

STATEMENT ACCOMPANYING REQUEST TO MODIFY EXPERIMENTAL AUTHORIZATION WG2XVN OF AEROVIRONMENT, INC.

1. Introduction

By this application, AeroVironment, Inc. (AeroVironment), requests that the Commission grant a modification to call sign WG2XVN to operate facilities within the 1670-1675 MHz band to provide authorization at 8 sites. The proposed sites are detailed in the attached Form 442. The experiments involve agriculture (6), hydropower facilities (1) and petroleum refinery infrastructure (1). There are no modifications to the technical elements of the technology. In this statement, we explain the purpose of the modification and why this application is within the Commission's experimental authorization rules.

2. Purpose

Background

The purpose of these experiments is providing analysis and information to further aerial surveillance in support of the planting, growing and harvesting of farm land and the operational aspects of petroleum production and hydropower facilities. The ability of real-time full motion video via small unmanned aircraft system (SUAS) technologies to assist in monitoring on a regular basis contributes to better supervision, cost efficiencies and improved maintenance. Real time information and imagery allows more informed assessment and faster corrective action. Data captured by cameras is typically far more accurate than the human eye and provides lengthier opportunity to scrutinize the challenge. For nighttime operations, a SUAS can be fitted with an infrared (IR) camera to enhance visibility.

The SUAS experiments will pursue efficiencies in farming. With the harvest season approaching, the technology seeks to contribute to a more effective and efficient harvest and to assist the farm in adapting to the changing season, weather and crop cycle.

The aerial monitoring of the hydroelectric and petroleum refinery seeks to test how the technology can make a meaningful contribution to monitoring and maintaining these facilities. Both the petroleum facility and hydroelectric plant are of a size and magnitude significantly larger than other experiments, and present more varied and complex equipment and infrastructure. An important element of these experiments is ability of the transmitted video technology to discern variations and changes over short and longer time increments.

Each proposed site presents a unique environment to test the radio transmissions directing the command and control and payload features of the SUAS and the quality and detail of the data transmissions from the aircraft. As we have noted previously, the research and information resulting from this work is provided to the Federal Aviation Administration (FAA) and is critical to the FAA's congressionally mandated project to integrate SUAS into civilian airspace.

The experiments at the proposed sites contribute to the research portfolio surrounding SUAS radio technology. A critical facet of this research is the effectiveness of the SUAS datalink behavior and performance in varied environments while engaging in representative mission sets. The work is an important facet of AeroVironment's investment in a platform of SUAS commercial uses and upon which future investment relies. The detailed results from AeroVironment's experiments are documented and submitted for FAA review on a monthly basis.

The Commission's authorization is critical to developing a record demonstrating the safety and effectiveness of commercial small unmanned aircraft. Commercial use is contingent upon unmanned aircraft systems operating safely within assigned flight areas and causing no harm to the public. How the aircraft is able to function to deliver specific objectives within a sector's institutional protocols and other variables is only revealed when the SUAS is tested in an actual mission environment. The FAA examines how a system is designed, constructed and manufactured; including the engineering processes, software development and control, configuration management, and quality assurance procedures supporting the aircraft.

The Experiments Involving Agriculture

The experiments expand surveillance to more varied farm land and crops in San Joaquin, Fresno, Napa and Tulare Counties, California and supplement ongoing experiments in Stanislaus and Santa Barbara Counties. Encompassed within the experiments relating to the agriculture sector is whether the SUAS radio technology can, via applications designed to provide specific data regarding a particular crop, provide images that are meaningful and more efficient solutions than current labor intense or logistically difficult efforts. In particular, as September commences the harvest season in the proposed areas, opportunity will be afforded in determining how the technology can meaningfully assist these operations. The experiments will provide insight to the value and risks associated with integrating the applications into the core SUAS technology. The objective is discerning whether use of the radio spectrum can be replicated in farm areas throughout the US.

The Experiments Involving Petroleum Refinery and Hydropower Facilities

The proposed site relating to petroleum is the Chevron petroleum refinery in Richmond, Contra Costa County, California. The size and complexity of the infrastructure presents challenge to the SUAS technology in providing real time data from sensors and surveillance across the wide ranging physical infrastructure and to detect changes or variations that contribute to operational safety.

