Response - January 16, 2020	<i>Future negotiations will include discussions of the possibility of CU selling the OS-O land upon which the berm/levee resides. CU retains ownership rights to this berm/levee material even though it resides ontop of potential City land. City shall bear all costs associated with removing said berm/levee.</i>
107			
108		Key Issue	Determine responsible party for securing approvals.
109		City Policies or Council Direction	The city will be responsible for all federal, state and other governmental approvals for the flood mitigation project.
110		CU Statement (Feb. 2, 2019)	The City will be responsible for securing all federal, state, and other governmental approvals to remove the berm/levee. The City is also responsible for all associated costs and fees.
111	Yes	Staff Response to Feb. 2, 2019	The city will be responsible for all federal, state and other governmental approvals for the flood mitigation project.
112		CU Response - January 16, 2020	<i>Comment noted.</i>
113			
114		Key Issue	Impacts to floodplain on CU South
		City Policies or Council Direction	The flood mitigation project will detain water on CU South, which will affect the floodplain in the area of detention and also following removal of the existing CU levee (in PK-U/O and OS-O land use areas). The detention area will be defined with a flood mitigation easement with CU. The 100-year and 500- year floodplain would not increase in the PUB land use area.
115		CU Statement (Feb. 2, 2019)	The University intends to convey the area used for flood mitigation purposes to the City. The City must ensure, at its sole expense, that construction and/or operation of the flood mitigation dam and related structures and removal of the berm/levee shall not increase the FEMA 100-year or 500-year floodplain areas on any of the Property, now or in the future.
116			
	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	The city will design the flood mitigation project in accordance with state and federal regulations including FEMA's applicable requirements for avoiding adverse impacts to the floodplain. At the conclusion of the project the city will submit a Letter of Map Revision for acceptance by FEMA. Future flood mapping is out of the city's purview given the decision-making authority of FEMA and the State of Colorado. It is possible that in the future criteria could change, models could improve, or through climate change design storms and hydrology could change that would impact the future designation of floodplains. For these reasons, the city would not be able to ensure that the floodplain designations on CU South would not change in the future.
117			
118		CU Response - January 16, 2020	<i>Proper design and engineering by the City shall be conducted to ensure that future approved FEMA floodplain mapping does not increase the existing floodplain. CU shall be consulted throughout the design and engineering process.</i>
119			
120		Key Issue	Future claims or damages
121		City Policies or Council Direction	As part of standard practices, and as required by the State Engineer's Office, the city takes responsibility for the performance and safety of its construction projects
		CU Statement (Feb. 2, 2019)	The City will bear the costs and responsibilities of any claims or damages resulting from the failure of the design, construction, performance and/or safety of the Project and related structures and appurtenances. City shall be responsible for their negligent acts and omissions.
122			
	Yes	Staff Response to Feb. 2, 2019 CU Statement	The city will be the permit holder for the flood mitigation project and responsible for compliance with applicable state and federal regulations.
123			
124		CU Response - January 16, 2020	The city will not waive any of the provisions of the Colorado Governmental immunity act. <i>Comment noted.</i>
125			
126	Alignment	Open Space	
127		Key Issue	Open Space Conveyance Area east and outside of the existing levee
		City Policies or Council Direction	On Sept. 20 Council stated a preference for implementing the July 11 OSBT Recommendation: Convey 44 acres east and south of the existing CU levee to OSMP, with subsequent management and any restoration to be funded by OSMP.
128			
		CU Statement (Feb. 2, 2019)	If City or a City-related entity wishes to acquire additional portions (for example in OS-O area) of the Property for open space or other uses, then subject to University's approval (determined in its sole discretion) and agreement, City may purchase such land at fair market value as determined by a third-party appraisal. Any conveyance of University-owned land contemplated herein shall be subject to approval by The Regents of the University of Colorado.
129			
	Clarification Needed	Staff Response to Feb. 2, 2019 CU Statement	On September 20, 2018, Council stated a preference for implementing the July 11, 2018 OSBT recommendations that the University convey 44 acres east and south of the existing CU levee to OSMP as part of annexation, with subsequent management and any restoration.
130			Key Issue #4(i) - From letter dated 3/28/19 On September 20, 2018, Council stated a preference for implementing the July 11, 2018 OSBT recommendations that the University: (i) convey 44 acres of OS-O land east and south of the existing CU levee to the city, <i>CU Response: The university, as stated in our application, is open to discussing sale of a portion of the OS-O designated land to the city for Open Space.</i>
131		CU Response - January 16, 2020	
132			
133		Key Issue	Open Space Conveyance Area protected by Levee, within OS-O area
		City Policies or Council Direction	On Sept. 20 Council stated a preference for implementing the July 11 OSBT Recommendation: Convey 40 acres west and north of the existing CU levee to OSMP and restore approximately 17.4 acres as part of the flood mitigation project. Support through annexation conveyance and/or permanent protection of the remaining OS-O area inside the levee (appx. 35 acres) for long-term protection and possible restoration.
134		CU Statement (Feb. 2, 2019)	If City or a City-related entity wishes to acquire additional portions (for example in OS-O area) of the Property for open space or other uses, then subject to University's approval (determined in its sole discretion) and agreement, City may purchase such land at fair market value as determined by a third-party appraisal. Any conveyance of University-owned land contemplated herein shall be subject to approval by The Regents of the University of Colorado.
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136	Clarification Needed	Staff Response to Feb. 2, 2019 CU Statement	On September 20, 2018, Council stated a preference for implementing the July 11, 2018 OSBT recommendations that the University convey 40 acres west and north of the existing CU levee and convey or protect the remaining 35 acres of OS-O to OSMP as part of annexation. Conveyance of the OS-O land would include features and material thereon (e.g. the existing CU levee) as real property appurtenances.
137			Key Issue #4 (ii and iii) - From letter dated 3/28/19
138			On September 20, 2018, Council stated a preference for implementing the July 11, 2018 OSBT recommendations that the University: (ii) convey 40 acres of OS-O land west and north of the existing CU levee and (iii) convey or protect the remaining 35 acres of OS-O land. Conveyance of the OS-O land would include features and material thereon (e.g. the existing CU levee) as real property appurtenances.
139		CU Response - January 16, 2020	<i>CU Response: The university, as stated in our application, is open to discussing sale of a portion of the OS-O designated land to the city for Open Space.</i>
140		Key Issue City Policies or Council Direction	Restoration and other uses/activities allowed in OS-O Guiding Principles state that the city will...collaborate with CU to protect and improve the delivery of open space, restore high ecological value areas and/or provide areas for recreation in lower ecological value areas. The city and CU will work together to achieve greater open space acreage as part of either larger city open space conservation areas or limited-structural build, such as community gardens, recreation, solar gardens, etc.
