Appendix E
Biological Technical Report

Biological Resources Technical Report

Aquabella Project

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
BTR	Biological Resources Technical Report
CDFW	California Department of Fish and Wildlife
CNDDB	California Natural Diversity Database
CRPR	California Rare Plant Rank
HCP	Habitat Conservation Plan
MSHCP	Multiple Species Habitat Conservation Plan
Project	Aquabella Project
USFWS	U.S. Fish and Wildlife Service

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1 Introduction and Methods

In support of the Subsequent Environmental Impact Report for the proposed Aquabella Project (Project) in Moreno Valley, California, this Biological Resources Technical Report (BTR) discusses the methods and results of the biological technical studies and assessments that were conducted on the approximately 673-acre Project site in 2022 and 2023. Particular focus of this BTR is on the potential occurrence on the site for those species listed by state and/or federal resources agencies as threatened or endangered or otherwise considered by these agencies to be of special status.

Prior to conducting these studies, Dudek biologists queried local, state, and federal agency literature and databases to identify special-status biological resources (those resources protected or regulated by local, state, and/or federal resource agencies or otherwise considered of special status by these agencies) that have potential to occur on the Project site or in the vicinity based on previously documented occurrences. These database searches consisted of the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB) (CDFW 2022a), the California Native Plant Society's Inventory of Rare and Endangered Plants (CNPS 2022a), the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) (USFWS 2022), and the Western Riverside County Regional Conservation Authority's Multiple Species Habitat Conservation Plan (MSHCP) Information Map (RCA 2003). Based on the review of these databases, a target list of special-status plant and wildlife species known to occur in the Project region was developed (see Table 2 in Section 4.6 of the SEIR).

As discussed further below, a general biological reconnaissance assessment was conducted within the developed and undeveloped areas of the Project site by Dudek biologists in December 2022. The focus of the assessment was to identify and characterize general site conditions, map on-site vegetation communities and land cover types, and to determine the potential of the site to support any of the target list of special-status plant and wildlife species identified as part of the database search discussed above. Based on this assessment, a final target list of special-status plant and wildlife species was developed that consisted of those species determined to have some potential to occur on the Project site, for which focused protocol-level surveys were conducted. The methods and results of these surveys are included in this BTR.

Based on the database review and reconnaissance-level assessment, the following species-specific surveys and assessments were conducted in 2023 and are described in this BTR: wet- and dry-season protocol surveys for three state- and federally-listed threatened or endangered fairy shrimp species; protocol surveys for the state- and federally listed endangered least Bell's vireo (*Vireo bellii pusillus*); focused surveys for the recently state-listed candidate for threatened Crotch's bumblebee (*Bombus crotchii*); and protocol surveys for the state Species of Special Concern burrowing owl (*Athene cunicularia*). In addition, because vernal pools are considered sensitive aquatic resources under the Western Riverside County MSHCP (Riverside County Transportation and Land Management Agency 2003), pools in which surveys were conducted for special-status fairy shrimp were also evaluated for their potential to be characterized as vernal pools.

A brief discussion of the Project site, regional natural resources planning efforts that affect the site, and general conditions and vegetation communities occurring on the Project site is presented below, followed by a more detailed discussion of the methods and results of each of the special-status species and resource surveys and studies conducted on the site.

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2 Vegetation Communities and Land Cover Type Mapping

2.1 Methods

Vegetation communities within the Project site were mapped during the December 2022 site visit according to A Manual of California Vegetation, Online Edition (CNPS 2022b) and the California Natural Community List (CDFW 2022b). Some modifications, such as the Preliminary Descriptions of the Terrestrial Natural Communities of California (Holland 1986; Oberbauer et al. 2008) and the Habitat Classification System (Gray and Bramlet 1992), were incorporated to accommodate the lack of conformity of the observed communities to those provided in these references.

During the field survey, biologists used the Collector for ArcGIS application (ESRI 2023). Species composition data was collected for each of the vegetation communities and land cover types. Upon completion of the field mapping, Dudek GIS specialists incorporated all edits and notes into the GIS vegetation dataset for the Project for use in preparing maps and for further data analysis.

2.2 Results

The predominant soil types within the site are Ramona and Greenfield sandy loams (USDA 2023a). None of the soils within the site have a hydric rating (USDA 2023a). Table 1 summarizes the vegetation mapped according to the natural communities described within the Western Riverside County MSHCP Vegetation Community Classifications; one non-vegetated land cover type, "Disturbed", is also listed. Figure 1 in Section 4.6 of the SEIR shows the location of each vegetation community and land cover type within the Project site; descriptions of each vegetation community and land cover type are discussed further in this Section.

Table 1. Vegetation Communities and Land Covers within the Project Site

Vegetation Community/Land Cover	Acres
Disturbed/Unvegetated	470.4
Grass/Herb	
Non-Native Grassland	159.4
California Aster Association	1.3
Common Cocklebur Association	0.4
Scrub	
Brittlebush Association	9.7
Big Saltbush Association	0.9
Riparian	
*Cottonwood–Red Willow / Arroyo Willow–Mulefat Association	~~7.2~~11.8
Mulefat Association	8.7
*Black Willow / Mulefat Association	7.0
Mulefat – Tamarix Association	2.2
Tamarix Association	1.4
Total	~~668.6~~673.2

* Communities listed by the California Department of Fish and Wildlife as high priority for inventory (i.e., State Rank [S] 1, 2, or 3) (CDFW 2022b).

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3 Fairy Shrimp Surveys

3.1 Methods

Due to the presence of suitable pool habitat (i.e., those that were observed to support a minimum of 3 centimeters of water for 24 hours following a rain event) on the Project site and pursuant to the Western Riverside County MSHCP, protocol surveys for the federally-listed endangered vernal pool fairy shrimp (*Branchinecta lynchi*), San Diego fairy shrimp (*Branchinecta sandiegonensis*), and Riverside fairy shrimp (*Streptocephalus woottoni*) were required to be conducted on the Project site. The surveys followed the Survey Guidelines for Listed Large Branchiopods (USFWS 2017), which requires both a wet-season and a dry-season survey to determine presence/absence of listed fairy shrimp species. The habitat preferences, known occurrences in the Project region, and the potential of each of these species to occur on the Project site are described in Table 2 in Section 4.6 of the SEIR.

The focused wet-season survey was conducted by permitted biologist Darin Busby (TE-115373). The wet-season surveys were conducted from January 13 through May 30, 2023, at which time all basins initially surveyed were dry and did not re-fill with rainwater. A total of 21 sampling visits to 62 inundated pools were sampled at approximately 7-day intervals until either (a) the pools were no longer inundated, or (b) the pools were continuously inundated for at least 120 consecutive days, per the USFWS protocols (USFWS 2017). If a pool dried and refilled during the 2023 sampling season, the permitted biologist reinitiated sampling within 7 days of re-inundation. During each sampling event, biologists recorded information about each inundated basin such as air temperature, water temperature, average depth, approximate size, habitat condition (if changed), voucher information, and other relevant notes. For fairy shrimp species observed, biologists noted the reproductive status and approximate numbers of fairy shrimp in each basin and identified the species in the field with a hand lens or in the lab with a microscope if field identification was not possible. All pool locations were recorded using GPS and are shown in Figure 1, Fairy Shrimp Surveys. Of note, the project area was expanded to incorporate an additional basin, Basin 63, towards the end of the wet survey season after this basin had already dried; therefore, wet season fairy shrimp surveys were not conducted within Basin 63 (Figure 1) during the 2023 wet season. However, as discussed further below, this basin was included in the dry season sampling effort. The focused wet-season survey report is included as Appendix C.

The dry-season survey was conducted in June 2023 by permitted biologist Darin Busby (TE-115373) pursuant to the USFWS 2017 protocol. The dry-season survey included the collection of soil samples from all 63 basins once they were completely free from any water inundation. The samples were then provided to a USFWS-certified laboratory for analysis, during which samples containing fairy shrimp cysts were re-hydrated and hatched in the lab for species identification. The focused dry-season survey report is included as Appendix D.

3.2 Results

The protocol wet-season surveys for listed fairy shrimp were negative for vernal pool fairy shrimp, San Diego fairy shrimp, and Riverside fairy shrimp. Of the 62 basins that were sampled within the Project survey area during the wet season, fairy shrimp were detected in 57 basins (92 percent), and no fairy shrimp species were detected in the remaining 5 basins (8 percent). Of the 57 basins containing fairy shrimp, mature common versatile fairy shrimp (*Branchinecta lindahli*) were detected in 50 basins (88 percent) and immature fairy shrimp that were not identifiable to genus and/or species were detected in 7 basins (12 percent). Similarly, the results of the dry-season analysis for all 63 basins was also negative for the three listed fairy shrimp species; only the common, non-sensitive species

(versatile fairy shrimp) was detected, including within the 7 basins in which the species found during the wet-season survey were determined to be not identifiable due to the immature status of those shrimp that were detected.

The majority of the basins within the Project survey area provide low quality habitat for the listed fairy shrimp species because they have been artificially created, impacted by vehicle traffic from mowing and maintenance activities, are overgrown with non-native grasses and forbs, and/or are susceptible to alterations in their dimensions from ongoing vehicle activity in the Project survey area, particularly after rain events when the ground is saturated and muddy.

4 Vernal Pool Habitat Assessment

4.1 Methods

Botanical surveys were conducted within the 63 basins that were surveyed for sensitive fairy shrimp species (Figure 1) on May 19, June 2, and June 8, 2023, by Dudek biologists to determine if any of the areas met the criteria to be considered a vernal pool under the Western Riverside County MSHCP by virtue of supporting vernal pool indicator plant species. As previously noted, all of the pooled areas on site are a result of contouring and pads established during the initial grading of the site, including areas for a man-made lake feature. None of the pools provide water outflows; as such, and with the heavy rains in 2022–2023, the low-lying areas became pools that stayed inundated for many months. The pooled areas on the graded pads occurred where soils have been compacted during grading activities, and with that compaction, flat topography, and the heavy rains, very shallow pooling occurred within the pools in these locations lasting a few weeks following inundation.

Surveys focused on the presence or absence of vernal pool plant indicator species. The list of plant species that were targeted during this assessment are taken from the Western Riverside County MSHCP and additional sources describing vernal pool plant species list (Bauder and McMillan 1998; USFWS 1998). These plant lists include primary indicator species that are endemic only to vernal pool habitat, as well as more generalist wetland plant species that can occur in a wide range of seasonal wetland habitats, including vernal pools. These more generalist wetland species are considered secondary indicators of vernal pool habitat.

4.2 Results

During the vernal pool habitat assessment, five common plant species that are recognized as secondary indicators for vernal pool habitat were observed within 12 of the 63 pools: hyssop loosestrife (*Lythrum hyssopifolia*), alkali mallow (*Malvella leprosa*), pale spike rush (*Eleocharis macrostachya*), sand spikerush (*Eleocharis montevidensis*), and neckweed (*Veronica peregrina*). No primary vernal pool indicator species or any species considered special status by the resource agencies were identified within or adjacent to any of the pools on the Project site. As summarized in Table 2, the majority of pools only had one secondary indicator plant. Considering the fully manufactured landscape throughout the Project site, lack of surface soils, lack of primary vernal pool indicator plant species, and with the very low cover of the more generalist secondary indicator plant species, none of the 63 pooled areas identified on site are considered vernal pools.

Table 2. Vernal Pool Habitat Assessment Results

Basin	Secondary Vernal Pool Plant Indictor Species	Percent Cover	Determination
2	*Veronica peregrina*	<10%	Low cover, weak indicator, human-made
3	*Eleocharis macrostachya*	<10%	Low cover, weak indicator, human-made
11	*Veronica peregrina*	<10%	Low cover, weak indicator, human-made
12	*Veronica peregrina*	<10%	Low cover, weak indicator, human-made
24	*Veronica peregrina, Lythrum hyssopifolia*	<10%	Low cover, weak indicator, human-made
25	*Veronica peregrina*	<10%	Low cover, weak indicator, human-made
29	*Veronica peregrina*	<10%	Low cover, weak indicator, human-made
31	*Veronica peregrina*	<10%	Low cover, weak indicator, human-made

Table 2. Vernal Pool Habitat Assessment Results

Basin	Secondary Vernal Pool Plant Indictor Species	Percent Cover	Determination
39	*Veronica peregrina*	50%	Weak indicator, human-made
41	*Malvella leprosa*	25%	Weak indicator, human-made
42	*Veronica peregrina*	50%	Weak indicator, human-made
63	*Eleocharis montevidensis*	25%	Weak indicator, human-made

Note: None of the basins present within the site are considered vernal pools.

5 Least Bell's Vireo Surveys

5.1 Methods

As previously discussed in Section 2, Project Description, the Project site contains riparian habitat within the Line F riparian mitigation channel in the southeastern portion of the site, within a small rectangular area adjacent to the eastern end of the culverted portion of the Riverside County Flood Control Channel that bisects the Project site, and within a limited area in the central portion of the site, that is potentially suitable for least Bell's vireo (Figure 2, Least Bell's Vireo Survey Areas and Results). Consistent with Section 6.1.2 of the Western Riverside County MSHCP (Riverside County Transportation and Land Management Agency 2003) (see Section 3.2.1 above), protocol surveys for least Bell's vireo were conducted within the 2023 least Bell's vireo nesting season (generally April through July) to determine presence/absence of active nests or territories. Least Bell's vireo protocol surveys were conducted on the Project site within areas of suitable riparian habitat with an average canopy height of 10 meters. The habitat preferences, known occurrences in the Project region, and the potential of least Bell's vireo to occur on the Project site are described in Table 2 in Section 4.6 of the SEIR.

Surveys for least Bell's vireo followed the Least Bell's Vireo Survey Guidelines (USFWS 2001), which states that a minimum of eight survey visits be made within all suitable vireo habitat between April 10 and July 31. The site visits are required to be conducted at least 10 days apart to maximize the detection of early and late arrivals, females, non-vocal birds, and nesting pairs. Taped playback of least Bell's vireo vocalizations was not used during the surveys per USFWS 2001 protocol. Surveys were conducted between dawn and noon and were not conducted during periods of excessive or abnormal cold, heat, wind, rain, or other inclement weather. All surveys consisted of slowly walking a methodical, meandering transect within and adjacent to all suitable riparian habitat on the Project site. Survey conditions are summarized in Table 3.

Table 3. Least Bell's Vireo Survey Conditions

Date	Hours	Personnel	Survey Conditions
04/11/2023	6:20 AM–10:33 AM	Olivia Koziel	53–72°F; 0% cc; 0–3 mph
04/27/2023	6:20 AM–10:00 AM	Anna Cassady	53–76°F; 0–10% cc; 1–2 mph
05/09/2023	6:02 AM–10:01 AM	Sarah Greely	48°F; 100% cc; 0–1 mph
05/23/2023	6:40 AM–10:52 AM	Eilleen Salas	58–67°F; 90–100% cc; 0–2 mph
06/06/2023	7:02 AM–10:58 AM	Eilleen Salas	52–56°F; 100% cc; 0–1 mph
06/21/2023	5:27 AM–9:45 AM	Jeff Priest, Luz Badillo	54–70°F; 20% cc; 0–4 mph
07/06/2023	5:31 AM–10:00 AM	Jeff Priest	56–76°F; 0% cc; 1 mph
07/20/2023	5:25 AM–9:58 AM	Jeff Priest	65–90°F; 0% cc; 0–5 mph

cc = cloud cover; mph = miles per hour (wind).

5.2 Results

One adult male least Bell's vireo was observed calling within the rectangular riparian area adjacent to the eastern terminus of the County Flood Control channel during the April 27 survey, and another was observed within the western basin area of the Line F mitigation channel on May 23 (Figure 2). No further observations of least Bell's vireos were observed during subsequent surveys within this western basin so it was concluded that this individual was likely an unmated transient briefly

foraging within the basin. During the June 6 survey, one least Bell's vireo individual was observed within the riparian area adjacent to the eastern terminus of the County Flood Control channel. An additional vocal detection occurred during the June 21 survey located offsite just north of and immediately adjacent to the eastern riparian area consisting of a least Bell's vireo family group (i.e., an adult pair and three juveniles). Although the family group was initially heard calling offsite, the juveniles were later observed foraging within the western portion of the rectangular riparian habitat adjacent to the eastern end of the County Flood Control channel. During the July 6 survey, two separate adult individuals were observed calling simultaneously within this same riparian area east of the flood control channel. The female and juveniles observed during the previous survey were not observed during this visit. During the final survey that occurred on July 20, one adult and one juvenile were observed foraging north and offsite of the same easternmost riparian habitat area. These individuals are likely part of the family group observed during previous surveys.

No least Bell's vireos were detected in any of the other smaller riparian areas on the Project site, likely due to the relatively disturbed and fragmented nature of these areas and the less dense canopy of these areas compared to what occurs adjacent to and east of the County Flood Control channel. In addition, no actual nests were located within the areas in which least Bell's vireos were observed as USFWS survey protocols discourage searches for nests during the nesting season so as to minimize the potential for adverse impacts on nesting birds.

In summary, the protocol-level surveys determined that the westernmost riparian area within the Line F mitigation channel was briefly occupied by an unmated transient adult male. While no actual nests were located (USFWS survey protocols discourage searches for nests during the nesting season so as to minimize the potential for adverse impacts on nesting birds), it was concluded that the easternmost riparian area, and portions of the riparian habitat offsite and immediately north of the onsite riparian area, was likely occupied by one non-mated adult male and a family group of two adults (one male, one female) and three juveniles. All survey observations are depicted in Figure 2.

6 Crotch's Bumble Bee Surveys

6.1 Methods

Crotch's bumble bee was recently given candidacy as a state-threatened species. However, CDFW has not yet developed an official survey protocol for the species, nor has the agency determined what would constitute take of the species pursuant to the California Endangered Species Act or refined the definition of suitable habitat. Therefore, potential impacts to the species are assessed based on the potential of a given site to support appropriate bee nesting resources (generally rodent burrows, but may include other cavities and dense bunch grasses), as well as the presence and location of appropriate nectar resources. The habitat preferences, known occurrences in the Project region, and the potential of this species to occur on the Project site are described in Table 2 in Section 4.6 of the SEIR.

Based on what was known about Project site characteristics from surveys to date for other species, it was initially determined that there is low potential for Crotch's bumble bee to occur on the site due to the limited potential foraging and nesting resources available (in the form of some, but not many, rodent burrows), and on the absence of known detections of this species in the Project site vicinity. Nevertheless, a focused habitat assessment for this species was conducted on March 20, 2023, by Dudek biologists, when the potential for appropriate nectar plants could be more easily identified and where it could be determined whether suitable nesting resources (rodent burrows) are in adequate supply.

Following the habitat assessment, Dudek biologists conducted four surveys for Crotch's bumble bee in April, May, and June 2023 (as determined by the blooming period for target plant species). Figure 3, Crotch's Bumble Bee Survey Areas and Resources, shows the survey areas, plant resources, and identified burrow locations. The surveys were based on guidance from the CDFW Region 6 office (March 23, 2023), which recommended use of the survey methods for rusty patched bumble bee (*Bombus affinis*), a federally listed bumble bee located in the Midwestern United States, prepared by the U.S. Fish and Wildlife Service (USFWS 2019). The surveys were conducted by qualified biologists with expertise in surveying for bumble bees and this species in particular. Surveys occurred at least 2 hours after sunrise and 3 hours before sunset. Surveys were not conducted during wet conditions (e.g., foggy, raining, or drizzling), and surveyors waited at least 1 hour following rain. Optimal surveys were conducted during sunny to partly sunny skies at temperatures greater than 60°F. Surveys were not conducted during windy conditions (i.e., sustained winds greater than 8 miles per hour). Table 4 summarizes Crotch's bumble bee survey conditions.

Table 4. Crotch's Bumble Bee Survey Conditions

Date	Hours	Personnel	Survey Type	Survey Conditions
03/20/2023	7:59 AM–9:50 AM	Anna Cassady, Brock Ortega	Crotch's Bumble Bee Habitat Assessment	52°F, 40–80% cc, 1–2 mph
04/26/2023	8:00 AM–4:00 PM	Anna Cassady	Crotch's Bumble Bee Habitat Assessment	59–86°F; 0% cc; 1–4 mph
04/27/2023	10:25 AM–1:00 PM	Anna Cassady, Callie Amoaku	Crotch's Bumble Bee Habitat Assessment	76–86°F; 0–10% cc; 1–2 mph

Table 4. Crotch's Bumble Bee Survey Conditions

Date	Hours	Personnel	Survey Type	Survey Conditions
05/11/2023	10:01 AM–2:49 PM	Olivia Koziel	Crotch's Bumble Bee Focused Survey #1	65–73°F; 0–90% cc; 1–9 mph
05/19/2023	9:29 AM–1:36 PM	Callie Amoaku, Shana Carey	Crotch's Bumble Bee Focused Survey #2	66–74°F; 0% cc; 1–5 mph
06/08/2023	8:45 AM–4:20 PM	Sarah Greely, Zarina Pringle	Crotch's Bumble Bee Focused Survey #3	60–76°F; 10–100% cc; 0–8 mph
06/19/2023	11:51 AM–12:30 PM	Callie Amoaku	Crotch's Bumble Bee Focused Survey #4	79–82°F; 0% cc; 1–2 mph

Notes: cc = cloud cover; mph = miles per hour (wind).

Suitable floral resource habitat within the Project site was identified and mapped concurrent with the first couple of surveys. Each patch of suitable habitat was visually surveyed for 1 person-hour per 3 acres of the highest-quality habitat, as determined by a qualified biologist, or until 150 bumble bees were sighted, whichever came first. If bumble bee activity was detected, the GPS location was recorded and photographic evidence was documented. No bumble bees were netted or handled during the survey. The use of visual surveys is acceptable for distinguishing bumble bees from other bees; however, further distinguishment of Crotch's bumble bee may require further study if bumble bees (*Bombus* sp.) are observed.

6.2 Results

The Project site largely contains non-native grassland and disturbed habitat, with 10% to 20% vegetation cover containing suitable flowering resources. During each survey there were 6 to 15 plant species in bloom within the Project site (refer to Appendix A for plant species list). Appropriate bee nesting resources within the Project site consisted of rodent burrows, bare ground, rock piles, and gopher mounds. Refer to Figure 3 for survey areas, flowering plants, and burrow locations. Anthropogenic disturbances within the Project site included mowing for fuel modification and access roads, as well as artificially constructed ditches. Insects observed during the surveys included the following: ladybug (*Coccinellidae*), grasshopper (*Acrididae*), hoverfly (*Syrphidae*), dragonfly (*Odonata*), honeybee (*Apis mellifera*), bumblebee (*Bombus* sp.), ear wig (*Dermaptera*), sweat bee (*Halictidae*), carpenter bee (*Apidae*), stink bug (*Chlorochroa* sp.), fly (*Diptera*), crab spider (*Thomisidae*), Japanese beetle (*Popillia japonica*), and ant (*Formicidae*).

