

CA_UpperSouthAmerican_Eldorado_2019_B19

Survey Report

Contract Number: G17PC00044

Task Order Number: 140G0219F0344



Government Point-of-Contact (POC)

Organization: United States Geological Survey

Telephone: 573-308-3629

Address: Michael Bradford, MS 665

1400 Independence Road

Rolla, MO, 65401



Contractor Point-of-Contact (POC)

Address: Digital Aerial Solutions, LLC

Telephone: (813) 628-0788

Joshua Helton (VP)

4027 Crescent Park Drive

Riverview, FL 33578

Overview

Digital Aerial Solutions, LLC (DAS) with contract number G17PC00044 was contracted by the United States Geological Survey under task order number 140G0219F0344 collect a high-resolution LiDAR data set covering 297 square miles affecting Alameda, San Joaquin, Santa Clara and Stanislaus in California. Each of these categories was spread out as evenly as possible throughout the Area of Interest D2 (AOI). The survey was completed using the Global Positioning System (GPS). Each observation was identified in the field and surveyed utilizing GPS receivers, collecting GNSS and GLONASS information and utilizing a Leica Smart-Net RTK network. In accordance with section C.1.e.(i)(f) of the task order, the spatial reference system used was:

Spatial Reference System:

Coordinate System: NAD_1983_StatePlane_California_II_FIPS_0402_Feet

Horizontal Datum: North American Datum 1983 (2011)

Vertical Datum: North American Vertical Datum of 1988

Units: US SURVEY FEET

Geoid Model: Geoid12B

Section C.1.b. (viii)(a) of the task order outlines the ground control minimum requirements and specifications for this LiDAR project. 5 Supplemental ground control points were collected and used to support the airborne GPS solution and positional accuracy. DAS also collected more than the required number of Non-Vegetated Vertical Accuracy (NVA) and Vegetated Vertical Accuracy (VVA) Quality Checkpoints as stated in the task order. These checkpoints serve as an independent delivery to the client and were not incorporated into the vertical solution.

Glossary of Terms

Term - Definition

ATTN	- Attention
BE	- Bare Earth Checkpoint (see NVA)
CTRL	- Control
DAS	- Digital Aerial Solutions, LLC
Ellip	- Ellipsoid Height
FIPS	- Federal Information Processing Standard
GPS	- Global Positioning Systems
UT	- Urban Terrain (see NVA)
HV	- High Vegetation (see VVA)
ID	- Identification
LV	- Low Vegetation (see VVA)
LiDAR	- Light Detection and Ranging
MV	- Medium Vegetation (see VVA)
NAD83	- North American Datum of 1983
NAVD88	- North American Vertical Datum of 1988
NGS	- National Geodetic Survey
NGTOC	- National Geospatial Technical Operations Center
NVA	- Non-Vegetated Vertical Accuracy
Ortho	- Orthometric Height
POC	- Point of Contact
RTK	- Real Time Kinematics
USGS	- United States Geological Survey
VP	- Vice President
VVA	- Vegetated Vertical Accuracy

Supplemental Ground Control

The Map shows the overall distribution of the Supplemental Ground Control throughout the D2 AOI. The following tables contain a list of the control using Easting, Northing, and Orthometric height. The coordinate system displayed as NAD_1983_StatePlane_California_II_FIPS_0402_Feet, North American Datum 1983 (2011), North American Vertical Datum of 1988, Geoid12B and using US SURVEY FEET for measurement.

