PART 3: STEP-BY-STEP EXAMPLES

Examples

Feature – with Obvious Spatial Extent using GEOLocate

Feature – without Obvious Spatial Extent using Google Maps & MaNIS Georeferencing Calc.

Offset – Distance at a Heading using Google Maps & the MaNIS Georeferencing Calculator

Offset – Path using Google Maps and the MaNIS Georeferencing Calculator

Feature – with Obvious Spatial Extent

Example: *Lisbon Falls, Lisbon County, Maine (U.S.)*

Procedure:

- Use GEOLocate to find coordinates + radial for the city
- Ensure coordinates are at corrected center of the city
- Edit radial to encompass area as precisely as possible (snap to feature)

GEOLocate is best for simple localities: cities/towns, counties, offsets at a heading localities
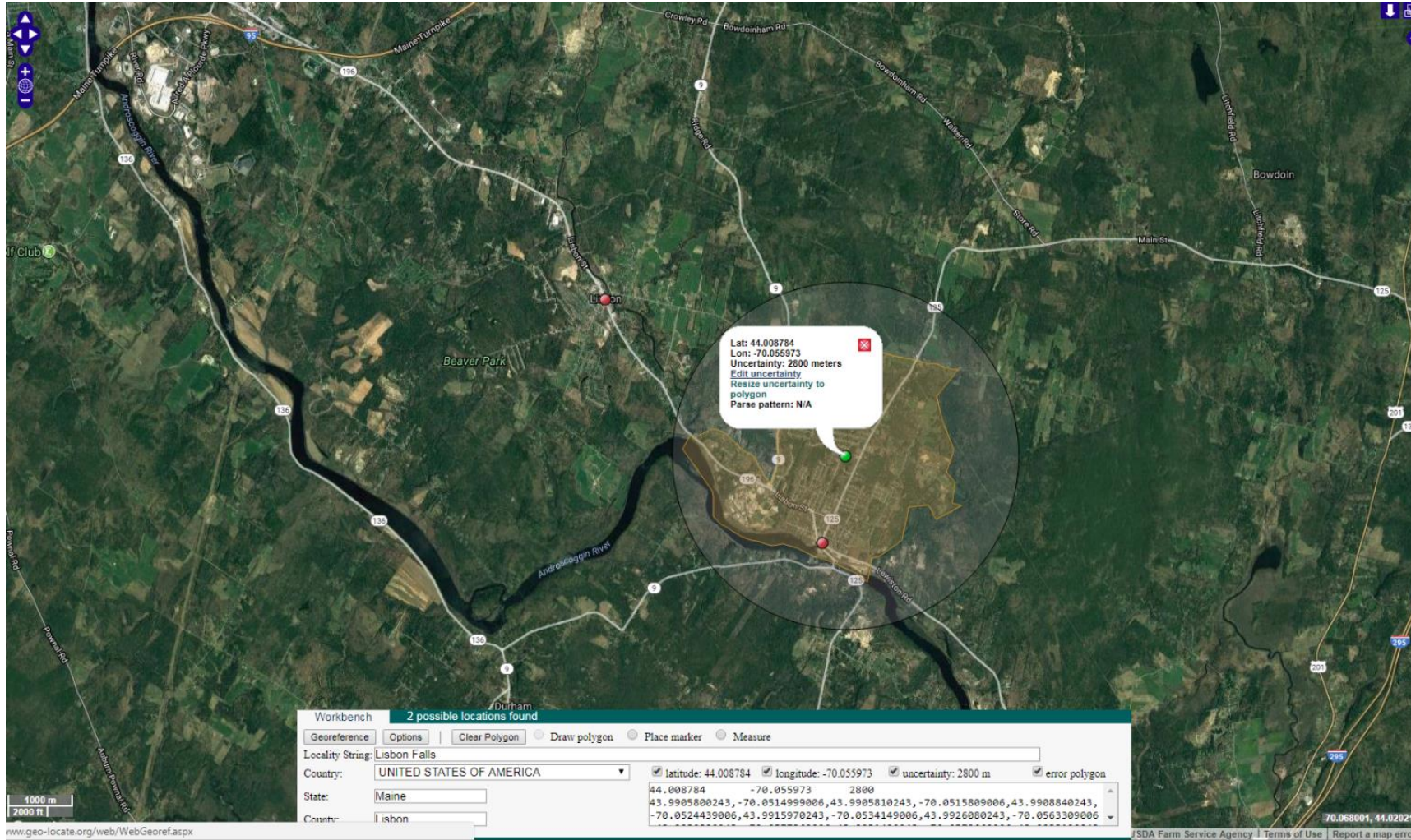
GEOLocate
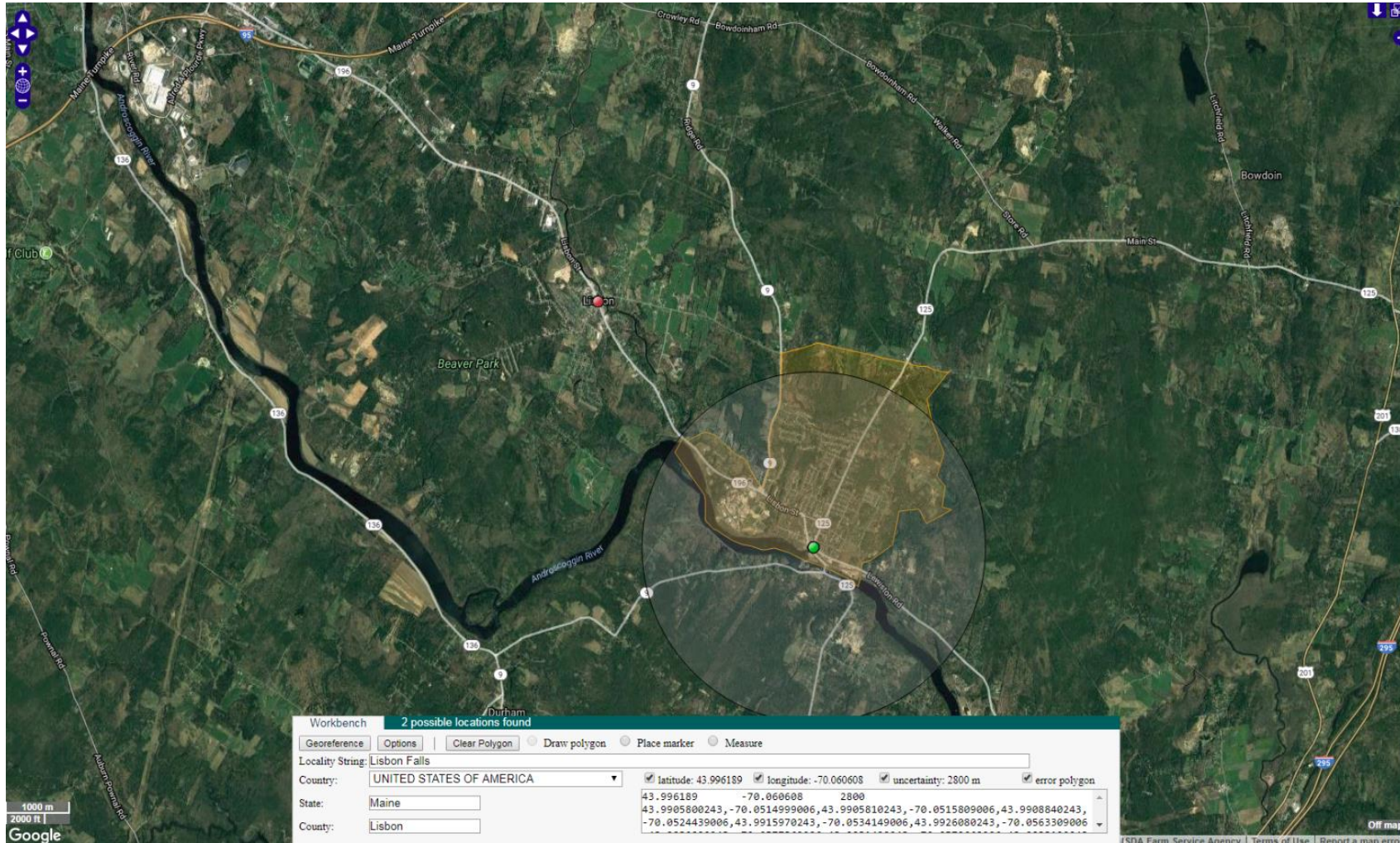
GEOLocate finds coordinates within Lisbon Falls

