ROSEMONT PROJECT: POTENTIAL EFFECTS TO YELLOW-BILLED CUCKOO AND ITS PROPOSED CRITICAL HABITAT

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ATTACHMENTS

1. INTRODUCTION

As part of the monitoring efforts proposed by Rosemont Copper Company and later HudBay Minerals, Inc. (collectively referred to as "Hudbay") to address potential impacts of the Rosemont Copper Project (the Project) on yellow-billed cuckoo (*Coccyzus americanus*; YBCU), HudBay retained WestLand Resources, Inc. (WestLand) to survey for YBCU within the perimeter fenceline of the Project. The Final Environmental Impact Statement (FEIS) for the Project acknowledged that YBCU were known from areas in the vicinity of the Project, included analyses of the potential effects of the Project on YBCU, and incorporated conservation measures to address potential impacts to the species. The conclusion of the analysis presented in the FEIS was that the action "may impact individuals but [is] not likely to result in a downward trend toward Federal listing as threatened or endangered or in a loss of population viability" (FEIS, pg. 686).

Since the publication of the FEIS, YBCU has been listed as threatened under the Endangered Species Act (FWS 2014b), and critical habitat has been proposed for the species (FWS 2014a).

In the proposed critical habitat rule, the U.S. Fish and Wildlife Service (FWS) identified six "physical and biological features" (PBFs) of YBCU habitat, which are considered important to the conservation of the species (FWS 2014a, pp. 48550-4). These PBFs are:

- "Rivers and streams of lower gradient and more open valleys with a broad floodplain."
- "The presence of abundant, large insect fauna and tree frogs during nesting season."
- "Flowing rivers and streams, elevated subsurface groundwater tables, and high humidity."
- "Flowing perennial rivers and streams and deposited fine sediments."
- "Riparian trees including willow, cottonwood, alder (*Alnus* sp.), walnut (*Juglans* sp.), sycamore (*Platanus* sp.), boxelder (*Acer* sp.), ash (*Fraxinus* sp.), mesquite, and tamarisk that provide cover and shelter for foraging and dispersing western yellow-billed cuckoos."
- "Blocks of riparian habitat greater than 200 ac (81 ha) in extent and greater than 325 ft (100 m) in width, with one or more densely foliaged, willow-dominated nesting sites and cottonwood-dominated foraging sites."

Generally, these habitat features are not found within or near the within the perimeter fenceline of the Project, but do occur, to a limited extent, within other portions of action area, such as segments of Lower and Upper Cienega Creek, a considerable distance from the perimeter fenceline.

This document transmits survey information for YBCU within the perimeter fenceline of the Project (***Attachments 1*** and ***2***) and provides an updated analysis of the effects of the Project on YBCU and its proposed critical habitat. The recent surveys conducted by WestLand do not significantly change the analysis provided by the FEIS.

2. STATUS OF YBCU IN THE AREA

Within the Analysis Area specified by the FEIS, YBCU have been reported from Upper and Lower Cienega Creek, Empire Gulch, Barrel Canyon, and Box Canyon. Surveys by the Bureau of Land Management (BLM) in 2001, 2010, 2011, and 2014 detected YBCU along Upper Cienega Creek within the Las Cienegas National Conservation Area (BLM 2014). In 2001, approximately 10.5 miles of Cienega Creek were surveyed during three survey periods in the breeding season. Surveyors recorded a maximum of 25 detections during a single survey period (BLM 2014). One to seven detections of YBCU were reported during surveys of shorter lengths of Upper Cienega Creek in 2010, 2011, and 2014 (BLM 2014). In Empire Gulch, near Empire Gulch Springs, surveys conducted by BLM detected YBCU in 2010 and 2014 (BLM 2014). In addition, a single YBCU was mist-netted in Empire Gulch during the summer in 2008 and 2011 (BLM 2014). Along Lower Cienega Creek, Pima County reported detecting 11 YBCU individuals during surveys in 2013 (Powell 2013). The FEIS reported that YBCU were detected along Barrel Canyon in 1975, and in Box Canyon every year between 2003 and 2012.

