2019 ANNUAL RARE PLANT SURVEY
Fort Ord Natural Reserve Operable Unit 1, Operable Unit Carbon Tetrachloride Plume, Operable Unit 2, & Fort Ord Dunes State Park Sites 2/12

CONTRACT NO. W91238-14-D-0010-F0015

FORMER FORT ORD

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Burleson Consulting Inc.
Woman-Owned Small Business
Environmental Services

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ACRONYMS AND ABBREVIATIONS

Ahtna	Ahtna Environmental, Inc.
BRAC	Base Realignment and Closure Division
Burleson	Burleson Consulting, Inc.
CNDDB	California Natural Diversity Database
CT	Carbon tetrachloride
DD&A	Denise Duffy & Associates
EISB	Enhanced In Situ Bioremediation
FODSP	Fort Ord Dunes State Park
FONR	Fort Ord Natural Reserve
ft^2	square feet
HGL	HydroGeoLogic, Inc.
HMP	Habitat Management Plan
in	inches
NWTS	Northwest Treatment System
OU1	Operable Unit 1
OU2	Operable Unit 2
OUCTP	Operable Unit Carbon Tetrachloride Plume
PBO	Programmatic Biological Opinion
TCE	Trichloroethene
UC	University of California
USACE	United States Army Corps of Engineers

1. INTRODUCTION

Burleson Consulting Inc. (Burleson) was issued Task Order W91238-14-D-0010-F0015 by the United States Army Corps of Engineers (USACE) to survey rare plants in Fort Ord Natural Reserve (FONR) and Fort Ord Dunes State Park at former Fort Ord in Marina, California (see Figure 1-1). This report summarizes the 2019 rare plant survey results for Year 2 surveys in Operable Unit 1 (OU1); Year 1 surveys in Operable Unit Carbon Tetrachloride Plume (OUCTP), Operable Unit 2 (OU2), and Sites 2/12 in Fort Ord Dunes State Park (FODSP); and a reference site survey.

The Fort Ord U.S. Army Base was closed in 1994 and a portion of former Fort Ord was transferred to the University of California (UC). Fort Ord Natural Reserve was established in 1996 as part of the UC Natural Reserve system. Fort Ord Dunes State Park was established in 2009 when the Army transferred land to California State Parks. Groundwater in the aquifer under FONR and FODSP was contaminated with trichloroethene (TCE), carbon tetrachloride (CT), and other chemicals of concern due to activities conducted at the former Fort Ord Fritzsche Army Airfield Fire Drill Area between 1962 and 1985. Groundwater cleanup began in 1988 with the construction of the Groundwater Extraction and Treatment System and is ongoing.

The *Installation-Wide Multispecies Habitat Management Plan* (HMP) and the reinitiated *Programmatic Biological Opinion* (PBO) *for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord* require that rare plant surveys be conducted for three years after destruction or installation of remediation facilities to ensure that project activities protect and maintain special-status species (USACE, 1997; USFWS, 2015; USFWS, 2017). The two rare plants of concern in FONR and FODSP are sand gilia (*Gilia tenuiflora* ssp. *arenaria*) and Monterey spineflower (*Chorizanthe pungens* var. *pungens*). Yadon's piperia (*Piperia yadonii*) was not initially surveyed but was added to the survey in 2016 at the request of the agencies in accordance with the 2017 PBO.

Burleson was contracted by USACE to conduct rare plant surveys for a reference site, OU1 (Year 2), and OUCTP, OU2, and Sites 2/12 (Year 1; see Table 1-1). The OU1 survey area consisted of 27 wells, secondary access routes, and the Northwest Treatment System (NWTS) which were decommissioned in 2017. OU1 Year 1 surveys were conducted in 2018 by Burleson and Baseline surveys (Year 0) were conducted in 2017 by Denise Duffy & Associates (DD&A) as a subcontractor to HydroGeoLogic, Inc. (HGL; HGL, 2018; Burleson, 2018). The OUCTP, OU2, and Sites 2/12 survey areas consisted of six wells and secondary access routes; three of which were installed and three were decommissioned in 2018. Baseline surveys (Year 0) for OUCTP, OU2, and Sites 2/12 were conducted in 2018 by DD&A as a subcontractor to Ahtna Environmental, Inc (Ahtna; Ahtna, 2018).

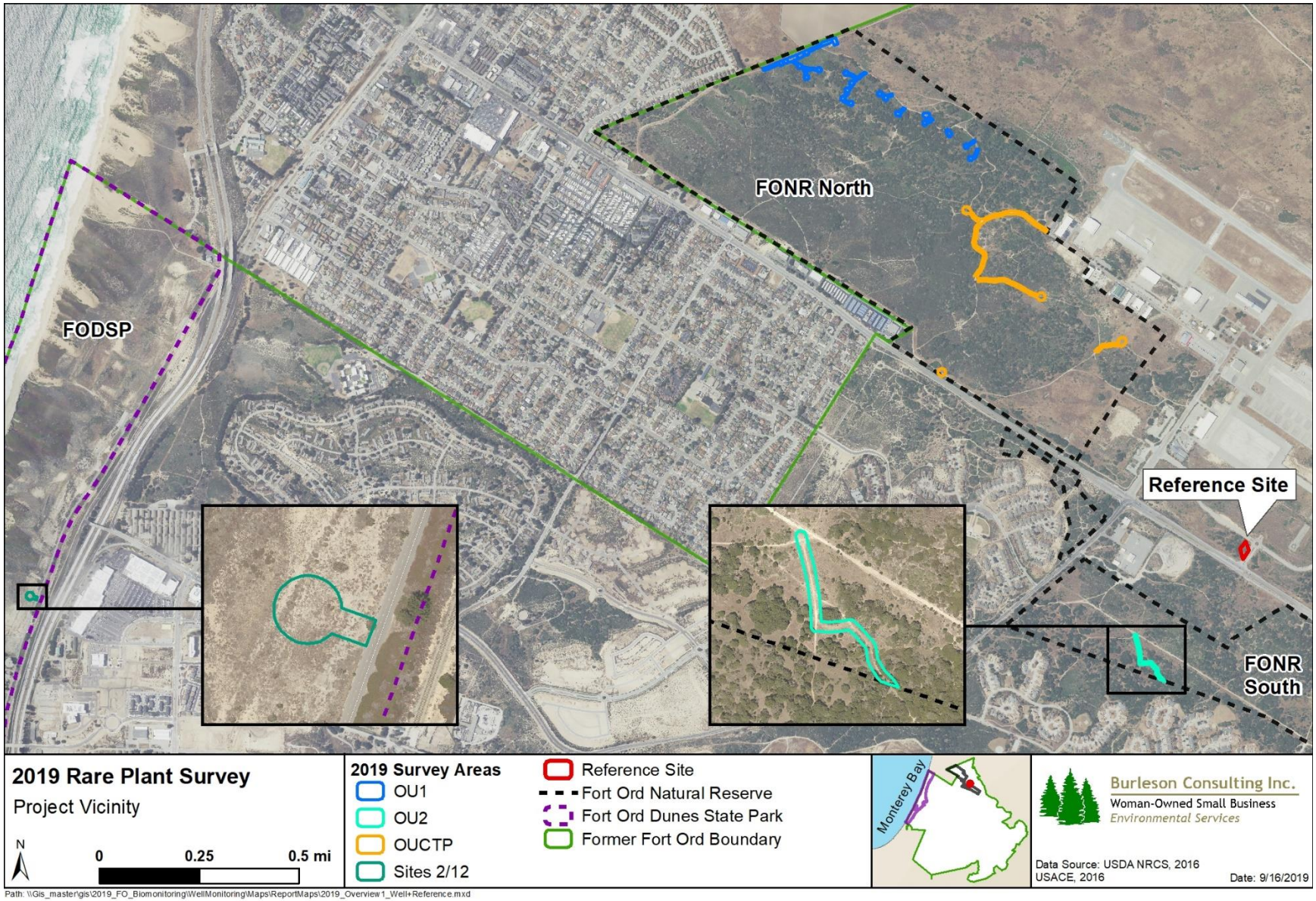


Figure 1-1. Project Vicinity

Table 1-1. Well Locations Surveyed in 2019

Year Decommissioned	Location	Unit	Well Identification	Survey Year
2017	FONR North	OU1	IW-OU1-02-A	2
2017	FONR North	OU1	PZ-OU1-02-A1	2
2017	FONR North	OU1	MW-OU1-46-A	2
2017	FONR North	OU1	MW-OU1-46-AD	2
2017	FONR North	OU1	EW-OU1-49-A	2
2017	FONR North	OU1	PZ-OU1-49-A1	2
2017	FONR North	OU1	MW-OU1-50-A	2
2017	FONR North	OU1	EW-OU1-52-A	2
2017	FONR North	OU1	EW-OU1-53-A	2
2017	FONR North	OU1	MW-OU1-57-A	2
2017	FONR North	OU1	MW-OU1-58-A	2
2017	FONR North	OU1	MW-OU1-59-A	2
2017	FONR North	OU1	EW-OU1-60-A	2
2017	FONR North	OU1	MW-OU1-61-A	2
2017	FONR North	OU1	EW-OU1-62-A	2
2017	FONR North	OU1	EW-OU1-63-A	2
2017	FONR North	OU1	EW-OU1-66-A	2
2017	FONR North	OU1	MW-OU1-67-A	2
2017	FONR North	OU1	EW-OU1-71-A	2
2017	FONR North	OU1	EW-OU1-72-A	2
2017	FONR North	OU1	IW-OU1-73-A	2
2017	FONR North	OU1	IW-OU1-74-A	2
2017	FONR North	OU1	MW-OU1-82-A	2
2017	FONR North	OU1	MW-OU1-83-A	2
2017	FONR North	OU1	MW-OU1-84-A	2
2017	FONR North	OU1	MW-OU1-85-A	2
2017	FONR North	OU1	MW-OU1-88-A	2
2018 (Installation)	FONR North	OUCTP	MW-BW-93-A	1
2018 (Installation)	FONR North	OUCTP	MW-BW-94-A	1
2018 (Installation)	FONR North	OUCTP	MW-BW-95-A	1
2018	FONR North	OUCTP	MW-BW-29-180	1
2018	FONR South	OU2	MW-OU2-59-A	1
2018	FODSP	Sites 2/12	MW-02-12-180	1

1.1 Site Location and Description

Fort Ord Natural Reserve is 605 acres of coast live oak woodland, coastal scrub, maritime chaparral, and annual grassland. The property is divided into two parcels, FONR North and FONR South. Fort Ord Dunes State Park is approximately 980 acres of beach strand and sand dunes. FONR and FODSP provide suitable habitat for several rare plant species including sand gilia and Monterey spineflower. Yadon's piperia prefers maritime chaparral, Monterey pine forest, and Monterey cypress forest; it was included in rare plant surveys beginning in 2016 per agencies request.

1.1.1 Reference Site

The reference site is located southeast of FONR North and was established by DD&A in 2010 due to its known populations of sand gilia and Monterey spineflower and easy accessibility (see Figure 1-2; HGL, 2011). The dominant habitat type of the reference site is coast live oak woodland with patches of annual grasslands that support populations of Monterey spineflower and sand gilia. It is bounded on three sides by paved roads (Reservation Road, MBEST Drive, and University Drive).

1.1.2 Operable Unit 1 Survey Area (Year 2)

USACE constructed a groundwater extraction and treatment system in 1988 to remediate TCE and other contaminants in OU1. In 2004, HGL took over remediation efforts and constructed the NWTS. Groundwater sampling in 2014 indicated that concentrations of chemicals of concern were below cleanup targets; OU1 officially met cleanup criteria and was approved by the agencies in 2016 (HGL, 2015; HGL, 2016a; HGL, 2016b). OU1 remediation facilities were decommissioned and destroyed in a phased approach in 2011, 2014, and 2017; all aboveground components of the OU1 remediation system were removed by July 2017 (HGL, 2018). Twenty-seven wells decommissioned in 2017 were surveyed in OU1 in the northwestern portion of FONR North (see Figure 1-3).

1.1.3 Operable Unit 2, OUCTP, and Sites 2/12 Survey Areas (Year 1)

Cleanup of groundwater in OUCTP is underway; the chemicals of concern are CT, tetrachloroethene, chloroform, 1,1-dichloroethene, total-1,2-dichloroethene, methylene chloride, vinyl chloride, and TCE. In 2016, the Enhanced In Situ Bioremediation (EISB) Deployment Area was constructed to treat groundwater in OUCTP (Ahtna, 2018). USACE contracted with Ahtna in 2014 to monitor groundwater gradients and implement additional EISB deployment areas if necessary.

Wells in the OUCTP, OU2, and Sites 2/12 survey areas were either decommissioned or installed in 2018 (see Figure 1-4). One decommissioned well and three newly installed wells were surveyed in OUCTP in the eastern half of FONR North. The one decommissioned well in OU2 was located in the western half of FONR South outside the FONR property boundary (MW-OU2-59-A) and only the secondary access route was surveyed. One decommissioned well was surveyed at Sites 2/12.

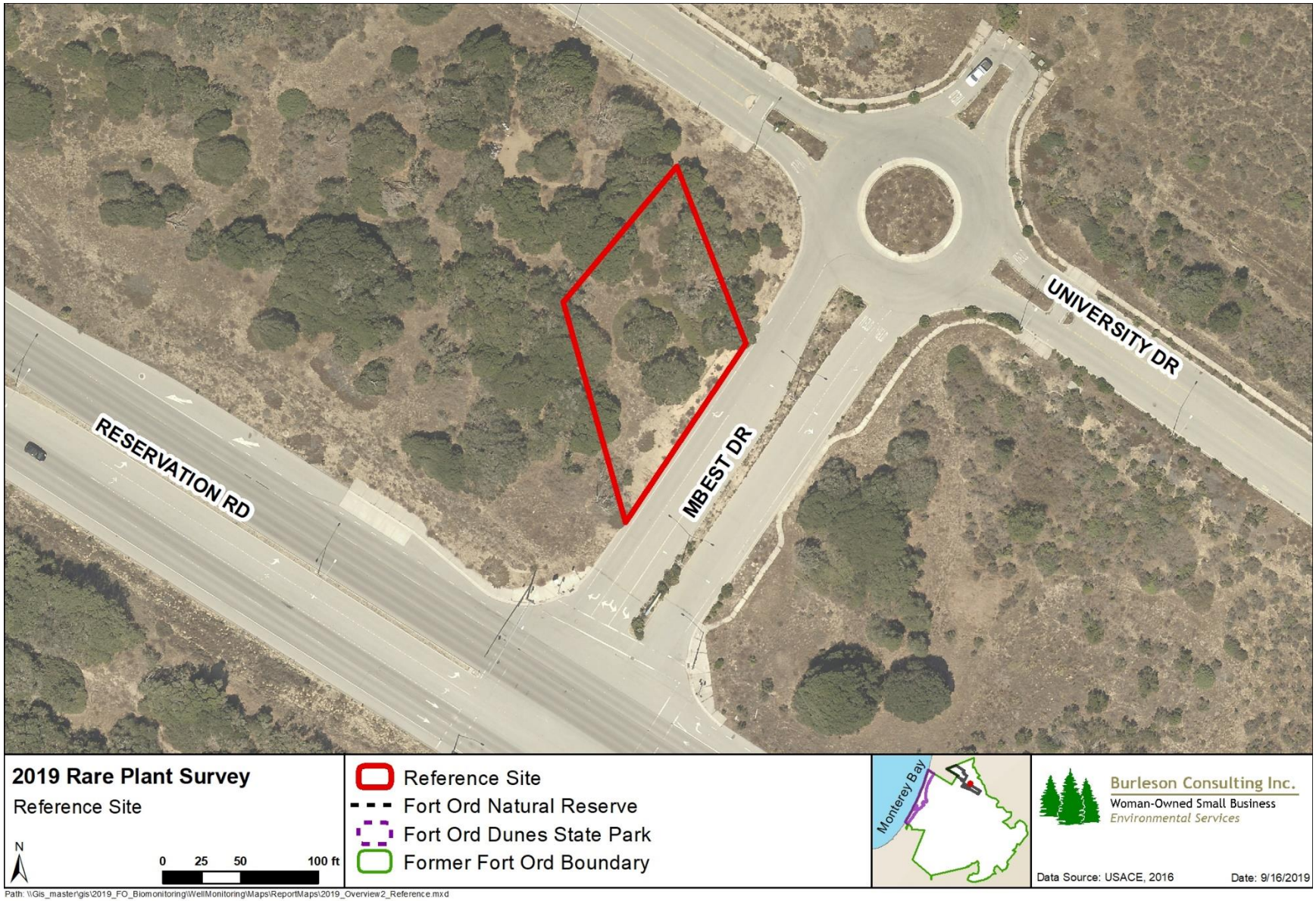


Figure 1-2. Reference Site Overview

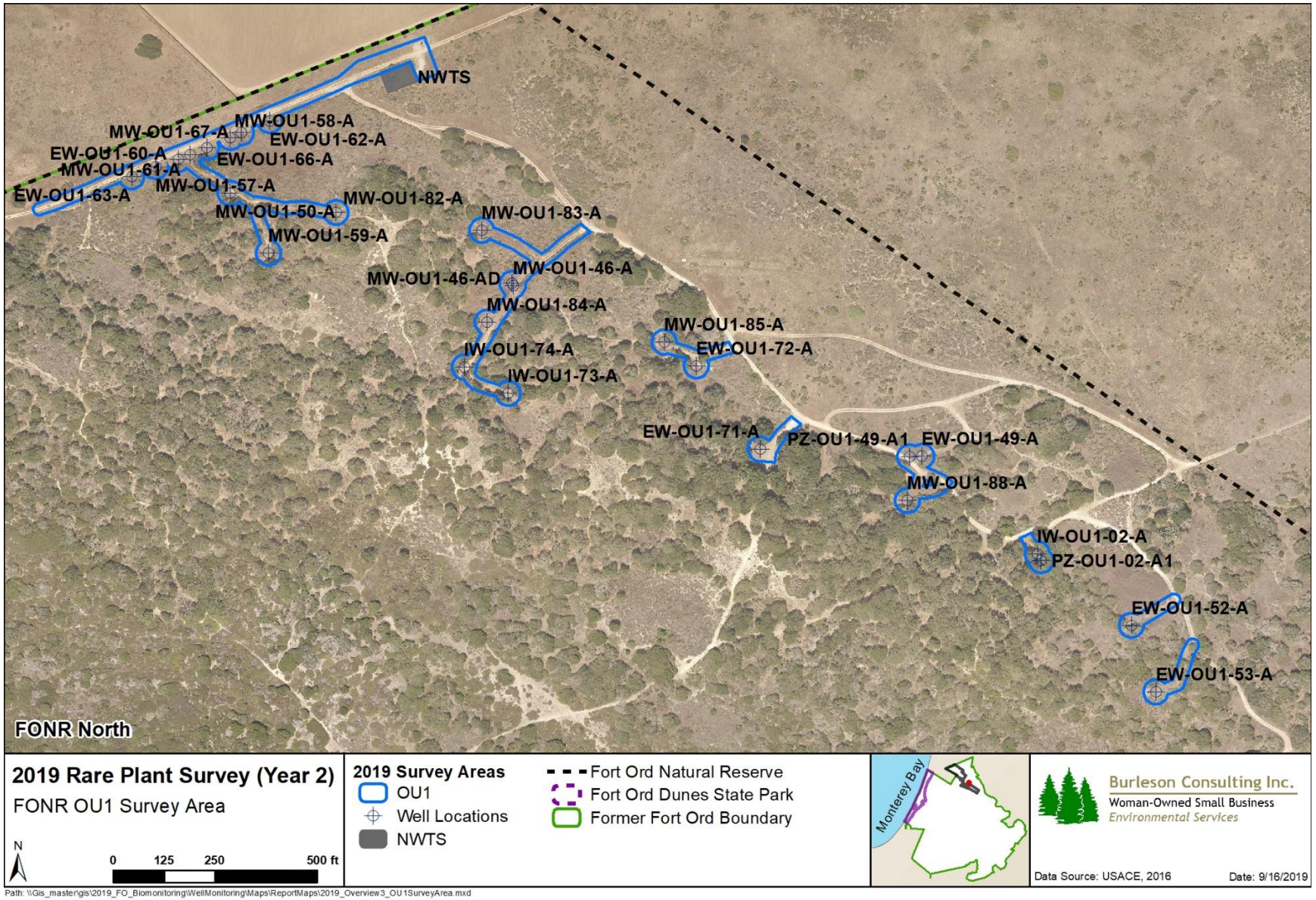


Figure 1-3. OU1 Survey Area Overview

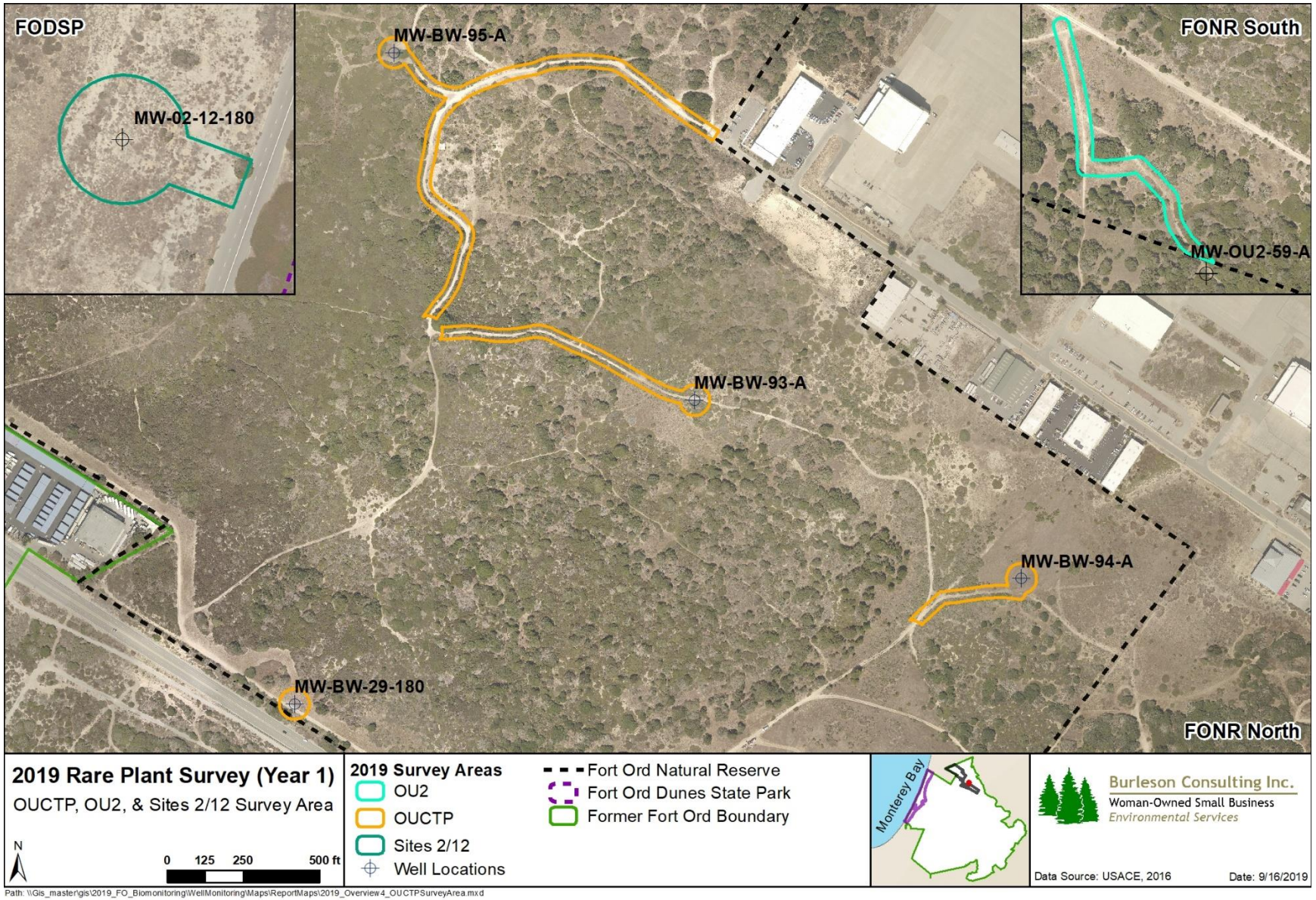


Figure 1-4. OUCTP, OU2, and Sites 2/12 Survey Area Overview

1.2 Special Status Species

1.2.1 Sand Gilia

Sand gilia is a native annual herb in the phlox family (*Polemoniaceae*). It is listed as state Threatened and federally Endangered (CNDDB, 2019). Sand gilia occurs in open sandy soil in maritime chaparral, dune scrub, coastal scrub, and disturbed areas. The plant forms a prostrate, basal rosette with serrate or once pinnate leaves (Porter, 2018). The branching flowering stalks range from two to six inches (in) tall and are densely glandular. The plant blooms from April through June and the flower consists of a narrow tube with a purple throat and pink to purple lobes. Sand gilia is endemic to Monterey Bay. The California Natural Diversity Database (CNDDB) lists 29 occurrences in Monterey County, four of which are extirpated (CNDDB, 2019).

