5.14 Floodplains and Drainage/Hydrology

This section discusses floodplain and drainage/hydrology resources and explains why they are important to the project. The impacts from the project alternatives on these resources also are evaluated, and proposed mitigation measures are discussed to minimize negative effects.

5.14.1 What are floodplains and ponding areas and why are they important to this project?

Floodplains typically are defined as areas adjacent to streams and rivers that periodically are flooded by water. The flood zones that are designated by the Federal Emergency Management Agency (FEMA) within the study area fall along the South Platte River and Sand Creek. Both of these areas are classified as having a one-percent chance of flooding each year. Potential ponding areas are developed areas with undersized storm drain systems that result in periodic flooding during storm events. It is important to perform a detailed analysis of floodplains, ponding areas, and drainage to ensure that adequate drainage is designed for the project alternatives in case of a storm and that the project alternatives will not negatively impact the ponding areas.

5.14.2 Have there been any changes to floodplains and drainage/hydrology in the study area or to the analysis process since the release of the 2008 Draft EIS?

With elimination of some of the previously analyzed alternatives in the 2008 Draft EIS, the study area has been modified to focus only on the alternatives that are under consideration in the Supplemental Draft EIS. The new smaller study area no longer includes Westerly Creek as a major drainageway. Analysis has been updated to include potential ponding areas identified by Denver. Additionally, the revised and new project alternatives have different impacts on floodplains and drainage/hydrology in the study area.

5.14.3 What study area and process were used to analyze floodplains and drainage?

The study area for the floodplains and drainage is the combined construction limits of the project alternatives. It includes bridge crossings at the South Platte River and Sand Creek, as seen in Exhibit 5.14-1. Both streams include a delineated 100-year floodplain.
Additionally, I-70 East crosses potential ponding areas identified in several locations. These are located in areas of the watershed that receive substantial surface flows or where water collects during extreme rainfall events.

A review of the effective FEMA Flood Insurance Rate Maps was completed for the study area. The South Platte River and Sand Creek both have detailed hydrologic and hydraulic studies and delineated floodplains.

Smaller drainage crossings are not defined by FEMA; however, Denver has identified potential ponding areas within the study area. Potential ponding areas identified in the Denver Storm Drainage Master Plan (Denver Wastewater Management Division, 2005), Park Hill (North of Smith Road) Drainage Outfall System Plan Conceptual Design Report (Enginuity & Matrix Design Group, 2012), Lower Montclair Street Flow Criteria Analysis Memorandum (Enginuity, 2010), and the Memorandum for I-70 Partial Cover Lowered Montclair Drainage Basin Hydrologic Analysis (Enginuity, 2014) were used to identify areas for additional drainage consideration and analysis.

FEMA floodplain zones

Floodplain zones are geographic areas that FEMA has defined according to varying levels of flood risk. These zones are shown in a community’s Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area.
5.14.4 What are the areas of floodplain and drainage interest that are being analyzed and what are their existing conditions?

The South Platte River is a confined urban floodplain that has been narrowed by previous development. The existing I-70 bridges and frontage road bridges cross the South Platte River. At this time, FEMA delineates the floodplain as Zone AE with calculated base flood elevations.

The existing I-70 bridge crosses Sand Creek. Channel stabilization projects have been constructed upstream and downstream of the existing bridge. FEMA currently delineates the floodplain as Zone AE with calculated base flood elevations.

Exhibit 5.14-2 shows the identified potential ponding areas along the I-70 corridor. These potential ponding areas represent flooding risks for the existing developed watershed, including flooded streets and structures.

**Exhibit 5.14-2. Potential ponding areas**

Denver identified substantial offsite flows through the area, including approximately 2,691 cubic feet per second (cfs) crossing I-70 between Brighton Boulevard and York Street, approximately 400 cfs near Steele Street, and approximately 660 cfs crossing I-70 between Colorado Boulevard and Dahlia Street. The Denver recommendation is to design for a 20-percent chance (five-year) flow, while I-70 will be designed for a one-percent
chance (100-year) event. The existing storm drainage system cannot convey these flows, resulting in substantial surface flows and potential ponding areas.

5.14.5 How do the project alternatives potentially affect floodplains and drainage?

The No-Action Alternative and the Revised Viaduct Alternative have a minimal impact to the potential ponding areas. The increased width of the viaduct could increase the amount of runoff from the I-70 viaduct. A proposed onsite drainage system (Exhibit 5.14-3) is designed for both the No-Action Alternative and Build Alternatives to capture and convey the onsite water flows and discharge into the South Platte River north of I-70 near Riverside Cemetery. This outfall will not change the boundary of the existing South Platte floodplain.

