4. Mill Pond Complex Restoration Concept

Georgia-Pacific and the City have initiated a community planning process to identify and evaluate projects that effectively encompass the regulatory requirements for site remediation and dam safety compliance, protection of environmental resources and their beneficial uses (e.g., jurisdictional waters/wetlands and ESHAs), and the long-term plan the City and community of Fort Bragg have for the MPC area. Central to this complex collaborative process is a strategic framework that established some basic concepts and understandings central to a successful planning effort. Key concepts embraced in this process are outlined below:

phasing = timing not responsibility or piecemealing

- The MPC Project will be accomplished in at least two phases of work. The actions in the first phase, which are necessary to address the dam safety issues, must be complete by 2015. This phase of work will encompass the rerouting of storm water; remediation of OU-E (including management of the sediment in Ponds 6, 7 and 8); removal of the Mill Pond dam, spillway, cribwall, and north wall; and associated mitigation and revegetation activities. Subsequent phases of work are anticipated to consist of actions necessary to implement the remainder of the City's long-term plan for the MPC. The later phase project(s) will be addressed at a programmatic level in the Mill Site Specific Plan EIR, whereas the first phase projects will be addressed at a project-specific level of design.

- Georgia-Pacific and City staff implemented a planning process to identify a preferred conceptual alternative for the MPC Restoration Project and at least one feasible alternative to be evaluated in the Mill Site Specific Plan EIR. The preferred alternative described herein is designed to create a platform on which subsequent phase project(s) related to the City's long-term MPC plan can be based. A key objective of the planning process was to define the City's long-term vision for the MPC at a programmatic level to facilitate a first phase project design that will result in site conditions that facilitate subsequent phases and do not preclude or impede future actions to achieve the long-term vision.

- OU-E, which encompasses the majority of the MPC Restoration Project area, contains areas that are potentially considered ESHAs under the CCA. Many of these areas will be disturbed during the project implementation, resulting in the need to evaluate possible mitigation measures. Regulatory policies of state and federal agencies generally require that mitigation be provided in-kind, preferably on-site, and within one year of project implementation. On a multiple-year project, piecemeal in-kind mitigation may lead to a disjointed and dysfunctional suite of restoration and mitigation projects that fail to achieve the MPC Restoration Project objectives and the community vision. To avoid this potential outcome, ecological areas within OU-E are considered as a complex of related ESHAs. One of the MPC Restoration Project goals is the development of an integrated restoration and mitigation plan based on a holistic view of the MPC that allows flexibility in the timing, kind, location, and extent of restoration and mitigation.

historic features, natural processes, functional ecologic system

- Investigation and remediation of site soil, sediment, and groundwater is necessary to achieve site closure under the oversight of DTSC, with input from the RWQCB, other regulatory agencies, and the City. Remediation objectives and actions necessary to complete the first phase scope of work could differ from remedial actions that may be necessary under the subsequent phases of work to implement the long-term vision for the MPC.

- The planning process has considered and qualitatively evaluated a range of MPC project alternatives with respect to the following factors for both: 1) the time period between the conclusion of the 2015 scope of work and implementation of the long-term vision; and 2) implementation of the long-term vision for:

  - Surface water and stormwater management
  - Regulatory complexity and feasibility
  - Remedial requirements
  - Restoration
  - Mitigation requirements
  - Long term operations and maintenance (O&M)
  - Ecological function
  - Implementation costs
  - Aesthetics
  - Public access

- The MPC Restoration Project alternative selected is required to be consistent with the policies for coastal resources management specified in the CZMA, as administered by the CCC and the City through the LCP. As such, the MPC Restoration Project preferred alternative has been designed to be consistent with CCC objectives and policies for restoration of historical ecological features in the Coastal Zone. This design objective is compatible with the site closure and remedial objectives for the site, the Mill Site Specific Plan, and the Fort Bragg community vision for the MPC area.

4.1 Overview

The MPC Restoration Project consists of the following three primary components:

- Creation of a single wetland system in the OU-E lowland composed of low marsh, high marsh, and adjacent coastal shrub and grassland habitats

- Restoration of Maple Creek through daylighting the historical Maple Creek channel, enhancing the existing Maple Creek channel by correcting stream incision and controlling invasive plants, and daylighting the open channel connection between the MSRA and Maple Creek between Wetlands L and J

- Restoration of the western end of the historical South Ponds stream channel to allow for flow from the South Ponds and portions of the southern areas of the site to drain into the Pacific Ocean off of the coastal bluff in the historical location.

The three primary MPC Restoration Project components will create an ecologically connected system that contains habitats currently rare on the site (e.g., stream channel, riparian corridor, and perennial marsh) and will improve the overall ecological function of the system compared to the current wetland and surface water features. The MPC Restoration Project will provide 50-foot buffers around each of these components.

4.2 Operable Unit E Lowland

The OU-E lowland area is slated for various remediation activities to address soil and sediment impacts, and closure activities to remove the Pond 8 spillway cribwall and north wall. As a part of the remediation and closure activities, the preferred alternative will restore those areas impacted to create new wetland areas in the OU-E lowland, and enhance wetland areas on the hillsides of the OU-E lowland by creating surrounding coastal shrub habitat and controlling growth of invasive plants. The OU-E lowland wetland and associated terrestrial habitats will form the central component of an ecologically functional public open space providing a broad range of beneficial services including: coastal access, recreation, ecological habitat and species diversity, and a wildlife migration corridor. The following section presents current conditions in the OU-E lowland, a description of the restoration proposed in the preferred alternative for this area, and the specific activities necessary to complete the restoration.

4.2.1 Current Conditions

The OU-E lowland area is an approximately 6.22-acre area located in the center of the site adjacent to Soldier Bay. This area formerly housed the Mill Site Powerhouse and related infrastructure. The OU-E lowland is a naturally low area bounded by a man made earthen berm (the beach berm) adjacent to Pond 6, which separates the OU-E lowland from Soldier Bay, the Pond 8 dam north wall on the south, and the upland terrace for the site on the north and east (Figure 1-2). Most of the industrial features and buildings in the OU-E lowland have been removed, although some foundations still exist in this area.