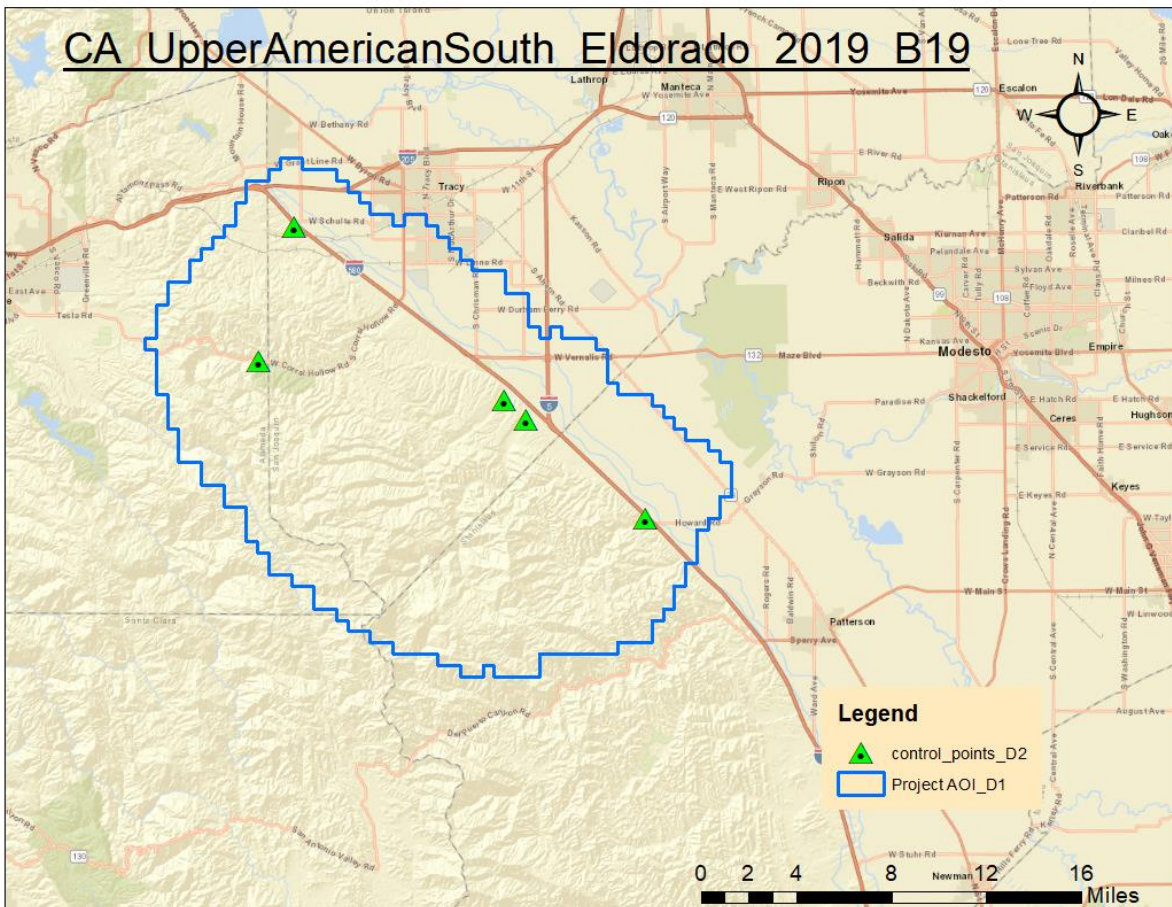


TABLE: Ground Control Points

Point ID	Easting	Northing	Ortho
2_GS0023	6742175.196	1621338.368	397.719
2_GS0031	6773424.826	1594969.63	272.16
2_GS0002	6695692.467	1659864.494	289.816
2_GS0011	6687659.24	1630043.807	731.604
2_GS0020	6747157.909	1616880.939	337.272

2_GS0023



Point ID: 2_GS0023

Northing: 1621338.368 US Survey Feet

Easting: 6742175.196 US Survey Feet

Orthometric Height: 397.719 US Survey Feet

Latitude: 37° 36' 45.31308" N

Longitude: 121° 22' 37.19829" W

Ellipsoid Height: 89.1978 US Survey Feet

2_GS0031



Point ID: 2_GS0031

Northing: 1594969.63 US Survey Feet

Easting: 6773424.826 US Survey Feet

Orthometric Height: 272.16 US Survey Feet

Latitude: 37° 32' 22.39469" N

Longitude: 121° 16' 11.57213" W

Ellipsoid Height: 50.8321 US Survey Feet

2_GS0002



Point ID: 2_GS0002

Northing: 1659864.494 US Survey Feet

Easting: 6695692.467 US Survey Feet

Orthometric Height: 289.816 US Survey Feet

Latitude: 37° 43' 08.85001" N

Longitude: 121° 32' 12.29006" W

Ellipsoid Height: 56.3039 US Survey Feet

2_GS0011



Point ID: 2_GS0011

Northing: 1630043.807 US Survey Feet

Easting: 6687659.24 US Survey Feet

Orthometric Height: 731.604 US Survey Feet

Latitude: 37° 38' 14.49308" N

Longitude: 121° 33' 54.02363" W

Ellipsoid Height: 191.3458 US Survey Feet

2_GS0020



Point ID: 2_GS0020

Northing: 1616880.939 US Survey Feet

Easting: 6747157.909 US Survey Feet

Orthometric Height: 337.272 US Survey Feet

Latitude: 37° 36' 00.91468" N

Longitude: 121° 21' 35.68062" W

Ellipsoid Height: 70.7694 US Survey Feet

Non-Vegetated Vertical Accuracy Checkpoints Bare Earth

The Map shows the overall distribution of the Non-Vegetated Vertical Accuracy Checkpoint, Bare Earth throughout the D2 AOI. The following tables contain a list of the control using Easting, Northing, and Orthometric height. The coordinate system displayed as NAD_1983_StatePlane_California_II_FIPS_0402_Feet, North American Datum 1983 (2011), North American Vertical Datum of 1988, Geoid12B and using US SURVEY FEET for measurement.