The proposed site, Big Creek, Fresno County, California is a hydroelectric facility of Southern California Edison. It is one of the largest and most extensive hydroelectric projects consisting of dams, tunnels, artificial lakes, reservoirs and powerhouses.

In both of these tests, the real time visual inspections obtain valuable information addressing conditions that assist engineers in monitoring, repairing or replacing the infrastructure. It will also test how the radio technology performs in a pervasive refinery and hydropower environment

in varied weather and climate. The testing will gauge multipath radio propagation challenges within both of these unique infrastructure environments.

3. Technology Use

The experiments embrace a model using a band segment aligning with technology and equipment currently available. AeroVironment reiterates its commitment to operations respecting other users of the band and those in adjacent segments. The limited power levels proposed are part of this commitment. AeroVironment believes the compelling purpose of bringing these advanced services to the electric utility and railway sectors serves the public interest. The 1670-1675 MHz channels provide SUAS control and video and telemetry transmission from the SUAS to the ground. Slots are dedicated for uplink data and a downlink.

At each individual site, there will be only one SUAS airborne at any time. Operations will be limited to 400' (121.92 meters) AGL. The SUAS will remain within the radius of the exercise center points, which range from 1 km to 25km.

The proposed locations of center point operations relating to farming and agriculture are:

- Manteca, San Joaquin County, California within 1 km of center point.
- Mapes, Modesto, Stanislaus County, California, within 2.5 km of center point
- B & B, Modesto, Stanislaus County, California, within 2.5 km of center point
- Firebaugh, Fresno County, California, within 10 km of center point
- Napa, Napa County, California, within 25 km of center point
- Goshen, Visalia, Tulare County, California, with 3 km of center point

The proposed sites relating to petroleum and hydroelectric are:

- Richmond, Contra Costa County, California, within 8 km of center point
- Big Creek, Fresno County California, within 8 km of center point

Maps of each site and the parameters of operations are provided in the Contour Attachment.

4. Nature of Operations

Surface Based and Airborne Transmission

As noted in our original application, AeroVironment's communications module, Digital Data Link (DDL), will use the 1670-1675 MHz band segment for purposes of sending ground based command and control data to and from the SUAS and to transmit video and telemetry to the ground control station. The technology, capable of operating within 1625-2390 MHz, requires 4 MHz for full motion video and a 1 MHz channel for video at 15 frames per second. Emission Designators are 4M68G7W and 1M56G7W, respectively, with a transmit power at 10W. Transmission control will be from the surface control station to the SUAS via a laptop or

console. AeroVironment's DDL system has been adopted by the US Army as the standard communications architecture for all small unmanned systems, including ground robots.

5. Stop Buzzer

Andy Thurling, Chief Test Pilot, Director, Product Safety and Mission Assurance, will be available by telephone at 805.581.2198, extension 1892, Cell Phone 805.368.6351 and will act as a "stop buzzer" if any matters involving interference arise during the testing.

6. Transmitting Equipment

The transmitting equipment is unchanged. It is AeroVironment Transreceiver Model 50280, with 2 units at each location. It is not experimental.

7. Antenna

The Antenna details have not changed from the current authorization and are as follows:

Antenna	Gain (Nominal)	Polarization	Orientation in Vertical Plane	Oriental in Horizontal Plane
GCU Antenna ASY AeroVironment Stack Patch	9dbi*	Vertical	30	85
1670-1675 MHz Tailboom ASSY AeroVironment Dipole	2dbi	Vertical	78	360

*Major Side Lobe

- E-Plane
 - Gain: -2 dbi
 - 120 deg
- H- Plane
 - Gain: -2 dbi
 - 179 deg

8. Restrictions on Operations and Interference Protection

AeroVironment understands that experimental operations must not cause harmful interference to authorized facilities. Should any interference occur, AeroVironment will take immediate steps to resolve the interference, including, if necessary, discontinuing operations.

9. Waiver of Station Identification Requirements

AeroVironment requests a waiver of the station identification requirements stated in Section 5.115 of the Commission's rules.