The basic characteristics of the aquatic habitat features associated with the OU-E lowland are presented in Table 2-1. Most waters/wetlands features in the OU-E lowland do not have a direct hydrologic surface connection to Soldier Bay. However, Pond 6 has a surface flow connection to Soldier Bay via a corrugated

high density polyethylene culvert that discharges through the beach berm onto the riprap on the outboard face of the beach berm. Seasonal wetlands (i.e., the western portion of Wetland E-1and Wetlands E-2, E-5/E-6 and E-7) and most industrial ponds (i.e., Ponds 6 and 7 and North Pond) in the OU-E lowland area are fed by direct precipitation and surface water runoff. Wetland E-4, an unvegetated ponded feature created by a remaining building foundation, and seep wetlands (i.e., the eastern portion of Wetland E-1and Wetlands E-3 and E-8) in the OU-E lowland are fed primarily by emergent groundwater. Runoff into the OU-E lowland also occurs from impervious surfaces (i.e., asphalt and concrete) in the upland terrace to the north and east.

Based on the CRAM results (Section 2.3), ARCADIS concluded that the components of the OU-E lowland (i.e., industrial Ponds 6, 7, North Pond, and Wetland E-4; seep and seasonal Wetlands E-1, E-2, and E-5/E-6) possessed between 43 and 58 percent of the ecological function present in a typical reference system. Seep and seasonal wetlands in the OU-E lowland received higher CRAM scores than the industrial ponds due to a more natural hydrologic regime, which resulted in a more consistent source of surface water. Hydrology in the industrial ponds is dominated by flashy stormwater inputs or stormwater surface flow from adjacent ruderal and paved areas. The most limiting factor of the OU-E lowland waters/wetlands is their small isolated nature, which limits the structural diversity that can develop in these areas.

Vegetation in the delineated boundaries of the OU-E lowland potential waters/wetlands is a mix of native and invasive hydrophytes. The potential waters/wetlands that have the furthest spread of invasive species are Pond 5 and Wetlands E-1, E-2, and E-5/E-6. Upland areas directly adjacent to the waters/wetlands in the OU-E lowland, including the adjacent hillsides, are dominated by non-native annual grasses and weeds. Pampas grass is a common invasive species growing in the upland areas of the OU-E lowland.

Historically, the OU-E lowland area contained the confluence of Alder and Maple Creeks and supported a wetland that discharged to Soldier Bay. The approximate locations of the historical aquatic features are shown on Figures 2-1 and 4-1. Current seeps in the OU-E lowland area indicate that the subsurface hydrology associated with these historical features remains.

4.2.2 Related Site Closure and Site Development Activities and Objectives

The following activities associated with the remediation and demolition will occur or influence restoration activities in the OU-E lowland:

- Pond 6 and Pond 7 sediment will be remediated and the bottom elevations backfilled to depths consistent with the OU-E lowland restoration grading plan.

- Remaining OU-E lowland concrete foundations and retaining walls will be removed.

- Pond 8 surface water flow (i.e., on-site surface runoff and City storm water discharge from the Alder Creek and Maple Creek watersheds) will be routed into the OU-E lowland to allow dewatering of Pond 8 in preparation for sediment management as defined in the pending OU-E remedial action plan.

- Following Pond 8 sediment management, the pond will be closed and the north wall (i.e., south wall of OU-E lowland) will be regraded to create a stable slope between the OU-E lowland and upland terrace.

- Closure of Pond 8 will result in the loss of approximately 7.3 acres of state and USACE jurisdictional waters, and potential ESHA, for which compensatory mitigation will be provided in the restored OU-E lowland (Section 4.2.3) and Maple Creek Riparian Corridor (MCRC; Section 4.3.2.1).

- The OU-E wetland will include sufficient volume, morphologic, and vegetative characteristics to facilitate flow control and flow energy dissipation during storm runoff events from the contributing watersheds.

- Mill Site Specific Plan storm water management planning for future development in the northern portion of the site will route pretreated storm water into the OU-E lowland. An area of approximately 18.4 acres north of the OU-E lowland will contribute estimated flows of approximately 39 cubic feet per second during a 100-year, 24-hour event. These projected flows will be incorporated in the OU-E lowland design.

- Upon completion of the OU-E restoration, the north and south segments of the California Coastal Trail (CCT) will be connected via a trail segment through the OU-E lowland area. The preferred alternative routes the CCT along the top of the beach berm to facilitate access to Soldier Bay and provide wet and dry season access.

4.2.3 Proposed Restoration Design

The OU-E lowland restoration components associated with the preferred alternative are described below; descriptions are organized by habitat type or physical feature. MPC Restoration Project features addressed include refurbishing of the beach berm and creation/restoration of ponded wetlands, low marsh, high marsh, and coastal shrub and grassland habitat. Figures 4-2 through 4-5 present details of the OU-E lowland and MCRC (Section 4.3) draft conceptual design. The OU-E lowland and MCRC are the central features of the MPC Restoration Project.

4.2.3.1 Beach Berm

In the preferred alternative, the beach berm will remain in place and continue to provide protection for the OU-E lowland area from high surf wave energy during storm events and serve as a platform for the CCT during wet and dry conditions. The following potential modifications for the beach berm are proposed:

- Box culvert - A low-profile box culvert consisting of three precast concrete cells (approximately 3 feet high by 10 feet wide and approximately 20 feet long) will be installed in the beach berm in the vicinity of the current Pond 6 outfall. The box culverts will be sized to safely pass the peak flow volume associated with a 100-year storm event, and the invert of the box culvert will serve as the controlling elevation for discharge from the OU-E lowland. A geotechnical evaluation of the beach berm will be conducted to determine the type and extent of the tie in (e.g., wing walls) and reinforcement (e.g., rip rap) necessary to secure the box culvert in the berm during high flow and surf conditions.

- Beach Stability - Rip rap will be placed at the outlet for the box culvert to dissipate flow energy and prevent erosion of Soldier Beach.

