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**Hydrology and  
Water Quality**



## 7 Hydrology and Water Quality

### 7.1 Existing Conditions

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#### 7.1.1 Watershed Hydrology

The Inland Area of the Concord Naval Weapons Station (CNWS) or the site is located in proximity to three watersheds, although it is primarily situated within the Mt. Diablo Creek watershed. This watershed encompasses an area of 23,800 acres (about 37 square miles) and drains the northwest flank of Mt. Diablo (CCRCD, 2006). Figure 7-1 shows the watershed boundary for Mt. Diablo Creek. The Mt. Diablo Creek watershed is located in a Mediterranean-like climate zone, which is characterized by warm dry summers and mild wet winters. The coldest temperatures occur in January (with a monthly average low of 36.7 degrees Fahrenheit [°F]) and the warmest temperatures occur in July (with a monthly average high of 86.6°F). Although fog does not commonly occur in the summer months in this watershed, local marine winds (also referred to as “Delta breezes”) serve to mitigate the hot summer temperatures. The upper elevations in the Mt. Diablo Creek watershed receive ephemeral winter snow (NHI, 2006).

Annual average precipitation in the Mt. Diablo Creek watershed varies from 23.5 inches at the top of Mt. Diablo to 15.5 inches at Hastings Slough on the south shore of Suisun Bay, which is equivalent to an average of 18 inches per year throughout the Mt. Diablo Creek watershed (CCRCD, 2006). Approximately 86 percent of the rainfall occurs between November and April (NHI, 2006).

The water resources at the site include surface water and groundwater. Surface water resources comprise the creek and a few unnamed ephemeral tributaries. Runoff from the site is captured in three local watersheds. The generalized flow paths for runoff for each of the three watersheds are shown on Figure 7-1. The Mt. Diablo Creek watershed drains 77 percent of the site. The Concord watershed (a tributary to the Walnut Creek watershed) drains 22 percent of the western portion of the site. The remaining 1 percent of the site is drained by the Willow Creek watershed along the crest of the Los Medanos Hills to the north.

The site includes two canals: the Contra Costa Canal, which is operated by the Contra Costa Water District (CCWD) and delivers water from the Sacramento-San Joaquin Delta (Delta) to its service area; and the non-operational Clayton Canal. Both canals are owned by the U.S. Bureau of Reclamation (Reclamation) (the canals are also discussed in Section 7.1.2.3 of this chapter and in Chapter 16. Utilities). In addition to Mt. Diablo Creek and the two canals, the site includes approximately 20 locations of mostly small ephemeral stock ponds, watering holes, and seepage ponds. The majority of these water features are located in the Los Medanos Hills where natural water sources are scarce. The water levels in the ponds fluctuate seasonally. Water levels in the ponds are highest in the winter as a result of runoff, and they gradually dry out during the summer. The only identified perennial ponds are Cistern Pond and Indian Springs (Department of the Navy, 2006). The prominent ponds and springs are identified on Figure 7-1. Groundwater resources include moderate amounts of groundwater in low-lying valley areas of the site.

## 7.1.2 Surface Water

### 7.1.2.1 Local and Downstream Drainage Conditions

Mt. Diablo Creek, as shown on Figure 7-1, is also known as Seal Creek from the point where it enters the site to the mouth at Suisun Bay (Department of the Navy, 2006). Historical maps show that the location of the creek was altered between 1885 and 1898. The pre-1885 maps show the creek flowing west to Pacheco Slough along the west side of the hills south of the North Concord BART Station. Seal Creek is shown draining a small area to the east of these hills (NHI, 2006).

The reach of Mt. Diablo Creek that flows through the site is characterized by limited development adjacent to the riparian corridor, except for the vicinity of the Diablo Creek Golf Course. Past ranching and farming practices and the network of roads, rail lines, and munitions bunkers developed by the Navy has substantially altered run-off, drainage, and vegetation patterns in the watershed.

Studies have evaluated and confirmed that increased runoff volumes and changes in sediment yields resulting from urbanization and grazing in the watershed have resulted in bank erosion (CCRCD, 2006). In 2006, the Natural Heritage Institute (NHI), under contract to the Contra Costa Resource Conservation District (CCRCD), conducted a watershed inventory of the Mt. Diablo Creek watershed. NHI performed detailed field studies at eight locations within the site. Most of the floodplain consists of grazed pastureland. Cattle have access to the creek in certain reaches, and are excluded from other reaches by fencing and/or steep eroded banks. Where cattle have access to the channel, bank erosion is documented. Certain reaches of the channel appear to be unaltered, whereas other reaches are channelized. Common species of riparian vegetation along the floodplain and within the active channel include cottonwood, willow, buckeye, mule fat, and grasses (see Chapter 8. Biological Resources). The channel has a gravel bed, and steep banks along the incised channel are common.

In addition to the NHI study, the *Stream Corridor Study, Management and Enhancement Program for Galindo and Mt. Diablo Creeks* (CCRCD, 2006) evaluated bank stability of the creek upstream of the site from Bailey Road to Kirker Pass Road. Although the study area was upstream of the site, the conclusions are applicable to the bank steepening observed by NHI. The study concluded that bank erosion is attributable to increased runoff volumes and changes in sediment yields from urban development and grazing in the watershed (CCRCD, 2006).

It should be noted that Chapter 16. Utilities provides additional information about the stormwater management system at the site. The information presented in Chapter 16 supplements the hydrology and water quality discussion presented in this chapter with more emphasis on the management of drainage from the site.

