ZENTNER
Planning & Ecology

CEMEX Cache Creek Mine

Habitat Restoration Plan

Project No.:
1076 CMX

Zentner Planning & Ecology
Oakland, CA

Prepared for:
Cemex

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I. INTRODUCTION

Zentner Planning and Ecology (Zentner) has prepared this Habitat Restoration Plan (Plan) in support of the CEMEX Construction Materials Pacific, LLC. (CEMEX) Cache Creek Mining Permit and Reclamation Plan Amendment Project (Project). Specifically, CEMEX proposes to modify Long-Term Off-Channel Mining Permit No. ZF #95-093, Reclamation Plan No. ZF #95-093 and Development Agreement No. 96-287 (as subsequently amended, "Existing Entitlements") with revised mining and reclamation plans and a 20-year time extension.

This Plan is an update of the mine's existing Habitat Restoration Plan (Zentner and Zentner 1995), which was originally approved in 1996 as a component of the Existing Entitlements and subsequently amended to address conditions of approval. This Plan will become effective only upon County approval of the proposed Project.

The Habitat Restoration plan has been developed to guide the restoration of natural habitats at the Project site as part of mine reclamation. This Plan is written to comply with the California Surface Mining and Reclamation Act of 1975 (SMARA) regulations and the Yolo County Off-Channel Surface Mining Ordinance (OCSMO) and Surface Mining Reclamation Ordinance (SMRO), and bring more focus to revegetating the remainder of the quarry along with performance standards that meet current SMARA regulations.

While CEMEX's Revised Reclamation Plan will include returning much of the site to agriculture, reclamation end uses will also feature habitats including open water lakes, riparian woodland, perennial marsh, oak savannah and native grassland buffers adjacent to restored habitats.

A. Objectives

This Plan details the overall objectives and methods for habitat restoration, including resoiling, restoration planting, performance standards, monitoring, reporting, weed control and maintenance. The restoration methods are considered by Zentner to be highly effective for the conditions present at the mine, based on Zentner's 20 plus years' experience with on-site monitoring and maintenance.

II. SETTING

A. Existing Conditions

The CEMEX Cache Creek Mine ("Mine", sometimes also referred to as the Madison Quarry or Madison Plant) is an active sand and gravel mining operation currently approved on ±586 acres between Highway 16 and Cache Creek (**Figure 1**). Interstate 505 marks the site's western boundary with the exception of a small portion of site (final phase) lying west of the Interstate. CEMEX's existing processing plant facilities are located near the western end of the property, just west of the entrance road, which runs north off of Highway 16. Just east of the plant is a former mined pit (part of Phase 1) that has already been reclaimed to agricultural production. Further to the east are active mine pits, some of which are open water as a result of permitted excavation into groundwater. The southern bank of Cache Creek is buffered from the active pits by at least a 200-foot buffer.

B. Site Ecology

The site consists primarily of mining and agricultural land that is in various stages of mining and reclamation. Agricultural production on and around the site are mainly row crops. Riparian vegetation forms a relatively narrow band on the southern bank of Cache Creek (north side of the Mine), which drops about 35 feet below the agricultural plain where mining is taking place. Remnant sections of riparian habitat also lay in depressions within the 200-foot buffer between the Creek and the mining pits (hereafter referred to as "riparian depressions"). Annual grassland with sections of ruderal vegetation is found around the perimeter of the agricultural and actively mined areas as well as in much of the 200-foot buffer.

2. Soils

The parent material of all project area soils is quaternary alluvium. Its thickest local unit is sand and gravel, but the high terrace south of Cache Creek is largely covered by varying thicknesses of loamy material that permit it to be farmed.

The soils of the creek and flood channels tend to be coarse and excessively drained with finer sediments washing away downstream. The soil series for the creek and bank include Riverwash and Soboba Gravelly Sandy Loam (SCS 1972).

Immediately adjacent to the creek are the flats, which are a highly variable mix of relatively coarse to medium textured loams. The band closest to the creek is mapped as Sycamore silt loam and the one south of that as Yolo silt loams (SCS 1972). In general, the farther away from the creek channel the more finer grained the soil, which once supported oak savannah and native grassland.

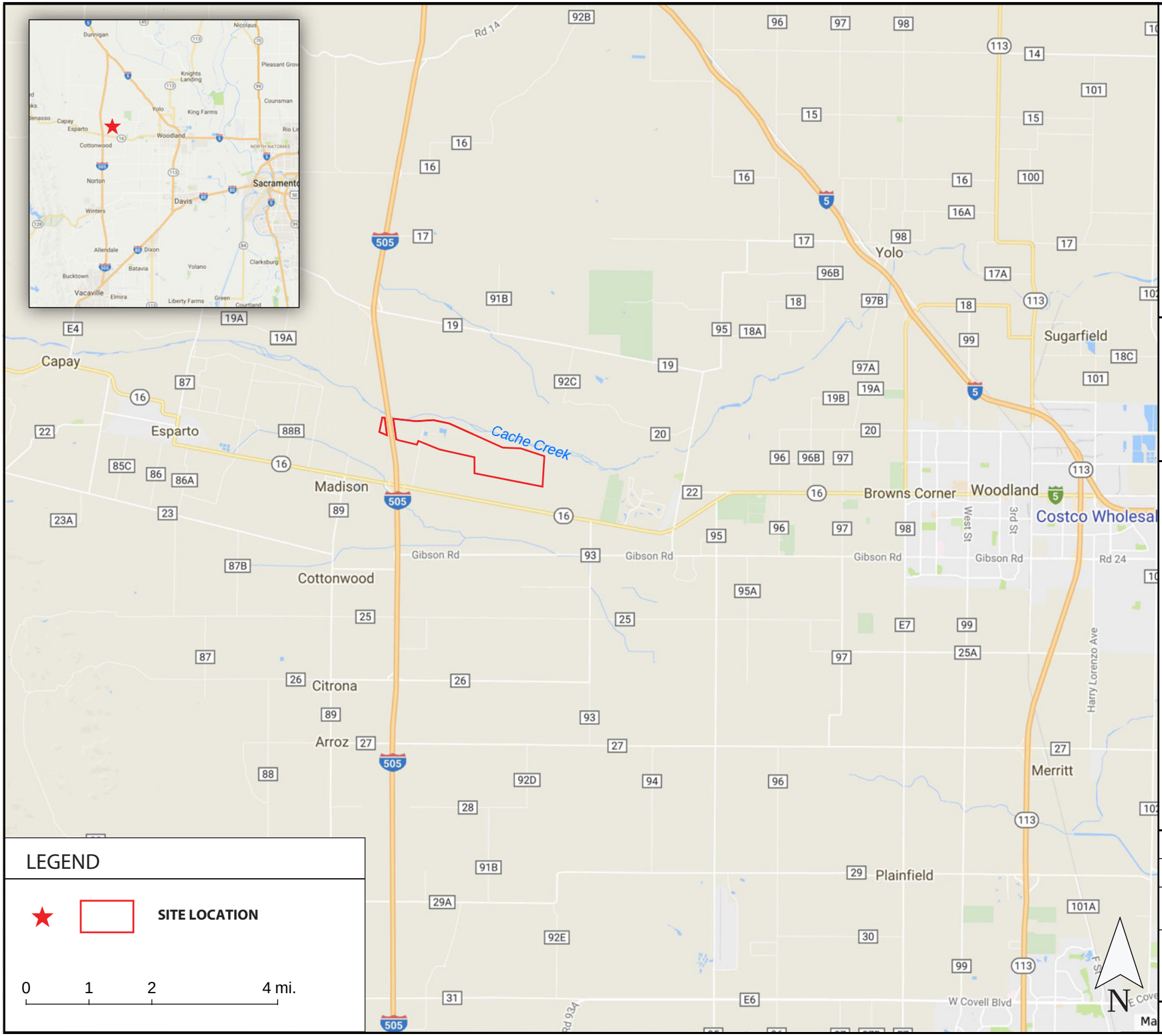

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FIGURE 1
SITE LOCATION

CEMEX
CACHE CREEK MINE
Madison, California

BY: **CJL**

PROJECT: **1076**

BASE MAP:
GOOGLE MAPS 2017

FILE:
D:\Graphic Designer\My Documents\PROJECTS\1000-1100\1076 Cache Creek\Adobe\1076 site location 17-11-09

DATE: **12/13/2017, 03:45 pm**

3. Habitats and Vegetation

a. Perennial Marsh

Perennial marsh is restricted to the periphery of the deeper pools found within Cache Creek. These pools usually are formed within eroded cuts near the toe of the creek banks or within beaver dams that are common throughout the channel. These marshes support deep-rooted perennials such as bulrush (*Schoenoplectus acutus*), cattail (*Typha sp.)* and rushes (*Juncus sp.)*.