No Crotch's bumble bee individuals were observed during any of the focused surveys. The small mammal burrows, bare ground, rock piles, and gopher mounds were checked for signs of bumble bee nesting activity. No bumble bee nests were detected. One bumble bee (*Bombus* sp.) was observed during the June 8, 2023, survey in the portion of the Project site directly west of Nason Street. The bumble bee was large (i.e., closer to carpenter bee size). However, Dudek biologists were unable to get a photo of the bumble bee to confirm the species but due to the size and other characteristics, it was determined to unlikely be a Crotch's bumble bee.

The nearest known CNDDB occurrence record of this species is approximately 4.5 miles east of the Project site from 2020 (CDFW 2022a). Given the lack of observations of Crotch's bumble bee or potential bumble bee nests within the Project site, and the general disturbed nature and poor quality of potential nectar habitat on the site, this species is not expected to occur on the Project site.

7 Burrowing Owl Surveys

7.1 Methods

The Project site is within the Western Riverside County MSHCP Burrowing Owl Habitat Assessment Area (RCA 2003). Dudek conducted a Step I burrowing owl habitat assessment in accordance with the Burrowing Owl Survey Instructions for the Western Riverside County MSHCP Area (RCA 2006). Suitable habitat (e.g., open vegetation and burrow resources with openings 4 inches or greater in diameter) was identified within the Project site during this assessment (Figure 4, Burrowing Owl Survey and Results). Consequently, and pursuant to Western Riverside County MSHCP guidance, focused burrowing owl surveys were conducted to determine the presence or absence of this species. The habitat preferences, known occurrences in the Project region, and the potential of this species to occur on the Project site are described in Table 2 in Section 4.6 of the SEIR.

Dudek biologists conducted surveys pursuant to the survey guidelines outlined in the Burrowing Owl Survey Instructions for the MSHCP Area (RCA 2006) and Appendix D of CDFW's Staff Report on Burrowing Owl Mitigation (CDFG 2012). These guidelines recommend four survey passes be conducted a minimum of 2 weeks apart within the species' breeding season (March through August). Per the Western Riverside County MSHCP instructions, a Step II-A focused burrow survey was conducted concurrently with the first Step II-B survey pass. The first pass of the focused burrowing owl survey covered the entire Project site and included the mapping of suitable small mammal burrows. Following this initial survey and habitat assessment, the three passes of focused burrowing owl surveys were conducted within areas that contained suitable burrows (e.g., small mammal burrows or burrow surrogates with openings 4 inches or greater in diameter). The focused burrowing owl surveys included surveying for burrowing owl individuals and sign (i.e., owl pellets, molted feathers, abundant insect remains, and whitewash). All potential burrows were examined for sign. Weather conditions at the time of the survey were within protocol guidelines, and surveys were conducted under good weather conditions that would permit clear detection of individuals should they occur on site. Table 5 summarizes the weather conditions during each of the burrowing owl surveys.

Table 5. Burrowing Owl Survey Conditions

Date	Hours	Personnel	Survey Type	Survey Conditions
03/07/2023	5:52 AM–9:56 AM	Sarah Greely, Zarina Pringle	Focused Burrow Survey; Focused Burrowing Owl Survey Pass 1	41–49°F; 10–40% cc; 0-2 mph
03/08/2023	5:52 AM–9:52 AM	Sarah Greely, Zarina Pringle	Focused Burrow Survey; Focused Burrowing Owl Survey Pass 1	37–48°F; 30–100% cc; 0-2 mph
03/27/2023	6:55 AM–9:57 AM	Sarah Greely, Zarina Pringle	Focused Burrow Survey; Focused Burrowing Owl Survey Pass 1	40–55°F; 0–10% cc; 1-15 mph
03/28/2023	6:30 AM–9:59 AM	Sarah Greely, Zarina Pringle	Focused Burrow Survey; Focused Burrowing Owl Survey Pass 1	44–58°F; 0% cc; 0-2 mph
04/03/2023	6:29 AM–9:57 AM	Sarah Greely, Zarina Pringle	Focused Burrow Survey; Focused Burrowing Owl Survey Pass 1	47–50°F; 80–100% cc; 6–10 mph

Table 5. Burrowing Owl Survey Conditions

Date	Hours	Personnel	Survey Type	Survey Conditions
04/10/2023	6:10 AM–10:15 AM	Zarina Pringle	Focused Burrow Survey; Focused Burrowing Owl Survey Pass 1	54–76°F; 0% cc; 1-4 mph
04/18/2023	6:01 AM–10:04 AM	Zarina Pringle	Focused Burrow Survey; Focused Burrowing Owl Survey Pass 1	51–56°F; 60–90% cc; 1-2 mph
04/26/2023	10:27 AM–10:00 AM	Max Murray	Focused Burrow Survey; Focused Burrowing Owl Survey Pass 1	51–72°F; 0% cc; 0-4 mph
04/27/2023	5:20 AM–9:40 AM	Max Murray	Focused Burrow Survey; Focused Burrowing Owl Survey Pass 1	54–77°F; 0% cc; 0-3 mph
05/10/2023	5:30 AM–10:00 AM	Olivia Koziel, Sierra Lippert	Focused Burrowing Owl Survey Pass 2	57–62°F; 90% cc
06/14/2023	5:55 AM–9:55 AM	Dylan Ayers, Eilleen Salas	Focused Burrowing Owl Survey Pass 3	54–62°F; 100% cc; 0-3 mph
07/07/2023	5:45 AM–9:49 AM	Dylan Ayers, Eilleen Salas	Focused Burrowing Owl Survey Pass 4	54–65°F; 0–100% cc; 0-1 mph

cc = cloud cover; mph = miles per hour (wind).

7.2 Results

No burrowing owl individuals, indicative sign, or active burrows were observed during the 2023 focused survey effort. However, one burrowing owl individual was incidentally observed within the Project site on January 13, 2023, during fairy shrimp protocol surveys. The burrowing owl individual was flushed near a small mammal burrow in the central portion of the site that contained both whitewash and pellets. Because this individual was not observed during the breeding season surveys, it was concluded that this individual was likely temporarily using the Project site only during winter months for foraging and potential roosting, which is typical during the non-breeding season when owls are relatively nomadic. This burrow was also visited during the focused survey effort; no owls were observed at or near the burrow and no recent whitewash, food pellets, feathers, or other sign was observed associated with the burrow.

8 References

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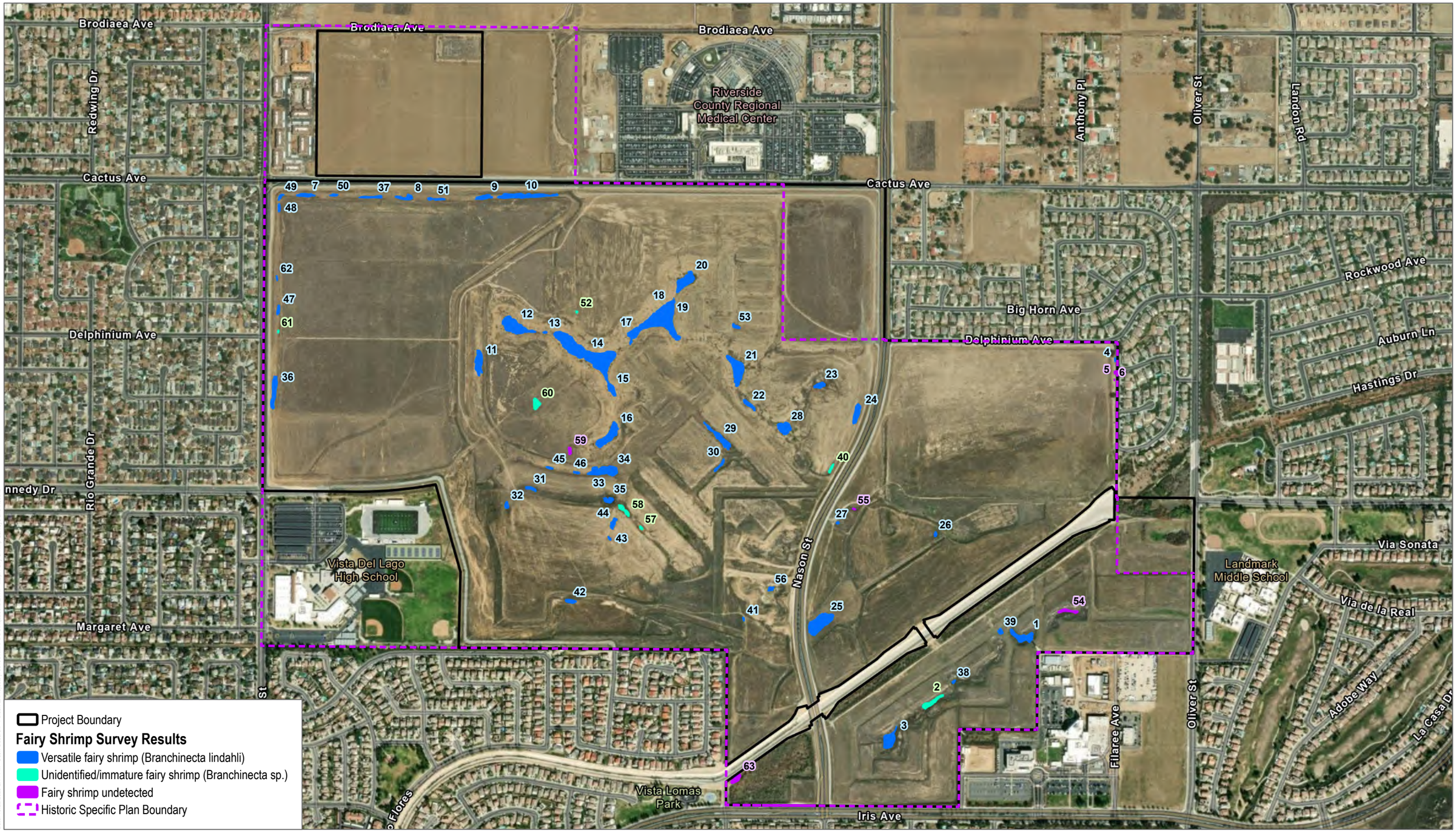

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FIGURE 1

Fairy Shrimp Surveys and Results

Aquabella Specific Plan Amendment Project BTR

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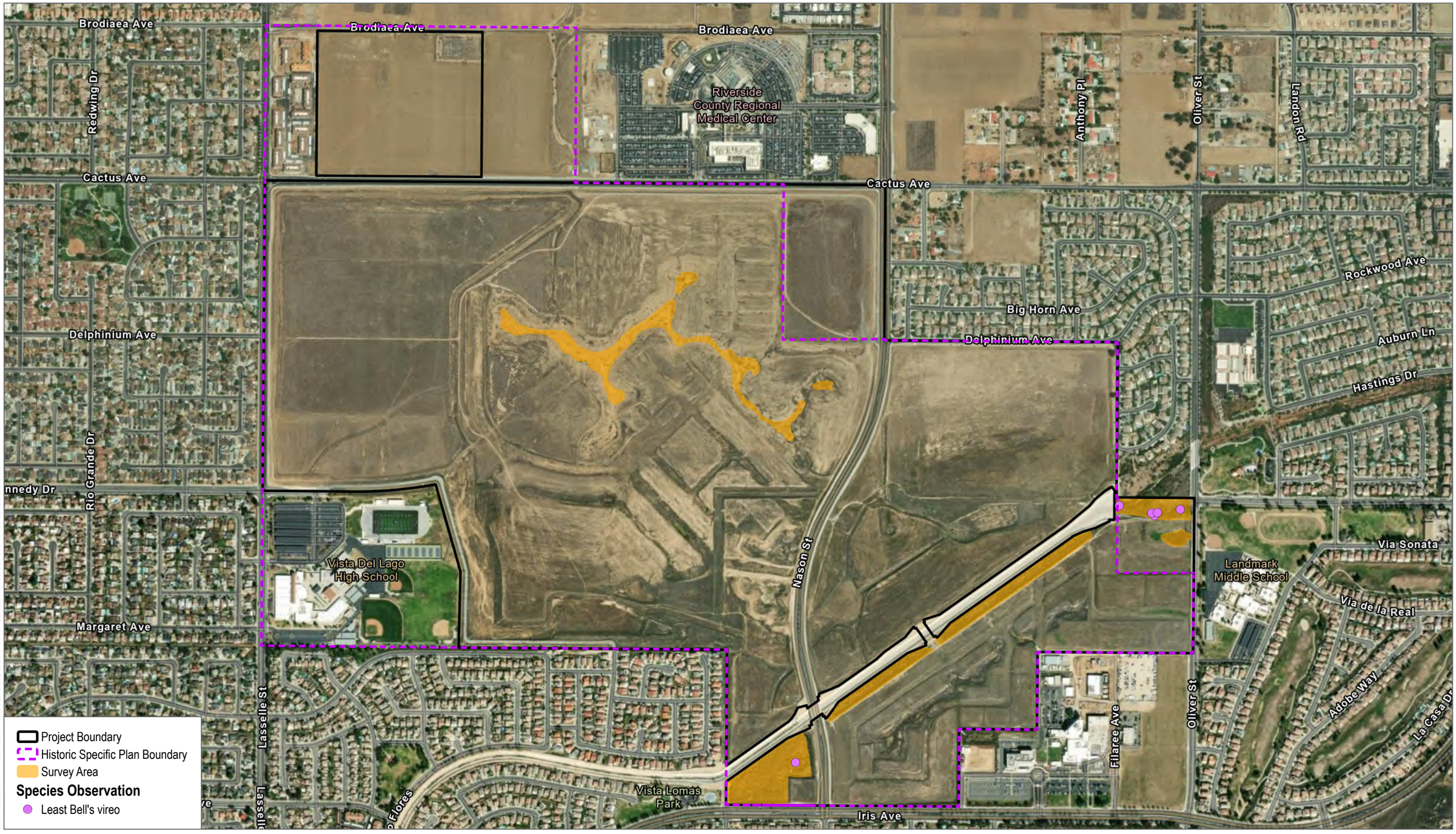

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FIGURE 2

Least Bells Vireo Survey Areas and Results

Aquabella Specific Plan Amendment Project BTR

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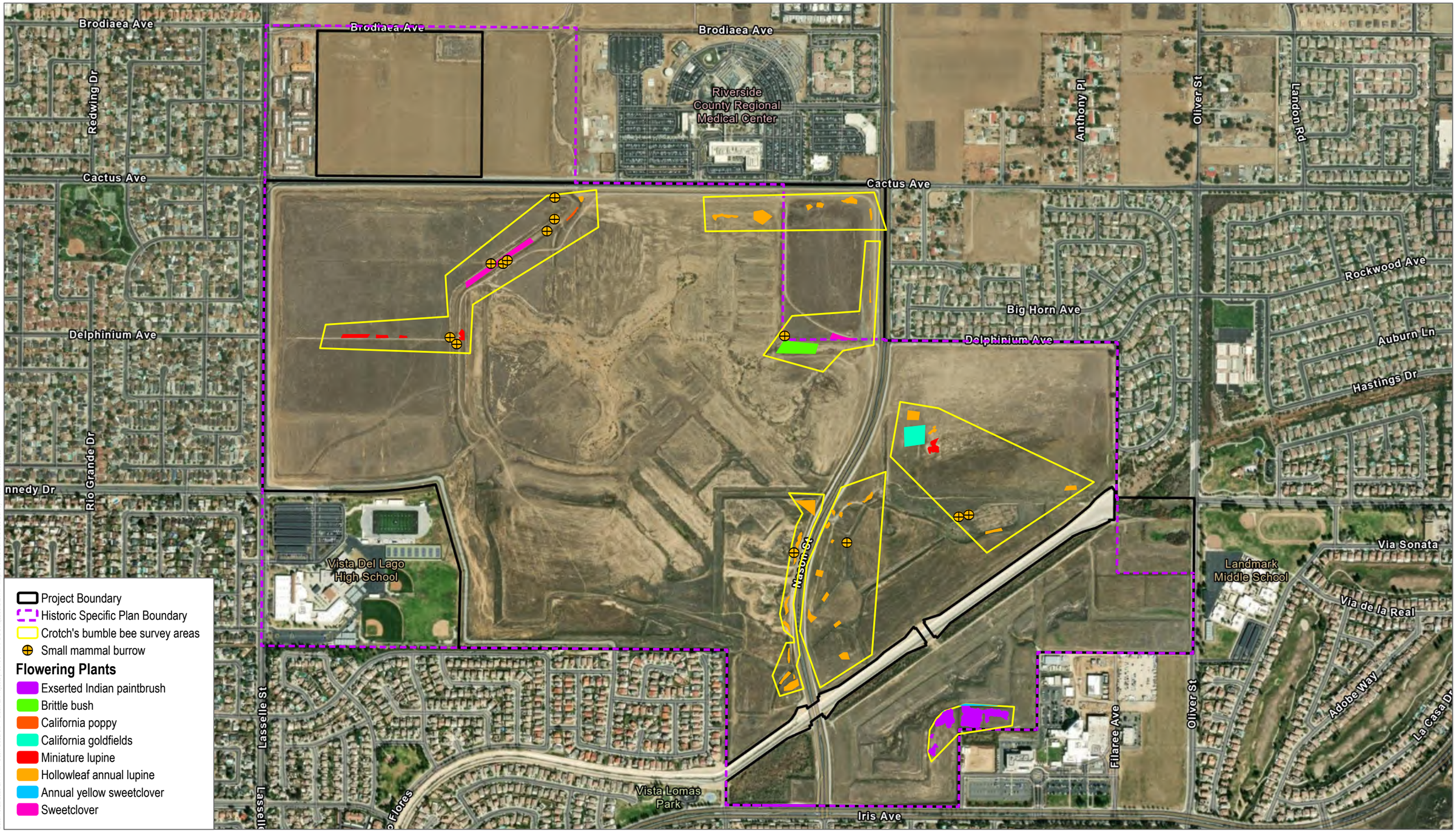

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FIGURE 3

Crotchs Bumble Bee Survey Areas and Resources

Aquabella Specific Plan Amendment Project BTR

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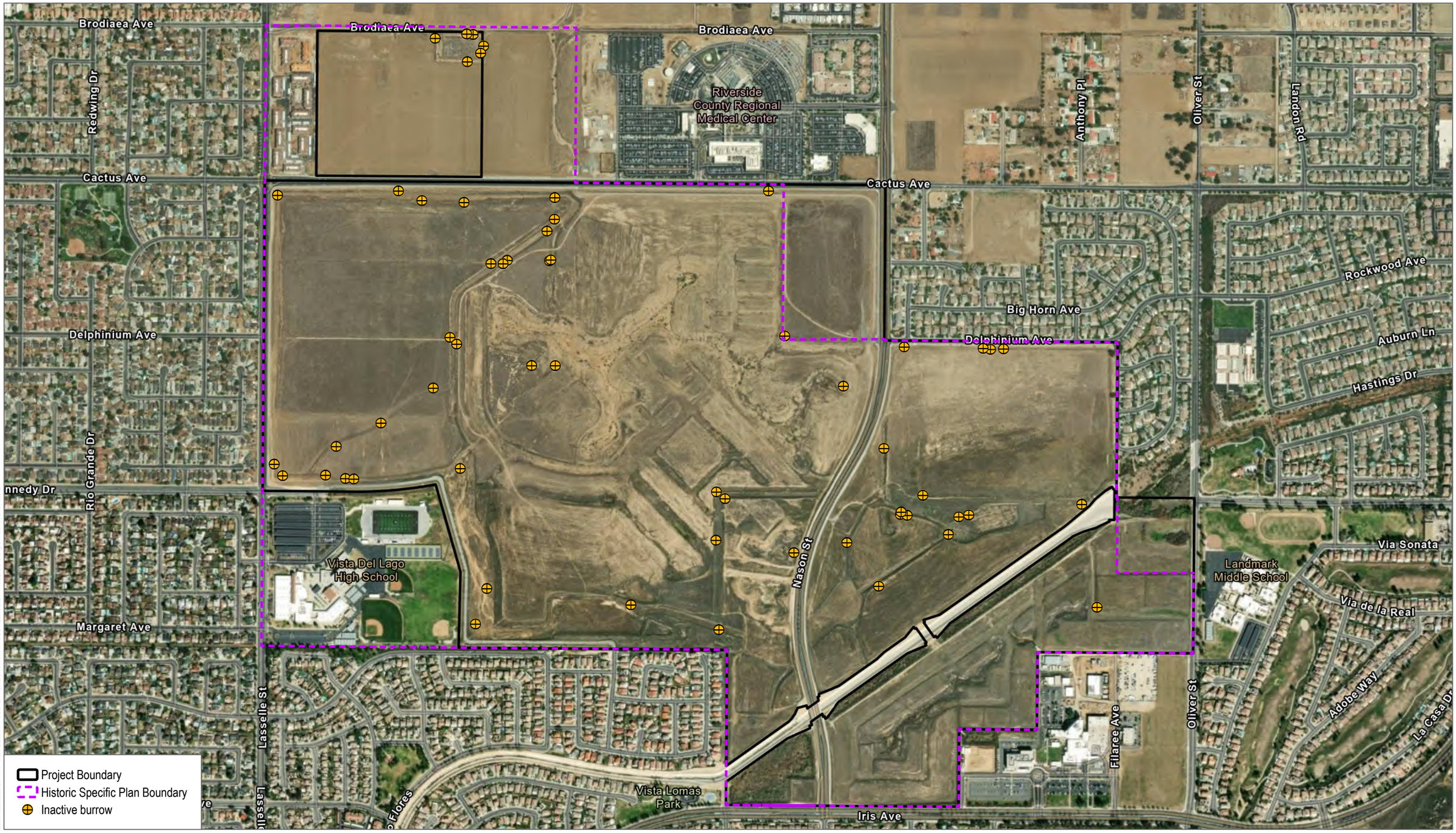

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FIGURE 4

Burrowing Owl Survey and Results

Aquabella Specific Plan Amendment Project BTR

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Appendix A
Plant Species Observed