### 7.1.2.2 Rainfall and Runoff

The Mt. Diablo Creek watershed maintains no significant snow storage, which results in minimal volumes from precipitation and urban runoff. The greatest flow levels occur during heavy rainstorms in the winter months, and the creek is dewatered in many reaches during the late spring, summer, and fall months. Most reaches are ephemeral, and only the





**Table 7-1:  
Calculated Peak Discharge Data <sup>1</sup>**

Site Description	Area (square miles)	Flood Recurrence Interval (years) <sup>2</sup>			
		Q <sub>10</sub>	Q <sub>25</sub>	Q <sub>50</sub>	Q <sub>100</sub>
Donner Creek Branch	2.94	875	1,080	1,290	1,440
Above Donner Creek Junction	4.07	1,130	1,390	1,670	1,860
Irish Canyon Branch	3.39	875	1,080	1,310	1,450
Mitchell Creek Branch	4.56	1,130	1,400	1,690	1,880
Below Donner Creek Junction	7.01	1,960	2,410	2,900	3,230
Above Irish Canyon Branch	7.90	2,080	2,570	3,100	3,450
Below Irish Canyon Branch	11.29	2,900	3,580	4,330	4,820
Below Mitchell Canyon	15.85	3,920	4,860	5,880	6,560
At Kirker Pass Road	17.00	3,930	4,880	5,910	6,600
700 feet downstream of Kirker Pass Road	19.75	4,140	5,180	6,290	7,020
At Bailey Road	22.06	4,210	5,280	6,420	7,170
At North Sacramento Railroad	30.10	4,240	5,410	6,660	7,470

**Notes:**

<sup>1</sup> The CCCFC&WCD used the unit hydrograph method to generate these 1981 data.

<sup>2</sup> Q<sub>x</sub> is the flood recurrence interval, commonly called the return period. For example, the Q<sub>25</sub> is the peak discharge statistically expected to occur once every 25 years. The Q<sub>100</sub> is the peak discharge statistically expected to occur once every 100 years.

Sources: Boucher, 2007; Contra Costa County Flood Control and Water Conservation District (CCCFC&WCD), 1981.

reaches in the upper and lower watershed maintain perennial flow (NHI, 2006). The upper watershed includes the area upstream of the site and the lower watershed includes the area downstream from the site.

Historically, discharge was not gauged in Mt. Diablo Creek or its tributaries. Peak discharge calculations from 1981 were obtained from the Contra Costa County Flood Control and Water Conservation District (CCCFC&WCD) (Boucher, 2007) and are summarized in Table 7-1. The CCCFC&WCD used the unit hydrograph method to calculate the peak discharge for Mt. Diablo Creek for 1 inch of runoff over the watershed, and used a dimensionless “S” curve (Boucher, 2007; CCCFC&WCD, 1978). NHI (2006) included peak discharges from the Soil Conservation Service (SCS)—now the Natural Resources Conservation Service (NRCS)—from 1989. The NRCS estimates are substantially lower at Bailey Road. The method used to estimate the NRCS peak discharges is unknown, and no reasons are provided for the substantial difference in the predicted discharge.

7.1.2.3 Canals

As introduced in Section 7.1.1, two canals cross the site (see Figure 7-1), both of which are within the rights-of-way owned by the Bureau of Reclamation. The Contra Costa Canal was completed in 1948 as part of the Federal Central Valley Project (CVP), and the right-of-way is currently leased, maintained, and monitored by the CCWD. The canal originates in Rock Slough near Oakley where it intercepts water from the Delta. The canal terminates 48 miles

downstream at the Martinez Reservoir (CCWD, 2006). The Contra Costa Canal is out of service during the winter.

Approximately 3.5 miles of the 4.85-mile Clayton Canal also cross the site. The Clayton Canal was built in 1949 and occupies about 38.33 acres, which includes the canal footprint and right-of-way for maintenance. The Clayton Canal has not been used to convey water for more than 20 years. (The canals are also discussed in Chapter 16. Utilities.)

7.1.3 Flooding and Floodplains

A floodplain can be defined as the typically flat land near the margin of a stream or river constructed by the channel under its current hydrologic regime that experiences periodic flooding. Floodplains typically contain an active channel and the surrounding land inundated during peak flows. Floodplains are typically composed of alluvial sediments that have been eroded and deposited by the channel over geologic time periods, and are important ecological features because they support diverse ecosystems.

The Federal Emergency Management Agency (FEMA) is responsible for administering the National Flood Insurance Program (NFIP) that provides flood insurance for properties located within floodplains. The NFIP requires properties located within mapped 100-year floodplains to purchase flood insurance (FEMA, 2002). The FEMA flood maps were completed for the site in 1996 (Department of the Navy, 2006) and updated in 2000. The 100-year floodplain is the area with a 1 percent annual chance of being inundated by floodwater. About 125 acres at the site are located within the 100-year floodplain, as shown on Figure 7-2. Table 7-2 lists the acreage inside and outside the 100-year floodplain (FEMA, 2000) at the site. Flooding occurs annually along limited portions of Mt. Diablo Creek, and areas affected by flood waters include the entrance gate in the Administration Area, the area downstream of SR 4 near the Diablo Creek Golf Course, at Port Chicago Highway, a small area upstream of Willow Pass Road, and downstream of Bailey Road.

**Table 7-2:  
 FEMA Floodplains at the Site**

100-year FEMA Floodplain Zone <sup>1</sup>	Acres
Areas Inside the Zone	125
Areas Outside the Zone	4,890
Unmapped Areas	13
<i>Total</i>	<i>5,028</i>

Note:

<sup>1</sup> FEMA Zones correspond to Figure 7-2.

Source: FEMA, 2000.

7.1.4 Surface Water Quality

A Surface Water Ambient Monitoring Program was implemented at three locations in 2003 in the Mt. Diablo Creek watershed by the California Regional Water Quality Control Board, San Francisco Bay Region (Water Board) (CCCCDD, 2006). (Also see Section 7.1.7.2 for the ongoing efforts to further characterize the conditions in Mt. Diablo Creek). Water quality





parameters for temperature, pH, and dissolved oxygen (DO), which can generally vary widely in such intermittent creeks, were found to be in the acceptable range for steelhead trout and other coldwater species during the winter and early spring in the upper watershed in areas upstream of the site. Dry season parameters were unacceptable for coldwater species in the middle watershed. In the lower watershed, DO was far below minimum standards for cold water fish. The lower watershed extends from Suisun Bay upstream to SR 4. The middle watershed extends from SR 4 to the upstream city limits of the City of Clayton (CCCCDD, 2006). The site is located predominately in the middle watershed and includes a portion of the lower watershed.