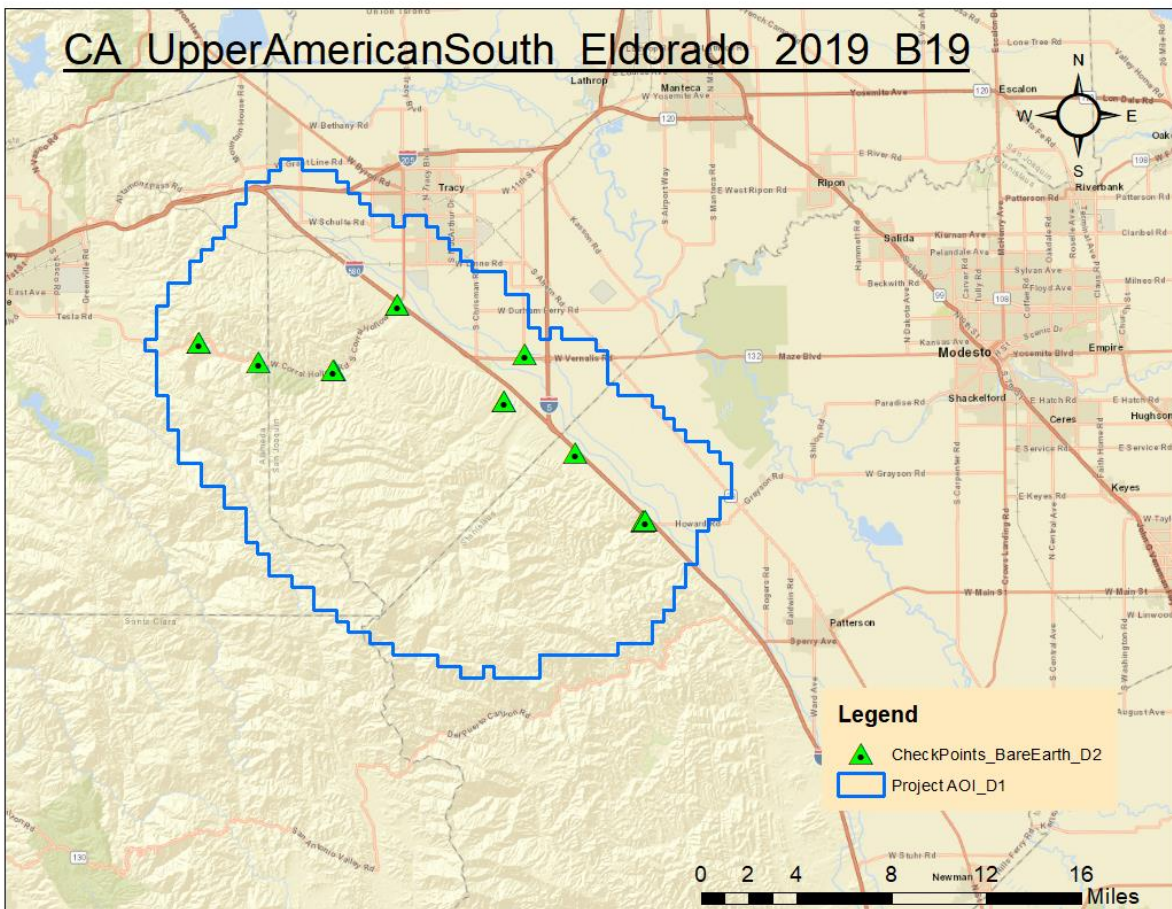


TABLE: Bare Earth

Point ID	Easting	Northing	Ortho
2_GS0006	6718428.567	1642598.726	302.815
2_GS0007	6718478.552	1642684.411	300.745
2_GS0009	6704461.975	1628150.119	541.627
2_GS0010	6704319.883	1628087.78	543.574
2_GS0012	6687775.245	1630013.506	729.591
2_GS0014	6674438.359	1634333.095	1601.834
2_GS0015	6674343.33	1634340.47	1599.548
2_GS0019	6746729.47	1631690.589	191.189
2_GS0022	6742107.382	1621312.47	398.254
2_GS0026	6758084.168	1609944.353	332.418
2_GS0027	6773046.873	1594617.185	279.638
2_GS0029	6773054.341	1594795.125	276.169
2_GS0032	6773467.282	1594882.567	272.717
2_GS0033	6773401.568	1594809.515	273.746