141		CU Statement (Feb. 2, 2019)	However, OSBT recommended that all of OS-O be conveyed to OSMP or permanently protected as Open Space, which would not allow for community gardens, recreational ball fields, solar gardens, etc. CU Boulder remains committed to the BVCP Guiding Principles, as stated. The City and CU Boulder will work together to achieve greater open space acreage as part of either larger City open space conservation areas or limited-structural builds, such as community gardens, recreation, solar gardens, etc. Restoration of any portion of the Property designated OS-O under the BVCP for ecological benefits desired by the City or related entity will be done in partnership with CU Boulder with costs borne by the City or related entity. If City or a City-related entity wishes to acquire additional portions (for example in OS-O area) of the Property for open space or other uses, then subject to University's approval (determined in its sole discretion) and agreement, City may purchase such land at fair market value as determined by a third-party appraisal. Any conveyance of University-owned land contemplated herein shall be subject to approval by The Board of Regents of the University of Colorado.
142	Clarification Needed	Staff Response to Feb. 2, 2019 CU Statement	Clarification is needed to determine whether the university agrees with OSBT recommendations for conveyance or permanent protection of all of OS-O, which would not allow community gardens, recreational ball fields, solar gardens. See previous comments regarding options for addressing CU Boulder's interests in recreational fields. When CU Boulder develops the PUB land use area in the future, wetlands or other habitat mitigation may be required. The city is open to CU restoring for mitigation purposes any areas that would be permanently protected as City open space through the annexation agreement, with costs borne by the university.
143		CU Response - January 16, 2020	<i>CU Response: At this time it appears the city is settling on some level of Variant I. CU remains committed to collaborating with the city on uses and activities in the OS-O area except for acreage that may be swapped for acreage in the Public area to allow for the development of the flood project. Restoration of any portion of the Property designated OS-O under the BVCP for ecological benefits desired by the City or related entity will be done in partnership with CU Boulder with costs borne by the City or related entity. If City or a City-related entity wishes to acquire additional portions (for example in OS-O area) of the Property for open space or other uses, then subject to University's approval (determined in its sole discretion) and agreement, City may purchase such land at fair market value as determined by a third-party appraisal. Any conveyance of University-owned land contemplated herein shall be subject to approval by The Board of Regents of the University of Colorado."</i>
144			
145		Key Issue City Policies or Council Direction	Realign Dry Creek Ditch #2 and Secure Water Rights On Sept. 20 Council stated a preference for implementing the July 11 OSBT Recommendation: Realign ditch to west of open space conveyance and restoration area, to extent practical and acceptable to the ditch board and CU and acquire sufficient water rights to support city's restoration goals.
146		CU Statement (Feb. 2, 2019)	Any realignment of Dry Creek Ditch No. 2 is to be designed in a manner that does not increase the existing 100-year or 500-year floodplain, as may be determined from time to time, and will not increase the presence of wetlands on the CU Boulder Development Tract. CU Boulder will be fairly compensated by the City for any land area that ceases to be developable due to building setbacks from the Dry Creek Ditch No. 2. If the University agrees, the City may, at its sole cost, realign Dry Creek Ditch No. 2. If the University agrees, the City may acquire or lease the University's water rights in Dry Creek Ditch No. 2.
147	Clarification & Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	The city would want First Right of Refusal on water rights as a condition of the provision of water service, per §11-1-19. The city would waive this requirement if water rights are conveyed to the city for open space and restoration purposes. Once decisions are made regarding ownership and permanent protection of open space and restoration on OS-O and ownership of the water rights, the City may seek to realign the Dry Creek No. 2 ditch for the purpose of providing irrigation to City open space and restoration areas. Any design modifications and realignment of the ditch for the purposes of irrigation would require collaboration and approval from the Dry Creek No. 2 Ditch Company.
148		CU Response - January 16, 2020	<i>Water Rights regarding Dry Creek Ditch No. 2 will be discussed in the future after the 6 key issues have been resolved.</i>
149			
150			
151	Alignment	Transportation Impacts	
152		Key Issue City Policies or Council Direction	Performance- based transportation Guiding Principles state that... The transportation needs generated by future development at the site will not unduly impact the transportation networks that serve the property. Impacts to local and regional networks will be mitigated through implementation of performance- based standards. The city and CU will complete additional planning and transportation analysis to further develop performance-based standards, including but not limited to maximum amount of parking, trip budgets, transit use, pedestrian and trail connections and access to transit passes. Planning considerations will be addressed collaboratively by the city and CU and will include innovative and long-range technologies, including electric vehicles, autonomous vehicles, etc. as well as possible joint options with city-funded transit.
153		CU Statement (Feb. 2, 2019)	CU Boulder remains committed to the Guiding Principles and will work with the City to identify a performance-based transportation plan at the time that a Concept Design is presented to the City by CU Boulder.
154	No	Staff Response to Feb. 2, 2019 CU Statement	The multi-modal traffic access study must be completed, and the study's conclusions / recommendations concurred by city staff prior to the annexation application being heard by Planning Board. This study will need to inform the performance standards that will be included in the annexation agreement.
155			

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			<p>Key Issue #5 - From letter dated 3/28/19 Conduct a transportation analysis to determine necessary public improvements, access/circulation and performance standards. The city and university both agree that performance-based transportation standards will be developed (e.g. trip budget). It is city staff's understanding that a transportation analysis will be conducted prior to annexation to inform these standards, though the application states that they will be developed at the time of university's Concept Design (i.e. post annexation). Clarification and further discussions are needed around the issue of when these standards will be developed. City staff views multi-modal connections through the site and to the RTD Park-N-Ride as critical factors in mitigating transportation-related impacts of future development. As such, city staff will recommend to City Council that, as part of the university's development program, CU Boulder:</p> <ul style="list-style-type: none">• Construct a 12' wide multi-use path with 2' wide shoulders on each side of the path along the west boundary of the site on an alignment consistent with what's in the Transportation Master Plan (TMP) from SH-93 to Table Mesa Drive;• Construct an east / west 12' wide multi-use path with 2' wide shoulders on each side of the path on the north side of South Loop Drive between Table Mesa Drive and the US-36 Bikeway path on an alignment consistent with the TMP;• Enhance the existing bike and pedestrian connection on Table Mesa Drive / S. Boulder Rd from the RTD Park-and-Ride Lot to South Loop Drive. This work would involve the construction of a 12' wide multi-use path and the construction of a buffered bike lane on the east side of Table Mesa Road; and• Obtain the CDOT Access Permit for the new access point (curb-cut) from SH-93. CU Boulder shall pay for the construction of the new intersection and traffic control (stop sign and/or traffic signal) as required by CDOT.CU Response: No. As we stated, CU Boulder remains committed to the Guiding Principles and will work with the City to identify a performance-based transportation plan at the time that a Concept Design is presented to the City by CU Boulder. <p><i>CU Response: We are open to discussing these requests with the city when more detail can be provided, in the context of the entire agreement and with resolution of other key issues.</i></p>
156		CU Response - January 16, 2020	
157			
158		Key Issue	Multi-modal hub
		City Policies or Council Direction	Guiding Principles state that...