b. Riparian

The riparian vegetation on site is primarily located near the toe of the creek banks along Cache Creek. It is also found in old carved out creek meanders on both the north and south banks, with some of the old meanders relatively high in elevation compared to the existing channel bed. A few of these old meanders are located within the Project site within a distance of approximately 150 feet of the channel bed. These riparian areas are dominated by various species of willows (*Salix sp.),* Fremont cottonwood (*Populus fremontii*) and mulefat (*Baccharis salicifolia*).

c. Oak Savanna

The oak savanna runs along a relatively narrow band near the top of the southern bank of Cache Creek (north side of the Mine). This habitat, which is dominated by valley oak (*Quercus lobata*) with an understory of annual grassland, likely covered much of the region in proximity to Cache Creek prior to human disturbance.

d. Annual Grassland

Perennial grassland habitat, along with oak savanna, likely once co-dominated the entire site from the banks of Cache Creek to the southern edge of the property along Highway 16. The existing grassland is dominated by non-native, annual grasses such as wild oat (*Avena fatua*), soft chess (*Bromus hordeaceus*), ripgut (*Bromus diandrus*), and rye (*Festuca perennis*). It is found along the upper banks of Cache Creek and on the terrace between the creek and the active mining areas and agricultural areas. A more ruderal form of the annual grassland is found along the margins of these mined areas and the agricultural parcels.

e. Ruderal

A portion the annual grassland habitat is dominated by ruderal (weedy) vegetation. These areas are generally located near the CEMEX processing plants or in disturbed areas adjacent to mining or agricultural fields. Habitat in these areas are dominated by thistles (milk thistle, *Silybum marianum*; bull thistle, *Cirsium vulgare*), starthistle (*Centaurea solstitialis*) and other weedy species.

III. RESTORATION PLAN

Restoration is proposed for the areas around the reclaimed agricultural fields, around the created lakes, and between Cache Creek and the reclaimed habitats (**Figure 2**). These restored habitats will not only provide buffers, but will also provide native habitat and wildlife corridors between the reclaimed mining areas and the creek and along the south bank of Cache Creek (**Figure 3**).

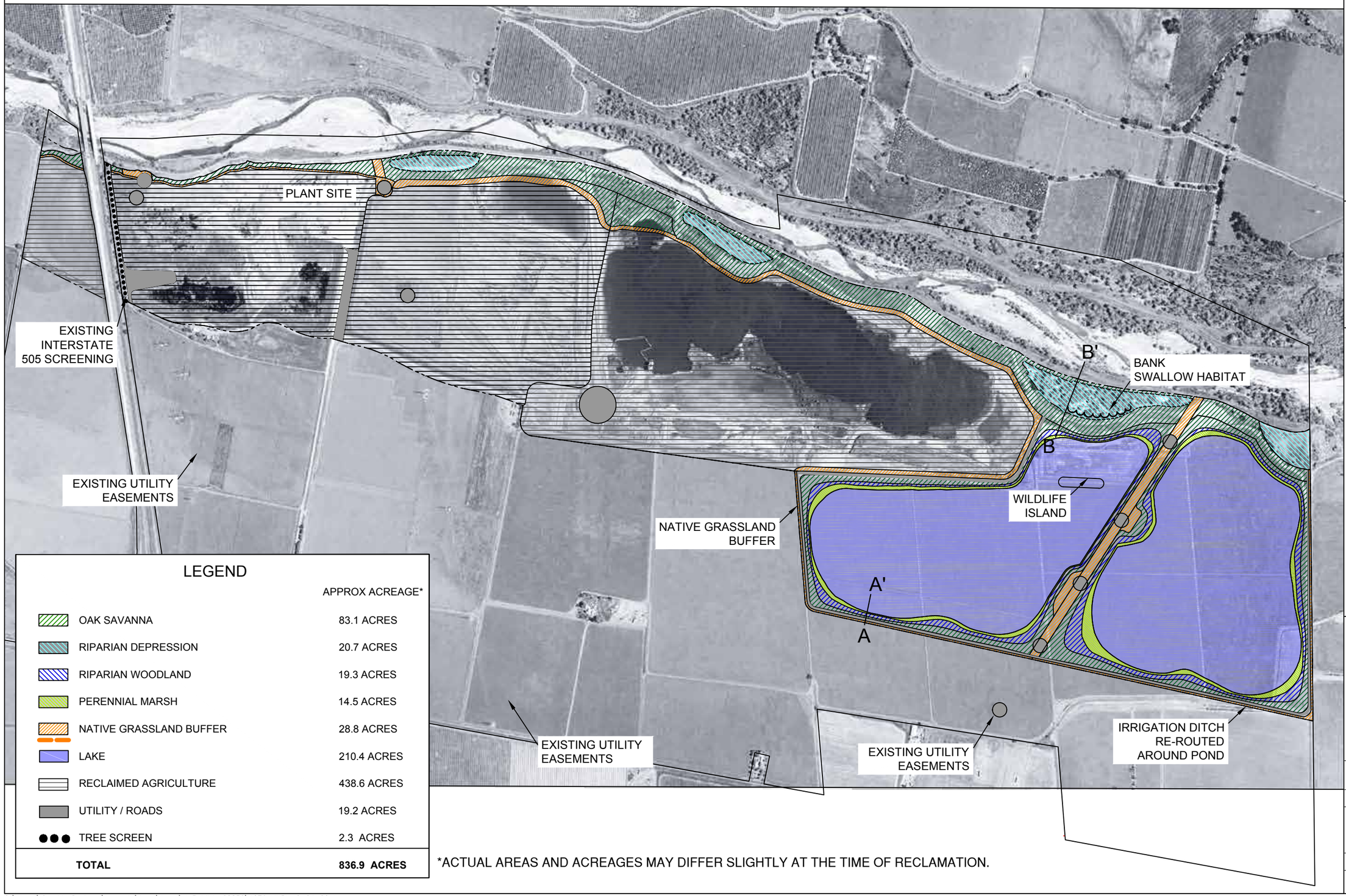
A. Goals for Restoration

This plan is designed to meet the goals and objectives of the OCSMO, SMRO and SMARA to provide for the protection and beneficial use of mined lands. In particular, the goal of this Plan is to create quality, self-sustaining habitats that provide native plant diversity for native wildlife where doing so is consistent with planned end uses. To meet these goals the Plan includes the following principles:

1. Provide for a diversity of native habitat types and vegetative communities that have the potential to support a variety of native wildlife including special status species.
2. Provide native grassland buffers around reclaimed agricultural parcels as well as a wide, continuous native buffer between Cache Creek and reclaimed habitats.
3. Provide a continuous corridor between the lakes and Cache Creek.
4. Provide for a structurally diverse shoreline around the lakes with variable slopes and communities.
5. Provide diverse riparian habitats around the lakes and within the preserved depressions to provide important roosting and nesting habitats.

B. Restored Habitats

This section describes the restored habitat objectives of this Plan. The restoration phasing and approximate acreage by each phase is shown in **Figure 4**. The primary objectives are to restore native habitats onsite for diversity and wildlife. These reclaimed and restored habitats will be an integrated, sustainable, and biologically diverse system formed by a variety of natural communities. The habitats will be to restored to a condition at least as good, if not better, than what existed prior to the project. Planting details are described later in Section V of the Plan.



LEGEND

	APPROX ACREAGE*
OAK SAVANNA	83.1 ACRES
RIPARIAN DEPRESSION	20.7 ACRES
RIPARIAN WOODLAND	19.3 ACRES
PERENNIAL MARSH	14.5 ACRES
NATIVE GRASSLAND BUFFER	28.8 ACRES
LAKE	210.4 ACRES
RECLAIMED AGRICULTURE	438.6 ACRES
UTILITY / ROADS	19.2 ACRES
TREE SCREEN	2.3 ACRES
TOTAL	**836.9 ACRES**

*ACTUAL AREAS AND ACREAGES MAY DIFFER SLIGHTLY AT THE TIME OF RECLAMATION.

