APPENDIX C

Dry Season Fairy Shrimp Survey and Hatching Report

HELIX
Environmental Planning

Pure Water San Diego Program
North City Water Purification Project

Dry Season Fairy Shrimp Survey and Hatching Report

December 8, 2016

Prepared for:
City of San Diego
Public Utilities Department
9192 Topaz Way, MS 901A
San Diego, CA 92123

Prepared by:
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7578 El Cajon Boulevard
La Mesa, CA 91942

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

Jason Kurnow

Pure Water San Diego Program North City Water Purification Project
Dry Season Fairy Shrimp Survey and Hatching Report

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1.0 INTRODUCTION

This report presents the findings of the 2016 dry season fairy shrimp sampling (survey) conducted by HELIX Environmental Planning, Inc. (HELIX) for the Pure Water San Diego Program's proposed North City Water Purification Project (project) located in San Diego County, California. The purpose of the dry season survey was to determine the presence of fairy shrimp cysts within the study area, which consists of 6 distinct sites. A wet season fairy shrimp survey was conducted for this project during the 2015-2016 rain season (Rocks 2016).

1.1 STUDY AREA LOCATION

The study area includes 6 distinct sites located throughout San Diego County: 1) Sander East; 2) Marine Corps Air Station (MCAS) Miramar; 3) Mast Boulevard; 4) Pueblo North; 5) Pueblo Central; and 6) Pueblo South (Figure 1). Sander East encompasses an approximate 30-acre area located in the community of Kearny Mesa in the City of San Diego, south of State Route 52, and north of Mercury Street. The site is located in unsectioned land within Townships 15 South, Range 3 West on the San Bernardino Base and Meridian USGS 7.5-minute La Jolla quadrangle map (Figure 2a).

MCAS Miramar encompasses an approximate 95-acre area located on MCAS Miramar, east of I-805. The site is located in unsectioned land within Township 15 South, Range 3 West on the San Bernardino Base and Meridian USGS 7.5-minute La Jolla quadrangle map (Figure 2b).

Mast Boulevard encompasses an approximate 2-acre area located on the border of the City of Santee and an unincorporated part of San Diego County, south of El Nopal, and north of Hillcreek Road. The site is located in unsectioned land within Townships 15 South, Range 1 West on the San Bernardino Base and Meridian USGS 7.5-minute El Cajon quadrangle map (Figure 2c).

The 3 Pueblo sites are located in the City of San Diego, east of Interstate (I-) 805, just west of the MCAS Miramar, and south of Carroll Canyon Road. Pueblo North encompasses a 14.0-acre area, Pueblo Central encompasses a 33-acre area, and Pueblo South encompasses a 29-acre area. Pueblo North is located in unsectioned land within Township 15 South, Range 3 West on the San Bernardino Base and Meridian U.S. Geological Survey (USGS) 7.5-minute Del Mar quadrangle map (Figure 2d). Pueblo Central is located in unsectioned land within Township 15 South, Range 3 West on the San Bernardino Base and Meridian USGS 7.5-minute La Jolla quadrangle map (in part) and the Del Mar quadrangle map (in part) (Figure 2d). Pueblo South is located in unsectioned land within Township 15 South, Range 3 West on the San Bernardino Base and Meridian USGS 7.5-minute La Jolla quadrangle map (Figure 2d).

1.2 SPECIES INFORMATION

There are 3 species of fairy shrimp with potential to occur within the study area: San Diego fairy shrimp (*Branchinecta sandiegonensis*), Riverside fairy shrimp (*Streptocephalus woottoni*), and versatile fairy shrimp (*Branchinecta lindahli*). The San Diego and Riverside fairy shrimp are

federally listed as endangered, while the versatile fairy shrimp is relatively common and is not listed or considered sensitive. San Diego fairy shrimp are found in San Diego and Orange counties and occur in vernal pools and other ephemeral ponds or basins. Riverside fairy shrimp can be found in Riverside, Orange, and San Diego counties and occur in vernal pools and other ephemeral basins with long inundation times. The versatile fairy shrimp is common in pools throughout California and can co-occur with both San Diego and Riverside fairy shrimp.

Fairy shrimp are adapted for variable and uncertain rainfall patterns. When fertilized by males of their species, female fairy shrimp produce "resting eggs," called cysts, which are dormant embryos surrounded by hard-shelled membranes capable of remaining viable in the soil for long periods of time. Dry season fairy shrimp surveys are designed to detect, collect, and identify cysts present in the soil. The surface characteristics of these cysts can be used to differentiate the genus and potentially the species of fairy shrimp.

2.0 METHODS

HELIX permitted biologist Jason Kurnow (Permit TE778195-13) led the dry season sampling effort in accordance with U.S. Fish and Wildlife Service (USFWS) protocol (USFWS 2015). Soil collection was conducted by Mr. Kurnow and HELIX permitted biologist Amy Mattson (Permit TE778195-13). Soil collection for the Pueblo North site occurred on June 17, 2016, on July 28, 2016 for Sander East, on July 29, 2016 for Mast Boulevard, on July 27 and 29, 2016 for MCAS Miramar, and on August 1, 2016 for Pueblo Central and Pueblo South. Representative photos of each of the 6 sites are included with this report (Appendix A). The USFWS Data Sheets for Dry Season Sample Analysis for Listed Large Branchiopods are included as Appendix B.

Following soil collection, the samples were transferred to the HELIX laboratory for analysis. Soil processing was conducted by HELIX permitted biologist Jason Kurnow, or under the supervision of Mr. Kurnow. Supervised individuals consisted of HELIX biologists Amy Mattson, Hannah Sadowski, and Summer Schlageter. Microscope work was solely conducted by Mr. Kurnow. Samples were prepared by dissolving the soil samples in water and sequentially sieving the material through 710- and 75-µm pore size screens. The small size of these screens ensures that cysts from the target fairy shrimp species are retained. The portion of each sample retained in the screen was dispersed in a brine solution to separate the organic from the inorganic material. The organic fraction was decanted, dried, and examined under a microscope. Cysts were identified to genus level based on surface characteristics. Multiple species of the *Branchinecta* genus can occur in San Diego County, but cannot be identified past genus level based on cyst characteristics. The relative amount of cyst abundance was estimate for each sample and the total egg abundance for each basin is provided in the Results section, according to the guidelines provided in the USFWS Survey Guidelines: Low (estimate of 1-10 cysts/100 mL soil); Medium (estimate of 11-50 cysts/100 mL soil); and High (estimate of more than 50 cysts/100 mL of soil).

To supplement the dry season sampling, a hatching effort was conducted for the MCAS Miramar and Pueblo North sites. This was done to provide adult specimens that could be identified to

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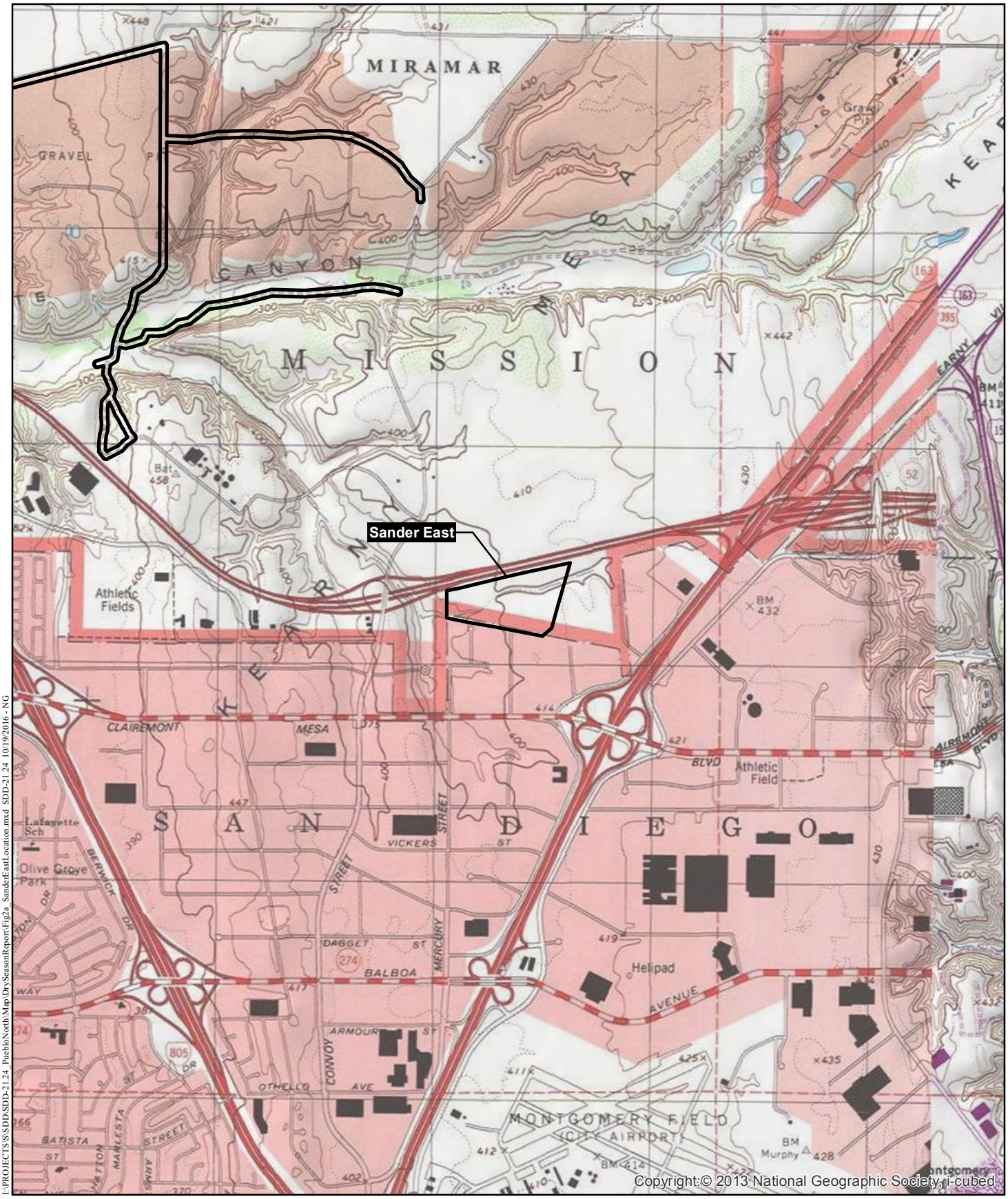
Regional Location Map

PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT

HELIX Environmental Planning

N 0 8 Miles

Figure 1



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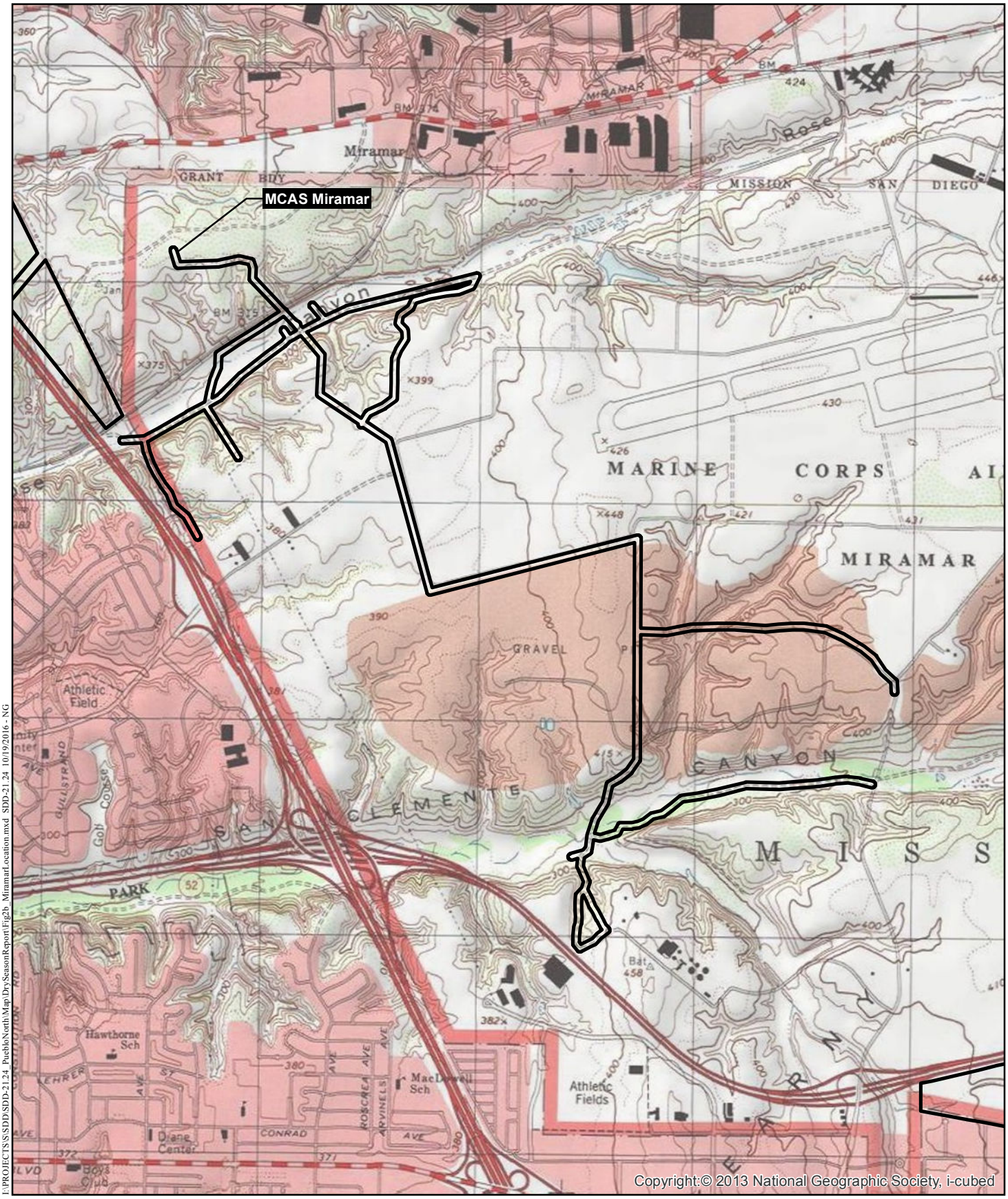
Site Location

PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT

HELIX Environmental Planning

N 0 2,000 Feet

Figure 2a



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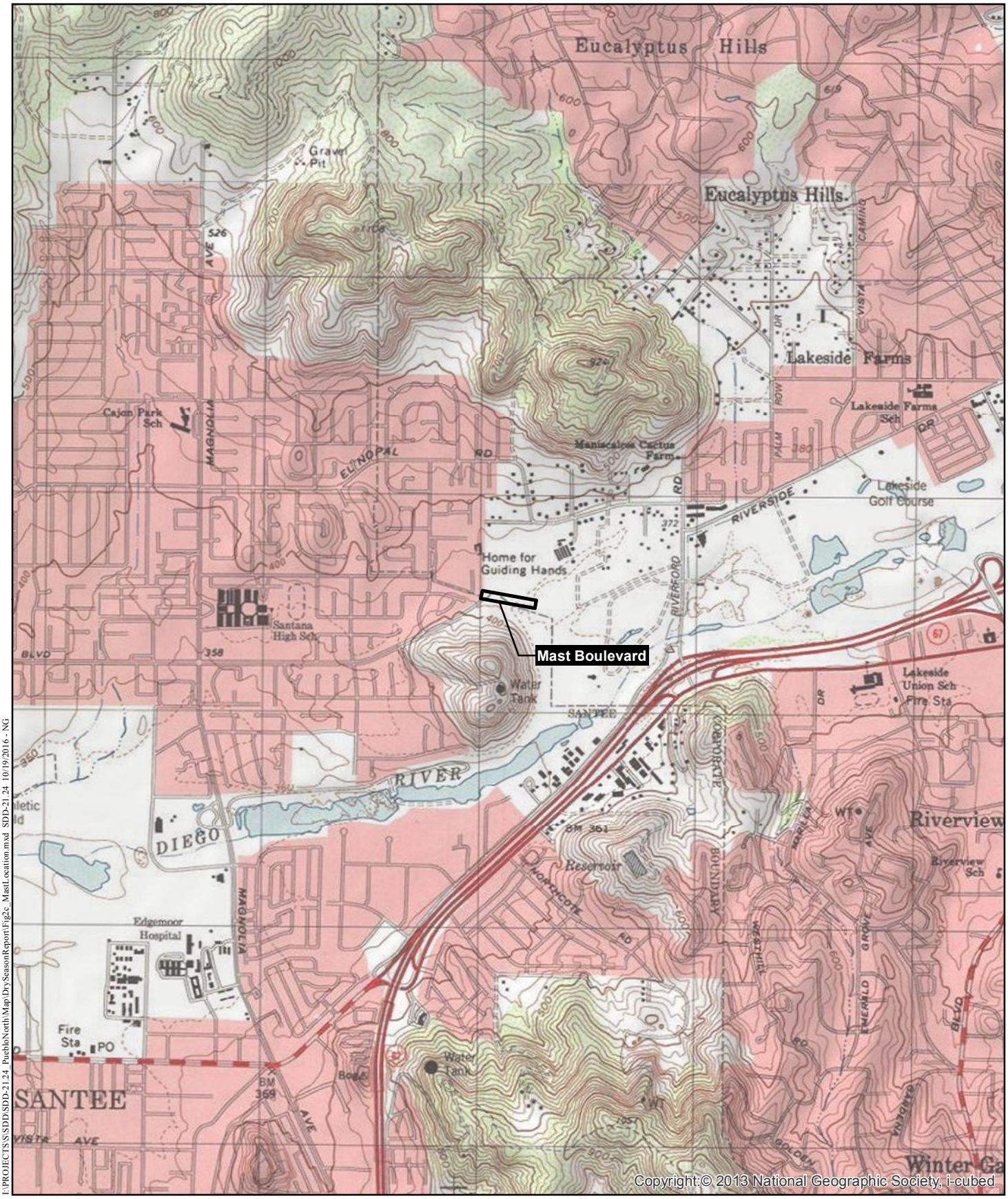
Site Location

PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT

HELIX Environmental Planning

N 0 2,000 Feet

Figure 2b



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Site Location

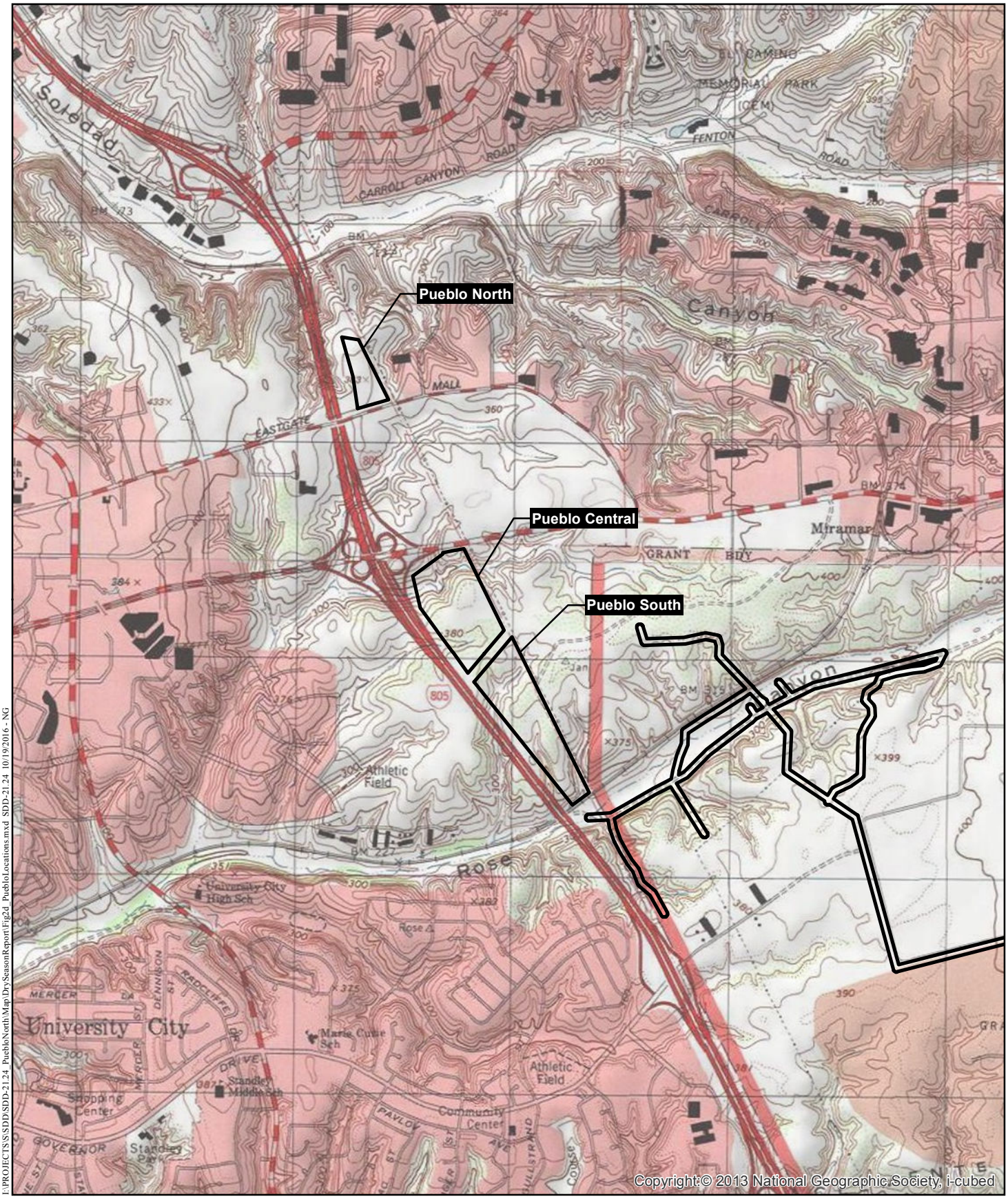
PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT

HELIX Environmental Planning

N

0 2,000 Feet

Figure 2c



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Site Locations

PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT

HELIX Environmental Planning

N

0 2,000 Feet

Figure 2d

species level. In anticipation of this, a small amount of soil from each basin associated with these 2 sites was set aside prior to processing. Following USFWS notification, soil samples from basins containing cysts that were not known to contain the federally listed as endangered San Diego fairy shrimp were sent out for hatching. Hatching was conducted by permitted fairy shrimp specialist, D. Christopher Rogers, using the established methods for hatching. Methodologies for hatching are detailed in the hatching reports, which are included as Appendices C1 and C2.

3.0 RESULTS

Sander East

Twenty-eight basins were sampled for the presence of fairy shrimp cysts (Figure 3a). *Branchinecta* cysts were observed in 5 of the 28 basins (Appendix D). The 5 basins containing *Branchinecta* cysts are: PW10, PW11, PW13, PW16, and PW25. *Streptocephalus* sp. cysts were not observed in any of the sampled basins.

MCAS Miramar

Thirty basins were sampled for the presence of fairy shrimp cysts (Figure 3b). *Branchinecta* cysts were observed in 21 of the 30 basins (Appendix D). The 21 basins containing *Branchinecta* cysts are: PW28, PW29, PW31, PW33 – PW39, PW41, PW43, PW46 – PW50, PW52, and PW80 – PW82. *Streptocephalus* sp. cysts were not observed in any of the sampled basins.

Of the 21 basins containing cysts, previous wet season surveys identified SDFS in 9 of them (Figure 3b). Basins where SDFS have been identified during wet season surveys are: PW31, PW33-39, and PW41. Cultures from the remaining 12 basins containing *Branchinecta* cysts produced the non-listed fairy shrimp *B. lindahli* (Appendix C1, Appendix D).

Mast Boulevard

Three basins were sampled for the presence of fairy shrimp cysts (Figure 3c). Neither *Branchinecta* sp. cysts nor *Streptocephalus* sp. cysts were observed in any of the sampled basins (Appendix D).

Pueblo North

Eleven basins were sampled for the presence of fairy shrimp cysts (Figure 3d). *Branchinecta* cysts were observed in 3 of the 11 basins (Appendix D). The 3 basins containing *Branchinecta* cysts are: PW55, PW56, and PW57. *Streptocephalus* sp. cysts were not observed in any of the sampled basins.

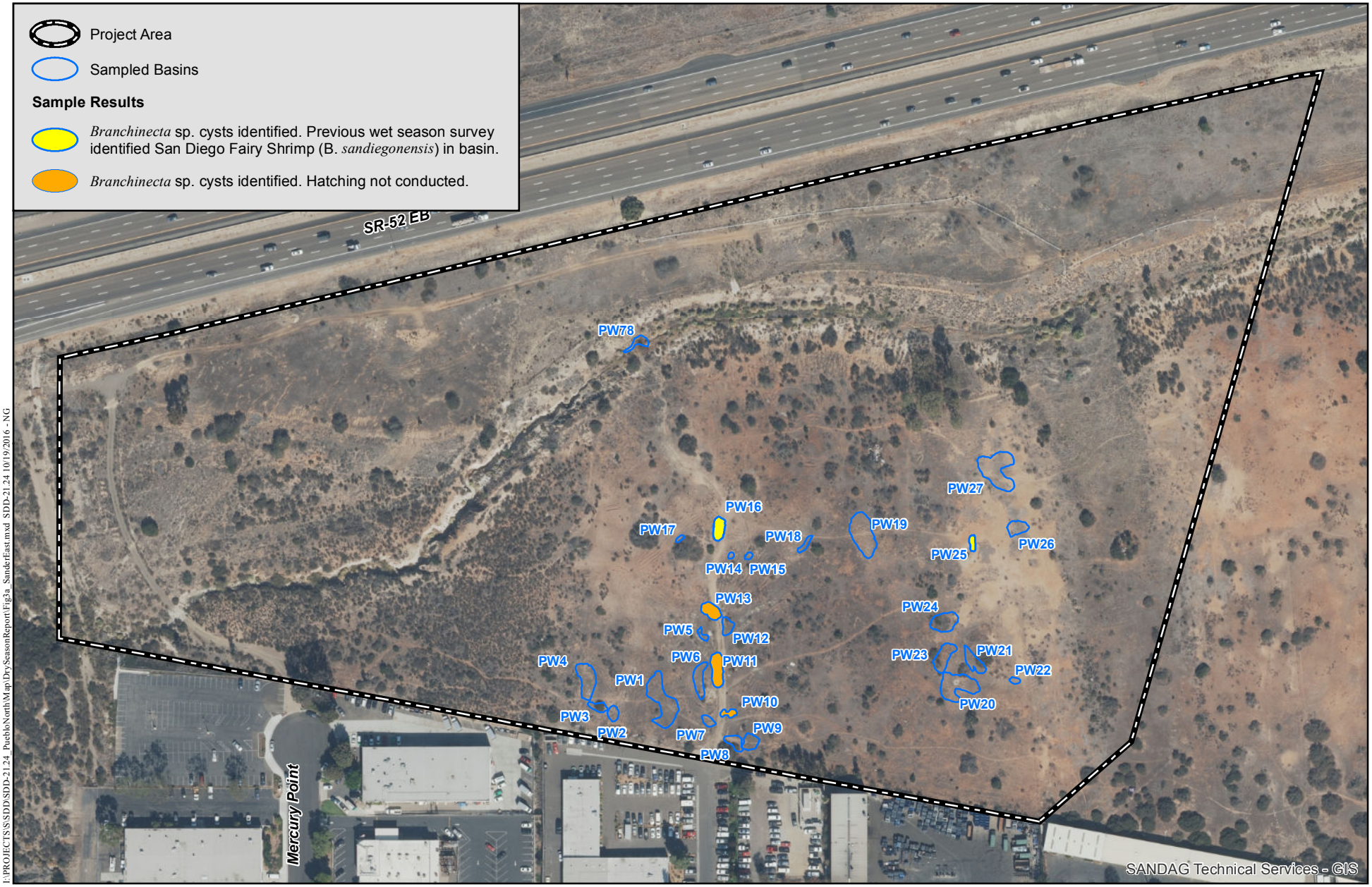
Cultures from all 3 of the basins containing *Branchinecta* cysts produced the non-listed fairy shrimp *B. lindahli* (Appendix C2, Appendix D).

Pueblo Central

Eight basins were sampled for the presence of fairy shrimp cysts (Figure 3e). *Branchinecta* cysts were observed in 2 of the 8 basins (Appendix D). The 2 basins containing *Branchinecta* cysts are: PW60, and PW64. *Streptocephalus* sp. cysts were not observed in any of the sampled basins.

Pueblo South

Eight basins were sampled for the presence of fairy shrimp cysts (Figure 3f). *Branchinecta* cysts were observed in 6 of the 8 basins (Appendix D). The 6 basins containing *Branchinecta* cysts are: PW70 – PW75. *Streptocephalus* sp. cysts were not observed in any of the sampled basins.