#### 7.1.5 Groundwater

Much of the site overlays the Clayton Valley Groundwater Basin, and Mt. Diablo Creek forms the eastern boundary of that basin. The Clayton Valley Groundwater Basin comprises thick alluvial deposits, and the water-bearing units of the basin are found in recent alluvium and older alluvium fill deposits. Aquifers in the Clayton Valley Groundwater Basin are hydrologically connected to Suisun Bay (DWR, 2004). The eastern portion of the site is located in an unmapped groundwater basin. The basin is underlain predominately by shale and sandstone, and occupies the area of the site that is generally to the east of Mt. Diablo Creek (Jennings, 1977). Although water quality data are limited for the Clayton Valley Groundwater Basin, the total dissolved solids (TDS) values range from 328 milligrams per liter (mg/L) to 864 mg/L. The EPA's Maximum Contamination Level for TDS is 500 mg/L; the State of California regulatory criterion is 1,000 mg/L. None of the five wells sampled in the groundwater basin had readings above the Maximum Concentration Unit for inorganic contaminants, radiological contaminants, nitrates, pesticides, volatile organic compounds, or semi-volatile organic compounds (DWR, 2004).

Groundwater at the site was characterized in 2002 (Department of the Navy, 2006). Groundwater is typically found in unconsolidated alluvial deposits consisting of coarser sand and gravel. At the site, groundwater was encountered at depths of 30 feet to 50 feet in low-lying valley portions of the site. TDS, hardness, chlorides, and iron concentrations were relatively high, but the overall quality of groundwater was considered fair, as determined in the Navy study (Department of the Navy, 2006). The report concluded that high extraction rates from deep wells would produce satisfactory yields of groundwater, but that extraction could also result in saltwater intrusion. Groundwater wells and two springs at the site currently supply the water for the Diablo Creek Golf Course and water for livestock and wildlife (Department of the Navy, 2006).

#### 7.1.6 Groundwater Quality

As discussed in Chapter 10. Hazardous Materials, groundwater at finite site locations has been contaminated by sources that include trichloroethylene and tetrachloroethylene (Department of the Navy, 2006). Ongoing site investigations have revealed no contaminants migrating to off-site properties. The maximum documented horizontal contaminant migration distance is expected to be approximately 1,000 feet for any given source area (based on the 40-year history of Navy operations and a calculated groundwater flow rate of 26 feet per year) (Department of the Navy, 2006). This distance is expected to have increased to 1,500 feet by 2001 (Department of the Navy, 2006).

### 7.1.7 Previous and Ongoing Studies

#### 7.1.7.1 Previous Studies

Collectively, the disturbances both upstream and within the site have resulted in changed channel hydraulics, geomorphic processes, and stream functions that have caused adverse effects to aquatic habitats in Mt. Diablo Creek. The re-channelization that apparently diverted Mt. Diablo Creek out of its historic watershed into the historic Seal Creek watershed and subsequent land use activities (including cattle grazing and construction and operation of the Navy facilities) have dramatically changed the hydrology, geomorphology, and quality of aquatic habitats. These actions and disturbances have resulted in diminished habitat quality, and have reduced the geographic extent of habitats suitable for supporting cold water fisheries at the site. Recent studies and field observations that support this condition are discussed below.

In 2005, the Friends of Mt. Diablo Creek sampled four sites on the main stem of Mt. Diablo Creek (CCCCDD, 2006). As explained further in Chapter 8. Biological Resources, the results provided an indicator of water quality, instream habitat, and other physical and biological factors. Also in 2005, the NHI conducted a detailed field study at 12 locations in the Mt. Diablo Creek Watershed (NHI, 2006). Of these 12 study locations, 8 were at the site. The NHI's field study comprised the following elements.

- Channel form cross-section survey
- Thalweg longitudinal profile survey representing a line drawn to join the lowest points along the length of the streambed
- Bed material pebble count
- Riparian vegetation mapping
- Photo-documentation
- High water mark survey
- Perennial pools survey
- Anadromous fish barrier survey

The NHI field study found that a general deepening of the creek channel has occurred in the uppermost to middle segments of the site. Furthermore, the stream channel has become narrower midway through the site to at least the downstream site boundary. The NHI study also concluded that the middle segments of the creek at the site have higher flow capacity than the downstream segments. The NHI findings further concluded that the stream bed materials generally become finer in the downstream reaches. Finally, the NHI study determined that a higher diversity of riparian vegetation species occurs on the site compared with field sites located outside the site boundary.

CH2M HILL (2007) conducted a reconnaissance-level aquatic habitat assessment from Bailey Road downstream through the site. The results of this survey show that this segment of Mt. Diablo Creek has been heavily affected by human activities over the past century. (See Appendix 8-A in Chapter 8. Biological Resources for the memorandum documenting the survey results.) These impacts to the character and function of the creek include:

- Bank failures and erosion related to cattle grazing
- Channel incision because of land use practices
- Alterations in channel hydraulics because of culvert structures
- Stream flow changes because of re-channelization and land use practices
- Loss of connectivity with the floodplain and stream bank rip-rapping
- Degraded water quality because of erosion, sedimentation, and non-point source pollution

From these investigations, it is evident that the creek channel throughout a substantial portion of the site is low gradient and is contained within deeply incised channel banks. Currently, channel banks likely contain all discharges in the upper reaches of the site (upstream of Willow Pass Road) with some flooding occurring at larger flow events in portions of the lower creek downstream of Willow Pass Road. As a result of the channel incision, there is little if any connection to a broad floodplain, except at the lowermost reaches of the creek (CH2M HILL, 2007, also see Appendix 8-A). Active cattle grazing has resulted in damage to the creek banks and channel habitats. Some small localized areas/segments of the creek contain complex aquatic habitats of alternating riffle, shallow pool sequences, and some areas of mature riparian canopy. For the most part, the creek habitat is simple, with few features that are desirable for the rearing or spawning of cold water fishes. The biological findings of this study are presented in Chapter 8. Biological Resources.

#### 7.1.7.2 Ongoing Studies

In addition to the existing historical studies that characterize water resources at the site, the City of Concord is conducting additional investigations to further characterize the condition of Mt. Diablo Creek. Mt. Diablo Creek has the potential to be an aesthetic element and provide habitat for some species. To evaluate this future potential, the City of Concord is currently assessing current conditions and identifying future opportunities that should help guide decisions for management/restoration of the riparian corridor. The ongoing efforts include flood corridor conveyance analysis, stream flow data, sediment transport, and water temperature monitoring. Preliminary findings as a result of these efforts are anticipated in late summer 2008.