1.2.2 Monterey Spineflower

Monterey spineflower is a native annual herb in the buckwheat family (*Polygonaceae*). It is listed as federally Threatened (CNDDB, 2019). Monterey spineflower occurs in open sandy soil in maritime chaparral, dune scrub, coastal scrub, and disturbed areas. The plant is prostrate with dense inflorescences and a white to pink corolla; it blooms from April to June (Reveal and Rosatti, 2014). Monterey spineflower may be confused with diffuse spineflower (*Chorizanthe diffusa*) except that diffuse spineflower has a lemon-yellow floral tube and an upright inflorescence. The CNDDB lists 51 occurrences in Monterey County, two of which are possibly extirpated and one which is extirpated (CNDDB, 2019).

1.2.3 Yadon's Piperia

Yadon's piperia is a native perennial herb in the orchid family (*Orchidaceae*). It is listed as federally Endangered (CNDDB, 2019). Yadon's piperia occurs in maritime chaparral, Monterey pine forest, and Monterey cypress forest. The plant has two to three basal leaves and a single erect flowering stalk (Ackerman and Lauri, 2013). The white flowers are distinguished from other piperia species by the short, downward facing spur. Yadon's piperia blooms from May to August. The CNDDB lists 26 occurrences in Monterey County, one of which is possibly extirpated (CNDDB, 2019).

1.3 Survey Objectives

The objectives of the 2019 rare plant surveys (Year 1 and Year 2) were to:

1. Identify locations and estimate populations of selected rare plants at a reference site near FONR.
2. Identify locations and estimate populations of selected rare plants at twenty-seven 2017 well destruction sites, secondary access routes, and the NWTS in FONR (Year 2).
3. Identify locations and estimate populations of selected rare plants at three 2018 well destruction sites, three 2018 well installation sites, and secondary access routes in FONR and FODSP (Year 1).
4. Map sand gilia, Monterey spineflower, and Yadon's piperia populations for comparison to past surveys and to inform future activities.
5. Assess results with respect to Success Criteria specified in the 2017 PBO. Those are:
   5.1. Densities and acreage of HMP annual species are within a normal range compared with information from reference sites, and
   5.2. The number of wells where HMP annual species are detected in follow up surveys will be the same or greater than the number of wells where these species were found in Baseline surveys.

2. METHODS

Sand gilia and Monterey spineflower were surveyed during peak bloom to map population size and abundance. Peak bloom was determined by visiting the reference site and communicating with FONR staff. Piperia was surveyed for the presence of vegetative structures at the same times as sand gilia and Monterey spineflower. If piperia plants were observed, locations were reported to the Base Realignment and Closure (BRAC) office so that the BRAC biologist could return during the appropriate bloom period to identify the species.

Burleson biologists mapped rare plants using a Trimble® Juno® T41/5B Series GPS unit with an external Trimble® R1 GNSS receiver. For OU1, rare plants were considered within the survey area if they were within a 30-foot radius of a well location or within 10 feet of secondary access routes and the NWTS (see Figure 1-3). For OUCTP, OU2, and Sites 2/12, rare plants were considered within the survey area if they were within a 50-foot radius of a well location or within 20 feet of secondary access routes (see Figure 1-4). When sand gilia, Monterey spineflower, or Yadon's piperia were encountered, the survey was extended beyond the survey area to the boundary of the population encountered. If the population extended more than 500 feet beyond the survey area, then the polygon was cut off at the survey area boundary.

Following protocol from the *2016 FONR Impact Assessment and Habitat and Rare Plant Species Survey Results, Operable Unit 1* and conversations with DD&A biologists, we considered populations discrete if there was a gap of greater than three feet between individuals (HGL, 2017). Populations of five or fewer individuals were mapped as points and the number of individual plants for each point was recorded. Populations with more than five individuals were mapped using polygons. Individual plants were counted for all sand gilia and Yadon's piperia populations (points and polygons), whereas Monterey spineflower individuals were only counted for points. Monterey spineflower populations mapped as polygons were instead characterized by the average absolute percent cover within the polygon. Percent cover was decided by visually assessing the entire polygon and determining which cover class best fit the polygon on average.

The cover classes used were:

- Very Sparse (corresponding to an absolute cover of less than 3 percent)
- Sparse (3 to 25 percent)
- Medium Low (26 to 50 percent)
- Medium (51 to 75 percent)
- Medium High (76 to 97 percent)
- Very High (greater than 97 percent)

Data defining rare plant populations were exported from the GPS unit to shapefile format. Shapefiles were mapped using ArcGIS 10.6.1 (ESRI, 2018).

3. RESULTS

3.1 Sand Gilia

Sand gilia was surveyed at all sites on April 15, 16, 17, and 19, 2019. The following sections describe sand gilia populations mapped within the reference site and OU1, OUCTP, OU2, and Sites 2/12 survey areas.

3.1.1 Reference Site

Sand gilia was present at the reference site in 2019. Nineteen populations of sand gilia (eight points and 11 polygons) were mapped (see Figure 3-1 and Appendix B Table B-1). The populations totaled 11,469 individuals and occupied 2,541 square feet (ft^2).

3.1.2 Operable Unit 1 (Year 2)

Sand gilia was present at one out of 27 wells within the OU1 survey area in 2019. Ten populations of sand gilia (two points and eight polygons) were mapped (see Figures 3-2 and 3-7 and Appendix B Table B-2). The populations totaled 3,162 individuals and occupied 456 ft^2.

3.1.3 Operable Unit 2, OUCTP, and Sites 2/12 (Year 1)

Sand gilia was present at three out of four wells within the OUCTP survey area and along the access route in the OU2 survey area in 2019 (see Figures 3-3 and 3-8 through 3-15 and Appendix B Table B-3). No sand gilia was encountered at Sites 2/12. Seventy-three populations of sand gilia (43 points and 30 polygons) totaling 12,540 individuals and occupying 3,574 ft^2 were mapped in the OUCTP survey area. Twenty-eight populations of sand gilia (13 points and 15 polygons) totaling 1,884 individuals and occupying 1,200 ft^2 were mapped in the OU2 survey area.

3.2 Monterey Spineflower

Monterey spineflower was surveyed at all sites on May 20–24, 2019. The following sections describe Monterey spineflower populations mapped at the reference site, OU1, OUCTP, OU2, and Sites 2/12.

3.2.1 Reference Site

Monterey spineflower was present at the reference site in 2019. Eighteen Monterey spineflower populations (11 points and seven polygons) occupying 3,045 ft^2 were mapped (see Figure 3-1 and Appendix B Table B-4). Of the seven populations represented by polygons, six were Sparse (3-25 percent cover) and one was Medium Low (26-50 percent cover).

3.2.2 Operable Unit 1 (Year 2)

Monterey spineflower was present at 25 out of 27 wells and the NWTS within the OU1 survey area (see Figure 3-2 and 3-4 through 3-7 and Appendix B Table B-5). One hundred and five populations (80 points and 25 polygons) occupying 33,955 ft^2 were mapped within the OU1 survey area. Of the 25 populations represented by polygons, four were Very Sparse (less than 3 percent cover), 20 were Sparse, and one was Medium Low.

3.2.3 Operable Unit 2, OUCTP, and Sites 2/12 (Year 1)

Monterey spineflower was present at four wells in the OUCTP survey area, along the OU2 access route, and at one well surveyed at Sites 2/12 (see Figures 3-3 and 3-8 through 3-15 and Appendix B Table B-6). One hundred and ninety-nine populations (129 points and 70 polygons) occupying 60,232 ft^2 were

mapped within the OUCTP survey area. Of the 70 populations represented by polygons, ten were Very Sparse, 58 were Sparse, and two were Medium Low.

Forty-four populations (30 points and 14 polygons) occupying 31,646 ft^2 were mapped within the OU2 survey area. Of the 14 populations represented by polygons, one was Very Sparse and 13 were Sparse.

Five populations (3 points and 2 polygons) occupying 78 ft^2 were mapped within the Sites 2/12 survey area. Of the 2 populations represented by polygons, one was Very Sparse and one was Sparse.

3.3 Yadon's Piperia

Yadon's piperia was surveyed simultaneously with sand gilia and Monterey spineflower. No individuals were observed at the reference site or within the 2019 survey areas. Yadon's piperia will not be discussed in the remainder of this report.

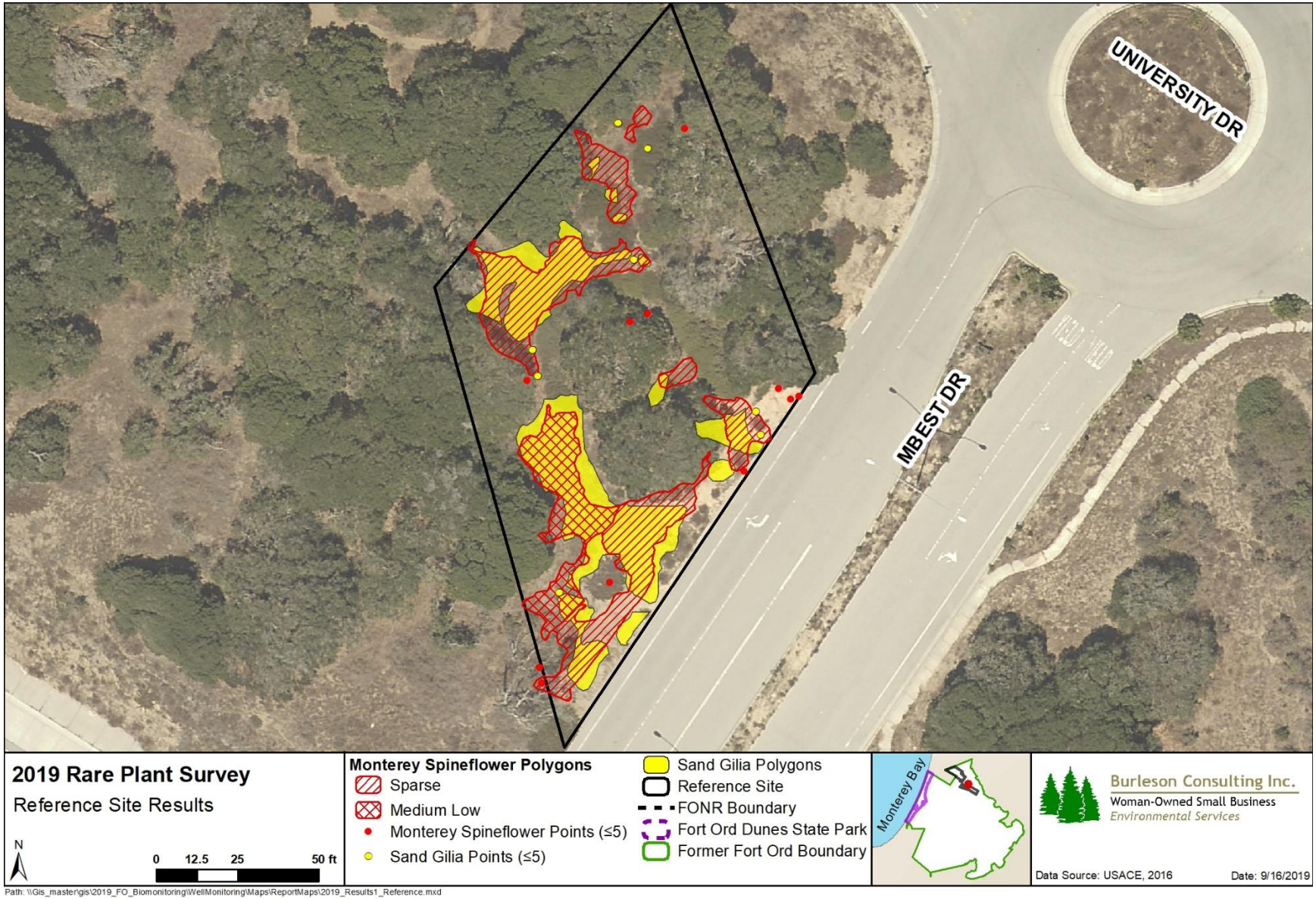


Figure 3-1. 2019 Reference Site Rare Plant Populations

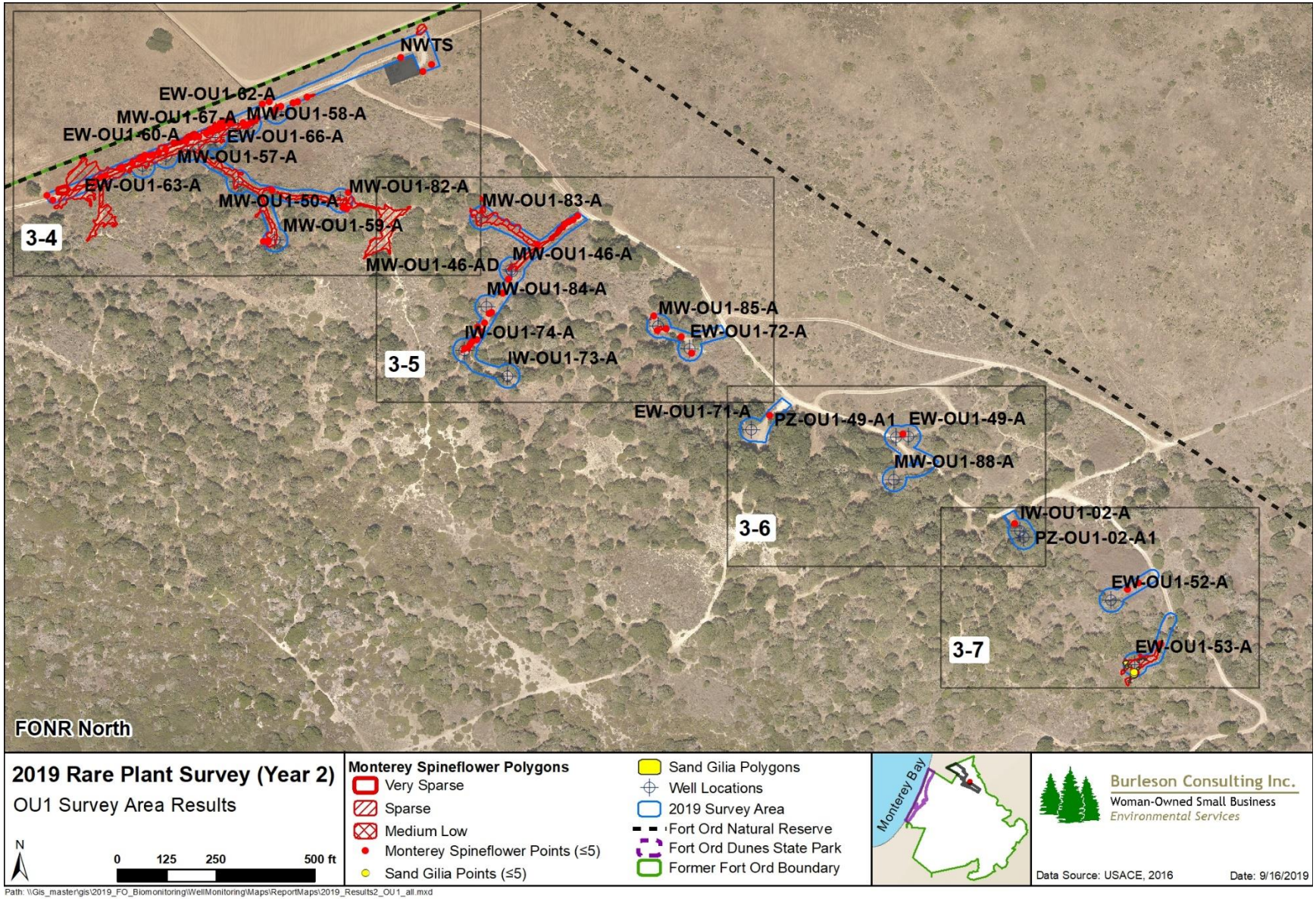


Figure 3-2. 2019 OU1 Survey Area Rare Plant Populations Overview

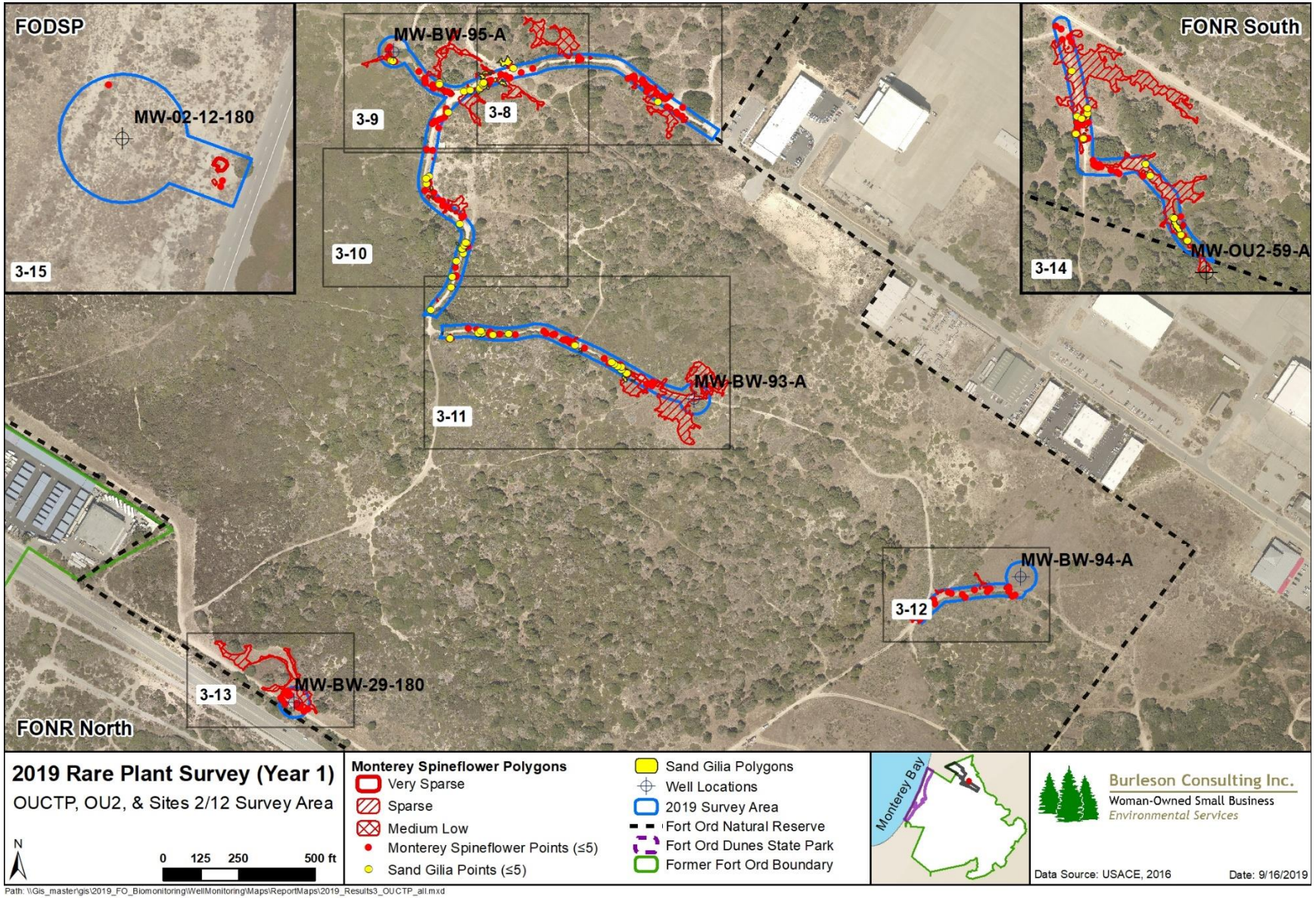


Figure 3-3. 2019 OUCTP, OU2, and Sites 2/12 Survey Area Rare Plant Populations Overview