159			Implement a multimodal mobility hub and transit connections between the CU South Boulder property and other Boulder campus locations to manage employee and resident access and mobility.
		CU Statement (Feb. 2, 2019)	As agreed to in the Guiding Principles, CU Boulder will create a multi- modal hub for transportation when a requisite number of employees and residents are occupying and accessing the Property at a level that justifies the creation of such multi-modal hub.
			On other areas of the Boulder campus, CU Boulder typically includes Vehicular Area Guidelines in the Design Guidelines. Examples of these include:
			<ul style="list-style-type: none">• Enhance existing streets throughout for safer multi-modal movement and improved appearance utilizing surfacing, lighting, signage, bicycle parking, and site accessories.• Recognize that campus policy is to give pedestrians and bicycles priority over service and private vehicles in multi- modal areas.• Provide facilities and amenities to encourage alternative means of travel to and from campus, such as information kiosks, bus shelters, maps, and visitor directions.
160			
	Analysis Needed	Staff Response to Feb. 2, 2019	Prior to the annexation application being heard by Planning Board, specific information about the standards and construction timing for a mobility hub will be developed. The multi-modal traffic access study will evaluate the level of transit service to provide convenient service and connectivity between CU
161		CU Statement	Boulder campuses and residential facilities.
162		CU Response - January 16, 2020	<i>CU Response: We are open to discussing these requests with the city when more detail can be provided, in the context of the entire agreement and with resolution of other key issues.</i>
163			
164		Key Issue	Multi-Modal Access
		City Policies or Council Direction	
165		CU Statement (Feb. 2, 2019)	
166			
	Analysis Needed	Staff Response to Feb. 2, 2019	<ul style="list-style-type: none">• City staff will recommend to City Council that CU Boulder construct a 12' wide multi-use path with 2' wide shoulders on each side of the path along the west boundary of the site on an alignment consistent with what's in the Transportation Master Plan (TMP) from SH-93 to Table Mesa Drive. CU Boulder will grant access to the public for the multi-use path.• City staff will recommend to City Council that CU Boulder construct an east / west 12' wide multi-use path with 2' wide shoulders on each side of the path on the north side of South Loop Drive between Table Mesa Drive and the US-36 Bikeway path on an alignment consistent with the TMP. CU Boulder will grant access to the public for the multi-use path.• City staff will recommend to City Council that CU Boulder enhance the existing bike and pedestrian connection on Table Mesa Drive / S. Boulder Rd from the RTD Park-and-Ride Lot to South Loop Drive. This work would involve the construction of a 12' wide multi-use path and the construction of a buffered bike lane on the east side of Table Mesa Rd.• City staff will recommend to City Council that CU Boulder reserve the right-of-way and permit access by the public for any of the other multi-use paths shown in the TMP on the site.• City staff will recommend to City Council that CU Boulder maintain the existing paths on the site and grant access to the public.• The main internal streets on the site shall be designed and constructed by CU Boulder and shall include multi-modal design features.
167		CU Statement	
168		CU Response - January 16, 2020	<i>CU Response: CU is years away from creating a development plan for the area and the suitability of a mobility hub will depend upon the final flood project scale and boundaries and whether housing is constructed on the site.</i>
169			
170		Key Issue	Access / Circulation
		City Policies or Council Direction	
171		CU Statement (Feb. 2, 2019)	
172			
	Analysis Needed	Staff Response to Feb. 2, 2019	CU Boulder shall obtain the CDOT Access Permit for the new access point (curb-cut) from SH-93. CU Boulder shall pay for the construction of the new intersection and traffic control (stop sign and/or traffic signal) as required by CDOT. The existing multi-use path must be intergraded into the design of the
173		CU Statement	intersection.
		CU Response - January 16, 2020	<i>CU Response: If access is required from SH-93 prior to CU's development of the area and is needed for the City to conduct, perform, execute, maintain, or in any other way operate their Project, now or in the future, the City is fully responsible for all costs and permits related to vehicle access from SH-93. City is also responsible for any multi-use path that is requested or necessitated prior to CU's development of the area.</i>
174			
175			
176		Key Issue	Connected multi-modal system
		City Policies or Council Direction	Guiding Principles state that...
			Incorporate connected and safe pedestrian, bike and transit systems through CU South integrated into the broader city and regional bicycle and pedestrian network, including safe street crossings, trailhead(s), soft surface recreation trails and a trail link(s) to the South Boulder Creek Trail in coordination with OSMP. When creating and maintaining recreational opportunities, such as trail connections through the property, do so with consideration for likely and potential impacts to adjacent open space, and for mitigation of those impacts, as appropriate.
177			

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178		CU Statement (Feb. 2, 2019)	<p>On other areas of the Boulder campus, CU Boulder typically includes Vehicular Area Guidelines in the Design Guidelines. Examples of these include:</p> <ul style="list-style-type: none">• Place generously-sized bicycle parking areas along multimodal streets and near campus activity centers and student residence halls and courts.• Orient bus shelters to allow sufficient views of arriving buses and to provide shelter from prevailing winter winds and snow. Include seating, trash receptacles, bus schedules, and brightly lit interiors. Use vandal-resistant materials including break-resistant glazing and coated black steel structures and roofs.• Establish drop-off zones near major activity centers for convenient use. Provide seating for waiting, attractive landscaping, emergency telephones, and adequate lighting.• Provide landscaping in and around parking lots to soften hardscape appearances from streets, break up extended rows of cars, and provide shade.• Ensure adequate lighting for safe use and clear pathways from parking lots to adjacent building entrances. Design sufficient setbacks between parking lots and streets, which could include raised landscaping, berms, and/or walls to block views into the lot.• Include loading and service vehicle parking spaces adjacent to major buildings. Screen or buffer views to service areas where possible with a combination of screen walls, opaque enclosures, gates, and landscaping. Limit service parking to designated spaces only.• Provide raised curbs selectively along campus walkways to discourage all modes of transportation from crossing or parking on lawns or adjacent landscaping.