Hudbay retained WestLand to survey for YBCU within the perimeter fence to obtain additional information on YBCU near the Project and fulfill the survey obligations included in the proposed conservation measures for the Project (Rosemont 2013). WestLand surveyed Barrel, McCleary, and

Wasps canyons, as well as the drainage associated with Rosemont Springs in 2013 and 2014 (see ***Attachments 1*** and ***2***). Surveys in 2013 resulted in three YBCU detections, one along Wasp Canyon, and two along Lower Barrel Canyon. No evidence of breeding was observed. In 2014, surveys resulted in a total of eight YBCU detections at six different locations along Barrel Canyon. At two locations, pairs of YBCU were observed interacting with each other, suggesting possible breeding at these locations per the guidelines outlined by Halterman et al. (2009).

3. POTENTIAL EFFECTS OF THE PROJECT ON YBCU

3.1. DIRECT EFFECTS

Surface Disturbance

Based on the most recent data from surveys within the perimeter fenceline of the Project, riparian vegetation will be lost at two locations along Barrel Canyon where a pair of YBCU were observed interacting with each other, suggesting possible breeding activities. Given the life history of the species, whereby they often range widely during the breeding season in search of optimal foraging conditions (FWS 2013), it is likely that any individuals that might be affected by disturbance to habitat along Wasp and Barrel canyons will nest at other locations in the Southwest. As such, impacts of the loss of riparian vegetation to population viability and dynamics of YBCU are not anticipated. Potential YBCU habitat along Box Canyon, Empire Gulch and Lower and Upper Cienega Creek will not be directly affected by surface disturbance as a result of the Project.

Lighting

Increased nighttime lighting from anthropogenic sources can have effects on the foraging behavior of birds. Little direct evidence is available in the literature to develop specific thresholds of light intensity under which birds may be affected by increased lighting. Acute changes in foraging behavior and parental care can be caused by large increases (10 lux) in nighttime lighting at nest sites (Titiulaer et al. 2012). Similarly, the behavior and orientation of migrating birds can be disrupted by increased nighttime lighting such as lighthouses and communication towers (e.g., Gauthreaux and Belser 2006). Effects from these sources appear to be driven by a combination of light intensity, duration, and the wavelength of light of the light source (e.g., Poot et al. 2008). In general, effects to avian species as a result of nighttime lighting are prevalent when light intensities are high, e.g. migrants' attraction to lighthouse beams and effects from experimental lighting of high intensity (Titulaer et al. 2012). Although effects of nighttime lighting as low as 0.3 lux have been documented in experiments with captive birds, these effects were only observed after chronic exposure (8-13 months; Dominoni et al. 2013) to low levels of nighttime lighting, far longer than the breeding season for YBCU in southern Arizona (late-June through mid-August [FWS 2013, 2014a,b]).

Analyses performed by WestLand (2012) predict that the Project will result in an increase in horizontal light above ambient conditions. The increase, however, will largely be limited to the areas within the perimeter fence. Where horizontal lighting is predicted to affect areas outside of the perimeter fence, such as Box Canyon, the increase in lighting will be slight (e.g., less than 0.01 lux in the areas surrounding

Box Canyon [WestLand 2012]). This increase in horizontal lighting is considerably less than the light intensities at light sources that attract and kill avian migrants (Gauthreaux and Belser 2006), and the light intensities used in experiments to document effects of nighttime lighting on nesting birds (Titulaer et al. 2012). Empire Gulch and Upper Cienega Creek are not predicted to experience increased levels of horizontal light (WestLand 2012). Lower Cienega Creek was not part of the lighting analysis in WestLand (2012), but is more than 12 miles from the lighting sources associated with the Project. Given the attenuation light with distance[1], any light that may reach Lower Cienega Creek will be minimal, and certainly less than the levels of light known to impact foraging, breeding, and migrating birds as discussed above.

The Project is also predicted to result in an increase in skyglow. A simplified analysis of skyglow performed by WestLand (2012) predicted that the geographic extent of this skyglow will be limited to the approximate extent of the perimeter fence. Thus, the potential effects of light from skyglow to breeding YBCU outside of the perimeter fence is anticipated to be minimal in those areas closer to the perimeter fence, i.e., Box Canyon, and not expected to occur in locations far from the Projects, such as Empire Gulch and Upper and Lower Cienega Creek. Any YBCU nesting within the perimeter fence, however, may be affected by horizontal lighting and skyglow during the active mining period.