Coordinates need to be shifted slightly to center

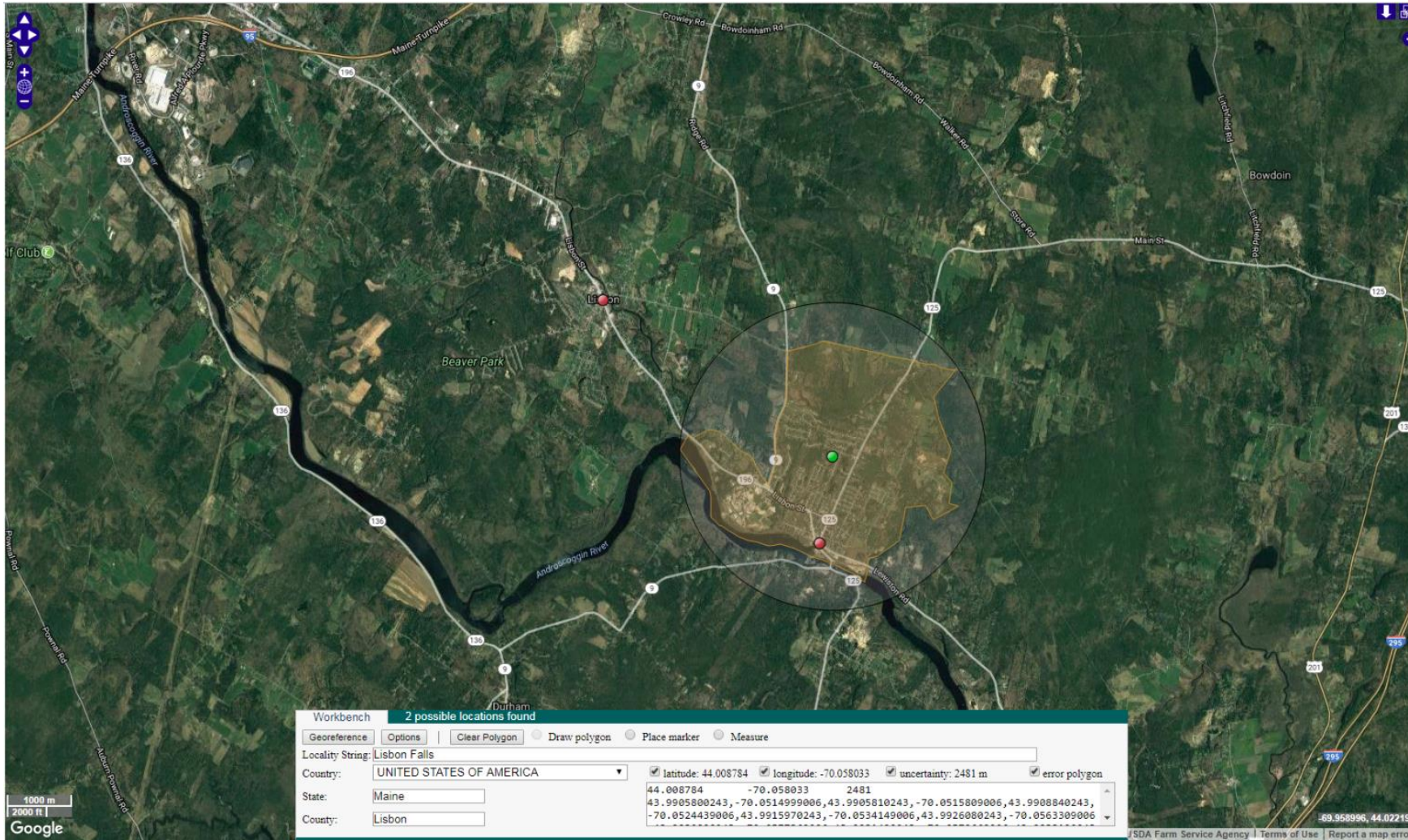Uncertainty radius does not encompass entire area of city