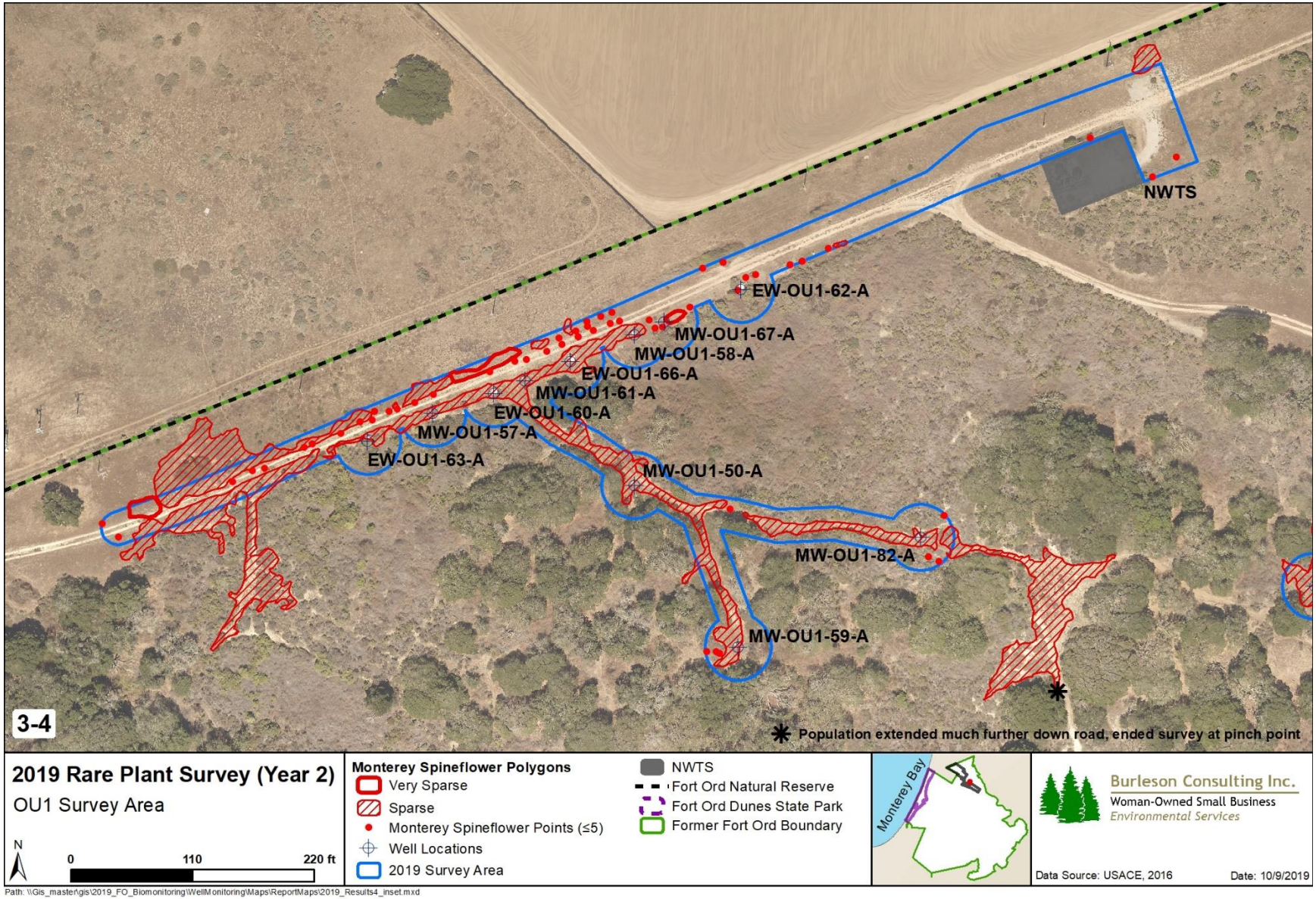


Figure 3-4. 2019 OU1 Survey Area Monterey Spineflower Populations

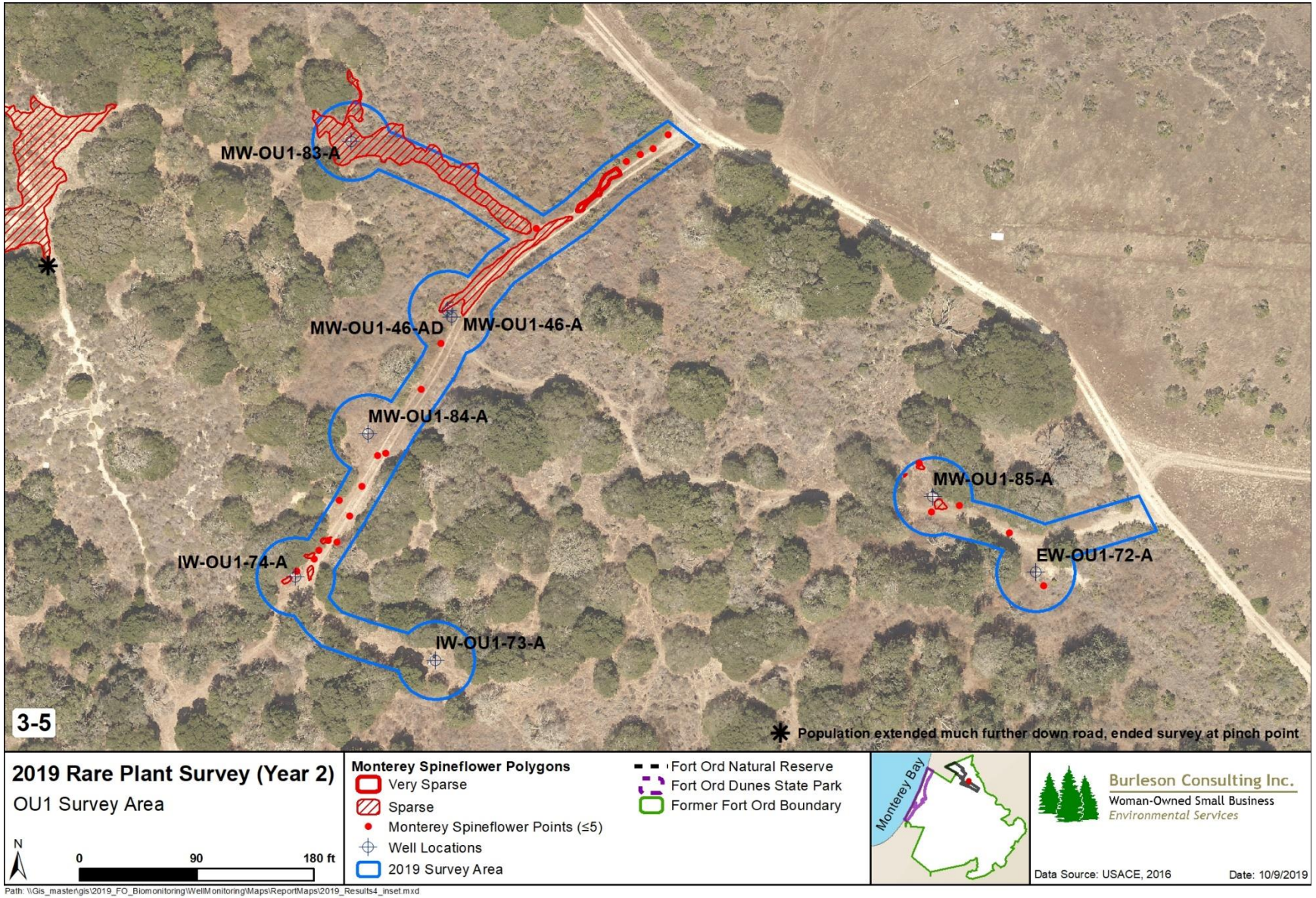


Figure 3-5. 2019 OU1 Survey Area Monterey Spineflower Populations

Figure 3-6. 2019 OU1 Survey Area Monterey Spineflower Populations

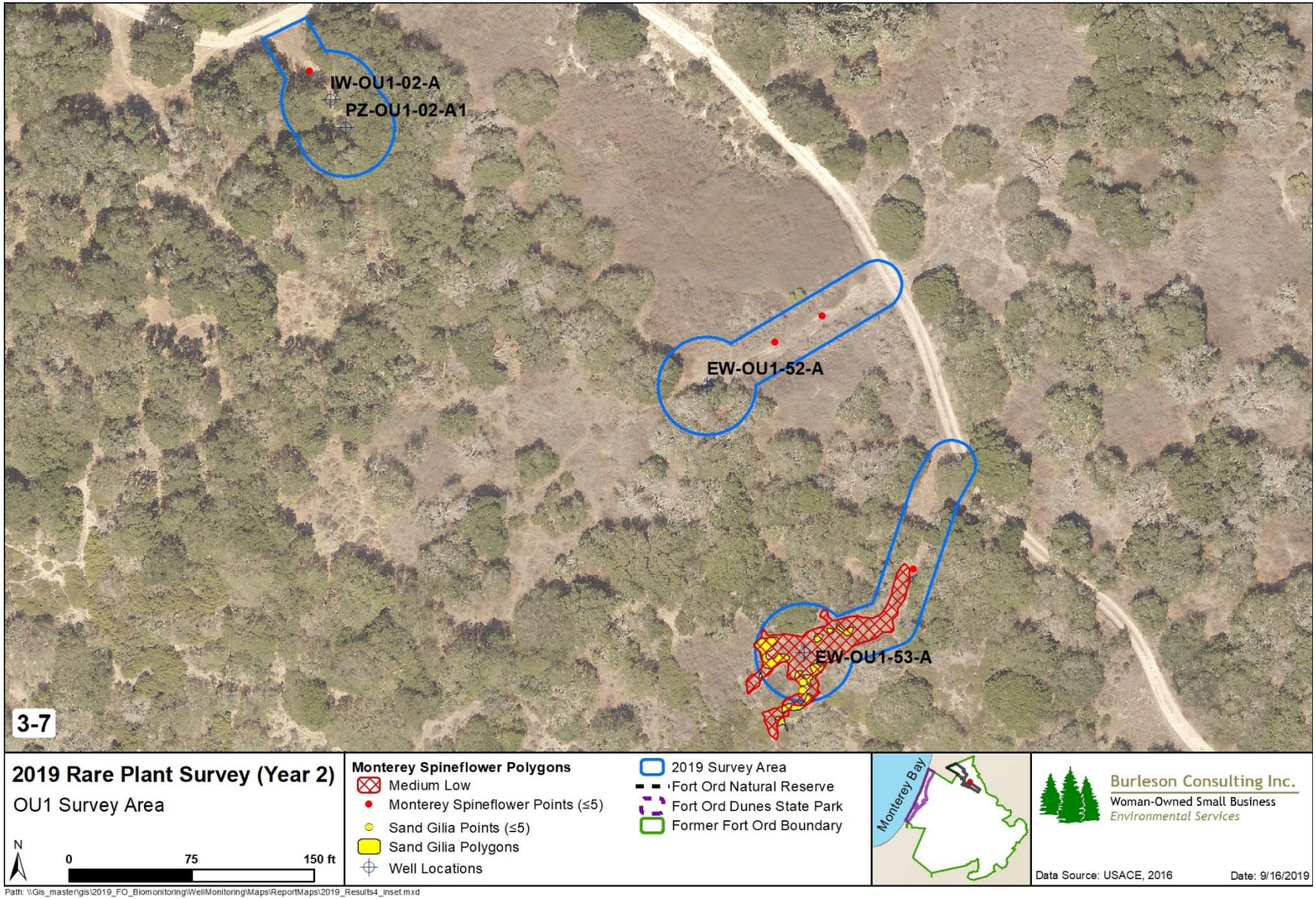


Figure 3-7. 2019 OU1 Survey Area Sand Gilia and Monterey Spineflower Populations

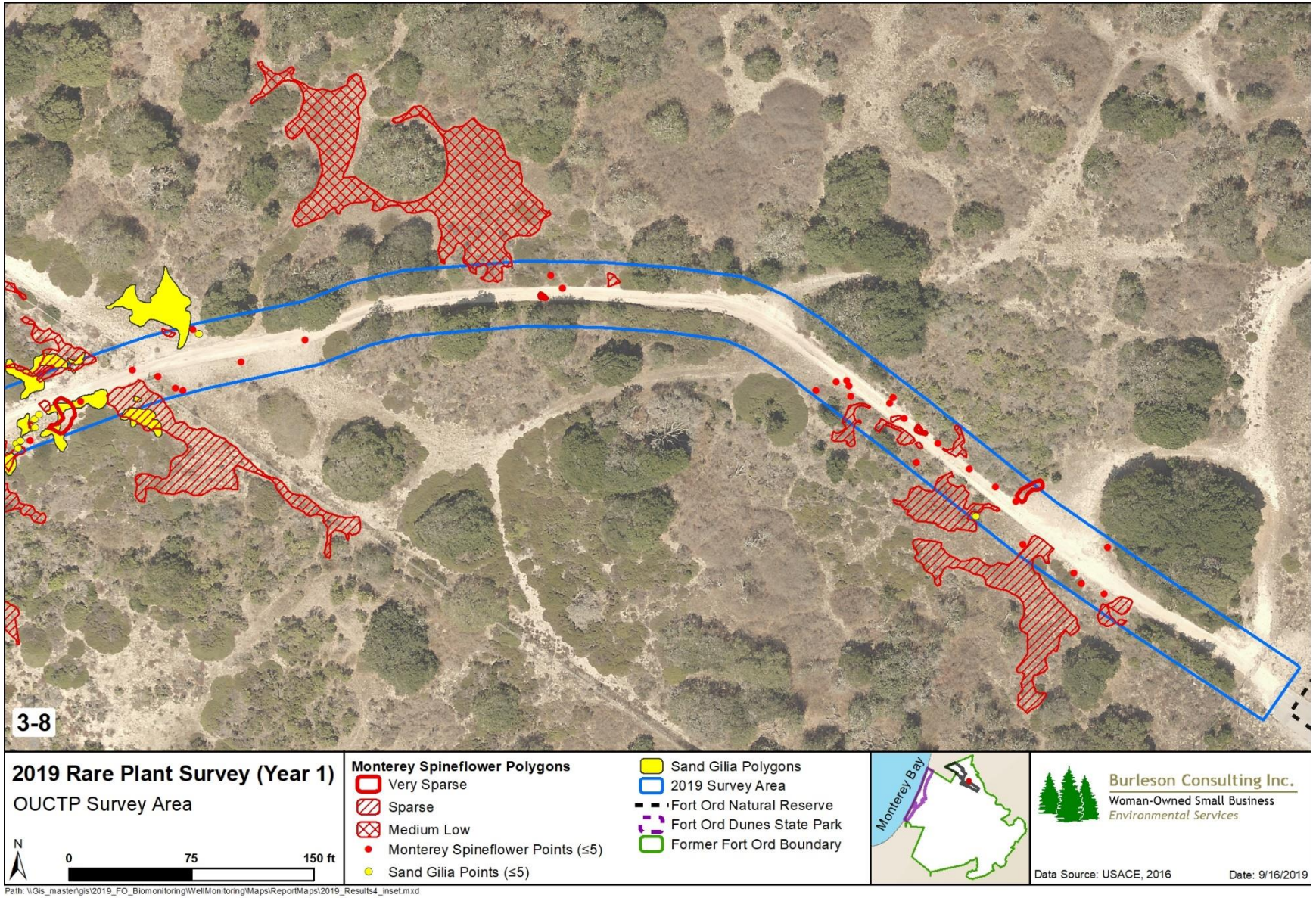


Figure 3-8. 2019 OUCTP Survey Area Sand Gilia and Monterey Spineflower Populations

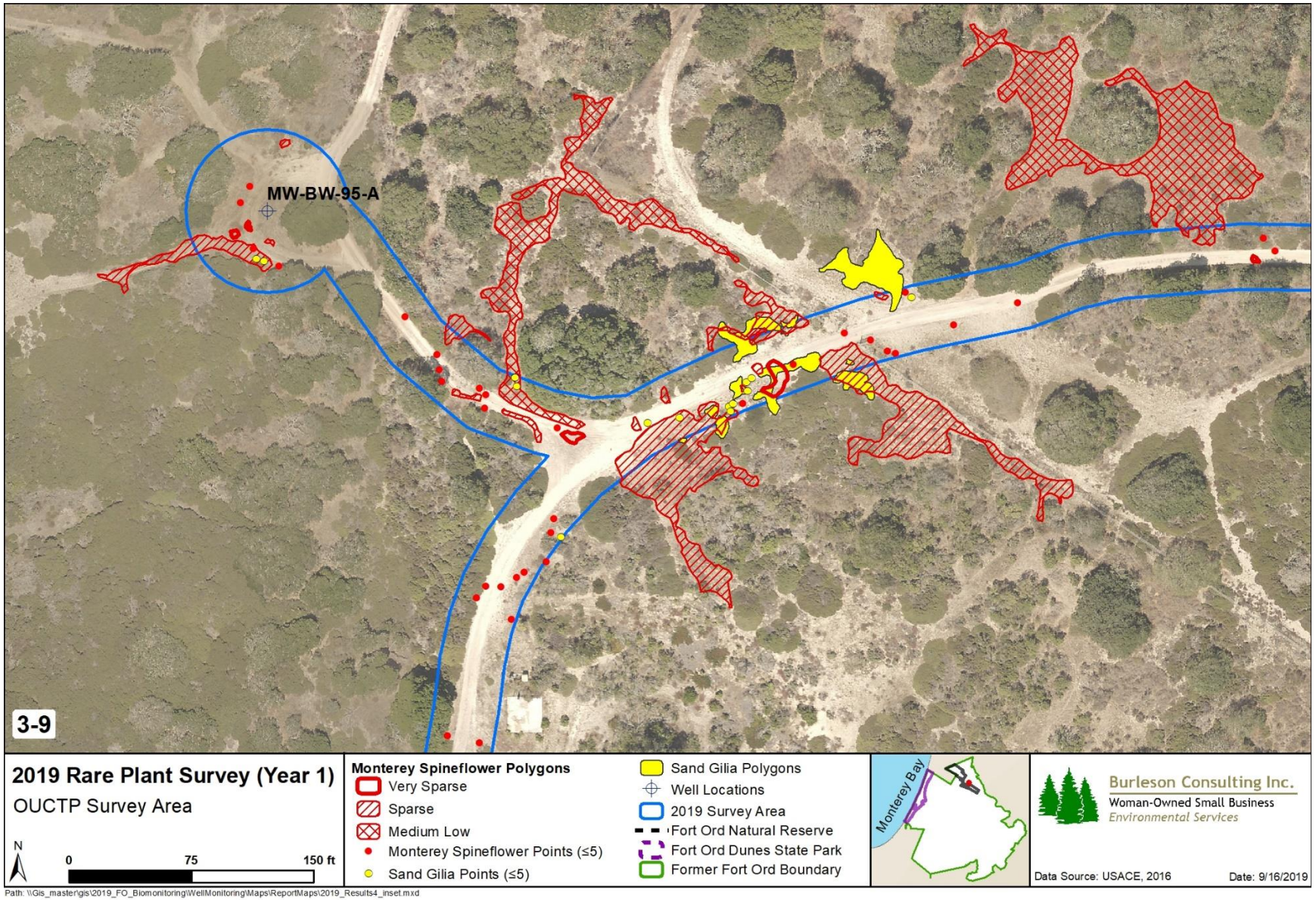


Figure 3-9. 2019 OUCTP Survey Area Sand Gilia and Monterey Spineflower Populations

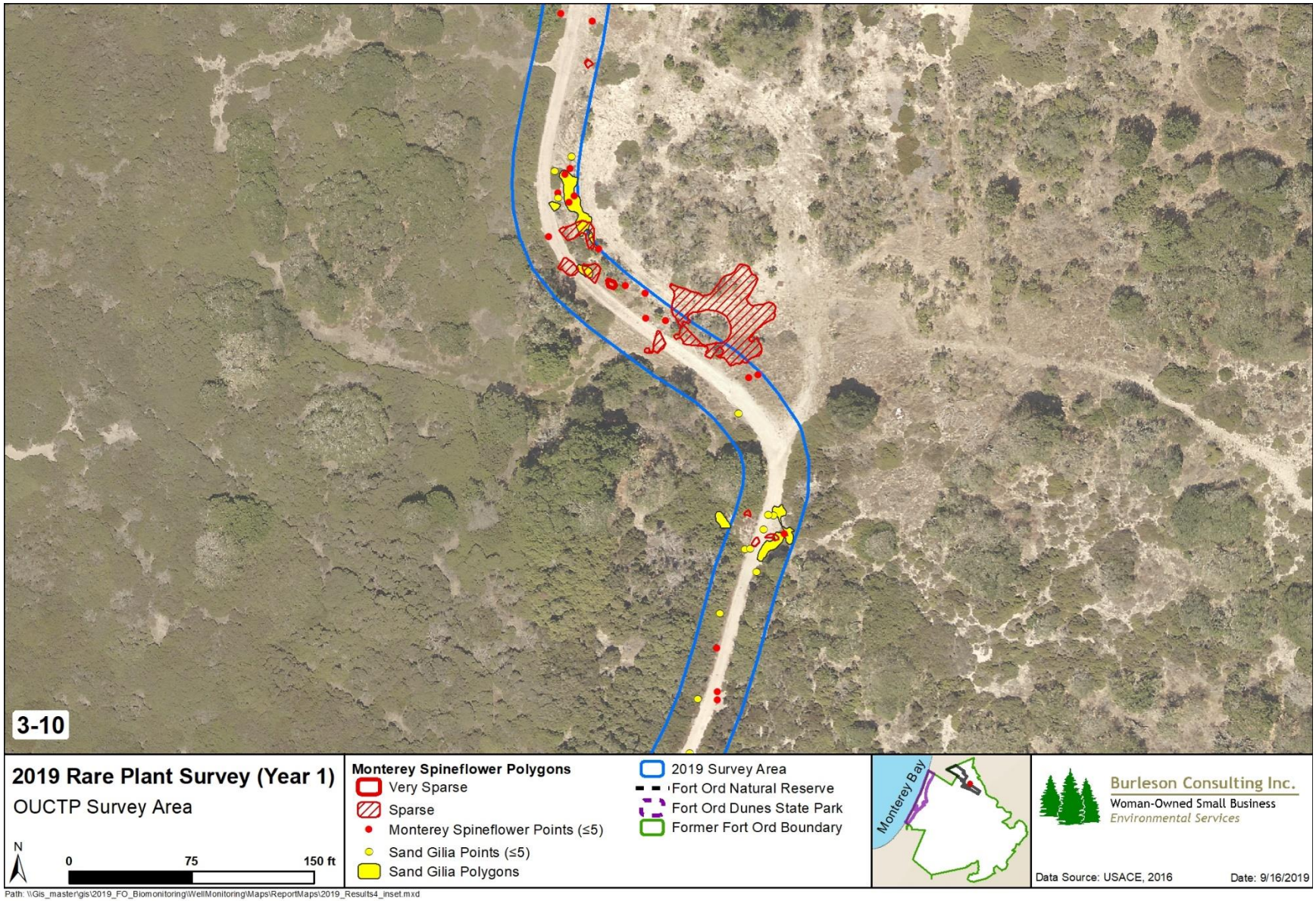


Figure 3-10. 2019 OUCTP Survey Area Sand Gilia and Monterey Spineflower Populations

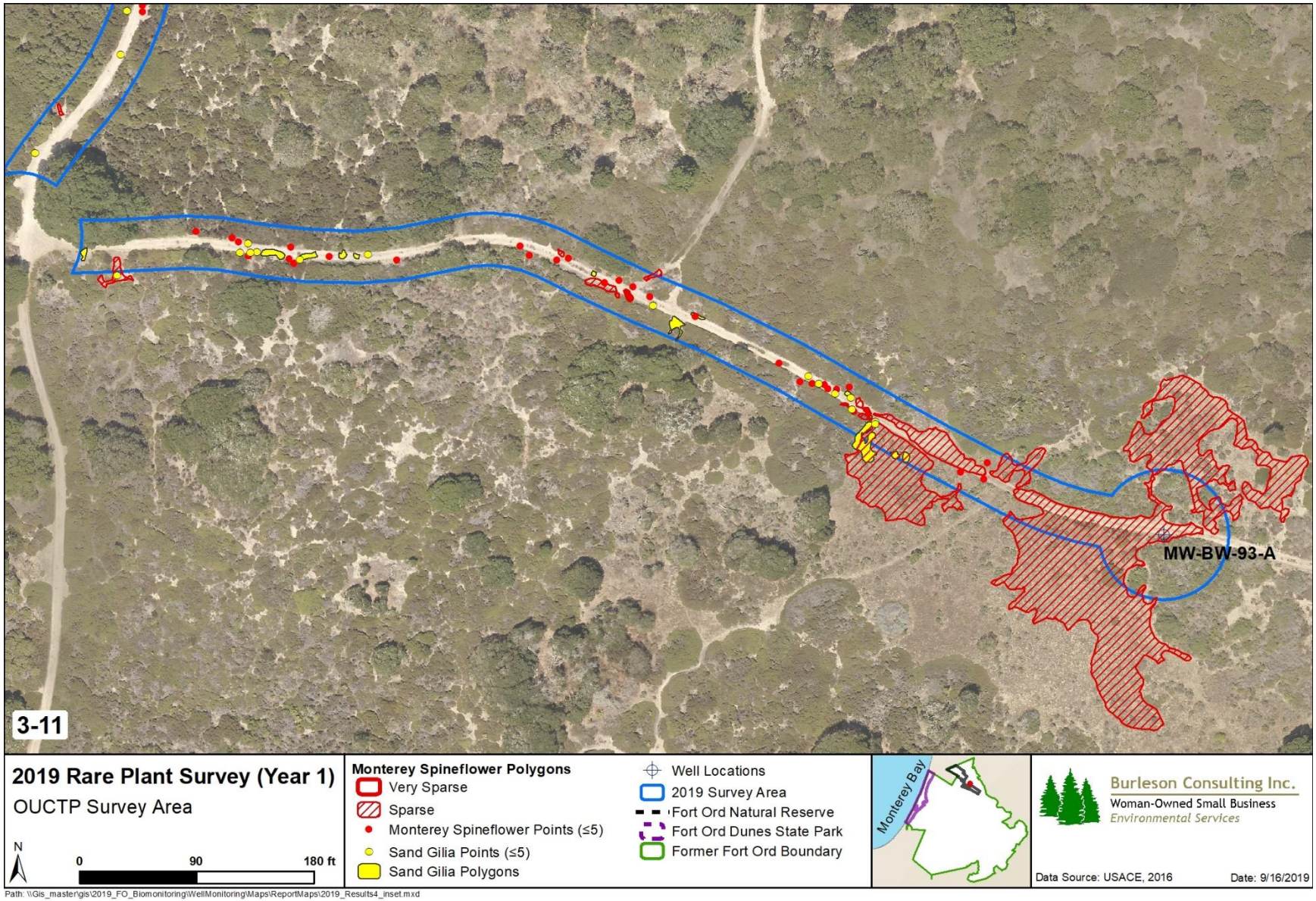


Figure 3-11. 2019 OUCTP Survey Area Sand Gilia and Monterey Spineflower Populations