179	Yes	Staff Response to Feb. 2, 2019 CU Statement	<ul style="list-style-type: none">• The site development should provide children’s play areas if the anticipated CU Boulder housing would accommodate families. The BVCP calls out a Level of Service standard for playgrounds at 1/4 mile. Depending upon the proximity of future development on CU South, a playground may be warranted. At a minimum, sidewalk and path connections should be planned to connect future residents to the existing Tantra Park.• All landscaping within public rights-of-way and along private streets will meet the city's minimum street tree and planting strip requirements.• Any roads or trails on land conveyed to the city, including any potential connectors to adjacent city Open Space, will either be designated by the city and become a part of the city's Open Space system or abandoned by restoring the underlying land at the city's expense. Designated roads and trails will need to be accessed from designated trailheads and access points. OSMF staff would like to remind CU of the following: all OSMF fences and boundaries must be respected at all times; and no gates, trail connections or other access points will be allowed from the CU property onto city Open Space without prior approval from the Open Space Board of Trustees and in accordance with the gate policy of OSMF.• In the spirit of the Guiding Principles, the city will coordinate with CU Boulder on the development of any new trail, or the designation or abandonment of any existing roads and trails, on land conveyed to the city. However, final determination on any of the above will be at the city’s sole discretion
180		CU Response - January 16, 2020	CU Response: CU will perform to the university standards listed and will consider playgrounds as appropriate to any housing developed on the site. Landscaping along right-of-ways will follow CU guidelines.
181			
182		Key Issue	Protect neighborhoods from Transportation Impacts
183		City Policies or Council Direction	Guiding Principles state that... The street design will minimize impacts into nearby residential neighborhoods, such as Tantra Park, Basemar, Martin Acres and High View.
184		CU Statement (Feb. 2, 2019)	As agreed to in the Guiding Principles, CU Boulder will minimize impacts into nearby residential neighborhoods. CU Boulder shall be given access to City streets and roadways at such points as are reasonably necessary to develop the Property and consistent with applicable provisions of the state highway access code and City's site access standards. The City will be given the opportunity to provide input during the Concept Design for CU Boulder South.
185	Analysis Needed	Staff Response to Feb. 2, 2019	The multi-modal traffic access study will evaluate ways to minimize impacts to adjacent neighborhoods and other key issues.
186		CU Response - January 16, 2020	CU Response: Per our May 20, 2019 letter, "We are open to discussing these requests with the city when more detail can be provided, in the context of the entire agreement and with resolution of the major issues above."
187			
188		Key Issue	No Bypass
189		City Policies or Council Direction	Guiding Principles state that... Discourage any outside traffic from cutting through the property to avoid impacts to the Table Mesa Drive/Broadway connection.
190		CU Statement (Feb. 2, 2019)	CU Boulder has committed to not creating a "bypass" roadway between SH 93 and US 36. CU Boulder will evaluate options for managing and restricting future traffic through traffic calming, speed reduction, and other design measures to ensure that a bypass roadway is not created between SH 93 and US 36.
191	Yes	Staff Response to Feb. 2, 2019	Agreed. Provisions will need to be made to allow transit buses and emergency response vehicles access through the site. Additionally, the multi-modal traffic access study will evaluate ways to discourage through traffic.
192		CU Response - January 16, 2020	CU Response: Per our May 20, 2019 letter, "We are open to discussing these requests with the city when more detail can be provided, in the context of the entire agreement and with resolution of the major issues above."
193			
194	Alignment	Building Mass, Height, and Design	
195		Key Issue	Viewsheds
196		City Policies or Council Direction	Guiding Principles state that... Buildings will be designed and sited in a manner to protect views and contribute positively to the character of the city's "gateway". Building location, massing and height will protect and complement views of the mountain backdrop, particularly the viewsheds from the US Highway 36 bike path, the South Boulder Creek Trail, US Highway 36 and State Highway 93.

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197		CU Statement (Feb. 2, 2019)	<p>CU Boulder has high standards for future development across all of its campus, and shares the same values as the City regarding gateway character and preservation of the mountain backdrop. CU Boulder agrees, and notes that CU Boulder's PK-U/O and OS-O designated land is located closest to the US 36, the primary access point to the City. These areas will act as the "gateway" to the City by contributing towards the City of Boulder's BVCP Community Identity and Land Use Pattern Policy 2.05 Design of Community Edges and Entryways.</p> <p>Preliminary viewshed analysis of the mountain backdrop demonstrate that buildings up to 110' will not impede views of the mountain backdrop, and we are restricting buildings to 55' through the Guiding Principles.</p> <p>On other areas of the Boulder campus, CU Boulder includes Landscaping Guidelines that address the relationship between the campus and the natural foothills landscape, campus land contours, drainage, and plantings in relation to buildings.</p> <ul style="list-style-type: none">• Identify and preserve view corridors, especially to the mountain backdrop.• The 2007 Design Guidelines include Community Interface Guidelines, which address campus corners, edges, entrances, and connections between other CU Boulder campuses and the City.• Create large-scale landscape designs at campus corners including mass plantings and clear durable functional identification signage. Consult the campus signage standards for all signage designs.• Provide campus edge landscaping, signage, site accessories, and material selections to create a break between adjacent uses while maintaining a sense of continuity, softening views of perimeter parking lots, and improving safety for all modes of movement along the campus interconnections with the community.• Enhance transitions to and from the campus through appropriate lighting levels, simple and functional signage, appropriately scaled plant material, and elimination of clutter.• Link CU Boulder properties through functional circulation systems, similar landscaping and accessories, and directional signage.
198	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	<p>Viewshed ProtectionBoth the city and CU Boulder agree that identifying and protecting high- quality view corridors is important. City staff proposes a height ceiling concept as a method for protecting views of the mountain backdrop.</p> <p>The height ceiling concept would include determining an elevation that no building can exceed. For example, the highest point on the southwest hillside is 5,465 (per city GIS) - roughly 100 feet from the lowest point of the Development Tract. A height ceiling at or around that elevation would allow 4 – 5 story buildings in the lower areas of the Development Tract, with progressively shorter buildings as the elevation increases toward the west. This approach could provide design latitude while protecting views of the mountain backdrop.</p> <p>Outdoor Lighting City staff propose that future lighting comply with the city's outdoor lighting standards to reduce impacts to wildlife in the South Boulder Creek riparian area. This would involve (i) compliance with the city's outdoor lighting standards and (ii) submit, at an appropriate time determined by the university, a Letter of Certification that the university's planned lighting complies with B.R.C. 9-9-16.g.</p>
199		CU Response - January 16, 2020	CU Response: Viewshields will be negotiated after the 6 key issues have been resolved.