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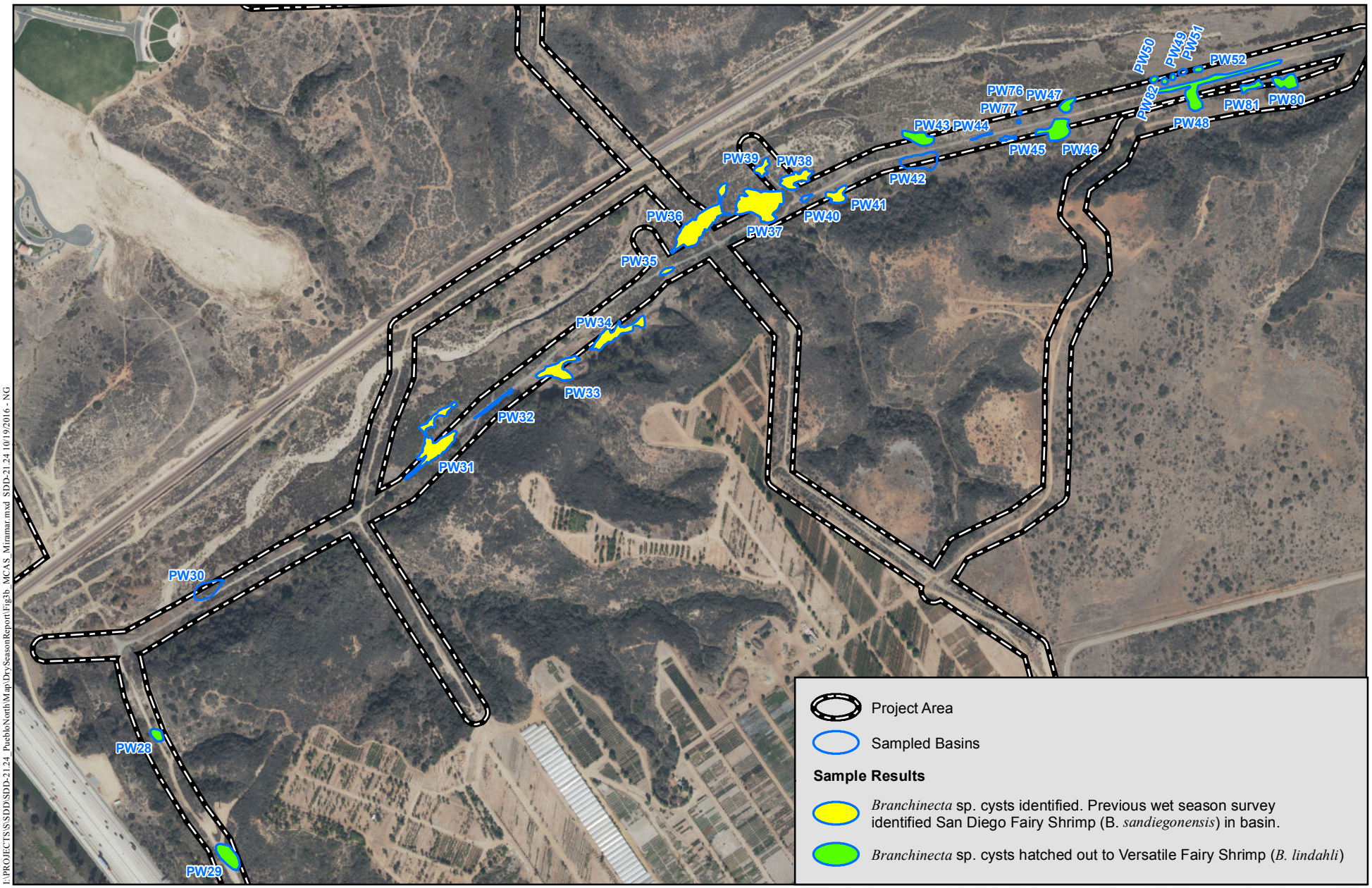
Sampled Basins

PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT - SANDER EAST SITE

HELIX Environmental Planning

N 0 200 Feet

Figure 3a



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Sampled Basins

PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT - MCAS MIRAMAR SITE

HELIX Environmental Planning

N 0 550 Feet

Figure 3b

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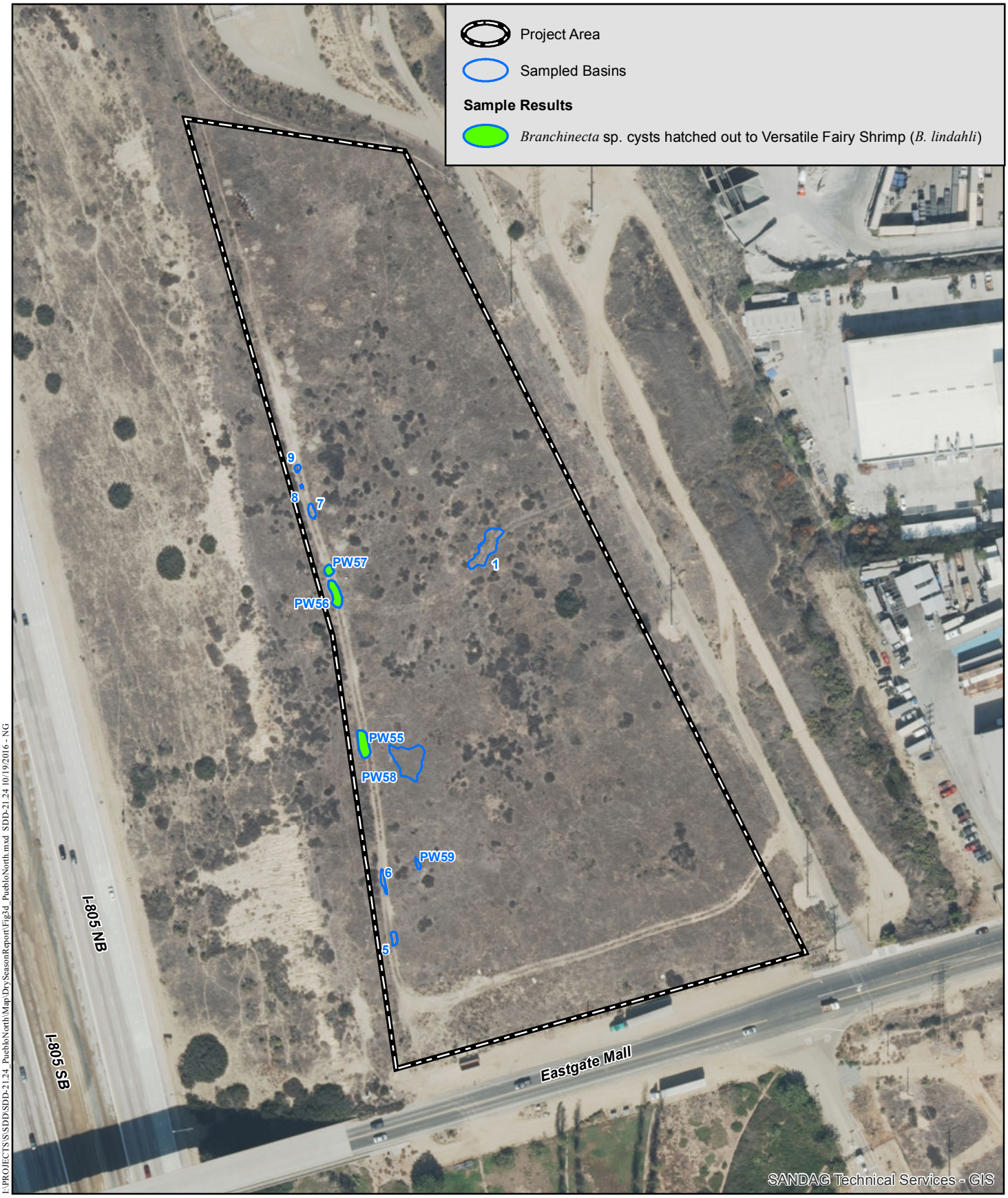
Sampled Basins

PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT - MAST BOULEVARD SITE

HELIX Environmental Planning

N 0 100 Feet

Figure 3c



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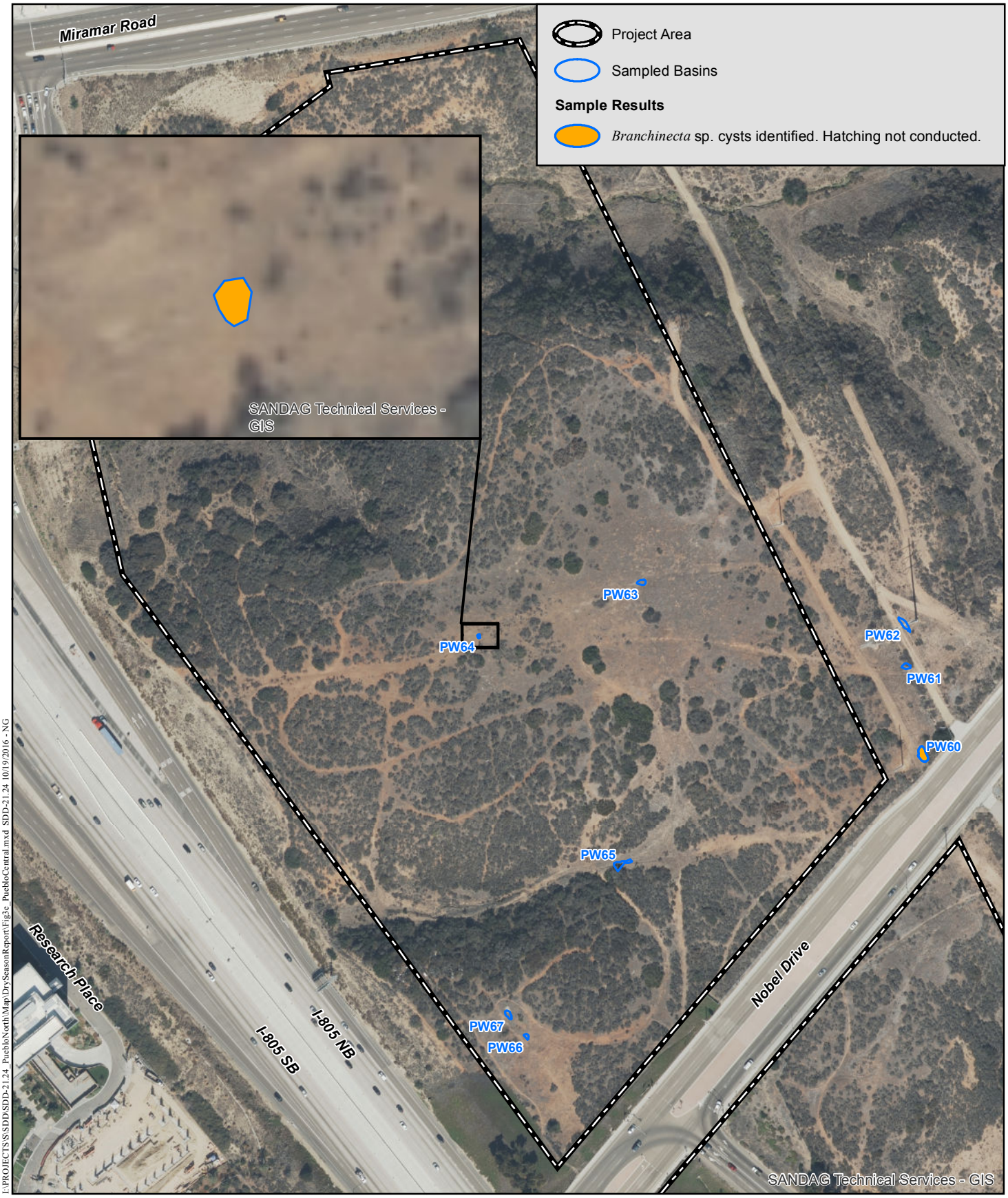
Sampled Basins

PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT - PUEBLO NORTH SITE

HELIX Environmental Planning

N 0 150 Feet

Figure 3d



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Sampled Basins

PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT - PUEBLO CENTRAL SITE

HELIX Environmental Planning

N 0 220 Feet

Figure 3e

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Sampled Basins

PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT - PUEBLO SOUTH SITE

HELIX Environmental Planning

N 0 300 Feet

Figure 3f

4.0 REFERENCES

Marine Corps Air Station (MCAS) Miramar. 2016. GIS Database files, "Natural Resources." Data provided to City of San Diego on August 30, 2016.

Rocks Biological Consulting. 2016. 90-Day Wet Season Results, Vernal Pool Branchiopod Surveys for the Pure water Program Project, San Diego, California. September 13.

U.S. Fish and Wildlife Service (USFWS). 2015. Survey Guidelines for the Listed Large Branchiopods. May 31.

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Appendix A

REPRESENTATIVE SITE PHOTOS

Basins PW8 and PW9 – Sander East Site – 7/28/16 - JK

Basins PW14 to PW16 – Sander East Site – 7/28/16 - JK

Basins PW20 to PW24 – Sander East Site – 7/28/16 - JK

Basin PW32 – MCAS Miramar Site – 7/29/16 - AM

Basin PW33 – MCAS Miramar Site – 7/29/16 - AM

Basin PW46– MCAS Miramar Site – 7/29/16 - AM

Basin PW53– Mast Blvd Site – 7/29/16 – JK

Basin PW55– Pueblo North Site – 6/17/16 – JK

Basin PW56– Pueblo North Site – 6/17/16 – JK

Basin PW63– Pueblo Central Site – 8/1/16 –AM

Basin PW74– Pueblo South Site – 8/1/16 –AM

Appendix B

USFWS DATA SHEETS FOR DRY SEASON SAMPLING FOR LARGE BRANCHIOPODS

Appendix 2. U.S. Fish and Wildlife Service – Data Sheet for Dry Season Sample Analysis for Listed Large Branchiopods

Project Information

Project Name: Pure Water SD- Snyder East Site
USFWS Project Number:
County: San Diego
Lat: 32° 50' 15" N
Long: 117° 08' 42" W
Quad: La Jolla
Township: 15 south
Range: 3 west
Section: Unsectioned

Biologist Information

Name of Person(2) Who Conducted the Following Tasks and Permit Number(s):

Soil Collection: Jason Kwasny (TE 778195-13)
Soil Processing: Amy Mattson (TE 778195-13)X, Hannah Badowski,X Summer SchlaykX
Soil Analysis/Cysts ID: Jason Kwasny (TE 778195-13)
Soil Collection Date: 7/28/16

Pool/ Habitat/ Basin No.	Invertebrates Present (X)															Comments
	Insect Exo-Skeletons	Micro-Turbellaria Cysts	Cladocera Ephippia	Ostracods Live/Cysts/ Carapaces	Copepods Live/Cysts	Number of Large Branchiopod Cysts: *Branchinecta* sp.	*Lepidurus packardi*	*Streptocephalus wootoni*	*Linderiella occidentalis*	*Lynceus brachyurus*	*Cyzicus californicus*	Hydracarina Live	Nematoda	Collembola	Other Species	
PW 15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
PW 16	–	–	–	–	–	385	–	–	–	–	–	–	–	–	–	
PW 17	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 19	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 21	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 22	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 23	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 24	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 25	–	–	–	–	–	751	–	–	–	–	–	–	–	–	–	
PW 26	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 27	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 78	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	

X Supervised Individual

Appendix 2. U.S. Fish and Wildlife Service – Data Sheet for Dry Season Sample Analysis for Listed Large Branchiopods

Project Information

Project Name: Pure Water SD- Snyder East Site
USFWS Project Number:
County: San Diego
Lat: 32° 50' 15" N
Long: 117° 08' 42" W
Quad: La Jolla
Township: 15 south
Range: 3 west
Section: Unsectioned

Biologist Information

Name of Person(2) Who Conducted the Following Tasks and Permit Number(s):

Soil Collection: Jason Kwong (TE 778195-13)
Soil Processing: Amy Mattson (TE 778195-13)x, Hannah Sadowski,x Summer Schlyer x
Soil Analysis/Cysts ID: Jason Kwong (TE 778195-13)
Soil Collection Date: 7/29/16

Pool/ Habitat/ Basin No.	Invertebrates Present (X)																Comments
	Insect Exo-Skeletons	Micro-Turbellaria Cysts	Cladocera Ephippia	Ostracods Live/Cysts/ Carapaces	Copepods Live/Cysts	Number of Large Branchiopod Cysts: *Branchinecta* sp.	*Lepidurus packardi*	*Streptocephalus wootoni*	*Linderiella occidentalis*	*Lynceus brachyurus*	*Cyzicus californicus*	Hydracarina Live	Nematoda	Collembola	Other Species	
PW 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
PW 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 10	–	–	–	–	–	27	–	–	–	–	–	–	–	–	–	
PW 11	–	–	–	–	–	309	–	–	–	–	–	–	–	–	–	
PW 12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
PW 13	–	–	–	–	–	28	–	–	–	–	–	–	–	–	–	
PW 14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	

x Supervised Individual

Appendix 2. U.S. Fish and Wildlife Service – Data Sheet for Dry Season Sample Analysis for Listed Large Branchiopods

Project Information

Project Name: Pure Water SD- MCAS Miramar Site
USFWS Project Number:
County: San Diego
Lat: 32° 52' 10" N
Long: 117° 10' 43" W
Quad: La Jolla
Township: 15 south
Range: 3 west
Section: unsectioned

Biologist Information

Name of Person(2) Who Conducted the Following Tasks and Permit Number(s):

Soil Collection: Amy Mattson (TE 778195-13)*
Soil Processing: Amy Mattson (TE 778195-13)x, Hannah Sadowski,x Summer Schlageter x
Soil Analysis/Cysts ID: Jason Kwong (TE 778195-13)
Soil Collection Date: 7/27/16 & 7/29/16

Pool/ Habitat/ Basin No.	Invertbrates Present (X)															Other Species	Comments
	Insect Exo-Skeletons	Micro-Turbellaria Cysts	Cladocera Ephippia	Ostracods Live/Cysts/ Carapaces	Copepods Live/Cysts	Number of Large Branchiopod Cysts						Hydracarina Live	Nematoda	Collembola		
						Branchinecta sp.	*Lepidurus packardi*	*Streptocephalus wootoni*	*Linderiella occidentalis*	*Lynceus brachyurus*	*Cyzicus californicus*					
PW 28	–	–	–	–	–	9	–	–	–	–	–	–	–	–	–	Hatched to B. lindahli
PW 29	–	–	–	–	–	8	–	–	–	–	–	–	–	–	–	Hatched to B. lindahli
PW 30	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
PW 31	–	–	–	–	–	18	–	–	–	–	–	–	–	–	–	Prev. wet season survey had B. sandiegonensis
PW 32	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
PW 33	–	–	–	–	–	68	–	–	–	–	–	–	–	–	–	Prev wet season survey had B. sandiegonensis
PW 34	–	–	–	–	–	181	–	–	–	–	–	–	–	–	–	Prev wet season survey had B. sandiegonensis
PW 35	–	–	–	–	–	68	–	–	–	–	–	–	–	–	–	Prev wet season survey had. B. sandiegonensis
PW 36	–	–	–	–	–	19	–	–	–	–	–	–	–	–	–	Prev wet season survey had B. sandiegonensis
PW 37	–	–	–	–	–	167	–	–	–	–	–	–	–	–	–	Prev wet season survey had B. sandiegonensis
PW 38	–	–	–	–	–	145	–	–	–	–	–	–	–	–	–	Prev wet season survey had B. sandiegonensis
PW 39	–	–	–	–	–	232	–	–	–	–	–	–	–	–	–	Prev wet season survey had B. sandiegonensis
PW 40	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
PW 41	–	–	–	–	–	1080	–	–	–	–	–	–	–	–	–	Prev wet season survey had B. sandiegonensis