- Beach Berm Appearance - The outboard surface of the beach berm is currently protected with riprap consisting of large rock and concrete debris. The outboard surface of the beach berm will be modified to improve its appearance, provide safe public access to Soldier Beach, and provide continued erosion protection. Methods under consideration include but are not limited to:
  - Removal of the concrete debris and consistent use of rock riprap
  - Removal of the concrete debris and rock riprap, consolidation of the rock rip rap and the introduction of geogrid mats and native woody and herbaceous plantings tolerant of salt spray
  - Removal of concrete debris and rock riprap and installation of articulated block mats

- CCT - Future CCT development is proposed to occur along the top of the beach berm and over the box culvert. It is anticipated that the City will design and construct an all weather trail or will opt for a seasonal trail using native materials. It is anticipated that final design of the CCT will include public safety features such as railings on both sides of the trail at and near the box culvert and stairs or other safe pathway to Soldier Beach.

4.2.3.2 OU-E Lowland Wetlands

The OU-E lowland wetland will consist of three primary habitat types: ponded wetlands, low marsh, and high marsh. The extent, characteristics, and functions of these habitat types in the OU-E lowland wetland are described below. The OU-E lowland wetland will be approximately 6.26 acres and will encompass all of the OU-E lowland between the beach berm and the mouth of the restored MCRC at the eastern end of OU-E lowland (Figure 4-2). Coastal shrub and native grassland habitat will be created on the slopes surrounding the OU-E lowland wetland.

Ponded Wetland

Approximately 0.88 acre of ponded wetland will be created/restored in the OU-E lowland. Characteristics of the ponded wetlands are presented below:

- The daylighted Maple Creek Channel will discharge to the OU-E lowland into a ponded wetland (the Forebay) designed to dissipate energy and release flows to the low and high marsh areas.
- The Aftbay is located on the inboard side of the beach berm in the approximate location of Pond 6. The Aftbay will dissipate energy from the marsh system and release flows via a box culvert in the beach berm above the high tide line adjacent to Soldier Bay.
- Both ponded wetlands will be approximately 2 to 3 feet deep and will be fed by groundwater during the dry season. They will also provide flow retention during low to moderate flows and will regulate discharge of water through the system.
- Bottom materials used to construct the Forebay are expected to be composed of stone and soil to help prevent erosion. Following maturation of the restored system, sediment in the Aftbay is expected to be composed of silty or clayey loam.
- Vegetative species expected in the ponded wetlands will primarily be tall emergent and floating hydrophytes. Revegetation is expected to occur through natural recruitment from local seed source on the site. Therefore, these species are not expected to be necessary for a planting plan. However, Table 4-1 presents typical species expected to occur in this habitat.
- Ponded wetland habitat is expected to provide the following ecological functions: perennial aquatic habitat, wildlife habitat, carbon sequestration and storage, nutrient (e.g., phosphorous and nitrogen) sequestration and storage, surface water filtration, sediment retention, and storm flow retardation.

Low Marsh

Approximately 2.90 acres of low marsh will be created/restored in the OU-E lowland. Low marsh makes up one of the two central components of the OU-E lowland wetland (high marsh being the second), and is described by the following features:

- Low marsh habitat will directly connect flow between the Forebay and Aftbay and will be approximately 100 to 125 feet wide. A small meandering low-flow channel is expected to develop in the low marsh. The low marsh habitat will provide the primary flow path for low to moderate flows. Hydrology of the low

marsh area will be supplied by direct groundwater discharge during the dry season. Therefore, the low marsh habitat is classified as herbaceous seep wetlands.

- Following maturation of the restored system, soil in the low marsh areas is expected to be silty to clayey loam.

- Vegetation expected in the low marsh will primarily be tall emergent hydrophytes. Revegetation will be achieved through a combination of seeding and natural recolonization from local seed sources on the site. Table 4-1 presents typical species expected to occur in low marsh habitat.

- Low marsh habitat is expected to provide the following ecological functions: wildlife habitat, perennial aquatic habitat, carbon sequestration and storage, nutrient (e.g., phosphorous and nitrogen) sequestration and storage, surface water filtration, sediment retention, and stormwater retardation.

High Marsh

Approximately 2.49 acres of high marsh will be created/restored in the OU-E lowland (Figure 4-2). High marsh will make up approximately 40 percent of the OU-E lowland wetland, and is described by the following features:

- High marsh habitat will be created on a floodplain area approximately 1-foot higher than the low marsh plain. High marsh habitat will encourage low to moderate flow in the low marsh to meander though the OU-E lowland, thereby increasing residence time. During high flow events, surface water will overtop the high marsh area and flow directly between the Forebay and Aftbay. Surface hydrology in the high marsh is expected to be dominated by wet season flows and precipitation. During the dry season, the high marsh is expected to have moist to saturated soils within 1-foot of the ground surface due to the high groundwater table. Due to this hydrologic regime, the MPC Restoration Project defines the high marsh area as herbaceous seasonal wetland.

- Following maturation of the restored system, soil in the high marsh areas is expected to be sandy loam.

- Vegetation expected in the high marsh will primarily be tall emergent hydrophytes. However, some shrub species will be present in the areas where drier conditions occur. Additionally, willow fascines may be used to help stabilize slopes at the outside bends of the low marsh areas. High marsh revegetation will occur through a combination of seeding, planting, and natural recolonization. Table 4-1 presents typical species expected to occur in high marsh habitat.

- High marsh habitat is expected to provide the following ecological functions: wildlife habitat, seasonal aquatic habitat, carbon sequestration and storage, nutrient sequestration and storage, surface water filtration, sediment retention, and storm flow retardation.

Coastal Shrub and Grassland Habitat

Approximately 12.17 acres of coastal shrub and grassland habitat will be created adjacent to the OU-E lowland, and approximately 0.45 acre of seasonal and seep wetlands will be enhanced through creation of this habitat (Figure 4-2).

- Coastal shrub habitat will be created in the ruderal areas currently located on the hillsides immediately north of the OU-E lowland and the regraded slope created following the remove of Pond 8 and the spillway, cribwall, and north wall dam (Figure 4-2).