10. Federal Aviation Administration (FAA) Certificate of Waiver Authorization (COA)

AeroVironment has or will file applications for a Certificate of Waiver or Authorization with the FAA detailing the areas where the SUAS will be flying during the proposed operations. AeroVironment understands that no operations will be pursued until FAA approval of the COA and that any operations will be within the COA parameters.

11. Diagram

A diagram and referenced maps of the proposed operations are provided in the Attachment.

Conclusion

AeroVironment appreciates very much the Commission's consideration of this modification application for an Experimental Authorization. Please call upon us if we can respond to any questions.

Attachment

Operations Diagram



Small Unmanned Aircraft-

Video and Telemetry
1670-1675 MHz

Aircraft Command and Control Main and
1670-1675 MHz



CONTOURS OF PROPOSED SITES

Manteca

Location: 37°46'40.79"N 121° 9'19.23"W

Radius: 1.0km

Altitude: 400ft AGL

37°46'40.79"N 121°9'19.23"W

Ruler

Line Path Polygon **Circle** 3D path 3D polygon

Measure the circumference or area of a circle on the ground

Radius: 1.00 Nautical Miles

Area: 2,672.87 Acres

Circumference: 6.30 Nautical Miles

Mouse Navigation

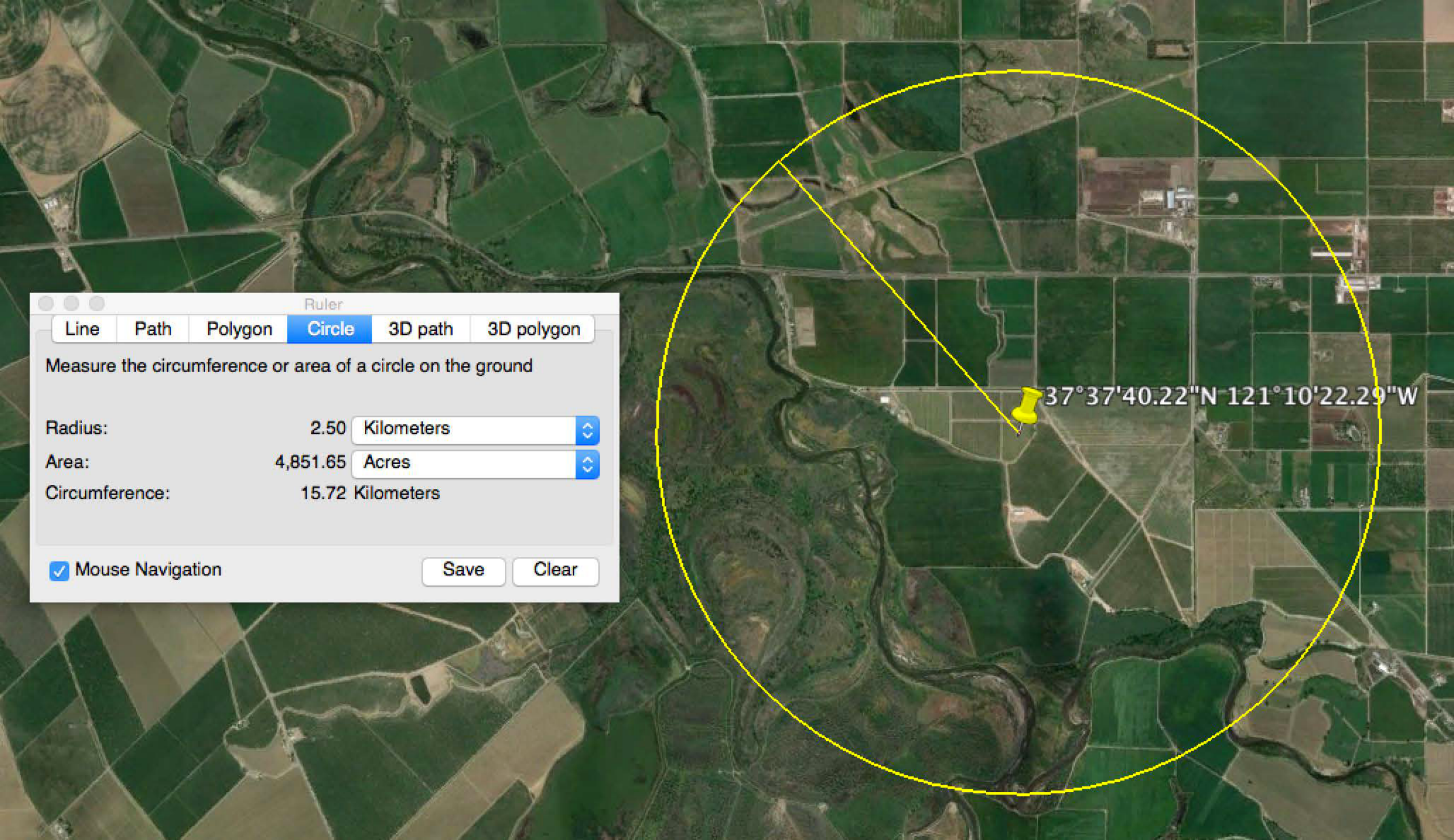
Save Clear

Mapes

Location: 37°37'40.22"N 121°10'22.29"W

Radius: 2.50 km

Altitude: 400ft AGL



Ruler

Line Path Polygon **Circle** 3D path 3D polygon

Measure the circumference or area of a circle on the ground

Radius: 2.50 Kilometers

Area: 4,851.65 Acres

Circumference: 15.72 Kilometers

Mouse Navigation

Save Clear

37°37'40.22"N 121°10'22.29"W

B&B – Modesto

Location: 37°34'14.98"N 121° 2'29.17"W

Radius: 2.50km

Altitude: 400ft AGL

Ruler

Line Path Polygon **Circle** 3D path 3D polygon

Measure the circumference or area of a circle on the ground

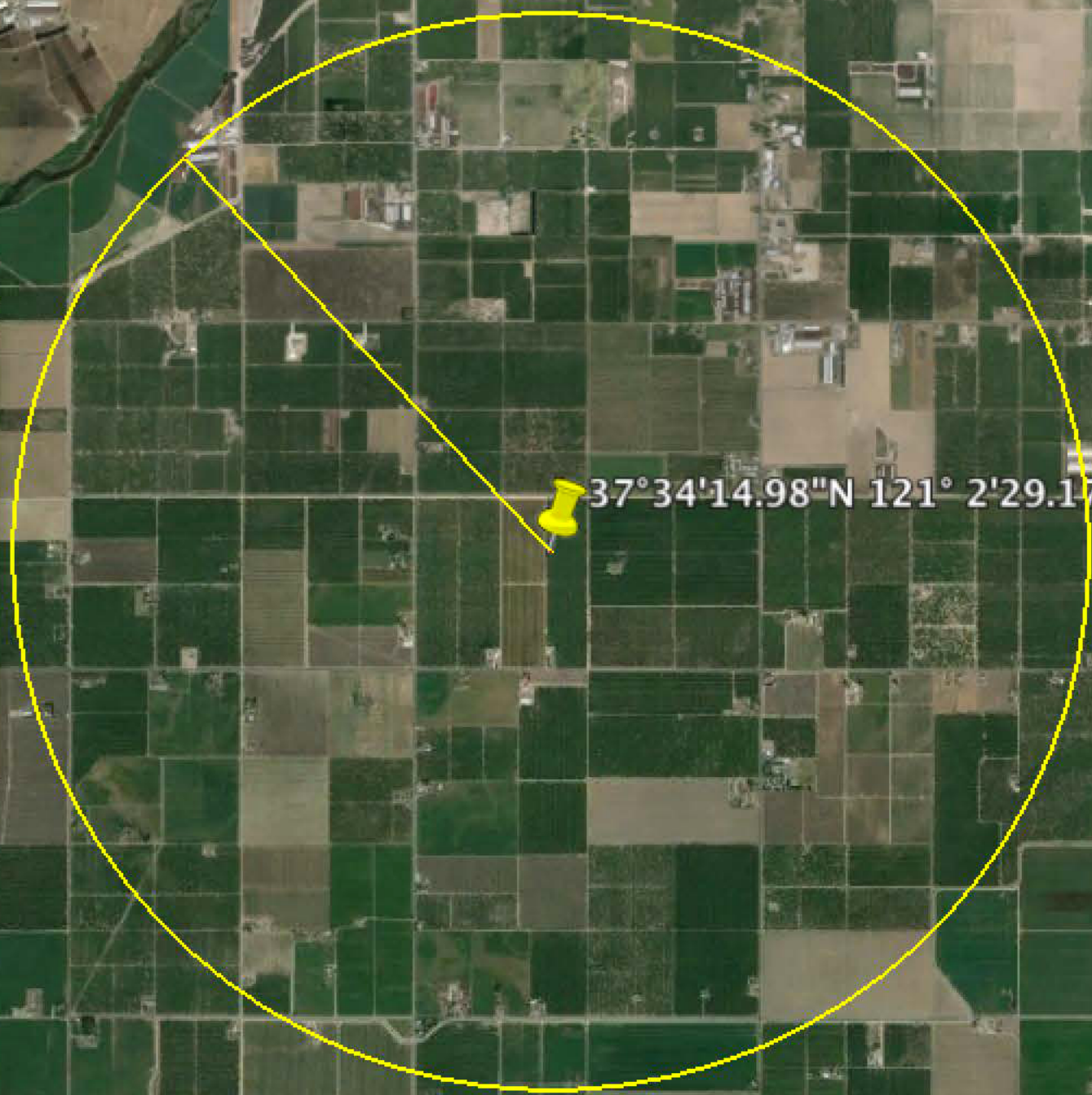