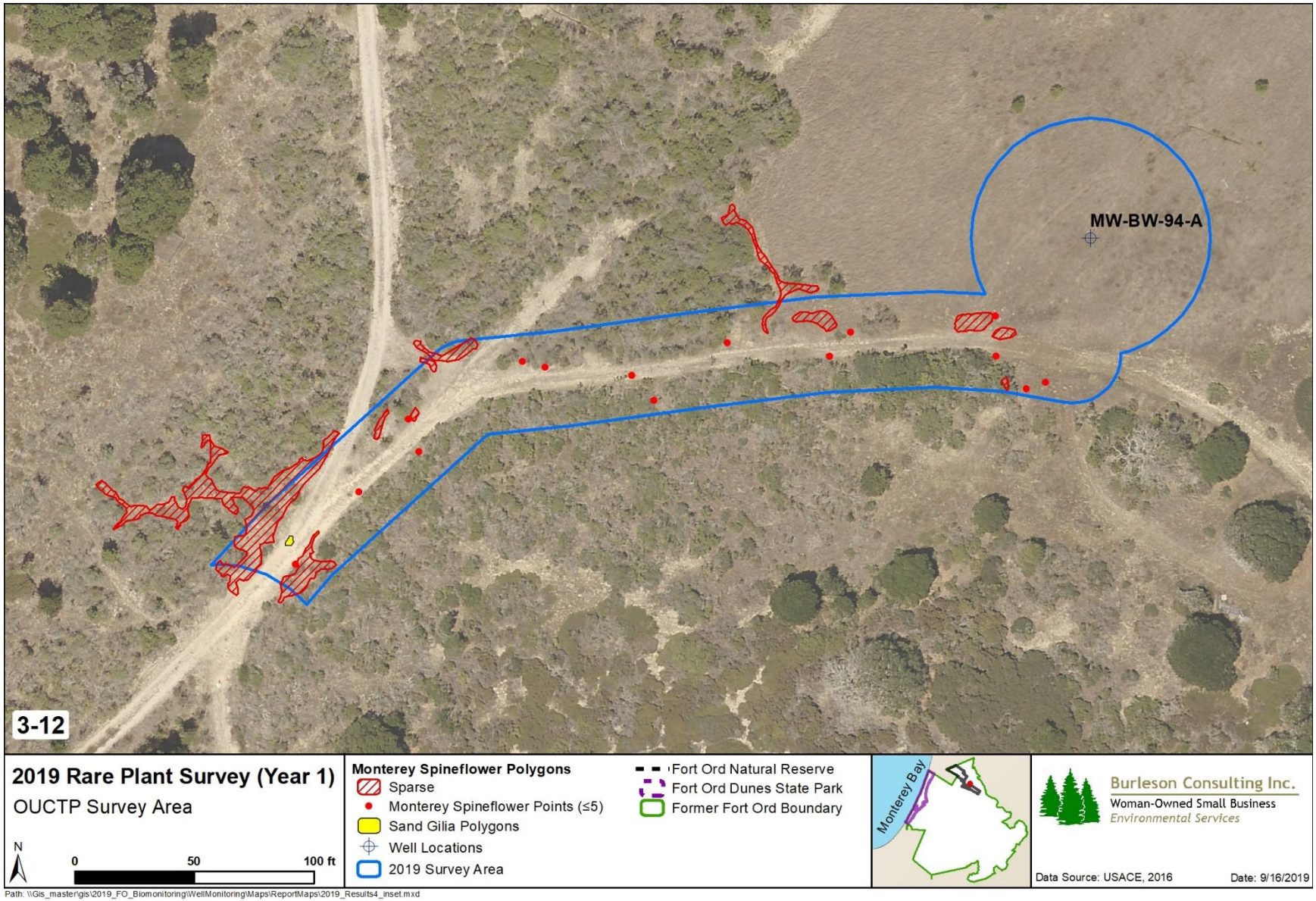


Figure 3-12. 2019 OUCTP Survey Area Sand Gilia and Monterey Spineflower Populations

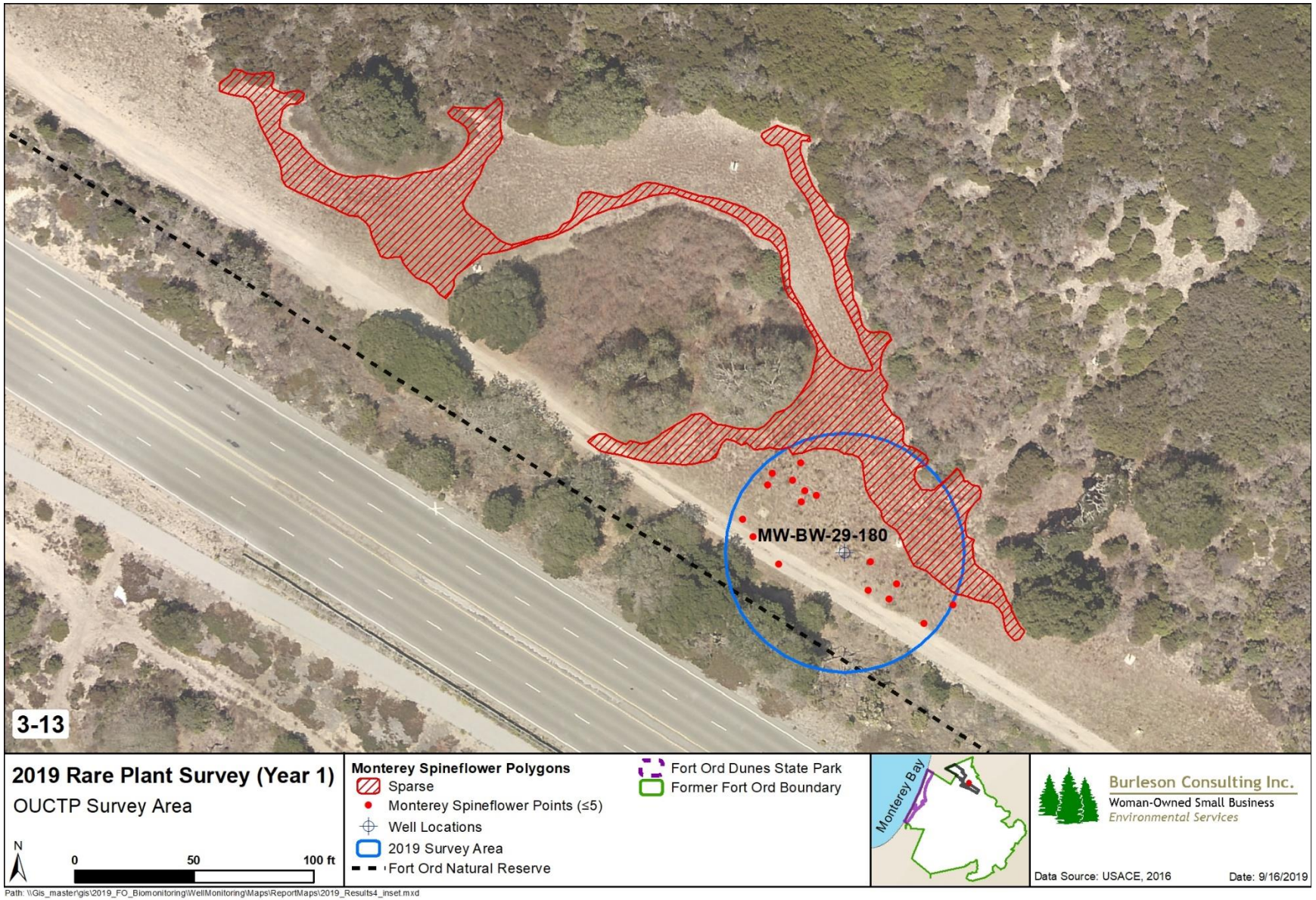


Figure 3-13. 2019 OUCTP Survey Area Monterey Spineflower Populations

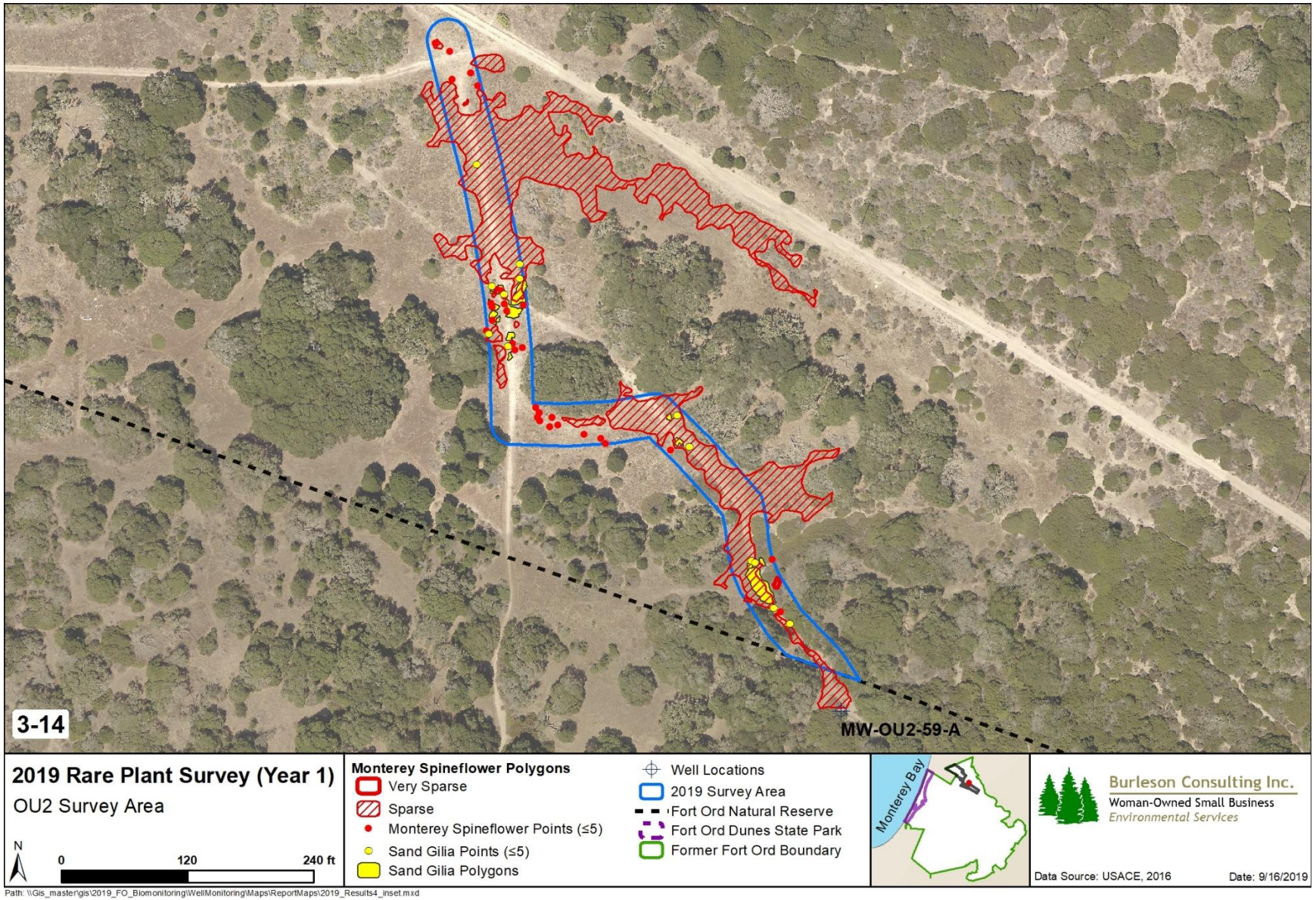


Figure 3-14. 2019 OU2 Survey Area Sand Gilia and Monterey Spineflower Populations

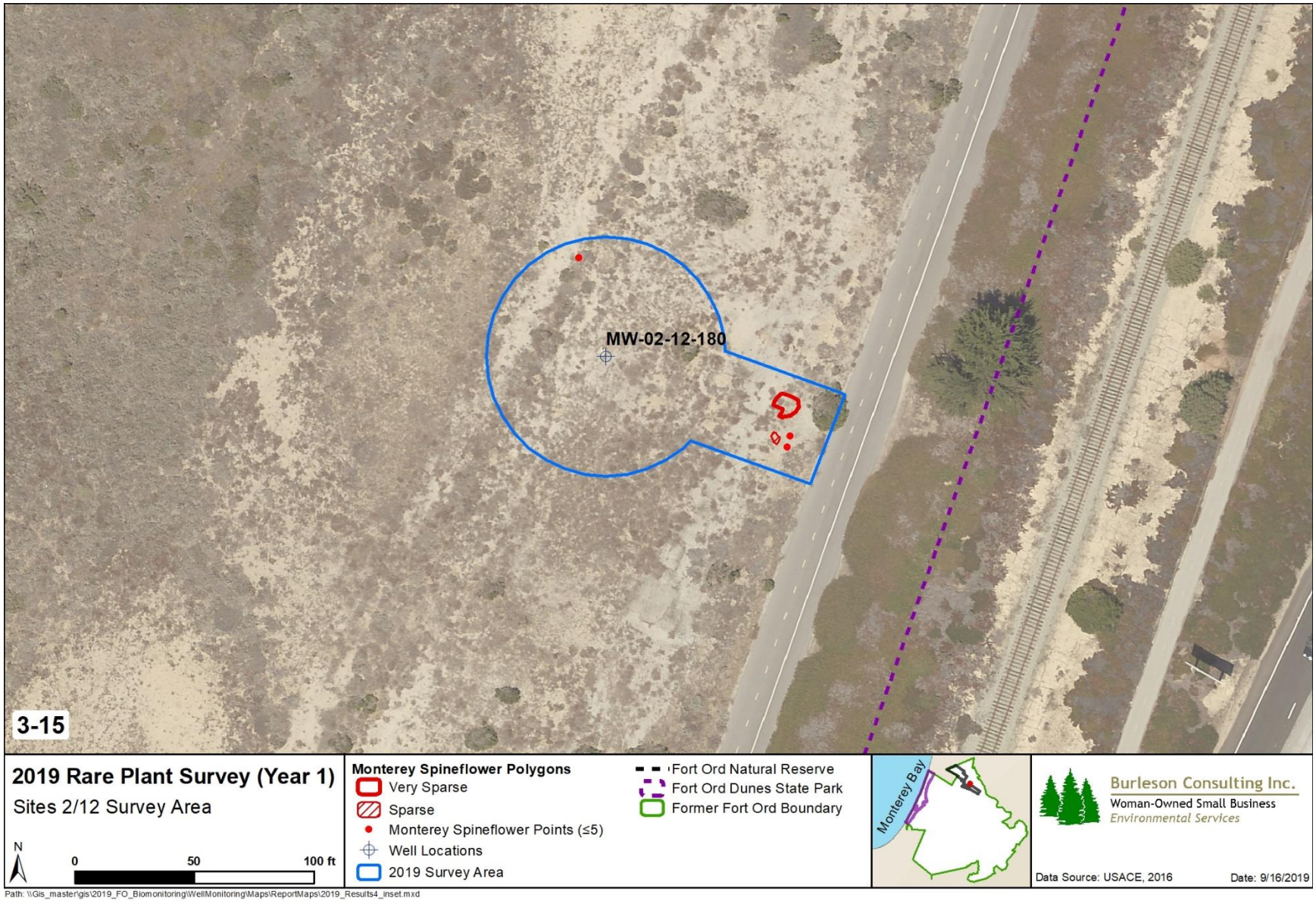


Figure 3-15. 2019 Sites 2/12 Survey Area Monterey Spineflower Populations

4. DISCUSSION

Rare plant surveys are conducted for three years after a disturbance occurs during the remediation effort as required by the HMP and the 2017 PBO (USACE, 1997; USFWS, 2017). The 2019 surveys were Year 2 follow up surveys for wells decommissioned in 2017 and Year 1 surveys for wells decommissioned or installed in 2018 (HGL, 2018; Ahtna, 2018). For OU1, rare plants were mapped if they were within a 30-foot radius of a well location or within 10 feet of secondary access routes and the NWTS. For OUCTP, OU2, and Sites 2/12, rare plants were mapped if they were within a 50-foot radius of a well location or within 20 feet of secondary access routes.

4.1 Sand Gilia

4.1.1 Reference Site

At the reference site, sand gilia increased by 11,148 individuals from 2018 (Year 1) to 2019 (Year 2; see Table 4-1). Sand gilia populations vary from year to year and their abundance may depend on the timing and amount of precipitation and the level of herbivory (Dorrell-Canepa, 1994; Fox *et al*, 2006; Fox, 2007). The increase in sand gilia at the reference site from 2018 to 2019 could be due to receiving increased rainfall during 2019; however, the population does not seem to fluctuate consistently with the water year or the amount of spring rainfall (see Table 4-2 and Figure 4-1).

Table 4-1. Sand Gilia Populations within the Reference Site from 2017–2019

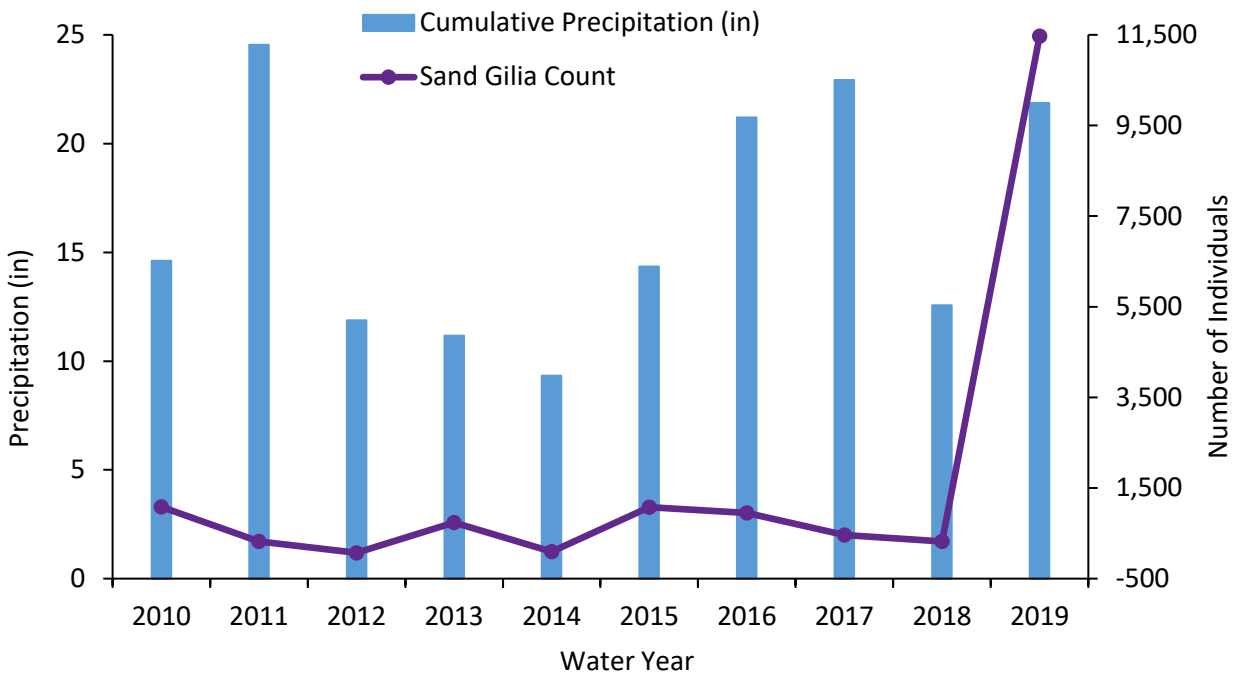
Year	Total Populations	Individual Plants	Indiv. Plants Percent Change from Previous Year	Points	Polygons	Area of Polygons (ft^2)	Area Percent Change from Previous Year
2017	8	463	–	6	2	1,950	–
2018	7	321	-31%	1	6	1,102	-43%
2019	19	11,469	3,473%	8	11	2,541	131%

Table 4-2. Precipitation for 2017–2019 and Average Precipitation from 1981-2010

	Precipitation (in)			
	2017*	2018*	2019*	Average (1981-2010)†
Water Year	22.92	12.56	21.86	17.84
Winter (November-January)	10.32	4.87	7.84	8.28
Spring (February-April)	9.74	7.42	11.35	7.74

* 2017, 2018, and 2019 precipitation from NPS, 2019

† Average precipitation from NOAA, 2018



Precipitation data from NPS, 2019; 2010-2017 rare plant data from HGL, 2018.

Figure 4-1. Sand Gilia Populations at the Reference Site verses Monthly Precipitation

4.1.2 Operable Unit 1 (Year 2)

Sand gilia increased by 3,009 individuals at one well location (EW-OU1-53-A) within the OU1 survey area from 2018 (Year 1) to 2019 (Year 2; see Tables 4-3 and 4-4). No sand gilia was found in the OU1 survey area in 2017 and sand gilia was observed at only two of 33 well locations during historical surveys (EW-OU1-53-A in 2006/2007 and MW-OU1-59-A in 2006; HGL, 2018). Historical survey results are summarized in Appendix A Table A-1. Disturbance and precipitation may have contributed to the increase in the number of sand gilia individuals from 2017 to 2019 within the OU1 survey area.

Table 4-3. Sand Gilia Populations within the OU1 Survey Area in 2017, 2018, & 2019

Year	Total Populations	Individual Plants	Indiv. Plants Percent Change from Previous Year	Points	Polygons	Area of Polygons (ft^2)	Area Percent Change from Previous Year
2017 (Year 0)	0	0	–	0	0	0	–
2018 (Year 1)	4	153	–	1	3	573	–
2019 (Year 2)	10	3,162	1,960%	2	8	456	-20%

Table 4-4. OU1 Monterey Spineflower and Sand Gilia Populations Surveyed in 2017, 2018, & 2019

Well Identification	Monterey Spineflower Populations (No. Individuals or Cover Class)			Sand Gilia Populations (No. Individuals)		
	2017	2018	2019	2017	2018	2019
IW-OU1-02-A; PZ-OU1-02-A1*	0	1	1	0	0	0
IW-OU1-10-A; PZ-OU1-10-A1*	0	0	–	0	0	–
MW-OU1-26-A	0	0	–	0	0	–
MW-OU1-46-A; MW-OU1-46-AD*	S	2, VS	1, S	0	0	0
EW-OU1-49-A; PZ-OU1-49-A1*	0	0	1	0	0	0
MW-OU1-50-A	ML	ML	S	0	0	0
EW-OU1-52-A	0	2, 2	1, 3	0	0	0
EW-OU1-53-A	ML	2, 2, 5, S, ML	1, ML	0	1, 11, 50, 91	4, 5, 11, 14, 23, 53, 100, 195, 1077, 1680
MW-OU1-57-A	ML	ML	1, 1, 2, S, S, S	0	0	0
MW-OU1-58-A	S, ML	1, 2, ML	1, 1, 2, 3, S	0	0	0
MW-OU1-59-A	ML	ML, 1	1, 1, 2, S, S, S	0	0	0
EW-OU1-60-A	2, 3, ML	3, 8, S, ML	1, VS, S	0	0	0
MW-OU1-61-A	2, 3, S, ML	ML	1, 4, VS, S, S	0	0	0
EW-OU1-62-A	0	1	1, 1, 1, 2, 2, 3, 3, 4, S	0	0	0
EW-OU1-63-A	ML	ML	1, 1, 1, 1, 1, 2, 3, 3, 4, 4, 4, 4, S, VS, S, S	0	0	0
EW-OU1-66-A	S, S, S, ML	S, ML	1, 1, 1, 1, 2, 3, 4, 4, S, S, S	0	0	0
MW-OU1-67-A	S	1, 1, 2	1, 1, 1, 3, VS	0	0	0
MW-OU1-68-A	0	0	–	0	0	–
EW-OU1-71-A	0	0	3	0	0	0
EW-OU1-72-A	0	2, 1	1, 1	0	0	0
IW-OU1-73-A	0	1	0	0	0	0
IW-OU1-74-A	S	1, 1, 1, S	1, 1, 1, 2, 3, 4, 4, 5, S, S, S, S	0	0	0
MW-OU1-82-A	1, S, S, ML	1, 1, 1, 2, 2, 2, 2, 5, 5, 5, S, S, S, S	2, 2, 3, 4, S, S	0	0	0
MW-OU1-83-A	M	6, 7, S, M	1, 1, 1, 1, 3, VS, S	0	0	0
MW-OU1-84-A	0	3	1, 1, 4	0	0	0

Table 4-4. OU1 Monterey Spineflower and Sand Gilia Populations Surveyed in 2017, 2018, & 2019

Well Identification	Monterey Spineflower Populations (No. Individuals or Cover Class)			Sand Gilia Populations (No. Individuals)		
	2017	2018	2019	2017	2018	2019
MW-OU1-85-A	1, 1	1, 2, 2, 2, 3, S	1, 3, 3, 3, S, S, S	0	0	0
MW-OU1-86-A	0	0	–	0	0	–
MW-OU1-87-A	0	0	–	0	0	–
MW-OU1-88-A	2	3	0	0	0	0
NWTS	0	1	1, 2, 5, S	0	0	0

2017 data from Table 3.3B in *2017 FONR Impact Assessment and Habitat and Rare Plant Species Survey Results Report* (HGL, 2018).

* Considered one location
– Not surveyed
EW - Extraction Well
IW - Injection Well
M - Medium
ML - Medium Low
MW - Monitoring Well
NWTS - Northwest Treatment System
PZ - Piezometer
S -Sparse
VS - Very Sparse

4.1.3 Operable Unit 2, OUCTP, and Sites 2/12 (Year 1)

Sand gilia increased by 12,465 individuals at all four well locations within the OUCTP survey area. Sand gilia increased by 1,865 individuals along the access route within the OU2 survey area from 2018 (Year 1) to 2019 (Year 2; see Tables 4-5 and 4-6). In the 2018 Baseline survey, sand gilia was observed at two out of four wells in the OUCTP survey area and along the OU2 access route (Ahtna, 2018). Sand gilia was not observed at Sites 2/12 in 2018 or 2019. From 1998 to 2010, sand gilia was observed multiple times at MW-BW-93-A and MW-BW-95-A wells and secondary access routes. Sand gilia was observed along the MW-OU2-59-A access route in 1998 and 2010 and once at MW-BW-29-180 in 1998. Sand gilia was not observed in historical surveys at MW-02-12-180 at Sites 2/12 or MW-BW-94-A. Historical survey results are summarized in Appendix A Table A-3.