2_GS0006



2_GS0006_North



2_GS0006_East



2_GS0006_West



2_GS0006_South

Point ID: 2_GS0006

Northing: 1642598.726 US Survey Feet

Easting: 6718428.567 US Survey Feet

Orthometric Height: 302.815 US Survey Feet

Latitude: 37° 40' 16.95170" N

Longitude: 121° 27' 30.66650" W

Ellipsoid Height: 60.2538 US Survey Feet

2_GS0007



Point ID: 2_GS0007

Northing: 1642684.411 US Survey Feet

Easting: 6718478.552 US Survey Feet

Orthometric Height: 300.745 US Survey Feet

Latitude: 37° 40' 17.79566" N

Longitude: 121° 27' 30.03861" W

Ellipsoid Height: 59.6222 US Survey Feet

2_GS0009



Point ID: 2_GS0009

Northing: 1628150.119 US Survey Feet

Easting: 6704461.975 US Survey Feet

Orthometric Height: 541.627 US Survey Feet

Latitude: 37° 37' 54.92808" N

Longitude: 121° 30' 25.31202" W

Ellipsoid Height: 133.3382 US Survey Feet

2_GS0010



Point ID: 2_GS0010

Northing: 1628087.78 US Survey Feet

Easting: 6704319.883 US Survey Feet

Orthometric Height: 543.574 US Survey Feet

Latitude: 37° 37' 54.31954" N

Longitude: 121° 30' 27.08215" W

Ellipsoid Height: 133.9343 US Survey Feet

2_GS0012



2_GS0012_North



2_GS0012_East



2_GS0012_West



2_GS0012_South

Point ID: 2_GS0012

Northing: 1630013.506 US Survey Feet

Easting: 6687775.245 US Survey Feet

Orthometric Height: 729.591 US Survey Feet

Latitude: 37° 38' 14.18811" N

Longitude: 121° 33' 52.58363" W

Ellipsoid Height: 190.7319 US Survey Feet

2_GS0014



Point ID: 2_GS0014

Northing: 1634333.095 US Survey Feet

Easting: 6674438.359 US Survey Feet

Orthometric Height: 1601.834 US Survey Feet

Latitude: 37° 38' 57.48106" N

Longitude: 121° 36' 38.11694" W

Ellipsoid Height: 456.5689 US Survey Feet

2_GS0015



Point ID: 2_GS0015

Northing: 1634340.47 US Survey Feet

Easting: 6674343.33 US Survey Feet

Orthometric Height: 1599.548 US Survey Feet

Latitude: 37° 38' 57.55798" N

Longitude: 121° 36' 39.29788" W

Ellipsoid Height: 455.8718 US Survey Feet

2_GS0019



Point ID: 2_GS0019

Northing: 1631690.589 US Survey Feet

Easting: 6746729.47 US Survey Feet

Orthometric Height: 191.189 US Survey Feet

Latitude: 37° 38' 27.31986" N

Longitude: 121° 21' 39.70931" W

Ellipsoid Height: 26.1309 US Survey Feet

2_GS0022



Point ID: 2_GS0022

Northing: 1621312.47 US Survey Feet

Easting: 6742107.382 US Survey Feet

Orthometric Height: 398.254 US Survey Feet

Latitude: 37° 36' 45.06169" N

Longitude: 121° 22' 38.04301" W

Ellipsoid Height: 89.3622 US Survey Feet

2_GS0026



Point ID: 2_GS0026

Northing: 1609944.353 US Survey Feet

Easting: 6758084.168 US Survey Feet

Orthometric Height: 332.418 US Survey Feet

Latitude: 37° 34' 51.57270" N

Longitude: 121° 19' 20.59336" W

Ellipsoid Height: 69.2469 US Survey Feet

2_GS0027



Point ID: 2_GS0027

Northing: 1594617.185 US Survey Feet

Easting: 6773046.873 US Survey Feet

Orthometric Height: 279.638 US Survey Feet

Latitude: 37° 32' 18.94130" N

Longitude: 121° 16' 16.29833" W

Ellipsoid Height: 53.1191 US Survey Feet

2_GS0029



Point ID: 2_GS0029

Northing: 1594795.125 US Survey Feet

Easting: 6773054.341 US Survey Feet

Orthometric Height: 276.169 US Survey Feet

Latitude: 37° 32' 20.69938" N

Longitude: 121° 16' 16.18792" W

Ellipsoid Height: 52.0601 US Survey Feet

2_GS0032



Point ID: 2_GS0032

Northing: 1594882.567 US Survey Feet

Easting: 6773467.282 US Survey Feet

Orthometric Height: 272.717 US Survey Feet

Latitude: 37° 32' 21.53084" N

Longitude: 121° 16' 11.05386" W

Ellipsoid Height: 51.0017 US Survey Feet

2_GS0033



Point ID: 2_GS0033

Northing: 1594809.515 US Survey Feet

Easting: 6773401.568 US Survey Feet

Orthometric Height: 273.746 US Survey Feet

Latitude: 37° 32' 20.81406" N

Longitude: 121° 16' 11.87678" W

Ellipsoid Height: 51.317 US Survey Feet

Non-Vegetated Vertical Accuracy Checkpoints Urban Terrain

The Map shows the overall distribution of the Non-Vegetated Vertical Accuracy Checkpoint, Urban Terrain throughout the D2 AOI. The following tables contain a list of the control using Easting, Northing, and Orthometric height. The coordinate system displayed as NAD_1983_StatePlane_California_II_FIPS_0402_Feet, North American Datum 1983 (2011), North American Vertical Datum of 1988, Geoid12B and using US SURVEY FEET for measurement.