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FIGURE 2
RESTORATION PLAN

CEMEX
CACHE CREEK MINE
MADISON, CALIFORNIA

N

0 500' 1000'

SOURCE: GOOGLE EARTH 5/20/17
CUNNINGHAM ENGINEERING 10/20/17

PROJECT NO. 1076

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BY: JPE

DATE: 3.10.2020

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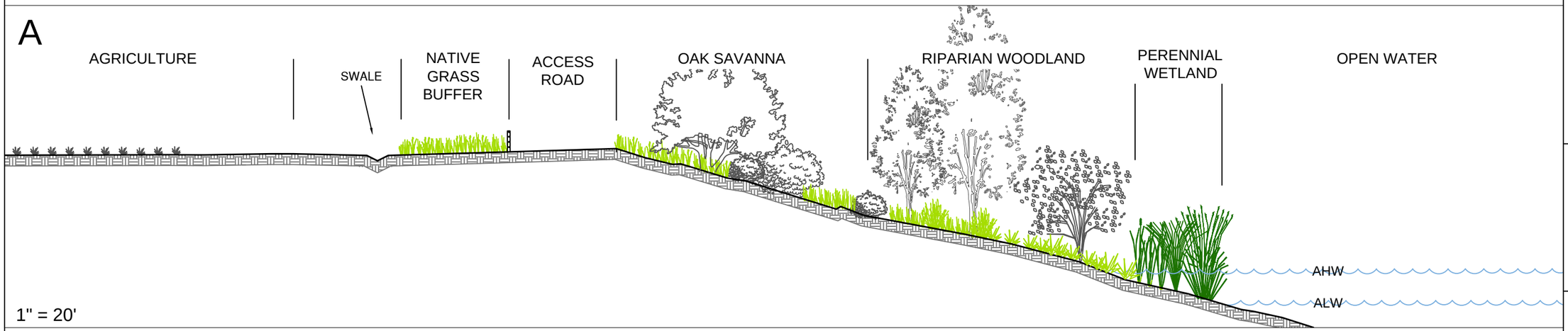
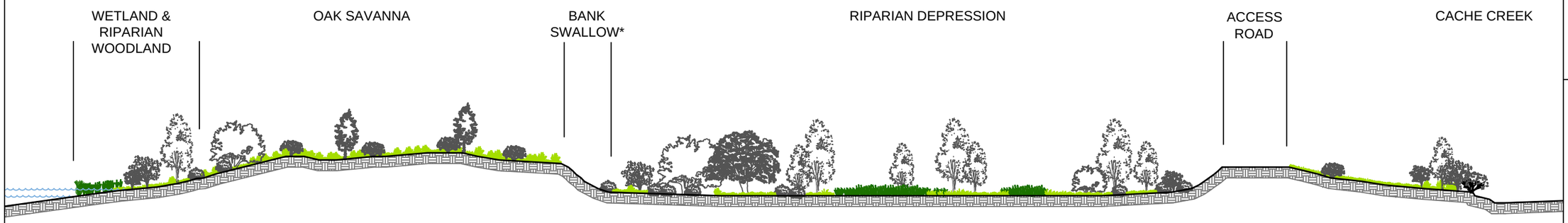
A



1" = 20'

B



1" = 60'

NOTES:

1. ACTUAL DISTANCES AND AREAS MAY VARY SLIGHTLY AT THE TIME OF RECLAMATION.
2. *BANK SWALLOW HABITAT PRESERVED WHERE APPLICABLE.

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FIGURE 3
TYPICAL CROSS SECTIONS

CEMEX
CACHE CREEK MINE
MADISON, CALIFORNIA

N

SCALE VARIES

SOURCE: CUNNINGHAM ENGINEERING

PROJECT NO. 1076

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BY: CJL

DATE: 2.22.2018

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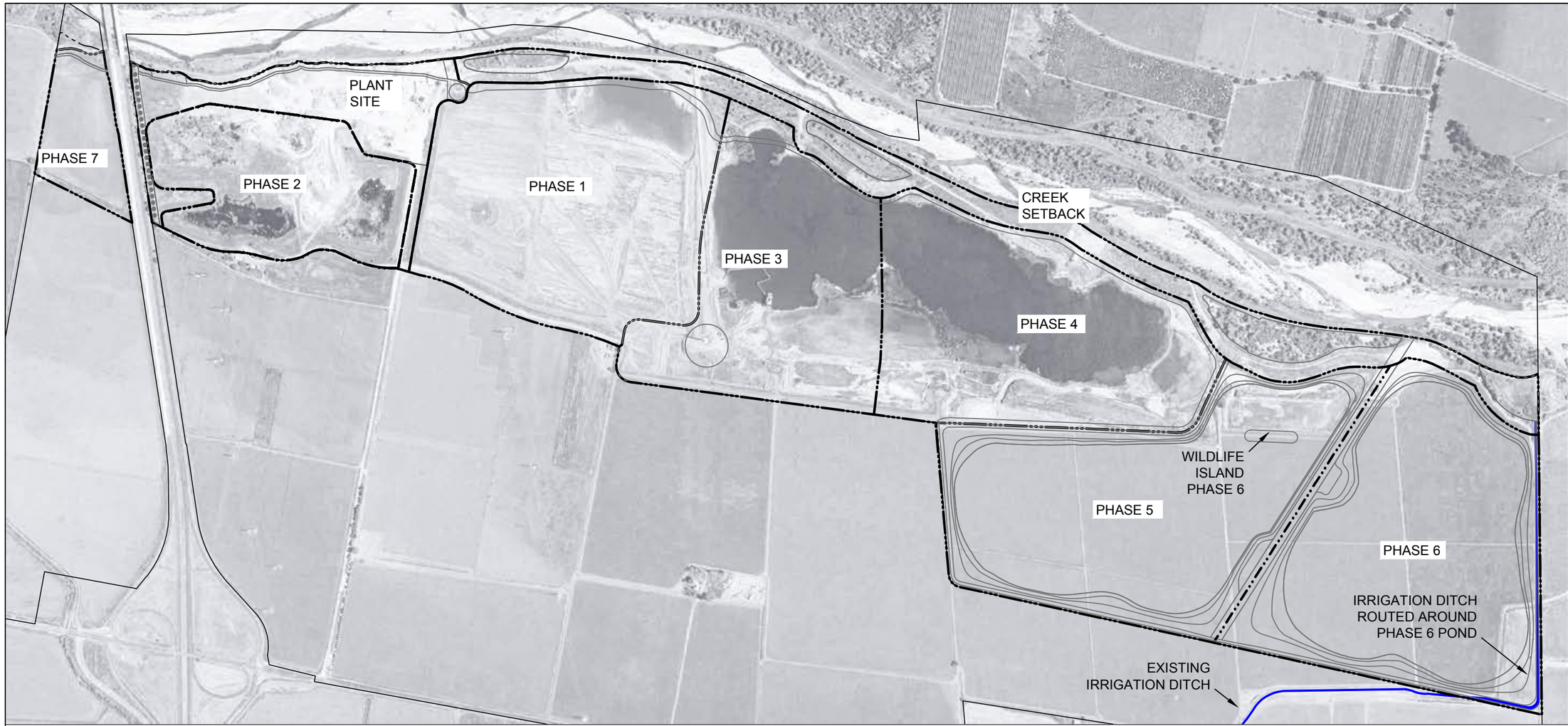

NOTES:

* ACTUAL AREAS AND ACREAGES MAY DIFFER SLIGHTLY AT THE TIME OF RECLAMATION.

** SHORELINE HABITAT ACREAGE IS INCLUDED AS PART OF THE OAK SAVANNA, RIPARIAN WOODLAND, AND PERENNIAL WETLAND ACREAGES

APPROXIMATE ACREAGE BY PHASE*

	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5	PHASE 6	PHASE 7	CREEK SETBACK	PLANT SITE	OTHER BUFFER	I-505 BUFFER	APPROX TOTAL
OAK SAVANNA	1.9	0	3.7	0	12.1	13.6	0.8	47.3	3.7	0	0	**83.1**
RIPARIAN DEPRESSION	0	0	0	0	0	0	0	20.7	0	0	0	**20.7**
RIPARIAN WOODLAND	0	0	0	0	9.0	10.3	0	0	0	0	0	**19.3**
PERENNIAL MARSH	0	0	0	0	6.4	8.1	0	0	0	0	0	**14.5**
NATIVE GRASSLAND BUFFER	3.9	0	1.7	8.1	5.6	6.1	0.2	0.7	2.5	0	0	**28.8**
LAKE	0	0	0	0	106.6	103.8	0	0	0	0	0	**210.4**
RECLAIMED AGRICULTURE	124.5	63.7	91.7	111.3	0	0	20.0	0	27.4	0	0	**438.6**
UTILITY / ROADS	0.4	0	2.9	0	5.9	4.1	0.0	0.03	1.3	4.6	0	**19.2**
TREE SCREEN	0	0	0	0	0	0	0	0	0	0	2.3	2.3
SHORELINE HABITAT	0	0	0	0	27.5	32.0	0	0	0	APPROX TOTAL		836.9

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FIGURE 4
RESTORATION PHASING

CEMEX
CACHE CREEK MINE
MADISON, CALIFORNIA

N

0 500' 1000'

SOURCE: GOOGLE EARTH 5/20/17
CUNNINGHAM ENGINEERING 10/20/17

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BY: JPE

DATE: 3.10.2020

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1. Lake

The lake habitat will be created by mining in the Phase V and VI areas. The surrounding slopes to the lake will be restored with riparian woodland and oak savannah habitats (see below). The Phase V lake will include one island that will be reclaimed after mining in Phase VI, which will provide refugia and potential nesting habitat for native waterfowl and other wildlife.