* Authorized to conduct wet season fairy shrimp surveys. Also knowledgeable of the methods used for soil collection under 2015 guidelines

x Supervised Individual

Appendix 2. U.S. Fish and Wildlife Service – Data Sheet for Dry Season Sample Analysis for Listed Large Branchiopods

Project Information

Project Name: Pure Water SD - MCAS Miramar Site
USFWS Project Number:
County: San Diego
Lat: 32°52'10"N
Long: 117° 10' 43" W
Quad: La Jolla
Township: 15 south
Range: 3 west
Section: unsectioned

Biologist Information

Name of Person(2) Who Conducted the Following Tasks and Permit Number(s):

Soil Collection: Amy Mattson (TE 778195-13)*
Soil Processing: Amy Mattson (TE 778195-13)x, Hannah Sadowski,* Summer Schlagster*
Soil Analysis/Cysts ID: Jason Kurnow (TE 778195-13)
Soil Collection Date: 7/27/16 & 7/29/16

Pool/ Habitat/ Basin No.	Invertebrates Present (X)															Other Species	Comments
	Insect Exo-Skeletons	Micro-Turbellaria Cysts	Cladocera Ephippia	Ostracods Live/Cysts/ Carapaces	Copepods Live/Cysts	Number of Large Branchiopod Cysts: *Branchinecta* sp.	*Lepidurus packardi*	*Streptocephalus wootoni*	*Linderiella occidentalis*	*Lynceus brachyurus*	*Cyzicus californicus*	Hydracarina Live	Nematoda	Collembola		
PW 42	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		None
PW 43	–	–	–	–	–	4	–	–	–	–	–	–	–	–	–		Hatched to B. lindahli
PW 44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		None
PW 45	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		None
PW 46	–	–	–	–	–	45	–	–	–	–	–	–	–	–	–		Hatched to B. lindahli
PW 47	–	–	–	–	–	55	–	–	–	–	–	–	–	–	–		Hatched to B. lindahli
PW 48	–	–	–	–	–	72	–	–	–	–	–	–	–	–	–		Hatched to B. lindahli
PW 49	–	–	–	–	–	20	–	–	–	–	–	–	–	–	–		Hatched to B. lindahli
PW 50	–	–	–	–	–	68	–	–	–	–	–	–	–	–	–		Hatched to B. lindahli
PW 51	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		None
PW 52	–	–	–	–	–	14	–	–	–	–	–	–	–	–	–		Hatched to B. lindahli
PW 76	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		None
PW 77	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		None
PW 80	–	–	–	–	–	15	–	–	–	–	–	–	–	–	–		Hatched to B. lindahli

* Authorized to conduct wet season fairy shrimp surveys. Also knowledgeable of the methods used for soil collection under 2015 guidelines
x Supervised Individual

Appendix 2. U.S. Fish and Wildlife Service – Data Sheet for Dry Season Sample Analysis for Listed Large Branchiopods

Project Information

Project Name: Pure Water SD- MCAS Miramar Site
USFWS Project Number:
County: San Diego
Lat: 32°52'10"N
Long: 117° 10' 43" W
Quad: La Jolla
Township: 15 south
Range: 3 west
Section: unsectioned

Biologist Information

Name of Person(2) Who Conducted the Following Tasks and Permit Number(s):

Soil Collection: Amy Mattson (TE 778195-13)*
Soil Processing: Amy Mattson (TE 778195-13)x, Hannah Sadowski,* Summer Schlagter*
Soil Analysis/Cysts ID: Jason Kwong (TE 778195-13)
Soil Collection Date: 7/27/16 & 7/29/16

Pool/ Habitat/ Basin No.	Invertbrates Present (X)												Hydracarina Live	Nematoda	Collembola	Other Species	Comments
	Insect Exo-Skeletons	Micro-Turbellaria Cysts	Cladocera Ephippia	Ostracods Live/Cysts/ Carapaces	Copepods Live/Cysts	Number of Large Branchiopod Cysts: *Branchinecta* sp.	*Lepidurus packardi*	*Streptocephalus wootoni*	*Linderiella occidentalis*	*Lynceus brachyurus*	*Cyzicus californicus*						
PW81	—	—	—	—	—	6	—	—	—	—	—	—	—	—	—	—	Hatched to B. lindahli
PW82	—	—	—	—	—	8	—	—	—	—	—	—	—	—	—	—	Hatched to B. lindahli

* Authorized to conduct wet season fairy shrimp surveys. Also knowledgeable of the methods used for soil collection under 2017 guidelines
x Supervised Individual

Appendix 2. U.S. Fish and Wildlife Service – Data Sheet for Dry Season Sample Analysis for Listed Large Branchiopods

Project Information

Project Name: Pure Water SD - Mast Blvd Site
USFWS Project Number:
County: San Diego
Lat: 32° 51' 25" N
Long: 116° 57' 22" W
Quad: El Cajon
Township: 15 South
Range: 1 West
Section: Unsectioned

Biologist Information

Name of Person(2) Who Conducted the Following Tasks and Permit Number(s):

Soil Collection: Jason Kwong (TE 778195-13)
Soil Processing:
Soil Analysis/Cysts ID: Jason Kwong (TE 778195-13)
Soil Collection Date: 7/29/16

Pool/ Habitat/ Basin No.	Invertbrates Present (X)															Comments
	Insect Exo-Skeletons	Micro-Turbellaria Cysts	Cladocera Ephippia	Ostracods Live/Cysts/ Carapaces	Copepods Live/Cysts	Number of Large Branchiopod Cysts						Hydracarina Live	Nematoda	Collembola	Other Species	
						Branchinecta sp.	*Lepidurus packardi*	*Streptocephalus wootoni*	*Linderiella occidentalis*	*Lynceus brachyurus*	*Cyzicus californicus*					
RW53	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
RW54	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	↓
RW79	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	

Appendix 2. U.S. Fish and Wildlife Service – Data Sheet for Dry Season Sample Analysis for Listed Large Branchiopods

Project Information		Biologist Information	
Project Name: Pure Water SD - Pueblo North Site	Quad: Del Mar	Name of Person(2) Who Conducted the Following Tasks and Permit Number(s):	
USFWS Project Number:	Township: 15 South	Soil Collection: Jason Kwasny (TE 778195-13)	
County: San Diego	Range: 3 west	Soil Processing: Jason Kwasny (TE 778195-13)	
Lat: 32° 52' 57" N	Section: Unsectioned	Soil Analysis/Cysts ID: Jason Kwasny (TE 778195-13)	
Long: 117° 12' 00" W		Soil Collection Date: 6/17/16	

Pool/ Habitat/ Basin No.	Invertebrates Present (X)															Other Species	Comments
	Insect Exo-Skeletons	Micro-Turbellaria Cysts	Cladocera Ephippia	Ostracods Live/Cysts/ Carapaces	Copepods Live/Cysts	Number of Large Branchiopod Cysts						Hydracarina Live	Nematoda	Collembola		
						Branchinecta sp.	*Lepidurus packardi*	*Streptocephalus wootoni*	*Linderiella occidentalis*	*Lynceus brachyurus*	*Cyzicus californicus*					
1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
PW 55	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None
PW 56	–	–	–	–	–	110	–	–	–	–	–	–	–	–	–	Hatched to B. lindahli
PW 57	–	–	–	–	–	47	–	–	–	–	–	–	–	–	–	Hatched to B. lindahli
PW 58	–	–	–	–	–	56	–	–	–	–	–	–	–	–	–	Hatched to B. lindahli
PW 59	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	None

Appendix 2. U.S. Fish and Wildlife Service – Data Sheet for Dry Season Sample Analysis for Listed Large Branchiopods

Project Information

Project Name: Pure Water SD - Pueblo Central Site
USFWS Project Number:
County: San Diego
Lat: 32° 52' 25" N
Long: 117° 11' 43" W
Quad: La Jolla & Del Mar
Township: 15 South
Range: 3 west
Section: Unsectioned

Biologist Information

Name of Person(2) Who Conducted the Following Tasks and Permit Number(s):
Soil Collection: Amy Mattson (TE 778195)*
Soil Processing: Hannah Sadowski X
Soil Analysis/Cysts ID: Jason Kurnow (TE 778195)
Soil Collection Date: 8/1/16

Pool/ Habitat/ Basin No.	Invertebrates Present (X)															Comments
	Insect Exo-Skeletons	Micro-Turbellaria Cysts	Cladocera Ephippia	Ostracods Live/Cysts/ Carapaces	Copepods Live/Cysts	Number of Large Branchiopod Cysts						Hydracarina Live	Nematoda	Collembola	Other Species	
						Branchinecta sp.	*Lepidurus packardi*	*Streptocephalus wootoni*	*Linderiella occidentalis*	*Lynceus brachyurus*	*Cyzicus californicus*					
PW 60	—	—	—	—	—	123	—	—	—	—	—	—	—	—	—	None
PW 61	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
PW 62	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
PW 63	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
PW 64	—	—	—	—	—	14	—	—	—	—	—	—	—	—	—	
PW 65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
PW 66	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
PW 67	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