- Existing Wetlands B, C, and D, and E-7 and E-8 (Figure 2-3b) will not be disturbed as part of this habitat creation. However, these wetland areas will be enhanced through creation of a more ecologically functional surrounding habitat and control of invasive species.

- Vegetation in this habitat will be consistent with coastal shrub and grassland habitats present in the Fort Bragg area. Additionally, invasive species (e.g., pampas grass) currently dominating these areas will be controlled.

- The coastal shrub and grassland habitat will be dominated by a mosaic of native herbaceous and woody shrub vegetation and native grasses. Table 4-1 presents typical species that would be expected to occur in this coastal habitat. However, species that would be planted following construction may vary slightly depending on availability from local/regional nurseries.

- Coastal shrub and grassland habitat is expected to provide the following ecological functions: wildlife habitat, perennial aquatic seeps, carbon sequestration and storage, and nutrient sequestration and storage. This habitat will also reduce velocity of surface runoff from the areas surrounding the OU-E lowland compared to current conditions, increasing surface water filtration, and groundwater recharge. Furthermore, this habitat will facilitate infiltration and reduce the velocity of surface runoff between the OU-E wetland habitats and future development on the upland terraces to the north and east.

4.3 Maple Creek Riparian Corridor Restoration

During the MPC Restoration Project scoping process, the following key objectives were incorporated into the preferred alternative:

- Rerouting of surface flow from Maple and Alder Creek storm drainages around Pond 8 to the OU-E lowland to facilitate management of sediment in Pond 8 prior to closure of the pond and removal of the dam

- A strong community interest to daylight historic Maple Creek and restore riparian habitat to the site

- A practical objective to limit the construction of hard structures and creation of related maintenance and operational requirements

These objectives guided design of the MCRC component of the MPC Restoration Project.

The following section describes current conditions for the surface drainages that will need to be rerouted to dewater Pond 8 (i.e., Maple Creek and Alder Creek storm drainages), a description of the restoration and enhancements proposed in the preferred alternative to daylight Maple Creek, connect the restored Maple Creek channel and associated riparian area (MCRC) to the existing MSRA, and manage flows from the Alder Creek storm drainage. Figures 4-2 through 4-5 present the plan view, cross-sections and profile of the proposed Maple Creek activities.

4.3.1 Current Conditions

Pond 8 receives direct surface runoff from the ruderal and impervious surfaces located to the south and east of the pond, Basin S including the South Ponds, as well as piped stormwater and base flow from the Maple Creek watershed (124 acres) in the City of Fort Bragg, the on-site MSRA (30 acres), and from the Alder Creek watershed (103 acres) in the City.

- The lands immediately south and east of Pond 8 formerly contained a sawmill, planer, and weigh station facilities located in OU-D. The majority of these facilities have been removed and soil remediation has occurred.

- The Maple Creek storm drain is fed almost entirely urban runoff and baseflow input from drainage basin C, as defined in the City's *Storm Drainage Master Plan* (Winzler and Kelly 2004).

- Wetland D-1 and Wetland L (Figure 2-3c) convey surface water runoff from the MSRA to Wetland J and a short above-grade section of the Maple Creek channel. The magnitude of the site's surface water input to Maple Creek is expected to be small when compared to that of the City.

The Maple Creek storm drain enters the site at the northeast corner of the MSRA via two 36-inch culverts and runs through a deeply incised channel for a distance of approximately 200 feet where it enters a 36-inch culvert that routes the flow to the southeast corner of Pond 8. The surface channel, which is in poor

condition, runs through an area densely vegetated with invasive species (Himalayan blackberry [*Rubus discolor*]), is cut off from its surrounding floodplain, and shows field indicators of moderate to severe channel degradation (e.g., downcutting of the channel bed, erosion of the channel banks at the headwall on the east end of Maple Creek adjacent to Highway 1, and slumping of channel banks as the channel bed erodes).

Historically, flows in Maple Creek would likely have been regulated by riparian buffers and vegetated landscapes with little to no impervious surface resulting in a high degree of infiltration and surface runoff retardation, which collectively reduce the intensity and magnitude of storm event flows. Development of the City's urban landscape in the Maple Creek watershed over the past 100 years or more has substantially increased the amount of impervious surfaces, removed riparian and vegetated buffers, culverted Maple Creek throughout the watershed, and facilitated rapid discharge of stormwater flows. These changes result in short-duration, high-intensity flows in response to precipitation events (ARCADIS 2011b).

The MSRA contributes on-site surface runoff during storm events and base flow resulting from emergent groundwater. The MSRA is described as follows:

- The Maple Street Riparian Area encompasses approximately 30 acres located on the eastern edge of the site (Figures 2-3 and 2-3c). It contains a mix of forest and grassland upland (approximately 24 acres), degraded riparian habitat (approximately 2 acres), wetlands (approximately 3 acres), and channelized drainage features (approximately 962 linear feet). The MSRA captures the on-site runoff from these areas and funnels into the existing Maple Creek drainage channel in Wetland D-1 prior to entering the culvert to Pond 8. The man-made drainage channels capture runoff from portions of OU-D. The aquatic features in this area are components of OU-E.

- Wetland L is a spring-fed linear stream channel feature (Figure 2-3c) that is thought to be the channelized drainage that captures flow from the historical Maple Creek (Figure 4-1).

- Vegetation in MSRA is dominated by a mix of native and invasive species. The dominant species in the northern portion of the MSRA is invasive Himalayan blackberry. A few native species of trees, dominated by red alder, are present in a limited woody overstory. The abandoned Maple Creek floodplain is a seep wetland area with groundwater discharge at the surface through much of the year. The floodplain is primarily herbaceous cover, dominated by a mix of native and invasive wetland grasses and forbs. The Maple Creek channel and abandoned floodplain are surrounded by steep berms on all sides that transition to the site and Highway 1. The MSRA uplands support native and non-native grasses and forbs and a Bishop pine overstory.