Adjust Coordinates

Adjust point to be in approximate center of region

Resize uncertainty to polygon

↓

Automates the georeference

Edit Uncertainty

Uncertainty should encompass <u>entire</u> area of city (polygon)

Note: polygon of city extent is not always displayed/known

Feature – without Obvious Spatial Extent

Example: *Tabocal, Amazonas (Brazil)*

- Use Google Maps to locate coordinates of the region

- Measure from the coordinates to the approximate center of the nearest feature (of similar locality type)

- Divide distance in half to approximate the geographic radial

- Input information into the MaNIS Georef. Calculator to find the uncertainty radius
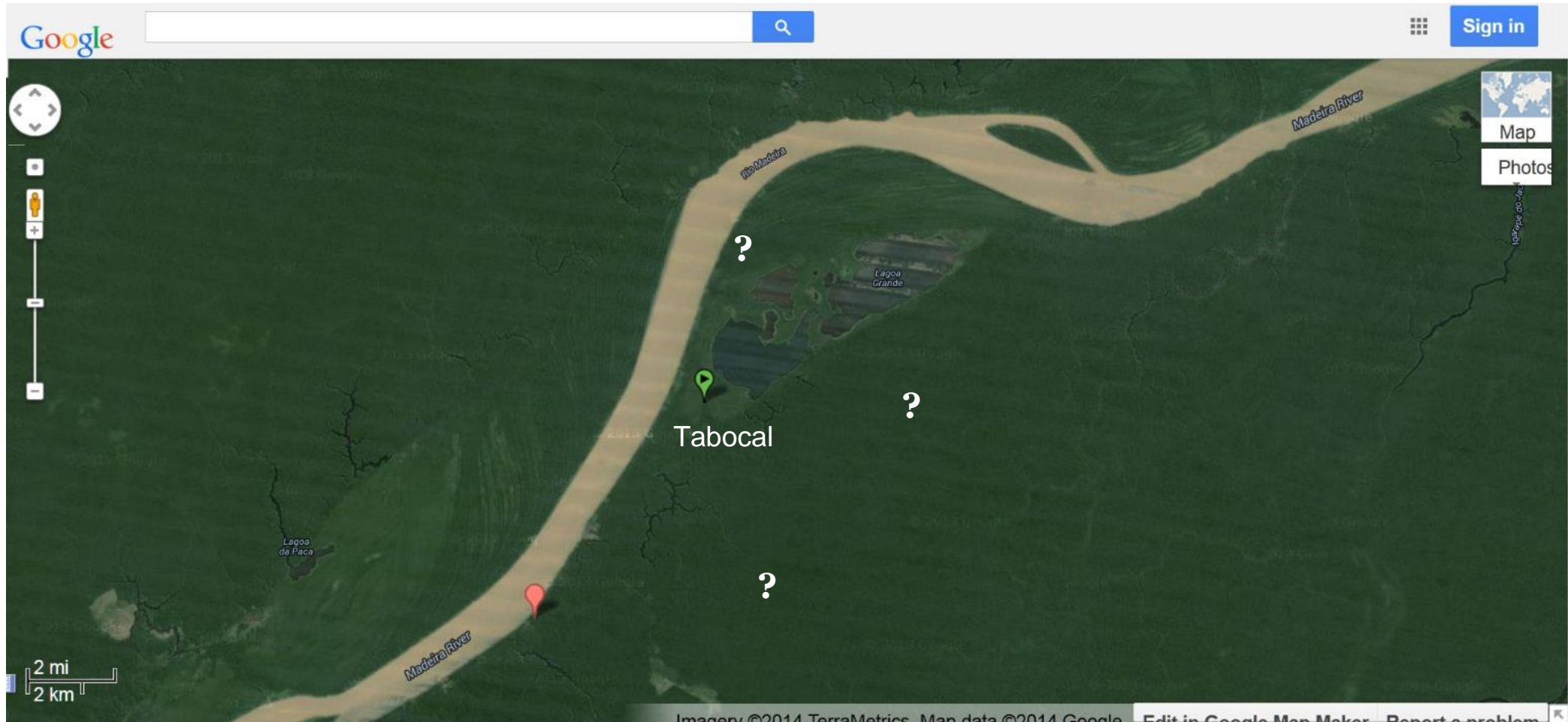
Without Obvious Spatial Extent