Vascular Species

Eudicots

AMARANTHACEAE – AMARANTH FAMILY

* *Amaranthus albus* – prostrate pigweed

ASTERACEAE – SUNFLOWER FAMILY

Ambrosia acanthicarpa – flatspine bur ragweed
Artemisia californica – California sagebrush
Baccharis pilularis – coyote brush
Baccharis salicifolia – mulefat
Baccharis sarothroides – desertbroom
Baileya multiradiata – desert marigold
* *Centaurea melitensis* – Maltese star-thistle
Corethrogyne filaginifolia – sand-aster
Encelia farinosa – brittle bush
Ericameria nauseosa – rubber rabbitbrush
* *Gazania linearis* – treasureflower
Gnaphalium palustre – western marsh cudweed
Helianthus annuus – common sunflower
Helianthus gracilentus – slender sunflower
Heterotheca grandiflora – telegraphweed
Isocoma menziesii – Menzies's golden bush
Lasthenia californica – California goldfields
Lasthenia gracilis – needle goldfields
Logfia filaginoides – California cottonrose
Matricaria discoidea – disc mayweed
* *Oncosiphon pilulifer* – stinknet
Uropappus lindleyi – Lindley's silverpuffs
Xanthium strumarium – cocklebur

BORAGINACEAE – BORAGE FAMILY

Amsinckia intermedia – common fiddleneck
Heliotropium curassavicum – salt heliotrope

BRASSICACEAE – MUSTARD FAMILY

* *Capsella bursa-pastoris* – shepherd's purse
* *Hirschfeldia incana* – shortpod mustard
* *Raphanus raphanistrum* – wild radish

CARYOPHYLLACEAE – PINK FAMILY

* *Herniaria hirsuta* – hairy rupturewort
* *Polycarpon tetraphyllum* – fourleaf manyseed
* *Spergularia bocconi* – Boccone's sandspurry

CHENOPODIACEAE – GOOSEFOOT FAMILY

Atriplex lentiformis – quailbush

Atriplex polycarpa – allscale

* *Atriplex semibaccata* – Australian saltbush
* *Salsola tragus* – prickly Russian thistle

CRASSULACEAE – STONECROP FAMILY

Crassula connata – sand pygmyweed

EUPHORBIACEAE – SPURGE FAMILY

Croton setiger – dove weed

FABACEAE – LEGUME FAMILY

* *Acacia redolens* – bank catclaw

Astragalus sp. – milk-vetch

Lupinus bicolor – miniature lupine

Lupinus succulentus – hollowleaf annual lupine

* *Medicago sativa* – alfalfa
* *Melilotus officinalis* – sweetclover
* *Parkinsonia aculeata* – Jerusalem thorn
* *Trifolium hirtum* – rose clover

GERANIACEAE – GERANIUM FAMILY

* *Erodium cicutarium* – redstem stork's bill

LYTHRACEAE – LOOSESTRIFE FAMILY

* *Lythrum hyssopifolia* – hyssop loosestrife

MALVACEAE – MALLOW FAMILY

* *Malva parviflora* – cheeseweed mallow

Malvella leprosa – alkali mallow

OROBANCHACEAE – BROOM-RAPE FAMILY

Castilleja exserta – exserted Indian paintbrush

PAPAVERACEAE – POPPY FAMILY

Eschscholzia californica – California poppy

PLANTAGINACEAE – PLANTAIN FAMILY

Veronica peregrina – neckweed

POLYGONACEAE – BUCKWHEAT FAMILY

Eriogonum fasciculatum – California buckwheat

* *Polygonum aviculare* – prostrate knotweed
* *Rumex crispus* – curly dock

SALICACEAE – WILLOW FAMILY

Populus fremontii – Fremont cottonwood

Salix exigua – sandbar willow

Salix gooddingii – Goodding's willow

Salix laevigata – red willow

Salix lasiolepis – arroyo willow

SOLANACEAE – NIGHTSHADE FAMILY

Datura wrightii – sacred thorn-apple

* *Nicotiana glauca* – tree tobacco
* *Solanum elaeagnifolium* – silverleaf nightshade

TAMARICACEAE – TAMARISK FAMILY

* *Tamarix ramosissima* – tamarisk

VIBURNACEAE – MUSKROOT FAMILY

Sambucus mexicana – blue elderberry

Monocots

CYPERACEAE – SEDGE FAMILY

Eleocharis macrostachya – pale spike rush

Eleocharis montevidensis – sand spikerush

JUNCACEAE – RUSH FAMILY

Juncus mexicanus – Mexican rush

POACEAE – GRASS FAMILY

* *Bromus diandrus* – ripgut brome
* *Bromus madritensis* – compact brome
* *Bromus rubens* – red brome
* *Cynodon dactylon* – Bermudagrass

Elymus triticoides – creeping ryegrass

* *Festuca myuros* – rat-tail fescue

* *Festuca perennis* – perennial rye grass
* *Hordeum murinum* – mouse barley
* *Phalaris aquatica* – Harding grass
* *Polypogon monspeliensis* – annual rabbitsfoot grass
* *Schismus barbatus* – common Mediterranean grass
  Stipa pulchra – purple needlegrass

* signifies introduced (non-native) species

Appendix B
Wildlife Species Observed

Amphibians

Frogs

HYLIDAE – TREEFROGS

Pseudacris hypochondriaca – Baja California treefrog

Toads

BUFONIDAE – TRUE TOADS

Anaxyrus boreas – western toad

Birds

Blackbirds, Orioles and Allies

ICTERIDAE – BLACKBIRDS

Agelaius phoeniceus – red-winged blackbird

Icterus cucullatus – hooded oriole

Sturnella neglecta – western meadowlark

* *Molothrus ater* – brown-headed cowbird

Bushtits

AEGITHALIDAE – LONG-TAILED TITS AND BUSHTITS

Psaltriparus minimus – bushtit

Cardinals, Grosbeaks and Allies

CARDINALIDAE – CARDINALS AND ALLIES

Passerina caerulea – blue grosbeak

Pheucticus melanocephalus – black-headed grosbeak

Piranga ludoviciana – western tanager

Falcons

FALCONIDAE – CARACARAS AND FALCONS

Falco sparverius – American kestrel

Finches

FRINGILLIDAE – FRINGILLINE AND CARDUELINE FINCHES AND ALLIES

Haemorhous mexicanus – house finch
Spinus lawrencei – Lawrence's goldfinch
Spinus psaltria – lesser goldfinch
Spinus tristis – American goldfinch

Flycatchers

TYRANNIDAE – TYRANT FLYCATCHERS

Myiarchus cinerascens – ash-throated flycatcher
Sayornis nigricans – black phoebe
Sayornis saya – Say's phoebe
Tyrannus verticalis – western kingbird
Tyrannus vociferans – Cassin's kingbird

Hawks

ACCIPITRIDAE – HAWKS, KITES, EAGLES, AND ALLIES

Accipiter cooperii – Cooper's hawk
Buteo jamaicensis – red-tailed hawk

Herons and Bitterns

ARDEIDAE – HERONS, BITTERNS, AND ALLIES

Ardea alba – great egret
Ardea herodias – great blue heron

Hummingbirds

TROCHILIDAE – HUMMINGBIRDS

Calypte anna – Anna's hummingbird
Selasphorus sp. – Allen's/rufous hummingbird

Jays, Magpies and Crows

CORVIDAE – CROWS AND JAYS

Corvus brachyrhynchos – American crow
Corvus corax – common raven

Larks

ALAUDIDAE – LARKS

Eremophila alpestris – horned lark

Mockingbirds and Thrashers

MIMIDAE – MOCKINGBIRDS AND THRASHERS

Mimus polyglottos – northern mockingbird

Toxostoma redivivum – California thrasher

New World Vultures

CATHARTIDAE – NEW WORLD VULTURES

Cathartes aura – turkey vulture

Old World Sparrows

PASSERIDAE – OLD WORLD SPARROWS

* *Passer domesticus* – house sparrow

Owls

STRIGIDAE – TYPICAL OWLS

Athene cunicularia – burrowing owl

Bubo virginianus – great horned owl

Pigeons and Doves

COLUMBIDAE – PIGEONS AND DOVES

Zenaida macroura – mourning dove

* *Columba livia* – rock pigeon (rock dove)

Shorebirds

CHARADRIIDAE – LAPWINGS AND PLOVERS

Charadrius vociferus – killdeer

SCOLOPACIDAE – SANDPIPERS, PHALAROPES, AND ALLIES

Tringa melanoleuca – greater yellowlegs

Starlings and Allies

STURNIDAE – STARLINGS

* *Sturnus vulgaris* – European starling

Swallows

HIRUNDINIDAE – SWALLOWS

Hirundo rustica – barn swallow

Petrochelidon pyrrhonota – cliff swallow

Stelgidopteryx serripennis – northern rough-winged swallow

Tachycineta bicolor – tree swallow

Swifts

APODIDAE – SWIFTS

Aeronautes saxatalis – white-throated swift

Thrushes

TURDIDAE – THRUSHES

Sialia currucoides – mountain bluebird

Vireos

VIREONIDAE – VIREOS

Vireo bellii pusillus – least Bell's vireo

Wagtails and Pipits

MOTACILLIDAE – WAGTAILS AND PIPITS

Anthus rubescens – American pipit

Waterfowl

ANATIDAE – DUCKS, GEESE, AND SWANS

Anas platyrhynchos – mallard

Branta canadensis – Canada goose

Waxwings

BOMBYCILLIDAE – WAXWINGS

Bombycilla cedrorum – cedar waxwing

Wood Warblers and Allies

PARULIDAE – WOOD-WARBLERS

Geothlypis trichas – common yellowthroat
Setophaga coronata – yellow-rumped warbler
Setophaga petechia – yellow warbler
Leiothlypis celata – orange-crowned warbler

Woodpeckers

PICIDAE – WOODPECKERS AND ALLIES

Dryobates nuttallii – Nuttall's woodpecker

Wrens

TROGLODYTIDAE – WRENS

Troglodytes aedon – house wren
Thryomanes bewickii – Bewick's wren

New World Sparrows

PASSERELLIDAE – NEW WORLD SPARROWS

Ammodramus savannarum – grasshopper sparrow
Chondestes grammacus – lark sparrow
Junco hyemalis – dark-eyed junco
Melospiza lincolnii – Lincoln's sparrow
Melospiza melodia – song sparrow
Melozone crissalis – California towhee
Passerculus sandwichensis – savannah sparrow
Zonotrichia leucophrys – white-crowned sparrow

Invertebrates

Butterflies

NYMPHALIDAE – BRUSH-FOOTED BUTTERFLIES

Junonia coenia – common buckeye
Nymphalis antiopa – mourning cloak
Vanessa cardui – painted lady

PIERIDAE – WHITES AND SULFURS

Colias eurytheme – orange sulphur
Pieris rapae – cabbage white
Pontia protodice – checkered white

Mammals

Canids

CANIDAE – WOLVES AND FOXES

Canis latrans – coyote

Hares and Rabbits

LEPORIDAE – HARES AND RABBITS

Lepus californicus – black-tailed jackrabbit
Sylvilagus audubonii – desert cottontail

Pocket Gophers

GEOMYIDAE – POCKET GOPHERS

Thomomys bottae – Botta's pocket gopher

Squirrels

SCIURIDAE – SQUIRRELS

Otospermophilus beecheyi – California ground squirrel

Raccoons

PROCYONIDAE – RACCOONS AND RELATIVES

Procyon lotor – northern raccoon

Reptiles

Lizards

PHRYNOSOMATIDAE – IGUANID LIZARDS

Sceloporus occidentalis – western fence lizard

Uta stansburiana – common side-blotched lizard

* signifies introduced (non-native) species

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Appendix C

Wet-Season Fairy Shrimp Report

BUSBY
Biological Services

September 18, 2023

Ms. Stacey Love
Recovery Permit Coordinator
Carlsbad Fish and Wildlife Office
2177 Salk Avenue, Suite 250
Carlsbad, California 982008

RE: Survey Summary Report for the 2023 Protocol-Level, Wet Season Large Branchiopod Survey for the Updated Aquabella Project in Moreno Valley, Riverside County, California

Ms. Love:

This letter provides a summary of the 2023 protocol-level, wet season survey for federally listed large branchiopod species (i.e., fairy shrimp species) conducted in 62 basins by Busby Biological Services, Inc. (BBS) on behalf of Dudek for the approximately 673-acre, updated Aquabella Project (project) in Moreno Valley, Riverside County, California (Attachment 1: Figures 1 through 3). A small expansion of the project area towards the end of the survey season incorporated an additional basin, Basin 63, after this basin had already dried; therefore, wet season fairy shrimp surveys were not conducted within Basin 63 during the 2023 wet season.

The wet season fairy shrimp survey followed the most recent U.S. Fish and Wildlife Service (USFWS) survey guidelines, titled *Survey Guidelines for the Listed Large Branchiopods* and dated November 13, 2017 (USFWS 2017). This wet season fairy shrimp survey satisfies a portion of the current USFWS survey requirements, which include a minimum of one complete dry season survey and one complete wet season survey within a 3-year period.

The following report provides a brief description of the project, the fairy shrimp species that have a potential to occur within the vicinity of the project, the survey methods, and the results of the wet season fairy shrimp survey.

PROJECT LOCATION & DESCRIPTION

The project area is located in Range 3 West, Township 3 South, and Sections 15-17 and 21-22 on the U.S. Geological Survey (USGS) Sunnymead 7.5-minute quadrangle map (USGS 2023; Attachment 1: Figure 2). The project area is bisected by north-south running Nason Street and bounded by Brodiaea Avenue, Cactus Avenue, and Delphinium Avenue to the north, Iris Avenue to the south, Oliver Street to the east, and Lasselle Street to the west. The approximate center point of the project is 33.918299, -117.126291 (Attachment 1: Figure 3).

The project area has been subject to impacts from mowing, discing, grading, and other maintenance activities. Most recently, grading occurred across approximately 66 percent of the project area in 2007, and other project activities, such as public improvement along Nason Road

and Riverside County flood control channel maintenance activities occurred from 2010 to 2015. Besides the numerous graded basins throughout the project area, the majority of the project area is relatively flat and contains areas of rolling topography, with elevations ranging from approximately 1560 feet above mean sea level (amsl) in the north to 1500 feet amsl in the south (Attachment 1: Figure 2).

The project area contains a variety of basins, such as graded basins, road ruts, ditches, tire tracks, and other depressions, that provide potential fairy shrimp habitat. Many of the graded basins contain low-density riparian scrub within and along the edges of the basins, while other basins contain little to no vegetation or are dominated by a dense cover of non-native grasses and forbs. The basins appear to be filled by direct rainfall and surrounding surface flows. The majority of the basins provide low quality habitat for fairy shrimp because they appear to be repeatedly impacted by mowing, discing, and other maintenance activities and/or are overgrown with non-native grasses and forbs. Representative photographs of the basins are provided in Attachment 2.

FAIRY SHRIMP NATURAL HISTORY

The project area contains 63 basins that provide fairy shrimp habitat with potential to support the common, non-sensitive versatile fairy shrimp (*Branchinecta lindahli*), as well as three federally listed fairy shrimp species, vernal pool fairy shrimp (*Branchinecta lynchi*), Riverside fairy shrimp (*Streptocephalus woottoni*), and San Diego fairy shrimp (*Branchinecta sandiegonensis*).

The Riverside fairy shrimp was federally listed as endangered in August of 1993 (USFWS 1993) and is a Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP)-covered species. On December 4, 2012, USFWS published a Final Rule revising the critical habitat for the Riverside fairy shrimp that became effective on January 3, 2013 (USFWS 2012). The revised critical habitat now includes land in three units in Ventura, Orange, and San Diego counties, California, for a total of approximately 1,724 acres of critical habitat for this species. No critical habitat for Riverside fairy shrimp occurs in Riverside County in the original or revised Final Rules.

The vernal pool fairy shrimp was federally listed as threatened on September 19, 1994 (USFWS 1994), and is a MSHCP-covered species. On August 11, 2005, USFWS published a Final Rule designating 858,846 acres of critical habitat for four vernal pool crustaceans and 11 vernal pool plants that became effective on September 12, 2005 (USFWS 2005). This critical habitat includes 597,821 acres of land from Oregon south to Ventura County, California. No critical habitat for vernal pool fairy shrimp occurs in Riverside County in this Final Rule.

The San Diego fairy shrimp was federally listed as endangered in February 1997 (USFWS 1997). On December 12, 2007, USFWS published a Final Rule revising the critical habitat for the San Diego fairy shrimp that became effective on January 11, 2008 (USFWS 2007). This revised Final Rule designated critical habitat for the San Diego fairy shrimp to include approximately 3,082 acres of habitat in five units, with a total of 29 subunits throughout Orange and San Diego counties, California. No critical habitat for San Diego fairy shrimp occurs in Riverside County in the original or revised Final Rules.

SURVEY METHODS

The wet season fairy shrimp survey followed the most recent USFWS survey guidelines, titled *Survey Guidelines for the Listed Large Branchiopods* and dated November 13, 2017 (USFWS

2017). This wet season fairy shrimp survey satisfies a portion of the current USFWS survey requirements, which include a minimum of one complete dry season survey and one complete wet season survey within a 3-year period.

Following approval from USFWS to conduct the wet season fairy shrimp survey, BBS immediately initiated sampling efforts. During the initial sampling event, BBS assessed the entire project area for inundated/potential basins and sampled all inundated basins identified. During each subsequent sampling event, BBS visited all basins that were inundated during the previous sampling event to determine if the basins were still holding water. If a rain event occurred between sampling events, BBS also visited all known and potential basins that may have been inundated by the rain event while also re-assessing the survey area for new basins.

During each sampling event, BBS biologists recorded information about each inundated basin, such as air temperature, water temperature, average depth, approximate size, habitat condition (if changed), voucher information, and other relevant notes. BBS sampled each inundated basin by sweeping a hand-held net through the water, examining the net contents, and recording all aquatic species. For fairy shrimp species observed, BBS noted the reproductive status and approximate numbers of fairy shrimp in each basin and identified the species in the field with a hand lens or in the lab with a microscope if field identification was not possible. In addition, as necessary during the survey season, BBS estimated the maximum depth of each basin and estimated the maximum surface area of each basin by using a handheld Global Positioning Systems (GPS) unit to record the approximate boundaries of each basin. BBS completed the basin sampling once a basin dried up and was not re-inundated during the wet season or once the basin reached 120 days of continual inundation.

Mature male and female fairy shrimp voucher specimens were collected from as many basins as possible during the wet season survey. These fairy shrimp voucher specimens, along with a copy of the Vernal Pool Data Sheet, will be submitted to the collections department at the Natural History Museum of Los Angeles.

RESULTS

The following sections provide a summary of the actual and historical precipitation totals, and the wet season fairy shrimp survey results.

Summary of Precipitation

Attachment 3 provides a summary of precipitation statistics, which includes monthly precipitation totals between October 2022 and May 2023 and the historical average monthly precipitation totals from the Riverside Municipal Airport between October and May (National Oceanic and Atmospheric Administration [NOAA] 2022 and 2023).

The precipitation total for 2022/2023 rainy season was above average, with a total of 13.33 inches recorded between October 2022 and May 2023, compared to an average of 9.09 inches normally recoded during this time period. The first significant precipitation of the 2022/2023 wet season occurred on October 11 and 15, 2022, the only days with precipitation in October. Precipitation was slightly below average in October 2022 with 0.20 inches, more than two times above average in November 2022 with 1.30 inches, slightly above average in December 2022 with 2.02 inches, slightly above average in January 2023 with 3.09 inches, slightly below average in February 2023 with 1.95 inches, more than 3.5 times above average in March 2023 with 4.25 inches, more than 10 times below average in April 2023 with 0.05 inches, and more than 2 times above average in May 2023 with 0.47 inches.

The project area is in Western Riverside County in Southern California, which is currently not classified as being under drought conditions according to the Palmer Drought Index as of August 2023 (National Integrated Drought Information Center 2023). The Palmer Drought Index is a measurement of dryness based on recent precipitation and temperature, which can be used to determine long-term drought conditions on a regional level.

Summary of Survey Results

The 2023 wet season fairy shrimp survey was initiated on January 13, 2023, immediately following Dudek's submittal and USFWS's approval of the survey notification letter on January 11, 2023. Surveys continued until May 30, 2023, when all basins were dry and did not re-inundate. Attachment 4 provides a summary of the wet season fairy shrimp survey dates, times, and conditions during each survey.

The wet season fairy shrimp survey consisted of a total of 21 sampling visits to 62 basins within the project area. Wet season sampling was performed by USFWS-permitted biologists Darin Busby (TE-115373-4), Paul Lemons (TE-051248-6), and Erin Bergman (TE-53771B-2), with assistance from Brian Parker, Andrew Kort, and Eilleen Salas. The project area was expanded to incorporate an additional basin, Basin 63, towards the end of the survey season after this basin had already dried; therefore, wet season fairy shrimp surveys were not conducted within Basin 63 during the 2023 wet season.

Figure 3 (Attachment 1) contains a map depicting the location and the survey results of each sampled basin. Of the 62 basins that were sampled within the project area, fairy shrimp were detected in 57 basins (92 percent), and no fairy shrimp species were detected in the remaining 5 basins (8 percent; i.e., Basins 5, 6, 54, 55, and 59). Of the 57 basins containing fairy shrimp, mature versatile fairy shrimp were detected in 50 basins (88 percent) and unidentifiable immature and/or female *Branchinecta* sp. were detected in 7 basins (12 percent; i.e., Basins 2, 40, 52, 57, 58, 60, and 61).

The unidentifiable immature and/or female *Branchinecta* sp. that were detected in Basins 2, 40, 52, 57, 58, 60, and 61, and any fairy shrimp that might have occurred in Basin 63 are expected to be the common versatile fairy shrimp based on the presence of this singular species throughout the entire project area. The results of the dry season fairy shrimp survey will likely provide a definitive identification of the known or potentially occurring fairy shrimp species in these basins, as well as determine the presence or absence of the federally listed Riverside fairy shrimp, vernal pool fairy shrimp, and San Diego fairy shrimp within the project area.

Representative organisms present within many of the basins, as indicated in Attachments 5 and 6, include species such as oar-feet (Class Copepoda), seed shrimp (Class Ostracoda), water flea (Order Cladocera), predaceous diving beetle (Order Coleoptera), water boatmen (Order Hemiptera), mosquito larvae (Order Diptera), midge larvae (Order Diptera), Baja California tree frog (*Pseudacris hypochondriaca hypochondriaca*), and California toad (*Anaxyrus boreas halophilus*).