Alder Creek drainage captures stormwater runoff from the City of Fort Bragg Basin D (Winsler and Kelly 2004) and conveys baseflow from the historic Alder Creek watershed. Alder Creek is piped throughout the watershed. It enters the site northeast of Pond 8 and discharges to the northeast corner of Pond 8.

Pond 5 is located immediately east of Pond 8. This triangular pond received water pumped from Pudding Creek, which was then transferred to Pond 8. Pond 5 currently receives only surface runoff from the upgradient paved areas and potentially emergent groundwater during the wet season. Stormwater is actively pumped from Pond 5 into Pond 8, when necessary, to prevent overflow. The pond is predominately open water but does support cattails and ruderal vegetation along its margin and steep banks.

4.3.2 Related Site Closure and Site Development Activities and Objectives

The following activities associated with the MPC remediation and demolition will occur in the Maple Creek stream restoration area or influence restoration activities:

- Surface water discharge to Pond 8 from the Alder Creek and Maple Creek drainages will be rerouted around Pond 8 to the OU-E lowland wetland. This will likely occur in two steps: the first to route flow around the northeast corner of Pond 8 and the second to shift the restored MCRC to its final position cutting across the northeast corner of Pond 8 following Pond 8 closure.

- The culverted Maple Creek drainage will be restored to create the 1,500-foot-long MCRC.

- The northern end of the MSRA will be regraded to connect with the restored MCRC and provide a stable stream channel and confluence with the existing MSRA drainages (i.e., Wetlands J, K, D-1, and D-2; Figure 2-3c).

- Impacted sediment in the MSRA drainage channel (i.e., Wetland L; Figure 2-3c) and soil in the restoration of the affected channel will be remediated.

- Alder Creek drainage will be connected to the MCRC and OU-E Lowland wetland.

- Pond 5 (Figure 4-2) will be connected hydraulically to the MCRC through the Alder Creek drainage outfall.

- Transportation and utility routing between the north and southern portions of the site will need to be designed to accommodate the restored MCRC.

4.3.3 Proposed Restoration Design

The various components of the Maple Creek restoration activities are described in the following sections.

4.3.3.1 Maple Creek Riparian Corridor

To create a continuous ecological system between the OU-E lowland and the existing MSRA, the MPC Restoration Project preferred alternative proposes to daylight the culverted Maple Creek storm drain in a flow path similar to the historical Maple Creek. Due to the expected increase of intensity of flows in the Maple Creek channel, compared to those likely historically present, the channel will need to flow slightly to the north and west of its historical location (Figure 4-1) to reduce channel grade and to allow for energy dissipation of the water flow as the new channel enters the OU-E lowland. The new MCRC will contain three distinct habitat components: stream channel, riparian floodplain, and riparian upland. These components are further described below.

Restored Stream Channel

The new Maple Creek channel will create approximately 1,500 linear feet of stream channel with a 180-foot-wide riparian corridor (approximately 0.68 acre). The new Maple Creek stream channel will be the primary conduit for site and City surface flow to the OU-E lowland, and is described below:

- The new Maple Creek channel will have an overall slope of approximately 2 percent with intermittent rock weirs (e.g., boulder arches) installed to form pool, glide, and riffle habitats and encourage flow dispersal on to the channel floodplain. The channel will be approximately 10 feet wide at the bottom and approximately 2 feet deep with 2:1 (horizontal to vertical distance) slopes meeting the adjacent floodplain. The new Maple Creek channel will be designed to convey estimated peak channel forming flow (i.e., between the 1.5- and 2-year return period storm). A conceptual cross-section of the new stream channel is presented as cross-sections A and B on Figure 4-3.

- Flow within the new Maple Creek channel will be dominated by storm flow from the City and the site during the rainy season. During the dry season, Maple Creek drainage conveys modest base flow from the Maple Creek watershed and Maple Street Riparian Area. This flow will be supplemented by emergent groundwater because the proposed channel bottom is expected to be below the groundwater table during the dry season. Figure 4-4 shows the channel bottom profile and the representative dry season (i.e., October) groundwater level measurements for 2010.

- The channel bottom will be constructed of cobble and gravel of an appropriate diameter to withstand sheer stress of predicted flows and to prevent mass erosion and downcutting of the channel.

- Vegetation is not expected to grow in the newly created stream channel except along the channel margins in areas where slower flow conditions occur near geomorphic flow control features.

Riparian Flood Plain

A substantial component of the MCRC will be the riparian floodplain created adjacent to the new Maple Creek stream channel. The riparian floodplain will transmit stream flow during storms exceeding the channel forming flow, will mitigate volume and velocity of overland stormflows into the aquatic habitat present in the stream channel, and will provide allochthonous organic input to the aquatic ecosystem. The riparian floodplain will contain two aquatic sub-habitats (seasonal and seep riparian wetlands) as defined by typical groundwater levels in relation of the riparian floodplain surface elevation. Approximately 0.69 acre of seasonal riparian wetlands and 1.36 acres of seep riparian wetlands will be created in the Maple Creek riparian floodplain. Distinguishing characteristics of the riparian floodplain and two sub-habitats are described below:

- The riparian floodplain will be designed to transmit peak flow of the 100-year return period storm with a minimum of 1 foot of freeboard above the high water mark. Depressional areas will also be graded in the floodplain to pond surface water as storm flows recede. Width of the floodplain on either side of the channel will vary as the stream channel meanders within the floodplain. However, the floodplain will total approximately 60 feet in width. The riparian floodplain will abut the riparian upland slopes that transition to the surrounding existing grade. Cross-sections A and B on Figure 4-3 present two conceptual cross-sections of the riparian floodplain as the stream channel meanders from left to right.

- The riparian floodplain will consist of two sub-habitats: seep riparian wetlands and seasonal riparian wetlands. Approximately the first 500 linear feet of the new riparian floodplain are defined as seasonal riparian wetlands in the conceptual design, as the primary source of hydrology will be overflow from the creek channel during the rainy season. The remaining 1,000 linear feet of riparian floodplain is defined as seep riparian wetland in the conceptual design because the floodplain surface will be approximately 1 foot below the current dry season groundwater table (Figure 4-3).