Noise

To our knowledge, the potential effect of noise has not been well-studied in western YBCUs. In eastern YBCUs, noise does appear to affect or at least correlate with occupancy, particularly when the noise source matches the frequency of YBCU vocalizations (Goodwin and Shriver 2011). This correlation is prevalent closer to heavily travelled highways (i.e., average daily traffic of 41,000 to 59,000 vehicles), but attenuates with distance such that occupancy rates of cuckoo are decreased compared to locations further away. “Quiet sites” were associated with noise levels of approximately 41-52 dBA and were greater than 700 m from heavily-travelled roads “Noisy sites” were associated with noise levels of approximately 45-57 dBA and were within 250 m of a heavily-travelled road (Goodwin and Shriver 2011).

Noise modeling conducted in support of the review of the Project indicate that 40 dBA noise contours associated with intermittent machinery and the plant site will largely be limited to areas within the perimeter fence (Tetra Tech 2009, 2010a). Most of the areas outside of the perimeter fence that will be affected by noise from these activities will experience levels between 40 dBA and 30 dBA (equivalent to a bedroom at night, ADOT 2015), although portions of Box Canyon may experience slightly higher noise levels from intermittent equipment (Tetra Tech 2010a).

Similarly, noise modeling of traffic along SR 83 indicates that noise levels decrease considerably as distance from the road increases (Tetra Tech 2009, 2010a). Noise levels associated with increased traffic volumes on SR 83 are predicted to increases slightly, but may be indiscernible from background levels (i.e. a less than 3 dBA difference) (Tetra Tech 2009). For humans, an increase of 3 dBA is the threshold at which a change will be noticed for a sound with the same frequency content or timbre (FHWA 1980).

[1] A simple geometric representation of how light attenuates can be calculated as lumens of the light source divided by $2\pi r$, where r is the distance between a location of interest and the light source.

Although exactly how a YBCU will perceive a 3 dBA increase in noise is unknown (see Peter et al. 2008), no areas outside of the perimeter fence where YBCU are known to occur will experience noise levels from traffic that is greater than 30 dBA (Tetra Tech 2010a).

Even without incorporating localized shielding from terrain, noise from blasting will not increase above 30 dBA in areas where YBCU are known to occur in Empire Gulch and Upper and Lower Cienega Creek (Tetra Tech 2009). Box Canyon will experience noise levels of 40 to 50 dBA due to blasting, although blasting will only occur once per day.

Based on the available data on potential effects to YBCU and noise modeling associated with the Project, the potential effects of noise on YBCU is anticipated to be limited to those areas within the perimeter fence, and perhaps areas along Box Canyon. The latter location may experience small increases in noise levels, but based on the noise levels where YBCU are found in eastern North America (Goodwin and Shriver 2011) noise levels at Box Canyon are not anticipated to preclude YBCU from Box Canyon. Any YBCU that breed within the perimeter fence are likely to experience noise levels that are consistently above 50 dBA.

Dust

The effect of dust from Project activities on YBCU is anticipated to be minimal. The spatial extent of dust deposition is known to attenuate with distance from the source of dust formation. For example, dust loads along unpaved haul ways decreases exponentially with distance, such that more than 70 percent of total dust is deposited within 10 m of the road, and more than 90 percent within 30 m (Walker and Everett 1987). Thus although other factors such as weather conditions and particle size will influence the spatial extent of dust deposition (Walker and Everett 1987), riparian vegetation that supports YBCU but does not occur within close proximity of dust sources are likely to incur considerably less impacts than those that occur adjacent to sources of dust. The location of the perimeter fence (which precludes access by the public) represents that point at which compliance with the National Ambient Air Quality Standards (NAAQS) is measured (FEIS, p. 220). Air quality modeling completed for the Rosemont Project indicates that the proposed action will meet NAAQS at the perimeter fence; as such, the air quality in areas of public exposure (i.e., outside the perimeter fence) will comply with national standards developed to protect public health. Although these thresholds were not developed for YBCU, the location of the perimeter fence does indicate that dust will be greatest in the areas within the perimeter fence. As such, effects of dust from the Project to riparian vegetation in areas far from the perimeter fence where YBCU are known to occur, i.e., Empire Gulch and Upper and Lower Cienega Creek, are not expected to occur. Even in riparian areas relatively close to the perimeter fence, such as Box Canyon, given the attenuation of dust with distance from dust sources, it is unlikely that fugitive dust levels will be so great as to affect riparian vegetation to such a degree that they no longer can support YBCU.