2. Riparian Woodland

The riparian woodland restoration will take place along the fringes of the mined lakes and within the riparian habitat depressions along the creek buffer (**Figure 2**). The banks of the lakes above water will be graded to provide a range of slopes between 2:1 and 4:1 or flatter (**Figure 3**). This will provide for a variable shoreline resulting in more structurally diverse habitats around its perimeter. The groundwater, which provides the water levels in the lakes, will fluctuate as much as five to ten feet in elevation (from average high to average low water). The riparian vegetation will be planted where it would naturally occur, which is starting from just inside the average high water mark to about halfway up the slopes.

The other area, which will be enhanced and restored with riparian woodland will be the riparian depressions. Some of these areas contain good cover by riparian species, however it is made up with just a few species. Therefore, native diversity should be increased. As well, some of these depressions also contain relatively high levels of non-native vegetation including tamarisk (*Tamarix sp.)* and perennial pepperweed (*Lepidium latifolium*). To the extent practicable, these invasive species will be removed and controlled before native vegetation is planted. The Maintenance section of this report contains a detailed weed management program. In order to increase native diversity, a mix of riparian trees, shrubs and wetland vegetation are proposed for these areas.

Restoration of the riparian depressions will include enlargement of the watershed that drains into the riparian depressions. Grading within the Oak Savannah habitat, which surrounds the depressions, will be completed so that a larger area than what currently exists, will drain into the depressions and augment their existing hydrology. The current plan calls for draining as much area as is practicable into these depressions, up to approximately 7 acres. These changes will help simulate flood hydrology during rain events and provide better riparian hydrology to these preserved and enhanced areas.

3. Perennial Marsh

The perennial marsh will be formed between AHW and ALW around the perimeter of the lakes (**Figures 2 and 3**). This habitat will occur elevationally just below the riparian habitat. As noted above, the proposed grading plan includes scalloping of the lake

shorelines to produce varied slopes. This will result in areas with wider and narrower bands of perennial marsh, with dominance by different species. The perennial marsh will be planted with deep-rooted, native perennial vegetation such as tule, cattails, and rush.

4. Oak Savannah

The oak savannah habitat will be restored within the 200' Creek setback and around the upland perimeter of the lakes (**Figure 2**). These areas will be planted with oak savanna species and seeded with native grasses for the savannah understory. Valley oak (*Quercus lobata*) and coyote bush (*Baccharis pilularis*) will be dominant woodland species mixed within a perennial grassland understory. Because the 200' setback is actively used for mining access and transporting mine materials as the conveyer is located within this zone, this area will not be restored until at or near the end of active mining.

5. Native Grassland Buffer

A native grassland buffer will be restored between the existing and reclaimed agricultural fields and the restored areas including the lakes and oak savannah. (**Figure 2**). The slopes around these fields will be graded to approximately 2:1 or flatter. Areas that have slopes of 3:1 or flatter will be drill seeded with a mix of native grassland species. Drill seeding with native grasses, which was completed on significant portion of the Phase 2 area and within a portion of the 200' creek buffer, has already proven effective at the site. Areas steeper than 3:1 will be prepared and broadcast seeded with the same mix of native grassland species. A forb and sub-shrub component is included in the grassland habitat as well, which was present within the historical grasslands in the region and provides benefits to local wildlife.

While a small maintenance road will run around the lakes the native grass buffer will be restored between the road and the agricultural fields. A swale will run between the buffer and the fields to capture reclaimed drainage water from the agricultural fields and prevent that water from draining into the lakes.

6. Interstate 505 Screening

As part of earlier phases of the existing Habitat Restoration Plan (Zentner 1995), Interstate 505 screening was initiated (**Figure 2**). This screening was completed using Fremont cottonwoods (*Populus fremontii*) and was very successful. Over time, however, some gaps have formed along the screen where trees have fallen. Therefore, additional trees will be planted to fill in the gaps to restore the screen. A few patches of invasive vegetation including tamarisk (*Tamarix sp.)* and perennial giant reed grass (*Arundo donax*) occur in the northern portion of the screen area. To the extent practicable, these invasive species will be removed and controlled before native vegetation is planted.

7. Bank Swallow Habitat

As part of the Existing Entitlements, the project applicant agreed to restore the bluffs above the large, easterly riparian depression (shown in **Figure 2**). This riparian depression was found to be suitable habitat for bank swallows with near-vertical bluffs. Bank swallows were noted as having recently begun nesting in these bluffs as of approximately 1997. Therefore, the steep banks associated with this riparian depression will be protected and preserved.

C. Planting and Revegetation Methods

1. Technical Supervision

Revegetation activities should be conducted under the supervision of an experienced Ecological Monitor (EM). The EM and Restoration Contractor (RC) will work closely together to assure that revegetation is accomplished according to plans. Any substantial deviation from the revegetation plans will need to be approved by the EM and the County.

2. Experienced Contractor

Only contractors with previous experience in native habitat restoration should be considered for this project. By limiting this work to personnel that have developed a working knowledge of the nuances and complications of native habitat restoration, the risk of failure or damage to existing habitats is significantly reduced. This also allows greater flexibility for making adjustments in the field as is often necessary.

3. Preconstruction Activities

Prior to initiation of plantings, the EM and RC will establish and stake the limits of habitat planting areas. Flagging of the new habitats may involve making minor adjustments from plan locations as dictated by field conditions.

Access routes, staging areas, and similar features will also be located and staked in the field. Where necessary, preconstruction surveys will be conducted and orange construction fencing or similar visible barrier will be installed to delimit sensitive areas adjacent to construction areas (see Biological Resources Update, Zentner Planning and Ecology 2017 for more details).

4. Site Preparation

New habitat and restoration areas will generally be prepared for revegetation as follows:

- Non-native vegetation, trash, debris, and weeds will be cleared.
- Prior to habitat restoration in the riparian depressions, grading within the adjacent Oak Savannah and upland mining areas will be completed in order to enlarge the watersheds for the Riparian depressions as much as practicable.

Adding very shallow slopes that drain into the depressions will be completed to augment existing hydrology.

- The shoreline of the Phase 5 and 6 lakes will be scalloped as shown on the Project Reclamation Plan drawings to provide a variety of slopes as well as shallow water habitats.
- Resoiling will occur as necessary, especially within the reclaimed agricultural parcels. Please see Section IV Resoiling, for more detailed information.
- In the case of seeding, grow-kills should be completed as detailed in Section 9c of Chapter V entitled Restoration Planting.

5. Supplemental Irrigation System

Several areas call for the planting of trees and shrubs, which require supplemental irrigation. These areas include the Riparian habitat and the Oak Savannah/Native Grassland. The native trees and shrubs planted will be irrigated through a simple, temporary drip system. Drip irrigation will be supplied for the planted trees and shrubs for up to two years from their initial planting with a gradual tapering in the third year and no irrigation in the fourth and fifth years. No broadcast irrigation will be applied at any time. The species chosen for inclusion in the seed mixes and are intended to be self-sustaining without dependence on long-term irrigation, or ongoing applications of soil amendments or fertilizers.

A planting basin shall be formed around each installed plant to help hold water near these plants, to ensure adequate irrigation. The basin consists of a two-foot diameter water ring two inches deep with a surrounding berm two inches above grade centered on the plant. An emitter will be placed directly on top of the root ball. After installation, the plant will be watered thoroughly. Plants will all be checked for settling and stress within two to three days of installation. All rooted plantings will be watered-in at the time of planting.

Seeded areas rely upon seasonal rainfall for water and, therefore, should not be watered in. This will help ensure that adequate rainfall occurs after seeding and germination. Additional irrigation of the seeded graminoids (grasses) should not occur beyond this initial watering, however, the need for supplemental watering may be deemed necessary if these plants show serious stress due to any prolonged dry spells during monitoring in the first winter/spring after planting.

At the direction of the EM, irrigation may be continued on an as-needed basis during the third year following initial planting to facilitate root development, so that plants will be sufficiently established. However, irrigation should not extend beyond this and will not be required as part of the long-term management.

The amount and frequency of irrigation of each planting area will be determined through monitoring soil moisture conditions and plant vigor during the initial irrigation period. The goal is to provide deep, infrequent watering to encourage deep rooting of all perennial species.

6. Timing and Phasing

Phasing for the restoration work should generally follow the phasing of the Mining and Reclamation Plan. Restoration work on each phase should be initiated in the same season as the reclamation for that phase is complete. Currently, resoiling in the phase 1 area is nearly complete. Therefore, restoration of the native grass slopes may be initiated upon approval of this Plan and based upon the timing described below.