Radius: 2.50 Kilometers

Area: 4,863.23 Acres

Circumference: 15.74 Kilometers

Mouse Navigation

Save Clear



37°34'14.98"N 121° 2'29.17"W

Firebaugh

Location: 36°46'36.14"N 120°36'8.80"W

Radius: 10km

Altitude: 400ft AGL

Ruler

Line Path Polygon **Circle** 3D path 3D polygon

Measure the circumference or area of a circle on the ground

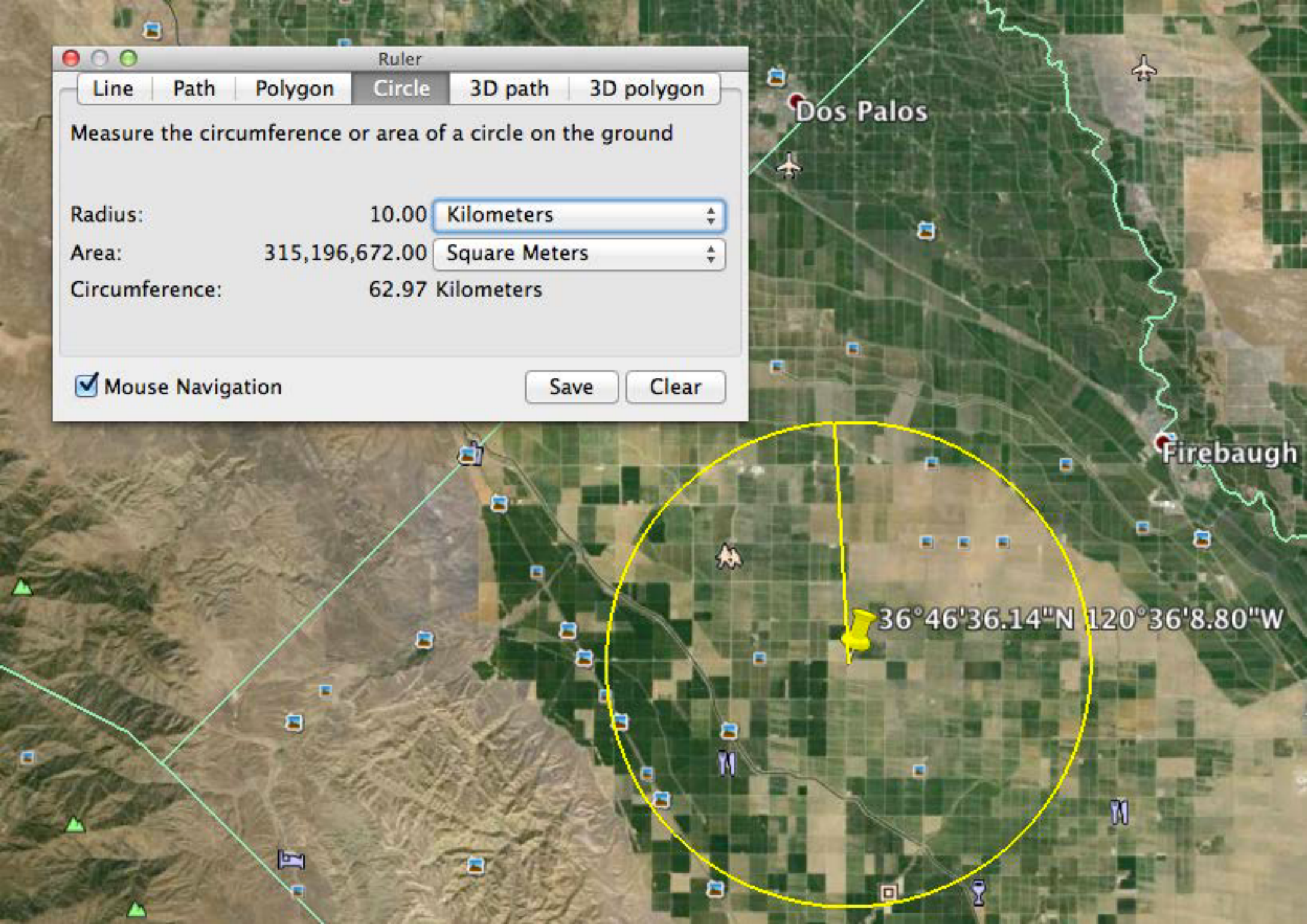
Radius: 10.00 Kilometers

Area: 315,196,672.00 Square Meters

Circumference: 62.97 Kilometers

Mouse Navigation

Save Clear

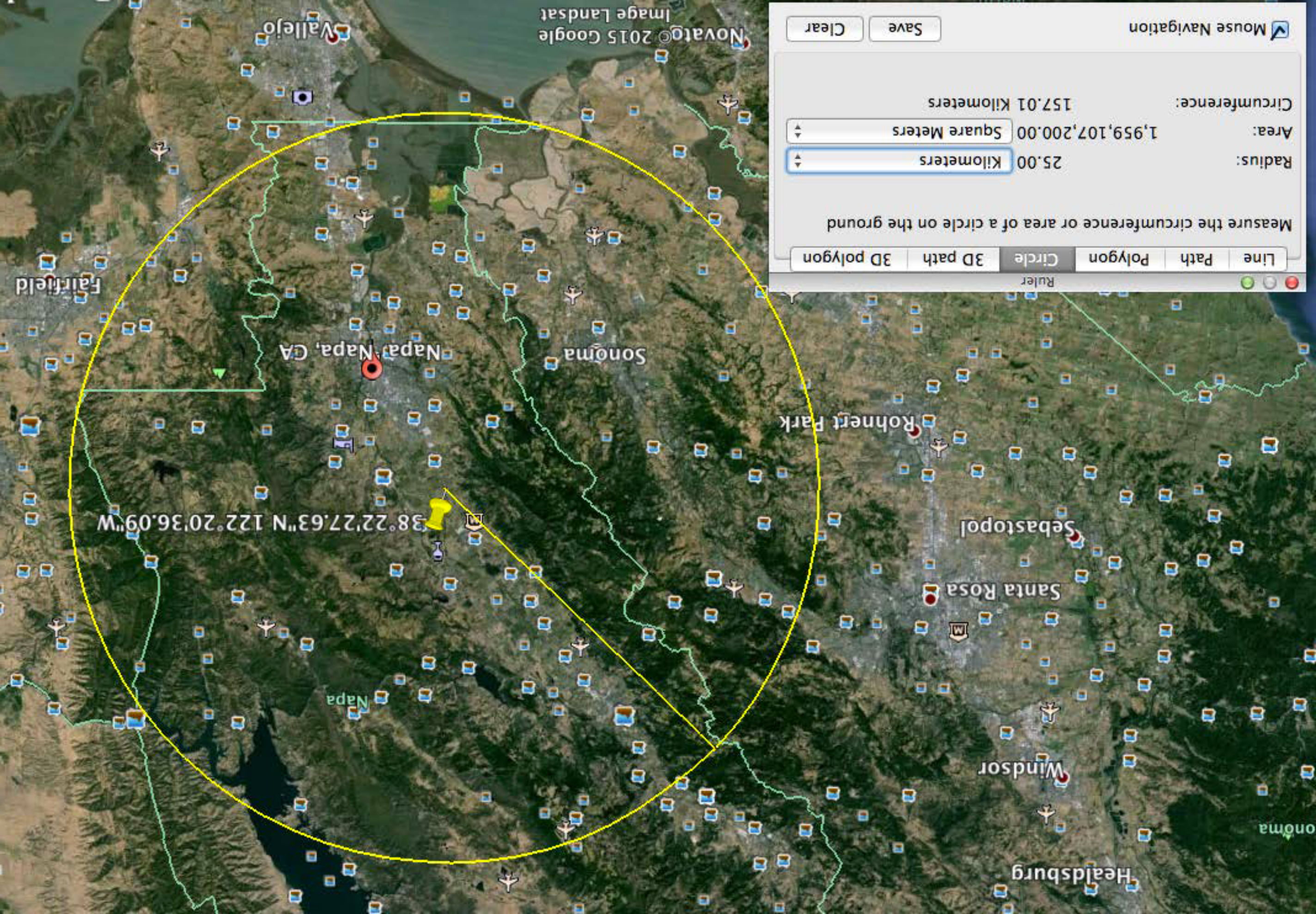


Napa/Sonoma Valley

Location: 38°22'27.63"N 122°20'36.09"W

Radius: 25km