Immediately, we notice there are no discernable boundaries for this locality

Without Obvious Spatial Extent
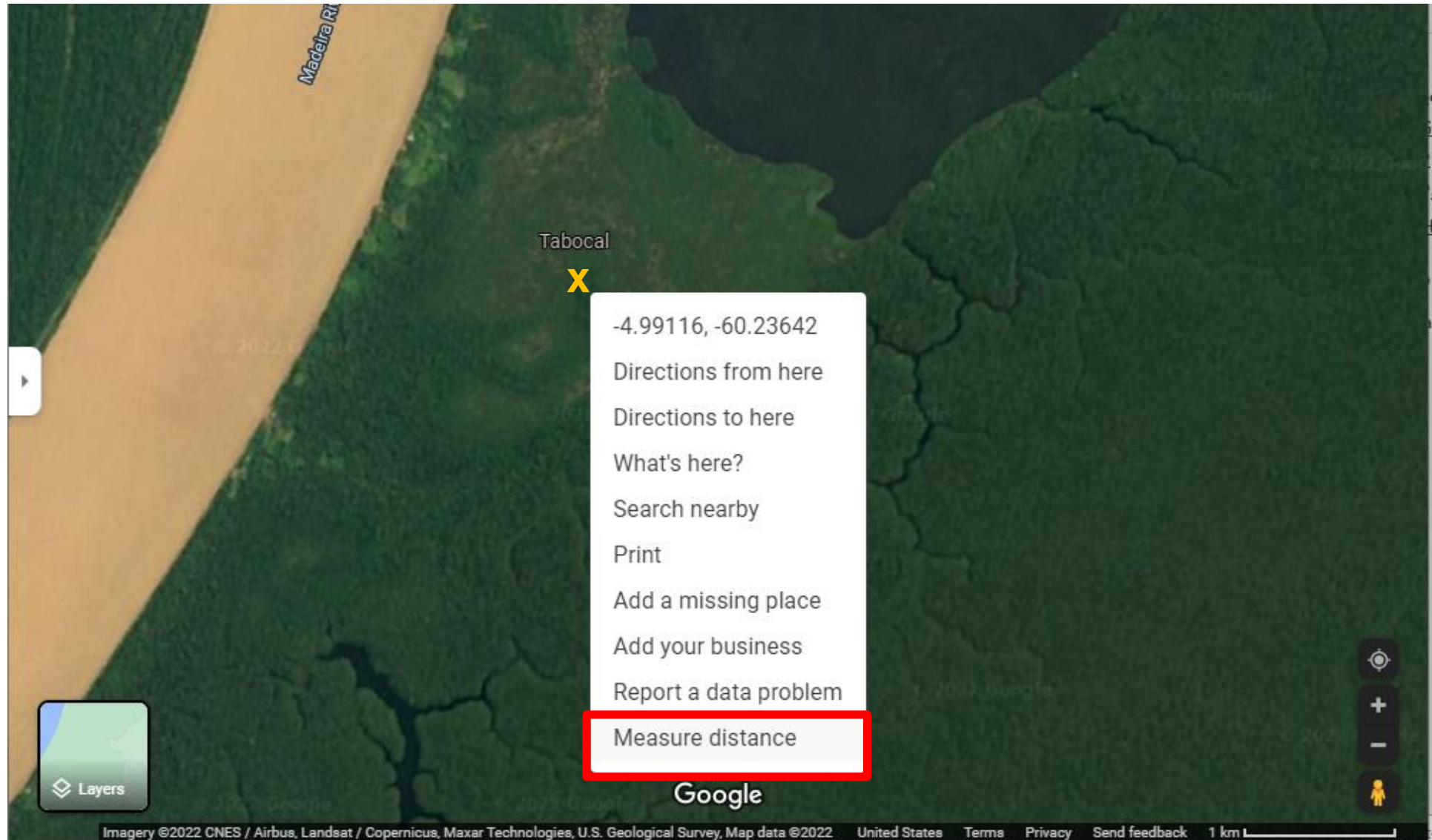
Begin by starting the Measure distance tool by right clicking on the map next to where Google Maps places the name of the place
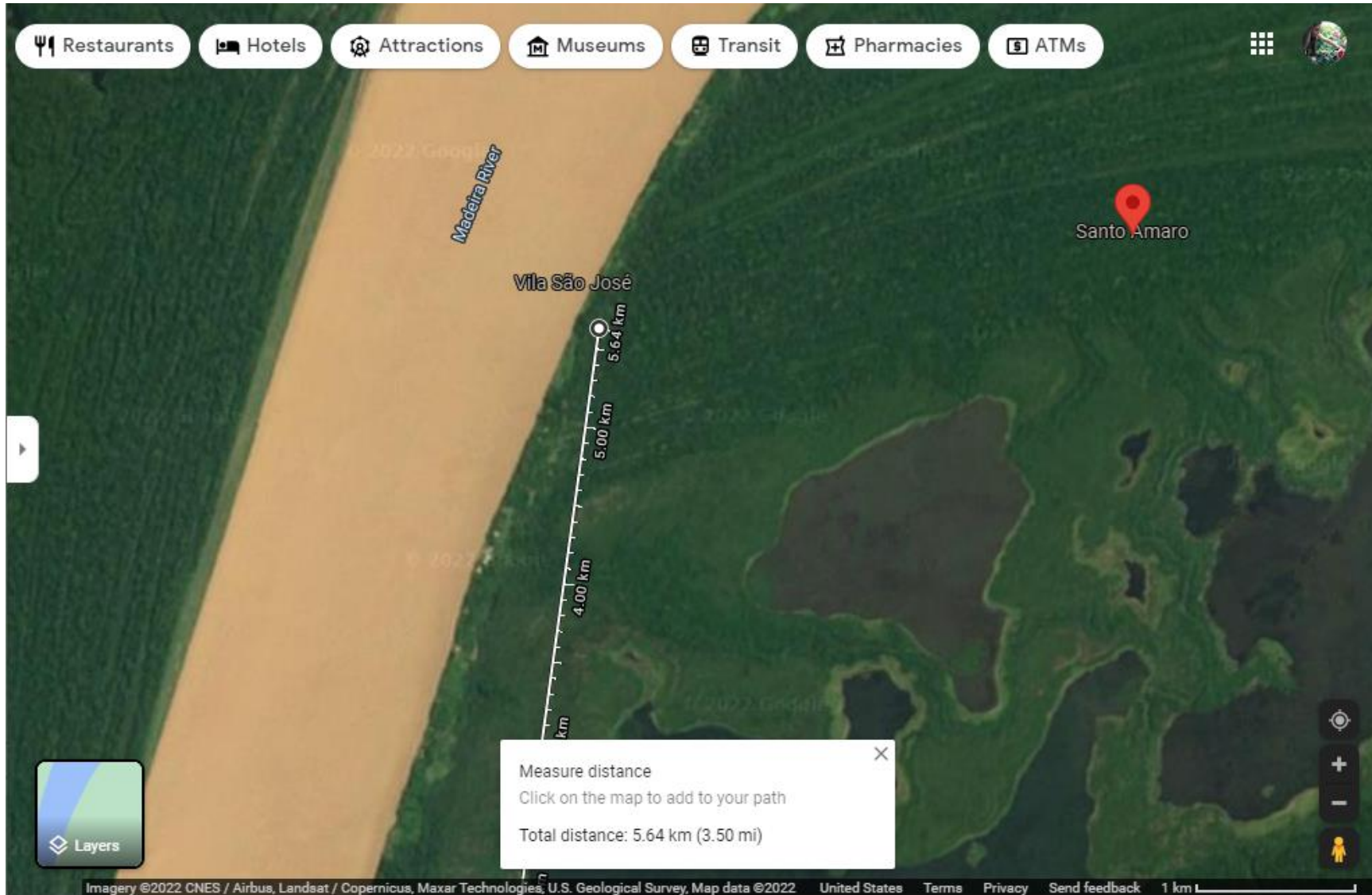
Without Obvious Spatial Extent

Nearest named place? Must pan around the map to locate.