Container and cutting plant materials will be installed between October 1 and February in the same year as reclamation; fall and winter are the optimal periods for planting as many plants are dormant and weather conditions are favorable. Any replacement plantings, if required, will also be installed during the fall or early winter. Seeding (both drill seeding and broadcast seeding) will be conducted between October 1 and November 31 within the same year that a restoration phase has been completed. Specific planting dates will be based on weather conditions and based on guidance by the EM.

The exception will be the Oak Savannah within the 200-foot creek buffer, including the upland surface mining disturbances on the north side of Phases 3 and 4. This area will continue to be actively used for material transport until reclamation is complete. Therefore, this area will be restored after equipment removal (e.g., conveyor removal) has been completed.

IV. RESOILING

Resoiling is the process of artificially building or reconstructing a soil profile. This Section addresses SMARA regulations related to resoiling as codified in the California Code of Regulations (CCR) Section 3500 et. seq. The specifics of these regulations are further detailed in CEMEX's Revised Reclamation Plan.

Resoiling will occur in mined areas south of the 200-foot Creek buffer. The majority of the resoiling will take place primarily to return mined areas back to agriculture production. As shown in the Reclamation Plan and in **Figure 2**, Phases 1 through 4 and 7 are slated to be reclaimed to agriculture, while Phases 5 and 6 will not require substantial resoiling (except limited resoiling around the perimeter of the lake on mining cut slopes) as they will remain as lakes. Some resoiling will also occur in the buffer areas around the reclaimed agricultural fields and the mined lakes.

Growth media for revegetation will consist of native topsoil and overburden. The average thickness of overburden and topsoil replaced on the site during reclamation will vary depending on the reclamation use of an area. Where salvaged topsoil and growth media cannot be used immediately, topsoil (A horizon) and other growth media (e.g., B and C horizon) will be stockpiled separately and will not be disturbed until needed for reclamation. Stockpiles will be properly identified to help ensure topsoil and other growth media are not mistakenly blended. Soil stockpiles will have maximum heights of 40 feet and maximum side slopes of 2:1 (horizontal:vertical). These stockpiles will be seeded with an appropriate seed mixture as needed to prevent water and wind erosion and to discourage the growth of weeds.

Prior to revegetation, the operator will generally handle soils and prepare a revegetation substrate in the following manner:

1. Remove soils only as necessary to access new mining areas and use them for reclamation as soon as it can be accommodated by the mining schedule.
2. To the extent practicable, limit topsoil and vegetation removal to within one-year of fill placement, unless a longer time period is administratively approved by the County.
3. Where possible, place soils that have been removed for direct use in reclamation. Where salvage topsoil cannot be used immediately for reclamation, stockpile it separately from other overburden and do not disturb the soils until needed for reclamation.
4. Prior to resoiling, rip, disc and/or scarify fill areas as needed to relieve compaction and rills, ruderal vegetation, or other surface irregularities.

5. Distribute topsoil in preparation for revegetation, with a target thickness of 12-inches of topsoil atop overburden and/or other native substrate materials.
    a. The thickness of topsoil salvaged and redistributed on the site during reclamation will vary. The target thickness of 12-inches is only a guideline based on available site-specific soil information.
    b. Where prime agricultural reclamation is intended, and distinct soil horizons are distinguishable, then the sequence of horizons will have the A atop the B, the B atop the C, and the C atop the graded surface.
6. Following resoiling, where soil has been compacted, till or scarify the ground surface to create a favorable seedbed.

Soil amendments, if required during revegetation efforts, should be applied according to manufacturer's specifications.

V. RESTORATION PLANTING

A. Riparian Woodland

Riparian woodland will be planted around the perimeter of the lakes in Phases 5 and 6 and within the riparian depressions that are located within the geographic limits of the 200-foot Creek buffer[1]. Within the lake area, riparian woodland will be planted on the slopes buffering the lake starting at or just inside of average high water (AHW). This habitat will slowly transition to oak savannah and native grassland. The result will be a complete system of grasslands and woodlands that will provide native diversity and cover for wildlife foraging and movement.

The riparian depressions will also be planted with riparian woodland. The surrounding slopes within the oak savannah and upland mining areas between Phases 3 and 4 and the riparian depressions will be graded such that they drain into these areas and help support the riparian hydrology of these depressional habitats. Invasive vegetation including tamarisk will be removed and treated with an herbicide prior to revegetation work.

The plant list for the Riparian Woodland habitat is detailed in **Table 1**. **Figure 3** provides a cross-section of these areas.

Table 1

Riparian Woodland Plant List

Common Name	Scientific Name	Size	# per Acre
TREES			
red Willow	*Salix laevigata*	tree pot	32
arroyo willow	*Salix lasiolepis*	tree pot	25
black willow	*Salix gooddingii*	tree pot	15
Fremont cottonwood	*Populus fremontii*	tree pot	27
N. California walnut	*Juglans hindsii*	tree pot	10
boxelder	*Acer negundo*	tree pot	8

[1] Note: The riparian depressions are excluded from the calculation of the 200-foot creek buffer. Therefore, where the riparian depressions are present, the actual measures distance between the creek bank and the top of the mining slopes is greater than 200 feet.

Common Name	Scientific Name	Size	# per Acre
SHRUBS			
buttonbush	*Cephalanthus occidentalis*	1 gal	35
mugwort	*Artemesia douglasiana*	1 gal	40
mulefat	*Baccharis salicifolia*	1 gal	35
Calif. rose	*Rosa californica*	1 gal	23
Calif. blackberry	*Rubis ursinus*	1 gal	10
wild grape	*Vitis californica*	1 gal	10
		TOTAL	**270**
GRASSES			
creeping wildrye	*Elymus triticoides*	Plug	800

B. Perennial Marsh

Native perennial marsh vegetation will be planted around the Phase 5 and 6 lakes. This habitat most naturally occurs between average high water (AHW) and average low water (ALW), which is the zone where planting will take place. Vegetation will consist of relatively deep-rooted perennials that are adapted to perennially wet conditions. This vegetation will transition naturally to riparian woodland.

The plant list for the Perennial Marsh is detailed in **Table 2**. **Figure 3** provides an illustrative cross-section of this and other habitats.

Table 2

Perennial Marsh Plant List

Common Name	Scientific Name	Size	# per Acre
bulrush	*Schoenoplectus acutus*	tree band	15
bulrush	*Schoenoplectus americanus*	tree band	15
cattail	*Typha domingensis*	tree band	20

Common Name	Scientific Name	Size	# per Acre
baltic rush	*Juncus balticus*	rose-pot	100
common rush	*Juncus effuses*	tree band	15
dense sedge	*Carex densa*	rose-pot	100
horsetail	*Equisetum hyemale*	1 gal	10
		TOTAL	**275**

C. Oak Savannah and Native Grassland

The Oak Savannah habitat will be restored within the 200-foot buffer between Cache Creek and the mined areas. This habitat will contain relatively sparse trees with denser shrubs and a native grassland understory. This habitat better approximates the vegetation that existed in this zone prior to habitat conversion. As well, this vegetation is better adapted to the soils in this zone. The soils in this area are generally well-drained but contain pockets of more and less well drained soils. The planting pallet below allows for planting appropriate vegetation based upon soil micro-habitats as well as native grassland that is adapted to all of these soils.

This vegetation will also be planted in the upper banks around the Phase 5 and 6 lakes above the Riparian Woodland vegetation and just up to the top of bank.

The tree and shrub plant list for the Oak Savannah is detailed in **Table 3**, while the grassland component is detailed in **Table 4**. **Figure 3** provides an illustrative cross-section.

Table 3

Oak Savannah/Native Grassland Plant List

Common Name	Scientific Name	Size	# per Acre
TREES			
Valley oak	*Quercus lobata*	tree pot	5
buckeye	*Aescuslus californica*	tree pot	7
interior live oak	*Quercus wizlensii*	tree pot	2
SHRUBS			
coyote bush	*Baccharis pilularis*	1 gal	48

Common Name	Scientific Name	Size	# per Acre
yerba santa	*Eriodictyon californicum*	1 gal	37
		TOTAL	**99**
GRASSES			
*See Native Grassland Plant List **(Table 4)** below*			

D. Native Grassland Buffer

The Native Grassland Buffer habitat restoration will be located in areas that abut the restored habitats including the lakes and the oak savannah. (**Figure 2**). This habitat is meant to provide both a buffer from agricultural land uses and as a habitat transition to the restored habitats. As such, this habitat will be dominated by grasses and forbs. The restoration will occur by drill-seed in areas 3:1 or flatter and broadcast seeding in other instances at the rates provided in **Table 4** below. Rose-pots will generally be planted in clusters of between five to seven plants at the rates indicated in Table 5.

The plant list for the Native Grassland Buffer is detailed in **Table 4**. **Figure 3** provides an illustrative detail for this habitat.

