



# DRAFT MEMORANDUM

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Project 16134

**TO:** Brandon Coleman, P.E. – City of Boulder

**FROM:** Robert Huzjak, P.E. - RJH Consultants, Inc.

**DATE:** July 22, 2021

**RE:** South Boulder Creek Regional Detention Project  
University of Colorado Fill Configuration

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## 1.0 Introduction

The purpose of this memorandum is to present a summary of design criteria, concepts, potential issues, and cost impacts associated with a revised earthfill configuration on the University of Colorado Boulder (CU Boulder) South Campus property for the South Boulder Creek (SBC) Regional Detention Project (Project).

## 2.0 Background

The purpose of the Project is to improve flood resiliency in portions of the Frasier Meadows, Keewaydin Meadows, and East Boulder neighborhoods from floods originating along SBC up to a 100-year flood event. This Project is needed because SBC flood waters overtop U.S. Highway 36 (US36) and adversely impacts up to 660 structures, 1,600 dwelling units, and 3,500 residents downstream of US36. The Project is being developed by the City of Boulder (City) and Mile High Flood District (MHFD).

The initial phase of work for the Project (i.e., concept design phase) consisted of developing concept-level alternatives to facilitate the City's selection of a preferred alternative to advance into preliminary design. The methodology, results, and conclusions of the concept-level alternatives evaluation are presented in the *Concept Design Report – South Boulder Creek Regional Detention* (Concept Design Report) (RJH, 2020).

The preferred concept-level alternative selected by City Council included a mass earthfill placement on portions of the CU Boulder South campus site to provide buildable area above the 500-year floodplain. This earthfill would encompass approximately 35 acres of CU Boulder property that would not currently be flooded during a 500-year event, but would be flooded during a 500-year event as a result of constructing the Project. The top of the earthfill would be set at the 500-year flood elevation. The quantity of fill required for the earthfill is about 360,000 cubic yards (cy).

The earthfill would be required to meet criteria established in the Boulder Valley Comprehensive Plan, which prohibits the construction of structures on the CU Boulder South Campus within the 500-year floodplain or within areas protected by a levee.

A general plan of the preferred concept-level alternative is presented on Figure 1.

### 3.0 Revised Earthfill Configuration

#### 3.1 General

The CU Boulder South Campus property will be annexed by the City to facilitate development of the Project. As part of discussions between the City and CU Boulder, a revised earthfill configuration was identified that may significantly reduce Project costs while meeting development requirements for both the Project and CU Boulder. A general plan of the revised earthfill configuration is presented on Figure 2.

The revised earthfill configuration is based on the following criteria:

- The earthfill would be placed as an embankment along the eastern boundary of the PUB land use area.
- The top of the earthfill would be set at the 500-year flood elevation.
- The top of the embankment would serve as an access road to portions of the CU Boulder development south of the Project site. The top of the embankment would be 80 feet wide.
- The east slope of the embankment would be at a 4 horizontal to 1 vertical (H:V) slope similar to other grading features for the Project.
- The west slope of the embankment would vary so that the west toe of the embankment is generally along the alignment of the existing gravel access road.

RJH developed a concept-level layout of the revised earthfill configuration based on the criteria described above. A plan and sections of the revised earthfill is presented on Figures 3 and 4, respectively. The quantity of fill required for the earthfill/road embankment is about 120,000 cy.

#### 3.2 Potential Issues

Based on our experience with similar projects and our understanding of the Project and site constraints, RJH identified the following key issues that need to be resolved to advance the revised earthfill configuration.

- **Drainage:** The area between the earthen dam and the earthfill/road embankment would not drain unless some type of outlet facility is constructed. The outlet facility would likely need to extend through the dam embankment and discharge into Viele Channel. Adding an outlet pipe to the Project facilities may impact flood routing and may change the configuration of the original outlet pipe and detention excavation to achieve project objectives.
- **Seepage Management:** It is possible that some type of seepage management facilities may be required to manage seepage during some reservoir loading conditions, because the embankment would impound water on one side.
- **Slope Protection:** The embankment would be overtopped by flood events larger than the 500-year event. It is possible that some type of slope protection may be desired on part of the west embankment slope to reduce erosion from extreme storm events that exceed the 500-year event.
- **Regulatory Issues:** The earthfill/road embankment would impound water on one side during some storm events, but it is within the inundation area of the Project. The regulatory agency and the regulatory requirements are currently unknown.