Attachment 5 provides a table summarizing the overall survey results for the entire wet season fairy shrimp survey, including actual maximum depth, estimated maximum depth, actual maximum surface area, and estimated maximum surface area for the basins; the fairy shrimp and other species observed; habitat conditions, disturbance types, and disturbance levels; notes and voucher information; and GPS coordinates. Attachment 6 provides a table of the actual survey data collected during each survey date.

SUMMARY

The wet season fairy shrimp survey consisted of a total of 21 sampling visits to 62 basins within the project area. Of the 62 basins that were sampled within the project area, fairy shrimp were detected in 57 basins and no fairy shrimp species were detected in the remaining 5 basins (i.e., Basins 5, 6, 54, 55, and 59). Of the 57 basins containing fairy shrimp, mature versatile fairy shrimp were detected in 50 basins and unidentifiable immature and/or female *Branchinecta* sp. that are likely versatile fairy shrimp, were detected in 7 basins (i.e., Basins 2, 40, 52, 57, 58, 60, and 61). The project area was expanded to incorporate an additional basin, Basin 63, towards the end of the survey season after this basin had already dried; therefore, wet season fairy shrimp surveys were not conducted within Basin 63 during the 2023 wet season. No federally listed Riverside fairy shrimp, vernal pool fairy shrimp, or San Diego fairy shrimp were observed in the project area during the 2023 wet season fairy shrimp survey.

The unidentifiable immature and/or female *Branchinecta* sp. that were detected in Basins 2, 40, 52, 57, 58, 60, and 61, and any fairy shrimp that might have occurred in Basin 63 are expected to be the common versatile fairy shrimp based on the presence of this singular species throughout the entire project area. The results of the dry season fairy shrimp survey will likely provide a definitive identification of the known or potentially occurring fairy shrimp species in these basins, as well as determine the presence or absence of the federally listed Riverside fairy shrimp, vernal pool fairy shrimp, and San Diego fairy shrimp within the project area.

This 2023 wet season fairy shrimp survey satisfies a portion of the current USFWS survey requirements, which include a minimum of one complete dry season survey and one complete wet season survey within a 3-year period.

Please do not hesitate to contact me at darin@busbybiological.com or 858.334.9508 if you have any questions.

Sincerely,

Darin Busby
Principal Biologist

ATTACHMENTS

Attachment 1: Figures
Attachment 2: Representative Basin Photographs
Attachment 3: Summary of Precipitation
Attachment 4: Survey Dates, Times, and Conditions
Attachment 5: Summary of Survey Results
Attachment 6: Survey Data

REFERENCES

National Integrated Drought Information Center

2023 National Integrated Drought Information Center: US Drought Portal. https://www.drought.gov/drought/data-maps-tools/current-conditions. Accessed online August.

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2017 Survey Guidelines for the Listed Large Branchiopods. Nov 13.

U.S. Geological Survey (USGS)

2023 Sunnymead 7.5-Minute Topographic Map. Accessed online August.

SURVEYORS' CERTIFICATION

I certify that the information in this survey report and attached exhibits fully and accurately represent my work.

Darin Busby
Principal Biologist
Busby Biological Services, Inc.
USFWS Permit Number TE-115373-4

Paul Lemons
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Erin Bergman
Senior Biologist
Dudek
USFWS Permit Number TE-53771B-2

Attachment 1 – Figures

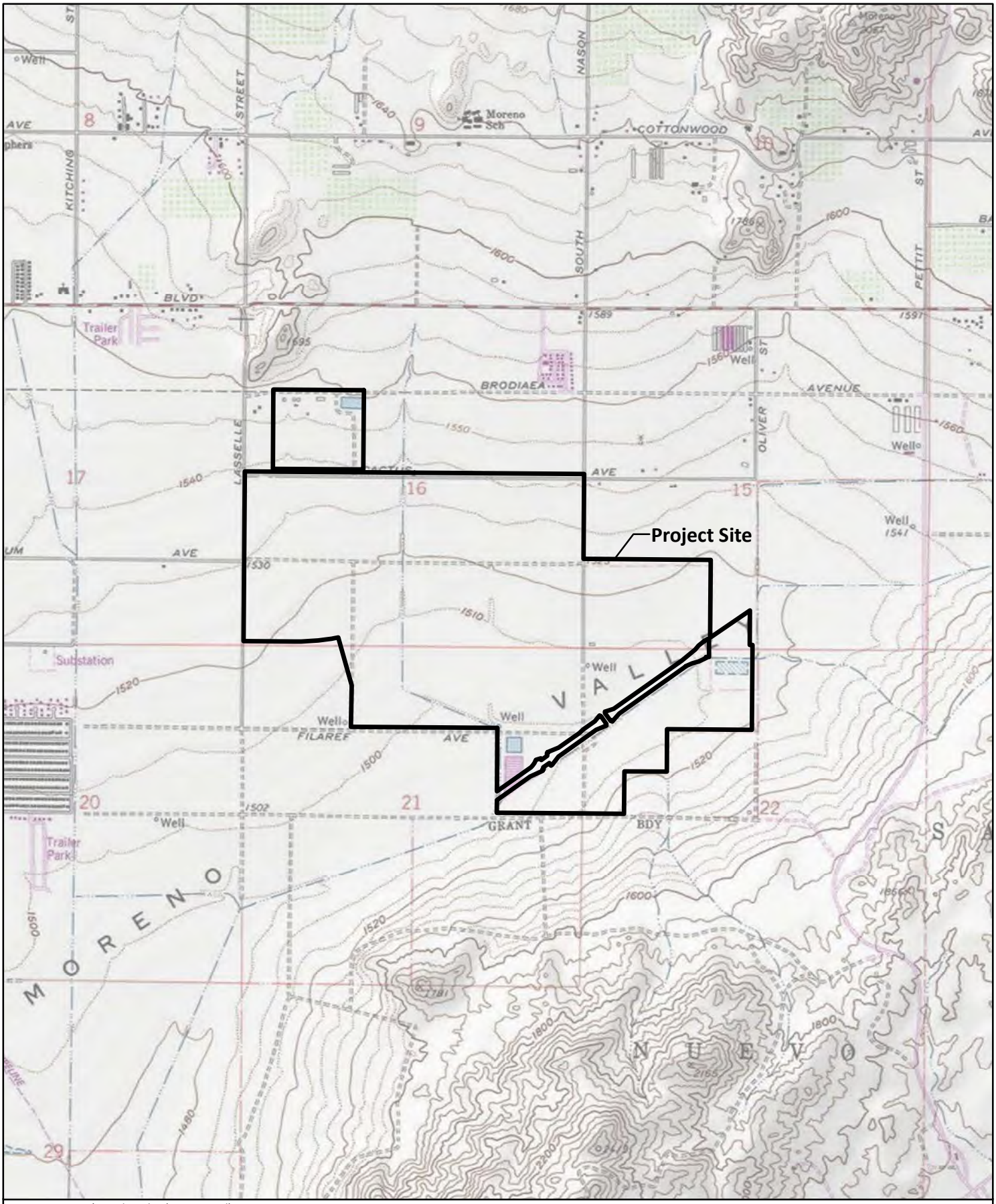
Source: National Geographic, Esri

BUSBY Biological Services

Regional Location

PROPOSED AQUABELLA PROJECT

Figure 1



Source: USGS 7.5' Quadrangles (Sunnymead)

BUSBY Biological Services

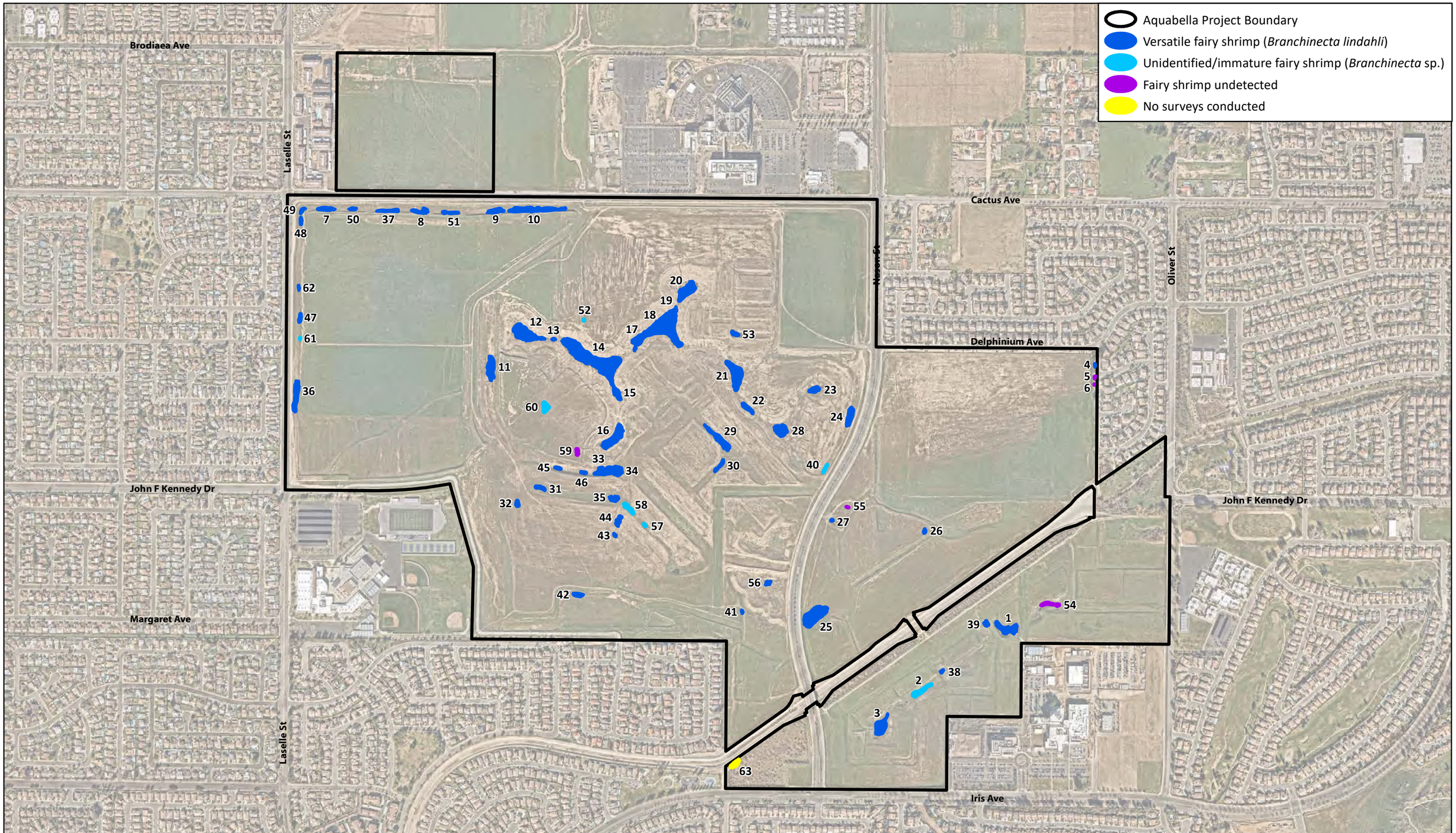
N

0 1,000 2,000 Feet

Project Location (USGS)

PROPOSED AQUABELLA PROJECT

Figure 2



Aerial Photo: Nearmap 2023

BUSBY Biological Services

N 0 400 800 Feet

2023 Wet Season Fairy Shrimp Survey Results

PROPOSED AQUABELLA PROJECT

Figure 3

Attachment 2 – Representative Basin Photographs

	Photograph 1. View of Basin 3 in southeastern portion of project area (taken 1/13/23; facing southeast).
	Photograph 2. View of Basin 8 in northwestern portion of project area (taken 1/13/23; facing west).
	Photograph 3. View of Basin 11 in western half of project area (taken 1/13/23; facing east).

	Photograph 4. View of Basin 14 in central portion of project area (taken 1/13/23; facing southeast).
	Photograph 5. View of Basin 20 in north-central portion of project area (taken 1/13/23; facing north).
	Photograph 6. View of Basin 25 in eastern half of project area (taken 3/2/23; facing northeast).

	Photograph 7. View of Basin 36 along western edge of project area (taken 3/8/23; facing south).
	Photograph 8. View of Basin 44 in central portion of project area (taken 3/8/23; facing south).
	Photograph 9. View of Basin 52 in north-central portion of project area (taken 3/8/23; facing north).

Attachment 3 – Summary of Precipitation

Date	Precipitation Total (inches)*	
	Actual	Historical Average
October 2022	**0.20**	**0.33**
10/11/22	0.03	
10/15/22	0.17	
November 2022	**1.30**	**0.57**
11/02/22	0.05	
11/05/22	0.05	
11/08/22	0.98	
11/09/22	0.22	
December 2022	**2.02**	**1.51**
12/2/22	0.01	
12/4/22	0.04	
12/5/22	T	
12/6/22	T	
12/11/22	0.48	
12/12/22	0.32	
12/27/22	0.35	
12/28/22	0.06	
12/29/22	T	
12/30/22	0.01	
12/31/22	0.75	
January 2023	**3.09**	**2.29**
1/1/23	0.20	
1/2/23	0.04	
1/3/23	0.08	
1/4/23	0.03	
1/5/23	0.42	
1/9/23	T	
1/10/23	0.23	
1/14/23	1.12	
1/15/23	0.59	
1/16/23	0.31	
1/17/23	T	
1/19/23	T	
1/28/23	T	
1/29/23	0.03	
1/30/23	0.04	
February 2023	**1.95**	**2.41**
2/5/23	T	
2/13/23	T	
2/14/23	0.22	
2/21/23	T	
2/22/23	0.01	
2/23/23	0.29	
2/24/23	0.09	
2/25/23	1.21	
2/26/23	0.06	
2/27/23	0.03	
2/28/23	0.04	
March 2023	**4.25**	**1.21**
3/1/23	0.04	
3/5/23	T	
3/6/23	0.03	

3/10/23	0.59	
3/11/23	0.08	
3/14/23	0.70	
3/15/23	0.71	
3/16/23	0.01	
3/19/23	0.01	
3/20/23	T	
3/21/23	1.08	
3/22/23	0.43	
3/29/23	0.35	
3/30/23	0.22	
April 2023	**0.05**	**0.57**
4/12/23	0.02	
4/13/23	0.02	
4/14/23	T	
May 2023	**0.47**	**0.20**
5/1/23	0.02	
5/2/23	T	
5/4/23	0.44	
5/5/23	0.01	
5/9/23	T	
5/28/23	T	
TOTAL (Oct-Apr)	**13.33**	**9.09**

* https://www.weather.gov/wrh/Climate?wfo=sgx (Riverside Municipal Airport, Riverside, CA)

T = trace amount

Attachment 4 – Survey Dates, Times, and Conditions

Survey Number	Date	Time	Temp (C)	Wind (mph)	Clouds (%)	Precip	Permitted Surveyor	Assistant	FS Species Detected/Notes
1	1/13/23	0750-1635	8-16	1-4	90	0	D. Busby	B. Parker	BRLI; 24 basins inundated
2	1/19/23	0745-1545	3-14	0-6	0	0	D. Busby	B. Parker	BRLI; 24 basins inundated
3	1/26/23	0820-1715	12-15	0-2	0	0	E. Bergman	B. Parker	BRLI; 37 basins inundated
4	2/1/23	0815-1400	7-16	0-1	0	0	D. Busby	B. Parker	BRLI; 23 basins inundated
5	2/7/23	0940-1540	16-21	0-4	0	0	D. Busby	B. Parker	BRLI; 13 basins inundated
6	2/15/23	0805-1145	6-9	2-7	0	0	D. Busby	B. Parker	BRLI; 11 basins inundated
7	2/21/23	0850-1230	14-22	0-1	0-50	0	D. Busby	B. Parker, E. Salas	BRLI; 11 basins inundated
8	3/2/23	0810-1545	4-14	0-3	0	0	D. Busby	B. Parker, A. Kort	BRLI, 37 basins inundated
9	3/8/23	0800-1515	7-14	0-3	0-10	0	D. Busby	B. Parker, A. Kort	BRLI; 50 basins inundated
10	3/14/23	0745-1325	11-13	0-4	100	Light Rain	D. Busby	B. Parker, A. Kort	BRLI; 38 basins inundated
11	3/20/23	0810-1430	11-14	2-11	90-100	0	D. Busby	B. Parker, A. Kort	BRLI; 51 basins inundated
12	3/27/23	0830-1600	9-15	0-4	0-50	0	P. Lemons	B. Parker, A. Kort	BRLI; 60 basins inundated
13	4/4/23	0830-1575	7-14	1-9	0	0	D. Busby	B. Parker, A. Kort	BRLI; 36 basins inundated
14	4/11/23	0850-1315	17-24	0-2	15-17	0	D. Busby	B. Parker, A. Kort	BRLI; 20 basins inundated
15	4/17/23	1215-1530	12-16	0-3	10-100	0	D. Busby	B. Parker, A. Kort	BRLI; 15 basins inundated
16	4/24/23	0830-1215	13-18	1-5	0-100	0	D. Busby	A. Kort	BRLI; 12 basins inundated
17	5/1/23	0850-1305	12-13	2-4	100	0	D. Busby	A. Kort	BRLI; 9 basins inundated
18	5/9/23	0825-1045	11-15	0-2	75-100	0	D. Busby	A. Kort	BRLI; 7 basins inundated
19	5/15/23	0820-1040	16-22	0-2	75-100	0	D. Busby	A. Kort	BRLI; 4 basins inundated
20	5/22/23	1145-1230	26-27	1-3	10	0	D. Busby	N/A	No fairy shrimp; 1 basin inundated
21	5/30/23	0745-0840	16	0	100	0	D. Busby	N/A	All basins dry

BRLI = Versatile fairy shrimp (*Branchinecta lindahli*)

Attachment 5 – Summary of Survey Results

Basin ID	Survey Date Range	Maximum Temp (°C)		Maximum Depth (cm)		Maximum Surface Area (sq m)		Maximum Number of Anostracans (1s, 10s, 100s, 1000s)		Other Inverts/Verts (check box/specify)								Habitat Conditions	Notes/Voucher Info	GPS Coordinates (Latitude/Longitude)	
		Air	Water	Actual Average	Estimated	Actual Present	Estimated	BRLI	Unknown (Naup./Imm./fem.)	Copepods	Ostracods	Cladocera	Coleoptera	Hemiptera	Mosquito larvae	Midge larvae	Amphibian (E, T, A)	AB = algal bloom C = constructed N = natural D = disturbed UD = undisturbed TT = tire tracks			
1	1/13/23-5/1/23	21	19	100	100	840	450	100	10,000	X	X						A	C, D	Voucher 3F, 3M, 1imm (1/13/23)	33.899574	-117.187553
2	1/13/23-4/4/23	14	14	35	40	480	150		10		X				X	X	E, A	C, D	Unidentified/immature fairy shrimp (*Branchinecta* sp.); Western Toad	33.898020	-117.190095
3	1/13/23-5/15/23	21	16	120	150	920	350	10,000	10,000	X	X	X		X	X	X	E, T, A	AB, C, D	Voucher 4F, 4M BRLI (2/1/23); Western toad	33.897131	-117.191259
4	1/13/23-4/11/23	13	16	10	20	25	50	1										AB, C, D, TT		33.906074	-117.185039
5	1/13/23-4/4/23	13	16	4	5	25	15											AB,C,D,TT	Fairy shrimp undetected	33.905778	-117.185040
6	1/13/23-3/8/23	14	16	3	5	4	7											AB, C, D, TT	Fairy shrimp undetected	33.905601	-117.185054
7	1/13/23-4/11/23	18	22	10	6	275	55	1,000	1,000	X				X	X			AB, C, D, TT	Voucher 4F, 4M BRLI (1/19/23)	33.909746	-117.207772
8	1/13/23-4/17/23	23	28	10	10	295	300	10,000	10,000	X	X	X			X	X		AB, C, D, TT	Voucher 4F, 4M BRLI (1/19/23)	33.909711	-117.204954
9	1/13/23-4/11/23	18	23	8	10	290	50	10,000	100,000		X	X			X			AB, C, D, TT	Voucher 4F, 4M BRLI (1/19/23)	33.909737	-117.202740
10	1/13/23-5/1/23	23	24	12	10	1,160	80	10,000	1,000		X	X			X			AB, C, D, TT	Voucher 4F, 4M BRLI (1/19/23)	33.909776	-117.201651
11	1/13/23-5/1/23	23	25	25	20	860	600	10,000	100,000		X	X			X	X		AB, C, D, TT	Voucher 3F, 3M, BRLI (1/19/23)	33.905873	-117.202860
12	1/13/23-5/15/23	23	26	20	15	1,780	1,500	100,000	100,000		X	X		X	X	X	T	AB, C, D, TT	Voucher 4F, 4M BRLI (2/01/23)	33.906726	-117.201877
13	1/13/23-	18	23	12	10	35	30	1,000	1,000	X	X							AB, C, D	Voucher 4F, 4M BRLI (1/19/23)	33.906591	-117.201012