Stormwater Diversion

The impoundment of surface water will occur relatively early in mine life, and effects will largely be limited to the Davidson Canyon watershed. According to the FEIS, annual average runoff through Barrel and Davidson Canyons is predicted to be reduced by approximately 30 to 40 percent during operations

and 17 percent post closure. In lower Davidson Canyon, the volume of stormwater runoff is estimated to decrease by approximately 4 percent.

Although this reduction in stormwater runoff could result in a small decrease in recharge to the local aquifer along Barrel and Davidson canyons, the effects of this reduction will attenuate with distance from the Project (WestLand 2011a,b). Much of the riparian vegetation in lower Barrel Canyon and upper Davidson Canyon is xeroriparian, and the pockets of mesoriparian species are limited (WestLand 2011a), indicating that the nature and extent of riparian vegetation in these reaches are strikingly different than the large blocks of riparian woodland along broad flowing rivers considered as habitat for YBCU by FWS (2013, 2014a,b). As such, we do not anticipate YBCU to regularly use these areas. Thus, although the riparian vegetation in lower Barrel Canyon and upper Davidson Canyon may experience deleterious effects from stormwater diversion, such as canopy dieback and mortality (WestLand 2011a,b), these areas lack the PBFs identified by FWS as the defining characteristics of habitat for YBCU, and the effects to YBCU from these potential effects to riparian vegetation are expected to be limited. Larger pockets of wetland-associated species and generally denser xeroriparian vegetation occurs in lower Davidson Canyon and at the confluence with Cienega Creek (WestLand 2011a), where YBCU are known to occur (Powell 2013). The reduction of stormwater runoff at these downstream reaches of lower Davidson Canyon, however, is minimal. As such, at locations where YBCU are most likely to occur in lower Davidson Canyon and Lower Cienega Creek, the reduction in stormwater runoff as a result of the Project is unlikely to have more than a minimal effect on riparian vegetation that may be capable of supporting the species (WestLand 2011a,b).

3.2. INDIRECT EFFECTS

Groundwater Drawdown

As a result of the pit development and the resulting hydrologic sink, groundwater drawdown is expected to propagate from the pit following the cessation of mining. Quantitative predictions of the absolute levels of drawdown have been provided from three different models (M&A 2010, Myers 2010, Tetra Tech 2010b). Although these models include different assumptions, parameter values, and model structure, they all predict similar results. Quantitative predictions (i.e., the absolute level of groundwater drawdown) differ among the models, but the overall geographic extent, relative magnitude, and temporal dynamics of regional groundwater drawdown as a result of the proposed pit are similar. The fact that the three models have produced similar qualitative results in part addresses the uncertainty associated with equifinality, the principle that environmental systems can be explained equally well by multiple models (see Konikow and Bredehoeft 1992, Beven 2002). The similar results supply confidence in the general conclusions of these models; a dispersed decline in groundwater level will occur gradually over the course of centuries as a result of the Project, and could cause a small magnitude of drawdown in areas far from the pit, such as Upper and Lower Cienega Creek. Moreover, sensitivity analyses performed by M&A (2010) and Tetra Tech (2010b) suggest that this general conclusion is consistent even when using large changes in parameter estimates, thus lending further confidence to the qualitative results of these models.

The general findings of the groundwater models provide a robust conclusion suggesting that the drawdown will be small in magnitude in Upper and Lower Cienega Creek and will occur centuries after the cessation of mining activities. Quantitative predictions of groundwater drawdown and its effects on riparian vegetation should be used with caution, particularly those related to regional groundwater declines that occur centuries in the future. The ability of any model to predict small quantitative changes in drawdown hundreds of years into the future is limited, and reliance on models to predict effects over such long-time periods has been explicitly cautioned against (e.g., Faust et al. 1981, Konikow 1986, Konikow and Bredehoeft 1992, Oreskes et al. 1994, Parker et al. 1995). As such, we do not consider the minimal amount of drawdown predicted along Upper and Lower Cienega Creek to be reasonably certain to occur, and thus no effects to YBCU and to suitable YBCU habitat that might occur along these drainages are anticipated.[2]