Table 4

Native Grassland Buffer Plant List

Common Name	Scientific Name	Size	# per Acre
creeping wild rye	*Elymus triticoides*	seed	9
purple needlegrass	*Stipa pulchra*	seed	6
blue wildrye	*Elymus glaucus*	seed	8
six-weeks fescue	*Festuca microstachys*	seed	2.5
meadow barley	*Hordeum brachyantherum*	seed	4
yarrow	*Achillea millefolium*	seed	2.5
California poppy	*Eschscholzia californica*	seed	3
gumplant	*Grindelia camporum*	seed	3

Common Name	Scientific Name	Size	# per Acre
		TOTAL	**38 lbs/ Acre**
milkweed	*Asclepias fascicularis*	rose pot	40
mugwort	*Artemesia douglasiana*	rose pot	15
		TOTAL	**55**

Note: Composition of seed mix (and appropriate modifications) to be determined based on availability from suppliers, test plot results (if applicable) and species determined most suitable at the time planting occurs.

For the above habitats, grass and grass-like plug plantings will be placed on one-foot centers. Trees and shrubs will be placed in clusters of approximately 3-5 plants except within the oak savannah, where trees will be relatively widely spread over the habitat.

The Native Grassland seed mix in **Table 4** may also be used for temporarily disturbed areas outside of these planned restoration areas as needed. Alternatively, a native erosion control seed mix may be used for temporary disturbances (see, e.g., Table 13).

E. Interstate 505 Screening

Fremont cottonwoods will be planted to fill in the gaps of the existing cottonwoods that make up the Interstate screening. A total of 40 of these will be used to fill in these areas. In addition, a small portion of the screen closest to Cache Creek will be planted with California walnut, as these have been successful in this portion of the project area, and they will integrate into those that already exist in this area. The plant list is provided in **Table 5**.

A relatively small amount of invasive vegetation including tamarisk and giant reed grass, is currently found within the northern end of the screening area. These plants will be removed and treated with an herbicide prior to revegetation work.

Table 5

Interstate 505 Screening Plant List

Common Name	Scientific Name	Size	Number
TREES			
Fremont cottonwood	*Populus fremontii*	tree pot	40

Common Name	Scientific Name	Size	Number
California walnut	*Juglans hindsii*	tree pot	15

F. Bank Swallow Habitat

No planting measures are necessary for this habitat as more open areas are preferred for nesting by bank swallow. However, the southern edge of the habitat, which contains the near-vertical bluffs should be protected with orange construction fencing to ensure that grading does not get to close to the edge or that soil materials are not accidentally pushed over the edge of the habitat and impact the steep banks. This fencing will be erected prior to work commencing within 50 feet of the area and may be removed after work is completed.

9. Planting Techniques

Trees and shrubs will be planted in clusters within their respective habitats. These clusters will vary based on proximity to water, slope, exposure and other factors. The plant contractor shall work with the EM to ensure proper placement of plantings.

a. Plugs

The following specifications will be employed for installing the plugs:

- Planting holes shall be slightly deeper than the plug, by about ¼" to provide for additional soil on top of the plug surface. This will prevent excessive transpiration after planting.
- Roots will be protected from the sun and/or drying winds.
- After plants are removed from the plug trays, the root ball will be bent and slightly twisted to free the roots from the tray form.
- Plants will be set in planting holes so that the crown of the root ball is just below the ultimate soil surface (i.e., finished grade).
- Finely broken-up backfill will be tamped firmly on top of the plug.
- Immediately following installation, plug planting areas will be watered in with sufficient water to reach the lower roots.

b Shrubs

The following specifications will be employed for installing the shrubs:

- Planting holes will have vertical sides with roughened surfaces. Each planting hole will be partially backfilled with soil excavated from the planting hole.

- Roots will be adequately protected from the sun and/or drying winds.
- After plants are removed from containers, the sides of the root ball will be scarified to promote development of new roots. Any roots wrapped around the sides of the container will be pulled loose from the root ball.
- Plants will be planted with the roots untangled, and spread out in the planting hole to promote even root penetration.
- Plants will be set in planting holes so that the crown of the root ball is at or just above the ultimate soil surface (i.e., finished grade).
- Finely broken-up backfill will be tamped firmly around the root ball, making certain not to depress the crown of the plant.
- The top of the root collar shall be exposed rather than covered with soil; however, the sides of the root ball will not be exposed.
- Immediately following installation, each plant will be deep soaked with sufficient water to reach the lower roots.

c. Seed Installation Technique

Seeding will take place in October or November using the current weather forecast in order to provide the most optimal time as practicable in regards to early season rainfall.

Prior to seeding grow-kill cycles will be used in order to remove non-native and invasive weeds. A grow-kill cycle involves irrigating the soil (or using natural rainfall), allowing the existing seedbank to germinate, followed by removing the vegetation using a chemical, post-emergent herbicide treatment. The cycles will be conducted a sufficient number of times to remove the majority of the weed species present in the seed bank, but a minimum of at least one grow-kill cycle will be completed for any seeded area. If rainfall is to occur early enough in the year, this could be completed, in part, through early season rainfall. Otherwise, supplemental water from a water truck or other source should be used.

Before seeding, all debris will be removed from the area to be seeded. If the soil has been compacted, the ground surface will be tilled to a minimum 12-inch depth if practicable but at least scarified to 3 inches in depth to create an adequate seed bed for planting. Seed will be sown via broadcast seeding or drill seeding and then raked in and watered.

10. Plant Protection

Shrubs may be subject to herbivory that could result in damage or loss of plants. Based on the recommendation of the EM, any or all of the following corrective

measures may be implemented during plant installation, if it is determined that plants may be jeopardized by wildlife:

- Plants susceptible to browsing will be protected using wire cages, tree shelters (e.g., hardware wire cages, etc.), or exclosure fencing (e.g., temporary rabbit fences).
- Wire screening will be installed around the roots of plants to prevent damage attributed to subterranean herbivores (e.g., gophers).
- Protective devices will be maintained in place for at least three years, or until herbivory is no longer a threat to the survival of the plants.
- During annual monitoring visits, the EM will observe for evidence of browsing and direct implementation of the measures outlined above as appropriate.

VI. PERFORMANCE STANDARDS

This Plan proposes to restore habitats that feature California native vegetation and wildlife diversity. The success of achieving these goals will be determined by comparing the mitigation habitats with the performance standards established for each habitat type. The success of the restored areas will be evaluated over a three to five-year period after construction they have been restored and at least two years after any replacement of any failed plantings.

A. Proposed Mitigation Performance Standards

The performance criteria, provided in **Tables 6, 7, and 8**, will be used to determine successful completion of restoration responsibilities. Fulfillment of these criteria will indicate that the restoration areas are progressing well toward the habitat characteristics, functions, and values that fulfill the long-term goals of this Plan. The restored habitats will be monitored annually and performance standards should be met by between the third and fifth year of monitoring.

Vegetation monitoring of the marsh, grassland, and understory (non-trees and shrubs) will be conducted in the same fashion for all of the habitat types, using permanent 1 square meter (approx. 10' x 10') plots.

1. Perennial Marsh

The perennial marsh will be planted in the zone between AHW and ALW, which will ensure ponding throughout the year and lead to high cover by native perennials. These two factors are the most significant with regards to the functional analysis: both contribute strongly to water storage, nutrient, pollutant and sediment transformation/sequestration as well as the maintenance of native plant and wildlife communities. As well, high perennial cover should help reduce the potential for invasive, non-native species to establish. **Table 6** details the performance criteria.

Table 6

Perennial Marsh Performance Criteria

Habitat Element	Final Performance Criteria
Vegetation Cover	≥60% per plot avg
Relative hydrophyte Cover	≥60% per plot avg

Relative cover of Native Species	≥60% per plot avg
Average number of Native Species (Species Richness)	≥3 native species per plot avg
Invasive cover	<10%

2. Riparian Woodland and Oak Savannah

Though the Riparian Woodland habitat is quite different from the Oak Savannah the performance standards relating to the health and survivorship of the woodland plantings is the top priority as is reflected in **Table 7**. All of these areas will serve as high quality habitat and movement corridors for wildlife.

Table 7

Riparian Woodland and Oak Savannah
Performance Criteria

Habitat Element	Final Performance Criteria
Woodlands	
Average Number of Native Trees	70% of target density *
Height of Trees	≥6'
Shrubs	
Number of Shrubs	70% of target density *
Height of Shrubs	≥2'

* Performance criterial can be met via planted materials or recruitment of native species or a combination of both

2. Native Grassland Buffer and Savannah Understory

The species composition of native grasslands and the understories of woodland and savannahs are quite similar with minor differences relating to the effects of woody vegetation on soil and shading, which tend to evolve over time. The perennial grassland cover in these areas provides cover and habitat for wildlife while filling space that would otherwise be filled with non-native or invasive vegetation. Overall cover in these areas should be relatively high with a base of native grasses and forbs (wildflowers) and other vegetation, which is what the performance standards provided in **Table 8**, will measure.