	4/11/23																			
14	1/13/23-5/22/23	24	23	18	30	5,450	4,500	100,000	100,000		X	X	X	X		X		C, D	Voucher 4F, 4M BRLI (2/01/23); 4F, 4M BRLI (2/07/23)	33.906110	-117.199839
15	1/13/23-4/17/23	24	26	5	10	365	300	1,000	10,000		X	X				X	T	AB, C, D	Voucher 3F, 3M, BRLI (1/19/23)	33.905274	-117.199133
16	1/13/23-5/15/23	22	22	15	30	1,290	1,400	10,000	100,000		X	X		X	X	X	T, A	C, D	Voucher 4F, 4M BRLI (2/01/23)	33.904182	-117.199212
17	1/13/23-4/24/23	18	16	3	5	4	5	X	100									C, D	Combined with Basin 18 which contained BRLI	33.906652	-117.198494
18	1/13/23-5/22/23	23	23	25	50	4,570	2,500	10,000	100,000	X	X	X	X	X	X	X	T	C, D, TT	Voucher 4F, 4M BRLI (2/01/23)	33.906870	-117.197831
19	1/13/23-3/08/23	18	17	10	12	2	3	100	100									C, D	Voucher 3F, 3M, BRLI (1/19/23)	33.907407	-117.197417
20	1/13/23-5/22/23	23	23	25	40	1,135	900	10,000	10,000	X	X	X	X	X	X	X		C, D	Voucher 4F, 4M BRLI (2/01/23)	33.907812	-117.197102
21	1/13/23-5/15/23	19	20	20	50	1,540	900	10,000	10,000		X	X	X	X	X	X	A,T	C, D	Voucher 4F, 4M BRLI (2/0723); tree frog	33.905758	-117.195635
22	1/13/23-4/17/23	19	21	12	10	260	100	1,000	10,000	X	X	X			X	X	T	C, D	Voucher 3F, 4M BRLI (2/07/23)	33.904947	-117.195284
23	1/13/23-4/17/23	19	22	20	8	280	60	1,000	1,000		X				X			C, D	Voucher 4F, 4M BRLI (2/01/23)	33.905409	-117.193305
24	1/13/23-4/11/23	16	18	13	10	560	500	1,000	1,000		X				X	X		AB, C, D, TT	Voucher 4F, 4M BRLI (2/01/23)	33.904760	-117.192253
25	1/26/23-5/09/23	18	18	20	40	1,990	1,000	10,000	10,000		X	X	X	X	X	X	T	C,D, TT	Erodium filled	33.899851	-117.193246
26	1/26/23-4/24/23	18	16	15	10	55	55	10,000	10,000		X	X			X	X	T	AB, C,D	Voucher 4F, 4M BRLI (2/07/23)	33.901953	-117.190018
27	1/26/23-4/11/23	15	12	8	5	30	20	100						X	X			AB, C,D	Voucher 4F, 5M BRLI (3/14/23)	33.902201	-117.192755
28	1/26/23-4/11/23	15	18	12	10	760	760	1,000	10,000		X	X	X		X	X		C,D		33.904405	-117.194285
29	1/26/23-4/11/23	17	18	10	10	790	700	1,000	10,000		X	X			X			C,D	Voucher 4F, 5M BRLI (3/14/23); Erodium filled	33.904151	-117.196079
30	1/26/23-4/17/23	21	25	7	5	150	150	1,000	10,000		X	X			X	X		C,D	Erodium filled	33.903516	-117.196086
31	1/26/23-4/24/23	22	22	20	10	150	100	1,000	100,000		X	X			X	X	T	C,D, TT		33.902938	-117.201373

32	1/26/23-4/11/23	17	22	10	10	120	100	1,000	1,000		X				X	X		C,D, TT		33.902541	-117.202043
33	1/26/23-4/11/23	18	22	8	5	760	700	1,000	10,000		X				X	X		C,D, TT	Voucher 4F, 5M BRLI (3/14/23)	33.903362	-117.199475
34	1/26/23-4/11/23	18	22	12	10	540	500	1,000	10,000		X				X	X	T	C,D,TT		33.903368	-117.199104
35	1/26/23-5/30/23	26	23	30	40	240	240	10,000	1,000		X	X	X	X	X		E, T, A	C,D	Anoxic odor, discolored water; Western toad	33.902684	-117.199185
36	1/26/23-4/11/23	18	24	32	10	740	750	1,000	100,000						X	X		AB,C,D,TT		33.905151	-117.208602
37	1/26/23-4/04/23	18	21	10	10	215	220	10,000	1,000		X				X			AB,C,D,TT		33.909716	-117.205899
38	3/8/23-4/04/23	12	12	12	12	45	55	100	100									C,D		33.898513	-117.189470
39	3/8/23-4/11/23	12	14	7	5	120	48	100	100						X		T	C,D,TT	Voucher 4F, 4M BRLI (3/14/23)	33.899695	-117.188176
40	3/8/23-4/4/23	13	17	5	20	100	100		1,000									C,D,TT	Unidentified/immature fairy shrimp (*Branchinecta* sp.)	33.903468	-117.192970
41	3/8/23-4/04/23	13	23	4	10	25	25	100	100									C,D,TT		33.899935	-117.195381
42	3/8/23-4/04/23	14	23	4	10	190	190	1,000	100		X		X					C,D,TT	Voucher 4F, 4M BRLI (3/20/23)	33.900313	-117.200228
43	3/8/23-4/4/23	14	24	2	8	35	35	1	10							X		C,D,TT		33.901787	-117.199156
44	3/8/23-4/11/23	14	22	4	10	235	240	100	100							X		AB,C,D,TT	Voucher 4F, 4M BRLI (3/14/23)	33.902142	-117.199053
45	3/8/23-4/11/23	14	20	8	18	65	70	1,000	1,000		X				X	X		AB,C,D,TT		33.903424	-117.200852
46	3/8/23-4/04/23	14	20	4	5	60	60	1,000	1,000				X					C,D,TT		33.903320	-117.200096
47	3/8/23-4/04/23	15	22	2	6	125	125	10							X	X		C,D,TT		33.907055	-117.208501
48	3/8/23-4/04/23	15	23	2	5	80	80	100	100		X		X		X	X		C,D,TT		33.909444	-117.208504
49	3/8/23-4/11/23	15	23	3	10	80	80	1,000	100		X					X	X	C,D,TT		33.909703	-117.208470
50	3/8/23-	15	24	3	6	75	45	100	100						X			C,D,TT		33.909753	-117.206972

	4/04/23																			
51	3/8/23-4/04/23	15	22	6	10	150	90	100	1,000		X					X		AB,C,D,TT		33.909682	-117.204112
52	3/8/23-4/04/23	15	24	3	6	20	20		100							X		C,D,TT	Unidentified/immature fairy shrimp (*Branchinecta* sp.)	33.907075	-117.200130
53	3/8/23-4/04/23	15	21	8	8	120	120	100	100						X	X		C,D		33.906767	-117.195672
54	3/27/23-4/04/23	9	10	18	40	250	250											C,D	Fairy shrimp undetected	33.900188	-117.186301
55	3/27/23-4/04/23	12	9	7	12	20	20											C,D,TT	Fairy shrimp undetected	33.902529	-117.192304
56	3/27/23-4/04/23	13	16	3	10	100	100	10			X							C,D		33.900646	-117.194626
57	3/27/23-4/04/23	14	16	2	3	50	50		100									C,D	Unidentified/immature fairy shrimp (Branchinecta sp.)	33.902042	-117.198274
58	3/27/23-4/11/23	14	22	6	25	265	265		1 female						X			C,D	1 unidentified female (*Branchinecta* sp.)	33.902458	-117.198761
59	3/27/23-4/04/23	14	16	6	9	105	105											C,D	Fairy shrimp undetected	33.903832	-117.200288
60	3/27/23-4/04/23	14	14	5	15	350	350		1,000									C,D	Unidentified/immature fairy shrimp (Branchinecta sp.)	33.904919	-117.201239
61	3/27/23-4/04/23	15	22	2	10	20	20		10							X		C,D,TT	Unidentified/immature fairy shrimp (*Branchinecta* sp.)	33.906555	-117.208497
62	3/27/23-4/04/23	15	22	2	4	25	25	1										C,D,TT		33.907801	-117.208549
63	5/9/23				30		285												Dry; Did not survey while inundated	33.896188	-117.195552

BRLI = Versatile fairy shrimp (*Branchinecta lindahli*)
fem. = female
imm. = immature fairy shrimp
naup. = nauplii fairy shrimp
E = Egg
T = Tadpole
A = Adult

Attachment 6 – Survey Data

Basin ID	Survey Date	Survey Number	Temp (°C)		Depth (cm)		Surface Area (sq m)		Anostracans (1s, 10s, 100s, 1000s)		Other Inverts/Verts (check box/specify)								Habitat Conditions	Notes/Voucher Info
			Air	Water	Present Average	Est. Max	Present	Est. Max	BRLI	Unknown (Naup./Imm./fem.)	Copepods	Ostracods	Cladocera	Coleoptera	Hemiptera	Mosquito larvae	Midge larvae	Amphibian (E, T, A)	AB = algal bloom C = constructed N = natural D = disturbed UD = undisturbed TT = tire tracks	
1	1/13/23	1	8	7	60	100	370	450	100	100 imm	X	X							C, D	Voucher 3F, 3M, 1imm
1	1/19/23	2	12	7	100	100	840	450	100	100 imm	X	X							C, D	
1	1/26/23	3	12	7	20	100	400	450											C,D	No life; ice in pool
1	2/1/23	4	16	6	20	100	200	450	100	100 imm		X							C,D	
1	2/7/23	5	21	8	20	100	150	450	100	100 imm		X							C,D	
1	2/15/23	6	6	4	16	100	135	450				X							C,D	Icy
1	2/21/23	7	17	8	10	100	105	450				X							C,D	
1	3/2/23	8	14	19	100	100	830	450											C,D	No Life
1	3/8/23	9	7	10	85	100	750	450		10,000		X							C,D	*Branchinecta* sp.
1	3/14/23	10	11	11	65	100	550	450				X						A	C,D	
1	3/20/23	11	12	11	100	100	700	450	100				X						C,D	
1	3/27/23	12	9	8	100	100	800	450					X						C,D	
1	4/4/23	13	9	3	50	100	500	450	10				X						C,D	
1	4/11/23	14	18	12	40	100	300	450	10			X	X						AB,C,D	
1	4/17/23	15	12	16	8	100	90	450					X						C,D	No FS
1	4/24/23	16	13	14	5	100	15	450				X	X						C,D	No FS
1	5/1/23	17																		DRY
2	1/13/23	1	8	7	15	40	120	150											C, D	No life
2	1/19/23	2	12	10	35	40	480	150											C,D	No life
2	1/26/23	3	12	3	8	40	80	150		10 imm									C,D	Branchinecta sp.; Ice in pool
2	2/1/23	4																		Dry
2	3/2/23	8	14	14	25	40	465	150											C,D	No Life
2	3/8/23	9	7	10	20	40	425	150											C,D	No Life
2	3/14/23	10	11	12	15	40	150	150										E	C,D	Western Toad Eggs
2	3/20/23	11	11	12	18	40	300	150		10		X						A	C,D	Western Toad
2	3/27/23	12	9	9	12	40	350	150				X				X	X		C,D	No FS
2	4/4/23	13																		DRY
3	1/13/23	1	8	7	100	150	310	350		10,000									C, D	*Branchinecta* sp.
3	1/19/23	2	12	10	120	150	920	350	10,000	10,000									C,D	
3	1/26/23	3	13	7	80	150	350	350	10,000	10,000									C,D	
3	2/1/23	4	16	10	50	150	700	350	10,000	10,000	X	X							C,D	Voucher 4F, 4M BRLI
3	2/7/23	5	21	13	50	150	650	350	10,000	10,000	X	X							C,D	
3	2/15/23	6	7	6	45	150	400	350	10,000	10,000		X	X						C,D	
3	2/21/23	7	17	7	20	150	100	350	100	100		X	X						C,D	
3	3/2/23	8	15	14	80	150	900	350					X						C,D	No FS
3	3/8/23	9	7	10	70	150	850	350		100,000		X	X					A	C,D	Branchinecta sp.; Western toad
3	3/14/23	10	11	13	60	150	825	350		100,000			X					E	C,D	Branchinecta sp.; Western Toad Eggs
3	3/20/23	11	11	13	75	150	920	350					X						C,D	No FS
3	3/27/23	12	9	12	100	150	900	350				X	X			X		T	C,D	
3	4/4/23	13	10	12	75	150	800	350				X	X					T	AB,C,D	No FS
3	4/11/23	14	17	16	65	150	500	350					X			X		T	C,D	No FS
3	4/17/23	15	12	16	15	150	100	350					X		X		X	T	C,D	No FS
3	4/24/23	16	13	14	7	150	70	350				X	X		X			T	C,D	No FS
3	5/1/23	17	12	13	2	150	20	350										A	C,D	No FS
3	5/9/23	18																		DRY
3	5/15/23	19																		DRY
4	1/13/23	1	10	10	8	20	20	50											C, D, TT	No life
4	1/19/23	2	12	16	5	20	21	50											C,D,TT	No life
4	1/26/23	3	13																C,D,TT	Dry
4	3/2/23	8	4	4	10	20	25	50											AB,C,D,TT	No Life
4	3/8/23	9	10	13	7	20	6	50												No Life
4	3/14/23	10	11	12	5	20	4	50											AB,C,D,TT	No Life
4	3/20/23	11	12	13	5	20	4	50											AB,C,D,TT	No Life
4	3/27/23	12	11	9	5	20	5	50											C,D,TT	No Life
4	4/4/23	13	7	5	4	20	3	50	1										AB,C,D,TT	
4	4/11/23	14																		DRY
5	1/13/23	1	10	10	3	5	9	15											C, D, TT	No life
5	1/19/23	2	12	16	2	5	23	15											AB,C,D,TT	No life
5	1/26/23	3	13																C,D,TT	Dry
5	3/2/23	8	4	4	4	5	25	15											C,D,TT	No Life
5	3/8/23	9																		Dry
5	3/20/23	11	12	13	1	5	6	15											C,D,TT	No Life
5	3/27/23	12	11	10	1	5	6	15								X			AB,C,D,TT	
5	4/4/23	13																		DRY
6	1/13/23	1	10	10	3	5	4	7											C, D, TT	No life
6	1/19/23	2	12	16	2	5	4	7											AB,C,D,TT	No life
6	1/26/23	3	14																C,D,TT	Dry
6	3/2/23	8	4	3	2	5	4	7											C,D,TT	No Life
6	3/8/23	9																		Dry
7	1/13/23	1	14	14	3	6	45	55		1,000									C, D	*Branchinecta* sp.
7	1/19/23	2	8	7	10	6	275	55	1,000	1,000									C,D	Voucher 4F, 4M BRLI
7	1/26/23	3	18	18	4	6	145	55	1,000	1,000	X								AB,C,D,TT	
7	2/1/23	4	15	15	2	6	40	55	100	100 imm									AB,C,D,TT	
7	2/7/23	5																		Dry
7	3/2/23	8	15	17	8	6	265	55											C,D,TT	No Life
7	3/8/23	9	13	22	7	6	110	55		1,000									AB,C,D,TT	*Branchinecta* sp.
7	3/14/23	10	14	14	4	6	75	55	100	100									C,D,TT	
7	3/20/23	11	14	22	8	6	275	55								X			AB,C,D,TT	No FS
7	3/27/23	12	15	18	7	6	250	55	1,000	1,000									C,D,TT	
7	4/4/23	13	12	20	4	6	100	55							X	X			C,D,TT	
7	4/11/23	14																		DRY
8	1/13/23	1	14	13	7	10	35	45		1000									C, D, TT	*Branchinecta* sp.
8	1/19/23	2	9	7	10	10	235	45	1,000	1,000									C,D	Voucher 4F, 4M BRLI
8	1/26/23	3	18	16	7	10	100	45	10,000	10,000	X	X							AB,C,D,TT	*Branchinecta* sp.

8	2/1/23	4	15	13	4	10	25	45	1,000	1,000									AB,C,D,TT	
8	2/7/23	5																		Dry
8	3/2/23	8	15	18	9	10	246	45											C,D,TT	No Life
8	3/8/23	9	13	15	8	10	175	45		1,000									AB,C,D,TT	*Branchinecta* sp.
8	3/14/23	10	14	15	7	10	100	45		1,000									C,D,TT	*Branchinecta* sp.
8	3/20/23	11	14	21	8	10	225	45		10,000		X							AB,C,D,TT	*Branchinecta* sp.
8	3/27/23	12	15	20	8	10	295	45	1,000			X					X		AB,C,D,TT	
8	4/4/23	13	12	21	7	10	75	45				X				X			C,D,TT	
8	4/11/23	14	23	28	2	10	12	45				X	X			X			C,D,TT	No FS
8	4/17/23	15																		DRY
9	1/13/23	1	14	15	3	10	38	50		1000		X							C, D, TT	*Branchinecta* sp.
9	1/19/23	2	9	8	7	10	288	50	1,000	1,000									C,D	Voucher 4F, 4M BRLI
9	1/26/23	3	18	17	5	10	60	50	100	100									AB,C,D,TT	*Branchinecta* sp.
9	2/1/23	4	15	15	2	10	8	50	100	100 imm		X				X			AB,C,D,TT	
9	2/7/23	5																		Dry
9	3/2/23	8	15	16	7	10	290	50											C,D,TT	No Life
9	3/8/23	9	13	22	8	10	110	50		10,000									C,D,TT	*Branchinecta* sp.
9	3/14/23	10	14	15	3	10	90	50		100,000		X							C,D,TT	*Branchinecta* sp.
9	3/20/23	11	14	20	3	10	250	50	10,000			X	X						C,D,TT	
9	3/27/23	12	15	19	8	10	250	50	10,000			X				X			C,D,TT	
9	4/4/23	13	12	23	4	10	175	50	100			X	X			X			C,D,TT	
9	4/11/23	14																		DRY
10	1/13/23	1	16	12	6	10	63	80		1000		X							AB, C, D, TT	*Branchinecta* sp.
10	1/19/23	2	10	10	10	10	60	80	1,000	1,000									C,D	Voucher 4F, 4M BRLI
10	1/26/23	3	18	16	8	10	300	80	1,000	1,000									AB,C,D,TT	
10	2/1/23	4	15	12	4	10	250	80	1,000	1,000		X							AB,C,D,TT	
10	2/7/23	5	21	19	7	10	75	80	1,000	1,000		X	X						AB,C,D,TT	
10	2/15/23	6	8	10	2	10	30	80	100	100		X	X						AB,C,D,TT	
10	2/21/23	7																		Dry
10	3/2/23	8	15	16	11	10	1,160	80											C,D,TT	No Life
10	3/8/23	9	13	21	9	10	1,160	80		10,000									C,D,TT	*Branchinecta* sp.
10	3/14/23	10	14	15	7	10	700	80		10,000			X						C,D,TT	*Branchinecta* sp.
10	3/20/23	11	14	20	12	10	1,000	80	10,000	10,000		X							C,D,TT	
10	3/27/23	12	16	21	12	10	1,000	80	10,000	10,000		X							C,D,TT	
10	4/4/23	13	12	23	10	10	900	80				X	X			X			C,D,TT	No FS
10	4/11/23	14	23	24	8	10	600	80				X	X			X			C,D,TT	No FS
10	4/17/23	15	15	16	6	10	125	80				X	X			X			C,D,TT	No FS
10	4/24/23	16	17	20	3	10	25	80					X						C,D,TT	No FS
10	5/1/23	17																		DRY
11	1/13/23	1	18	14	10	20	425	600		10000									AB, C, D	*Branchinecta* sp.
11	1/19/23	2	8	7	25	20	860	600	10,000	10,000									C,D	Voucher 3F, 3M, BRLI
11	1/26/23	3	17	13	15	20	560	600	10,000	10,000									C,D	
11	2/1/23	4	14	10	8	20	450	600	1,000	1,000									AB,C,D	
11	2/7/23	5	20	11	8	20	325	600	100	1,000									AB,C,D	
11	2/15/23	6	8	7	4	20	150	600	1,000	1,000									AB,C,D,TT	
11	2/21/23	7	23	22	3	20	40	600	1	1		X	X				X		C,D	
11	3/2/23	8	12	14	18	20	700	600											C,D,TT	No Life
11	3/8/23	9	13	21	12	20	600	600		1,000									AB,C,D	*Branchinecta* sp.
11	3/14/23	10	14	14	9	20	400	600		100,000									AB,C,D,TT	*Branchinecta* sp.
11	3/20/23	11	14	19	13	20	800	600		10,000						X			AB,C,D,TT	*Branchinecta* sp.
11	3/27/23	12	14	20	12	20	750	600				X				X			AB,C,D,TT	No FS
11	4/4/23	13	12	20	8	20	420	600					X						AB,C,D,TT	
11	4/11/23	14	22	25	5	20	300	600		100		X	X			X			AB,C,D,TT	*Branchinecta* sp.
11	4/17/23	15	15	22	4	20	110	600				X	X			X			C,D,TT	No FS
11	4/24/23	16	16	22	2	20	2	600					X						C,D,TT	No FS
11	5/1/23	17																		DRY
12	1/13/23	1	18	15	8	15	1,300	1,500		100000		X							C, D	*Branchinecta* sp.
12	1/19/23	2	11	7	15	15	1,780	1,500	10,000	10,000									C,D	
12	1/26/23	3	17	12	16	15	850	1,500	10,000	10,000									C,D	
12	2/1/23	4	16	11	12	15	1,200	1,500	100,000	100,000		X	X						C,D	Voucher 4F, 4M BRLI
12	2/7/23	5	20	11	10	15	1,000	1,500	10,000	10,000		X	X						C,D	
12	2/15/23	6	8	8	6	15	750	1,500	1,000	1,000		X	X						C,D	
12	2/21/23	7	20	16	5	15	650	1,500	100	100		X	X						AB,C,D	
12	3/2/23	8	15	12	20	15	1,770	1,500	100				X						C,D	
12	3/8/23	9	13	18	16	15	1,500	1,500		10,000			X				X		AB,C,D	*Branchinecta* sp.
12	3/14/23	10	12	14	14	15	1,250	1,500		100,000			X						C,D	*Branchinecta* sp.
12	3/20/23	11	14	18	20	15	1,700	1,500		100,000			X						C,D,TT	*Branchinecta* sp.
12	3/27/23	12	15	18	20	15	1,700	1,500	10,000	10,000			X						C,D	
12	4/4/23	13	13	18	18	15	1,500	1,500	100			X	X				X		C,D	
12	4/11/23	14	23	26	14	15	1,000	1,500				X	X				X	T	C,D	No FS
12	4/17/23	15	16	18	8	15	800	1,500				X	X			X		T	C,D	No FS
12	4/24/23	16	17	21	8	15	650	1,500					X						C,D	No FS
12	5/1/23	17	13	14	5	15	575	1,500					X		X				C,D	No FS
12	5/9/23	18	13	14	2	15	400	1,500				X						T	C,D	No FS
12	5/15/23	19																		DRY
13	1/13/23	1	18	17	5	10	22	30		1000									C, D	*Branchinecta* sp.
13	1/19/23	2	12	12	7	10	24	30	1,000	1,000		X							C,D	Voucher 4F, 4M BRLI
13	1/26/23	3	17	15	1	10	5	30			X	X							C,D	No shrimp
13	2/1/23	4																		Dry
13	3/2/23	8	16	18	12	10	35	30											C,D	No Life
13	3/8/23	9	13	23	5	10	21	30		100									AB,C,D	*Branchinecta* sp.
13	3/14/23	10	12	16	5	10	20	30		100									C,D	*Branchinecta* sp.
13	3/20/23	11	14	20	7	10	35	30	10	10		X							AB,C,D	
13	3/27/23	12	15	23	7	10	35	30	100			X							C,D	
13	4/4/23	13	13	22	6	10	25	30	100			X							C,D	
13	4/11/23	14																		DRY
14	1/13/23	1	19	12	12	30	3,800	4,500		100000		X	X						C, D	*Branchinecta* sp.
14	1/19/23	2	12	7	18	30	5,450	4,500	10,000	10,000		X	X						C,D	
14	1/26/23	3	17	13	15	30	4,000	4,500	100,000	100,000		X							C,D	
14	2/1/23	4	16	9	10	30	4,000	4,500	100,000	100,000		X	X						C,D	Voucher 4F, 4M BRLI
14	2/7/23	5	20	11	9	30	3,200	4,500	10,000	10,000		X	X						C,D	Voucher 4F, 4M
14	2/15/23	6	8	8	9	30	2,500	4,500				X	X						C,D	
14	2/21/23	7	20	13	9	30	2,000	4,500	100	100		X	X						C,D	
14	3/2/23	8	16	19	15	30	5,400	4,500					X						C,D	No FS
14	3/8/23	9	13	16	12	30	5,000	4,500					X						C,D	No FS
14	3/14/23	10	14	14	11	30	3,500	4,500					X						C,D	No FS
14	3/20/23	11	14	17	13	30	5,000	4,500		100			X						C,D	*Branchinecta* sp.
14	3/27/23	12	15	17	13	30	5,000	4,500	1,000				X				X		C,D	