#### **Flood Corridor Conveyance**

The City is evaluating flood corridor conveyance, the objective of which is to identify constraints and limitations and assess the influence of build-out conditions on channel conveyance characteristics. The City's efforts will identify opportunities for stormwater retention that can be integrated into future reuse planning. The evaluation will assist in understanding existing aquatic and riparian habitats and future plans for the protection and enhancement of those habitats. The specific activities include surveying up to ten cross sections at the site and building a hydrology model to assess conditions. This effort also supports the evaluation of potential buffers between the creek and the surrounding land uses.

### **Stream Flow Data**

The City has established a flow-gauging station at the site to collect stream flow data, the objective of which is to identify opportunities and constraints to habitat and flood control enhancements. An understanding of stream discharges is needed prior to making decisions to manage, rehabilitate, or enhance creek or riparian habitats at the site. The value of the riparian corridor to aquatic and riparian species is greatly dependent on the hydrology (e.g. timing and magnitude of flows) of the creek. Preliminary stream-flow observations of Mt. Diablo Creek indicate that the flows in the creek diminish rapidly following rain events. There is no significant flow in Mt. Diablo Creek downstream of Bailey Road just a few days after even substantial winter rain storms (2008) when the watershed was saturated. In addition, flows in Mt. Diablo Creek at the gauge upstream of SR 4 are most likely dependent on spill from the Contra Costa Canal.

The next steps in this study are to collect and organize available site hydrology data and run the model to identify flows at various intervals (from 1-year flows to 100-year flows) under the existing hydrological conditions and under conditions that could occur with build-out conditions.

### **Sediment Transport Assessment**

The City is also evaluating the ability of the creek to transport sediment. In brief, the City is collecting sediment data concurrently with measuring stream flows. The future use of the creek by aquatic species will depend on both flow conditions and sediment transport dynamics, and the sediment transport assessment will help identify potential changes to the creek from flood risk and the long-term potential for habitat enhancement or restoration actions.

### **Water Temperature Monitoring**

The City has established long-term water temperature monitoring stations at strategic locations to characterize water temperature in the creek. Understanding the water temperature in the creek will help identify whether aquatic species, particularly cold water fish, could use the creek in the future. As discussed in Chapter 8. Biological Resources, historical observations and the existing degraded conditions of Mt. Diablo Creek indicate no current occurrence of cold water fish in the creek. Water temperature monitoring was initiated in Mt. Diablo Creek at the site in the fall of 2007. Water temperature data will be collected throughout the summer 2008 to establish baseline water temperature conditions during the summer period. These are the critical periods in which the temperature could be a key limiting factor for future creek restoration efforts.

### **Fish Passage Assessment**

Using the data from the above activities, the City is assessing fish passage to evaluate the existing potential for fish movement through the site. The City is characterizing approximately 12 existing culverts that cross Mt. Diablo Creek at the site to assess in more detail the existing barriers to fish passage. Understanding the conditions in which

the existing culverts and bridge structures could allow for future passage of migrating fish will inform the City and other decision-makers on possible future approaches, such as removing or retrofitting culverts to provide fish passage.

## 7.2 Standards of Significance

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Criteria for determining the significant impacts of hydrology and water quality have been developed based on Appendix G of the California Environmental Quality Act (CEQA, 1970) Guidelines and any relevant agency thresholds. For the purposes of this Environmental Impact Report (EIR), an alternative may have a significant impact on hydrology and water quality if it would:

- Violate water quality standards or waste discharge requirements.
- Substantially deplete groundwater supplies or interfere with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table.
- Substantially alter the existing drainage pattern of the site or area, or substantially increase the rate or amount of surface runoff in a manner that would result in substantial erosion, siltation, or flooding on or off site.
- Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems, or that would provide substantial additional sources of polluted runoff.
- Substantially degrade water quality.
- Place housing or structures that would impede or redirect flood flows within a 100-year flood hazard area.
- Expose people or structures to significant risk of loss, injury, or death involving flooding.
- Contribute to inundation by seiche, tsunami, or mudflow.

## 7.3 Potential Hydrology and Water Quality Impacts

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This section begins with a description of assumptions that have been incorporated in the analysis of potential hydrology and water quality impacts. Then, impacts common (C) to all seven alternative reuse concepts are identified. Impacts that are considered to be significant are presented first, accompanied by an explanation of why the application of a standard resulted in a determination that the impact would be significant. When a significant impact has been set forth, mitigation measures to address that potential impact are also presented, along with a determination of whether the impact will continue to be significant after implementation of the mitigation measure. Next, impacts that are less than significant are presented. After the presentation of information about the impacts common to all of the seven alternative reuse concepts, information is then presented about potential land use impacts that are specific to Alternative Concepts 1 through 7. Potentially significant impacts and mitigation measures are presented first, followed by impacts that are

considered to be less than significant. The section concludes with a description of the potential impacts of the “No Project” (NP) Alternative.

#### 7.3.1 Assumptions about Potential Hydrology and Water Quality Impacts

Following are the assumptions that have been applied in the analysis of potential hydrology and water quality impacts of the alternative reuse concepts. The assumptions are based on information gathered during the planning process to develop the seven alternative reuse concepts. This information has been incorporated into all the reuse concepts as ways to avoid or minimize their environmental consequences.

- The existing hydrologic conditions have been substantively deteriorated as a result of past management practices that include stream diversion, grazing, and erosion.
- Future planning efforts would be performed in accordance with local regulations, including the *San Francisco Bay Basin (Region 2) Water Quality Control Plan* (Basin Plan) (Water Board, 2007) and regulated by the Water Board.
- All future development would comply with the Contra Costa Clean Water Program’s Joint Municipal National Pollution Discharge Elimination System (NPDES) permits and the City municipal code, Chapter 86 “Stormwater Management and Grading and Erosion Control” requirements. These requirements are also addressed in Chapter 16. Utilities.
- All future development proposed would be performed in accordance with local regulations including the Concord General Plan regulations and its related requirements.
- Future development would not alter the existing watershed boundaries.
- Under all seven alternative concepts, a 300-foot-wide corridor (150 feet from the centerline of the channel on each side of the creek) would be retained along Mt. Diablo Creek.
- The CCWD would provide potable water to the site during the construction phase and during subsequent land use (see Chapter 16. Utilities).
- The Central Contra Costa Sanitary District would provide wastewater service to the site during the construction phase and during subsequent land use (see Chapter 16. Utilities).
- The design of proposed stream crossings would be evaluated at a project-level environmental review to ensure that the new structures would not impede or redirect flood flows.