200			
201		Key Issue	Building Height
202		City Policies or Council Direction	<p>Guiding Principles state that...</p> <p>Building heights will maintain general consistency with the city's height limits, with buildings varying in height and visual interest. Building heights will transition gently from the open space and to neighborhoods to the west.</p>
203		CU Statement (Feb. 2, 2019)	<p>CU Boulder has agreed to "maintain general consistency with the City's height limits" which means that CU Boulder will abide by a height limit of 55 feet for the construction of buildings on CU Boulder South, with building height being measured as the vertical distance from the average of the finished ground level to the average height of a finished roof.</p> <p>Natural grades and contours of the Property will allow for gentle transitions from open space and to neighborhoods to the west.</p>
204	Clarification Needed	Staff Response to Feb. 2, 2019 CU Statement	<p>Building Height Buildings within the city of Boulder have been constructed with the city's height limit since 1971. More information is needed to determine if staff are supportive of using an alternate method for measuring building height, such as an analysis indicating a need to use an alternative approach.</p> <p>City and university staff are in agreement that future development will be designed with natural contours. However, more information is needed to quantify how this standard will be achieved. Please provide specific standards or a diagram showing how the university plans to meet this goal</p> <p>Regarding Varying Height Please indicate your willingness to include the following standard as a guide for future master planning and site planning: §M-1-28(b) Please propose amendments as necessary.</p> <p>Regarding Transitions to Neighborhood: City staff proposes that the annexation include a suite of tools the university would use to avoid or minimize noise and visual conflicts between adjacent residential land uses and future development. Examples include interface zones, transitional areas, site and building design and cascading gradients of density in the design of the site.</p>
205		CU Response - January 16, 2020	CU Response: See our response above on Feb 2, 2019. City and CU staff are currently discussing standards for benchmark heights across the property.
206			
207		Key Issue	Wetlands
208		City Policies or Council Direction	<p>Guiding Principles state that...</p> <p>Wetlands will be maintained, preserved, protected, restored and enhanced in a manner consistent with the city's Land Use Code.</p>
209		CU Statement (Feb. 2, 2019)	Agreed
210	Clarification Needed	Staff Response to Feb. 2, 2019 CU Statement	<p>The city will require a wetland delineation of the flood mitigation project area for environmental permitting. Prior to the first reading of the annexation ordinance, all wetlands on the site must be delineated in compliance with the city's Stream, Wetland and Water Body ordinance. As previously discussed with CU Boulder staff, the city recommends that CU Boulder and the City conduct a joint wetland delineation, with costs split proportionate to the land area required for each purpose.</p> <p>As a condition of annexation, CU Boulder will be responsible for obtaining all necessary environmental permits and mitigate for environmental impacts resulting from any development on CU land, including a city of Boulder Stream, Wetland and Water Body permit.</p> <p>Any activities performed in the wetland or wetland buffer areas shall be regulated by the city's Stream, Wetlands and Water Body Protection ordinance and may require a wetland permit.</p>
211		CU Response - January 16, 2020	CU Response: More discussion and detail is required for CU to respond.
212			
213		Key Issue	Steep Slopes
214		City Policies or Council Direction	<p>Guiding Principles state that...</p> <p>Development on slopes at or exceeding 15 percent will be minimized in a manner consistent with the city's Land Use Code.</p>
215		CU Statement (Feb. 2, 2019)	Agreed

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216	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	<p>Hillside Development</p> <p>The CU South Shapins Study (2002) identified potential building pads on portions of the western slopes, particularly the southwest slopes. The conceptual plan developed in 2017 included 66.2 acres identified as "Natural No Build Area Including Wetlands" along the eastern and western areas of the site.</p> <p>Section 9-2-17 of the city's Land Use Code states that "in annexations of hillside areas, the city council may impose conditions designed to mitigate the effects of development on lands containing slopes of fifteen percent or greater." As shown on page 18 of this map packet, several areas along the western portion of the site contain slopes that exceed 15 percent.</p> <p>Please provide a narrative or illustration describing areas along the western hillside that you do and do not anticipate exploring for future development. If you do anticipate development along the western hillside(s), please describe your approach to ensuring compatibility with adjacent land uses (e.g. housing type, density, building height, etc.) and specific steps to be taken to account for the suitability for future development and access (e.g. noise mitigation, lighting, etc.)</p>
217		CU Response - January 16, 2020	<i>CU Response: Once the city has selected a final flood mitigation project and negotiated with CU what final area will be available for development, recognizing that we will have no detailed development plans at time of annexation, we can agree to identify the areas available for development that have a 15% or greater slope and will agree not to develop within such areas. There will be no details beyond this to provide a narative or illustration of before annexation is required.</i>
218			
219	Alignment	Site Design & Quality	
220		Key Issue	Clustered, Village Design
		City Policies or Council Direction	Guiding Principles state that... Residential development will be of high quality and contextually appropriate to neighboring properties.