RJH has not performed geotechnical and hydraulic analyses or engaged regulatory agencies in discussions regarding the revised earthfill configuration. It is possible that these analyses and discussions may identify other issues that would need to be resolved. Also, we have not collected geotechnical data (i.e., borings) along this alignment, and subsurface information would be needed to support the geotechnical analyses.

### **3.3 Potential Cost Impacts**

RJH developed a comparative cost estimate for the earthfill/road embankment. The comparative cost estimate was developed using the same methodology, unit costs, and cost allowances presented in the Concept Design Report. The cost estimate only accounts for the earthfill and does not include ancillary items that may be needed including: slope protection, seepage management facilities, drainage facilities, roadway paving, etc. The comparative cost estimate is presented in Table 1.

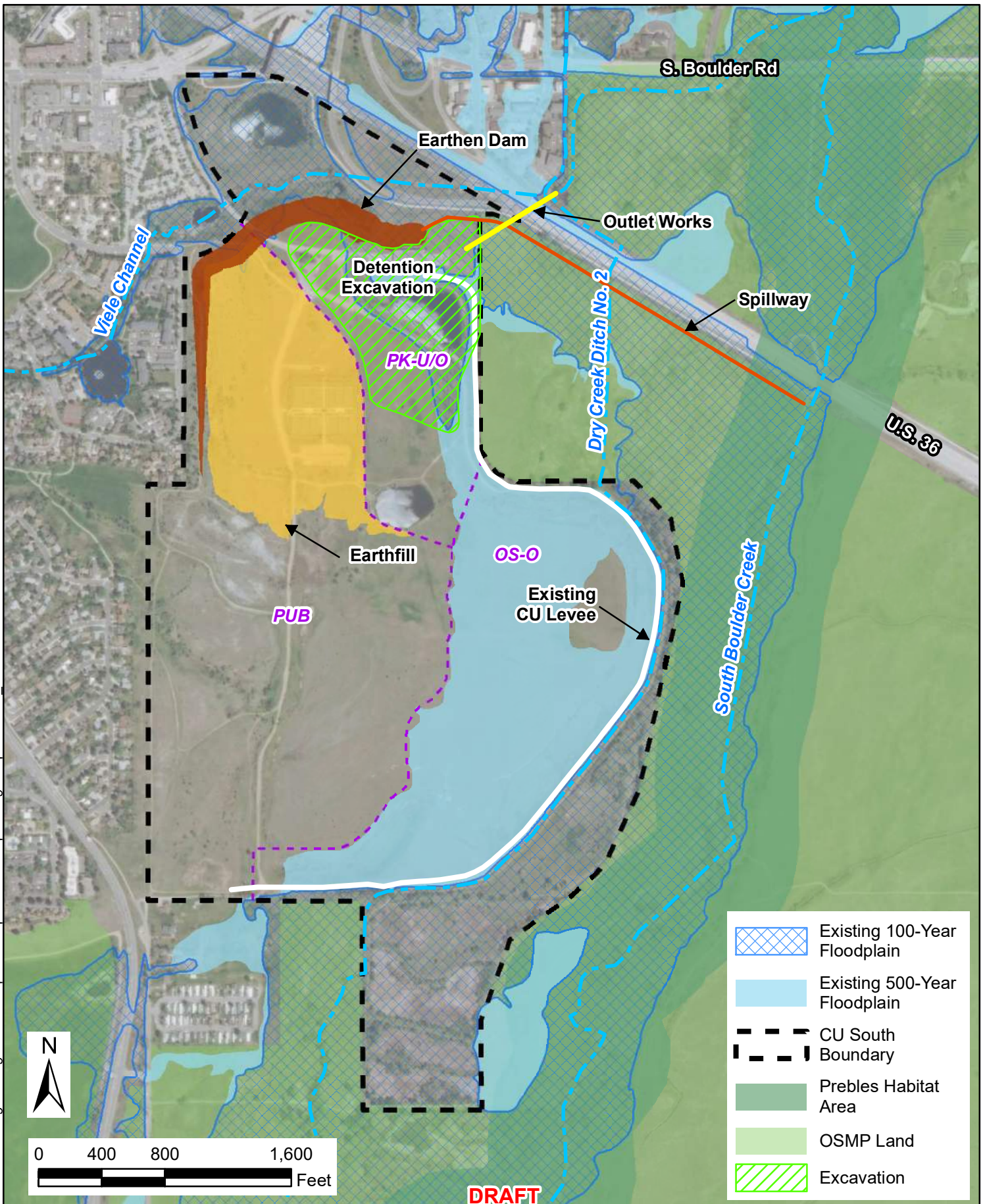
**TABLE 1  
COMPARATIVE COST ESTIMATE**

<b>Component</b>	<b>OPPC (\$M)</b>
Original Earthfill Configuration	9.4
Revised Earthfill/Road Configuration	3.2

Costs in this memorandum are presented in 2018 dollars to be consistent with previous cost opinions presented to City Council and the public.