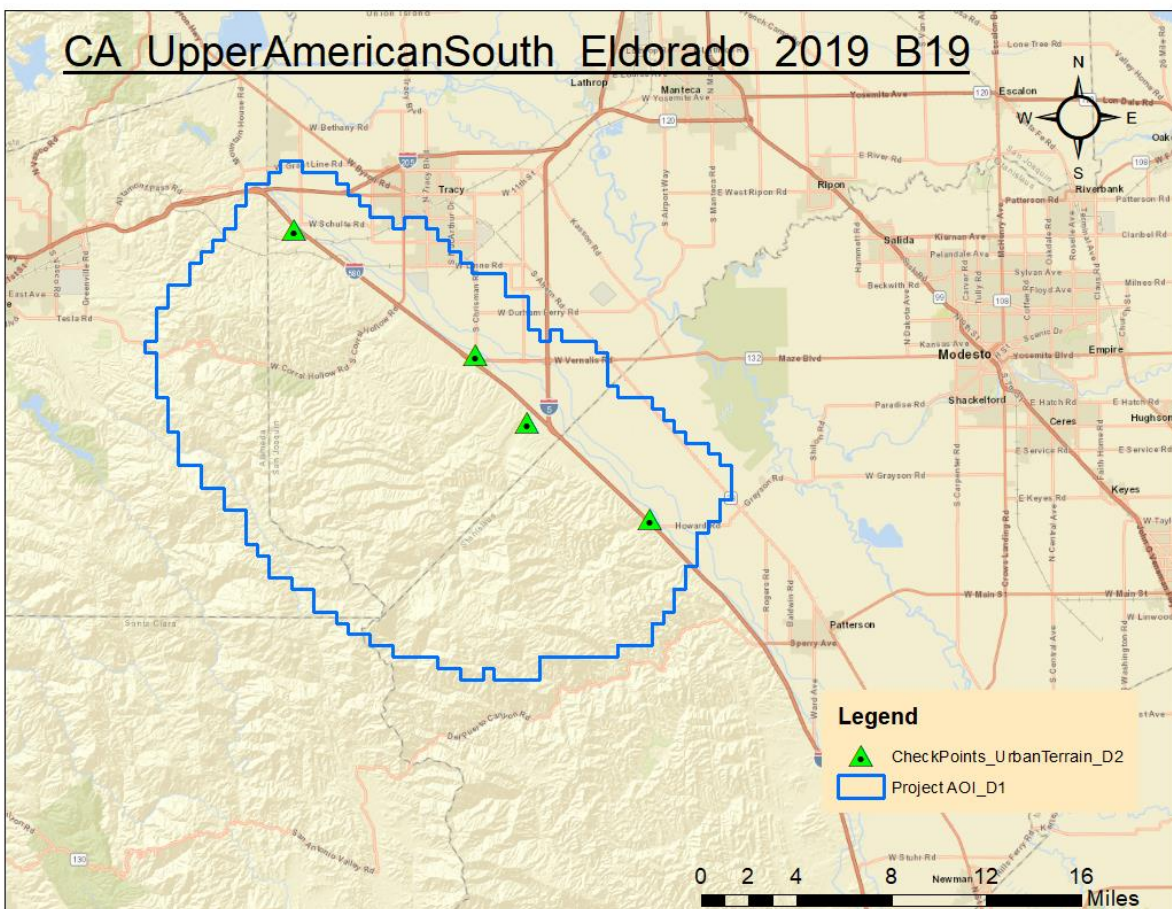


TABLE: Urban Terrain

Point ID	Easting	Northing	Ortho
2_GS0003	6695584.894	1659775.823	288.988
2_GS0017	6735933.477	1631868.734	264.804
2_GS0021	6747198.874	1616978.452	336.226
2_GS0036	6774531.454	1595567.855	259.885