221			Development will be compact, clustered in a village style. Any non-residential buildings will be human- scaled.
222		CU Statement (Feb. 2, 2019)	Agreed.
	Yes	Staff Response to Feb. 2, 2019 CU Statement	<p>During the study session on Oct. 9, City Council asked for more specific definitions for terms like "village concept". Below are examples of existing definitions with sources. Please respond to the following two questions:</p> <p>1. Indicate your willingness to include these definitions in the annexation agreement and/or offer any suggested amendments.</p> <p>2. Indicate when, in the university's process, design guidelines for CU South will be developed and how the city can provide input into the guidelines.</p> <p>• "High Quality": Building Design Quality and Aesthetics.Design high-quality buildings that are compatible with the character of the area through simple, proportional, and varied design, high quality and natural building materials that create a sense of permanence, and building detailing, materials and proportions (referenced from Boulder Land Use Code §M-1-3).• "Compact, clustered in a village style": The heart of the village will have a recognizable center, discrete physical boundaries, and a pedestrian scale and orientation. Residential buildings will be located in a contiguous group, with adjacent and fronting lots oriented toward each other in some ordered geometric way—as on a street, a green, or a paved square—and forming a distinct boundary with the surrounding countryside. Future planning will emphasize an orderly mix of land uses that meets the daily needs of on-site residents. This mix is intended to contain convenience retail, food services, personnel, and other student service uses as determined through further planning and consistent with university needs. Direct pedestrian linkages will be provided between residential and non-residential uses.• Human-scaled: Projects are designed to a human scale and promote a safe and vibrant pedestrian experience through the location of building frontages along public streets, plazas, sidewalks and paths, and through the use of building elements, design details and landscape materials that include, without limitation, the location of entrances and windows, and the creation of transparency and activity at the pedestrian level (referenced from Boulder Land Use Code §M-1-3).• Usable open spaceis arranged to be accessible and functional and incorporates quality landscaping, a mixture of sun and shade and places to gather. Open space designated for active recreational purposes is of a size that it will be functionally useable and located in a safe and convenient proximity to the uses to which it is meant to serve. The open space will provide a buffer to protect sensitive environmental features and natural areas. (Referenced from B.R.C. §9-2-14(h)-2(A))</p>
223			
224		CU Response - January 16, 2020	<i>CU Reponse: See response to "Review Process on Future Development Plans" above. CU has offered the city and community to have input on the campus Master Plan, and then a 60 day review and input on conceptual plans for the overall development of the site.</i>
225			
226		Key Issue	Structures within the 500- year floodplain
		City Policies or Council Direction	Guiding Principles state that... All enclosed academic structures, offices, or residential uses will be constructed outside of the FEMA 500-year floodplain.
		CU Statement (Feb. 2, 2019)	As agreed to in the Guiding Principles, no habitable structures or academic buildings will be built on the Property within the FEMA 500-year floodplain.
228			Notwithstanding the foregoing, If additional land is required for the flood mitigation project outside of the PK-UO designated portion of the Property or if the City Council selects a flood mitigation project that would change the boundaries of the 500-year flood plain, or if the City proposes any other boundary changes, and University agrees to such adjustment, the City shall change the BVCP to allow development in the 500-year flood plain.
	No	Staff Response to Feb. 2, 2019 CU Statement	<p>The flood mitigation project will be designed to mitigate for a 500-year storm event. As such, the detention area for the flood mitigation project will be in the 500-year floodplain. Although the city's floodplain regulations would allow buildings for human occupancy in the 500-year floodplain, the city would restrict such buildings in a flood mitigation detention area. Any future development in the detention area could affect the volume of water that would be detained, and therefore reduce the effectiveness of the mitigation project.</p> <p>If necessary, city staff will coordinate the review of Land Use Map changes. Such changes, if made prior to annexation, require approval of the City of Boulder Planning Board and City Council, with a Call-up option for the Boulder County Board of County Commissioners. The land use change may be processed prior to public hearings on the annexation application.</p> <p>Critical Facilities. Any structure in the floodplain consider a critical facility or lodging facility (including student housing) will require an emergency management plan approval prior to issuance of a floodplain development permit, that meets the requirements of the city's floodplain development regulations. All structures in the floodplain will be required to comply with the city's floodplain development regulations in effect at the time of permitting and may require a floodplain development permit.</p>
229			<i>CU Response: As long as the university retains the right to develop no less than 129 acres in the area designated as Public, the university commits that no habitable structures or academic buildings will be built on the site within the FEMA 500-year flood plain. CU will follow FEMA regulations regarding floodplain development and will submit a floodplain development permit to the City of Boulder. CU is not required to follow the Critical Facilities Ordinance or High Hazard zone requirements, as those are local regulations. If the university does not retain the right to develop the full 129 acres in the area designated as Public and is granted the right to develop some acreage in the area designated as OS-O, the university will be allowed to develop in the 500 year flood plain, if any, in those OS-O designated acres.</i>
230		CU Response - January 16, 2020	
231			
232		Key Issue	Building Standards
		City Policies or Council Direction	Guiding Principles state that... It will model future resilience and sustainability for design, construction, and maintenance strategies. Development will meet the equivalent of the U.S. Green Building Council's Gold or Platinum LEED standards or other applicable sustainability standards for residential development.
233			
234		CU Statement (Feb. 2, 2019)	CU Boulder's development will model future resiliency and sustainability for design, construction and maintenance strategies. CU Boulder is required by the state to build to USGBC LEED Gold or equivalent.
	Clarification Needed	Staff Response to Feb. 2, 2019 CU Statement	City staff proposes that future development meeting the USGBC LEED Gold standard achieve 12 points within the Energy and Atmosphere credit number two: Minimum Energy Performance. The university would share a copy of the LEED application once submitted and the final LEED certification once received by the USGBC.
235		CU Response - January 16, 2020	<i>CU Response: CU Boulder's development will model future resiliency and sustainability for design, construction and maintenance strategies. CU Boulder is required by the state to build to USGBC LEED Gold or equivalent.</i>
236			
237			
238		Key Issue	Public access to site
		City Policies or Council Direction	Guiding Principles state that... Access will continue to be allowed on the site consistent with public access provided on other CU campuses.
239			
240		CU Statement (Feb. 2, 2019)	Agreed.

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	Clarification Needed	Staff Response to Feb. 2, 2019 CU Statement	Prior to annexation, submit a pre-development access management plan that describes, at a high level, how trash, public parking, signage and public access timing will be managed. Parks and Recreation• CU Boulder should consider the development of a formal running track with field sports as part of the Campus Master Plan update. Throughout the past several years, the city has gotten increasing numbers of track and field athletes approaching the city and requesting a new facility for these types of sports. This is in large part to decreased access of the public on to CU Boulder tracks and limited availability on Boulder Valley School District tracks. A new track and field venue at CU South, with some level of public access, would solve many of these types of challenges. • Similarly, city staff requests that CU Boulder consider a publicly accessible dog park in their future plans for CU South. This area has long performed as an off-leash dog area for all the various residential areas adjacent to the site and this area of the city could use a designated dog park. Currently, the city provides dog parks in the east part of the city (East Boulder Community Park, Valmont) and the north at Foothills Community Park. • Parks and Recreation staff will review and coordinate with the applicant to determine the appropriate park uses and sizes (for any shared parks and recreation facilities) according to the Parks and Recreation Design Standards and needs assessment of park amenities for the CU south area.
241			
242		CU Response - January 16, 2020	CU Response: Access will continue to be allowed on the site consistent with public access provided on other CU campuses. CU will consider site amenities for public enjoyment during later designing phases.