### **4.0 Next Steps**

If the City elects to advance the earthfill/road embankment concept, we recommend a) obtaining geotechnical data along the alignment of the road, b) performing geotechnical and hydraulic analyses, and c) initiating discussions with the regulatory agencies.



**REPRODUCE  
IN COLOR**



**SOUTH BOULDER CREEK  
REGIONAL DETENTION  
CONCEPT DESIGN**

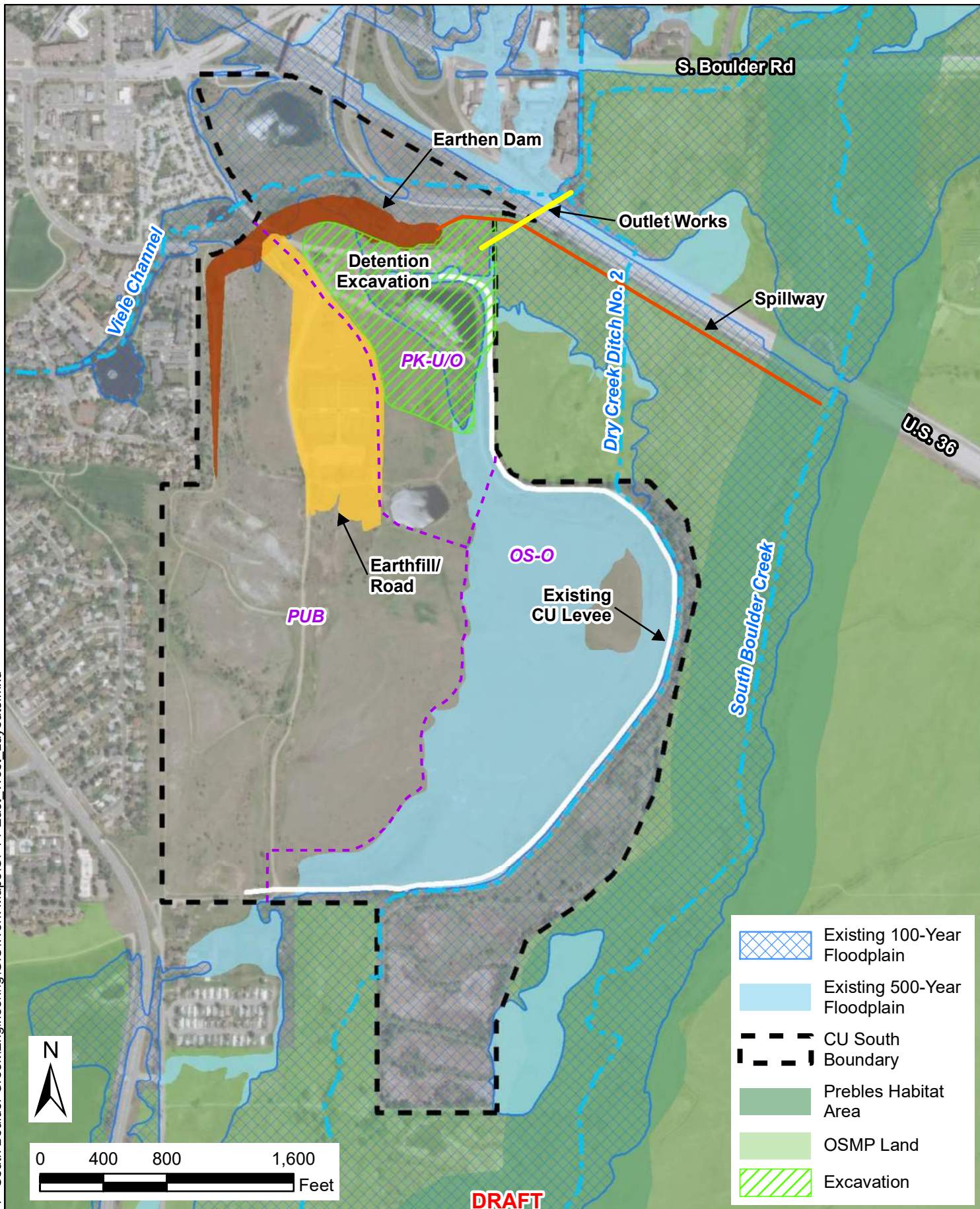
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**PLAN OF  
PREFERRED ALTERNATIVE**