Table 4-5. Sand Gilia Populations within the OUCTP, OU2, & Sites 2/12 Survey Areas in 2018 & 2019

Location	Year	Total Populations	Individual Plants	Indiv. Plants Percent Change from Previous Year	Points	Polygons	Area of Polygons (ft^2)	Area Percent Change from Previous Year
OUCTP	2018 (Year 0)	11	75	–	7	4	79	–
	2019 (Year 1)	73	12,540	16,620%	43	30	3,574	4,424%
OU2	2018 (Year 0)	9	19	–	8	1	25	–
	2019 (Year 1)	28	1,884	9,816%	13	15	1,200	4,700%
Sites 2/12	2018 (Year 0)	0	0	–	0	0	0	–
	2019 (Year 1)	0	0	–	0	0	0	–

Table 4-6. OU2, OUCTP, & Sites 2/12 Monterey Spineflower and Sand Gilia Populations Surveyed in 2018 & 2019

Well Identification	Monterey Spineflower Populations (No. Individuals or Cover Class)		Sand Gilia Populations (No. Individuals)	
	2018	2019	2018	2019
MW-BW-93-A	1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 3, 3, 3, 3, VS, VS, S, S, S, S, S, ML	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 4, S, S, S, S, S, S, S, S, S, S, S, VS, VS	2, 2, 2, 11	1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 3, 5, 6, 6, 10, 14, 18, 20, 27, 34, 69, 96, 160, 250, 1464
MW-BW-94-A	1, 1, VS, VS, VS, VS, VS, S, S, S, ML	1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 3, 3, 3, 4, S, S, S, S, S, S, S, S, S, S, S	0	34
MW-BW-95-A	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 3, 4, 4, S, S, S, S, S, S, S, S, S, S, S, S, S, S, ML, ML, ML, ML	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 4, 4, 4, 4, 4, 4, 4, 5, 5, 5, 5, 5, ML, ML, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, S, VS, VS, VS, VS, VS, VS, VS, VS	1, 1, 1, 4, 15, 15, 21	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 3, 3, 3, 3, 4, 4, 4, 6, 7, 26, 26, 45, 63, 122, 145, 167, 187, 590, 591, 862, 937, 952, 5529
MW-BW-29-180	S	1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 3, 3, 3, 4, S	0	0
MW-OU2-59-A	1, 1, 3, S, S, S, S, S, S, S, S, ML	1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 3, 3, 4, 4, 4, 5, 5, S, S, S, S, S, S, S, S, S, S, S, S, S, VS	1, 1, 2, 2, 2, 2, 3, 5, 7	1, 1, 1, 1, 2, 2, 3, 3, 3, 3, 5, 5, 5, 6, 10, 12, 13, 20, 21, 27, 27, 36, 45, 62, 71, 222, 569, 708
MW-02-12-180	S, S, S	1, 1, 3, VS, S	0	0

2018 data from the GIS data deliverable for the *2018 Annual Rare Plant Survey for the Ahtna Monitoring Wells and Enhanced In Situ Bioremediation (EISB) Deployment Area at the Operable Unit Carbon Tetrachloride Plume (OUCTP)* report (Ahtna, 2018).

4.2 Monterey Spineflower

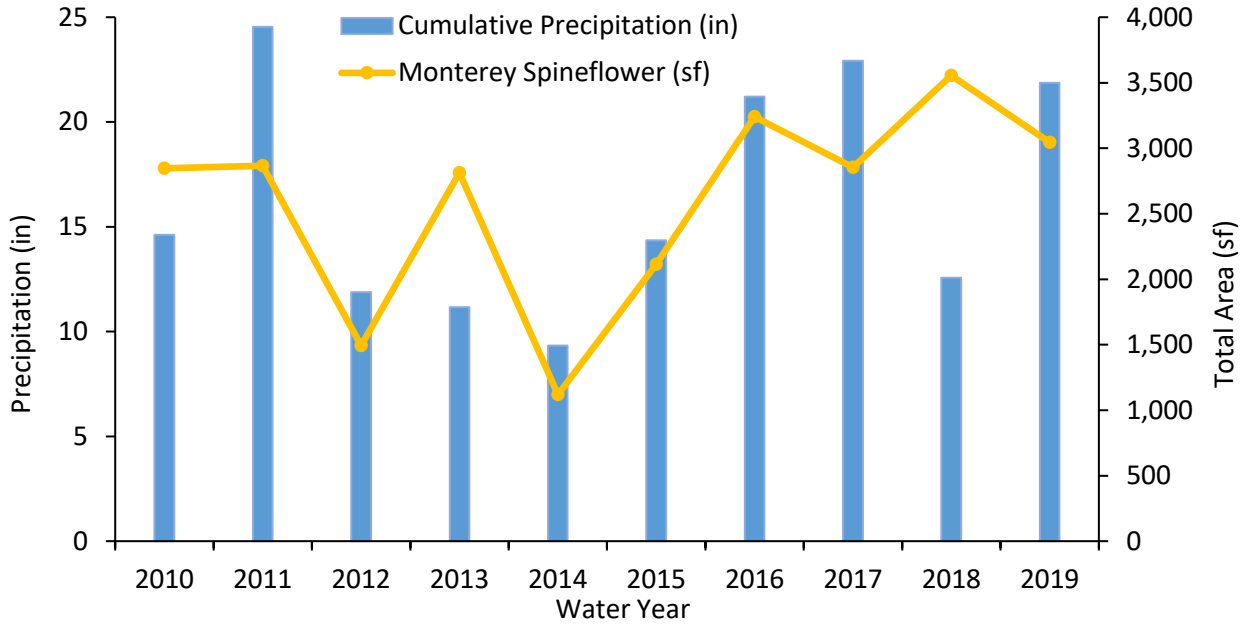
4.2.1 Reference Site

At the reference site, Monterey spineflower populations decreased by 511 ft^2 from 2018 to 2019 but increased by 190 ft^2 from 2017 to 2019 (see Table 4-7). The reference site populations were more

dispersed than in 2017 and 2018 with similar densities to 2017. Monterey spineflower germinates more readily in dry years than wet years and survival to maturity is facilitated by spring rainfall (Fox *et al*, 2006). The 2019 water year had above average precipitation; this may explain the decrease in total area of Monterey spineflower at the reference site from 2018 to 2019 (see Table 4-2 and Figure 4-2).

Table 4-7. Monterey Spineflower Populations within the Reference Site from 2017–2019

Year	Total Populations	Points	Polygons per Density Class			Area of Polygons (ft^2)	Area Percent Change from Previous Year
			Very Sparse	Sparse	Medium Low		
2017	4	0	0	3	1	2,855	–
2018	4	1	2	1	0	3,556	25%
2019	18	11	0	6	1	3,045	-14%



Precipitation data from NPS, 2019; 2010-2017 rare plant data from HGL, 2018.

Figure 4-2. Monterey Spineflower Populations at the Reference Site with Annual Precipitation

4.2.2 Operable Unit 1 (Year 2)

Within the OU1 survey area, Monterey spineflower populations decreased by 2,439 ft^2 from 2018 (Year 1) to 2019 (Year 2) but increased from 2017 (Year 0). Monterey spineflower was found at 25 well locations, along secondary access routes, and outside the NWTS (see Tables 4-8 and 4-4). The total number of populations increased from 52 to 105 from 2018 to 2019 even though the total area decreased; this indicates that Monterey spineflower populations were more numerous but smaller and more spread out in 2019 than 2018. This trend is consistent with reference site populations. Historical survey results are summarized in Appendix A Table A-2.

Of the 27 OU1 well locations surveyed in 2019:

- Monterey spineflower was not observed at one well location at which Monterey spineflower had been observed in historical surveys (1998-2017).
- Monterey spineflower was observed at 20 well locations at which Monterey spineflower had been observed in historical surveys.
- Monterey spineflower was observed at 5 well locations at which Monterey spineflower had not been observed in any historical survey.
- Monterey spineflower was not observed at one well location at which Monterey spineflower was only previously observed in 2018.

Table 4-8. Monterey Spineflower Populations within the OU1 Survey Area in 2017 & 2018

Year	Total Populations	Points	Polygons per Density Class				Area of Polygons (ft^2)	Area Percent Change from Previous Year
			Very Sparse	Sparse	Medium Low	Medium		
2017 (Year 0)	19	6	0	7	5	1	26,939	-
2018 (Year 1)	52	36	4	9	2	1	36,394	35%
2019 (Year 2)	105	80	4	20	1	0	33,955	-7%

4.2.3 Operable Unit 2, OUCTP, and Sites 2/12 (Year 1)

Within the OUCTP survey area, Monterey spineflower populations increased by 28,394 ft^2 from 2018 (Year 0) to 2019 (Year 1) and was found at all four well locations and along secondary access routes (see Tables 4-9 and 4-6). The total number of populations increased from 69 in 2018 to 199 in 2019.

Within the OU2 survey area, Monterey spineflower increased by 13,505 ft^2 along the secondary access route from 2018 (Year 0) to 2019 (Year 1). The total number of populations increased from 12 in 2018 to 44 in 2019.

Within the Sites 2/12 survey area, Monterey spineflower decreased by 231 ft^2 at one well from 2018 (Year 0) to 2019 (Year 1). The total number of populations increased from three in 2018 to five in 2019. Historical survey results are summarized in Appendix A Table A-4.

Of the six OUCTP, OU2, and Sites 2/12 well locations surveyed in 2019:

- Monterey spineflower was observed at five well locations at which Monterey spineflower had been observed in historical surveys (1998-2017).
- Monterey spineflower was observed at one well location at which Monterey spineflower was observed in the 2018 Baseline survey but not in any other historical survey.

Table 4-9. Monterey Spineflower Populations within the OUCTP, OU2, & Sites 2/12 Survey Areas in 2018 & 2019

Location	Year	Total Populations	Points	Polygons per Density Class			Area of Polygons (ft^2)	Area Percent Change from Previous Year
				Very Sparse	Sparse	Medium Low		
OUCTP	2018 (Year 0)	69	34	7	22	6	31,838	-
	2019 (Year 1)	199	129	10	58	2	60,232	89%
OU2	2018 (Year 0)	12	3	-	8	1	18,141	-
	2019 (Year 1)	44	30	1	13	-	31,646	74%
Sites 2/12	2018 (Year 0)	3	-	-	3	-	309	-
	2019 (Year 1)	5	3	1	1	-	78	-75%

5. IMPACT ASSESSMENT

Rare plant survey data were compared to the 2017 PBO Success Criteria in Sections 5.1 and 5.2 to assess the impact of remediation activities on rare plant populations in FONR and FODSP.

5.1 Success Criteria 1

Success Criteria 1 in the 2017 PBO states, "densities and acreage of HMP annual species are within a normal range compared with information from reference sites" (USFWS, 2017). Survey results for sand gilia and Monterey spineflower were compared to Success Criteria 1 in the following sections.

5.1.1 Operable Unit 1 (Year 2)

5.1.1.1 Sand Gilia

The following observations were made to compare 2017 (Year 0), 2018 (Year 1), and 2019 (Year 2) sand gilia survey results between the reference site and OU1 survey area:

1. Sand gilia was observed at the reference site in 2017, 2018, and 2019 but was only observed within the OU1 survey area in 2018 and 2019.
2. Relative abundance of sand gilia was generally consistent between the reference site and the OU1 survey area in 2018 and 2019. The total area and number of individual plants increased at the reference site and within the OU1 survey area from 2017 to 2019.

The densities and acreage of sand gilia populations observed in 2019 (Year 2) within the OU1 survey area appear to be within a normal range when compared to the reference site. The total area and number of individuals in sand gilia populations within the OU1 survey area increased from 2017 to 2019, suggesting that well destruction activities in 2017 did not adversely impact sand gilia populations. In accordance with the HMP and PBO, one additional year of monitoring will be completed. This will facilitate a more thorough evaluation of the effect of OU1 remediation activities on sand gilia populations.

5.1.1.2 Monterey Spineflower

The following observations were made to compare 2017 (Year 0), 2018 (Year 1), and 2019 (Year 2) Monterey spineflower survey results between the reference site and OU1 survey area:

1. Monterey spineflower populations of similar densities were observed at the reference site and OU1 survey area in 2017, 2018, and 2019.
2. Relative abundance of Monterey spineflower appears to be consistent between the reference site and OU1 survey area. From 2017 to 2018, the total area increased and density decreased at both sites. From 2018 to 2019, the total area decreased and the number of populations increased at both sites. Overall, the total area of Monterey spineflower populations increased from 2017 to 2019 at the reference site and within the OU1 survey area.

The densities and acreage of Monterey spineflower populations observed in 2019 (Year 2) within the OU1 survey area appear to be within the normal range when compared to the reference site. This suggests that well destruction activities in 2017 did not adversely impact Monterey spineflower populations. In accordance with the HMP and PBO, one additional year of monitoring will be completed. This will facilitate a more thorough evaluation of the effect of OU1 remediation activities on Monterey spineflower populations.

5.1.2 Operable Unit 2, OUCTP, and Sites 2/12 (Year 1)

5.1.2.1 Sand Gilia

The following observations were made to compare 2018 (Year 0) and 2019 (Year 1) sand gilia survey results between the reference site and OUCTP, OU2, and Sites 2/12 survey areas:

1. Sand gilia was observed at the reference site and within the OUCTP and OU2 survey areas in 2018 and 2019 but was not observed at Sites 2/12 in either year.
2. Relative abundance of sand gilia appears to be consistent between the reference site and the OUCTP and OU2 survey areas. The total area and number of individual plants increased at the reference site, OUCTP, and OU2 from 2018 to 2019.

The densities and acreage of sand gilia populations observed in 2019 (Year 1) within the OUCTP and OU2 survey areas appear to be within the normal range when compared to the reference site. Sites 2/12 cannot be compared to the reference site because no sand gilia was present in the Sites 2/12 survey area in 2018 or 2019. This suggests that well destruction and installation activities in 2018 did not adversely impact sand gilia populations. In accordance with the HMP and PBO, two additional years of monitoring will be completed. This will facilitate a more thorough evaluation of the effect of OUCTP, OU2, and Sites 2/12 remediation activities on sand gilia populations.

5.1.2.2 Monterey Spineflower

The following observations were made to compare 2018 (Year 0) and 2019 (Year 1) Monterey spineflower survey results between the reference site and OUCTP, OU2, and Sites 2/12 survey areas:

1. Monterey spineflower populations of similar densities were observed at the reference site and OUCTP, OU2, and Sites 2/12 survey areas in 2018 and 2019.
2. Relative abundance of Monterey spineflower appears to be consistent between the reference site and the Sites 2/12 survey area as the total area decreased and the number of populations increased at both sites from 2018 to 2019. Relative abundance of Monterey spineflower in the OUCTP and OU2 survey areas was partially consistent with the reference site because the total area and number of Monterey spineflower populations in the OUCTP and OU2 survey areas increased from 2018 to 2019 while at the reference site the total area decreased.

The densities and acreage of Monterey spineflower populations observed in 2019 (Year 1) within the Sites 2/12 survey area appear to be within the normal range when compared to the reference site. The acreage of Monterey spineflower populations observed within the OUCTP and OU2 survey areas was not consistent with trends exhibited at the reference site. However, the total area of Monterey spineflower populations within the OUCTP and OU2 survey areas increased from 2018 to 2019, suggesting that remediation activities in 2018 did not adversely impact Monterey spineflower populations. In accordance with the HMP and PBO, two additional years of monitoring will be completed. This will facilitate a more thorough evaluation of the effect of OUCTP, OU2, and Sites 2/12 remediation activities on Monterey spineflower populations.

5.2 Success Criteria 2

Success Criteria 2 in the 2017 PBO states that “the number of wells where HMP annual species are detected in follow up surveys will be the same or greater than the number of wells where these species were found in baseline surveys” (USFWS, 2017). Survey results for sand gilia and Monterey spineflower were compared to Success Criteria 2 in the following sections.

5.2.1 Operable Unit 1 (Year 2)

5.2.1.1 Sand Gilia

Sand gilia was detected at one out of 27 well locations in 2019, one out of 33 well locations in 2018, and zero out of 33 well locations in 2017 and 1998. Sand gilia was observed at only two out of 33 well locations during past surveys (EW-OU1-53-A in 2006/2007 and MW-OU1-59-A in 2006). Five impact categories were defined in previous FONR rare plant survey reports as follows (HGL, 2018):

1. Rare plant species not detected in any survey – 31 wells
   IW-OU1-02-A[1], PZ-OU1-02-A1[1], IW-OU1-10-A[2,5], PZ-OU1-10-A1[2,5], MW-OU1-26-A[5], MW-OU1-46-A[3], MW-OU1-46-AD[3], EW-OU1-49-A[4], PZ-OU1-49-A1[4], MW-OU1-50-A, EW-OU1-52-A, MW-OU1-57-A, MW-OU1-58-A, EW-OU1-60-A, MW-OU1-61-A, EW-OU1-62-A, EW-OU1-63-A, EW-OU1-66-A, MW-OU1-67-A, MW-OU1-68-A[5], EW-OU1-71-A, EW-OU1-72-A, IW-OU1-73-A, IW-OU1-74-A, MW-OU1-82-A, MW-OU1-83-A, MW-OU1-84-A, MW-OU1-85-A, MW-OU1-86-A[5], MW-OU1-87-A[5], and MW-OU1-88-A
2. Rare plant species detected before but not after well construction – none
3. Rare plant species detected before and after well construction – none
4. Rare plant species detected only after well construction – 2 wells
   EW-OU1-53-A and MW-OU1-59-A
5. Well was constructed before earliest rare plant survey in 1998 – none

Year 2 surveys indicated that the number of wells where sand gilia was detected in 2019 was greater than the number of wells where it was found in Baseline surveys (1998 and 2017). OU1 remediation activities did not appear to adversely impact sand gilia populations. In accordance with the HMP and PBO, one additional year of monitoring will be completed. This will facilitate a more thorough evaluation of the effect of OU1 remediation activities on sand gilia populations.

5.2.1.2 Monterey Spineflower

Monterey spineflower was detected at 25 out of 27 well locations in 2019, 24 out of 33 well locations in 2018, 17 out of 33 well locations in 2017, and 10 out of 33 well locations in 1998. Five impact categories were defined in previous FONR rare plant survey reports as follows (HGL, 2018):

1. Rare plant species not detected in any survey – 6 wells[5]
   IW-OU1-10-A[2], PZ-OU1-10-A1[2], MW-OU1-26-A, MW-OU1-68-A, MW-OU1-86-A, and MW-OU1-87-A
2. Rare plant species detected before but not after well construction – none
3. Rare plant species detected before and after well construction – 11 wells
   EW-OU1-49-A[4], PZ-OU1-49-A1[4], EW-OU1-53-A, EW-OU1-60-A, EW-OU1-66-A, MW-OU1-46-A[3], MW-OU1-46-AD[3], MW-OU1-50-A, MW-OU1-57-A, MW-OU1-61-A, and MW-OU1-84-A
4. Rare plant species detected only after well construction – 16 wells
   EW-OU1-52-A, EW-OU1-62-A, EW-OU1-63-A, EW-OU1-71-A, EW-OU1-72-A, IW-OU1-02-A[1], PZ-OU1-02-A1[1], IW-OU1-73-A, IW-OU1-74-A, MW-OU1-58-A, MW-OU1-59-A, MW-OU1-67-A, MW-OU1-82-A, MW-OU1-83-A, MW-OU1-85-A, and MW-OU1-88-A

[1, 2, 3, 4] Wells with the same notation were considered one location

[5] Wells not surveyed in 2018.

5. Well was constructed before earliest rare plant survey in 1998 – none

Monterey spineflower was also detected at the NWTS in 2019, 2018, and 1998.

Year 2 surveys indicated that the number of wells where Monterey spineflower was detected in 2019 was greater than the number of wells where it was found in Baseline surveys (1998 and 2017). OU1 remediation activities did not appear to adversely impact Monterey spineflower populations overall. In accordance with the HMP and PBO, one additional year of monitoring will be completed. This will facilitate a more thorough evaluation of the effect of OU1 remediation activities on Monterey populations.

5.2.2 Operable Unit 2, OUCTP, and Sites 2/12 (Year 1)

5.2.2.1 Sand Gilia

Sand gilia was detected at four out of six well locations in 2019, three out of six well locations in 2018, and four out of six well locations in 1998. Five impact categories were defined in previous FONR rare plant survey reports as follows (HGL, 2018):

1. Rare plant species not detected in any survey – 1 well
   MW-02-12-180
2. Rare plant species detected before but not after well construction – 1 well
   MW-BW-29-180
3. Rare plant species detected before and after well construction – 2 wells
   MW-BW-93-A, MW-BW-95-A
4. Rare plant species detected only after well construction – 1 well
   MW-BW-94-A
5. Well was constructed before earliest rare plant survey in 1998 – 2 wells
   MW-02-12-180, MW-OU2-59-A

Year 1 surveys indicated that the number of wells where sand gilia was detected in 2019 was the same or greater than the number of wells where it was found in Baseline surveys (1998 and 2018). OUCTP, OU2, and Sites 2/12 remediation activities did not appear to adversely impact sand gilia populations. In accordance with the HMP and PBO, two additional years of monitoring will be completed. This will facilitate a more thorough evaluation of the effect of OUCTP, OU2, and Sites 2/12 remediation activities on sand gilia populations.

5.2.2.2 Monterey Spineflower

Monterey spineflower was detected at all six well locations in 2019, all six well locations in 2018, and five out of six well locations in 1998. Five impact categories were defined in previous FONR rare plant survey reports as follows (HGL, 2018):

1. Rare plant species not detected in any survey – none
2. Rare plant species detected before but not after well construction – none
3. Rare plant species detected before and after well construction – 4 wells
   MW-BW-29-180, MW-BW-93-A, MW-BW-94-A, MW-BW-95-A

4. Well was constructed before earliest rare plant survey in 1998 – 2 wells MW-02-12-180, MW-OU2-59-A

Year 1 surveys indicated that the number of wells where Monterey spineflower was detected in 2019 was the same or greater than the number of wells where it was found in Baseline surveys (1998 and 2018). OUCTP, OU2, and Sites 2/12 remediation activities did not appear to adversely impact Monterey spineflower populations. In accordance with the HMP and PBO, two additional years of monitoring will be completed. This will facilitate a more thorough evaluation of the effect of OUCTP, OU2, and Sites 2/12 remediation activities on Monterey spineflower populations.

5.3 Future Work

The 2017 PBO states that, in FONR, "monitoring will be suspended at sites where HMP annuals have not been documented during baseline surveys nor in the first year of follow up surveys. Additionally, surveys for HMP annuals will not be conducted in areas considered low quality habitat for these species" (USFWS, 2017). Year 2 follow up surveys were completed for 27 OU1 wells decommissioned in 2017. During Baseline or Year 1 surveys, sand gilia was observed at two out of 27 wells and Monterey spineflower was observed at all 27 wells and the NWTS. The eight wells located at the northwest edge of FONR (EW-OU1-60-A, EW-OU1-62-A, EW-OU1-63-A, EW-OU1-66-A, MW-OU1-57-A, MW-OU1-58-A, MW-OU1-61-A, MW-OU1-67-A) have been surveyed for rare plants at least seven times since 1998, during which sand gilia has never been found (Appendix A Table A-1). This area is covered with nonnative annual grasses, which makes it low quality habitat for sand gilia. These well locations and the NWTS will not be surveyed for sand gilia in Year 3 surveys. Year 3 OU1 surveys will include 27 well locations, secondary access routes, and the NWTS: sand gilia surveys will be completed at 19 out of 27 well locations and Monterey spineflower surveys will be completed at all 27 well locations and the NWTS. If any sand gilia plants are detected during Monterey spineflower surveys at well locations where they were not found previously, they will be surveyed and recorded as well.

Year 1 follow up surveys were completed for six OUCTP, OU2, and Sites 2/12 wells that were either decommissioned or installed in 2018. During Baseline or Year 1 surveys, sand gilia was observed at four out of six wells and Monterey spineflower was observed at all six wells. Two of the wells (MW-02-12-180 and MW-BW-29-180) did not have sand gilia in Baseline, nor in Year 1 follow up surveys, and their locations are within low quality habitat for this species (Appendix A Table A-3). These well locations will not be surveyed for sand gilia in Year 2 surveys. Year 2 OUCTP, OU2, and Sites 2/12 surveys will include six well locations and secondary access routes: sand gilia surveys will be completed at four out of six well locations (MW-OU2-59-A, MW-BW-93-A, MW-BW-94-A, MW-BW-95-A) and Monterey spineflower surveys will be completed at all six well locations. If any sand gilia plants are detected during Monterey spineflower surveys at well locations where they were not found previously, they will be surveyed and recorded as well.