243			
244	Alignment	Land Use Mix	
245		Key Issue	Prohibited Uses
		City Policies or Council Direction	Guiding Principles state that... The site will not include large-scale sport venues (i.e., football stadium), high rise buildings (maintaining substantial consistency with the city's height limits), large research complexes, such as those on East Campus, roadway bypass between Highway 93 and Highway 36 or first-year student housing.
246			
247		CU Statement (Feb. 2, 2019)	Agreed.
248	Yes	Staff Response to Feb. 2, 2019	Prior to annexation, definitions for a large-scale sports venue and large research complex will be developed.
249		CU Response - January 16, 2020	CU Response: Definitions will be provided after the 6 key issues have been resolved.
250			
251		Key Issue	Housing the Predominant Use
		City Policies or Council Direction	Guiding Principles state that... Housing will be the predominant use of the site for areas not used for flood mitigation (i.e., with a target of 1,100 residential units and the final number guided by transportation performance and other site constraints), although the site may include a mix of residential and non-residential and facilities. The site will emphasize housing units over non- residential space (jobs) to help balance jobs and housing in the community.
252			
		CU Statement (Feb. 2, 2019)	CU Boulder will prioritize building housing for faculty, staff, graduate students and non-first year students on the Property to facilitate the goal shared by CU Boulder and the City to provide more housing on University property. CU Boulder is committed to not building first year student housing on the Property and no fraternities or sororities will be located on this Property. CU Boulder cannot commit to a specific development plan at this time as no development plans currently exist.
253			
254	Yes	Staff Response to Feb. 2, 2019	No further comments by city staff. CU Response:Should the city select a flood mitigation project that places an east-west dam across the entire north-end of the property, thereby isolating the developable property from Table Mesa and the local community, the university will need to determine if, and to what degree, housing remains suitable and feasible behind the dam. If housing is deemed suitable, the university commits that development on the site will be compact and clustered in a village style. (BVCP GP)
255		CU Response - January 16, 2020	
256			
257		Key Issue	Housing for university needs
		City Policies or Council Direction	Guiding Principles state that... Housing on the site will meet the needs of university faculty, staff and non-freshmen students in order to address the fact that Boulder housing is currently unaffordable to faculty, staff and students. Providing workforce and non-freshmen housing will contribute positively to the community's housing affordability goals and aid the university in its recruitment and retention. Housing should be mutually beneficial to the community and university and integrated with needs of the community rather than built as isolated enclaves.
258			
259		CU Statement (Feb. 2, 2019)	Agreed. If CU Boulder builds the anticipated 1,100 units on the Property, this would increase the City's total housing stock by over 2.4%, providing housing for CU Boulder staff, faculty and students, thereby relieving pressures on existing local housing stock and transportation arteries into the City.
260	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	For any future residential development the requirements of B.R.C. 9-13, Inclusionary Housing or any future affordable housing program that may replace Inclusionary Housing would apply unless the owner is otherwise exempt from zoning regulations.
261		CU Response - January 16, 2020	CU Response: See the response above for "Housing for Predominant Use". CU is not subject to city zoning, or the Inclusionary Housing or affordable housing programs.
262			
263		Key Issue	Non-residential Uses
		City Policies or Council Direction	Guiding Principles state that... The overall non-residential space footprint will be minimized and support and benefit the convenience of the residents, employees and visitors to residential and recreational uses of the property. The exact amount, types and location of residential and non-residential space will be refined to minimize impacts as a long-term master plan is developed and as transportation analysis is conducted. Academic facilities will include space for research and/or education pertaining to natural environment, such as ecological restoration, floodplains and related topics.
264			
265		CU Statement (Feb. 2, 2019)	Agreed.
266	Yes	Staff Response to Feb. 2, 2019	The city acknowledges that a transportation analysis will be completed during the annexation review to determine the maximum amount of non-residential space and residential units.
267		CU Response - January 16, 2020	Our long-term master plan and eventual development plans will inform a transportation many years from now. Further, non-residential uses as a percentage on the property may expand to 100% if the university should deem the property to be unsuitable for housing with the selection of Variant I.
268			
269		Key Issue	Phasing of Non- residential Development
		City Policies or Council Direction	Guiding Principles state that... Except for recreation facilities, development will be phased such that non-residential space will be phased after a significant amount of housing is built. Later phases will be dependent on demonstrating that initial phases achieve objectives of mitigating impacts.
270			
271		CU Statement (Feb. 2, 2019)	Agreed.
272	Clarification Needed	Staff Response to Feb. 2, 2019	Please propose a standard or definition for a "significant amount" housing. For example, would the university master plan include a general phasing schedule that would be referenced here?
273		CU Response - January 16, 2020	CU Response: Our long-term master plan and eventual development plans will inform what will be developed on the site many years from now. Further, non-residential uses may be the first and only type of development on the site with the selection of Variant I.
274			
275	Alignment	Public Safety/Emergency Connectivity	
276		Key Issue	Emergency Connectivity
		City Policies or Council Direction	Guiding Principles state that... Limited ingress and egress via local connections may be provided for emergency, life safety situations. Develop an Emergency Service and Evacuation Plan to address emergencies and use of emergency access and connections.
277			
		CU Statement (Feb. 2, 2019)	CU will provide limited ingress and egress connections for specific individuals/organizations/providers/units who are certified to provide services in emergency and life safety situations. Planning of these connections and identification of relevant parties will be determined later during property planning efforts.
278			The City can anticipate emergency connectivity to be similar to those of other CU Boulder properties within the city limits.

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279	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	<p>Collaborate on a public safety facility. City staff proposes that the city and university jointly explore a public safety facility to collocate CU Boulder Police and City of Boulder Fire & Rescue personnel and vehicles. A joint facility could benefit both organizations greatly by achieving an extremely short response call time to future CU South residents and visitors and meet a city goal of relocating Fire Station #4.</p> <p>Please indicate if this concept is acceptable to the university. Should CU Boulder be amenable to this concept, city staff proposes a meeting between the appropriate staff to begin discussing this concept further.</p> <p>Fire & Rescue 1. All buildings greater than 2000 sq. ft. must have a fire sprinkler system (new buildings) 2. Fire Department access must, at a minimum meet the City of Boulder Design and Construction Standard for emergency access concerning road widths, turn-arounds, and turning radius 3. Fire hydrants shall be spaced and installed in accordance with the City of Boulder Design and Construction Standard. 4. The size of the site will require a second emergency access entrance/exit. This is something that needs to be considered with the master planning of the site. 5. No emergency access can exceed 8% grade.</p>
280		CU Response - January 16, 2020	<p>Key Issue #6 - From letter dated 3/28/19</p> <p>City staff proposes that the city and university jointly explore a public safety facility to collocate CU Boulder Police and City of Boulder Fire & Rescue personnel and vehicles. A joint facility could benefit both organizations greatly by achieving an extremely short response call time to future CU South residents and visitors and meet a city goal of relocating Fire Station #4. Please indicate if this concept is acceptable to the university. Should CU Boulder be amenable to this concept, city staff proposes a meeting between the appropriate staff to begin discussing this concept further.</p>
281			CU Response: CU Boulder is open to exploring this concept
282	Alignment	Land Use Designation Changes	
283		Key Issue	Land use change process
284		City Policies or Council Direction	Guiding Principles state that... The Land Use Map may be amended to enable the city and CU to implement a shared vision for the site. The standard process detailed in the BVCP will guide any future land use designation changes.