2_GS0003



Point ID: 2_GS0003

Northing: 1659775.823 US Survey Feet

Easting: 6695584.894 US Survey Feet

Orthometric Height: 288.988 US Survey Feet

Latitude: 37° 43' 07.97902" N

Longitude: 121° 32' 13.63423" W

Ellipsoid Height: 56.0535 US Survey Feet

2_GS0017



2_GS0017_North



2_GS0017_East



2_GS0017_West



2_GS0017_South

Point ID: 2_GS0017

Northing: 1631868.734 US Survey Feet

Easting: 6735933.477 US Survey Feet

Orthometric Height: 264.804 US Survey Feet

Latitude: 37° 38' 29.80901" N

Longitude: 121° 23' 53.88247" W

Ellipsoid Height: 48.6313 US Survey Feet

2_GS0021



Point ID: 2_GS0021

Northing: 1616978.452 US Survey Feet

Easting: 6747198.874 US Survey Feet

Orthometric Height: 336.226 US Survey Feet

Latitude: 37° 36' 01.87564" N

Longitude: 121° 21' 35.16321" W

Ellipsoid Height: 70.4491 US Survey Feet

2_GS0036



Point ID: 2_GS0036

Northing: 1595567.855 US Survey Feet

Easting: 6774531.454 US Survey Feet

Orthometric Height: 259.885 US Survey Feet

Latitude: 37° 32' 28.21914" N

Longitude: 121° 15' 57.77685" W

Ellipsoid Height: 47.0719 US Survey Feet

Vegetated Vertical Accuracy Checkpoints Low Vegetation

The Map shows the overall distribution of the Vegetated Vertical Accuracy Checkpoint, Low Vegetation throughout the D2 AOI. The following tables contain a list of the control using Easting, Northing, and Orthometric height. The coordinate system displayed as NAD_1983_StatePlane_California_II_FIPS_0402_Feet, North American Datum 1983 (2011), North American Vertical Datum of 1988, Geoid12B and using US SURVEY FEET for measurement.

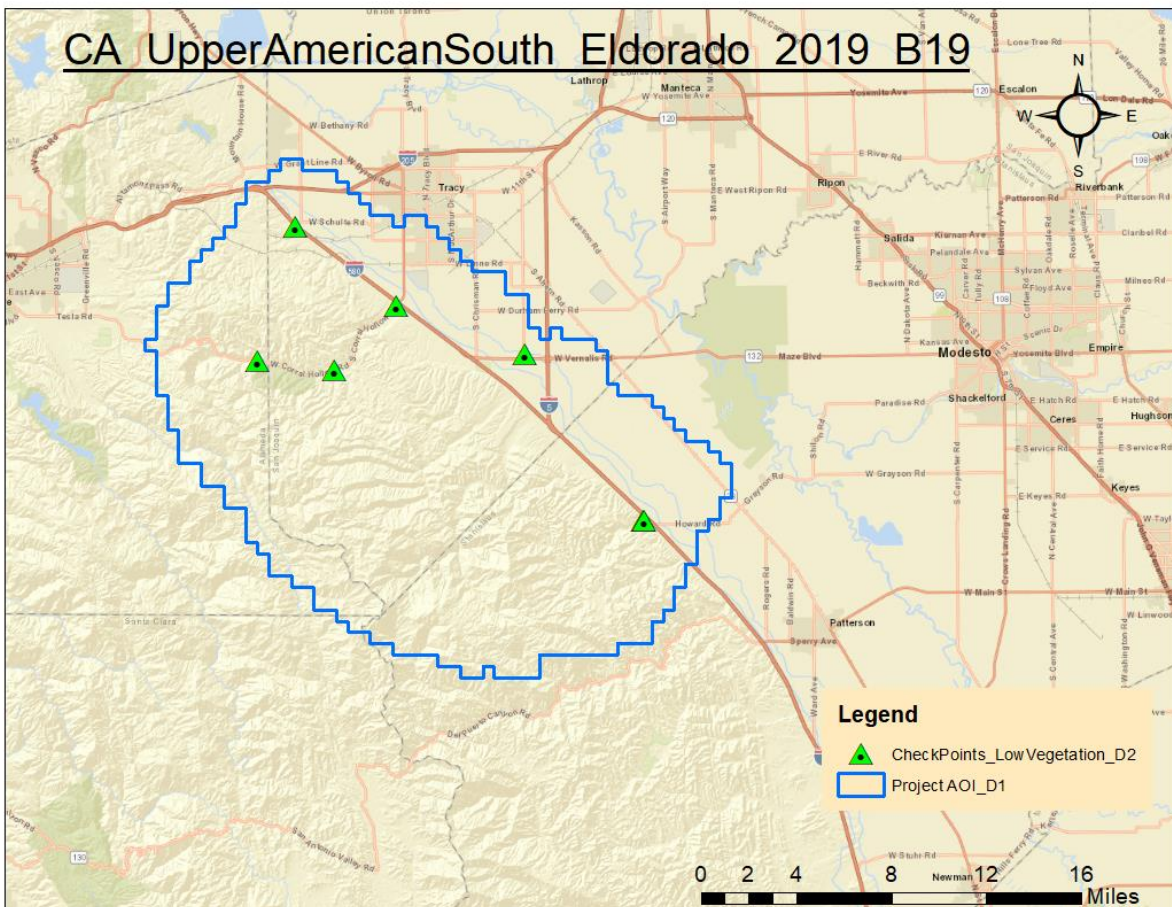


TABLE: Low Vegetation

Point ID	Easting	Northing	Ortho
2_GS0004	6695789.421	1659933.574	285.962
2_GS0005	6718354.922	1642519.512	304.323
2_GS0008	6704417.689	1628069.019	541.129
2_GS0013	6687576.522	1630084.968	730.902
2_GS0018	6746814.523	1631712.907	190.194
2_GS0028	6772976.9	1594758.569	277.614
2_GS0030	6773367.034	1594914.496	272.881