6. REFERENCES

Ackerman JD, Lauri R. 2013. *Piperia yadonii*, in Jepson Flora Project (eds.). Jepson eFlora. http://ucjeps.berkeley.edu/cgi-bin/get_IJM.pl?tid=38361. Accessed July 27, 2018.

Ahtna Environmental, Inc. (Ahtna). 2018. 2018 Annual Rare Plant Survey for the Ahtna Monitoring Wells and Enhanced In Situ Bioremediation (EISB) Deployment Area at the Operable Unit Carbon Tetrachloride Plume (OUCTP). AR# OUCTP-0087.

Burleson Consulting, Inc. 2018. 2018 Annual Report Fort Ord Natural Reserve Rare Plant Survey, Operable Unit 1. AR# OU1-634.

California Natural Diversity Database (CNDDB). 2019. RareFind 5. California Department of Fish and Wildlife. Commercial Version June 30, 2019. https://map.dfg.ca.gov/rarefind/view/RareFind.aspx. Accessed August 1, 2019.

Dorrell-Canepa J. 1994. Population Biology of *Gilia tenuiflora* ssp*. arenaria* (*Polemoniaceae*). Master's Theses. 904. http://scholarworks.sjsu.edu/etd_theses/904

ESRI. 2018. ArcGIS Version 10.6.1.

Fox LR, Steele HN, Holl KD, Fusari MH. 2006. Contrasting Demographies and Persistence of Rare Annual Plants in Highly Variable Environments. Plant Ecology 183(1):157-170.

Fox LR. 2007. Climatic and Biotic Stochacticity: Disparate Causes of Convergent Demographies in Rare, Sympatric Plants. Conservation Biology 21(6):1556-1561.

HydroGeoLogic, Inc (HGL). 2011. 2010 FONR Impact Assessment and Habitat and Rare Plant Species Survey Results, Fritzsche Army Airfield Fire Drill Area, Former Fort Ord, California. AR# OU1-585.

HGL. 2015. Final 2014 Annual and Third Quarter Groundwater Monitoring Report, Operable Unit 1 Fritzsche Army Airfield Fire Drill Area, Former Fort Ord, California. AR# OU1-613A.

HGL. 2016a. Final Remediation Action Completion Report Technical Memorandum Operable Unit 1 Attainment Monitoring Results Sampling Events #1 Through #4, Former Fort Ord, California. AR# OU1-623A.

HGL. 2016b. Final Technical Memorandum for Attainment Monitoring Evaluation and Summary for EPA Designated Emerging Contaminants in Operable Unit 1 Groundwater, Fritzsche Army Airfield, Former Fort Ord, California. AR# OU1-626.

HGL. 2017. 2016 FONR Impact Assessment and Habitat and Rare Plant Species Survey Results, Operable Unit 1, Former Fort Ord, CA. AR# OU1-628.

HGL. 2018. Final 2017 FONR Impact Assessment and Habitat and Rare Plant Species Survey Results, Operable Unit 1, Former Fort Ord, California. AR# OU1-632.

National Oceanic and Atmospheric Administration (NOAA). 2018. Data Tools: 1981-2010 Normals for Monterey Weather Forecast Office. https://www.ncdc.noaa.gov/cdo-web/datatools/normals. Accessed August 15, 2018.

Naval Postgraduate School, Department of Meteorology (NPS). 2019. Summary of Data for Weather in the Monterey region. http://met.nps.edu/~ldm/renard_wx/. Accessed July 15, 2019.

Porter JM. 2018. *Gilia tenuiflora* ssp. *arenaria*, in Jepson Flora Project (eds.). Jepson eFlora. http://ucjeps.berkeley.edu/cgi-bin/get_IJM.pl?tid=50823. Accessed July 27, 2018.

Reveal JL, Rosatti TJ. 2013. *Chorizanthe pungens* var. *pungens*, in Jepson Flora Project (eds.). Jepson eFlora. http://ucjeps.berkeley.edu/cgi-bin/get_IJM.pl?tid=56501. Accessed July 27, 2018.

United States Army Corps of Engineers (USACE). 1997. Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California. April 1997. Sacramento, CA.

USACE. 2016. Fort Ord Orthoimagery.

USACE. 2019a. "flora_special_species_area_MISCVEG" shapefile. Accessed from Fort Ord Data Integration System.

USACE. 2019b. "flora_special_species_area_VEGMONITORING" shapefile. Accessed from Fort Ord Data Integration System.

United States Department of Agriculture, Natural Resource Conservation Services (USDA NRCS). 2016. National Agricultural Imagery Program Imagery. https://gdg.sc.egov.usda.gov/. Accessed November 1, 2017.

U.S. Fish and Wildlife Service (USFWS). 2015. Programmatic Biological Opinion for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California (8-8-09-F-74) (2015 Biological Opinion). May 28. AR# BW-2747.

USFWS. 2017. Reinitiation of Formal Consultation for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California (Original Consultation #8-8-09-F-74, 81440-2009-5-00334). June 7. AR# BW-2747A

APPENDIX A

FONR Historical Rare Plant Survey Results

Table A-1. Historical Sand Gilia Survey Results Relative to OU1 Well Locations

Well Identification	Year Installed	1998	Harding Lawson Associates					HydroGeoLogic, Inc.														Burleson Consulting Inc.	
			1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Wells Installed from 1998 - 2001																							
MW-OU1-26-A	1998	N	--	--	--	--	--	N	--	N	N	--	--	--	--	--	--	--	--	--	N	N	--
MW-OU1-46-A[1]	2001	N	N	N	N	N	N	N	N	N	N	N	N	N	--	--	--	--	N	N	N	N	N
Wells Installed in 2004 After the Rare Plant Survey																							
MW-OU1-46-AD[1]	2004	N	N	N	N	N	N	N	N	N	N	N	N	--	--	--	--	--	N	N	N	N	N
EW-OU1-49-A[2]	2004	N	--	--	--	--	--	N	N	N	N	--	--	--	--	--	--	--	--	--	N	N	N
PZ-OU1-49-A1[2]	2004	N	--	--	--	--	--	N	N	N	N	--	--	--	--	--	--	--	--	--	N	N	N
EW-OU1-52-A	2004	N	--	--	--	--	--	N	N	N	N	--	--	--	--	--	--	--	--	--	N	N	N
EW-OU1-53-A	2004	N	--	--	--	--	--	N	N	SG#21-25; #30	SG#24[16]	--	--	--	--	--	--	--	--	--	N	SG#8[11]; SG#9[91]; SG#10[1]; SG#11[50]	SG#443[4]; SG#444[5]; SG#15[11]; SG#12[14]; SG#11[23]; SG#13[53]; SG#14[100]; SG#17[195]; SG#18[1077]; SG#16[1680]
IW-OU1-02-A[4]	2004	N	--	--	--	--	--	N	--	N	N	--	--	--	--	--	--	--	--	--	N	N	N
PZ-OU1-02-A1[4]	2004	N	--	--	--	--	--	N	--	N	N	--	--	--	--	--	--	--	--	--	N	N	N
IW-OU1-10-A[3]	2004	N	--	--	--	--	--	N	--	N	N	--	--	--	--	N	--	--	--	--	N	N	--
Wells Installed in 2004 in Area Not Surveyed																							
MW-OU1-50-A	2004	N	--	--	--	--	--	--	N	N	N	N	N	--	--	--	--	--	--	--	N	N	N
MW-OU1-57-A	2004	N	--	--	--	--	--	--	N	N	N	--	--	--	--	--	--	--	--	--	N	N	N
MW-OU1-58-A	2004	N	--	--	--	--	--	--	N	N	N	--	--	--	--	--	--	--	--	--	N	N	N
MW-OU1-59-A	2004	N	--	--	--	--	--	--	N	SG#26[13]	N	--	--	--	--	--	--	--	--	--	N	N	N
Wells Installed in 2005 After the Rare Plant Survey																							
PZ-OU1-10-A1[3]	2005	N	--	--	--	--	--	N	--	N	N	--	--	--	--	--	--	--	--	--	N	N	--
HCPP Wells Installed Along Northwest Boundary Road in 2006 Before the Rare Plant Survey																							
EW-OU1-60-A	2006	N	--	--	--	--	--	--	N	N	N	N	--	--	--	--	--	--	--	--	N	N	N
EW-OU1-62-A	2006	N	--	--	--	--	--	--	N	N	N	--	--	--	--	--	--	--	--	--	N	N	N
EW-OU1-63-A	2006	N	--	--	--	--	--	--	N	N	N	--	--	--	--	--	--	--	--	--	N	N	N
EW-OU1-66-A	2006	N	--	--	--	--	--	--	N	N	N	--	--	--	--	--	--	--	--	--	N	N	N
MW-OU1-61-A	2006	N	--	--	--	--	--	--	N	N	N	N	--	--	--	--	--	--	--	--	N	N	N
MW-OU1-67-A	2006	N	--	--	--	--	--	--	N	N	N	--	--	--	--	--	--	--	--	--	N	N	N
MW-OU1-68-A	2006	N	--	--	--	--	--	--	N	N	N	--	--	--	--	--	--	--	--	--	--	N	--
Wells Installed in 2006 After the Rare Plant Survey																							
EW-OU1-71-A	2006	N	--	--	--	--	--	N	--	N	N	N	N	--	--	--	--	--	--	--	N	N	N

Table A-1. Historical Sand Gilia Survey Results Relative to OU1 Well Locations

Well Identification	Year Installed	1998	Harding Lawson Associates					HydroGeoLogic, Inc.														Burleson Consulting Inc.	
			1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
EW-OU1-72-A	2006	N	--	--	--	--	--	N	N	N	N	N	N	--	--	--	--	--	--	--	N	N	N
IW-OU1-73-A	2006	N	--	--	--	--	--	--	N	N	N	N	N	--	--	--	--	--	--	--	N	N	N
IW-OU1-74-A	2006	N	--	--	--	--	--	--	N	N	N	N	N	--	--	--	--	--	--	--	N	N	N
MW-OU1-82-A	2006	N	--	--	--	--	--	--	N	N	N	N	N	--	--	--	--	--	--	--	N	N	N
MW-OU1-83-A	2006	N	--	--	--	--	--	N	N	N	N	N	N	--	--	--	--	--	--	--	N	N	N
MW-OU1-84-A	2006	N	N	N	N	N	N	--	N	N	N	N	N	--	--	--	--	--	--	N	N	N	N
MW-OU1-85-A	2006	N	--	--	--	--	--	N	N	N	N	N	N	--	--	--	--	--	--	--	N	N	N
MW-OU1-86-A	2006	N	--	--	--	--	--	N	--	N	N	N	N	--	--	--	--	--	--	--	N	N	--
MW-OU1-87-A	2006	N	--	--	--	--	--	N	N	N	N	N	N	--	--	--	--	--	--	--	N	N	--
MW-OU1-88-A	2006	N	--	--	--	--	--	N	--	N	N	N	N	--	--	--	--	--	--	--	N	N	N
NWTS	2006	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	N	N

1998-2017 data from Table 3.3 B in the *2017 FONR Impact Assessment and Habitat and Rare Plant Species Survey Results* Report (HGL, 2018).

(1) MW-OU1-46-A, MW-OU1-46-AD, and PZ-OU1-46-AD2 considered to be one location

(2) EW-OU1-49-A and PZ-OU1-49-A1 considered to be one location

(3) IW-OU1-10-A and PZ-OU1-10-A1 considered to be one location

(4) IW-OU1-02-A and PZ-OU1-02-A1 considered to be one location

-- Not Surveyed

EW - Extraction Well

HCCP - Hydraulic Control Pilot Project

IW - Injection Well

MW - Monitoring Well

N - Area surveyed; no rare plants detected

NWTS - Northwest Treatment System

PZ - Piezometer

SG - Sand Gilia

SG#26[13] - Population ID # [number of plants]

Table A-2. Historical Monterey Spineflower Survey Results Relative to OU1 Well Locations

Well Identification	Year Installed	1998	Harding Lawson Associates					HydroGeoLogic, Inc.										Burleson Consulting Inc.	
			1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010-2014	2015	2016	2017	2018	2019
Wells Installed from 1998 - 2001																			
MW-OU1-26-A	1998	N	--	--	--	--	--	N	--	N	N	--	--	--	--	--	N	N	--
MW-OU1-46-A[1]	2001	MS	MS	N	N	MS	MS	N	N	N	N	MS#34[VS]	MS#27[M]	--	MS#36[S]	MS#32[ML]	MS#30[S]	MS#39[VS]; MS#40[2]	MS#161[S]; MS#354[1]
Wells Installed in 2004 After the Rare Plant Survey																			
MW-OU1-46-AD[1]	2004	MS	MS	N	N	MS	MS	N	N	N	N	MS#34[VS]	MS#27[M]	--	MS#36[S]	MS#32[ML]	MS#30[S]	MS#39[VS]; MS#40[2]	MS#161[S]; MS#354[1]
EW-OU1-49-A[2]	2004	MS	--	--	--	--	--	N	N	N	N	--	--	--	--	--	N	N	MS#343[1]
PZ-OU1-49-A1[2]	2004	MS	--	--	--	--	--	N	N	N	N	--	--	--	--	--	N	N	MS#343[1]
EW-OU1-52-A	2004	N	--	--	--	--	--	N	N	N	N	--	--	--	--	--	N	MS#14[2]; MS#15[2]	MS#340[3]; MS#341[1]
EW-OU1-53-A	2004	MS	--	--	--	--	--	N	N	MS#92[S]	MS#52[VS]; MS#53[VS]	--	--	--	--	--	MS#20[ML]	MS#22[2]; MS#23[5]; MS#24[S]; MS#25[2]; MS#26[ML]	MS#156[ML]; MS#339[1]
IW-OU1-02-A[4]	2004	N	--	--	--	--	--	N	--	N	N	--	--	--	--	--	N	MS#13[1]	MS#342[1]
PZ-OU1-02-A1[4]	2004	N	--	--	--	--	--	N	--	N	N	--	--	--	--	--	N	MS#13[1]	MS#342[1]
IW-OU1-10-A[3]	2004	N	--	--	--	--	--	N	--	N	N	--	--	--	--	--	N	N	--
Wells Installed in 2004 in Area Not Surveyed																			
IW-OU1-10-A[3]	2004	N	--	--	--	--	--	N	--	N	N	--	--	--	--	--	N	N	--
MW-OU1-50-A	2004	MS	--	--	--	--	--	--	MS#21[MH]	N	MS#61[ML]	MS#49[ML]; MS#50[S]	MS#36[S]; MS#4[2]; MS#5[2]	--	--	--	MS#21[ML]	MS#53[ML]	MS#176[S]
MW-OU1-57-A	2004	MS	--	--	--	--	--	--	N	N	N	--	--	--	--	--	MS#21[ML]	MS#53[ML]	MS#171[S]; MS#172[S]; MS#176[S]; MS#388[2]; MS#389[1]; MS#390[1]
MW-OU1-58-A	2004	N	--	--	--	--	--	--	N	N	N	--	--	--	--	--	MS#21[ML]; MS#27[S]	MS#49[2]; MS#50[1]; MS#53[ML]	MS#176[S]; MS#372[1]; MS#373[3]; MS#398[1]; MS#399[2]
MW-OU1-59-A	2004	N	--	--	--	--	--	--	MS#153[2]	N	N	--	--	--	--	--	MS#22[ML]	MS#53[ML]; MS#56[1]	MS#176[S]; MS#402[2]; MS#403[1]; MS#404[1]
Wells Installed in 2005 After the Rare Plant Survey																			
PZ-OU1-10-A1[3]	2005	N	--	--	--	--	--	N	--	N	N	--	--	--	--	--	N	N	--
HCPP Wells Installed Along Northwest Boundary Road in 2006 Before the Rare Plant Survey																			
EW-OU1-60-A	2006	MS	--	--	--	--	--	--	N	N	N	N	--	--	--	--	MS#10[2]; MS#11[3]; MS#21[ML]	MS#51[S]; MS#52[8]; MS#53[ML]	MS#170[VS]; MS#176[S]; MS#391[1]

Table A-2. Historical Monterey Spineflower Survey Results Relative to OU1 Well Locations

Well Identification	Year Installed	1998	Harding Lawson Associates					HydroGeoLogic, Inc.									Burleson Consulting Inc.	
			1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010-2014	2015	2016	2017	2018	2019
EW-OU1-62-A	2006	N	--	--	--	--	--	--	N	N	N	--	--	--	--	--	N	MS#53[ML]	MS#179[S]; MS#370[1]; MS#371[1]; MS#413[2]; MS#414[4]; MS#415[3]; MS#416[2]; MS#417[3]; MS#418[1]
EW-OU1-63-A	2006	N	--	--	--	--	--	--	N	N	N	--	--	--	--	--	MS#21[ML]	MS#53[ML]	MS#173[S]; MS#174[VS]; MS#175[S]; MS#176[S]; MS#378[3]; MS#379[4]; MS#380[3]; MS#381[1]; MS#382[1]; MS#383[1]; MS#384[4]; MS#385[2]; MS#386[4]; MS#387[4]; MS#400[1]; MS#401[1]
EW-OU1-66-A	2006	MS	--	--	--	--	--	--	N	N	N	--	--	--	--	--	MS#21[ML]; MS#27[S]; MS#28[S]; MS#29[S]	MS#51[S]; MS#53[ML]	MS#168[S]; MS#169[S]; MS#176[S]; MS#374[1]; MS#375[3]; MS#376[4]; MS#377[4]; MS#394[2]; MS#395[1]; MS#396[1]; MS#397[1]
MW-OU1-61-A	2006	MS	--	--	--	--	--	--	N	N	N	N	--	--	--	--	MS#10[2]; MS#11[3]; MS#21[ML]; MS#29[S]	MS#53[ML]	MS#169[S]; MS#170[VS]; MS#176[S]; MS#392[4]; MS#393[1]
MW-OU1-67-A	2006	N	--	--	--	--	--	--	N	N	N	--	--	--	--	--	MS#27[S]	MS#48[1]; MS#49[2]; MS#50[1]	MS#178[VS]; MS#409[1]; MS#410[3]; MS#411[1]; MS#412[1]
MW-OU1-68-A	2006	N	--	--	--	--	--	--	N	N	N	--	--	--	--	--	N	N	--
Wells Installed in 2006 After the Rare Plant Survey																			
EW-OU1-71-A	2006	N	--	--	--	--	--	N	--	N	N	MS#42[S]	N	--	--	--	N	N	MS#344[3]
EW-OU1-72-A	2006	N	--	--	--	--	--	N	N	N	N	N	N	--	--	--	N	MS#27[2]; MS#28[1]	MS#345[1]; MS#349[1]

Table A-2. Historical Monterey Spineflower Survey Results Relative to OU1 Well Locations

Well Identification	Year Installed	1998	Harding Lawson Associates					HydroGeoLogic, Inc.										Burleson Consulting Inc.	
			1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010-2014	2015	2016	2017	2018	2019
IW-OU1-73-A	2006	N	--	--	--	--	--	--	N	N	N	N	N	--	--	--	N	MS#46[1]	N
IW-OU1-74-A	2006	N	--	--	--	--	--	--	N	N	MS#60[VS]	MS#39[S]	MS#41[S]; MS#33[ML]	--	--	--	MS#19[S]	MS#42[1]; MS#43[S]; MS#44[1]; MS#45[1]	MS#163[S]; MS#164[S]; MS#165[S]; MS#166[S]; MS#358[2]; MS#359[1]; MS#360[4]; MS#361[1]; MS#362[1]; MS#363[4]; MS#364[3]; MS#365[5]
MW-OU1-82-A	2006	N	--	--	--	--	--	--	N	N	N	MS#51[ML]	MS#10[2]	--	--	--	MS#12[1]; MS#24[S]; MS#25[S]; MS#26[ML]	MS#57[5]; MS#58[5]; MS#59[2]; MS#60[1]; MS#61[S]; MS#62[2]; MS#63[2]; MS#64[S]; MS#65[5]; MS#66[S]; MS#67[1]; MS#68[1]; MS#69[2]; MS#70[S]	MS#177[S]; MS#180[S]; MS#405[2]; MS#406[4]; MS#407[2]; MS#408[3]
MW-OU1-83-A	2006	N	--	--	--	--	--	N	N	N	N	MS#26[1]; MS#46[S] adjacent	MS#23[2]; MS#24[2]; MS#25[1]	--	--	--	MS#31[M]	MS#35[6]; MS#36[7]; MS#37[S]; MS#38[M]	MS#160[VS]; MS#162[S]; MS#350[1]; MS#351[1]; MS#352[1]; MS#353[3]; MS#366[1]
MW-OU1-84-A	2006	N	MS	N	N	N	N	--	N	N	MS#58 across road	MS#37[ML]; MS#36[ML] across road	MS#28[M]; MS#15[3]	--	--	MS#37[ML]; MS#38[S]	N	MS#41[3]	MS#355[1]; MS#356[4]; MS#357[1]
MW-OU1-85-A	2006	N	--	--	--	--	--	N	N	N	N	N	N	--	--	--	MS#7[1]; MS#8[1]	MS#29[2]; MS#30[1]; MS#31[2]; MS#32[2]; MS#33[S]; MS#34[3]	MS#157[S]; MS#158[S]; MS#159[S]; MS#346[3]; MS#347[1]; MS#348[3]
MW-OU1-86-A	2006	N	--	--	--	--	--	N	--	N	N	N	N	--	--	--	N	N	--
MW-OU1-87-A	2006	N	--	--	--	--	--	N	N	N	N	N	N	--	--	--	N	N	--
MW-OU1-88-A	2006	N	--	--	--	--	--	N	--	N	N	N	N	--	--	--	MS#9[2]	MS#16[3]	N

Table A-2. Historical Monterey Spineflower Survey Results Relative to OU1 Well Locations

Well Identification	Year Installed	1998	Harding Lawson Associates					HydroGeoLogic, Inc.										Burleson Consulting Inc.	
			1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010-2014	2015	2016	2017	2018	2019
NWTS	2006	MS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	MS#47[1]	MS#167[S]; MS#367[2]; MS#368[5]; MS#369[1]

1998-2017 data from Table 3.3 B in the *2017 FONR Impact Assessment and Habitat and Rare Plant Species Survey Results* Report (HGL, 2018).

(1) MW-OU1-46-A, MW-OU1-46-AD, and PZ-OU1-46-AD2 considered to be one location

(2) EW-OU1-49-A and PZ-OU1-49-A1 considered to be one location

(3) IW-OU1-10-A and PZ-OU1-10-A1 considered to be one location

(4) IW-OU1-02-A and PZ-OU1-02-A1 considered to be one location

-- Not Surveyed
EW - Extraction Well
HCCP - Hydraulic Control Pilot Project
IW - Injection Well
M - Medium
MH - Medium High
ML - Medium Low
MS - Monterey Spineflower
MS#49[VS] - Population ID # [density category or number of plants]
MW - Monitoring Well
N - Area surveyed; no rare plants detected
NWTS - Northwest Treatment System
PZ - Piezometer
S -Sparse
VS - Very Sparse

Table A-3. Historical Sand Gilia Survey Results Relative to OUCTP, OU2, & Sites 2/12 Well Locations

Location	Well Identification	Year Installed	1998	Harding Lawson Associates					HydroGeoLogic, Inc.								Ahtna Environmental, Inc.	Burleson Consulting Inc.
				1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011-2017	2018	2019
Sites 2/12	MW-02-12-180	1996	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	N
OU2	MW-OU2-59-A	1997	SG	--	--	--	--	--	--	--	--	--	--	--	SG	--	SG[1]; SG[1]; SG[2]; SG[2]; SG[2]; SG[2]; SG[3]; SG[5]; SG[7]	SG#461[1]; SG#462[1]; SG#463[1]; SG#466[1]; SG#468[2]; SG#471[2]; SG#465[3]; SG#467[3]; SG#469[3]; SG#470[3]; SG#459[5]; SG#460[5]; SG#464[5]; SG#37[6]; SG#38[10]; SG#34[12]; SG#43[13]; SG#44[20]; SG#35[21]; SG#42[27]; SG#46[27]; SG#41[36]; SG#36[45]; SG#33[62]; SG#45[71]; SG#40[222]; SG#39[569]; SG#47[708]
OUCTP	MW-BW-29-180	2000	SG	--	--	--	--	--	--	--	--	--	--	N	N	--	N	N
OUCTP	MW-BW-93-A	2018	SG	SG	SG	SG	SG	SG	--	SG	--	--	--	--	--	--	SG[2]; SG[2]; SG[2]; SG[11]	SG#448[1]; SG#451[1]; SG#452[1]; SG#454[1]; SG#457[1]; SG#458[1]; SG#445[2]; SG#446[2]; SG#447[2]; SG#449[2]; SG#450[2]; SG#455[2]; SG#456[3]; SG#453[5]; SG#23[6]; SG#27[6]; SG#29[10]; SG#28[14]; SG#25[18]; SG#31[20]; SG#20[27]; SG#24[34]; SG#30[69]; SG#32[96]; SG#21[160]; SG#26[250]; SG#22[1464]
OUCTP	MW-BW-94-A	2018	N	--	--	--	--	--	--	N	--	--	--	--	--	--	N	SG#19[34]

Table A-3. Historical Sand Gilia Survey Results Relative to OUCTP, OU2, & Sites 2/12 Well Locations

Location	Well Identification	Year Installed	1998	Harding Lawson Associates					HydroGeoLogic, Inc.								Ahtna Environmental, Inc.	Burleson Consulting Inc.
				1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011-2017	2018	2019
OUCTP	MW-BW-95-A	2018	SG	SG	SG	SG	SG	SG	SG	SG	SG	SG	--	--	--	--	SG[1]; SG[1]; SG[1]; SG[4]; SG[15]; SG[15]; SG[21]	SG#473[1]; SG#474[1]; SG#476[1]; SG#478[1]; SG#480[1]; SG#481[1]; SG#482[1]; SG#483[1]; SG#484[1]; SG#485[1]; SG#491[1]; SG#492[1]; SG#494[1]; SG#495[1]; SG#496[1]; SG#499[1]; SG#500[1]; SG#477[2]; SG#479[2]; SG#486[2]; SG#487[2]; SG#493[2]; SG#472[3]; SG#489[3]; SG#497[3]; SG#498[3]; SG#475[4]; SG#488[4]; SG#490[4]; SG#61[6]; SG#53[7]; SG#51[26]; SG#55[26]; SG#58[45]; SG#48[63]; SG#56[122]; SG#50[145]; SG#54[167]; SG#62[187]; SG#52[590]; SG#49[591]; SG#59[862]; SG#57[937]; SG#60[952]; SG#63[5529]

1998-2017 data from Fort Ord Data Integration System (USACE, 2019a; USACE, 2019b). 2018 data from the GIS data deliverable for the *2018 Annual Rare Plant Survey for the Ahtna Monitoring Wells and Enhanced In Situ Bioremediation (EISB) Deployment Area at the Operable Unit Carbon Tetrachloride Plume (OUCTP)* report (Ahtna, 2018).