14	4/4/23	13	13	16	13	30	4,500	4,500		1,000			X						C,D	*Branchinecta* sp.
14	4/11/23	14	24	21	12	30	4,000	4,500	100			X	X						C,D	
14	4/17/23	15	16	18	12	30	3,500	4,500				X	X						C,D	No FS
14	4/24/23	16	17	19	10	30	2,800	4,500					X						C,D	No FS
14	5/1/23	17	13	14	10	30	2,600	4,500						X	X				C,D	No FS
14	5/9/23	18	13	12	9	30	2,400	4,500				X			X				C,D	No FS
14	5/15/23	19	22	23	5	30	1,800	4,500				X	X		X				C,D	No FS
14	5/22/23	20																		DRY
15	1/13/23	1	19	17	5	10	166	300		100 imm									AB, C, D	*Branchinecta* sp.
15	1/19/23	2	14	14	5	10	365	300	1,000	1,000									C,D	Voucher 3F, 3M, BRLI
15	1/26/23	3	16	10	3	10	100	300	1,000	1,000									C,D	*Branchinecta* sp.
15	2/1/23	4	16	16	1	10	50	300	1,000	1,000		X	X						C,D	
15	2/7/23	5																		Dry
15	3/2/23	8	16	20	4	10	315	300											C,D	No Life
15	3/8/23	9	13	19	3	10	130	300		100									C,D	*Branchinecta* sp.
15	3/14/23	10	14	15	3	10	100	300		10,000									C,D	*Branchinecta* sp.
15	3/20/23	11	14	20	4	10	350	300	1,000				X						C,D	
15	3/27/23	12	15	18	4	10	350	300	1,000				X						C,D	
15	4/4/23	13	14	23	2	10	170	300				X	X				X	T	C,D	
15	4/11/23	14	24	26	2	10	20	300				X							C,D	No FS
15	4/17/23	15																		DRY
16	1/13/23	1	17	14	10	30	1,010	1,400		1,000									C, D	*Branchinecta* sp.
16	1/19/23	2	14	8	15	30	1,290	1,400	10,000	10,000			X						C,D	
16	1/26/23	3	18	15	6	30	1,200	1,400	1,000	1,000		X							C,D	
16	2/1/23	4	13	7	8	30	1,000	1,400	1,000	1,000		X							C,D	Voucher 4F, 4M BRLI
16	2/7/23	5	20	17	5	30	850	1,400	10,000	10,000		X							C,D	
16	2/15/23	6	7	4	4	30	400	1,400	1,000	1,000		X							C,D	Icy
16	2/21/23	7	22	20	4	30	150	1,400	10	100		X	X						C,D	
16	3/2/23	8	12	13	13	30	1,250	1,400		10			X						C,D	*Branchinecta* sp.
16	3/8/23	9	12	18	10	30	1,000	1,400		100,000			X						C,D	*Branchinecta* sp.
16	3/14/23	10	14	14	8	30	800	1,400		100,000			X						C,D	*Branchinecta* sp.
16	3/20/23	11	14	16	15	30	1,200	1,400	10,000			X	X						C,D	
16	3/27/23	12	14	16	15	30	1,200	1,400	1,000			X	X						C,D	
16	3/20/23	11	14	16	15	30	1,200	1,400	10,000			X	X						C,D	
16	3/27/23	12	14	16	15	30	1,200	1,400	1,000			X	X						C,D	
16	4/4/23	13	12	16	15	30	1,200	1,400	100				X					T	C,D	
16	4/11/23	14	22	21	10	30	1,100	1,400	10				X					T	C,D	
16	4/17/23	15	15	22	8	30	750	1,400					X			X		T	C,D	No FS
16	4/24/23	16	14	16	5	30	600	1,400					X				X	T	C,D	No FS
16	5/1/23	17	12	14	4	30	75	1,400				X	X		X			T	C,D	No FS
16	5/9/23	18	13	12	2	30	50	1,400				X						A,T	C,D	No FS
16	5/15/23	19																		DRY
17	1/13/23	1	18	16	3	5	4	5		100 imm									C, D	*Branchinecta* sp.
17	1/19/23	2																	C,D	Now part of Basin 18
17	1/26/23	3																		Part of Basin 18
17	2/1/23	4																		Part of Basin 18
17	2/7/23	5																		Part of Basin 18
17	3/2/23	8																		Part of Basin 18
17	3/8/23	9																		Part of Basin 18
17	3/14/23	10																		Dry
17	3/20/23	11																		Part of Basin 18
17	3/27/23	12																		Part of Basin 18
17	4/4/23	13																		Part of Basin 18
17	4/11/23	14																		Part of Basin 18
17	4/17/23	15																		Part of Basin 18
17	4/24/23	16																		DRY
17	5/1/23	17																		DRY
17	5/9/23	18																		DRY
17	5/15/23	19																		DRY
18	1/13/23	1	18	13	13	50	1,820	2,500		100,000		X							C, D	*Branchinecta* sp.
18	1/19/23	2	14	11	25	50	4,570	2,500	10,000	10,000		X							C,D	
18	1/26/23	3	17	12	25	50	2,500	2,500	10,000	10,000	X	X				X			C,D	
18	2/1/23	4	16	8	20	50	2,000	2,500	10,000	10,000		X							C,D	Voucher 4F, 4M BRLI
18	2/7/23	5	20	10	15	50	1,500	2,500	10,000	10,000		X							C,D	
18	2/15/23	6	8	8	13	50	1,200	2,500	1,000	1,000		X	X						C,D	
18	2/21/23	7	19	13	12	50	1,000	2,500	1,000	1,000		X	X				X		C,D,TT	
18	3/2/23	8	16	14	25	50	4,500	2,500				X	X						C,D	No FS
18	3/8/23	9	13	16	22	50	4,000	2,500	100			X	X						C,D	
18	3/14/23	10	14	15	20	50	3,000	2,500		10,000		X	X						C,D	*Branchinecta* sp.
18	3/20/23	11	14	18	21	50	4,500	2,500		10,000			X						C,D	*Branchinecta* sp.
18	3/27/23	12	15	18	21	50	4,500	2,500				X	X	X					C,D	No FS
18	4/4/23	13	13	17	15	50	4,000	2,500					X		X			T	C,D	
18	4/11/23	14	23	22	15	50	3,500	2,500	100				X					T	C,D	
18	4/17/23	15	16	18	14	50	3,000	2,500				X	X					T	C,D	No FS
18	4/24/23	16	17	17	14	50	2,500	2,500					X	X	X			T	C,D	No FS
18	5/1/23	17	13	14	14	50	2,100	2,500							X			T	C,D	No FS
18	5/9/23	18	13	13	13	50	1,900	2,500				X		X	X			T	C,D	No FS
18	5/15/23	19	22	23	6	50	1,500	2,500				X			X			T	C,D	No FS
18	5/22/23	20																		DRY
19	1/13/23	1	18	15	5	12	2	3											C, D	No life
19	1/19/23	2	14	13	6	12	2	3	100	100									C,D	Voucher 3F, 3M, BRLI
19	1/26/23	3							10	10										Dry
19	3/2/23	8	16	17	10	12	2	3											C,D	No Life
19	3/8/23	9																		Dry
20	1/13/23	1	18	12	20	40	685	900		10,000		X							C, D	*Branchinecta* sp.
20	1/19/23	2	14	9	25	40	1,135	900	10,000	10,000		X							C,D	
20	1/26/23	3	17	11	15	40	750	900	10,000	10,000	X	X							C,D	
20	2/1/23	4	16	9	15	40	800	900	10,000	10,000									C,D	Voucher 4F, 4M BRLI
20	2/7/23	5	19	11	15	40	600	900	10,000	10,000		X							C,D	
20	2/15/23	6	8	8	12	40	500	900	1,000	1,000			X						C,D	
20	2/21/23	7	20	12	10	40	350	900	1,000	1,000		X	X						C,D	
20	3/2/23	8	16	13	15	40	1,100	900	100			X	X						C,D	
20	3/8/23	9	13	15	12	40	1,000	900	100	10,000		X							C,D	
20	3/14/23	10	13	14	10	40	900	900				X	X						C,D	
20	3/20/23	11	14	13	13	40	1,100	900		100,000			X						C,D	*Branchinecta* sp.
20	3/27/23	12	15	18	12	40	1,000	900	1,000	100		X	X			X			C,D	
20	4/4/23	13	14	16	10	40	800	900		1,000			X		X				C,D	*Branchinecta* sp.
20	4/11/23	14	23	22	10	40	700	900					X			X	X		C,D	No FS
20	4/17/23	15	16	18	9	40	500	900					X						C,D	No FS
20	4/24/23	16	17	20	9	40	400	900					X						C,D	No FS

20	5/1/23	17	13	14	8	40	375	900				X	X		X				C,D	No FS
20	5/9/23	18	13	14	7	40	325	900				X	X		X				C,D	No FS
20	5/15/23	19	22	23	2	40	150	900				X	X	X					C,D	No FS
20	5/22/23	20																		DRY
21	1/13/23	1	18	12	15	50	720	900		10,000									C, D	*Branchinecta* sp.
21	1/19/23	2	14	13	20	50	1,540	900	10,000	10,000									C,D	
21	1/26/23	3	17	11	10	50	1,000	900	10,000	10,000		X							C,D	
21	2/1/23	4	11	6	10	50	1,200	900	10,000	10,000									C,D	
21	2/7/23	5	18	8	12	50	900	900	10,000	10,000		X	X						C,D	Voucher 4F, 4M
21	2/15/23	6	7	7	12	50	700	900	10,000	10,000		X	X						C,D	
21	2/21/23	7	18	11	10	50	600	900	100	100		X	X						C,D	
21	3/2/23	8	7	8	20	50	1,450	900	1,000				X						C,D	
21	3/8/23	9	9	13	20	50	1,300	900		100,000		X	X			X			C,D	*Branchinecta* sp.
21	3/14/23	10	12	14	15	50	1,100	900		100,000		X	X					A	C,D	Tree Frog
21	3/20/23	11	12	20	20	50	1,500	900		100,000		X	X						C,D	*Branchinecta* sp.
21	3/27/23	12	13	12	20	50	1,500	900					X				X	T	C,D	No FS
21	4/4/23	13	11	12	17	50	1,200	900					X		X	X		T	C,D	
21	4/11/23	14	19	14	17	50	1,100	900					X	X				T	C,D	No FS
21	4/17/23	15	14	16	15	50	400	900					X					T	C,D	No FS
21	4/24/23	16	13	16	13	50	350	900				X	X		X			T	C,D	No FS
21	5/1/23	17	12	14	10	50	300	900					X					T	C,D	No FS
21	5/9/23	18	12	13	3	50	225	900				X			X			A,T	C,D	No FS
21	5/15/23	19																		DRY
22	1/13/23	1	16	16	3	10	60	100		1,000									C, D	*Branchinecta* sp.
22	1/19/23	2	13	12	12	10	260	100	100	100									C,D	
22	1/26/23	3	15	10	5	10	165	100	100	100	X	X				X			C,D	
22	2/1/23	4	11	5	5	10	100	100	1,000	1,000		X							C,D	
22	2/7/23	5	18	15	5	10	90	100	1,000	100		X							C,D	Voucher 3F, 4M
22	2/15/23	6																		Dry
22	3/2/23	8	7	7	12	10	225	100											C,D	No Life
22	3/8/23	9	9	13	10	10	180	100		10,000		X							C,D	*Branchinecta* sp.
22	3/14/23	10	12	13	9	10	160	100		10,000		X							C,D	*Branchinecta* sp.
22	3/20/23	11	13	10	10	10	250	100	1,000			X							C,D	
22	3/27/23	12	13	12	10	10	250	100				X				X	X		C,D	No FS
22	4/4/23	13	11	15	9	10	220	100				X	X			X	X	T	C,D	
22	4/11/23	14	19	21	3	10	100	100				X	X					T	C,D	No FS
22	4/17/23	15																		DRY
23	1/13/23	1	16	16	2	8	30	60		100 imm									C, D	Only FS
23	1/19/23	2	12	8	15	8	280	60	100	100									C,D	
23	1/26/23	3	15	11	4	8	225	60	10	10									C,D	*Branchinecta* sp.
23	2/1/23	4	11	3	4	8	60	60	1,000	1,000									C,D	Voucher 4F, 4M BRLI
23	2/7/23	5																		Dry
23	3/2/23	8	7	5	20	8	275	60											C,D	No Life
23	3/8/23	9	9	12	10	8	200	60		1,000									C,D	*Branchinecta* sp.
23	3/14/23	10	12	12	7	8	120	60		1,000									C,D	*Branchinecta* sp.
23	3/20/23	11	13	15	15	8	250	60	1,000										C,D	
23	3/27/23	12	13	12	15	8	250	60	1,000										C,D	
23	4/4/23	13	11	14	7	8	150	60	100			X				X			C,D	
23	4/11/23	14	19	22	2	8	2	60	1			X							C,D	
23	4/17/23	15																		DRY
24	1/13/23	1	16	16	4	10	322	500		1,000									C, D, TT	Only FS
24	1/19/23	2	12	16	5	10	64	500	1,000	1,000									C,D,TT	
24	1/26/23	3	15	12	6	10	280	500	1,000	1,000									C,D,TT	
24	2/1/23	4	9	5	2	10	40	500	1,000	1,000									C,D,TT	Voucher 4F, 4M BRLI
24	2/7/23	5																		Dry
24	3/2/23	8	8	11	6	10	530	500											C,D,TT	No Life
24	3/8/23	9	10	17	6	10	160	500		1,000									AB,C,D,TT	*Branchinecta* sp.
24	3/14/23	10	12	14	4	10	130	500		1,000									AB,C,D,TT	*Branchinecta* sp.
24	3/20/23	11	13	13	13	10	560	500											AB,C,D,TT	No Life
24	3/27/23	12	13	14	13	10	550	500				X							AB,C,D,TT	No FS
24	4/4/23	13	11	18	7	10	90	500		1,000						X	X		AB,C,D,TT	*Branchinecta* sp.
24	4/11/23	14																		DRY
25	1/26/23	3	14	10	5	40	100	1,000	100	100									C,D	*Branchinecta* sp.
25	2/1/23	4	8	2	2	40	12	1,000	1,000	1,000		X							C,D	Icy
25	2/7/23	5																		Dry
25	3/2/23	8	7	5	8	40	1,000	1,000											C,D	No Life
25	3/8/23	9	8	14	5	40	70	1,000		1,000									C,D	*Branchinecta* sp.
25	3/14/23	10	11	12	3	40	25	1,000		1,000								T	C,D	*Branchinecta* sp.
25	3/20/23	11	12	13	13	40	1,329	1,000	1,000	10,000								T	C,D,TT	
25	3/27/23	12	12	12	20	40	1,990	1,000	10,000								X	T	C,D,TT	
25	4/4/23	13	7	8	16	40	1,600	1,000	1,000	1,000		X			X			T	C,D,TT	
25	4/11/23	14	18	18	8	40	1,000	1,000	100	100		X	X			X		T	C,D	
25	4/17/23	15	12	17	7	40	500	1,000	100	100			X			X	X	T	C,D	
25	4/24/23	16	13	15	4	40	100	1,000	10			X	X					T	C,D	
25	5/1/23	17	12	13	1	40	0.5	1,000				X		X			X		C,D	No FS
25	5/9/23	18																		DRY
26	1/26/23	3	14	6	10	10	55	55	100	100									C,D	
26	2/1/23	4	7	2	7	10	30	55		1,000									C,D	Icy; Branchinecta sp.
26	2/7/23	5	16	8	6	10	17	55	100	100									C,D	Voucher 4F, 4M
26	2/15/23	6																		Dry
26	3/2/23	8	4	6	15	10	50	55											C,D	No Life
26	3/8/23	9	8	11	10	10	40	55		1,000		X							AB,C,D	
26	3/14/23	10	11	13	9	10	35	55	10	1,000									AB,C,D	
26	3/20/23	11	12	15	15	10	55	55	10,000	10,000									AB,C,D	
26	3/27/23	12	12	10	15	10	55	55	10,000	1,000		X				X			AB,C,D	
26	4/4/23	13	7	8	13	10	45	55		1,000		X						T	AB,C,D	*Branchinecta* sp.
26	4/11/23	14	18	16	10	10	40	55		10		X	X					T	C,D	*Branchinecta* sp.
26	4/17/23	15	12	16	6	10	18	55				X	X			X	X	T	C,D	No FS
26	4/24/23	16																		DRY
27	1/26/23	3	15	11	3	5	20	20											C,D	No life
27	2/1/23	4																		Dry
27	3/2/23	8	4	5	8	5	30	20											C,D	No Life
27	3/8/23	9	8	12	5	5	20	20											C,D	No Life
27	3/14/23	10	11	12	4	5	15	20	10										C,D	Voucher 4F, 5M
27	3/20/23	11	12	5	5	5	20	20	100										C,D	
27	3/27/23	12	12	11	6	5	25	20	10							X			C,D	
27	4/4/23	13	7	7	5	5	14	20	10						X				AB,C,D	
27	4/11/23	14																		DRY

28	1/26/23	3	15	12	12	10	760	760		10 imm									C,D	*Branchinecta* sp.
28	2/1/23	4	11	4	4	10	95	760	1,000	1,000		X							C,D	
28	2/7/23	5																		Dry
28	3/2/23	8	7	9	12	10	750	760											C,D	No Life
28	3/8/23	9	9	12	6	10	650	760		10,000		X				X			C,D	*Branchinecta* sp.
28	3/14/23	10	12	13	2	10	100	760	1,000										C,D	
28	3/20/23	11	13	10	10	10	750	760	1,000			X				X	X		C,D	
28	3/27/23	12	13	12	10	10	750	760		10 fem		X		X			X		C,D	*Branchinecta* sp.
28	4/4/23	13	11	18	3	10	25	760				X	X			X	X		C,D	No FS
28	4/11/23	14																		DRY
29	1/26/23	3	17	15	5	10	300	700		10,000									C,D	*Branchinecta* sp.
29	2/1/23	4																		Dry
29	3/2/23	8	11	10	8	10	790	700											C,D	No Life
29	3/8/23	9	10	16	3	10	400	700		10,000									C,D	*Branchinecta* sp.
29	3/14/23	10	13	15	3	10	65	700	1,000			X							C,D	Voucher 4F, 5M
29	3/20/23	11	13	10	10	10	750	700	1,000			X							C,D	
29	3/27/23	12	13	15	10	10	750	700	1,000			X	X						C,D	
29	4/4/23	13	11	18	8	10	500	700	1,000				X			X			C,D	
29	4/11/23	14																		DRY
30	1/26/23	3	17	16	2	5	45	150		10,000									C,D	*Branchinecta* sp.
30	2/1/23	4																		Dry
30	3/2/23	8	11	12	4	5	150	150											C,D	No Life
30	3/8/23	9	10	19	2	5	35	150		1,000									C,D	*Branchinecta* sp.
30	3/14/23	10																		Dry
30	3/20/23	11	13	7	7	5	150	150		1,000									C,D	*Branchinecta* sp.
30	3/27/23	12	13	14	7	5	150	150	1,000										C,D	
30	4/4/23	13	11	20	5	5	100	150					X			X	X		C,D	
30	4/11/23	14	21	25	2	5	20	150	10			X				X	X		C,D	
30	4/17/23	15																		DRY
31	1/26/23	3	17	15	10	10	85	100		100,000									C,D	*Branchinecta* sp.
31	2/1/23	4	14	10	4	10	100	100		1,000			X						C,D	*Branchinecta* sp.
31	2/7/23	5																		Dry
31	3/2/23	8	11	12	15	10	80	100											C,D	No Life
31	3/8/23	9	12	18	11	10	45	100		1,000									C,D	*Branchinecta* sp.
31	3/14/23	10	14	14	7	10	50	100	1,000										C,D	
31	3/20/23	11	14	17	20	10	150	100				X								No FS
31	3/27/23	12	14	17	17	10	150	100		100									C,D	*Branchinecta* sp.
31	4/4/23	13	12	14	14	10	100	100	100	1,000		X				X			C,D	
31	4/11/23	14	22	19	10	10	80	100	1,000			X	X			X	X	T	C,D,TT	
31	4/17/23	15	15	22	4	10	20	100		100		X				X		T	C,D	*Branchinecta* sp.
31	4/24/23	16																		DRY
32	1/26/23	3	17	12	3	10	22	100		10 imm									C,D	*Branchinecta* sp.
32	2/1/23	4																		Dry
32	3/2/23	8	11	13	10	10	117	100											C,D	No Life
32	3/8/23	9	12	18	7	10	60	100		100									C,D	*Branchinecta* sp.
32	3/14/23	10	14	14	5	10	27	100	100	100									C,D,TT	
32	3/20/23	11	14	17	8	10	120	100	1,000	1,000										
32	3/27/23	12	14	17	6	10	100	100	100			X				X			C,D,TT	
32	4/4/23	13	12	22	5	10	16	100	10							X	X		C,D,TT	
32	4/11/23	14																		DRY
33	1/26/23	3	18	16	2	5	150	700		10,000									C,D	*Branchinecta* sp.
33	2/1/23	4																		Dry
33	3/2/23	8	11	14	8	5	196	700											C,D	No Life
33	3/8/23	9	12	22	3	5	175	700		1,000									C,D,TT	*Branchinecta* sp.
33	3/14/23	10	14	14	2	5	75	700	100	1,000									C,D,TT	Voucher 4F, 5M
33	3/20/23	11	13	19	5	5	760	700	1,000	1,000										
33	3/27/23	12	14	16	5	5	700	700	100	100									C,D	
33	4/4/23	13	11	22	2	5	1	700				X				X	X		C,D	
33	4/11/23	14																		DRY
34	1/26/23	3	18	19	1	10	100	500		10,000									C,D,TT	*Branchinecta* sp.
34	2/1/23	4																		Dry
34	3/2/23	8	11	12	12	10	196	500											C,D	No Life
34	3/8/23	9	12	22	5	10	175	500		1,000									C,D,TT	*Branchinecta* sp.
34	3/14/23	10	14	14	2	10	82	500		1,000									C,D,TT	*Branchinecta* sp.
34	3/20/23	11	13	19	6	10	540	500	1,000	1,000										
34	3/27/23	12	14	16	6	10	500	500	100	100									C,D	
34	4/4/23	13	11	22	2	10	20	500				X				X	X	T	C,D	
34	4/11/23	14																		DRY
35	1/26/23	3	18	11	40	40	240	240											C,D	No life, very strong odor
35	2/1/23	4	13	6	18	40	130	240											C,D	anoxic odor, discolored
35	2/7/23	5	20	13	15	40	185	240											C,D	No Life
35	2/15/23	6	7	5	12	40	135	240											C,D	
35	2/21/23	7	23	16	10	40	60	240				X							C,D	No FS
35	3/2/23	8	11	10	30	40	225	240		1,000		X		X		X			C,D	*Branchinecta* sp.
35	3/8/23	9	11	13	30	40	215	240	100	1,000		X		X					C,D	
35	3/14/23	10	14	14	28	40	200	240	100	1,000		X	X			X			C,D	
35	3/20/23	11	13	15	30	40	200	240	10,000			X	X			X		T		
35	3/27/23	12	14	12	30	40	200	240	10,000			X	X			X			C,D	
35	4/4/23	13	11	16	26	40	180	240					X			X		T	C,D	
35	4/11/23	14	21	16	26	40	150	240				X	X					T	C,D	No FS
35	4/17/23	15	15	17	25	40	150	240				X	X	X	X	X		T	C,D	No FS
35	4/24/23	16	14	17	25	40	150	240				X	X	X	X				C,D	No FS
35	5/1/23	17	12	16	23	40	150	240				X	X		X			E, A	C,D	No FS
35	5/9/23	18	12	15	21	40	150	240				X	X		X			A	C,D	No FS
35	5/15/23	19	18	20	18	40	125	240				X	X	X	X			A	C,D	No FS
35	5/22/23	20	26	23	8	40	50	240				X	X	X	X			A	C,D	No FS
35	5/30/23	21																		DRY
36	1/26/23	3	18	18	2	10	175	750		100,000									C,D	*Branchinecta* sp.
36	2/1/23	4																		Dry
36	3/2/23	8	14	16	9	10	638	750											C,D	No Life
36	3/8/23	9	13	24	5	10	500	750		100,000									AB,C,D,TT	*Branchinecta* sp.
36	3/14/23	10	14	14	3	10	200	750		10,000									AB,C,D,TT	*Branchinecta* sp.
36	3/20/23	11	14	20	10	10	738	750		1,000										*Branchinecta* sp.
36	3/27/23	12	15	20	32	10	740	750	1,000								X		AB,C,D,TT	
36	4/4/23	13	12	24	4	10	100	750		10,000						X	X		AB,C,D,TT	*Branchinecta* sp.
36	4/11/23	14																		DRY
37	1/26/23	3	18	15	2	10	100	220		100 imm									C,D,TT	*Branchinecta* sp.
37	2/1/23	4																		Dry