Table 8

Native Grassland Buffer and Savannah Understory
Performance Criteria

Habitat Element	Final Performance Criteria
Native Grassland	
Vegetation Cover (Across all stratums)	≥60% per plot avg
Average Number of Natives (Across all stratums) (Species Richness)	≥3 native species per plot avg
Relative Cover of Natives (Across all stratums)	≥20% per plot avg
Invasive cover (Across all stratums)	<10% per plot avg

VII. MONITORING and REPORTING

A. Post-Construction Monitoring

After completion of any portion of Restoration construction, usually after the reclamation of each Phase, all the elements discussed below will be monitored for a minimum of three years or until the performance standards are met for at least two consecutive years. Monitoring results, including photographs, will be submitted as an annual report to the County by November 1 of each monitoring year.

B. Monitoring Frequency and Season(s)

Generally, Project monitoring will be completed annually. However, qualitative hydrology monitoring of the riparian depressions will be completed up to three times during the first rainy season after the oak savannahs are graded to provide a larger watershed for the depressions. This will help ensure that the riparian areas are receiving a proper water supply. Vegetation monitoring will be completed in the spring or early summer when plant growth and blooming periods are high. Specific monitoring activities shall occur at the frequency and season(s) indicated in **Table 9**. Also, see the maintenance description above for additional detail site reviews focused on weed control.

Table 9

Monitoring Frequency & Seasons

Category	Frequency and Seasons
Hydrology	Up to 3x in the rainy season after completion of wetland depressions and Phases 5 and 6; then yearly
Vegetation	Annually, in late spring or early summer
Maintenance activities	As completed

C. Monitoring Methods

Performance monitoring will include both qualitative and quantitative assessment. Qualitative monitoring will occur during periodic inspections of the restoration areas. These inspections will occur frequently the first few months of some restoration phases and annually in subsequent years as noted above. Quantitative monitoring will take place annually until the final performance criteria are met and will typically occur annually in the late spring or early summer beginning the first year after planting.

1. Qualitative Monitoring

Qualitative monitoring methods will include visual observation and photo documentation from set stations. There are no specific performance criteria associated with this monitoring.

a. Visual Observation

During monitoring events, the EM will document the condition of the restoration area based on visual observations. Current conditions, potential problems (i.e., vandalism, fence damage, presence of exotic plant species, herbivory, etc.), and any recommended actions will be documented in a Field Memo that will be provided to the operator. Any recommended actions will also be documented in the annual Monitoring Report for that year.

b. Photo Documentation

Annual photographs, which are taken to qualitatively document the progress of the habitat restoration over time, will be taken from preset photo stations during scheduled quantitative data collection events. Additional photographs will be taken of any potential problem areas. All photographs will be logged and representative photos included in each annual report.

c. Hydrology

After grading in the oak savannah has been completed, the hydrology of the riparian depressions will be qualitatively assessed. The amount of soil saturation or the depth of recent ponding will be noted. Rainfall will be tabulated during the rainy season from a local source and the depth and extent of ponding defined will be compared to rainfall and the assessed depth.

2. Quantitative Monitoring

a. Marsh and Grassland Vegetation

Vegetation monitoring will be conducted in the same fashion for the perennial marsh and all of the grassland and understory areas. Permanent square meter (approx. 10' x 10') plots will be randomly established throughout each habitat. Enough plots will be placed within each habitat in order to obtain an adequate sample of each. At a minimum, the total number of plots within each habitat will equal at least 10% of the total acreage (i.e. a 50-acre habitat would require a minimum of 5 plots).

The percent cover of unvegetated ground and of each species will be recorded from these plots in the late spring or early summer of each year during the monitoring

period (beginning at the end of the first growing season), using Braun-Blanquet cover classes. Other data will then be calculated from the cover data for each plot, using the mid-point of the range for each code (**Table 10**, below).

Table 10

Braun-Blanquet Cover Classes

Percent Cover	Braun-Blanquet Code	Value Used for Calculations
75-100%	5	87.5%
50-75%	4	62.5%
25-50%	3	37.5%
5-25%	2	15%
many-5%	1	2.5%
Few	+	.1%
one individual	r	.01%

Plants will also be categorized as either "wetland species" or other species. Indicator status will be based on the most current National Wetland Plant List for this region. For comparison to performance criteria, values for all stands within a habitat type will also be averaged. Formulas are described in **Table 11**, below.

Table 11

Vegetation Cover Calculations

Cover Calculation	**Formula**
Total Species Cover (totals can exceed 100 with shading or 'overlap' between species.)	Sum of cover for all species.
Vegetation Cover	100 minus non-plant cover
Relative Cover by Native Species	Sum of cover for the native species / Total Species Cover.
Relative Cover of Hydrophytes	Sum of cover for the wetland species /Total Species Cover.

b. Woodland Vegetation

All planted trees and shrubs will be checked annually in the spring or early summer for height and health. All trees and shrubs will be placed in one of the height categories in **Table 12**.

Table 12

Tree and Shrub Height Categories

	Class 1	Class 2	Class 3
Trees	<2′	2-6′	>6′
Shrubs	<1′	1-2′	>2′

Each tree and shrub will also be identified as healthy or unhealthy, based on general appearance. Data will be displayed in the annual report by species, including live, dead, and unhealthy plants.

c. Maintenance Activities

All maintenance activities will be reported in the annual monitoring report, including the date and a short description of the work involved. Maintenance activities to be reported include mowing, herbicide use, replacement of dead or unhealthy shrubs, replacement of plantings, major debris removal and irrigation line repair.

D. Annual Reports

As required by the OCSMO Section 10-4.701, monitoring reports will be submitted annually beginning the first year after construction and continuing until the project meets the performance standards. Reports will include both raw data (as appendices) and summary tables and graphs of the data required to assess project progress. These reports will be due by the 1st of November of each year. In addition to evaluating the progress relative to the performance standards quantitatively and qualitatively, the reports will include representative photographs taken each year from permanent photo stations. The reports will include a list of names, titles, and companies of all persons who prepared the reports and who participated in the monitoring.

VIII. TEST PLOTS

Beginning in 2018 or upon County adoption of this Plan, disturbed mining slopes (in Phase 3) and agricultural backfill areas (in Phase 1) that have reached their final configuration and will not be further disturbed will serve as test plots for the respective revegetation seed mixes. If a portion of the Phase 4 area is seeded with the erosion control mix, test plots will be set up in this area as a substitute for one of the above areas.

The test plots will be used to study the success of the prescribed native grassland and erosion control mixes. The native grassland mix is provided in **Section V, Table 4**. The erosion control mix is provided below in **Table 13**. At least two plots of each mix will be tested, with at least 1 plot in each of the areas described above. In addition, at least one plot in each area, which will remain unseeded, will be used as a control.

Table 13

Native Erosion Control
Broadcast Seed Specification

Common Name	Scientific Name	Size	lbs/acre
blue wildrye	*Elymus glaucus*	seed	6
California brome	*Bromus carinatus*	seed	6
meadow barley	*Hordeum brachyantherum*	seed	5
six-weeks fescue	*Festuca microstachys*	seed	3.5
California poppy	*Eschscholzia californica*	seed	2.5
		TOTAL	**23**

The test plots, which will be 100m2 in size, will be monitored during the late spring at a time that best corresponds to identification of the majority of the species. The plots will be surveyed by biologist experienced in the identification and ecology of these species. Data that is to be collected during the surveys of each plot will include:

- A list of all species found within the plot
- Total cover
- Total native cover
- Total non-native cover

- Total invasive plant cover using the species from **Section IX Table 14**
- Total relative cover of each of the species within the prescribed grassland and erosion control mixes.

The test plots will be monitored over the course of two consecutive years after seeding. The results of the test plot monitoring will be used to update planting procedures, species, and success criteria monitoring as necessary in consultation with the County.

IX. WEED CONTROL PLAN

This section describes the weed maintenance activities that the operator will implement on the restoration site during the time period between initiation of the restoration and once reclamation has been completed and all phases have met their performance standards.

A. Control of Weeds and Exotic Plants

Weed control is likely to be the foremost issue for maintenance. **Table 14** shows the invasive species found on or near the mitigation site or likely to occur. These are arranged by their California Invasive Plant Council (IPC) class (Cal-IPC 2017). An explanation of the IPC ratings is provided below the table.