2_GS0004



Point ID: 2_GS0004

Northing: 1659933.574 US Survey Feet

Easting: 6695789.421 US Survey Feet

Orthometric Height: 285.962 US Survey Feet

Latitude: 37° 43' 09.52792" N

Longitude: 121° 32' 11.07928" W

Ellipsoid Height: 55.1284 US Survey Feet

2_GS0005



Point ID: 2_GS0005

Northing: 1642519.512 US Survey Feet

Easting: 6718354.922 US Survey Feet

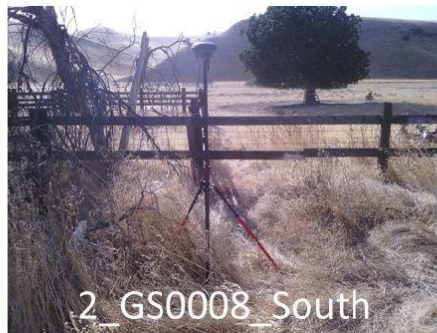
Orthometric Height: 304.323 US Survey Feet

Latitude: 37° 40' 16.17310" N

Longitude: 121° 27' 31.58813" W

Ellipsoid Height: 60.7151 US Survey Feet

2_GS0008



Point ID: 2_GS0008

Northing: 1628069.019 US Survey Feet

Easting: 6704417.689 US Survey Feet

Orthometric Height: 541.129 US Survey Feet

Latitude: 37° 37' 54.12887" N

Longitude: 121° 30' 25.86788" W

Ellipsoid Height: 133.1879 US Survey Feet

2_GS0013



Point ID: 2_GS0013

Northing: 1630084.968 US Survey Feet

Easting: 6687576.522 US Survey Feet

Orthometric Height: 730.902 US Survey Feet

Latitude: 37° 38' 14.90385" N

Longitude: 121° 33' 55.04932" W

Ellipsoid Height: 191.1318 US Survey Feet

2_GS0018



Point ID: 2_GS0018

Northing: 1631712.907 US Survey Feet

Easting: 6746814.523 US Survey Feet

Orthometric Height: 190.194 US Survey Feet

Latitude: 37° 38' 27.53453" N

Longitude: 121° 21' 38.65021" W

Ellipsoid Height: 25.827 US Survey Feet

2_GS0028



Point ID: 2_GS0028

Northing: 1594758.569 US Survey Feet

Easting: 6772976.9 US Survey Feet

Orthometric Height: 277.614 US Survey Feet

Latitude: 37° 32' 20.34421" N

Longitude: 121° 16' 17.15274" W

Ellipsoid Height: 52.5024 US Survey Feet

2_GS0030



2_GS0030_North



2_GS0030_East



2_GS0030_West



2_GS0030_South

Point ID: 2_GS0030

Northing: 1594914.496 US Survey Feet

Easting: 6773367.034 US Survey Feet

Orthometric Height: 272.881 US Survey Feet

Latitude: 37° 32' 21.85437" N

Longitude: 121° 16' 12.29493" W

Ellipsoid Height: 51.0529 US Survey Feet

Vegetated Vertical Accuracy Checkpoints Medium Vegetation

The Map shows the overall distribution of the Vegetated Vertical Accuracy Checkpoint, Medium Vegetation throughout the D2 AOI. The following tables contain a list of the control using Easting, Northing, and Orthometric height. The coordinate system displayed as NAD_1983_StatePlane_California_II_FIPS_0402_Feet, North American Datum 1983 (2011), North American Vertical Datum of 1988, Geoid12B and using US SURVEY FEET for measurement.