Drawdown at locations closer to the proposed pit, such as Box Canyon, are more likely to occur. Box Canyon–a location that lacks many of the PBFs identified by FWS as characteristic of YBCU habitat (i.e., extensive riparian woodland along broad flowing rivers), but where YBCU are known to occur–is predicted to experience relatively large amounts of groundwater drawdown (10 to 100 feet) within 150 years following the cessation of mining (M&A 2010, Tetra Tech 2010b). If we assume that Box Canyon is connected to the regional groundwater system, riparian vegetation along the reach near the Project that, although lacking many of the PBFs identified by FWS for YBCU habitat, could support YBCU, will likely experience dieback and/or mortality due to groundwater drawdown. Riparian vegetation along lower Barrel Canyon and Davidson Canyon near the proposed pit could experience relatively large groundwater drawdown (10 to 100 feet) within 150 years following the cessation of mining (M&A 2010, Tetra Tech 2010b). These areas, however, are dominated by xeroriparian vegetation that is not reliant on shallow groundwater (WestLand 2011a,b) and is strikingly dissimilar to the large expanses of riparian woodland considered by FWS (2013, 2014a) to be YBCU breeding and foraging habitat. Moreover, Davidson Canyon is considered to be likely disconnected from the regional groundwater (FEIS, pg. 534), such that drawdown of regional groundwater as a result of the Project will not affect the riparian vegetation in Davidson Canyon.. As such, we do not anticipate effects to YBCU habitat along lower Barrel Canyon and Davidson Canyon as a result of groundwater drawdown.

Drawdown at Empire Gulch is expected to be relatively minor (3 to 6 feet) until 150 years after the cessation of mining (M&A 2012, Engineering Analytics 2012). Riparian vegetation that supports YBCU could experience dieback and mortality should drawdown of this magnitude occur. However, this amount of drawdown is also far from certain; 3-6 feet of drawdown is predicted to occur centuries in the future (M&A 2010, Tetra Tech 2010b), and the artesian conditions that exist at Empire Gulch may temper drawdown (HydroLogic 2014), such that riparian vegetation may be relatively unaffected. As such, although the riparian vegetation that supports YBCU at Empire Gulch Springs may be affected by drawdown centuries in the future, the magnitude of these effects are far from certain.

[2] Note that even if we assumed that drawdown 1,000 year in the future was reasonably certain to occur, the absolute level of that drawdown and the effects to aquatic habitat for Upper and Lower Cienega Creek are expected to be exceedingly small (WestLand 2012, Powell et al. 2014, Rosemont 2014).

Pit Lake Chemistry

The pit lake that is predicted to develop following the cessation of mining is expected to have elevated concentrations of certain elements known to have adverse effects on wildlife. The potential that elevated levels of minerals and other constituents will affect YBCU through bioaccumulation is governed by two conditions. First, there must be sufficient habitat within the pit lake for macroinvertebrates and other potential YBCU prey species to develop and be exposed to high mineral concentrations. Second, these macroinvertebrates or their predators must be ingested by YBCU in sufficient quantity to result in toxic effects, whether lethal or sub-lethal.

The structure of open pit mines, characterized by a succession of benches, results in a small amount of area within the pit lake that is available for aquatic plants and their associated macroinvertebrates (Hakonson et al. 2009). The steepness of the benches of many mine pits, including the pit proposed by the Project, results in only a small amount of the pit lake where light penetrates to substrate to allow for the development of aquatic plants, i.e., the littoral zone (Hakonson et al. 2009). Although aquatic organisms do inhabit other areas of pit lakes, particularly in the euphotic zone where light penetrates open water, the physical and chemical characteristics of most pit lakes create oligotrophic conditions, characterized by limited primary production and overall productivity (Hakonson et al. 2009). As such, the opportunity for the bioaccumulation of minerals and other constituents and their entry into the food chain of YBCU is limited.

Although we know of no studies that explicitly test the lateral extent to which elevated concentrations of metals other constituents are incorporated into the biotic community surrounding water bodies that support YBCU, studies of mercury-contaminated water bodies provide valuable insight. In a study of several passerine species that nest and feed near contaminated water bodies, Howie (2010) found that the lateral extent of elevated mercury levels in birds and invertebrate prey species varied between approximately 250 and 650 meters. After this distance, mercury levels in the blood and feathers could not be distinguished from background levels, indicating that only those individuals that forage adjacent to contaminated water bodies show signs of bioaccumulation of constituents. This range is far smaller than the distance between the pit and Box Canyon (approximately 4 km), Empire Gulch Springs (approximately 12 km), and Upper (approximately 15.5 km) and Lower Cienega Creek (approximately 23.5 km). Thus, although the data available do not explicitly address YBCU, the elevated concentrations of metals and other constituents in the pit lake are not anticipated to affect YBCU breeding far from the mine pit.