Without Obvious Spatial Extent

North of Tabocal we see two named places (similar locality type), Vila São José and Santo Amaro.

Without Obvious Spatial Extent

Vila São José is nearer to Tabocal; measure a straight line between approximated centers of both features, then halve distance = radial.

Without Obvious Spatial Extent

Radial: 5640 m / 2 = 2820 m

Without Obvious Spatial Extent

LOCALITY TYPE	CALCULATION PROCEDURE (instructions on how to use the Georeferencing Calculator)
Named place **Undefined Area**: Locality refers to a geographic feature that does not have a clear spatial boundary *Example: "Pampa Grande" (the extent is 4.7 km given that the center of the nearest named place, "Colonia Mariano Sarratea" is 9.4 km distant)*	~~Calculation Type: "Error only - enter Lat/Long for the actual locality"~~ **Locality Type**: "Named place only" ← **Coordinates**: Determine the coordinates for the named place as well as possible using visible evidence near the label for the named place on the map. **Extent**: Use half the measured distance from the selected coordinates to the center of the nearest named placed. Make note of the measure and the nearest named place in **georeferenceRemarks**.

MaNIS: Locality Type

Locality Type = Geographic feature only
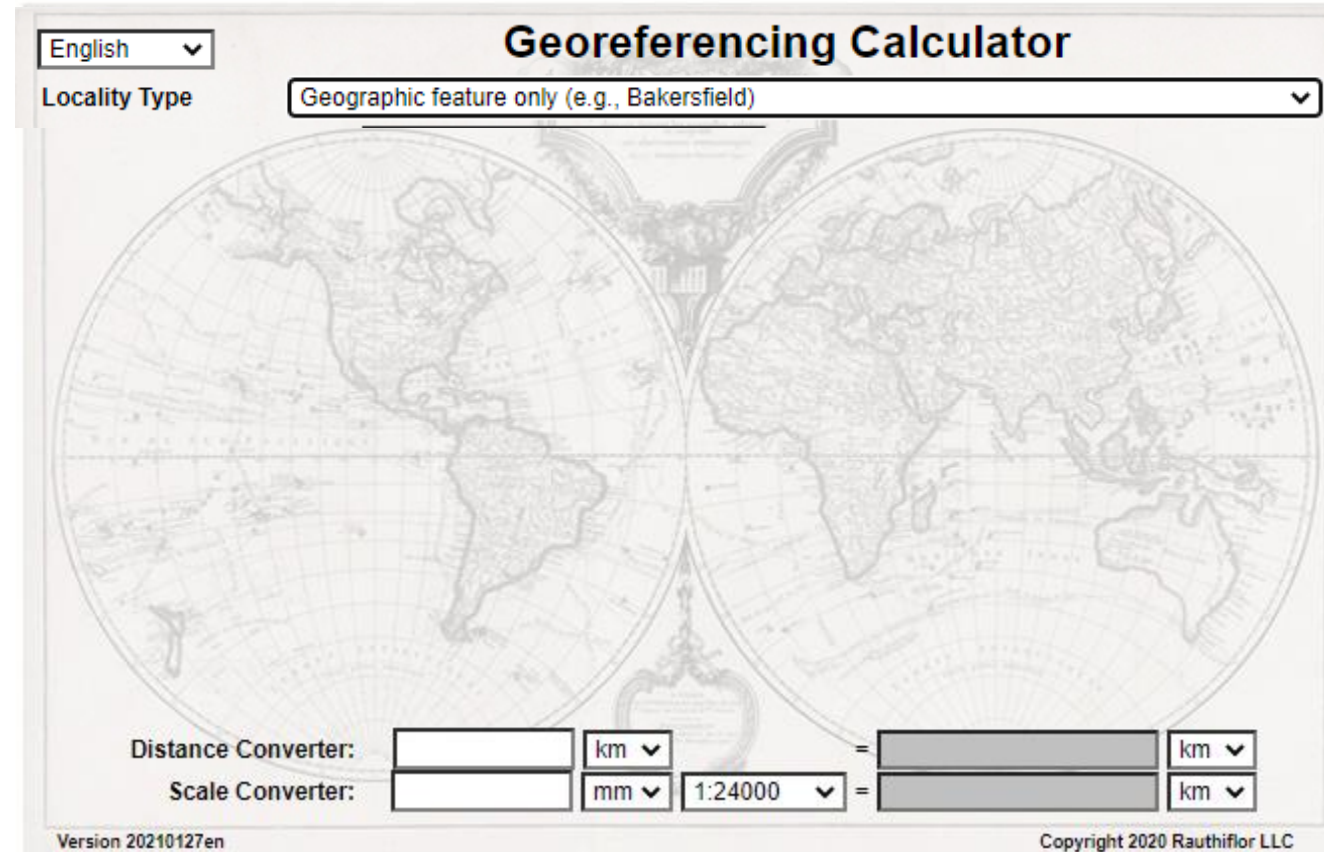
MaNIS Georeferencing Calculator

Undefined Area: Tabocal, Município Borba, Amazonas (Brazil)

MaNIS: Locality Type

LOCALITY TYPE	CALCULATION PROCEDURE (instructions on how to use the Georeferencing Calculator)
Named place **Undefined Area**: Locality refers to a geographic feature that does not have a clear spatial boundary *Example: "Pampa Grande" (the extent is 4.7 km given that the center of the nearest named place, "Colonia Mariano Sarratea" is 9.4 km distant)*	~~**Calculation Type**: "Error only – enter Lat/Long for the actual locality"~~ **Locality Type**: "Named place only" **Coordinates**: Determine the coordinates for the named place as well as possible using visible evidence near the label for the named place on the map. **Extent**: Use half the measured distance from the selected coordinates to the center of the nearest named placed. Make note of the measure and the nearest named place in **georeferenceRemarks**.