### 7.3.2 Hydrology and Water Quality Impacts Common (C) to all Seven Alternative Concepts

#### 7.3.2.1 Common Potentially Significant Hydrology and Water Quality Impacts

**Impact Hydrology and Water Quality C-1: All seven alternative reuse concepts could place housing or structures in locations that could impede or redirect flood flows within a 100-year floodplain. This impact is considered to be potentially significant.**

Development of the site under each of the seven alternative concepts would place housing or structures within the 100-year floodplain. Areas mapped by FEMA as being within the 100-year floodplain that extend beyond the 300-foot Mt. Diablo Creek buffer are located at: the downstream extent of the site upstream to SR 4; a small area upstream of the Contra Costa Canal; and an area north of Mt. Diablo Creek and extending downstream of Bailey Road from the first railroad bridge downstream of Bailey Road. As discussed in Section 7.1.3, approximately 125 acres at the site are located within the 100-year floodplain. The magnitude of this impact varies depending on the anticipated level of development for each alternative concept. The impact under all seven of the alternatives, however, would be potentially significant.

**Mitigation Measure Hydrology and Water Quality C-1: The City shall require that flood control actions be implemented to protect any structures that would be located in the approximately 125 acres of the site that are located within the 100-year floodplain. With implementation of this mitigation measure, this potential significant impact would be reduced to a level that is less than significantly.**

Development of the site would provide an opportunity to integrate flood control and/or flood protection actions along the portion of Mt. Diablo Creek where the 100-year floodplain extends past the 300-foot buffer. The flood control/flood protection actions, including the following, could be employed to direct flood flows around these floodplains:

- Excavate a multistage channel that increases flood conveyance and increase riparian habitat.
- Construct setback levee to increase conveyance and connect the channel to the floodplain.

In addition, the *City of Concord 2030 Urban Area General Plan (General Plan)* (City of Concord, 2007) has several polices intended to reduce adverse effects of flooding. These, in turn, would also avoid adverse effects of altering drainage patterns and increasing the rate and amount of stormwater runoff. These policies would need to be incorporated into a Stormwater Pollution Prevention Plan (SWPPP) for any development at the site.

*Policy S-4-1.1: Manage development to ensure compliance with the City's Flood Management Ordinance and the City's Stormwater Management and Discharge Control Ordinance.*

*Policy S-4-1.2: Establish engineering design standards for constructing a storm drainage system to protect against loss of life and property and minimize the risks of flooding.*

*Policy S-4-1.3: Coordinate storm drainage management with appropriate agencies, including the Contra Costa County Flood Control and Water Conservation District, Regional Board, Army Corps of Engineers, Department of Fish and Game, and with the Contra Costa Water District, in the vicinity of the Contra Costa Canal.*

*Policy S-4-1.4: Design storm drainage facilities to meet the Contra Costa County Flood Control and Water Conservation District standards and ensure adequate and safe flow to minimize flooding.*

*Policy PF-1.3.1: Require new development to provide any needed storm drains that are not part of the City's master storm drain system and to incorporate features into site improvements to minimize surface runoff.*

*Policy PF-1.3.4: Continue the Drainage Area Fee Program to fund master stormwater drainage improvements.*

*Policy PF-1.3.5: Ensure that new development contributes needed drainage improvements in proportion to a project's impacts, to assure an equitable distribution of costs to construct and maintain the City's master storm drainage system.*

**Impact Hydrology and Water Quality C-2: All seven alternative reuse concepts have the potential to expose people or structures to significant risk of loss, injury, or death involving flooding that could occur as a result of global climate change. This impact is considered to be potentially significant.**

Global warming has been identified by several federal and State agencies, including the Bay Conservation and Development Commission (BCDC), as the source of potential problems due to increasing sea level in the San Francisco Bay Area (BCDC, 2008). The BCDC has initiated a Climate Change Planning Project to address this problem. The goals of the project are to:

- Identify and report on the impacts of climate change on San Francisco Bay;
- Identify strategies for adapting to climate change;
- Develop a regional task force to inform and coordinate local governments, stakeholders, and land use planning bodies in the Bay Area regarding the potential Bay-related impacts of and approaches for adapting to global climate change;
- Identify the findings and policies in BCDC's San Francisco Bay Plan (Bay Plan) pertaining to climate change, such as the findings and policies on sea level rise, and update other relevant Bay Plan policies to incorporate new information about the impacts of climate change.

Historical records show that sea level in San Francisco Bay has risen approximately 7 inches over the past 150 years. The Intergovernmental Panel on Climate Change and the 2006 California Climate Action Team Report project that mean sea level will rise between 12 and 36 inches by the year 2100. Sea level rise models indicate that a 12 inch rise in sea level would shift the 100-year storm surge-induced flood event to once every 10 years. With each flood event, public health and safety concerns and economic impacts in the Bay Area have the potential to occur resulting in injury and loss of life, real estate impacts, critical public infrastructure damage, and natural resources impacts.

Through the sea level rise mapping project, BCDC used geographic information system (GIS) software to identify the shoreline areas likely to be most affected by sea level rise. The sea level rise maps are generally consistent with the projections in the 2006 California Climate Action Team Report. They illustrate an impact scenario in which sea level rises three feet by the year 2100. Limitations in the geospatial data may affect accuracy. Therefore, they are illustrative and should not be used for small-scale planning purposes. The maps are based on U.S. Geological Survey (USGS) 2005 Urban Areas digital elevations and the National Agriculture Imagery Program 2004 aeriols.

Addressing the potential rise in sea level will require consistency and compliance with the BCDC's programs to address sea-level rise. BCDC is embarking on an eight year program to assess the potential impact of climate change and to identifying and prioritize and action plan to address these impacts (BCDC, 2008). In years six through eight, each local government with property that front the Bay will be required to prepare:

- Sea level rise protection program that identifies needed levees and other infrastructure;
- Relocation and resource enhancement program; and
- Sustainability program that will offset greenhouse gas emissions from new development.