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**Figure 1**





**REPRODUCE  
IN COLOR**



**SOUTH BOULDER CREEK  
REGIONAL DETENTION  
CONCEPT DESIGN**

PROJECT NO. 16134

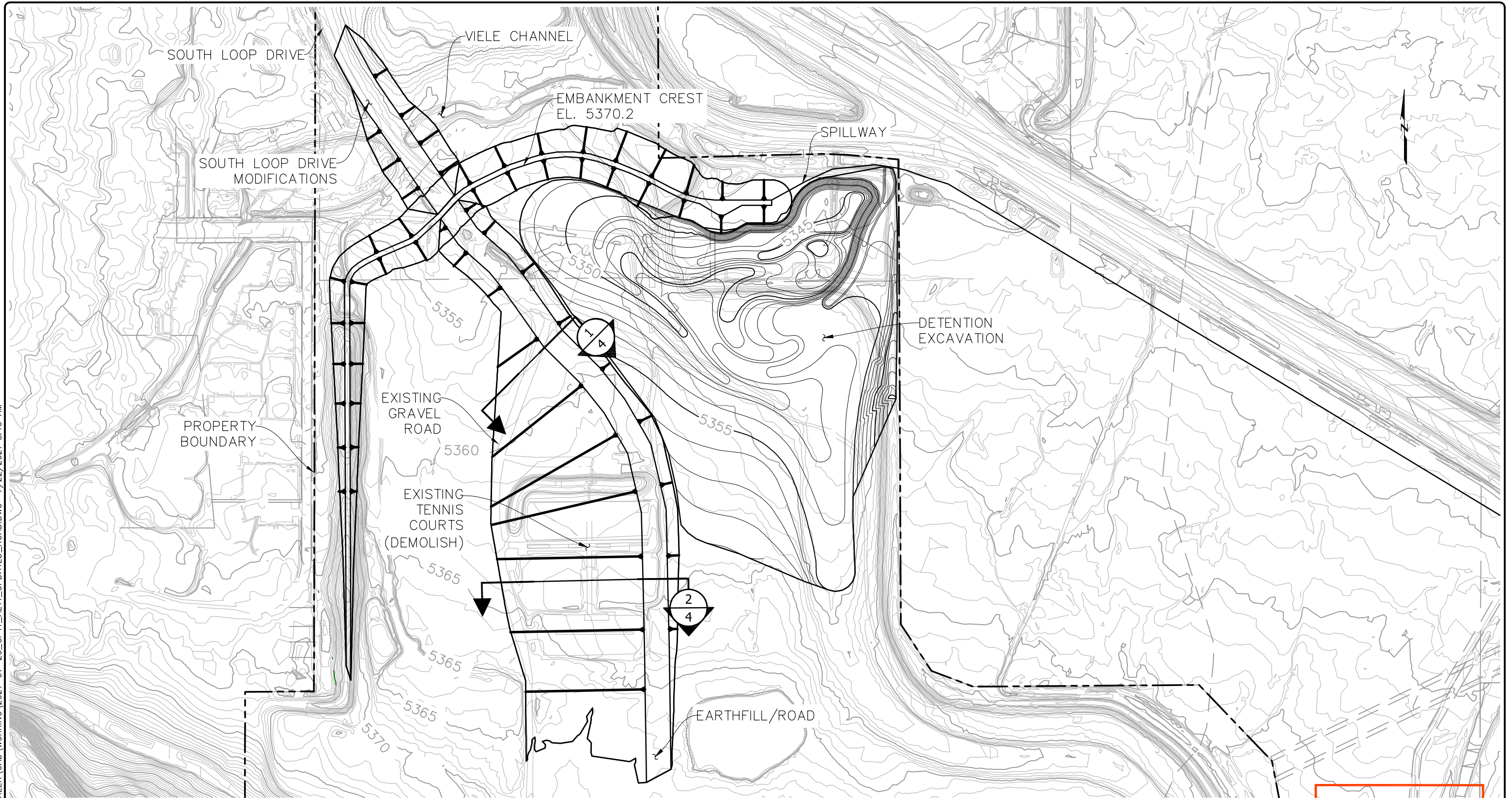
**PLAN OF PREFERRED  
ALTERNATIVE WITH  
REVISED EARTHFILL**