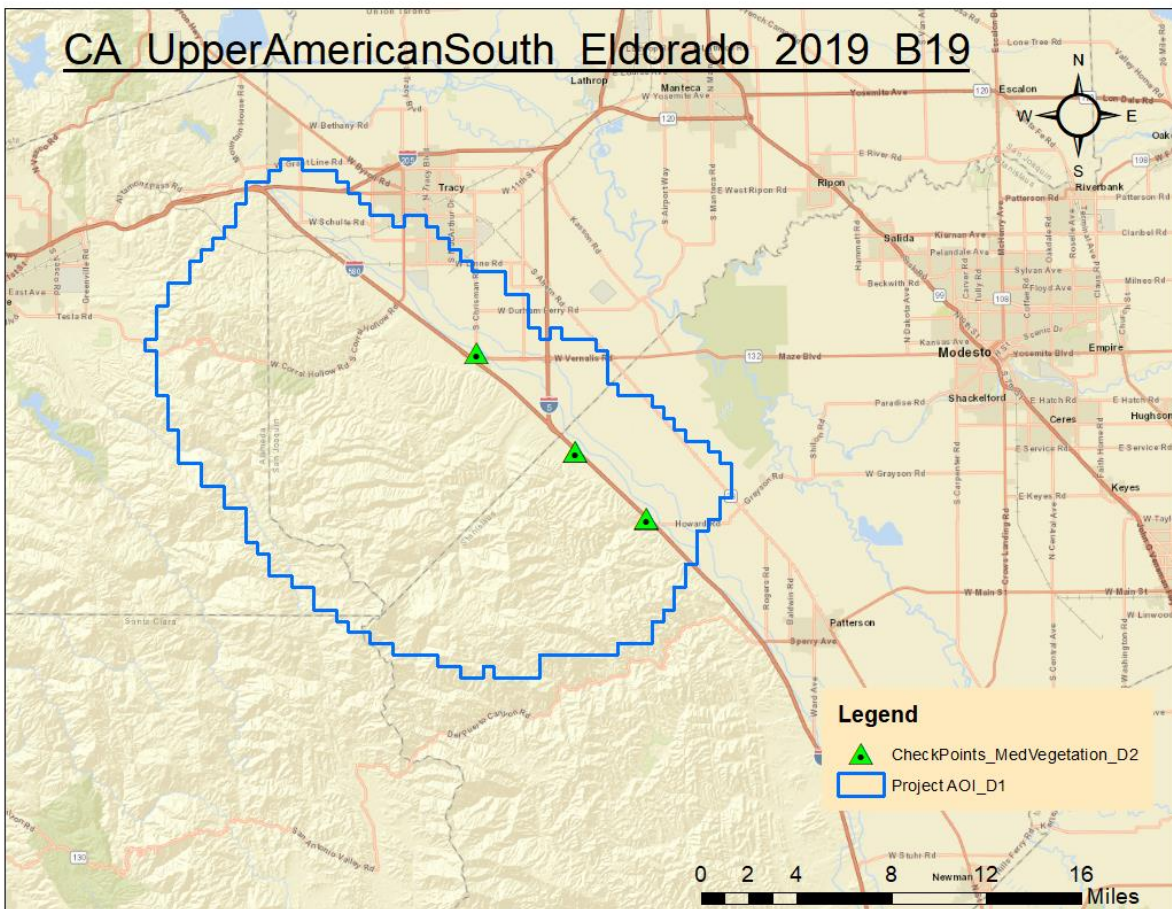


TABLE: Medium Vegetation

Point ID	Easting	Northing	Ortho
2_GS0016	6735997.207	1631937.963	262.436
2_GS0024	6757910.532	1610062.95	338.977
2_GS0025	6758091.747	1610044.351	332.953
2_GS0034	6773786.114	1595124.887	269.492
2_GS0035	6773725.579	1595185.623	269.705

2_GS0016



Point ID: 2_GS0016

Northing: 1631937.963 US Survey Feet

Easting: 6735997.207 US Survey Feet

Orthometric Height: 262.436 US Survey Feet

Latitude: 37° 38' 30.48910" N

Longitude: 121° 23' 53.08466" W

Ellipsoid Height: 47.9077 US Survey Feet

2_GS0024



Point ID: 2_GS0024

Northing: 1610062.95 US Survey Feet

Easting: 6757910.532 US Survey Feet

Orthometric Height: 338.977 US Survey Feet

Latitude: 37° 34' 52.75766" N

Longitude: 121° 19' 22.73879" W

Ellipsoid Height: 71.2468 US Survey Feet

2_GS0025



Point ID: 2_GS0025

Northing: 1610044.351 US Survey Feet

Easting: 6758091.747 US Survey Feet

Orthometric Height: 332.953 US Survey Feet

Latitude: 37° 34' 52.56049" N

Longitude: 121° 19' 20.49000" W

Ellipsoid Height: 69.4092 US Survey Feet

2_GS0034



Point ID: 2_GS0034

Northing: 1595124.887 US Survey Feet

Easting: 6773786.114 US Survey Feet

Orthometric Height: 269.492 US Survey Feet

Latitude: 37° 32' 23.90046" N

Longitude: 121° 16' 07.07235" W

Ellipsoid Height: 50.0133 US Survey Feet

2_GS0035



Point ID: 2_GS0035

Northing: 1595185.623 US Survey Feet

Easting: 6773725.579 US Survey Feet

Orthometric Height: 269.705 US Survey Feet

Latitude: 37° 32' 24.50555" N

Longitude: 121° 16' 07.81767" W

Ellipsoid Height: 50.0781 US Survey Feet