- Following maturation of the restored system, soils comprising the floodplain areas are expected to be sand to sandy loams derived primarily from the existing soil profile in the restoration area.

- The riparian floodplain is expected to be dominated by herbaceous and woody plant communities, with shrubs and low trees dominating the canopy, saplings dominating the understory, and herbaceous wetland vegetation dominating the groundcover. Vegetation comprising the seasonal and seep wetland areas is expected be similar with species more adapted to continually saturated conditions being more prevalent in the riparian seep wetland areas. The depressional areas in the floodplain will likely retain water for longer periods than other areas of the floodplain and will likely provide habitat for more obligate wetland species. Revegetation of the riparian floodplain will occur through a combination of planting, seeding, and natural recolonization. Table 4-1 presents typical species that would be expected to occur

in the riparian floodplain area. However, species that would be planted following construction may vary slightly depending on availability from local/regional nurseries.

- Riparian floodplain habitat will provide ecological functions typical of small perennial coastal stream systems, including wildlife and aquatic habitat, groundwater exchange, carbon sequestration and storage, carbon export to the adjacent aquatic system, nutrient sequestration and storage, sediment retention, and stormwater retardation.

Riparian Upland

The upland riparian habitat will occupy approximately 50 feet on each side of the riparian floodplain areas. Approximately 3.29 acres of riparian upland will be created in the MCRC. The riparian upland will mitigate volume and velocity of overland storm flows to the aquatic habitat present in the stream channel and riparian floodplain wetlands by retarding surface flow as it drains from the surrounding elevations to the riparian floodplain areas.

- The transition slope between the riparian floodplain and the surrounding existing grade will be a minimum of 3:1 (horizontal to vertical distance) to provide stability. Cross-sections A and B on Figure 4-3 present conceptual cross-sections depicting riparian upland transition slopes and areas as they extend onto the existing grade.

- Following maturation of the restored system, soils comprising the floodplain areas are expected to be sandy loams composed predominantly of existing site soils.

- The upland habitat is expected to be dominated by a tall woody canopy, a relatively open shrub understory, and herbaceous groundcover. Vegetative species present in the riparian upland are expected to be those more adapted to dry conditions. However, deep-rooted species more accustomed to wetter habitats will likely appear as the slope transitions from the existing grade to the riparian floodplain. Revegetation of the riparian upland will occur through a combination of planting, seeding, and natural recolonization. Table 4-1 presents typical species that would be expected to occur in the riparian upland area. However, species that would be planted following construction may vary slightly depending on availability from local/regional nurseries.

- Riparian upland habitat is expected to provide the following ecological functions: wildlife habitat, carbon sequestration and storage, carbon export to the adjacent aquatic system, nutrient sequestration and storage, surface runoff retardation, and sediment retention.

Collectively, the MCRC (i.e., stream channel, floodplain, and riparian upland) will provide the following ecological functions:

- Wildlife riparian habitat and a migration corridor between the Soldier Bay, the OU-E wetland, and MSRA; the riparian corridor will provide vertical structure and cover, which is lacking on the site

- Aquatic habitats in the form of perennial stream, perennial seep, floodplain depressional wetlands, and seasonal floodplain wetlands

- Water quality benefits related to groundwater exchange, nutrient storage and cycling, sediment retention, and stormwater and surface runoff retardation

- The stream system is not expected to provide habitat for fish due to the upstream culverting and lack of upstream freshwater fish habitat and existing populations

4.3.3.2 Maple Street Riparian Area

Remediation and Maple Creek restoration activities in the MSRA include excavation of impacted sediment in the Wetland L stream channel, removal of the culvert connecting Wetland L to the current Maple Creek channel, and enhancement of Wetland J to create a more stable and ecologically functional confluence for the Maple Creek drainage from the City with Wetland L and drainage D-1.

Remediation of Wetland L sediment will remove surface sediment impacted by site-related constituents and ash from the previously adjacent Ash pile, which was remediated in September 2006. The location, extent, and methods of remediation will be defined in the OU-E Remedial Action Plan (pending). Following sediment treatment, the remediation action area will be restored to existing grade and revegetated with native plants suitable for the habitat areas.

The objective of the Wetland J/Maple Creek Confluence activities is to create a stable entrance to the restored MCRC for the Maple Creek drainage from the City and tie in the other surface drainages from the MSRA (i.e., Wetland L and Drainage D-1; Figure 2-3c). This area will receive short duration and high intensity storm flows generated by the impervious surfaces in Basin C during the wet season, and base flow and emergent groundwater throughout the wet and dry seasons. The preferred alternative includes the following:

- The existing segment of the Maple Creek channel that passes through Wetland J (Figure 2-2c) will be broadened and the near-vertical banks will be regraded to provide more stable conditions (Figure 4-5, Cross-section C-C'). This cross-section should only be viewed as conceptual, as detailed survey information is necessary to evaluate current elevations of the channel bottom, morphology of the channel cross-sections, and elevations of the adjacent abandoned floodplain. Approximately, 0.05 acre (400 linear feet) of the Maple Creek channel will be enhanced.

- Rip rap and cobble will be placed at the discharge for the Maple Creek drainage pipes adjacent to Highway 1 to raise the initial channel elevation and dissipate the energy of the laminar piped flow to retard channel incision that is currently occurring.

- The culvert and overlying soil that connects Wetland L to Wetland J will be removed, and the southwest portion of Wetland J will be regraded to establish stable channel slopes and banks transitioning into the confluence at the head of the restored MCRC. Approximately 150 linear feet (0.01 acre) of stream channel and 0.18 acre of riparian habitat will be created.

- The created MSRA tributary channel will have a narrow herbaceous seep wetland floodplain adjacent to the creek with an upland transition area dominated by herbaceous and shrub vegetation with some overstory woody plants.

- Existing invasive wetland and riparian plants will be removed within the construction footprint.