Altitude: 400ft AGL



Mouse Navigation

Save Clear

Radius: 25.00 Kilometers

Area: 1,959,107,200.00 Square Meters

Circumference: 157.01 Kilometers

Measure the circumference or area of a circle on the ground

Line Path Polygon Circle 3D path 3D polygon

Ruler

Goshen

Location: 36°22'10.31"N 119°27'17.72"W

Radius: 3km

Altitude: 400ft AGL

Ruler

Line Path Polygon **Circle** 3D path 3D polygon

Measure the circumference or area of a circle on the ground

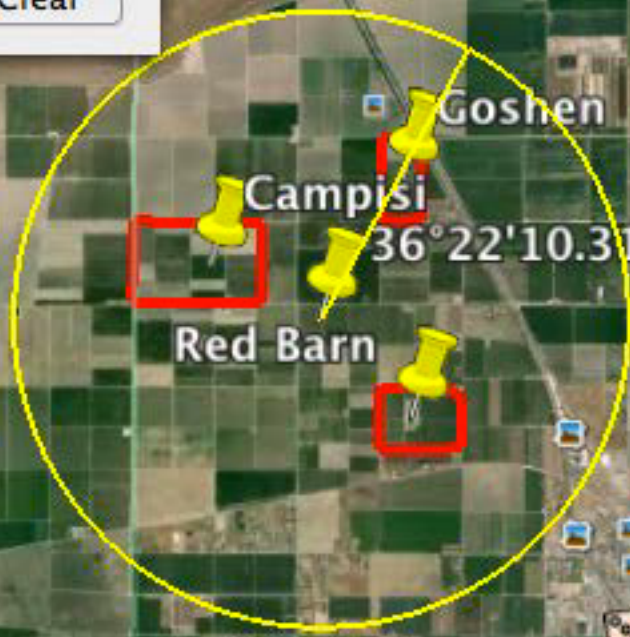
Radius: 3.00 Kilometers

Area: 28,249,386.00 Square Meters

Circumference: 18.85 Kilometers

Mouse Navigation

Save Clear



Richmond