37	3/2/23	8	15	21	10	10	215	220											AB,C,D,TT	No Life
37	3/8/23	9	13	21	6	10	100	220	100	1,000									AB,C,D,TT	
37	3/14/23	10	14	15	4	10	50	220	100			X							C,D,TT	
37	3/20/23	11	14	21	6	10	200	220	100							X				
37	3/27/23	12	15	19	6	10	175	220	10,000										C,D,TT	
37	4/4/23	13																		DRY
38	3/8/23	9	7	7	10	12	42	55											C,D	No Life
38	3/14/23	10																		Dry
38	3/20/23	11	12	12	12	12	45	55		100										*Branchinecta* sp.
38	3/27/23	12	9	9	10	12	40	55	100										C,D	
38	4/4/23	13																		DRY
39	3/8/23	9	7	9	4	5	40	48		100									C,D,TT	*Branchinecta* sp.
39	3/14/23	10	11	10	2	5	3	48	10										C,D,TT	Voucher 4F, 4M
39	3/20/23	11	12	12	6	5	70	48	100											
39	3/27/23	12	9	9	7	5	120	48	100										C,D,TT	
39	4/4/23	13	9	14	3	5	10	48	100							X		T	C,D,TT	
39	4/11/23	14																		DRY
40	3/8/23	9	10	17	5	20	10	100		1,000									C,D,TT	*Branchinecta* sp.
40	3/14/23	10																		Dry
40	3/20/23	11	13	17	4	20	100	100		10				X						*Branchinecta* sp.
40	3/27/23	12	13	15	4	20	100	100		10							X		C,D,TT	*Branchinecta* sp.
40	4/4/23	13																		DRY
41	3/8/23	9	11	23	4	10	25	25		100									C,D,TT	*Branchinecta* sp.
41	3/14/23	10																		Dry
41	3/20/23	11	13	17	4	10	20	25		100										*Branchinecta* sp.
41	3/27/23	12	13	17	4	10	20	25	100										C,D,TT	
41	4/4/23	13																		DRY
42	3/8/23	9	11	22	2	10	40	190		100									C,D,TT	*Branchinecta* sp.
42	3/14/23	10																		Dry
42	3/20/23	11	14	23	4	10	190	190	100	100		X		X						Voucher 4F, 4M
42	3/27/23	12	13	18	3	10	150	190	1,000										C,D,TT	
42	4/4/23	13																		DRY
43	3/8/23	9	11	24	2	8	5	35		10									C,D,TT	*Branchinecta* sp.
43	3/14/23	10	13	14	2	8	4	35		10									C,D,TT	*Branchinecta* sp.
43	3/20/23	11	13	18	2	8	35	35	1								X			
43	3/27/23	12	14	17	2	8	20	35	1										C,D,TT	
43	4/4/23	13																		DRY
44	3/8/23	9	11	22	3	10	60	240		100									C,D,TT	*Branchinecta* sp.
44	3/14/23	10	13	14	3	10	30	240	10	100									AB,C,D,TT	Voucher 4F, 4M
44	3/20/23	11	13	19	4	10	235	240	100											
44	3/27/23	12	14	17	4	10	200	240	100										AB,C,D,TT	
44	4/4/23	13	11	22	3	10	10	240	10	100							X		C,D,TT	
44	4/11/23	14																		DRY
45	3/8/23	9	12	20	8	18	50	70											AB,C,D	No Life
45	3/14/23	10	14	14	4	18	16	70		1,000									AB,C,D	*Branchinecta* sp.
45	3/20/23	11	13	19	8	18	65	70		1,000		X				X				*Branchinecta* sp.
45	3/27/23	12	14	15	5	18	35	70	1,000										AB,C,D,TT	
45	4/4/23	13	11	20	2	18	1	70	100								X		AB,C,D,TT	
45	4/11/23	14																		DRY
46	3/8/23	9	12	20	2	5	4	60		100									C,D,TT	*Branchinecta* sp.
46	3/14/23	10																		Dry
46	3/20/23	11	13	20	4	5	60	60		1,000				X						*Branchinecta* sp.
46	3/27/23	12	14	17	4	5	50	60	1,000										C,D	
46	4/4/23	13																		DRY
47	3/8/23	9	13	22	2	6	8	125											C,D,TT	No Life
47	3/14/23	10																		Dry
47	3/20/23	11	14	22	2	6	125	125	10							X				
47	3/27/23	12	15	22	2	6	40	125	10								X		C,D,TT	
47	4/4/23	13																		DRY
48	3/8/23	9	13	23	2	5	20	80		100									C,D,TT	*Branchinecta* sp.
48	3/14/23	10																		Dry
48	3/20/23	11	14	21	2	5	80	80	1			X		X		X				
48	3/27/23	12	15	20	2	5	60	80	100	100							X		C,D,TT	
48	4/4/23	13																		DRY
49	3/8/23	9	13	23	3	10	10	80		100									C,D,TT	*Branchinecta* sp.
49	3/14/23	10	14	14	3	10	6	80	100										C,D,TT	
49	3/20/23	11	14	20	3	10	80	80	100											
49	3/27/23	12	15	20	3	10	50	80	1,000										C,D,TT	
49	4/4/23	13	12	20	2	2	2	80	10			X					X	X		
49	4/11/23	14																		DRY
50	3/8/23	9	13	24	3	6	5	45		10									C,D,TT	*Branchinecta* sp.
50	3/14/23	10	14	14	3	6	5	45	100										C,D,TT	
50	3/20/23	11	14	21	2	6	75	45	100											
50	3/27/23	12	15	20	2	6	65	45	100	100						X			C,D,TT	
50	4/4/23	13																		DRY
51	3/8/23	9	13	22	6	10	40	90		1,000									C,D,TT	*Branchinecta* sp.
51	3/14/23	10	14	14	3	10	25	90	10	1,000									AB,C,D,TT	
51	3/20/23	11	14	21	5	10	150	90	100											
51	3/27/23	12	15	19	5	10	125	90	100			X					X		AB,C,D,TT	
51	4/4/23	13																		DRY
52	3/8/23	9	13	24	3	6	4	20		100									C,D,TT	*Branchinecta* sp.
52	3/14/23	10																		Dry
52	3/20/23	11	14	19	2	6	16	20												No Life
52	3/27/23	12	15	19	2	6	20	20									X		C,D	No FS
52	4/4/23	13																		DRY
53	3/8/23	9	12	21	4	8	80	120		100									C,D	*Branchinecta* sp.
53	3/14/23	10																		Dry
53	3/20/23	11	13	13	8	8	120	120												No Life
53	3/27/23	12	15	19	5	8	100	120	100	100						X	X		C,D	
53	4/4/23	13																		DRY
54	3/27/23	12	9	10	18	40	250	250											C,D	No Life
54	4/4/23	13																		DRY
55	3/27/23	12	12	9	7	12	20	20											C,D,TT	No Life
55	4/4/23	13																		DRY
56	3/27/23	12	13	16	3	10	100	100	10			X							C,D	
56	4/4/23	13																		Dry
57	3/27/23	12	14	16	2	3	50	50		100									C,D	*Branchinecta* sp.
57	4/4/23	13																		DRY

58	3/27/23	12	14	15	6	25	265	265										C,D	No Life
58	4/4/23	13	11	22	5	25	20	265		1 fem						X			C,D	*Branchinecta* sp.
58	4/11/23	14																		DRY
59	3/27/23	12	14	16	6	9	105	105											C,D	No Life
59	4/4/23	13																		DRY
60	3/27/23	12	14	14	5	15	350	350		1,000									C,D	
60	4/4/23	13																		DRY
61	3/27/23	12	15	22	2	10	20	20		10							X		C,D,TT	*Branchinecta* sp.
61	4/4/23	13																		DRY
62	3/27/23	12	15	22	2	4	25	25	1										C,D,TT	
62	4/4/23	13																		DRY
63	5/9/23	18				30		285			D									

BRLI = Versatile fairy shrimp (*Branchinecta lindahli*)

fem. = female

imm. = immature fairy shrimp

naup. = nauplii fairy shrimp

E = Egg

T = Tadpole

A = Adult

Appendix D

Dry-Season Fairy Shrimp Report

BUSBY
Biological Services

September 18, 2023

Ms. Stacey Love
Recovery Permit Coordinator
Carlsbad Fish and Wildlife Office
2177 Salk Avenue, Suite 250
Carlsbad, California 92008

RE: Survey Summary Report for the 2023 Protocol-Level, Dry Season Large Branchiopod Survey for the Updated Aquabella Project in Moreno Valley, Riverside County, California

Ms. Love:

This letter provides a summary of the 2023 protocol-level, dry season survey for federally listed large branchiopod species (i.e., fairy shrimp species) conducted in 63 basins by Busby Biological Services, Inc. (BBS) on behalf of Dudek for the approximately 673-acre, updated Aquabella Project (project) in Moreno Valley, Riverside County, California (Attachment 1: Figures 1 through 3).

The dry season fairy shrimp survey followed the most recent U.S. Fish and Wildlife Service (USFWS) survey guidelines, titled *Survey Guidelines for the Listed Large Branchiopods* and dated November 13, 2017 (USFWS 2017). This dry season fairy shrimp survey satisfies a portion of the current USFWS survey requirements, which include a minimum of one complete dry season survey and one complete wet season survey within a 3-year period. A wet season fairy shrimp survey was also conducted for the project in 2023 and the results of these surveys were submitted to Ms. Love at the Carlsbad Fish and Wildlife Office (CFWO) in a survey summary report, dated September 18, 2023 (BBS 2023).

The following report provides a brief description of the proposed project, the fairy shrimp species that have a potential to occur within the vicinity of the proposed project, the survey methods, and the results of the 2023 dry season fairy shrimp survey.

PROPOSED PROJECT LOCATION & DESCRIPTION

The dry season fairy shrimp survey was conducted within 63 basins within the project area. The project area is located in Range 3 West, Township 3 South, and Sections 15-17 and 21-22 on the U.S. Geological Survey (USGS) Sunnymead 7.5-

minute quadrangle map (USGS 2023; Attachment 1: Figure 2). The project area is bisected by north-south running Nason Street and bounded by Brodiaea Avenue, Cactus Avenue, and Delphinium Avenue to the north, Iris Avenue to the south, Oliver Street to the east, and Lasselle Street to the west. The approximate center point of the project is 33.918299, -117.126291 (Attachment 1: Figure 3).

The project area has been subject to impacts from mowing, discing, grading, and other maintenance activities. Most recently, grading occurred across approximately 66 percent of the project area in 2007, and other project activities, such as public improvement along Nason Road and Riverside County flood control channel maintenance activities occurred from 2010 to 2015. Besides the numerous graded basins throughout the project area, the majority of the project area is relatively flat and contains areas of rolling topography, with elevations ranging from approximately 1560 feet above mean sea level (amsl) in the north to 1500 feet amsl in the south (Attachment 1: Figure 2).

The project area contains a variety of basins, such as graded basins, road ruts, ditches, tire tracks, and other depressions, that provide potential fairy shrimp habitat. Many of the graded basins contain low-density riparian scrub within and along the edges of the basins, while other basins contain little to no vegetation or are dominated by a dense cover of non-native grasses and forbs. The basins appear to be filled by direct rainfall and surrounding surface flows. The majority of the basins provide low quality habitat for fairy shrimp because they appear to be repeatedly impacted by mowing, discing, and other maintenance activities and/or are overgrown with non-native grasses and forbs. Representative photographs of the basins are provided in Attachment 2.

FAIRY SHRIMP NATURAL HISTORY

The project area contains 63 basins that provide fairy shrimp habitat with potential to support the common, non-sensitive versatile fairy shrimp (*Branchinecta lindahli*), as well as three federally listed fairy shrimp species, vernal pool fairy shrimp (*Branchinecta lynchi*), Riverside fairy shrimp (*Streptocephalus woottoni*), and San Diego fairy shrimp (*Branchinecta sandiegonensis*).

The Riverside fairy shrimp was federally listed as endangered in August of 1993 (USFWS 1993) and is a Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP)-covered species. On December 4, 2012, USFWS published a Final Rule revising the critical habitat for the Riverside fairy shrimp that became effective on January 3, 2013 (USFWS 2012). The revised critical habitat now includes land in three units in Ventura, Orange, and San Diego counties, California, for a total of approximately 1,724 acres of critical habitat for this species. No critical habitat for Riverside fairy shrimp occurs in Riverside County in the original or revised Final Rules.

The vernal pool fairy shrimp was federally listed as threatened on September 19, 1994 (USFWS 1994), and is a MSHCP-covered species. On August 11, 2005, USFWS published a Final Rule designating 858,846 acres of critical habitat for four vernal pool crustaceans and 11 vernal pool plants that became effective on September 12, 2005 (USFWS 2005). This critical habitat includes 597,821 acres of land from Oregon south to Ventura County, California. No critical habitat for vernal pool fairy shrimp occurs in Riverside County in this Final Rule.

The San Diego fairy shrimp was federally listed as endangered in February 1997 (USFWS 1997). On December 12, 2007, USFWS published a Final Rule revising the critical habitat for the San Diego fairy shrimp that became effective on January 11, 2008 (USFWS 2007). This revised Final Rule designated critical habitat for the San Diego fairy shrimp to include approximately 3,082 acres of habitat in five units, with a total of 29 subunits throughout Orange and San Diego counties, California. No critical habitat for San Diego fairy shrimp occurs in Riverside County in the original or revised Final Rules.

SURVEY METHODS

The dry season fairy shrimp survey followed the methods in the most recent USFWS survey guidelines (USFWS 2017). A brief description of the sampling methods is provided in this section.

Soil Sample Collection

A hand trowel was used to collect the appropriate number and volume of samples from the top 1 to 3 centimeters of soil within each basin based on Table 1 of the current USFWS survey guidelines (USFWS 2017). These soil samples were collected into bags, with the basin number, sample volume, and date written on each bag to inform the lab analysis, and logged in a soil sample collection table.

Soil Sample Processing and Cyst Identification

The soil samples were taken to an approved laboratory for processing and identification. The collected soil from each basin was divided into subsamples, based on the area of the pool and the amount of soil collected. The soil samples were hydrated and processed through a series of sieves to separate fairy shrimp cysts that may have been present in the soil. The sieves used were of 710-, 355-, and 212-micron pore size screens, and the final sieve pore size is smaller than the target fairy shrimp genera (i.e., *Branchinecta* and *Streptocephalus*) average cyst diameter and, therefore, would retain any cysts present within the soil samples. The remaining material on the final sieve was then placed in a brine solution to help separate organic material from inorganic material. The remaining organic material was then filtered through a standard coffee filter and allowed to dry. The dried organic material was then examined under a stereo dissection microscope to determine if fairy shrimp cysts were present. For all identified cysts, cyst surface

characteristics were then used to identify cysts to genus. Any cysts identified as belonging to the genus *Streptocephalus* are Riverside fairy shrimp, as this is the only species of this genus in the region.

Fairy Shrimp Hydration, Rearing, Hatching, and Identification

Three species of fairy shrimp in the genus *Branchinecta* have the potential to occur in the project area. Because *Branchinecta* cysts cannot be identified to species under the microscope, cysts of this genus require hydration, hatching, rearing, and subsequent identification to identify them to species.

When identified during the soil sample processing and analysis, *Branchinecta* cysts are hydrated by placing them into plastic containers filled with approximately 525 milliliters of filtered, non-chlorinated drinking water. The coffee filters with the collected cysts are slowly opened over the containers and gently shaken to allow the material to fall into the water. The sides of the filters are then rubbed against one another to release any additional material. Finally, a squirt bottle with filtered, non-chlorinated drinking water is used to spray any additional material from the filters into the containers.

The containers are given sample identification numbers and placed on a table in a climate-controlled room. Lighting in the room is provided by indirect sunlight as well as an overhead, full spectrum light that is kept on approximately 12 hours a day to help emulate outside, spring season lighting conditions. An overhead fan also is kept on at a low level to provide for some air movement across the water surface in the sample containers.

The samples are checked daily to see if any fairy shrimp have emerged. Once nauplii are observed, feeding begins. The hatched shrimp are fed a single drop of prepared food on a daily basis until they are collected for identification. The food used is typically a mix of active brewer’s yeast, sugar, powdered fish food, and water.

The hatched shrimp are allowed to continue under these conditions until they reach maturity, as determined by reaching full size, antennal development (males), and brood pouch (females). Once mature, the fairy shrimp are collected for identification by pouring the material in the container through a small strainer. Collected shrimp are then placed into a dish of carbonated water to slowly asphyxiate them. Once dead, the collected shrimp are placed in a 27- by 57-millimeter (5-dram) clean glass vial, filled with 70 percent ethyl alcohol. The collected shrimp are then identified to the species level with the aid of a stereo dissection microscope, and subsequently provided to the Natural History Museum of Los Angeles for preservation.

SURVEY RESULTS

The results of the soil sample collection, processing, hydration, rearing, hatching, and Identification are summarized in this section.

Soil Sample Collection

On June 27 and July 7, 2023, BBS biologist Darin Busby (TE-115373-4), with the assistance of Andrew Kort, collected a total of 2,275 samples for a total of 113,626 ml of soil from the 63 basins within the project area, which included all basins within the project area that provided potential fairy shrimp habitat during the 2023 wet season fairy shrimp surveys (Attachment 1: Figure 3). These basins had been mapped and photographed (Attachment 2) previously during the 2023 wet season fairy shrimp surveys. Table 1 provides a summary of the dry season fairy shrimp survey dates, times, and conditions during each of the two soil sample collection days. Information from the soil samples collected is included in Attachment 3.

Table 1. Survey Information

Date	Time	Temp (C)	Wind (mph)	Clouds (%)	Precip	Permitted Surveyor	Assistant
6/27/23	0830-1500	18-29	0-5	0	0	D. Busby	A. Kort
7/7/23	0745-1530	14-30	0-4	0-50	0	D. Busby	A. Kort

Soil Sample Processing and Cyst Identification

On June 29 and July 8, 2023, Mr. Busby delivered the soil samples from the 63 basins to Alden Environmental, Inc. biologist Greg Mason (TE-115373-4) for processing and identification. Mr. Mason processed the soil samples from all 63 basins to determine if fairy shrimp cysts were present. A total of 13,747 fairy shrimp cysts from the genus *Branchinecta* were detected in 62 of the 63 basins during soil sample processing and cyst identification. No fairy shrimp cysts were detected in Basin 6. In addition, no cysts of the genus *Streptocephalus* were detected in any of the soil samples. The laboratory results of the soil sample processing and cyst identification is provided in a letter from Alden Environmental, Inc. that is included in Attachment 4.

Fairy Shrimp Hydration, Rearing, Hatching, and Identification

Fairy shrimp cysts were hydrated and reared to maturity to determine the species present. Of the samples hydrated from the 62 basins with *Branchinecta* cysts, a combined total of 576 non-sensitive versatile fairy shrimp, including 381 males and 195 females, were identified in all 62 basins. No federally listed San Diego fairy shrimp or vernal pool fairy shrimp were present in any of the samples. A summary of the results from the 2023 wet and dry season fairy shrimp surveys is included in Attachment 3 and the laboratory results of the hydration, rearing, hatching, and

identification is provided in a letter from Alden Environmental, Inc. that is included in Attachment 4.