- Vegetation to be planted in the new MSRA tributary section will be similar to that proposed in the Maple Creek riparian floodplain and riparian upland, as discussed in Section 4.3.2.1 and presented in Table 4-1. However, species that would be planted following construction may vary slightly depending on availability from local/regional nurseries.

- Regraded slopes will be a minimum of 3:1 (horizontal to vertical distance) for stability and will be further evaluated as more detailed survey data for the Maple Creek corridor is obtained. Figure 4-5 (Cross-sections D-D' and E-E') presents conceptual cross-sections of the new MSRA tributary channel as it transitions to the current surrounding grade. These cross-sections should only be viewed as conceptual, as detailed survey information is necessary to evaluate current elevations of the channel bottom, morphology of the channel cross-sections, and elevations of the adjacent abandoned floodplain.

Habitat restoration and enhancement actions in the MSRA will provide following ecological benefits:

- Daylighting of approximately 150 feet of stream channel and creation of the Wetland J and Wetland L confluence

- Retardation of Maple Creek channel incision and improved management of storm flow discharge from the Basin C Maple Creek storm drain

- Connection of the existing MSRA habitat to the restored MCRC

- A reduction in the prevalence of exotic/invasive riparian and aquatic plants within the construction footprint

4.3.3.3 Alder Creek Drainage

The Alder Creek drainage currently conveys base flow and stormwater runoff from Basin D in the City to the northeast corner of Pond 8. The Alder Creek drainage is expected to provide approximately 40 percent of the inflow to the OU-E lowland wetlands. The MPC Restoration Project preferred alternative does not include daylighting Alder Creek, but does not preclude such an action in the future. During construction of the MCRC, approximately the last 100 feet of the Alder Creek drainage pipe will be removed and a new pipe segment will be added to redirect the Alder Creek flows to a constructed outfall in the MCRC (Figure 4-2). Design of the outfall will be determined during the engineering phase of work.

Although daylighting the Alder Creek drainage is not considered in the preferred alternative, the proposed action does not preclude daylighting Alder Creek in the future.

4.3.3.4 Pond 5

Pond 5 currently does not have a hydrologic connection to other aquatic features on the site. The preferred alternative originally proposed to relocate Pond 5 and provide equivalent or enhanced aquatic features at a point in the MPC Restoration Project where they could be an integral part of the ecosystem. The CCC has indicated that, although isolated, Pond 5 could not be relocated, but should remain at its current location and size and be connected hydraulically to the MCRC. To achieve this objective, a flow control weir will be installed in the northwest corner of Pond 5, and the spillage will be conveyed via pipeline to the Alder Creek drainage outfall in the MCRC.

Herbaceous and woody riparian vegetation will be planted in a 30-foot buffer around Pond 5 to provide enhanced ecological function for the buffer, retard surface flow, and facilitate sediment deposition.

4.4 South Ponds Channel

Basin S and sub-catchment O-2 surface runoff is conveyed to Pond 8 via several drainages ditches and culverts (Figure 2-2). Surface flow from these areas will need to be rerouted before Pond 8 sediment management, closure, and dam removal can occur. The South Ponds (i.e., Pond 1 through 4) are located in OU-E, approximately 1,200 feet south of the OU-E lowland area (Figures 2-3 and 2-3c). The MPC Restoration Project preferred alternative proposes to daylight the western end of the stream channel that historically drained the Basin S and South Ponds area and discharged to the Pacific Ocean over the coastal bluff. Figure 4-6 presents the conceptual design for the South Ponds channel restoration.

4.4.1 Current Conditions

The South Ponds are former industrial ponds that were part of the wastewater treatment system for the site. They are not USACE jurisdictional waters/wetlands, but may be waters of the state and/or coastal ESHAs (ARCADIS 2011a). The South Ponds are the central aquatic feature in an on-site drainage area of approximately 68 acres referred to as Basin S (Figure 2-2). The area north of the South Ponds is dominated by impervious surfaces (primarily asphalt and concrete foundations). The South Ponds receive runoff from the Consolidation Cell located to the south and east of Pond 4. The Consolidation Cell is contained within the area demarcated as having ongoing construction activities on Figure 2-3c. The largest portion of the Basin S watershed consists of compacted dirt with ruderal vegetation, and a large portion of this area drains to Pond 3 northwest (NW) through drainage ditches and swales. Basin S eventually drains into the southwest end of Pond 8 through a series of small surface drainages and subsurface pipes. The foundations of the former log ramp and log debarker are located immediately northwest of the western end of Pond 3 NW. The City Waste Water Treatment Plant (WWTP) and the north extent of the southern CCT property are directly west of the South Ponds area along the coastal bluffs.

The 1873 Geodetic Survey Map (Figure 2-1) indicates that prior to development of the site, an unnamed stream channel discharged off of the coastal bluff face at two locations between the current locations of the WWTP and west end of Pond 8. During development of the site, the stream channel was piped, backfilled, and graded. Rip rap was placed at the mouth of the historical stream channel and concreted over at the coastal bluff face (Appendix B).

4.4.2 Related Site Closure and Site Development Activities and Objectives

The following activities associated with the MPC remediation and demolition will occur in the South Pond channel restoration area or influence MPC restoration activities:

- Surface runoff and emergent groundwater generated in the approximately 78-acre Basin S and O-2 watershed area currently drains into the southwest end of Pond 8. This surface flow will need to be rerouted prior the management of sediment in Pond 8.

- Storm drains that currently capture storm water runoff from the area immediately south of the Planer building and direct the flow to Pond 8 may be rerouted to the proposed South Pond channel.

- An unnamed historic stream channel shown on the 1873 Geodetic Survey Map (Figures 2-1and 4-1) will be restored between the South Ponds and the historic creek mouth at the coastal bluff within the Open Space area designated in the Mill Site Specific Plan (Figure 4-6). For discussion purposes, the channel is referred to herein as "South Ponds Channel" and will be a component of the "South Ponds Riparian

Corridor." Restoration of the South Ponds Riparian Corridor will create approximately 650 linear feet of stream channel and 0.95 acre of riparian habitat.