* Authorized to conduct wet season fairy shrimp surveys. Also knowledgeable of the methods used for soil collection under 2017 guidance
X Supervised Individual

Appendix 2. U.S. Fish and Wildlife Service – Data Sheet for Dry Season Sample Analysis for Listed Large Branchiopods

Project Information

Project Name: Pure Water SD - Pueblo South Site
USFWS Project Number:
County: San Diego
Lat: 32°52' 12" N
Long: 117° 11' 31" W
Quad: La Jolla
Township: 15 south
Range: 3 west
Section: unsectioned

Biologist Information

Name of Person(2) Who Conducted the Following Tasks and Permit Number(s):
Soil Collection: Amy Mattson (TE 778195-13)*
Soil Processing: Hannah Sadowski X
Soil Analysis/Cysts ID: Jason Kurnow (TE 778195-13)
Soil Collection Date: 8/1/16

Pool/ Habitat/ Basin No.	Invertbrates Present (X)															Comments
	Insect Exo-Skeletons	Micro-Turbellaria Cysts	Cladocera Ephippia	Ostracods Live/Cysts/ Carapaces	Copepods Live/Cysts	Number of Large Branchiopod Cysts: *Branchinecta* sp.	*Lepidurus packardi*	*Streptocephalus wootoni*	*Linderiella occidentalis*	*Lynceus brachyurus*	*Cyzicus californicus*	Hydracarina Live	Nematoda	Collembola	Other Species	
PW 68	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	None
PW 69	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
PW 70	—	—	—	—	—	27	—	—	—	—	—	—	—	—	—	
PW 71	—	—	—	—	—	107	—	—	—	—	—	—	—	—	—	
PW 72	—	—	—	—	—	455	—	—	—	—	—	—	—	—	—	
PW 73	—	—	—	—	—	45		—	—	—	—	—	—	—	—	
PW 74	—	—	—	—	—	91	—	—	—	—	—	—	—	—	—	
PW 75	—	—	—	—	—	14	—	—	—	—	—	—	—	—	—	

* Authorized to conduct wet season fairy shrimp surveys. Also knowledgeable of the methods used for soil collection under 2015 guidelines
X Supervised Individual

Appendix C1

CULTURE RESULTS OF SOIL SAMPLES COLLECTED FROM THE PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT (MCAS MIRAMAR SITE), SAN DIEGO, CALIFORNIA

The University of Kansas

Kansas Biological Survey

13 October 2016

Shelby Howard
HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
Suite 200
La Mesa, CA 91942

SUBJECT: Culture Results of Soil Samples Collected from the Pure Water San Diego Program North City Water Purification Project (MCAS Miramar Site), San Diego, California.

Dear Mr. Howard,

HELIX Environmental Planning, Inc. (HELIX) biologists collected soil samples from 12 potential special status shrimp habitats within the MCAS Miramar site associated with the City of San Diego's Pure Water San Diego Program North City Water Purification Project, San Diego County, California. Soil samples were collected from previously identified habitat determined to contain anostracan eggs, which were judged to be potentially suitable for special status shrimp species. All cultures produced the nonlisted fairy shrimp *Branchinecta lindahli*.

Kansas Biological Survey understands that HELIX will submit this report and all other pertinent materials and information to the US Fish and Wildlife Service (USFWS), and the California Department of Fish and Wildlife (CDFW), as required by the USFWS guidelines for a protocol level survey.

Definitions

For the purpose of this report, special status shrimp are defined to include shrimp species listed as threatened or endangered under the federal Endangered Species Act (ESA) (50 CFR 17.11 for listed animals and various Federal Register notices for proposed species). Two special status fairy shrimp species (*Branchinecta sandiegonensis* Fugate, 1993, and *Streptocephalus woottoni* Eng, Belk, & Eriksen, 1990) have the potential to occur within the vicinity of the MCAS Miramar project site. In addition, the nonlisted fairy shrimp species *Branchinecta lindahli* Packard, 1883 is known from the site vicinity.

Methods

HELIX collected dry soil samples from 12 potential special status shrimp habitats at the MCAS Miramar site. These 12 habitats are identified as PW28, PW 29, PW 43, PW46, PW47, PW48, PW49, PW50, PW52, PW80, PW81, and PW 82. The soil samples were placed in a plastic ziplock bag, labeled with the locality number, and submitted to the Kansas Biological Survey laboratory for culture.

Laboratory Analysis

The soil was prepared for examination in the laboratory by dissolving the clumps of soil in distilled water. Adult shrimp were reared from the recovered eggs using methods following U.S. Environmental Protection Agency (1985), Belk, et al. (1990), Maeda-Martinez, et al., (1995a and 1995b), and Jawahar & Dumont (1995). Hatched shrimp were fed a standard *Daphnia* food that includes; fish food, fish oil, baker's yeast, and the alga *Selenastrum capricornutum*. The shrimp were reared to maturity. Adult *Branchinecta* reared from culture were killed in 90% ethyl alcohol, and examined under a stereo dissection microscope. Identifications were made based upon comparisons with specimens in our collections, the original species descriptions and professional experience.

Results

The nonlisted fairy shrimp *Branchinecta lindahli* was cultured from all 12 samples (PW28, PW 29, PW 43, PW46, PW47, PW48, PW49, PW50, PW52, PW80, PW81, and PW 82).

If you have any questions please call me.

Sincerely,

D. Christopher Rogers
785.864.1714
Crustacean Taxonomist and Ecologist
Kansas Biological Survey and The Biodiversity Institute
Kansas University, Higuchi Hall
2101 Constant Avenue, Lawrence, KS 66047-3759 USA

Literature Cited

Belk, D., G. Anderson & S-Y. Hsu. 1990. Additional observations on variations in egg size among populations of *Streptocephalus sealii* (Anostraca). Journal of Crustacean Biology 10: 128-133.

Federal Register. 1994. 19 September: Fish & Wildlife Service, Interior. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status and Withdrawal of Proposal to Give Endangered Status; Final Rule and Proposed Rule; 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. 59 CFR (17): 48153-48185.

Jawahar, A. & H. J. Dumont. 1995. Larviculture of the fairy shrimp, *Streptocephalus probocideus* (Crustacea: Anostraca): effect of food concentration and physical and chemical properties of the culture medium. Hydrobiologia 298: 159-165.

Maeda-Martinez, A. M., H. Obregón-Barboza & H. J. Dumont. 1995a. Food-dependant color patterns in *Thamnocephalus platyurus* Packard (Branchiopoda: Anostraca); a laboratory study. Hydrobiologia 298: 133-139.

Maeda-Martinez, A. M., H. Obregón-Barboza & H. J. Dumont. 1995b. Laboratory culture of fairy shrimps using baker's yeast as basic food in a flow-through system. Hydrobiologia 298: 141-157.

U. S. Environmental Protection Agency. 1985. Methods for measuring the acute toxicity of effluents too freshwater and marine organisms. EPA/600/4-85/013/. Environmental Research Laboratory, Duluth, MN, 216 pp.

U. S. Fish & Wildlife Service. 1996. Interim Survey Guidelines to Permittees for Recovery Permits under the Endangered Species Act for the Listed Vernal Pool Branchiopods. Sacramento, CA.

Appendix C2

CULTURE RESULTS OF SOIL SAMPLES COLLECTED FROM THE PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT (PUEBLO NORTH SITE), SAN DIEGO, CALIFORNIA

The University of Kansas

Kansas Biological Survey

16 August 2016

Shelby Howard
HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
Suite 200
La Mesa, CA 91942

SUBJECT: Culture Results of Soil Samples Collected from the Pure Water San Diego Program North City Water Purification Project (Pueblo North Site), San Diego, California.

Dear Mr. Howard,

HELIX Environmental Planning, Inc. (HELIX) biologists collected 3 soil samples from potential special status shrimp habitats within the Pueblo North site associated with the City of San Diego's Pure Water San Diego Program North City Water Purification Project, San Diego County, California. Soil samples were collected from previously identified habitat determined to contain anostracan eggs, which were judged to be potentially suitable for special status shrimp species. All cultures produced the nonlisted fairy shrimp *Branchinecta lindahli*.

Kansas Biological Survey understands that HELIX will submit this report and all other pertinent materials and information to the US Fish and Wildlife Service (USFWS), and the California Department of Fish and Wildlife (CDFW), as required by the USFWS guidelines for a protocol level survey.

Definitions

For the purpose of this report, special status shrimp are defined to include shrimp species listed as threatened or endangered under the federal Endangered Species Act (ESA) (50 CFR 17.11 for listed animals and various Federal Register notices for proposed species). Two special status fairy shrimp species (*Branchinecta sandiegonensis* Fugate, 1993, and *Streptocephalus woottoni* Eng, Belk, & Eriksen, 1990) have the potential to occur within the vicinity of the Pueblo North site. In addition, the nonlisted fairy shrimp species *Branchinecta lindahli* Packard, 1883 is known from the proposed site vicinity.

Methods

HELIX collected dry soil samples from 3 potential special status shrimp habitats at the Pueblo North site. These three habitats are identified as PW55, PW56, and PW 57. The soil samples were placed in a plastic ziplock bag, labeled with the locality number, and submitted to the Kansas Biological Survey laboratory for culture.

Laboratory Analysis

Higuchi Hall • 2101 Constant Ave., Room 108 • Lawrence, KS 66047-3759
(785) 864-1500 • Fax: (785) 864-1534 • www.kbs.ku.edu

The soil was prepared for examination in the laboratory by dissolving the clumps of soil in distilled water. Adult shrimp were reared from the recovered eggs using methods following U.S. Environmental Protection Agency (1985), Belk, et al. (1990), Maeda-Martinez, et al., (1995a and 1995b), and Jawahar & Dumont (1995). Hatched shrimp were fed a standard *Daphnia* food that includes; fish food, fish oil, baker's yeast, and the alga *Selenastrum capricornutum*. The shrimp were reared to maturity. Adult *Branchinecta* reared from culture were killed in 90% ethyl alcohol, and examined under a stereo dissection microscope. Identifications were made based upon comparisons with specimens in our collections, the original species descriptions and professional experience.