TABLE 14
Invasive Plant Species On-Site

Species		IPC Rating	Frequency of Occurrence
Common Name	**Botanical Name**		
ravennagrass	*Saccharum ravennae*	**Moderate/Alert**	Sparse
giant reed grass	*Arundo donax*	**High**	Limited distribution
stinkwort	*Dittrichia graveolens*	**Moderate/Alert**	Co-Dominant
tamarisk	*Tamarix sp.*	**High**	Limited distribution
perennial pepperweed	*Lepidium latifolium*	**High**	Limited distribution
yellow starthistle	*Centaurea solstitialis*	**High**	Co-Dominant on creek slopes
tree tobacco	*Nicotiana glauca*	Moderate	Co-Dominant near creek
smilo grass	*Stipa miliacea var. miliacea*	Limited	Limited distribution
Russian thistle	*Salsola tragus*	Limited	Limited distribution
white horehound	*Marrubium vulgare*	Limited	Sparse
bull thistle	*Cirsium vulgare*	Moderate	Co-Dominant

Italian thistle	*Carduus pycnocephalus*	Moderate	Abundant
milk thistle	*Silybum marianum*	Limited	Co-Dominant
summer mustard	*Hirschfeldia incana*	Moderate	Co-Dominant

IPC RATINGS KEY

High *– These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.*

Moderate *– These species have substantial and apparent-but generally not severe-ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.*

Limited *– These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.*

Alert *– An Alert is listed on species with High or Moderate impacts that have limited distribution in California, but may have the potential to spread much further.*

Watch *– These species have been assessed as posing a high risk of becoming invasive in the future in California.*
(IPC 2017)

Maintenance work will be conducted to reduce the cover of species rated High or Alert by the IPC. Reductions in these aggressive weeds, which outcompete native plant species for resources (e.g. space, water, nutrients, and light), will help the restoration work meet the required performance standards. However, complete eradication may not be feasible unless the weed-infested patches are small.

Once sprouted, these invasive weeds should be removed mechanically to the maximum extent practicable through hand-pulling, mowing, and similar strategies. If mechanical control is not effective or practicable, an EPA-approved systemic herbicide may be applied. Herbicides will be applied under the direction of a licensed applicator and shall be consistent with protection of wildlife potentially occurring on-site, e.g. VELB, Bank swallow, Bat species, Swainson's hawk. More specific recommendations for each of these plant species is provided below.

Ravennagrass/hardy pampas grass (*Saccharum ravennae*): Ravennagrass is an extremely large (up to approximately 12 feet) perennial grass with dense, purplish-colored plumes.

This plant is found sparsely along the channel and channel banks of Cache Creek where it is known to be spreading. When observed, pampas should be spot sprayed with a broad spectrum herbicide. Larger plants will likely require repeated treatments to be affective. Given the limited spread and distribution, new invaders along the edge of Cache Creek should be relatively easy to control.

Giant reed grass (*Arundo donax*): Giant reed grass is also an extremely tall (up to 20 feet) grass with relatively short wide leaves and tall, white plumes. This species is found sporadically along the banks of Cache Creek and in the high terrace zone. Once established, this plant forms dense, impenetrable stands.

Stands should be cut to near ground level before using a broad spectrum herbicide, which may be painted on the stems. Early identification and eradication of establishing grasses greatly simplifies control. Given the limited spread and distribution, new invaders along the edge of Cache Creek should be relatively easy to control.

Stinkwort (*Dittrichia graveolens*): Stinkwort is an annual sticky, glandular plant with a pungent odor. It normally grows between 1 to 3 feet high, though it can get up to as much as 6 feet tall. It has small yellow flowers that produce large amounts of seed that are carried by the wind.

Stinkwort is a plant species that is spreading relatively rapidly throughout the region. Treatment of these plants should be completed prior to flowing and seed development. Prior to maturation, the plant is easy to remove and control. At early stages well before flowering, the plant can be removed using weed whips. When flowering or close to flowering, all cut plant material should be bagged and properly disposed of as seed can continue to mature after the plant has been cut and this species is highly successful at spreading through relatively disturbed areas through seeding. Given the ongoing disturbances at the site and the relatively high level of wind that the area experiences, this plant has a high potential to spread. Once spread, the plant will be very difficult to control. Therefore, this species should be subject to ongoing control measures during plant operation and reclamation.

Tamarisk (*Tamarix sp.):* This species is being found more often in the lower banks of cache creek and is also present in the riparian depressions, especially the largest one near the eastern border. This plant is a known invader of riparian areas and should be treated when found on the slopes of Cache Creek. Those that are found within the habitat depressions do not pose a risk to the remainder of the site as they are very unlikely to spread out of those areas. Tamarisk in these depressions should be removed and treated during the restoration process of these areas.

Perennial pepperweed (*Lepidium latifolium*): Perennial pepperweed was observed primarily around the shop and the roadside to the shop. This plant spreads quickly in mesic areas. Currently, the amount of area this plant takes up is relatively small and therefore, should be treated before it can spread and while it is comparatively easy to control. A broad-leaf herbicide should be used to treat this species.

Yellow starthistle (*Centaurea solstitialis*): This species is widespread throughout the site. However, it has been successfully treated in a number of areas during reclamation and restoration. The westernmost portion of the Phase 1 area was completely dominated by yellow starthistle for a number of years. However, the site was successfully restored by discing the field and applying herbicide treatment prior to drill seeding. Therefore, given this success and the already widespread nature of the plant on the site, it should be dealt with during the reclamation and restoration process of each phase and once at final reclamation.

Besides these plants, which have the potential to become invasive on the site, there are a number of other weeds, primarily mustards and thistles that are known on the site. While these weeds can dominate locally disturbed areas, they are unlikely to become invasive outside of these areas. Treatment without replacement does little good with these weeds. There are areas that have been dominated by these weeds for many years, but have not moved off of these sites. Control by burning or herbicides provides short term relief, but does little good in the long term. These areas including both vegetation and soils are best left undisturbed and should be dealt with during the reclamation and restoration process of each phase and once at final reclamation. When ready, the top 12 inches or so of soil should be removed and buried to a depth of at least 5 feet so as to kill off the seed bank.

These species include:

Smilo grass (*Stipa miliacea var. miliacea*): This species is very localized in a few locations around the banks of Cache Creek and is not spreading rapidly. Given its limited distribution and ability to spread, it should be dealt with during the reclamation and restoration process of each phase and in the final condition.

Russian thistle (*Salsola tragus*): Outside of a few individuals, this species is noted almost exclusively from the disturbed northeastern portion. This outbreak should be controlled while it is relatively small and easier to manage. Adult individuals should be cut and removed. Seedlings can be sprayed with a post emergent, or cut at the base with hand tools or weed whips.

White horehound (*Marrubium vulgare*): A very few individuals of this species were noted sporadically around the site. It does not appear to be a large danger of spreading

Tree tobacco (*Nicotiana glauca*): Tree tobacco has been found occasionally along and near the banks of cache creek and in some of the gravel piles near the plant. In the past, these have been successfully treated with herbicide during restoration.

Bull thistle (*Cirsium vulgare*), **Italian thistle** (*Carduus pycnocephalus*), **Milk thistle** (*Silybum marianum*), **Summer mustard** (*Hirschfeldia incana*): These plants are often found together in the margins of agricultural land or on previously disturbed areas. They are not in danger of spreading and should be left undisturbed until the final

condition when the top foot or so of soil should be removed and buried to control the seed bank.

In general, weed control will require at least annual surveys and reporting, followed by active management. Weed control on the site will include the following steps:

1. The biological monitor will complete a spring (March - May) survey of the site to identify sprouted material. They will define and map areas that are in need of invasive weed control including the species and note any recommendations.
2. The results of the weed control measures will be reviewed in the annual vegetation monitoring survey. The report will identify the areas and species that were noted for control, identify results, and provide additional recommendations to help meet the restoration performance standards.
3. The weed control methods will take an adaptive management approach. The methods will continue to be refined based upon the previous year's results until the most practicable approach is found.

As mentioned above, complete eradication of weeds may not be feasible unless the weed-infested patches are small.

X. MAINTENANCE PLAN

A. Supplemental Irrigation

As previously noted, artificial drip irrigation will be supplied during the two years after planting to facilitate the establishment of plants. Spray type irrigation should not be used as it facilitates the spread of non-native and invasive vegetation.

B. Protective Devices

Protective devices, *e.g*. tubex tree shelters or wire cages, if installed, will be maintained in good condition. Additional devices will be installed or other measures taken if monitoring indicates shrub damage from herbivory. However, these will be removed prior to the onset of long-term management.

C. Replacement of Dead or Diseased Plant Materials

The planting densities and the performance standards, which are detailed in this plan, assume a certain level of mortality during the monitoring period as well as potential colonization of the site by native species. As long as the performance standards are met, replacement of plant materials will not be necessary. If mortality levels exceed the performance standards, however, the cause of mortality will be investigated and corrective actions taken as necessary to resolve any problems prior to plant replacement. Plants will be replaced only during the appropriate time of year as noted above. Note, though, that plant replacement will not be required as part of the long-term management. Dead species that are not replaced may remain onsite and be allowed to naturally decompose.

XI. REFERENCES

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