4.4.3 Proposed Restoration Design

The MPC Restoration Project requires that surface drainage from Basin S be rerouted to bypass Pond 8. To accommodate the rerouting of surface drainage, the preferred alternative proposes to create a new stream channel and riparian corridor that will reestablish a portion of the historical drainage for the South Ponds area. The restored stream channel and associated riparian corridor will transmit surface water from the South Ponds and the surrounding site drainage basin to the historic creek mouth at the coast bluff prior to stabilization of Pond 8. Habitat types that will be created in the South Ponds area include stream channel, riparian floodplain, and riparian upland habitat. These habitats are described in more detail below.

Stream Channel

The surface water flow from the South Ponds will flow through the current culvert and discharge to the restored South Ponds Channel, which will flow in the approximate historical location of the stream that drained this area prior to site development. The South Ponds Channel will be approximately 650 feet long and provide 0.13 acre of stream habitat. Surface runoff from other parts of Basin S and O-2 will enter the stream channel within the daylighted section.

- The South Ponds Channel will have an overall slope of approximately 2 to 3 percent. The channel will be approximately 3 feet wide at the bottom and approximately 1 foot deep with 3:1 (horizontal to vertical distance) slopes meeting the adjacent floodplain. The channel will be designed to hold peak channel forming flows (i.e., between the 1.5- and 2-year return period storm). A conceptual cross-section of the new channel is presented as cross-section F-F' on Figure 4-6.

- Flow within the South Ponds Channel will be dominated by surface water flow from the site during the rainy season. During the dry season, emergent groundwater will provide base flow, and all of the channel bottom is expected to be below the groundwater table during the dry season in wet and normal water years. Figure 4-6 shows the channel bottom profile and the estimated groundwater level measurements for 2010 (direct measurements from groundwater monitoring wells were not available for this area).

- The channel bottom will be constructed of cobble and gravel of an appropriate diameter to withstand sheer stress of predicted flows and to prevent mass erosion and down cutting of the channel.

- No vegetation is expected to grow in the stream channel with the exception of the shallow margins of the stream where it transitions to the channel floodplain.

Riparian Flood Plain

A riparian floodplain will be created adjacent to the South Ponds Channel. The riparian floodplain will transmit flow during storms exceeding the channel forming flow, will mitigate volume and velocity of stormflows to the aquatic habitat present in the stream channel, and the associated riparian vegetation will provide allochthonous organic input to the aquatic ecosystem. The riparian floodplain will contain seep riparian wetlands, as defined by typical groundwater levels in relation of the riparian floodplain surface elevation. Approximately 0.12 acre of seep riparian wetland will be created in the South Ponds Riparian Corridor. Distinguishing characteristics of the seep riparian wetland are described below:

- The floodplain will be designed to transmit peak flow of the 100-year 24-hour return period storm with a minimum of 1 foot of freeboard above the estimated high water mark. Width of the floodplain on either side of the channel will vary as the stream channel meanders within the floodplain. However, the floodplain will be approximately 8 feet in total width. The riparian floodplain will abut the riparian upland slopes that transition to the surrounding existing grade. Figure 4-6 presents a conceptual cross-section of the South Ponds riparian floodplain.

- The South Ponds riparian floodplain will be composed of seep riparian wetlands. The 650 linear feet of riparian floodplain is defined as seep riparian wetlands in the conceptual design because the floodplain surface will be approximately 1 foot below the dry season groundwater table during most water years.

- Following maturation of the restored system, soils comprising the floodplain areas are expected to be sandy loams.

- The South Ponds riparian floodplain will to be dominated by herbaceous and woody plant communities, with shrubs and low trees dominating the canopy, saplings dominating the understory, and herbaceous wetland vegetation dominating the groundcover. Vegetation comprising the seasonal and seep wetland areas is expected will be species adapted to the continually saturated conditions that will be prevalent in the riparian seep wetland areas. Riparian floodplain revegetation will occur through a combination of planting, seeding, and natural recolonization. Table 4-1 presents typical species that would be expected to occur in the riparian floodplain area. However, species that would be planted following construction may vary slightly depending on availability from local/regional nurseries.

Riparian Upland

The riparian upland associated with the South Ponds riparian corridor will mitigate volume and velocity of stormflows to the wetland and aquatic habitats present in the floodplain and stream channel and will retard surface flow as it drains from the surrounding elevations to the riparian floodplain areas. The upland riparian

habitat will be approximately 30 feet to each side of the riparian floodplain areas (Figure 4-6). Approximately 0.83 acre of riparian upland will be created in the South Ponds riparian corridor.

- The transition slope from the riparian floodplain to the surrounding existing grade will be a minimum of 3:1 (horizontal to vertical distance) to provide stability. Figure 4-6 presents a conceptual cross-section depicting riparian upland transition slopes and areas as they extend onto the existing grade.

- Following maturation of the restored system, soils in the floodplain areas are expected to be sandy loams.

- The upland buffer is expected to include tall woody canopy with shrubby understory and herbaceous groundcover near the eastern end with the tall woody overstory diminishing as the channel flows westward towards the coastal bluff. Vegetative species present in the riparian upland are expected to be those more adapted to dry conditions. However, deep-rooted species more accustomed to wetter habitats will likely appear as the slope transitions from the existing grade to the riparian floodplain. Revegetation will occur through a combination of planting, seeding, and natural recolonization. Table 4-1 presents typical species that would be expected to occur in the riparian upland area. However, species that would be planted following construction may vary slightly depending on availability from local/regional nurseries.

Ecological functions provided by the South Ponds Channel, riparian floodplain, and upland include: wildlife habitat and migration corridor, seasonal and perennial aquatic habitat, surface runoff retardation, sediment retention, water quality improvement, groundwater exchange, nutrient storage, and cycling.

The proposed daylighting of the historic stream channel is consistent with CCC policy for restoration of historic ecological habitat features, LCP policies, and the proposed Mill Site Specific Plan land use policies for the Mill Pond Open Space District. The stream channel and associated riparian habitat will provide an aesthetically pleasing contribution to the open space and provide a visual buffer between the central portion of the MPC and the City WWTP.