The Partial Cover Lowered Alternative substantially impacts the potential ponding areas located between Brighton Boulevard and Dahlia Street. The lowering of I-70 will create a depression that captures and retains surface flows from the upstream basin before their discharge to the South Platte River. The Partial Cover Lowered Alternative will capture approximately 3,993 cfs of offsite flow between Brighton Boulevard and Dahlia Street that currently drains north through the developed watershed. The capture of this offsite flow substantially reduces the ponding areas and existing flooding north of I-70. This drainage system (Exhibit 5.14-4) is along the south side of I-70, south of the coliseum and through Globeville Landing Park and discharges the offsite flows to the South Platte River; however, it will not change the boundary of the existing floodplain.

The Build Alternatives may impact the floodplain for Sand Creek with bridge construction and new bridge structures crossing this waterway. New bridge structures will be designed to have minimal effect on the existing regulatory base flood elevation and floodplain limits.

Proposed drainage

All the alternatives include drainage improvements on the north side of I-70 to capture and convey the onsite water runoff.

The Partial Cover Lowered Alternative also includes an offsite drainage system south of I-70 to capture surface water before it enters the lowered section of the highway.
Exhibit 5.14-3. Onsite drainage system north of I-70
Exhibit 5.14-4. Offsite drainage for the Partial Cover Lowered Alternative south of I-70

Attachment M, *Hydrology and Hydraulics Technical Report*, includes additional detail on the hydrologic and hydraulic analysis of the offsite and onsite drainage. A preliminary onsite hydrological analysis was done to estimate flows and size the drainage system to route the onsite flows to the South Platte River. Additional design and analysis for the proposed drainage facilities, including pipe and pond sizes, will be conducted as part of the final design.

5.14.6 How are the negative effects from the project alternatives mitigated for floodplains and drainage?

The No-Action Alternative and the Build Alternatives will not negatively impact the floodplain resources for the South Platte River and Sand Creek. The effects to human safety, health, and welfare will be minimized and the beneficial values of the floodplains will be preserved.

The potential ponding areas between Brighton Boulevard and Dahlia Street will be substantially impacted by the Partial Cover Lowered Alternative. To mitigate the risk to human safety, an offsite drainage system is required to capture and convey the offsite surface runoff before reaching the lowered section of I-70 between Brighton Boulevard and Colorado Boulevard and to discharge the stormwater runoff to the South Platte River. An additional offsite system is required to capture
the offsite flows between Colorado Boulevard and Dahlia Street, reduce the discharges in a regional detention pond, and convey the flows north of I-70 to an existing storm drain system.

The runoff from I-70 will be captured and conveyed in a storm drain system that discharges to the South Platte River. Prior to discharging to the South Platte River, the system will discharge to a water quality pond to provide water quality treatment. Additional detail on water quality is discussed in Section 5.16, Water Quality. Exhibit 5.14-5 lists the impacts and mitigations associated with floodplains and drainage/hydrology.

**Exhibit 5.14-5. Summary of floodplains and drainage/hydrology impacts and mitigations**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Permanent Impacts and/or Benefits</th>
<th>Mitigation Measures Specific to Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-Action Alternative</td>
<td>Minimal impact to potential ponding areas due to the increased width of the viaduct, which may increase runoff from I-70</td>
<td>Create detention ponds and implement storm drainage for onsite drainage system improvements</td>
</tr>
<tr>
<td>Revised Viaduct Alternative</td>
<td>• May impact the floodplain for Sand Creek since bridge construction and new bridge structures will cross this waterway&lt;br&gt;• Minimal impact to potential ponding areas due to the increased width of the viaduct, which may increase runoff from I-70</td>
<td></td>
</tr>
<tr>
<td>Partial Cover Lowered Alternative</td>
<td>• Impact to potential ponding areas due to the increased width of the highway, which may increase runoff from I-70&lt;br&gt;• The potential ponding areas between Brighton Boulevard and Dahlia Street will be substantially impacted due to lowered profile of the highway</td>
<td>• Create detention ponds and implement storm drainage for onsite drainage system improvements&lt;br&gt;• Build an offsite drainage system to reduce the risk of flooding within the lowered section of I-70, as well as the portion of the watershed between I-70 and the South Platte River</td>
</tr>
</tbody>
</table>
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