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**Figure 2**



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SCALE IN FEET



SOUTH BOULDER CREEK  
REGIONAL DETENTION PROJECT

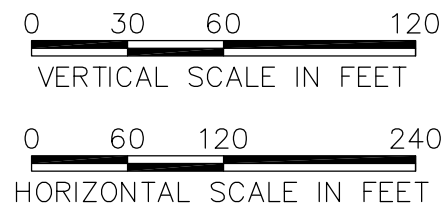
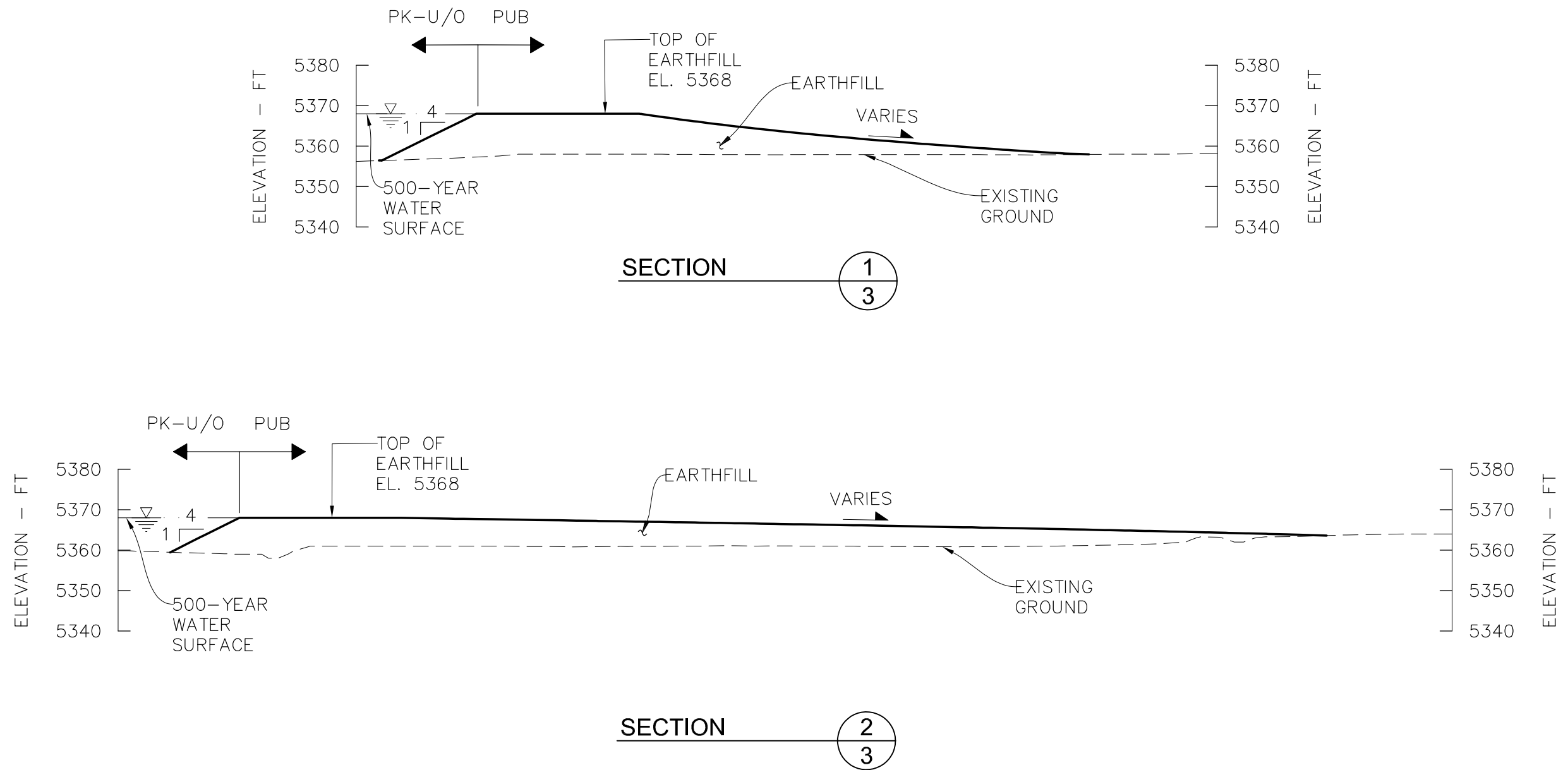
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PLAN OF PREFERRED  
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Figure 3

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SOUTH BOULDER CREEK  
REGIONAL DETENTION PROJECT

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PREFERRED ALTERNATIVE  
WITH REVISED EARTHFILL  
SECTIONS

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Figure 4