Based on the limited amount of habitat that will likely be available within the pit for aquatic vegetation and macroinvertebrates, and the distance between the pit and areas that contain expansive blocks of dense riparian vegetation capable of supporting YBCU nesting and breeding (FWS 2014a at pp. 48550-4), as well as known locations of YBCU in the vicinity of the Project, the likelihood that YBCU will be affected by elevated metal and other constituents in the pit lake is small and speculative.

4. EFFECTS TO YBCU PROPOSED CRITICAL HABITAT

Critical habitat within the Action Area has been proposed for the YBCU on Upper Cienega Creek (Unit 33) and on Lower Cienega Creek (Unit 38) (FWS 2014a). The Upper Cienega Creek Unit consists of 10 linear miles along Cienega Creek and 4 miles within Empire Gulch and is 5,204 acres in size. The Lower Cienega Creek Unit consists of 11 linear miles along Lower Cienega Creek and is 2,360 acres in size.

As discussed previously, FWS has identified six PBFs, which are the features considered by FWS to be essential for the conservation of the YBCU. Based on those PBFs, FWS has identified three Primary Constituent Elements (PCE) of YBCU critical habitat, which form the baseline for determining the location of proposed critical habitat units (FWS 2014a, pg. 48554). There are three defined PCE's for the YBCU:

(1) "Primary Constituent Element 1—*Riparian woodlands*. Riparian woodlands with mixed willow-cottonwood vegetation, mesquite-thorn-forest vegetation, or a combination of these that contain habitat for nesting and foraging in contiguous or nearly contiguous patches that are greater than 325 ft (100 m) in width and 200 ac (81 ha) or more in extent.

(2) Primary Constituent Element 2— *Adequate prey base*. Presence of a prey base consisting of large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies) and tree frogs for adults and young in breeding areas during the nesting season and in post-breeding dispersal areas.

(3) Primary Constituent Element 3— *Dynamic riverine processes*. River systems that are dynamic and provide hydrologic processes that encourage sediment movement and deposits that allow seedling germination and promote plant growth, maintenance, health, and vigor (e.g. lower gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers and streams)."

4.1. DIRECT EFFECTS

As described above, surface water impoundment will result in the reduction of stormwater runoff along Davidson Canyon, which is a tributary to Lower Cienega Creek. According to the FEIS, the reduction in runoff that will report to Lower Cienega Creek, however, will be small, less than 5 percent, and will only affect proposed critical habitat unit 38 downstream of the confluence of Davidson Canyon and Lower Cienega Creek. Because much of the surfacewater, and presumably subsurface water along Lower Cienega Creek is a function of the contribution of Cienega Creek itself, rather than a result of flows from Davidson Canyon (PAG 2003), such a small reduction in runoff along Davidson Canyon is not anticipated to affect substantially the riparian vegetation and aquatic invertebrate community in Lower Cienega Creek. Reductions in runoff are also not expected to preclude Lower Cienega Creek from experiencing the dynamic riverine processes that current exist. Although the absolute volume of flow and sediment will be reduced along Davidson Canyon, proposed critical habitat along Lower Cienega Creek will still experience flood flows that will establish and promote riparian vegetation. Thus, although a portion of proposed critical habitat for YBCU along Lower Cienega Creek will experience reduced

stormwater runoff, it is not anticipated that this reduction will result in the failure of critical habitat unit 38 to meet the described PCEs.

No direct effects to proposed critical habitat unit 33 along Empire Gulch and Upper Cienega Creek are anticipated.

4.2. INDIRECT EFFECTS

As discussed above, effects to Upper and Lower Cienega Creek from groundwater drawdown are not reasonably certain to occur. Thus, effects to proposed critical habitat along Upper and Lower Cienega Creek are not anticipated.