MaNIS: Coordinate Source, Format, Datum, Precision

Coordinate Source: **Google Maps > 2008**

The basis of how the coordinates were located.

Coordinate Format: Based on coordinate source (Google Maps) = **decimal degrees**

Datum: **WGS84** (Google Maps)

Precision (of the coordinates): **exact** (Google Maps)

Undefined Area: Tabocal, Município Borba, Amazonas (Brazil)

MaNIS: Coordinates

Latitude & Longitude: *Do **NOT** need to be entered*

Undefined Area: Tabocal, Município Borba, Amazonas (Brazil)

MaNIS: Radial of Feature

Radial of Feature: Enter approximate **radial** of Tabocal.

 - The halved linear distance from the estimated centers of Tabocal and nearest named place, Vila São José

Measurement Error: **10 m** (standard)

= *Error associated with the **georeferencer's ability to measure on the map***

Distance Unit: m (must reflect the two fields above)

Undefined Area: Tabocal, Município Borba, Amazonas (Brazil)

MaNIS: Calculate

CALCULATE !

Undefined Area: Tabocal, Município Borba, Amazonas (Brazil)

MaNIS: Calculate

Uncertainty is provided in meters

Undefined Area: Tabocal, Município Borba, Amazonas (Brazil)

Offset – Distance at a Heading

Example: *5 km north of Baní, Dominican Republic*

- Use Google Maps to locate coordinates of the city
- Find radial by measuring from coordinates to the farthest extent of the city
- Input information into the MaNIS Georeferencing Calculator to find the offset coordinates and the uncertainty radius.

Note: Use GEOLocate when applicable (U.S., Canada, Europe)

Offset at a Heading
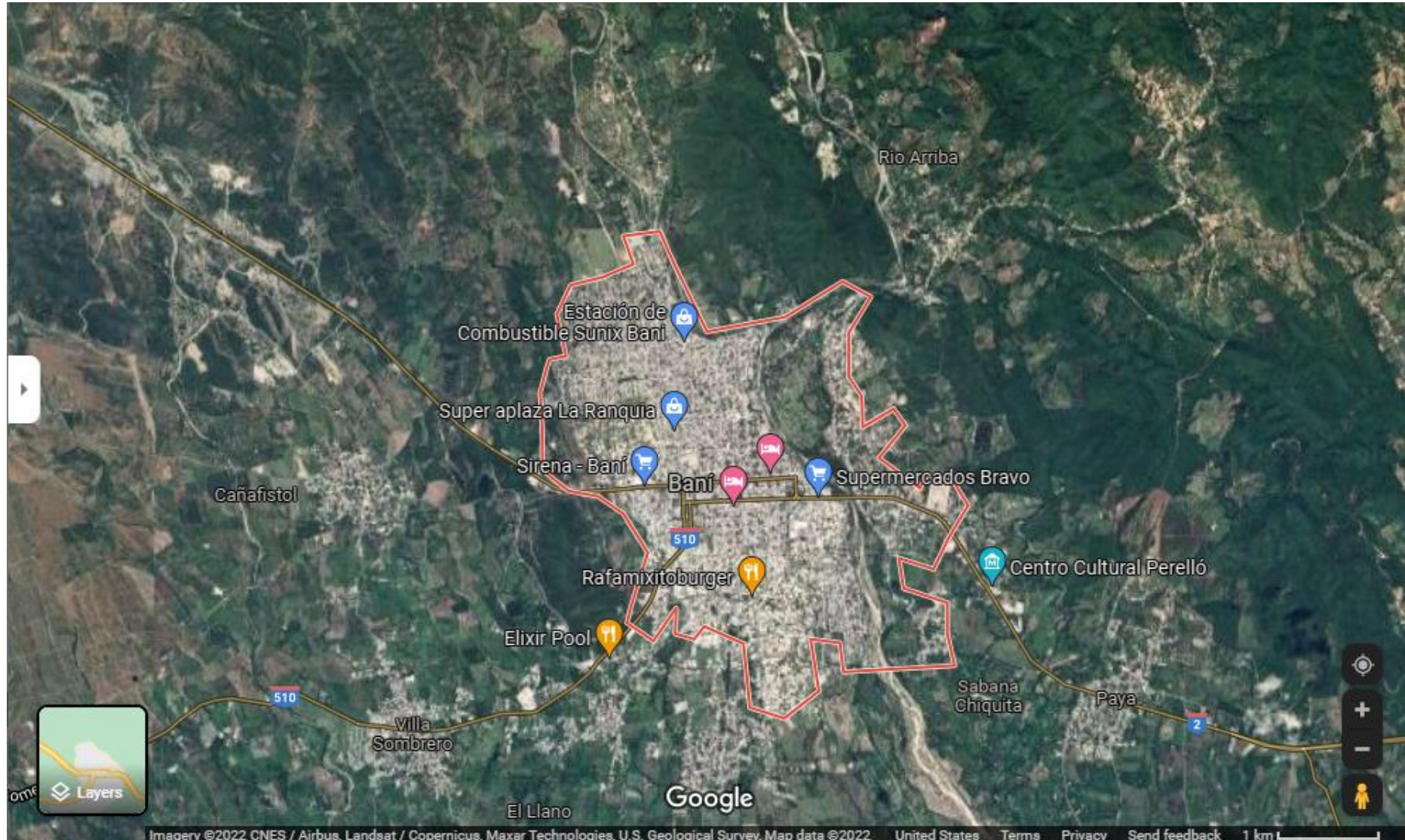
Locate city of Baní

Offset at a Heading

Locate coordinates for center of Baní (18.282227044, -70.32871990) and radial (2.72 km – matching units of offset)