285		CU Statement (Feb. 2, 2019)	Agreed, consistent with CU Boulder Response under Flood Mitigation: Section 3(C).
286	Yes	Staff Response to Feb. 2, 2019 CU Statement	<p>If necessary, city staff will coordinate the review of Land Use Map changes. Such changes, if made prior to annexation, require approval of the City of Boulder Planning Board and City Council, with a Call-up option for the Boulder County Board of County Commissioners. The land use change may be processed prior to public hearings on the annexation application.</p> <p>To be eligible for a Land Use Map change, the proposed change:</p> <ol style="list-style-type: none">1. on balance, is consistent with the policies and overall intent of the comprehensive plan;2. would not have significant cross-jurisdictional impacts that may affect residents, properties or facilities outside the city;3. would not materially affect the land use and growth projections that were the basis of the comprehensive plan;4. does not materially affect the adequacy or availability of urban facilities and services to the immediate area or to the overall service area of the City of Boulder;5. would not materially affect the adopted Capital Improvements Program of the City of Boulder; and6. would not affect the Area II/Area III boundaries in the comprehensive plan.
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289	Alignment	Urban Services and Utilities	
290		Key Issue	Water and Wastewater Service Agreement
291		City Policies or Council Direction	The Guiding Principles state that future agreements between the city and university will be contingent on the ability of the city to provide adequate urban facilities and services and the university's contribution to cover the cost of the necessary services and utilities on site and to address off-site impacts to systems.
292		CU Statement (Feb. 2, 2019)	Consistent with CU Boulder's Main Campus, CU Boulder South shall be subject to the Water and Wastewater Service Agreement of January 1997 between the parties
293	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	<p>Further analysis is needed to understand the extent to which the 1997 agreement is in alignment with current City water and wastewater service practices. A new agreement or amendments to the 1997 agreement may be needed to provide CU South development-specific service or connection details.</p> <p>Utilities</p> <ol style="list-style-type: none">1. A water system distribution analysis is needed prior to connection to the city's water distribution system, in order to assess the impacts and service demands of the proposed development. Conformance with the city's Treated Water Master Plan, October 2011 is necessary.2. A collection system analysis is needed prior to connection to the city's wastewater collection system, to determine any system impacts based on the proposed demands of the development. The analysis will need to show conformance with the city's Wastewater Collection System Master Plan, July 2016.3. On-site and off-site water main and wastewater main construction per the City of Boulder Design and Construction Standards (DCS) as necessary to serve the development, as well as perpetuate the overall system, may be required. All proposed public utilities for this project shall be designed in accordance with the DCS.
294		CU Response - January 16, 2020	CU Response: Consistent with CU Boulder's Main Campus, CU Boulder South shall be subject to the Water and Wastewater Service Agreement of January 1997 between the parties.
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296		Key Issue	Stormwater Plant Investment Fees
297		City Policies or Council Direction	N/A
298		CU Statement (Feb. 2, 2019)	N/A
299	N/A	Staff Response to Feb. 2, 2019	At the time of development, CU will be responsible for paying all Plant Investment Fees applicable at that time.
300		CU Response - January 16, 2020	CU Response: Agree in concept. Need more detail.
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302		Key Issue	Stormwater requirements
303		City Policies or Council Direction	Guiding Principles state that... Stormwater impacts of new development will be mitigated based on established criteria for minor and major storm events and applicable stormwater quality requirements. Preservation or restoration of existing undeveloped areas will be considered to attenuate peak runoff from the site and to mitigate stormwater quality impacts.
304		CU Statement (Feb. 2, 2019)	CU Boulder will adhere to State stormwater regulations/requirements.

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305	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	Stormwater/Drainage Storm water quality enhancement and detention ponding are issues that need to be addressed prior to commencement of construction. A Storm Water Report and Plan, prepared in accordance with the City of Boulder Design and Construction Standards (DCS), needs to be provided by the applicant to the city. The report and plan need to also address the following issues: <ul style="list-style-type: none">• Water quality for surface runoff using "Best Management Practices"• Minimize Directly Connected Impervious Areas (MDCIA)• Detention ponding facilities• Water Quality Capture Volume (WQCV)• Storm sewer construction• Irrigation Ditches and Laterals• Groundwater discharge• Wetland mitigation• Erosion control during construction activities Discharge of groundwater to the public storm sewer system is anticipated to accommodate construction and operation of the proposed developments. City and/or State permits will be required for this discharge. The applicant is advised to contact the City of Boulder Storm Water Quality Office at 303-413-7350 regarding permit requirements. All applicable permits must be in place prior to building permit application. Additionally, special design considerations for the properties to handle groundwater discharge as part of the development may be necessary. A construction storm water discharge permit is required from the State of Colorado for projects disturbing one (1) acre of land or more. The applicant is advised to contact the Colorado Department of Public Health and Environment.
306		CU Response - January 16, 2020	<i>CU Response: Further discussion is required. The university is not subject to submitting building permit application and works regularly and in good faith with the city on water discharge and meeting state regulations/permitting.</i>
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308		Key Issue	Electric Service
309		City Policies or Council Direction	N/A
310		CU Statement (Feb. 2, 2019)	N/A
311	Analysis Needed	Staff Response to Feb. 2, 2019 CU Statement	If the property is to be served by a City of Boulder electric utility, space for an electric substation may be needed depending on the load to be served. City staff proposes that the annexation agreement include a provision requiring the city and university to determine a mutually suitable location for a substation at an appropriate time during the university's review process. The City also recommends that CU coordinates with Xcel Energy to determine what their infrastructure needs may be related to the development.
312		CU Response - January 16, 2020	<i>CU Response: Agreed.</i>