**Mitigation Measure Hydrology and Water Quality C-2: The City shall require that prior to the approval of any development at the site measures are incorporated into development plans to address flooding and other potential problems associated with sea level rise. The City shall consult with BCDC and other appropriate State and federal agencies to establish potential levels of sea level rise and to establish the minimum types of flood control/flood proofing measures that will be required for development at the site. With implementation of this mitigation measure, this potential significant impact would be reduced to a level that is less than significantly.**

Regarding the potential for impacts attributable to flooding, the measures described in Impact Hydrology and Water Quality C-1 would also result in avoidance of this risk. In addition, the General Plan has several polices intended to reduce adverse effects of flooding, including risk to humans. These policies are discussed under Mitigation Measure Hydrology and Water Quality C-1 and are also applicable to this mitigation measure. Implementing these measures would reduce the potential impacts of sea level rise.

#### 7.3.2.2 Common Hydrology and Water Quality Impacts that are Less Than Significant

**Impact Hydrology and Water Quality C-3: All seven alternative reuse concepts have the potential to result in violations to water quality standards or waste discharge requirements. This potential impact is considered to be less than significant.**

Standards for water quality in the San Francisco Bay Area are defined in the Basin Plan and regulated by the Water Board. Objectives for water quality are established in the Basin Plan for surface waters in the San Francisco Bay Region. The Basin Plan also addresses standards for wastewater discharge. Pursuant to this Plan, a NPDES permit would be obtained and a SWPPP and Stormwater Control Plan would be prepared, as required by the

C.3 provision added to Contra Costa County's NPDES permits. With these standards in place, no significant impact is anticipated.

**Mitigation Measure Hydrology and Water Quality C-3: None required.**

**Impact Hydrology and Water Quality C-4: All seven alternative reuse concepts could create or contribute runoff water that could exceed the capacity of existing or currently planned stormwater drainage systems (as considered in existing City engineering planning documents), or could result in additional sources of polluted runoff compared with existing conditions. This potential impact is considered to be less than significant.**

Development of the site under each of the seven alternative reuse concepts would increase the amount of impervious surfaces. The increase in impervious surfaces would increase the surface runoff, which would exceed the capacity of the existing stormwater drainage system. Construction activities can increase the amount of erosion of fine sediment that could violate water quality standards in downstream waters. Water quality could also be affected from non-point source pollution from newly developed areas. As discussed in subsequent alternative sections, the magnitude of this impact varies according to the alternative concept. Development of and implementation of a SWPPP and a Stormwater Control Plan to control erosion and non-point pollutants, as discussed under Impact Hydrology and Water Quality C-1, would reduce impacts to less than significant.

Furthermore, the General Plan (City of Concord, 2007) includes several policies intended to reduce adverse effects of increasing the amount of stormwater runoff that would exceed the capacity of existing stormwater drainage system. These policies are the same as discussed under Impact Hydrology and Water Quality C-1.

**Mitigation Measure Hydrology and Water Quality C-4: None required.**

**Impact Hydrology and Water Quality C-5: All seven alternative reuse concepts could substantially degrade water quality. This potential impact is considered to be less than significant.**

Development of the site under each of the seven alternative reuse concepts would result in ground disturbance and grading. Construction activities can increase the amount of erosion of fine sediment that could degrade water quality in downstream waters. Water quality could also be degraded by non-point source pollution from newly developed areas. Non-point source pollutants could occur from increased use of landscape fertilizers and pesticides, litter, heavy metals, oil and gas residues, tire fragments, and debris from vehicular traffic. The individual impact of these pollutants is expected to be minimal. Collectively, however, runoff from these sources could degrade water quality in downstream waters. As discussed in subsequent analysis of the alternatives, the magnitude of this impact varies depending on the anticipated level of development for each alternative concept.

The City would require a SWPPP to be prepared for any property greater than 1 acre, in accordance with NPDES regulations to control erosion and non-point pollutants. The City Engineering Department and the CCCFC&WCD would monitor adherence to these plans and pollution prevention standards. The SWPPP would establish requirements such as:

- Develop the site in phases to leave existing vegetated areas undisturbed until that portion of the site is ready for development.
- Revegetate, hydroseed, mulch, and/or install jute netting to protect areas from erosion after completion of grading and construction.
- Direct runoff from areas disturbed by construction while providing continuity of the existing drainage pathways.
- Collect runoff into vegetated swales or stable drainage channels to prevent erosion from stormwater runoff.
- Construct/install sediment ponds or siltation basins to collect suspended sediment before runoff is discharged into the existing drainage system on the site.
- Limit major excavation and earthmoving to avoid the rainy season.
- Develop and implement a program for the handling, storage, use, and disposal of hazardous materials and fuels. This program should include a plan for accidental hazardous material spills.

Source control and pre-discharge treatment measures are addressed by the Contra Costa Countywide Clean Water Program. Examples of source controls applicable to the alternatives include:

- Labeling storm drains that drain to the Delta or local creeks.
- Restricting the use of non-biodegradable fertilizers and pesticides.
- Reducing urban pollutants and debris that can be washed into the storm drain system.
- Limiting vehicle maintenance and washing to areas not directly connected to the storm drain system.
- Regular maintenance and cleaning of streets and parking areas.

Pre-discharge treatment measures are designed to remove stormwater contaminants that are not captured by the source controls listed above. Pre-treatment measures are often considered best management practices and include media filtration or small ponds and swales to remove contaminants. Media filters are used to remove contaminants by separating suspended sediment/debris and skimming floating grease and petroleum products from surface runoff. Media filter devices are typically installed in individual catch basins, or runoff from numerous catch basins is routed through a centralized media filter. Detention basins contain stormwater runoff and allow suspended sediment to settle out before the runoff is slowly discharged from the basin or infiltrates into the ground. Vegetated swales remove contaminants that adhere to vegetation in the swale.

Adherence to these local regulations and protocols would avoid any significant impact.

**Mitigation Measure Hydrology and Water Quality C-5: None required.**

**Impact Hydrology and Water Quality C-6: All seven alternative reuse concepts have the potential to interfere with groundwater recharge. However, the alternatives would not deplete groundwater supplies. This potential impact is considered to be less than significant.**

All seven alternative reuse concepts would result in an increase in the amount of impervious surfaces at the site. These additional impervious surfaces could change the existing groundwater recharge region. However, implementing existing required standards related to management of stormwater, such as the use of vegetated swales, sediment ponds, and filtration basins, will aid the continued recharge of groundwater. In addition, groundwater pumping is not anticipated with any of the alternative reuse concepts. Therefore, impacts to groundwater would be less than significant.