Location: 37°55'40.96"N 122°25'8.40"W

Radius: 8.0 km

Altitude: 400ft AGL

Ruler

Line Path Polygon **Circle** 3D path 3D polygon

Measure the circumference or area of a circle on the ground

Radius: 8.00 Kilometers

Area: 49,548.00 Acres

Circumference: 50.23 Kilometers

Mouse Navigation

Save Clear

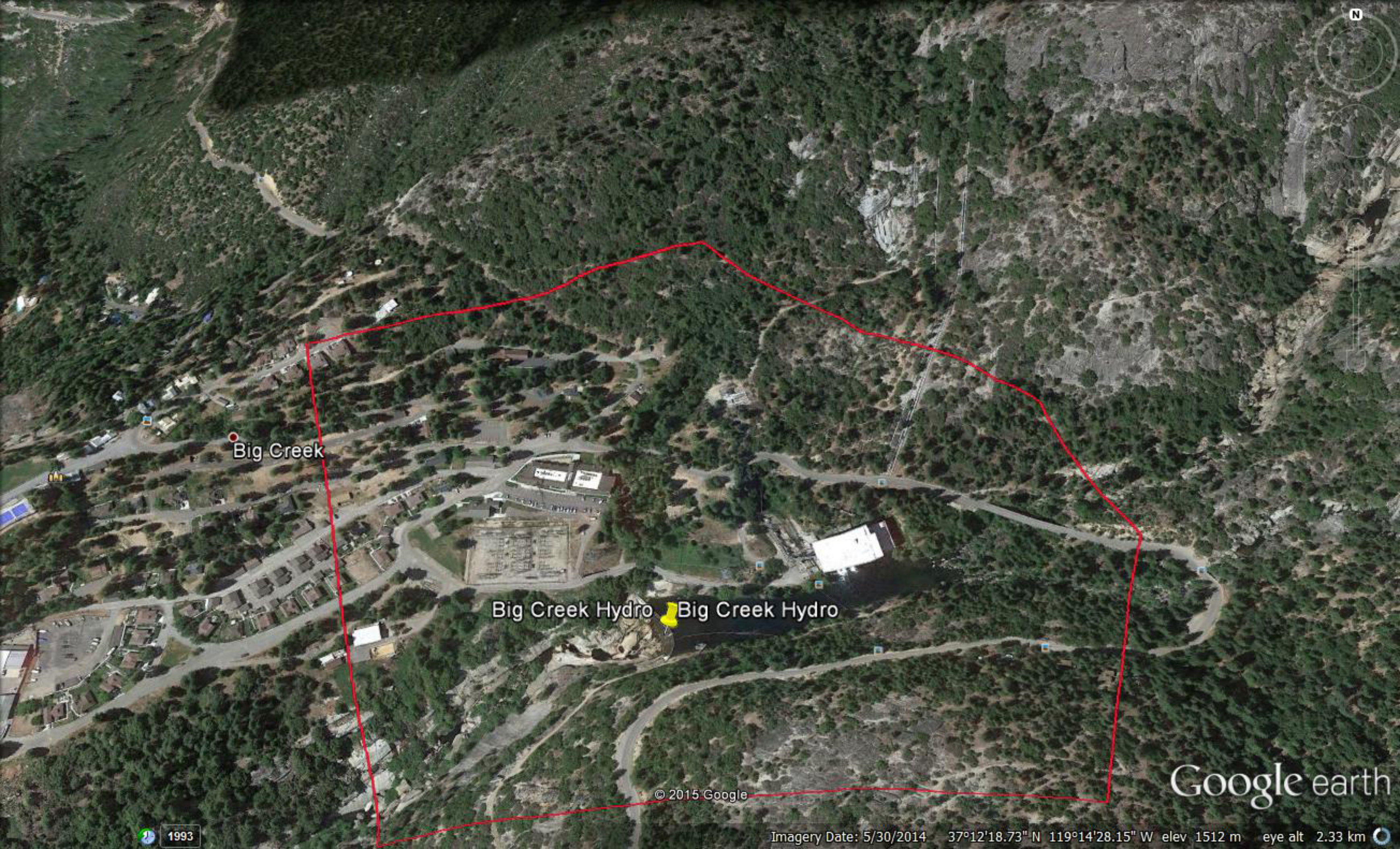


Big Creek

Location: 37°20'33.85"N 119°24'15.12"W

Radius: 8.0 km

Altitude: 400ft AGL



Big Creek

Big Creek Hydro Big Creek Hydro

Google earth

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Imagery Date: 5/30/2014 37°12'18.73" N 119°14'28.15" W elev 1512 m eye alt 2.33 km