A portion of proposed critical habitat unit 33 at Empire Gulch Springs is predicted to experience small amounts of drawdown after the cessation of mining. Drawdown at Empire Gulch is expected to be relatively minor (3 to 6 feet) until 150 years after the cessation of mining (M&A 2012, Engineering Analytics 2012). Riparian vegetation within proposed critical habitat could experience dieback and mortality should drawdown of this magnitude occur. However, this amount of drawdown is also far from certain, and is predicted to occur centuries in the future (M&A 2010, Tetra Tech 2010b). Moreover, the artesian conditions that exist at Empire Gulch may temper drawdown (HydroLogic 2014), such that riparian vegetation may be relatively unaffected. As such, although proposed critical habitat at Empire Gulch Springs may be affected by drawdown centuries in the future, the magnitude of these effects are uncertain. Furthermore, Empire Gulch Springs contains only a small portion of critical habitat unit 33, less than 9 percent of the entire critical habitat unit. As such, the majority of the unit along Upper Cienega Creek will remain unaffected, as potential effects from groundwater drawdown are not reasonably certain to occur along Upper Cienega Creek.

5. CONSERVATION MEASURES

The suite of conservation measures proposed by the Project proponent in 2013 and incorporated into the FEIS and Final Biological Opinion for the Project addresses potential effects to YBCU and its proposed critical habitat. These include many of the conservation measures developed for other riparian and aquatic species, such as the southwestern willow flycatcher (*Empidonax traillii extimus*), that also benefit YBCU and its critical habitat.

These conservation measures are briefly summarized below. No new conservation measures have been proposed.

Monitoring

Monitoring for YBCU has been conducted within the perimeter fence of the Project in 2013 and 2014. Surveys of drainages with larger trees within the undisturbed portions of the perimeter fence will continue annually for the first five years of mine operation.

Predicted impacts to aquatic species and the avian species including the southwestern willow flycatcher and YBCU along Cienega Creek and in Empire Gulch are based on predicted groundwater drawdown as a result of the formation of the mine pit lake. The groundwater models constructed for the Project produced similar predictions of the extent of groundwater withdrawal from Project activities that are robust to changes in the estimates of hydrologic parameters. Although these models represent the best scientific data available, some degree of predictive error is inherent in mathematical modeling. As such, Hudbay will monitor changes in groundwater and surface water as a result of mining activities and update both groundwater and surface water models based on data obtained from monitoring efforts. As a result, these efforts will reduce the uncertainties associated with the predicted effects of mining activities on stream flow along Cienega Creek.

Restrictions on Vegetation Clearance

Should vegetation clearing be proposed during the YBCU nesting season, Hudbay will coordinate with the Coronado National Forest and FWS prior to vegetation clearing in any suitable YBCU habitat. Vegetation clearing within 50 meters of an active YBCU nest or the center of an active YBCU territory shall not occur during the YBCU nesting period. This conservation measure shall not restrict vegetation clearing for implementation of an approved Plan of Operations outside of the YBCU nesting period.

Land Acquisition

Hudbay will finalize the acquisition of Sonoita Creek Ranch, containing approximately 1,500 acres of semi-desert grassland, Madrean evergreen forest, and riparian habitat along upper Sonoita Creek. The acquisition includes surface water rights that support two perennial ponds and associated riparian vegetation. This property provides habitat connectivity between drainages in the Patagonia and Santa Rita mountains that could benefit YBCU. Conservation and restoration of riparian vegetation in this parcel will add to the nesting, foraging, and migration potential of this parcel to YBCU.

Purchase of Water Rights and Cienega Creek Watershed Conservation Fund

Hudbay has acquired the right to purchase approximately 1,122 acre-feet of surface water rights held by the Del Lago Golf Course. These surface water rights will be used to enhance aquatic habitat values in the Cienega Creek watershed that could benefit YBCU and its proposed critical habitat.

Hudbay will also provide funding for stream renovation and restoration projects to increase water flows and enhance wetlands in the Cienega Creek watershed through a conservation fund. The location and design of these projects will be determined by the Bureau of Land Management and the Arizona Game and Fish Department, with input from other key stakeholders in the watershed, including the Coronado National Forest and FWS. The development and implementation of these projects will seek to preserve and enhance aquatic and riparian ecosystems and protect and maintain habitat for federally listed aquatic and riparian species in the watershed. This fund and the associated water rights will directly benefit YBCU and its critical habitat.

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APPENDIX A

2013 YELLOW-BILLED CUCKOO (COCCYZUS AMERICANU) SURVEY FOR ROSEMONT COPPER

APPENDIX B

2014 YELLOW-BILLED CUCKOO (COCCYZUS AMERICANU) SURVEY FOR ROSEMONT COPPER