**Mitigation Measure Hydrology and Water Quality C-6: None required.**

**Impact Hydrology and Water Quality C-7: All seven alternative reuse concepts have the potential to alter existing drainage patterns or increase the rate or amount of surface runoff. This potential impact is considered to be less than significant.**

Development of the site with any of the seven alternative reuse concepts would require substantial ground disturbance and grading, which would alter the existing drainage pattern. The watershed boundary between the Mt. Diablo Creek watershed and Concord watershed is not clearly defined by topographic features in portions of the site, and has the potential to be altered by development of the site.

Additionally, development would increase the amount of impervious surfaces, which would increase the rate and amount of surface runoff. An increase in the amount of impervious surfaces resulting from the construction of residential and commercial buildings and parking lots would decrease the time in which precipitation would reach channels. The reduced infiltration as a result of these structures would thereby increase the amount of runoff. As the power of the flow is increased from the greater amount of water in a channel, the increased rate and amount of surface runoff typically results in channel incision in natural channels. Channel incision separates the active channel from the floodplain and decreases riparian habitat as vegetation on the former floodplain is perched above the altered shallow groundwater table. The increased rate and amount of surface runoff typically results in out-of-channel flooding in engineered channels that do not have excess flood capacity. However, because the City of Concord shall require that all development be designed to comply with existing requirements with respect to managing surface water flows from the site, there should be no significant impact.

**Mitigation Measure Hydrology and Water Quality C-7: None required.**

**Impact Hydrology and Water Quality C-8: All seven alternative reuse concepts have the potential to contribute to inundation by seiche, tsunami, or mudflow. This impact is considered to be less than significant.**

Seismic hazards are addressed in Chapter 6. Earth Resources. No large body of water is located on the site that would result in impacts from a seiche or tsunami. Landslide hazards are concentrated on steep terrain (over 30 percent grade) where no development is proposed. Impact Earth Resources C-3 discusses in detail why impacts from landslide, settlement, or collapse would be less than significant.

**Mitigation Measure Hydrology and Water Quality C-8: None required.**

7.3.3 Hydrology and Water Quality Impacts of Alternative Concept 1

7.3.3.1 Potentially Significant Hydrology and Water Quality Impacts of Alternative Concept 1

None identified.

7.3.3.2 Hydrology and Water Quality Impacts of Alternative Concept 1 that are Less Than Significant

**Impact Hydrology and Water Quality 1-1: Alternative Concept 1 could potentially result in the development of approximately 2,778 acres at the site in addition to any development for parks, recreation, and open space. This potential development would result in an increase in impervious surfaces and stormwater runoff directly proportional to the developed area. It would also result in potentially 11 new road crossings over Mt. Diablo Creek. However, all of the new development would have to comply with existing federal, State, and local regulations addressing runoff, water quality, and channel alterations. This impact is considered to be less than significant.**

Alternative Concept 1 would require implementation of Mitigation Measures Hydrology and Water Quality C-1 and C-2 to address possible impacts at the site due to flooding as a result of excess flows in Mt. Diablo Creek or as a result of increased water levels due to climate change. In addition, this Alternative would require compliance with existing stormwater management and water quality requirements for any development on the site. In addition, any construction activities within a stream channel to develop new stream crossings would also have to comply with existing regulations and obtain the necessary permits. For these reasons, it is anticipated that Alternative Concept 1 would result in potential hydrology and water quality impacts that are less than significant.

**Mitigation Measure Hydrology and Water Quality 1-1: None required.**

7.3.4 Hydrology and Water Quality Impacts of Alternative Concept 2

7.3.4.1 Potentially Significant Hydrology and Water Quality Impacts of Alternative Concept 2

None identified.

7.3.4.2 Hydrology and Water Quality Impacts of Alternative Concept 2 that are Less Than Significant

**Impact Hydrology and Water Quality 2-1: Alternative Concept 2 could potentially result in the development of approximately 2,578 acres at the site in addition to any development associated with parks, recreation, and open space. This potential development would result in an increase in impervious surfaces and stormwater runoff directly proportional to the developed area. It would also result in potentially 12 new road crossings over Mt. Diablo Creek. However, all of the new development would have to comply with existing federal, State, and local regulations addressing**

**runoff, water quality, and channel alterations. This impact is considered to be less than significant.**

Alternative Concept 2 would require implementation of Mitigation Measures Hydrology and Water Quality C-1 and C-2 to address possible impacts at the site due to flooding as a result of excess flows in Mt. Diablo Creek or as a result of increased water levels due to climate change. In addition, this Alternative would require compliance with existing stormwater management and water quality requirements for any development on the site. In addition, any construction activities within a stream channel to develop new stream crossings would also have to comply with existing regulations and obtain the necessary permits. For these reasons, it is anticipated that Alternative Concept 2 would result in potential hydrology and water quality impacts that are less than significant.

**Mitigation Measure Hydrology and Water Quality 2-1: None required.**

7.3.5 Hydrology and Water Quality Impacts of Alternative Concept 3

7.3.5.1 Potentially Significant Hydrology and Water Quality Impacts of Alternative Concept 3

None identified.

7.3.5.2 Hydrology and Water Quality Impacts of Alternative Concept 3 that are Less Than Significant

**Impact Hydrology and Water Quality 3-1: Alternative Concept 3 could potentially result in the development of approximately 2,378 acres at the site in addition to any development associated with parks, recreation, and open space. This potential development would result in an increase in impervious surfaces and stormwater runoff directly proportional to the developed area. It would also result in potentially 12 new road crossings over Mt. Diablo Creek. However, all of the new development would have to comply with existing federal, State, and local regulations addressing runoff, water quality, and channel alterations. This impact is considered to be less than significant.**

Alternative Concept 3 would require implementation of Mitigation Measures Hydrology and Water Quality C-1 and C-2 to address possible impacts at the site due to flooding as a result of excess flows in Mt. Diablo Creek or as a result of increased water levels due to climate change. In addition, this Alternative would require compliance with existing stormwater management and water quality requirements for any development on the site. In addition, any construction activities within a stream channel to develop new stream crossings would also have to comply with existing regulations and obtain the necessary permits. For these reasons, it is anticipated that Alternative Concept 3 would result in potential hydrology and water quality impacts that are less than significant.

**Mitigation Measure Hydrology and Water Quality 3-1: None required.**

7.3.6 Hydrology and Water Quality Impacts of Alternative Concept 4

7.3.6.1 Potentially Significant Hydrology and Water Quality Impacts of Alternative Concept 4

None identified.