Results

The nonlisted fairy shrimp *Branchinecta lindahli* was cultured from all three samples (PW 55, PW 56, and PW 57).

If you have any questions please call me.

Sincerely,

D. Christopher Rogers
785.864.1714
Crustacean Taxonomist and Ecologist
Kansas Biological Survey and The Biodiversity Institute
Kansas University, Higuchi Hall
2101 Constant Avenue, Lawrence, KS 66047-3759 USA

Literature Cited

Belk, D., G. Anderson & S-Y. Hsu. 1990. Additional observations on variations in egg size among populations of *Streptocephalus sealii* (Anostraca). Journal of Crustacean Biology 10: 128-133.

Federal Register. 1994. 19 September: Fish & Wildlife Service, Interior. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status and Withdrawal of Proposal to Give Endangered Status; Final Rule and Proposed Rule; 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. 59 CFR (17): 48153-48185.

Jawahar, A. & H. J. Dumont. 1995. Larviculture of the fairy shrimp, *Streptocephalus probocideus* (Crustacea: Anostraca): effect of food concentration and physical and chemical properties of the culture medium. Hydrobiologia 298: 159-165.

Maeda-Martinez, A. M., H. Obregón-Barboza & H. J. Dumont. 1995a. Food-dependant color patterns in *Thamnocephalus platyurus* Packard (Branchiopoda: Anostraca); a laboratory study. Hydrobiologia 298: 133-139.

Maeda-Martinez, A. M., H. Obregón-Barboza & H. J. Dumont. 1995b. Laboratory culture of fairy shrimps using baker's yeast as basic food in a flow-through system. Hydrobiologia 298: 141-157.

U. S. Environmental Protection Agency. 1985. Methods for measuring the acute toxicity of effluents too freshwater and marine organisms. EPA/600/4-85/013/. Environmental Research Laboratory, Duluth, MN, 216 pp.

U. S. Fish & Wildlife Service. 1996. Interim Survey Guidelines to Permittees for Recovery Permits under the Endangered Species Act for the Listed Vernal Pool Branchiopods. Sacramento, CA.

Higuchi Hall • 2101 Constant Ave., Room 108 • Lawrence, KS 66047-3759
(785) 864-1500 • Fax: (785) 864-1534 • www.kbs.ku.edu

Appendix D

DRY SEASON/HATCHING RESULTS TABLES

Appendix D
DRY SEASON/HATCHING RESULTS TABLES

Table D-1
DRY SEASON/HATCHING RESULTS FOR SANDER EAST

Basin	*Branchinecta* sp. Present	Abundance[1]	Hatching Results	*Streptocephalus* sp. Present	Abundance
PW1	No	---	---	No	---
PW2	No	---	---	No	---
PW3	No	---	---	No	---
PW4	No	---	---	No	---
PW5	No	---	---	No	---
PW6	No	---	---	No	---
PW7	No	---	---	No	---
PW8	No	---	---	No	---
PW9	No	---	---	No	---
PW10	Yes	Low	Not Hatched	No	---
PW11	Yes	Medium	Not Hatched	No	---
PW12	No	---	---	No	---
PW13	Yes	Low	Not Hatched	No	---
PW14	No	---	---	No	---
PW15	No	---	---	No	---
PW16	Yes	Medium	Not Hatched[2]	No	---
PW17	No	---	---	No	---
PW18	No	---	---	No	---
PW19	No	---	---	No	---
PW20	No	---	---	No	---
PW21	No	---	---	No	---
PW22	No	---	---	No	---
PW23	No	---	---	No	---
PW24	No	---	---	No	---
PW25	Yes	High	Not Hatched[2]	No	---
PW26	No	---	---	No	---
PW27	No	---	---	No	---
PW78	No	---	---	No	---

[1] Low (estimate of 1-10 cysts/100 mL soil); Medium (estimate of 11-50 cysts/100 mL soil); and High (estimate of more than 50 cysts/100 mL of soil)

[2] Hatching was not conducted for Sander East. Wet season sampling from 2015/2016 previously detected *Branchinecta sandiegonensis* in Basins PW 16 and PW 25.

Table D-2
DRY SEASON/HATCHING RESULTS FOR MCAS MIRAMAR

Basin	*Branchinecta* sp. Present	Abundance[1]	Hatching Results[2]	*Streptocephalus* sp. Present	Abundance
PW28	Yes	Low	*B. lindahli*	No	---
PW29	Yes	Low	*B. lindahli*	No	---
PW30	No	---	---	No	---
PW31	Yes	Low	Not Hatched[2]	No	---
PW32	No	---	---	No	---
PW33	Yes	Low	Not Hatched[2]	No	---
PW34	Yes	Low	Not Hatched[2]	No	---
PW35	Yes	Low	Not Hatched[2]	No	---
PW36	Yes	Low	Not Hatched[2]	No	---
PW37	Yes	Low	Not Hatched[2]	No	---
PW38	Yes	Low	Not Hatched[2]	No	---
PW39	Yes	Low	Not Hatched[2]	No	---
PW40	No	---	---	No	---
PW41	Yes	Medium	Not Hatched[2]	No	---
PW42	No	---	---	No	---
PW43	Yes	Low	*B. lindahli*	No	---
PW44	No	---	---	No	---
PW45	No	---	---	No	---
PW46	Yes	Low	*B. lindahli*	No	---
PW47	Yes	Low	*B. lindahli*	No	---
PW48	Yes	Low	*B. lindahli*	No	---
PW49	Yes	Low	*B. lindahli*	No	---
PW50	Yes	Low	*B. lindahli*	No	---
PW51	No	---	---	No	---
PW52	Yes	Low	*B. lindahli*	No	---
PW76	No	---	---	No	---
PW77	No	---	---	No	---
PW80	Yes	Low	*B. lindahli*	No	---
PW81	Yes	Low	*B. lindahli*	No	---
PW82	Yes	Low	*B. lindahli*	No	---

[1] Low (estimate of 1-10 cysts/100 mL soil); Medium (estimate of 11-50 cysts/100 mL soil); and High (estimate of more than 50 cysts/100 mL of soil)

[2] Hatching was not conducted for basins where San Diego fairy shrimp were detected during wet season surveys. Cysts from these basins are assumed to be from San Diego fairy shrimp.

Table D-3
DRY SEASON/HATCHING RESULTS FOR MAST BOULEVARD

Basin	*Branchinecta* sp. Present	Abundance	Hatching Results	*Streptocephalus* sp. Present	Abundance
PW53	No	---	---	No	---
PW54	No	---	---	No	---
PW79	No	---	---	No	---

Table 4
PURE WATER SAN DIEGO PROGRAM NORTH CITY WATER PURIFICATION PROJECT
DRY SEASON/HATCHING RESULTS FOR PUEBLO NORTH

Basin	*Branchinecta* sp. Present	Abundance[1]	Hatching Results	*Streptocephalus* sp. Present	Abundance
1	No	---	---	No	---
5	No	---	---	No	---
6	No	---	---	No	---
7	No	---	---	No	---
8	No	---	---	No	---
9	No	---	---	No	---
PW55	Yes	Low	*B. lindahli*	No	---
PW56	Yes	Low	*B. lindahli*	No	---
PW57	Yes	Low	*B. lindahli*	No	---
PW58	No	---	---	No	---
PW59	No	---	---	No	---

[1] Low (estimate of 1-10 cysts/100 mL soil); Medium (estimate of 11-50 cysts/100 mL soil); and High (estimate of more than 50 cysts/100 mL of soil)

Table D-5
DRY SEASON/HATCHING RESULTS FOR PUEBLO CENTRAL

Basin	*Branchinecta* sp. Present	Abundance[1]	Hatching Results[2]	*Streptocephalus* sp. Present	Abundance
PW60	Yes	Low	Not Hatched	No	---
PW61	No	---	---	No	---
PW62	No	---	---	No	---
PW63	No	---	---	No	---
PW64	Yes	Low	Not Hatched	No	---
PW65	No	---	---	No	---
PW66	No	---	---	No	---
PW67	No	---	---	No	---

[1] Low (estimate of 1-10 cysts/100 mL soil); Medium (estimate of 11-50 cysts/100 mL soil); and High (estimate of more than 50 cysts/100 mL of soil)
[2] Hatching was not conducted for Pueblo Central.

Table D-6
DRY SEASON/HATCHING RESULTS FOR PUEBLO SOUTH

Basin	*Branchinecta* sp. Present	Abundance[1]	Hatching Results[2]	*Streptocephalus* sp. Present	Abundance
PW68	No	---	---	No	---
PW69	No	---	---	No	---
PW70	Yes	Low	Not Hatched	No	---
PW71	Yes	Medium	Not Hatched	No	---
PW72	Yes	Medium	Not Hatched[2]	No	---
PW73	Yes	Low	Not Hatched[2]	No	---
PW74	Yes	Low	Not Hatched[2]	No	---
PW75	Yes	Low	Not Hatched[2]	No	---

[1] Low (estimate of 1-10 cysts/100 mL soil); Medium (estimate of 11-50 cysts/100 mL soil); and High (estimate of more than 50 cysts/100 mL of soil)
[2] Hatching was not conducted for Pueblo South. Wet season sampling from 2015/2016 previously detected *Branchinecta sandiegonensis* in Basins PW72, PW73, PW74, and PW75.