-- Not Surveyed
IW - Injection Well
M - Medium
MH - Medium High
ML - Medium Low
MS - Monterey Spineflower
MW - Monitoring Well
N - Area surveyed; no rare plants detected
S -Sparse
SG#49[VS] - population ID # [density category or number of plants]
VS - Very Sparse

Table A-4. Historical Monterey Spineflower Survey Results Relative to OUCTP, OU2, & Sites 2/12 Well Locations

Location	Well Identification	Year Installed	1998	Harding Lawson Associates					HydroGeoLogic, Inc.								Ahtna Environmental, Inc.	Burleson Consulting Inc.
				1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011-2017	2018	2019
Sites 2/12	MW-02-12-180	1996	--	--	--	--	--	--	--	--	--	--	--	--	--	--	MS[S]; MS[S]; MS[S]	MS#306[1]; MS#308[1]; MS#307[3]; MS#140[S]; MS#141[VS]
OU2	MW-OU2-59-A	1997	MS	--	--	--	--	--	--	--	--	--	--	--	MS	--	MS[1]; MS[1]; MS[3]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[ML]	MS#309[1]; MS#319[1]; MS#322[1]; MS#323[1]; MS#325[1]; MS#327[1]; MS#334[1]; MS#337[1]; MS#338[1]; MS#310[2]; MS#311[2]; MS#312[2]; MS#313[2]; MS#314[2]; MS#317[2]; MS#318[2]; MS#324[2]; MS#326[2]; MS#328[2]; MS#329[2]; MS#331[2]; MS#332[2]; MS#335[2]; MS#316[3]; MS#333[3]; MS#321[4]; MS#330[4]; MS#336[4]; MS#315[5]; MS#320[5]; MS#151[S]; MS#142[S]; MS#144[S]; MS#145[S]; MS#146[S]; MS#147[S]; MS#148[S]; MS#149[S]; MS#150[S]; MS#152[S]; MS#153[S]; MS#154[S]; MS#155[S]; MS#143[VS]
OUCTP	MW-BW-29-180	2000	MS	--	--	--	--	--	--	--	--	--	--	MS	MS	--	MS[S]	MS#419[1]; MS#422[1]; MS#425[1]; MS#426[1]; MS#427[1]; MS#429[1]; MS#431[1]; MS#434[1]; MS#421[2]; MS#423[2]; MS#428[2]; MS#433[2]; MS#420[3]; MS#424[3]; MS#432[3]; MS#430[4]; MS#181[S]

Table A-4. Historical Monterey Spineflower Survey Results Relative to OUCTP, OU2, & Sites 2/12 Well Locations

Location	Well Identification	Year Installed	1998	Harding Lawson Associates					HydroGeoLogic, Inc.								Ahtna Environmental, Inc.	Burleson Consulting Inc.
				1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011-2017	2018	2019
OUCTP	MW-BW-93-A	2018	MS	N	MS	MS	MS	MS	--	--	--	--	--	--	--	--	MS[1]; MS[1]; MS[1]; MS[1]; MS[1]; MS[1]; MS[1]; MS[2]; MS[3]; MS[3]; MS[3]; MS[3]; MS[VS]; MS[VS]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[ML]	MS#208[1]; MS#209[1]; MS#213[1]; MS#214[1]; MS#215[1]; MS#216[1]; MS#217[1]; MS#218[1]; MS#223[1]; MS#224[1]; MS#226[1]; MS#227[1]; MS#228[1]; MS#229[1]; MS#230[1]; MS#231[1]; MS#232[1]; MS#235[1]; MS#210[2]; MS#220[2]; MS#221[2]; MS#222[2]; MS#234[2]; MS#212[3]; MS#219[3]; MS#225[3]; MS#233[3]; MS#236[3]; MS#211[4]; MS#85[S]; MS#88[S]; MS#82[S]; MS#83[S]; MS#84[S]; MS#87[S]; MS#89[S]; MS#91[S]; MS#92[S]; MS#93[S]; MS#94[S]; MS#86[VS]; MS#90[VS]
OUCTP	MW-BW-94-A	2018	MS	--	--	--	--	--	--	--	--	--	--	--	--	--	MS[1]; MS[1]; MS[VS]; MS[VS]; MS[VS]; MS[VS]; MS[VS]; MS[S]; MS[S]; MS[S]; MS[ML]	MS#194[1]; MS#199[1]; MS#200[1]; MS#201[1]; MS#205[1]; MS#193[2]; MS#195[2]; MS#197[2]; MS#202[2]; MS#204[2]; MS#206[2]; MS#196[3]; MS#198[3]; MS#207[3]; MS#203[4]; MS#71[S]; MS#72[S]; MS#73[S]; MS#74[S]; MS#75[S]; MS#76[S]; MS#77[S]; MS#78[S]; MS#79[S]; MS#80[S]; MS#81[S]

Table A-4. Historical Monterey Spineflower Survey Results Relative to OUCTP, OU2, & Sites 2/12 Well Locations

Location	Well Identification	Year Installed	1998	Harding Lawson Associates					HydroGeoLogic, Inc.								Ahtna Environmental, Inc.	Burleson Consulting Inc.
				1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011-2017	2018	2019
OUCTP	MW-BW-95-A	2018	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	--	--	--	--	MS[1]; MS[1]; MS[1]; MS[1]; MS[1]; MS[1]; MS[1]; MS[1]; MS[1]; MS[2]; MS[2]; MS[2]; MS[2]; MS[3]; MS[4]; MS[4]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[S]; MS[ML]; MS[ML]; MS[ML]; MS[ML]	MS#238[1]; MS#239[1]; MS#240[1]; MS#242[1]; MS#244[1]; MS#245[1]; MS#246[1]; MS#249[1]; MS#250[1]; MS#252[1]; MS#256[1]; MS#264[1]; MS#265[1]; MS#266[1]; MS#274[1]; MS#275[1]; MS#279[1]; MS#282[1]; MS#283[1]; MS#284[1]; MS#285[1]; MS#286[1]; MS#288[1]; MS#290[1]; MS#292[1]; MS#293[1]; MS#297[1]; MS#298[1]; MS#299[1]; MS#300[1]; MS#301[1]; MS#302[1]; MS#303[1]; MS#305[1]; MS#237[2]; MS#254[2]; MS#255[2]; MS#257[2]; MS#259[2]; MS#260[2]; MS#261[2]; MS#262[2]; MS#263[2]; MS#268[2]; MS#270[2]; MS#271[2]; MS#272[2]; MS#277[2]; MS#281[2]; MS#287[2]; MS#294[2]; MS#304[2]; MS#248[3]; MS#251[3]; MS#258[3]; MS#276[3]; MS#278[3]; MS#243[4]; MS#247[4]; MS#253[4]; MS#267[4]; MS#269[4]; MS#280[4]; MS#295[4]; MS#241[5]; MS#273[5]; MS#289[5]; MS#291[5]; MS#296[5]; MS#106[ML]; MS#129[ML]; MS#98[S]; MS#124[S]; MS#122[S]; MS#96[S]; MS#95[S]; MS#97[S]; MS#99[S]; MS#100[S]; MS#101[S]; MS#103[S]; MS#104[S]; MS#105[S]; MS#107[S]; MS#108[S]; MS#109[S]; MS#110[S]; MS#112[S]; MS#113[S]; MS#115[S]; MS#116[S]; MS#117[S]; MS#119[S]; MS#120[S];

Table A-4. Historical Monterey Spineflower Survey Results Relative to OUCTP, OU2, & Sites 2/12 Well Locations

Location	Well Identification	Year Installed	1998	Harding Lawson Associates					HydroGeoLogic, Inc.								Ahtna Environmental, Inc.	Burleson Consulting Inc.
				1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011-2017	2018	2019
																		MS#121[S]; MS#125[S]; MS#126[S]; MS#127[S]; MS#130[S]; MS#131[S]; MS#132[S]; MS#133[S]; MS#135[S]; MS#136[S]; MS#137[S]; MS#138[S]; MS#128[VS]; MS#102[VS]; MS#111[VS]; MS#114[VS]; MS#118[VS]; MS#123[VS]; MS#134[VS]; MS#139[VS]

1998-2017 data from Fort Ord Data Integration System (USACE, 2019a; USACE, 2019b). 2018 data from the GIS data deliverable for the *2018 Annual Rare Plant Survey for the Ahtna Monitoring Wells and Enhanced In Situ Bioremediation (EISB) Deployment Area at the Operable Unit Carbon Tetrachloride Plume (OUCTP)* report (Ahtna, 2018).

-- Not Surveyed
IW - Injection Well
M - Medium
MH - Medium High
ML - Medium Low
MS - Monterey Spineflower
MS#49[VS] - population ID # [density category or number of plants]
MW - Monitoring Well
N - Area surveyed; no rare plants detected
S -Sparse
VS - Very Sparse

APPENDIX B

2019 Rare Plant Survey Results

Table B-1. Sand Gilia Populations found in 2019 Reference Site Survey

Population Number	Well ID	Individuals (#)	Area (ft^2)	GIS Feature Type
0	Reference	33	38.26	Polygon
1	Reference	290	152.27	Polygon
2	Reference	57	43.23	Polygon
3	Reference	31	47.56	Polygon
4	Reference	915	210.62	Polygon
5	Reference	5498	1283.65	Polygon
6	Reference	26	10.39	Polygon
7	Reference	4541	717.52	Polygon
8	Reference	27	9.98	Polygon
9	Reference	15	13.98	Polygon
10	Reference	17	13.63	Polygon
435	Reference	4	–	Point
436	Reference	1	–	Point
437	Reference	1	–	Point
438	Reference	4	–	Point
439	Reference	1	–	Point
440	Reference	3	–	Point
441	Reference	4	–	Point
442	Reference	1	–	Point

Table B-2. Sand Gilia Populations found in 2019 OU1 Survey

Population Number	Well ID	Individuals (#)	Area (ft^2)	GIS Feature Type
11	EW-OU1-53-A	23	15.42	Polygon
12	EW-OU1-53-A	14	20.78	Polygon
13	EW-OU1-53-A	53	11.09	Polygon
14	EW-OU1-53-A	100	30.73	Polygon
15	EW-OU1-53-A	11	4.69	Polygon
16	EW-OU1-53-A	1680	191.99	Polygon
17	EW-OU1-53-A	195	68.03	Polygon
18	EW-OU1-53-A	1077	113.07	Polygon
443	EW-OU1-53-A	4	–	Point
444	EW-OU1-53-A	5	–	Point

Table B-3: Sand Gilia Populations found in 2019 OUCTP & OU2 Survey

Population Number	Region	Well ID	Individuals (#)	Area (ft^2)	GIS Feature Type	Survey Date
33	OU2	MW-OU2-59-A	62	70.18	Polygon	4/19/2019
34	OU2	MW-OU2-59-A	12	7.86	Polygon	4/19/2019
35	OU2	MW-OU2-59-A	21	10.10	Polygon	4/19/2019
36	OU2	MW-OU2-59-A	45	70.54	Polygon	4/19/2019
37	OU2	MW-OU2-59-A	6	14.21	Polygon	4/19/2019
38	OU2	MW-OU2-59-A	10	11.17	Polygon	4/19/2019
39	OU2	MW-OU2-59-A	569	139.38	Polygon	4/19/2019
40	OU2	MW-OU2-59-A	222	205.13	Polygon	4/19/2019
41	OU2	MW-OU2-59-A	36	46.32	Polygon	4/19/2019
42	OU2	MW-OU2-59-A	27	21.52	Polygon	4/19/2019
43	OU2	MW-OU2-59-A	13	24.54	Polygon	4/19/2019
44	OU2	MW-OU2-59-A	20	42.01	Polygon	4/19/2019
45	OU2	MW-OU2-59-A	71	30.41	Polygon	4/19/2019
46	OU2	MW-OU2-59-A	27	28.91	Polygon	4/19/2019
47	OU2	MW-OU2-59-A	708	477.70	Polygon	4/19/2019
459	OU2	MW-OU2-59-A	5	–	Point	4/19/2019
460	OU2	MW-OU2-59-A	5	–	Point	4/19/2019
461	OU2	MW-OU2-59-A	1	–	Point	4/19/2019
462	OU2	MW-OU2-59-A	1	–	Point	4/19/2019
463	OU2	MW-OU2-59-A	1	–	Point	4/19/2019
464	OU2	MW-OU2-59-A	5	–	Point	4/19/2019
465	OU2	MW-OU2-59-A	3	–	Point	4/19/2019
466	OU2	MW-OU2-59-A	1	–	Point	4/19/2019
467	OU2	MW-OU2-59-A	3	–	Point	4/19/2019
468	OU2	MW-OU2-59-A	2	–	Point	4/19/2019
469	OU2	MW-OU2-59-A	3	–	Point	4/19/2019
470	OU2	MW-OU2-59-A	3	–	Point	4/19/2019
471	OU2	MW-OU2-59-A	2	–	Point	4/19/2019
20	OUCTP	MW-BW-93-A	27	31.94	Polygon	4/17/2019
21	OUCTP	MW-BW-93-A	160	26.13	Polygon	4/17/2019
22	OUCTP	MW-BW-93-A	1464	286.06	Polygon	4/17/2019
23	OUCTP	MW-BW-93-A	6	6.55	Polygon	4/17/2019
24	OUCTP	MW-BW-93-A	34	13.89	Polygon	4/17/2019
25	OUCTP	MW-BW-93-A	18	21.32	Polygon	4/17/2019
26	OUCTP	MW-BW-93-A	250	87.81	Polygon	4/17/2019
27	OUCTP	MW-BW-93-A	6	10.54	Polygon	4/17/2019
28	OUCTP	MW-BW-93-A	14	14.60	Polygon	4/17/2019
29	OUCTP	MW-BW-93-A	10	26.97	Polygon	4/17/2019
30	OUCTP	MW-BW-93-A	69	56.52	Polygon	4/17/2019

Table B-3: Sand Gilia Populations found in 2019 OUCTP & OU2 Survey

Population Number	Region	Well ID	Individuals (#)	Area (ft^2)	GIS Feature Type	Survey Date
31	OUCTP	MW-BW-93-A	20	83.20	Polygon	4/17/2019
32	OUCTP	MW-BW-93-A	96	32.35	Polygon	4/17/2019
445	OUCTP	MW-BW-93-A	2	–	Point	4/17/2019
446	OUCTP	MW-BW-93-A	2	–	Point	4/17/2019
447	OUCTP	MW-BW-93-A	2	–	Point	4/17/2019
448	OUCTP	MW-BW-93-A	1	–	Point	4/17/2019
449	OUCTP	MW-BW-93-A	2	–	Point	4/17/2019
450	OUCTP	MW-BW-93-A	2	–	Point	4/17/2019
451	OUCTP	MW-BW-93-A	1	–	Point	4/17/2019
452	OUCTP	MW-BW-93-A	1	–	Point	4/17/2019
453	OUCTP	MW-BW-93-A	5	–	Point	4/17/2019
454	OUCTP	MW-BW-93-A	1	–	Point	4/17/2019
455	OUCTP	MW-BW-93-A	2	–	Point	4/17/2019
456	OUCTP	MW-BW-93-A	3	–	Point	4/17/2019
457	OUCTP	MW-BW-93-A	1	–	Point	4/17/2019
458	OUCTP	MW-BW-93-A	1	–	Point	4/17/2019
19	OUCTP	MW-BW-94-A	34	9.32	Polygon	4/17/2019
48	OUCTP	MW-BW-95-A	63	58.76	Polygon	4/19/2019
49	OUCTP	MW-BW-95-A	591	209.78	Polygon	4/19/2019
50	OUCTP	MW-BW-95-A	145	49.48	Polygon	4/19/2019
51	OUCTP	MW-BW-95-A	26	24.52	Polygon	4/22/2019
52	OUCTP	MW-BW-95-A	590	316.85	Polygon	4/22/2019
53	OUCTP	MW-BW-95-A	7	10.69	Polygon	4/22/2019
54	OUCTP	MW-BW-95-A	167	87.76	Polygon	4/22/2019
55	OUCTP	MW-BW-95-A	26	44.43	Polygon	4/22/2019
56	OUCTP	MW-BW-95-A	122	74.47	Polygon	4/22/2019
57	OUCTP	MW-BW-95-A	937	378.07	Polygon	4/22/2019
58	OUCTP	MW-BW-95-A	45	12.75	Polygon	4/22/2019
59	OUCTP	MW-BW-95-A	862	234.59	Polygon	4/22/2019
60	OUCTP	MW-BW-95-A	952	383.12	Polygon	4/22/2019
61	OUCTP	MW-BW-95-A	6	8.22	Polygon	4/22/2019
62	OUCTP	MW-BW-95-A	187	36.33	Polygon	4/22/2019
63	OUCTP	MW-BW-95-A	5529	937.12	Polygon	4/22/2019
472	OUCTP	MW-BW-95-A	3	–	Point	4/19/2019
473	OUCTP	MW-BW-95-A	1	–	Point	4/19/2019
474	OUCTP	MW-BW-95-A	1	–	Point	4/19/2019
475	OUCTP	MW-BW-95-A	4	–	Point	4/19/2019
476	OUCTP	MW-BW-95-A	1	–	Point	4/19/2019
477	OUCTP	MW-BW-95-A	2	–	Point	4/19/2019

Table B-3: Sand Gilia Populations found in 2019 OUCTP & OU2 Survey

Population Number	Region	Well ID	Individuals (#)	Area (ft^2)	GIS Feature Type	Survey Date
478	OUCTP	MW-BW-95-A	1	–	Point	4/19/2019
479	OUCTP	MW-BW-95-A	2	–	Point	4/19/2019
480	OUCTP	MW-BW-95-A	1	–	Point	4/19/2019
481	OUCTP	MW-BW-95-A	1	–	Point	4/19/2019
482	OUCTP	MW-BW-95-A	1	–	Point	4/19/2019
483	OUCTP	MW-BW-95-A	1	–	Point	4/22/2019
484	OUCTP	MW-BW-95-A	1	–	Point	4/22/2019
485	OUCTP	MW-BW-95-A	1	–	Point	4/22/2019
486	OUCTP	MW-BW-95-A	2	–	Point	4/22/2019
487	OUCTP	MW-BW-95-A	2	–	Point	4/22/2019
488	OUCTP	MW-BW-95-A	4	–	Point	4/22/2019
489	OUCTP	MW-BW-95-A	3	–	Point	4/22/2019
490	OUCTP	MW-BW-95-A	4	–	Point	4/22/2019
491	OUCTP	MW-BW-95-A	1	–	Point	4/22/2019
492	OUCTP	MW-BW-95-A	1	–	Point	4/22/2019
493	OUCTP	MW-BW-95-A	2	–	Point	4/22/2019
494	OUCTP	MW-BW-95-A	1	–	Point	4/22/2019
495	OUCTP	MW-BW-95-A	1	–	Point	4/22/2019
496	OUCTP	MW-BW-95-A	1	–	Point	4/22/2019
497	OUCTP	MW-BW-95-A	3	–	Point	4/22/2019
498	OUCTP	MW-BW-95-A	3	–	Point	4/22/2019
499	OUCTP	MW-BW-95-A	1	–	Point	4/22/2019
500	OUCTP	MW-BW-95-A	1	–	Point	4/22/2019

Table B-4. Monterey Spineflower Populations found in 2019 Reference Site Survey

Population Number	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
64	Reference	3-25%	Sparse	213.88	Polygon	5/20/2019
65	Reference	3-25%	Sparse	61.48	Polygon	5/20/2019
66	Reference	3-25%	Sparse	34.26	Polygon	5/20/2019
67	Reference	3-25%	Sparse	234.20	Polygon	5/20/2019
68	Reference	3-25%	Sparse	874.92	Polygon	5/20/2019
69	Reference	26-50%	Medium Low	768.24	Polygon	5/20/2019
70	Reference	3-25%	Sparse	858.43	Polygon	5/20/2019
182	Reference	1	–	–	Point	5/20/2019
183	Reference	2	–	–	Point	5/20/2019
184	Reference	2	–	–	Point	5/20/2019

Table B-4. Monterey Spineflower Populations found in 2019 Reference Site Survey

Population Number	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
185	Reference	1	–	–	Point	5/20/2019
186	Reference	1	–	–	Point	5/20/2019
187	Reference	1	–	–	Point	5/20/2019
188	Reference	3	–	–	Point	5/20/2019
189	Reference	2	–	–	Point	5/20/2019
190	Reference	1	–	–	Point	5/20/2019
191	Reference	1	–	–	Point	5/20/2019
192	Reference	2	–	–	Point	5/20/2019

Table B-5. Monterey Spineflower Populations found in 2019 OU1 Survey

Population Number	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
343	EW-OU1-49-A; PZ-OU1-49-A1	1	–	–	Point	5/22/2019
340	EW-OU1-52-A	3	–	–	Point	5/22/2019
341	EW-OU1-52-A	1	–	–	Point	5/22/2019
156	EW-OU1-53-A	26-50%	Medium Low	2459.92	Polygon	5/22/2019
339	EW-OU1-53-A	1	–	–	Point	5/22/2019
179	EW-OU1-62-A	3-25%	Sparse	41.85	Polygon	5/24/2019
370	EW-OU1-62-A	1	–	–	Point	5/23/2019
371	EW-OU1-62-A	1	–	–	Point	5/23/2019
413	EW-OU1-62-A	2	–	–	Point	5/24/2019
414	EW-OU1-62-A	4	–	–	Point	5/24/2019
415	EW-OU1-62-A	3	–	–	Point	5/24/2019
416	EW-OU1-62-A	2	–	–	Point	5/24/2019
417	EW-OU1-62-A	3	–	–	Point	5/24/2019
418	EW-OU1-62-A	1	–	–	Point	5/24/2019
173	EW-OU1-63-A	3-25%	Sparse	4922.08	Polygon	5/23/2019
174	EW-OU1-63-A	<3%	Very Sparse	405.47	Polygon	5/23/2019
175	EW-OU1-63-A	3-25%	Sparse	5695.64	Polygon	5/23/2019
378	EW-OU1-63-A	3	–	–	Point	5/23/2019
379	EW-OU1-63-A	4	–	–	Point	5/23/2019
380	EW-OU1-63-A	3	–	–	Point	5/23/2019
381	EW-OU1-63-A	1	–	–	Point	5/23/2019
382	EW-OU1-63-A	1	–	–	Point	5/23/2019
383	EW-OU1-63-A	1	–	–	Point	5/23/2019