SUMMARY

Non-sensitive versatile fairy shrimp were detected in 62 of the 63 basins sampled within the project area during the 2023 dry season fairy shrimp survey. No fairy shrimp cysts were detected in Basin 6. No federally listed fairy shrimp species were detected within the project area during the 2023 wet and dry season fairy shrimp surveys.

This dry season fairy shrimp survey satisfies a portion of the current USFWS survey requirements, which include a minimum of one complete dry season survey and one complete wet season survey within a 3-year period. A wet season fairy shrimp survey was also conducted for the project in 2023 and the results of these surveys were submitted to Ms. Love at the CFWO in a survey summary report, dated September 18, 2023 (BBS 2023).

If you have any questions or comments regarding this survey report, please do not hesitate to contact me at 858.334.9508 or darin@busbybiological.com.

Sincerely,

Darin Busby
Principal Biologist
Busby Biological Services, Inc.
USFWS Permit Number TE-115373-4

ATTACHMENTS

Attachment1: Figures
Attachment 2: Representative Photographs
Attachment 3: 2023 Dry and Wet Season Fairy Shrimp Survey Results
Attachment 4: 2023 Laboratory Dry Season Fairy Shrimp Results Letter (Alden Environmental, August 23, 2023)

REFERENCES

Busby Biological Services, Inc. (BBS)

2023 Survey Summary Report for the 2023 Protocol-Level, Wet Season Large Branchiopod Survey for the Updated Aquabella Project in Moreno Valley, Riverside County, San Diego, California. September 18.

U.S. Fish and Wildlife Service (USFWS)

1993 Determination of Endangered Status for Three Vernal Pool Plants and the Riverside Fairy Shrimp. *Federal Register* 58(147): 41384-41392. Washington, D.C.: USFWS.

1994 Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Conservancy Fairy Shrimp, Longhorn Fairy Shrimp, and the Vernal Pool Tadpole Shrimp; and Threatened Status for the Vernal Pool Fairy Shrimp. *Federal Register* 59(180): 42136–48153. Washington, D.C.: USFWS.

1997 Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the San Diego Fairy Shrimp. 50 CFR Part 17. February 3, 1997.

2005 Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants in California and Southern Oregon; Final Rule. *Federal Register* 70(154): 46923–46999. Washington, D.C.: USFWS.

2007 Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the San Diego Fairy Shrimp (*Branchinecta sandiegonensis*). 50 CFR Part 17**.**

2012 Endangered and Threatened Wildlife and Plants; Revised Critical Habitat for the Riverside Fairy Shrimp; Final Rule. *Federal Register* 77(233): 72070–72140. Washington, D.C.: USFWS.

2017 Survey Guidelines for the Listed Large Branchiopods. Nov 13.

U.S. Geological Survey (USGS)

2023 Sunnymead 7.5-Minute Topographic Map. Accessed online August.

SURVEYORS' CERTIFICATION

I certify that the information in this survey report and attached exhibits fully and accurately represent my work.

Darin Busby
Principal Biologist
Busby Biological Services, Inc.
USFWS Permit Number TE-115373-4

ATTACHMENT 1
Figures

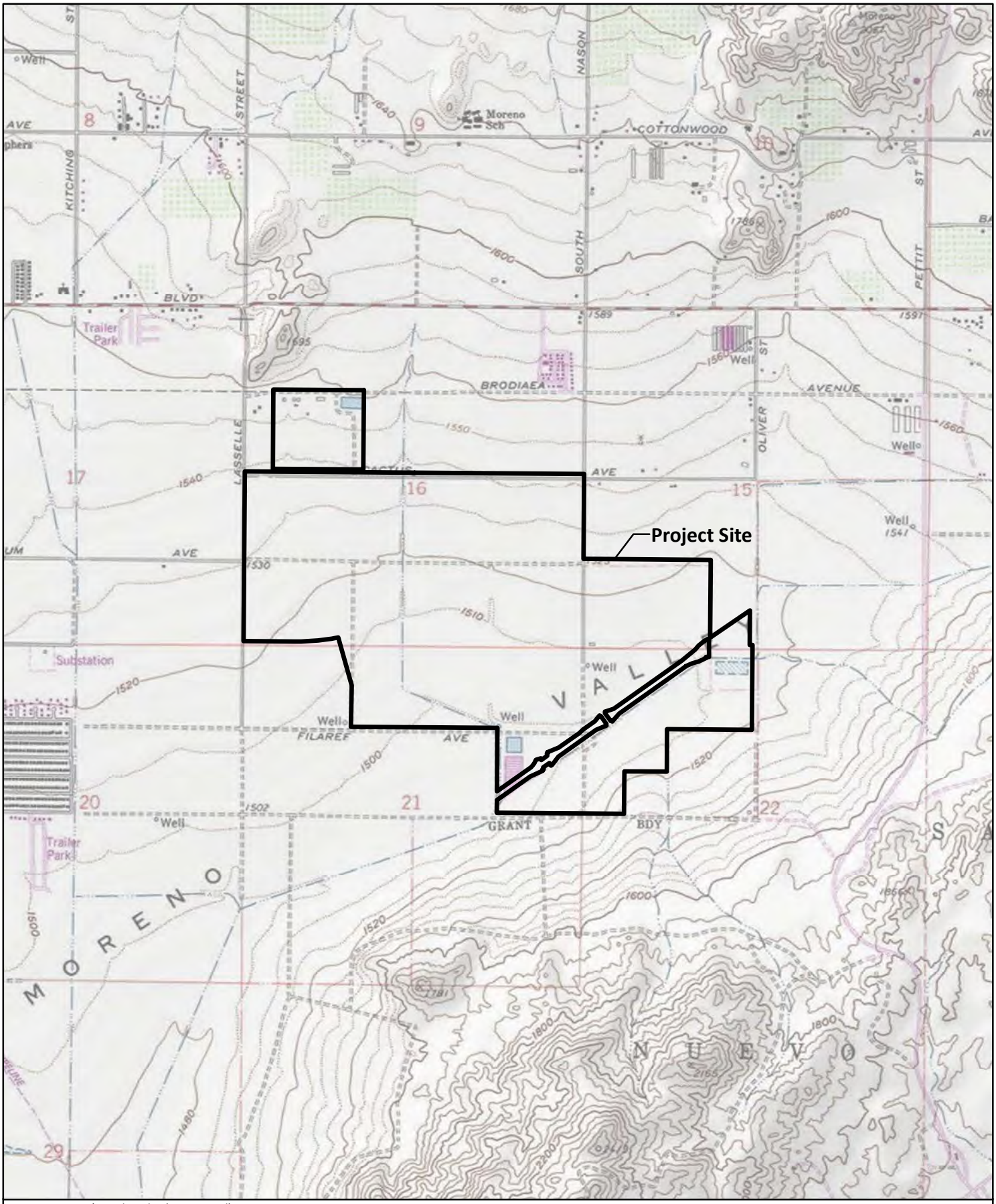
Source: National Geographic, Esri

BUSBY Biological Services

Regional Location

PROPOSED AQUABELLA PROJECT

Figure 1



Source: USGS 7.5' Quadrangles (Sunnymead)

BUSBY Biological Services

N

0 1,000 2,000 Feet

Project Location (USGS)

PROPOSED AQUABELLA PROJECT

Figure 2

Aquabella Project Boundary
Versatile fairy shrimp (*Branchinecta lindahli*)
Fairy shrimp undetected

Brodiaea Ave
Laselle St
Cactus Ave
Nason St
Oliver St
Delphinium Ave
John F Kennedy Dr
Margaret Ave
Iris Ave

Aerial Photo: Nearmap 2023

BUSBY Biological Services

N 0 400 800 Feet

2023 Dry Season Fairy Shrimp Survey Results

PROPOSED AQUABELLA PROJECT

Figure 3

ATTACHMENT 2
Representative Photographs

	Photograph 1. View of Basin 3 in southeastern portion of project area (taken 1/13/23; facing southeast).
	Photograph 2. View of Basin 8 in northwestern portion of project area (taken 1/13/23; facing west).
	Photograph 3. View of Basin 11 in western half of project area (taken 1/13/23; facing east).

	Photograph 4. View of Basin 14 in central portion of project area (taken 1/13/23; facing southeast).
	Photograph 5. View of Basin 20 in north-central portion of project area (taken 1/13/23; facing north).
	Photograph 6. View of Basin 25 in eastern half of project area (taken 3/2/23; facing northeast).

	Photograph 7. View of Basin 36 along western edge of project area (taken 3/8/23; facing south).
	Photograph 8. View of Basin 44 in central portion of project area (taken 3/8/23; facing south).
	Photograph 9. View of Basin 52 in north-central portion of project area (taken 3/8/23; facing north).

ATTACHMENT 3
2023 Dry and Wet Season Fairy Shrimp Survey Results

Basin ID	Average Depth (cm)	Maximum Surface Area (sq m)	Soil Samples Collected	Approximate Volume/Soil Sample (ml)	Maximum Soil Volume Collected (mL)	2023 Wet Season Survey Results		2023 Dry Season Survey Results			Habitat Conditions	GPS Coordinates (Latitude/Longitude)	
						Maximum Number of BRLI	Maximum Number of Unknown Branchinecta (Naup./Imm./fem.)	Number of Branchinecta Cysts	Number of Male BRLI	Number of Female BRLI			
1	100	840	50	50	2500	100	10,000	162	6	2	C, D	33.899574	-117.187553
2	35	480	50	50	2500	0	10	30	3	0	C, D	33.89802	-117.190095
3	120	920	50	50	2500	10,000	10,000	1900	6	4	AB, C, D	33.897131	-117.191259
4	10	25	10	50	500	1		10	1	0	AB, C, D, TT	33.906074	-117.185039
5	4	25	10	50	500	0	0	10	0	2	AB,C,D,TT	33.905778	-117.18504
6	3	4	25	50	1250	0	0	0	0	0	AB, C, D, TT	33.905601	-117.185054
7	10	275	50	50	2500	1,000	1,000	1250	7	4	AB, C, D, TT	33.909746	-117.207772
8	10	295	50	50	2500	10,000	10,000	2000	11	5	AB, C, D, TT	33.909711	-117.204954
9	8	290	50	50	2500	10,000	100,000	1900	25	8	AB, C, D, TT	33.909737	-117.20274
10	12	1,160	50	50	2500	10,000	1,000	1300	4	3	AB, C, D, TT	33.909776	-117.201651
11	25	860	50	50	2500	10,000	100,000	1400	2	2	AB, C, D, TT	33.905873	-117.20286
12	20	1,780	50	50	2500	100,000	100,000	900	2	0	AB, C, D, TT	33.906726	-117.201877
13	12	35	25	50	1250	1,000	1,000	469	15	11	AB, C, D	33.906591	-117.201012
14	18	5,450	100	50	5000	100,000	100,000	2331	17	12	C, D	33.90611	-117.199839
15	5	365	50	50	2500	1,000	10,000	350	1	0	AB, C, D	33.905274	-117.199133
16	15	1,290	50	50	2500	10,000	100,000	190	2	0	C, D	33.904182	-117.199212
17	3	4	10	50	500	10,000	100	586	11	9	C, D	33.906652	-117.198494
18	25	4,570	100	50	5000	10,000	100,000	391	5	5	C, D, TT	33.90687	-117.197831
19	10	2	5	25	125	100	100	200	4	1	C, D	33.907407	-117.197417
20	25	1,135	50	50	2500	10,000	10,000	1250	7	9	C, D	33.907812	-117.197102
21	20	1,540	50	50	2500	10,000	10,000	200	3	0	C, D	33.905758	-117.195635
22	12	260	50	50	2500	1,000	10,000	1250	9	11	C, D	33.904947	-117.195284

23	20	280	50	50	2500	1,000	1,000	500	5	5	C, D	33.905409	-117.193305
24	13	560	50	50	2500	1,000	1,000	1400	13	14	AB, C, D, TT	33.90476	-117.192253
25	20	1,990	50	50	2500	10,000	10,000	1800	3	0	C,D, TT	33.899851	-117.193246
26	15	55	25	50	1250	10,000	10,000	475	9	4	AB, C,D	33.901953	-117.190018
27	8	30	25	50	1250	100	0	210	9	1	AB, C,D	33.902201	-117.192755
28	12	760	50	50	2500	1,000	10,000	1750	8	1	C,D	33.904405	-117.194285
29	10	790	50	50	2500	1,000	10,000	1650	6	4	C,D	33.904151	-117.196079
30	7	150	25	50	1250	1,000	10,000	143	0	1	C,D	33.903516	-117.196086
31	20	150	25	50	1250	1,000	100,000	400	12	2	C,D, TT	33.902938	-117.201373
32	10	120	25	50	1250	1,000	1,000	90	4	1	C,D, TT	33.902541	-117.202043
33	8	760	50	50	2500	1,000	10,000	900	5	1	C,D, TT	33.903362	-117.199475
34	12	540	50	50	2500	1,000	10,000	500	4	1	C,D,TT	33.903368	-117.199104
35	30	240	50	50	2500	10,000	1,000	90	3	3	C,D	33.902684	-117.199185
36	32	740	50	50	2500	1,000	100,000	650	8	3	AB,C,D,TT	33.905151	-117.208602
37	10	215	25	50	1250	10,000	1,000	300	11	4	AB,C,D,TT	33.909716	-117.205899
38	12	45	25	50	1250	100	100	250	5	4	C,D	33.898513	-117.18947
39	7	120	25	50	1250	100	100	250	6	5	C,D,TT	33.899695	-117.188176
40	5	100	25	50	1250	0	1,000	300	3	5	C,D,TT	33.903468	-117.19297
41	4	25	25	50	1250	100	100	150	6	12	C,D,TT	33.899935	-117.195381
42	4	190	25	50	1250	1,000	100	140	9	8	C,D,TT	33.900313	-117.200228
43	2	35	25	50	1250	1	10	2	1	0	C,D,TT	33.901787	-117.199156
44	4	235	25	50	1250	100	100	900	16	0	AB,C,D,TT	33.902142	-117.199053
45	8	65	25	50	1250	1,000	1,000	1200	13	2	AB,C,D,TT	33.903424	-117.200852
46	4	60	25	50	1250	1,000	1,000	1000	10	0	C,D,TT	33.90332	-117.200096
47	2	125	25	50	1250	10	0	200	2	1	C,D,TT	33.907055	-117.208501
48	2	80	25	50	1250	100	100	10	2	0	C,D,TT	33.909444	-117.208504
49	3	80	25	50	1250	1,000	100	400	3	6	C,D,TT	33.909703	-117.20847
50	3	75	25	50	1250	100	100	280	2	1	C,D,TT	33.909753	-117.206972

51	6	150	25	50	1250	100	1,000	4000	18	2	AB,C,D,TT	33.909682	-117.204112
52	3	20	10	50	500	0	100	60	3	0	C,D,TT	33.907075	-117.20013
53	8	120	25	50	1250	100	100	60	2	1	C,D	33.906767	-117.195672
54	18	250	50	50	2500	0	0	240	5	0	C,D	33.900188	-117.186301
55	7	20	10	50	500	0	0	25	8	5	C,D,TT	33.902529	-117.192304
56	3	100	25	50	1250	10	0	125	2	6	C,D	33.900646	-117.194626
57	2	50	25	50	1250	0	100	480	4	0	C,D	33.902042	-117.198274
58	6	265	50	50	2500	0	1 female	800	8	2	C,D	33.902458	-117.198761
59	6	105	25	50	1250	0	0	9	1	0	C,D	33.903832	-117.200288
60	5	350	50	50	2500	0	1,000	175	6	0	C,D	33.904919	-117.201239
61	2	20	10	50	500	0	10	100	2	2	C,D,TT	33.906555	-117.208497
62	2	25	10	50	500	1	0	45	2	0	C,D,TT	33.907801	-117.208549
63	30	285	50	50	2500	N/A	N/A	14	1	0	C, D	33.896188	-117.195552

BRLI = Versatile fairy shrimp (Branchinecta lindahli)
fem. = female
imm. = immature fairy shrimp
naup. = nauplii fairy shrimp
AB = algal bloom
C = constructed
D = disturbed
TT = tire tracks

ATTACHMENT 4
2023 Laboratory Dry Season Fairy Shrimp Results Letter
(Alden Environmental, August 23, 2023)

ALDEN
ENVIRONMENTAL, INC
3245 University Ave, #1188 | San Diego, CA 92104 | **Phone/Fax:** 619.284.3815

August 23, 2023

Mr. Darin Busby
Busby Biological Services
4629 Cass Street, #192
San Diego, CA 92109

Subject: Dry Sampling Results-Aquabella

Dear Mr. Busby:

This letter presents the results of dry season fairy shrimp sampling (cyst identification and rearing) conducted on the Aquabella project by Greg Mason USFWS permit (No. TE835549).

Methods

Cyst Identification

Between June 29 and July 8, 2023, Alden received soil samples collected from 63 basins on the project site. The soil was provided in bags labeled with the basin numbers. The collected soil was divided into subsamples, based on the area of the pool and the amount of soil collected. Each sample was then hydrated and processed through a series of sieves to separate out fairy shrimp cysts that may be present. The sieves used were of 710-, 355-, and 212-µm pore size screens. The final sieve pore size is smaller than the target fairy shrimp genera (*Branchinecta* and *Streptocephalus*) average cyst diameter and therefore would retain cysts. The material remaining on the final sieve was next placed in a brine solution to help separate organic from inorganic material. The organic portion was then filtered through a standard coffee filter and allowed to dry. The dried material on the filters was then examined under a stereo dissecting scope to determine if cysts were present. Cyst surface characteristics were then used to identify cysts to genus, if present.

Hatching/Rearing

The collected *Branchinecta* fairy shrimp cysts were hydrated by placing them into plastic containers filled with approximately 525 ml of filtered, non-chlorinated drinking water. The coffee filters (from the soil sieving effort) with the collected cysts were slowly opened over the containers and gently shaken to allow the material to fall into the water. The sides of the filters were then rubbed against one another to release any additional material. Finally, a squirt bottle filled with filtered drinking water was used to spray any additional material from the filters into the containers.

The containers were given sample identification numbers and placed on a table in a climate controlled room. Lighting in the room was provided by indirect sunlight as well as an overhead light (full spectrum bulb) that was kept on approximately 12 hours a day to help emulate spring season lighting conditions. An overhead fan also was kept on at a low level to provide for some air movement across the water surface in the sample containers.

The samples were checked daily to see if any fairy shrimp had emerged. Once nauplii were observed, feeding began. The hatched shrimp were fed 2-4 drops of prepared food on a daily basis until they were collected. The food used was a mix of active brewer's yeast, sugar, powdered fish food, and water.

The hatched shrimp were allowed to continue under these conditions until they had reached maturity, as determined by reaching full size, antennal development (males) and brood pouch development (females). Once mature, the fairy shrimp were collected for identification by pouring the material in the container through a small strainer. Collected shrimp were then placed into a dish of carbonated (soda) water to slowly asphyxiate the shrimp. Once dead, the collected shrimp were placed in a 27 x 57 mm (5 dram) clear glass vial, filled with 70% ethyl alcohol. The collected shrimp were then identified to the species level with the aid of a stereo dissecting scope.

Results

Cyst Identification

Cysts of the genus *Branchinecta* were found in all but one (basin 6) of the sampled basins (Attachment A). No cysts of the genus *Streptocephalus* were found in any of the sampled basins.

Hatching/Rearing

Hydration and hatching of the samples with recovered cysts was conducted, resulting in the collection and identification of the non-sensitive versatile fairy shrimp (*B. lindahli*) from all of the basins with fairy shrimp cysts present (Attachment B). No other fairy shrimp species were identified.

The above text presents the final results of the dry season fairy shrimp cyst identification and hatching effort for the project. The non-listed versatile fairy shrimp was the only shrimp species to be reared from the recovered cysts. If you have any questions or need additional information please call.

Sincerely,

Greg Mason
Principal/Senior Biologist

Attachment A

Branchinecta Cysts Recovered

Basin	Subsamples	Branchinecta Cysts
1	50	162
2	50	30
3	50	1900
4	10	10
5	10	10
6	25	0
7	50	1250
8	50	2000
9	50	1900
10	50	1300
11	50	1400
12	50	900
13	25	469
14a	50	1670
14b	50	661
15	50	350
16	50	190
17	10	586
18a	50	46
18b	50	345
19	5	200
20	50	1250
21	50	200
22	50	1250
23	50	500
24	50	1400
25	50	1800
26	25	475
27	25	210
28	50	1750
29	50	1650
30	25	143
31	25	400
32	25	90

Attachment A (continued)

Branchinecta Cysts Recovered

Basin	Subsamples	Branchinecta Cysts
33	50	900
34	50	500
35	50	90
36	50	650
37	25	300
38	25	250
39	25	250
40	25	300
41	25	150
42	25	140
43	25	2
44	25	900
45	25	1200
46	25	1000
47	25	200
48	25	10
49	25	400
50	25	280
51	25	4000
52	10	60
53	25	60
54	50	240
55	10	25
56	25	125
57	25	480
58	50	800
59	25	9
60	50	175
61	10	100
62	10	45
63	50	14

Attachment B

Shrimp Hatching Results

Hatched *Branchinecta lindahli*		
Basin[1]	**Male**	**Female**
1	6	2
2	3	0
3	6	4
4	1	0
5	0	2
7	7	4
8	11	5
9	25	8
10	4	3
11	2	2
12	2	0
13	15	11
14	17	12
15	1	0
16	2	0
17	11	9
18	5	5
19	4	1
20	7	9
21	3	0
22	9	11
23	5	5
24	13	14
25	3	0
26	9	4
27	9	1
28	8	1
29	6	4
30	0	1
31	12	2
32	4	1
33	5	1
34	4	1
35	3	3
36	8	3
37	11	4
38	5	4
39	6	5

Attachment B (continued)

Shrimp Hatching Results

Hatched *Branchinecta lindahli*		
Basin[1]	**Male**	**Female**
40	3	5
41	6	12
42	9	8
43	1	0
44	16	0
45	13	2
46	10	0
47	2	1
48	2	0
49	3	6
50	2	1
51	18	2
52	3	0
53	2	1
54	5	0
55	8	5
56	2	6
57	4	0
58	8	2
59	1	0
60	6	0
61	2	2
62	2	0
63	1	0

[1]No cysts recovered in Basin 6