7.3.6.2 Hydrology and Water Quality Impacts of Alternative Concept 4 that are Less Than Significant

**Impact Hydrology and Water Quality 4-1: Alternative Concept 4 could potentially result in the development of approximately 2,228 acres at the site in addition to any development associated with parks, recreation, and open space. This potential development would result in an increase in impervious surfaces and stormwater runoff directly proportional to the developed area. It would also result in potentially 10 new road crossings over Mt. Diablo Creek. However, all of the new development would have to comply with existing federal, State, and local regulations addressing runoff, water quality, and channel alterations. This impact is considered to be less than significant.**

Alternative Concept 4 would require implementation of Mitigation Measures Hydrology and Water Quality C-1 and C-2 to address possible impacts at the site due to flooding as a result of excess flows in Mt. Diablo Creek or as a result of increased water levels due to climate change. In addition, this Alternative would require compliance with existing stormwater management and water quality requirements for any development on the site. In addition, any construction activities within a stream channel to develop new stream crossings would also have to comply with existing regulations and obtain the necessary permits. For these reasons, it is anticipated that Alternative Concept 4 would result in potential hydrology and water quality impacts that are less than significant.

**Mitigation Measure Hydrology and Water Quality 4-1: None required.**

7.3.7 Hydrology and Water Quality Impacts of Alternative Concept 5

7.3.7.1 Potentially Significant Hydrology and Water Quality Impacts of Alternative Concept 5

None identified.

7.3.7.2 Hydrology and Water Quality Impacts of Alternative Concept 5 that are Less Than Significant

**Impact Hydrology and Water Quality 5-1: Alternative Concept 5 could potentially result in the development of approximately 1,578 acres at the site in addition to any development associated with parks, recreation, and open space. This potential development would result in an increase in impervious surfaces and stormwater runoff directly proportional to the developed area. It would also result in potentially 10 new road crossings over Mt. Diablo Creek. However, all of the new development would have to comply with existing federal, State, and local regulations addressing**

**runoff, water quality, and channel alterations. This impact is considered to be less than significant.**

Alternative Concept 5 would require implementation of Mitigation Measures Hydrology and Water Quality C-1 and C-2 to address possible impacts at the site due to flooding as a result of excess flows in Mt. Diablo Creek or as a result of increased water levels due to climate change. In addition, this Alternative would require compliance with existing stormwater management and water quality requirements for any development on the site. In addition, any construction activities within a stream channel to develop new stream crossings would also have to comply with existing regulations and obtain the necessary permits. For these reasons, it is anticipated that Alternative Concept 5 would result in potential hydrology and water quality impacts that are less than significant.

**Mitigation Measure Hydrology and Water Quality 5-1: None required.**

7.3.8 Hydrology and Water Quality Impacts of Alternative Concept 6

7.3.8.1 Potentially Significant Hydrology and Water Quality Impacts of Alternative Concept 6

None identified.

7.3.8.2 Hydrology and Water Quality Impacts of Alternative Concept 6 that are Less Than Significant

**Impact Hydrology and Water Quality 6-1: Alternative Concept 6 could potentially result in the development of approximately 1,528 acres at the site in addition to any development associated with parks, recreation, and open space. This potential development would result in an increase in impervious surfaces and stormwater runoff directly proportional to the developed area. It would also result in potentially 7 new road crossings over Mt. Diablo Creek. However, all of the new development would have to comply with existing federal, State, and local regulations addressing runoff, water quality, and channel alterations. This impact is considered to be less than significant.**

Alternative Concept 6 would require implementation of Mitigation Measures Hydrology and Water Quality C-1 and C-2 to address possible impacts at the site due to flooding as a result of excess flows in Mt. Diablo Creek or as a result of increased water levels due to climate change. In addition, this Alternative would require compliance with existing stormwater management and water quality requirements for any development on the site. In addition, any construction activities within a stream channel to develop new stream crossings would also have to comply with existing regulations and obtain the necessary permits. For these reasons, it is anticipated that Alternative Concept 6 would result in potential hydrology and water quality impacts that are less than significant.

**Mitigation Measure Hydrology and Water Quality 6-1: None required.**

7.3.9 Hydrology and Water Quality Impacts of Alternative Concept 7

7.3.9.1 Potentially Significant Hydrology and Water Quality Impacts of Alternative Concept 7

None identified.

7.3.9.2 Hydrology and Water Quality Impacts of Alternative Concept 7 that are Less Than Significant

**Impact Hydrology and Water Quality 7-1: Alternative Concept 7 could potentially result in the development of approximately 1,128 acres at the site in addition to any development associated with parks, recreation, and open space. This potential development would result in an increase in impervious surfaces and stormwater runoff directly proportional to the developed area. It would also result in potentially 7 new road crossings over Mt. Diablo Creek. However, all of the new development would have to comply with existing federal, State, and local regulations addressing runoff, water quality, and channel alterations. This impact is considered to be less than significant.**

Alternative Concept 7 would require implementation of Mitigation Measures Hydrology and Water Quality C-1 and C-2 to address possible impacts at the site due to flooding as a result of excess flows in Mt. Diablo Creek or as a result of increased water levels due to climate change. In addition, this Alternative would require compliance with existing stormwater management and water quality requirements for any development on the site. In addition, any construction activities within a stream channel to develop new stream crossings would also have to comply with existing regulations and obtain the necessary permits. For these reasons, it is anticipated that Alternative Concept 7 would result in potential hydrology and water quality impacts that are less than significant.

**Mitigation Measure Hydrology and Water Quality 7-1: None required.**

7.3.10 Hydrology and Water Quality Impacts of the “No Project” (NP) Alternative

7.3.10.1 Potentially Significant Hydrology and Water Quality Impacts of the “No Project” (NP) Alternative

None identified.

7.3.10.2 Hydrology and Water Quality Impacts of the “No Project” (NP) Alternative that are Less Than Significant

With the “No Project” Alternative the hydrologic and water quality conditions at the site would remain unchanged. The ongoing remedial activities being implemented by the Navy are discussed in Chapter 12. Hazardous Materials/Waste would continue and would reduce the potential for surface water and groundwater contamination for known sources.

**Mitigation Measure Hydrology and Water Quality NP-1: None required.**

## 7.4 References

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