Table B-5. Monterey Spineflower Populations found in 2019 OU1 Survey

Population Number	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
384	EW-OU1-63-A	4	–	–	Point	5/23/2019
385	EW-OU1-63-A	2	–	–	Point	5/23/2019
386	EW-OU1-63-A	4	–	–	Point	5/23/2019
387	EW-OU1-63-A	4	–	–	Point	5/23/2019
400	EW-OU1-63-A	1	–	–	Point	5/23/2019
401	EW-OU1-63-A	1	–	–	Point	5/23/2019
168	EW-OU1-66-A	3-25%	Sparse	75.91	Polygon	5/23/2019
374	EW-OU1-66-A	1	–	–	Point	5/23/2019
375	EW-OU1-66-A	3	–	–	Point	5/23/2019
376	EW-OU1-66-A	4	–	–	Point	5/23/2019
377	EW-OU1-66-A	4	–	–	Point	5/23/2019
394	EW-OU1-66-A	2	–	–	Point	5/23/2019
395	EW-OU1-66-A	1	–	–	Point	5/23/2019
396	EW-OU1-66-A	1	–	–	Point	5/23/2019
397	EW-OU1-66-A	1	–	–	Point	5/23/2019
344	EW-OU1-71-A	3	–	–	Point	5/22/2019
345	EW-OU1-72-A	1	–	–	Point	5/23/2019
349	EW-OU1-72-A	1	–	–	Point	5/23/2019
163	IW-OU1-74-A	3-25%	Sparse	19.68	Polygon	5/23/2019
164	IW-OU1-74-A	3-25%	Sparse	20.50	Polygon	5/23/2019
165	IW-OU1-74-A	3-25%	Sparse	22.86	Polygon	5/23/2019
166	IW-OU1-74-A	3-25%	Sparse	33.46	Polygon	5/23/2019
358	IW-OU1-74-A	2	–	–	Point	5/23/2019
359	IW-OU1-74-A	1	–	–	Point	5/23/2019
360	IW-OU1-74-A	4	–	–	Point	5/23/2019
361	IW-OU1-74-A	1	–	–	Point	5/23/2019
362	IW-OU1-74-A	1	–	–	Point	5/23/2019
363	IW-OU1-74-A	4	–	–	Point	5/23/2019
364	IW-OU1-74-A	3	–	–	Point	5/23/2019
365	IW-OU1-74-A	5	–	–	Point	5/23/2019
161	MW-OU1-46-A; MW-OU1-46-AD	3-25%	Sparse	1015.37	Polygon	5/23/2019
354	MW-OU1-46-A; MW-OU1-46-AD	1	–	–	Point	5/23/2019

Table B-5. Monterey Spineflower Populations found in 2019 OU1 Survey

Population Number	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
176	MW-OU1-50-A; MW-OU1-57-A; MW-OU1-58-A; MW-OU1-59-A; EW-OU1-60-A; EW-OU1-61-A; EW-OU1-63-A; EW-OU1-66-A	3-25%	Sparse	7297.22	Polygon	5/23/2019
171	MW-OU1-57-A	3-25%	Sparse	467.38	Polygon	5/23/2019
172	MW-OU1-57-A	3-25%	Sparse	22.54	Polygon	5/23/2019
388	MW-OU1-57-A	2	–	–	Point	5/23/2019
389	MW-OU1-57-A	1	–	–	Point	5/23/2019
390	MW-OU1-57-A	1	–	–	Point	5/23/2019
372	MW-OU1-58-A	1	–	–	Point	5/23/2019
373	MW-OU1-58-A	3	–	–	Point	5/23/2019
398	MW-OU1-58-A	1	–	–	Point	5/23/2019
399	MW-OU1-58-A	2	–	–	Point	5/23/2019
402	MW-OU1-59-A	2	–	–	Point	5/23/2019
403	MW-OU1-59-A	1	–	–	Point	5/23/2019
404	MW-OU1-59-A	1	–	–	Point	5/23/2019
391	MW-OU1-60-A	1	–	–	Point	5/23/2019
170	MW-OU1-60-A; MW-OU1-61-A	<3%	Very Sparse	476.13	Polygon	5/23/2019
392	MW-OU1-61-A	4	–	–	Point	5/23/2019
393	MW-OU1-61-A	1	–	–	Point	5/23/2019
169	MW-OU1-61-A; EW-OU1-66-A	3-25%	Sparse	96.37	Polygon	5/23/2019
178	MW-OU1-67-A	<3%	Very Sparse	114.39	Polygon	5/24/2019
409	MW-OU1-67-A	1	–	–	Point	5/24/2019
410	MW-OU1-67-A	3	–	–	Point	5/24/2019
411	MW-OU1-67-A	1	–	–	Point	5/24/2019
412	MW-OU1-67-A	1	–	–	Point	5/24/2019
177	MW-OU1-82-A	3-25%	Sparse	1543.08	Polygon	5/23/2019
180	MW-OU1-82-A	3-25%	Sparse	5317.88	Polygon	5/24/2019
405	MW-OU1-82-A	2	–	–	Point	5/23/2019
406	MW-OU1-82-A	4	–	–	Point	5/23/2019
407	MW-OU1-82-A	2	–	–	Point	5/23/2019
408	MW-OU1-82-A	3	–	–	Point	5/23/2019
160	MW-OU1-83-A	<3%	Very Sparse	161.77	Polygon	5/23/2019

Table B-5. Monterey Spineflower Populations found in 2019 OU1 Survey

Population Number	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
162	MW-OU1-83-A	3-25%	Sparse	3243.96	Polygon	5/23/2019
350	MW-OU1-83-A	1	–	–	Point	5/23/2019
351	MW-OU1-83-A	1	–	–	Point	5/23/2019
352	MW-OU1-83-A	1	–	–	Point	5/23/2019
353	MW-OU1-83-A	3	–	–	Point	5/23/2019
366	MW-OU1-83-A	1	–	–	Point	5/23/2019
355	MW-OU1-84-A	1	–	–	Point	5/23/2019
356	MW-OU1-84-A	4	–	–	Point	5/23/2019
357	MW-OU1-84-A	1	–	–	Point	5/23/2019
157	MW-OU1-85-A	3-25%	Sparse	18.05	Polygon	5/23/2019
158	MW-OU1-85-A	3-25%	Sparse	2.61	Polygon	5/23/2019
159	MW-OU1-85-A	3-25%	Sparse	52.23	Polygon	5/23/2019
346	MW-OU1-85-A	3	–	–	Point	5/23/2019
347	MW-OU1-85-A	1	–	–	Point	5/23/2019
348	MW-OU1-85-A	3	–	–	Point	5/23/2019
167	NWTS	3-25%	Sparse	428.74	Polygon	5/23/2019
367	NWTS	2	–	–	Point	5/23/2019
368	NWTS	5	–	–	Point	5/23/2019
369	NWTS	1	–	–	Point	5/23/2019
342	PZ-OU1-02-A1	1	–	–	Point	5/22/2019

Table B-6: Monterey Spineflower Populations found in 2019 OUCTP, OU2, & Sites 2/12 Survey

Population Number	Region	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
140	Sites 2/12	MW-02-12-180	3-25%	Sparse	10.47	Polygon	5/22/2019
141	Sites 2/12	MW-02-12-180	<3%	Very Sparse	67.49	Polygon	5/22/2019
306	Sites 2/12	MW-02-12-180	1	–	–	Point	5/22/2019
307	Sites 2/12	MW-02-12-180	3	–	–	Point	5/22/2019
308	Sites 2/12	MW-02-12-180	1	–	–	Point	5/22/2019
142	OU2	MW-OU2-59-A	3-25%	Sparse	1061.09	Polygon	5/22/2019
143	OU2	MW-OU2-59-A	<3%	Very Sparse	34.50	Polygon	5/22/2019
144	OU2	MW-OU2-59-A	3-25%	Sparse	16.93	Polygon	5/22/2019
145	OU2	MW-OU2-59-A	3-25%	Sparse	9562.74	Polygon	5/22/2019
146	OU2	MW-OU2-59-A	3-25%	Sparse	211.89	Polygon	5/22/2019

Table B-6: Monterey Spineflower Populations found in 2019 OUCTP, OU2, & Sites 2/12 Survey

Population Number	Region	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
147	OU2	MW-OU2-59-A	3-25%	Sparse	255.96	Polygon	5/22/2019
148	OU2	MW-OU2-59-A	3-25%	Sparse	18.72	Polygon	5/22/2019
149	OU2	MW-OU2-59-A	3-25%	Sparse	145.83	Polygon	5/22/2019
150	OU2	MW-OU2-59-A	3-25%	Sparse	8.16	Polygon	5/22/2019
151	OU2	MW-OU2-59-A	3-25%	Sparse	10.06	Polygon	5/22/2019
152	OU2	MW-OU2-59-A	3-25%	Sparse	19890.35	Polygon	5/22/2019
153	OU2	MW-OU2-59-A	3-25%	Sparse	12.70	Polygon	5/22/2019
154	OU2	MW-OU2-59-A	3-25%	Sparse	373.63	Polygon	5/22/2019
155	OU2	MW-OU2-59-A	3-25%	Sparse	43.54	Polygon	5/22/2019
309	OU2	MW-OU2-59-A	1	–	–	Point	5/22/2019
310	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
311	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
312	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
313	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
314	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
315	OU2	MW-OU2-59-A	5	–	–	Point	5/22/2019
316	OU2	MW-OU2-59-A	3	–	–	Point	5/22/2019
317	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
318	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
319	OU2	MW-OU2-59-A	1	–	–	Point	5/22/2019
320	OU2	MW-OU2-59-A	5	–	–	Point	5/22/2019
321	OU2	MW-OU2-59-A	4	–	–	Point	5/22/2019
322	OU2	MW-OU2-59-A	1	–	–	Point	5/22/2019
323	OU2	MW-OU2-59-A	1	–	–	Point	5/22/2019
324	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
325	OU2	MW-OU2-59-A	1	–	–	Point	5/22/2019
326	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
327	OU2	MW-OU2-59-A	1	–	–	Point	5/22/2019
328	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
329	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
330	OU2	MW-OU2-59-A	4	–	–	Point	5/22/2019
331	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
332	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
333	OU2	MW-OU2-59-A	3	–	–	Point	5/22/2019
334	OU2	MW-OU2-59-A	1	–	–	Point	5/22/2019
335	OU2	MW-OU2-59-A	2	–	–	Point	5/22/2019
336	OU2	MW-OU2-59-A	4	–	–	Point	5/22/2019

Table B-6: Monterey Spineflower Populations found in 2019 OUCTP, OU2, & Sites 2/12 Survey

Population Number	Region	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
337	OU2	MW-OU2-59-A	1	–	–	Point	5/22/2019
338	OU2	MW-OU2-59-A	1	–	–	Point	5/22/2019
181	OUCTP	MW-BW-29-180	3-25%	Sparse	9216.59	Polygon	5/24/2019
419	OUCTP	MW-BW-29-180	1	–	–	Point	5/24/2019
420	OUCTP	MW-BW-29-180	3	–	–	Point	5/24/2019
421	OUCTP	MW-BW-29-180	2	–	–	Point	5/24/2019
422	OUCTP	MW-BW-29-180	1	–	–	Point	5/24/2019
423	OUCTP	MW-BW-29-180	2	–	–	Point	5/24/2019
424	OUCTP	MW-BW-29-180	3	–	–	Point	5/24/2019
425	OUCTP	MW-BW-29-180	1	–	–	Point	5/24/2019
426	OUCTP	MW-BW-29-180	1	–	–	Point	5/24/2019
427	OUCTP	MW-BW-29-180	1	–	–	Point	5/24/2019
428	OUCTP	MW-BW-29-180	2	–	–	Point	5/24/2019
429	OUCTP	MW-BW-29-180	1	–	–	Point	5/24/2019
430	OUCTP	MW-BW-29-180	4	–	–	Point	5/24/2019
431	OUCTP	MW-BW-29-180	1	–	–	Point	5/24/2019
432	OUCTP	MW-BW-29-180	3	–	–	Point	5/24/2019
433	OUCTP	MW-BW-29-180	2	–	–	Point	5/24/2019
434	OUCTP	MW-BW-29-180	1	–	–	Point	5/24/2019
82	OUCTP	MW-BW-93-A	3-25%	Sparse	162.05	Polygon	5/20/2019
83	OUCTP	MW-BW-93-A	3-25%	Sparse	15.04	Polygon	5/20/2019
84	OUCTP	MW-BW-93-A	3-25%	Sparse	118.47	Polygon	5/20/2019
85	OUCTP	MW-BW-93-A	3-25%	Sparse	7.94	Polygon	5/20/2019
86	OUCTP	MW-BW-93-A	<3%	Very Sparse	18.72	Polygon	5/20/2019
87	OUCTP	MW-BW-93-A	3-25%	Sparse	37.50	Polygon	5/20/2019
88	OUCTP	MW-BW-93-A	3-25%	Sparse	8.92	Polygon	5/20/2019
89	OUCTP	MW-BW-93-A	3-25%	Sparse	28.08	Polygon	5/20/2019
90	OUCTP	MW-BW-93-A	<3%	Very Sparse	8.37	Polygon	5/20/2019
91	OUCTP	MW-BW-93-A	3-25%	Sparse	3533.72	Polygon	5/20/2019
92	OUCTP	MW-BW-93-A	3-25%	Sparse	938.92	Polygon	5/20/2019
93	OUCTP	MW-BW-93-A	3-25%	Sparse	469.79	Polygon	5/21/2019
94	OUCTP	MW-BW-93-A	3-25%	Sparse	17839.51	Polygon	5/21/2019
208	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
209	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
210	OUCTP	MW-BW-93-A	2	–	–	Point	5/20/2019
211	OUCTP	MW-BW-93-A	4	–	–	Point	5/20/2019

Table B-6: Monterey Spineflower Populations found in 2019 OUCTP, OU2, & Sites 2/12 Survey

Population Number	Region	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
212	OUCTP	MW-BW-93-A	3	–	–	Point	5/20/2019
213	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
214	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
215	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
216	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
217	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
218	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
219	OUCTP	MW-BW-93-A	3	–	–	Point	5/20/2019
220	OUCTP	MW-BW-93-A	2	–	–	Point	5/20/2019
221	OUCTP	MW-BW-93-A	2	–	–	Point	5/20/2019
222	OUCTP	MW-BW-93-A	2	–	–	Point	5/20/2019
223	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
224	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
225	OUCTP	MW-BW-93-A	3	–	–	Point	5/20/2019
226	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
227	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
228	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
229	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
230	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
231	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
232	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
233	OUCTP	MW-BW-93-A	3	–	–	Point	5/20/2019
234	OUCTP	MW-BW-93-A	2	–	–	Point	5/20/2019
235	OUCTP	MW-BW-93-A	1	–	–	Point	5/20/2019
236	OUCTP	MW-BW-93-A	3	–	–	Point	5/20/2019
71	OUCTP	MW-BW-94-A	3-25%	Sparse	194.88	Polygon	5/20/2019
72	OUCTP	MW-BW-94-A	3-25%	Sparse	1137.23	Polygon	5/20/2019
73	OUCTP	MW-BW-94-A	3-25%	Sparse	24.02	Polygon	5/20/2019
74	OUCTP	MW-BW-94-A	3-25%	Sparse	10.62	Polygon	5/20/2019
75	OUCTP	MW-BW-94-A	3-25%	Sparse	92.70	Polygon	5/20/2019
76	OUCTP	MW-BW-94-A	3-25%	Sparse	16.32	Polygon	5/20/2019
77	OUCTP	MW-BW-94-A	3-25%	Sparse	83.61	Polygon	5/20/2019
78	OUCTP	MW-BW-94-A	3-25%	Sparse	158.43	Polygon	5/20/2019
79	OUCTP	MW-BW-94-A	3-25%	Sparse	9.17	Polygon	5/20/2019
80	OUCTP	MW-BW-94-A	3-25%	Sparse	99.21	Polygon	5/20/2019
81	OUCTP	MW-BW-94-A	3-25%	Sparse	33.62	Polygon	5/20/2019
193	OUCTP	MW-BW-94-A	2	–	–	Point	5/20/2019

Table B-6: Monterey Spineflower Populations found in 2019 OUCTP, OU2, & Sites 2/12 Survey

Population Number	Region	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
194	OUCTP	MW-BW-94-A	1	–	–	Point	5/20/2019
195	OUCTP	MW-BW-94-A	2	–	–	Point	5/20/2019
196	OUCTP	MW-BW-94-A	3	–	–	Point	5/20/2019
197	OUCTP	MW-BW-94-A	2	–	–	Point	5/20/2019
198	OUCTP	MW-BW-94-A	3	–	–	Point	5/20/2019
199	OUCTP	MW-BW-94-A	1	–	–	Point	5/20/2019
200	OUCTP	MW-BW-94-A	1	–	–	Point	5/20/2019
201	OUCTP	MW-BW-94-A	1	–	–	Point	5/20/2019
202	OUCTP	MW-BW-94-A	2	–	–	Point	5/20/2019
203	OUCTP	MW-BW-94-A	4	–	–	Point	5/20/2019
204	OUCTP	MW-BW-94-A	2	–	–	Point	5/20/2019
205	OUCTP	MW-BW-94-A	1	–	–	Point	5/20/2019
206	OUCTP	MW-BW-94-A	2	–	–	Point	5/20/2019
207	OUCTP	MW-BW-94-A	3	–	–	Point	5/20/2019
95	OUCTP	MW-BW-95-A	3-25%	Sparse	16.14	Polygon	5/21/2019
96	OUCTP	MW-BW-95-A	3-25%	Sparse	16.38	Polygon	5/21/2019
97	OUCTP	MW-BW-95-A	3-25%	Sparse	17.67	Polygon	5/21/2019
98	OUCTP	MW-BW-95-A	3-25%	Sparse	9.10	Polygon	5/21/2019
99	OUCTP	MW-BW-95-A	3-25%	Sparse	1815.95	Polygon	5/21/2019
100	OUCTP	MW-BW-95-A	3-25%	Sparse	73.12	Polygon	5/21/2019
101	OUCTP	MW-BW-95-A	3-25%	Sparse	78.48	Polygon	5/21/2019
102	OUCTP	MW-BW-95-A	<3%	Very Sparse	19.52	Polygon	5/21/2019
103	OUCTP	MW-BW-95-A	3-25%	Sparse	85.89	Polygon	5/21/2019
104	OUCTP	MW-BW-95-A	3-25%	Sparse	185.67	Polygon	5/21/2019
105	OUCTP	MW-BW-95-A	3-25%	Sparse	14.02	Polygon	5/21/2019
106	OUCTP	MW-BW-95-A	26-50%	Medium Low	3404.97	Polygon	5/21/2019
107	OUCTP	MW-BW-95-A	3-25%	Sparse	83.20	Polygon	5/21/2019
108	OUCTP	MW-BW-95-A	3-25%	Sparse	203.29	Polygon	5/21/2019
109	OUCTP	MW-BW-95-A	3-25%	Sparse	45.21	Polygon	5/21/2019
110	OUCTP	MW-BW-95-A	3-25%	Sparse	12.06	Polygon	5/21/2019
111	OUCTP	MW-BW-95-A	<3%	Very Sparse	10.19	Polygon	5/21/2019
112	OUCTP	MW-BW-95-A	3-25%	Sparse	20.13	Polygon	5/21/2019
113	OUCTP	MW-BW-95-A	3-25%	Sparse	737.38	Polygon	5/21/2019
114	OUCTP	MW-BW-95-A	<3%	Very Sparse	16.37	Polygon	5/21/2019

Table B-6: Monterey Spineflower Populations found in 2019 OUCTP, OU2, & Sites 2/12 Survey

Population Number	Region	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
115	OUCTP	MW-BW-95-A	3-25%	Sparse	98.98	Polygon	5/21/2019
116	OUCTP	MW-BW-95-A	3-25%	Sparse	10.92	Polygon	5/21/2019
117	OUCTP	MW-BW-95-A	3-25%	Sparse	89.22	Polygon	5/21/2019
118	OUCTP	MW-BW-95-A	<3%	Very Sparse	82.59	Polygon	5/21/2019
119	OUCTP	MW-BW-95-A	3-25%	Sparse	2676.44	Polygon	5/21/2019
120	OUCTP	MW-BW-95-A	3-25%	Sparse	1007.66	Polygon	5/21/2019
121	OUCTP	MW-BW-95-A	3-25%	Sparse	94.55	Polygon	5/21/2019
122	OUCTP	MW-BW-95-A	3-25%	Sparse	9.93	Polygon	5/21/2019
123	OUCTP	MW-BW-95-A	<3%	Very Sparse	14.62	Polygon	5/21/2019
124	OUCTP	MW-BW-95-A	3-25%	Sparse	14.79	Polygon	5/21/2019
125	OUCTP	MW-BW-95-A	3-25%	Sparse	104.38	Polygon	5/21/2019
126	OUCTP	MW-BW-95-A	3-25%	Sparse	196.78	Polygon	5/21/2019
127	OUCTP	MW-BW-95-A	3-25%	Sparse	37.30	Polygon	5/21/2019
128	OUCTP	MW-BW-95-A	<3%	Very Sparse	9.73	Polygon	5/21/2019
129	OUCTP	MW-BW-95-A	26-50%	Medium Low	7185.60	Polygon	5/21/2019
130	OUCTP	MW-BW-95-A	3-25%	Sparse	21.07	Polygon	5/21/2019
131	OUCTP	MW-BW-95-A	3-25%	Sparse	2969.25	Polygon	5/21/2019
132	OUCTP	MW-BW-95-A	3-25%	Sparse	678.64	Polygon	5/21/2019
133	OUCTP	MW-BW-95-A	3-25%	Sparse	29.90	Polygon	5/21/2019
134	OUCTP	MW-BW-95-A	<3%	Very Sparse	173.53	Polygon	5/21/2019
135	OUCTP	MW-BW-95-A	3-25%	Sparse	8.97	Polygon	5/21/2019
136	OUCTP	MW-BW-95-A	3-25%	Sparse	3471.03	Polygon	5/21/2019
137	OUCTP	MW-BW-95-A	3-25%	Sparse	34.52	Polygon	5/21/2019
138	OUCTP	MW-BW-95-A	3-25%	Sparse	27.54	Polygon	5/21/2019
139	OUCTP	MW-BW-95-A	<3%	Very Sparse	55.67	Polygon	5/21/2019
237	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
238	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
239	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
240	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
241	OUCTP	MW-BW-95-A	5	–	–	Point	5/21/2019
242	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
243	OUCTP	MW-BW-95-A	4	–	–	Point	5/21/2019

Table B-6: Monterey Spineflower Populations found in 2019 OUCTP, OU2, & Sites 2/12 Survey

Population Number	Region	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
244	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
245	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
246	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
247	OUCTP	MW-BW-95-A	4	–	–	Point	5/21/2019
248	OUCTP	MW-BW-95-A	3	–	–	Point	5/21/2019
249	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
250	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
251	OUCTP	MW-BW-95-A	3	–	–	Point	5/21/2019
252	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
253	OUCTP	MW-BW-95-A	4	–	–	Point	5/21/2019
254	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
255	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
256	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
257	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
258	OUCTP	MW-BW-95-A	3	–	–	Point	5/21/2019
259	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
260	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
261	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
262	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
263	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
264	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
265	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
266	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
267	OUCTP	MW-BW-95-A	4	–	–	Point	5/21/2019
268	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
269	OUCTP	MW-BW-95-A	4	–	–	Point	5/21/2019
270	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
271	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
272	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
273	OUCTP	MW-BW-95-A	5	–	–	Point	5/21/2019
274	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
275	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
276	OUCTP	MW-BW-95-A	3	–	–	Point	5/21/2019
277	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
278	OUCTP	MW-BW-95-A	3	–	–	Point	5/21/2019
279	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
280	OUCTP	MW-BW-95-A	4	–	–	Point	5/21/2019

Table B-6: Monterey Spineflower Populations found in 2019 OUCTP, OU2, & Sites 2/12 Survey

Population Number	Region	Well ID	Individuals (#) or Percent Cover (%)	Cover Class	Area (ft^2)	GIS Feature Type	Survey Date
281	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
282	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
283	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
284	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
285	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
286	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
287	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
288	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
289	OUCTP	MW-BW-95-A	5	–	–	Point	5/21/2019
290	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
291	OUCTP	MW-BW-95-A	5	–	–	Point	5/21/2019
292	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
293	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
294	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
295	OUCTP	MW-BW-95-A	4	–	–	Point	5/21/2019
296	OUCTP	MW-BW-95-A	5	–	–	Point	5/21/2019
297	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
298	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
299	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
300	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
301	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
302	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
303	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019
304	OUCTP	MW-BW-95-A	2	–	–	Point	5/21/2019
305	OUCTP	MW-BW-95-A	1	–	–	Point	5/21/2019