Offset at a Heading

Notice that there is not one distinct road leading north from the city. Because of this, we can safely assume offset by air.
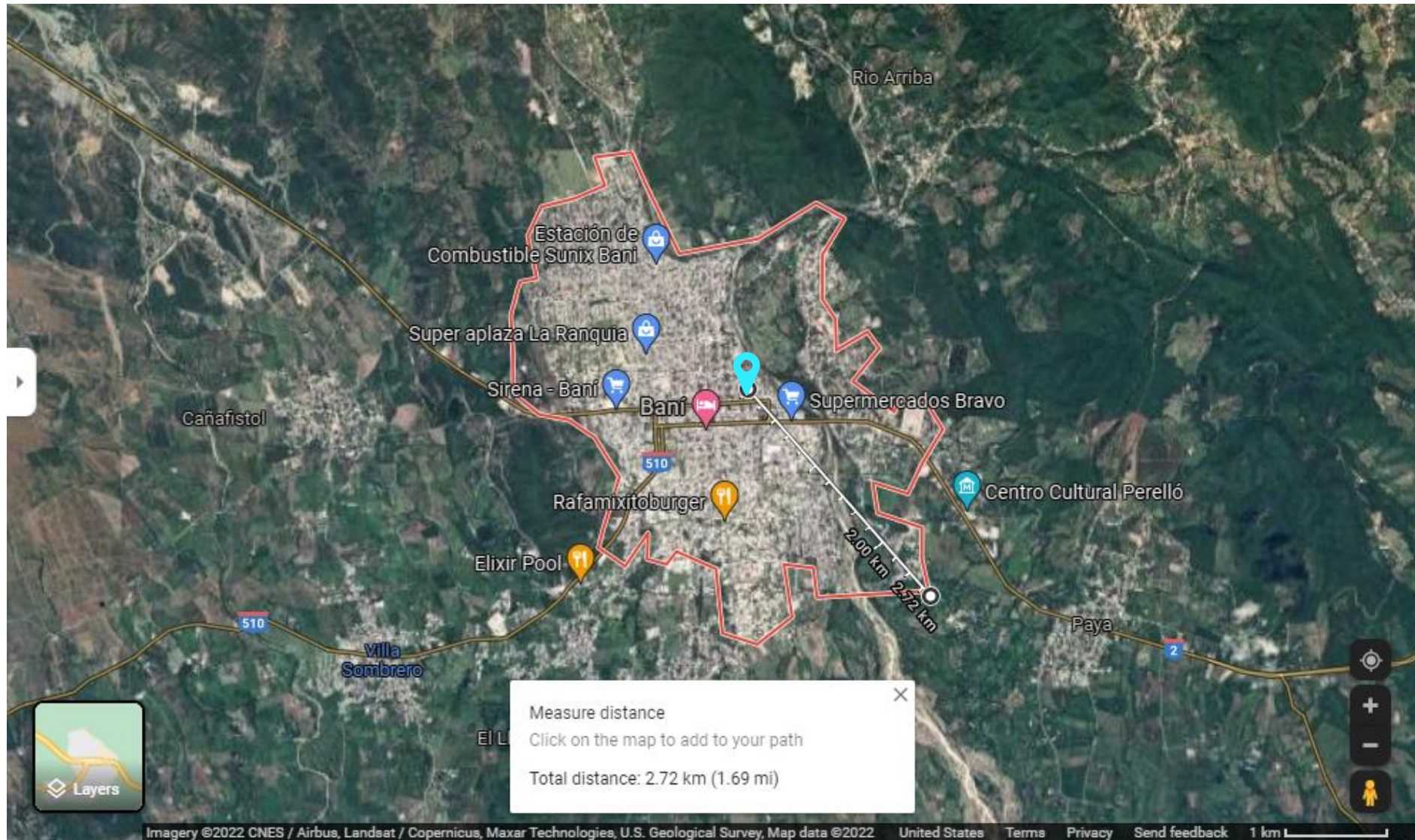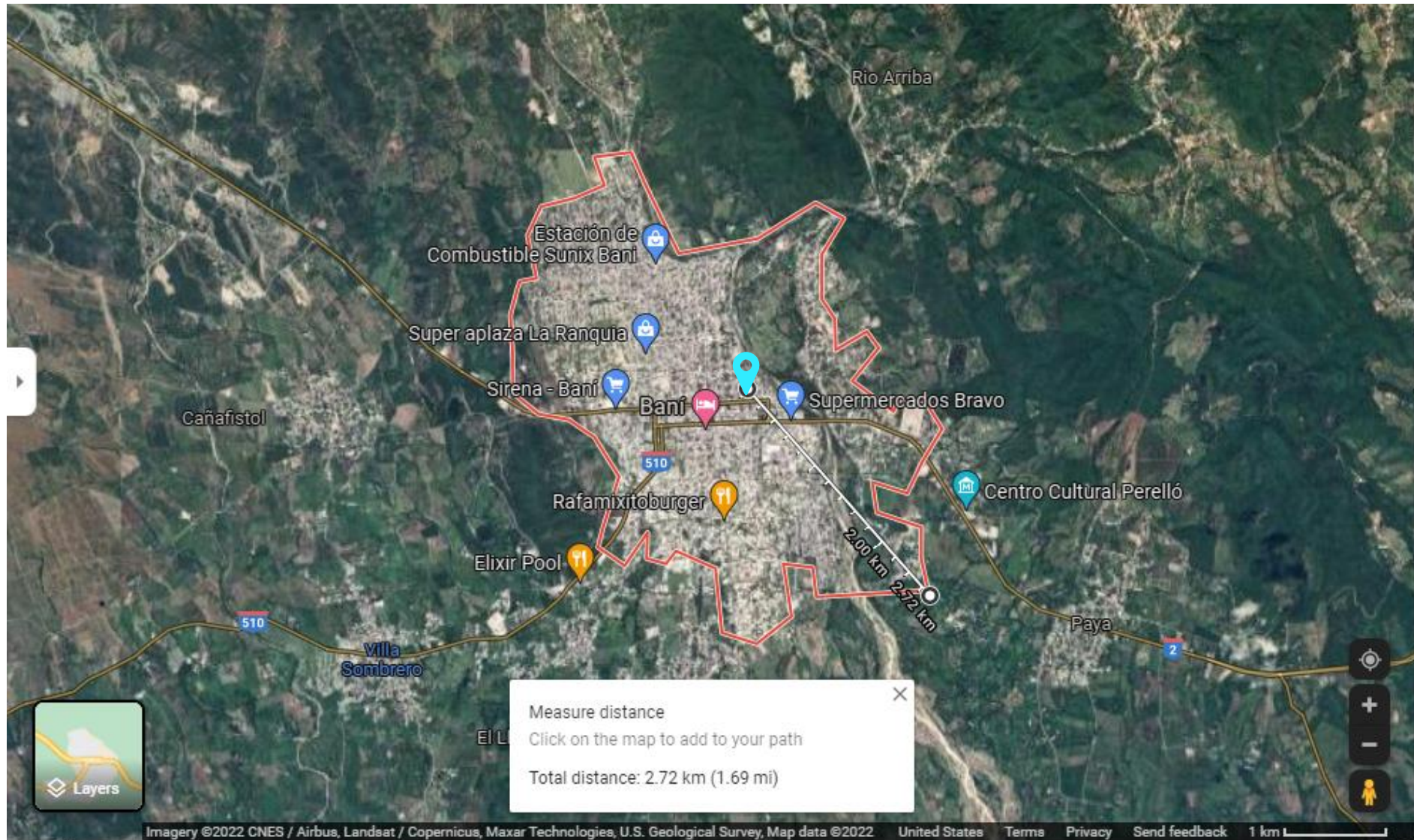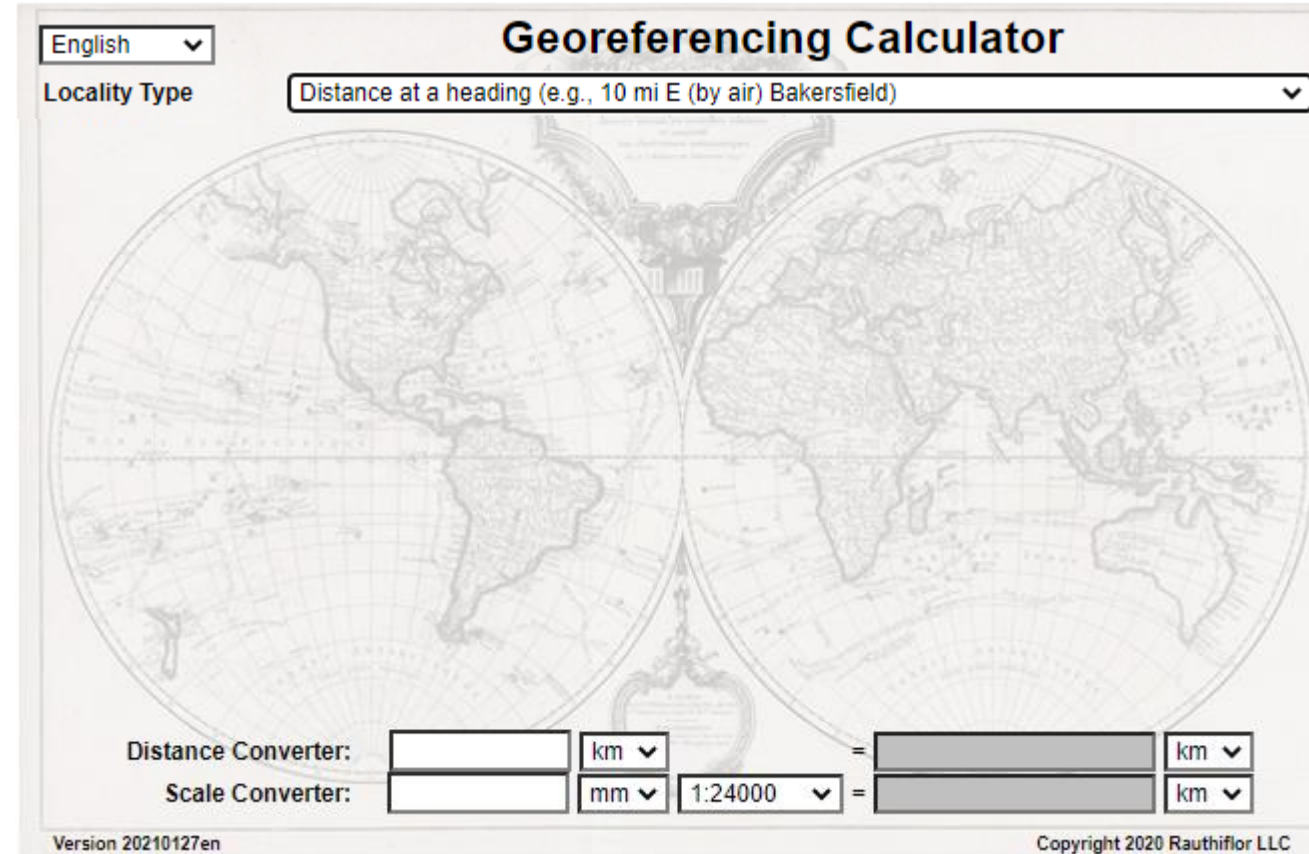
Offset at a Heading

LOCALITY TYPE	CALCULATION PROCEDURE (instructions on how to use the Georeferencing Calculator)
Offset **Offset at a heading** *Examples: "50 miles W of Las Vegas", "10 km E de Amamá"*	~~**Calculation Type**: "Coordinates and error - enter the Lat/Long for the named place or starting point"~~ New input! **Locality Type**: "Distance at a heading" **Coordinates**: If "by road" or other path is specified in the locality description, use the method under **Offset Along a Path**. If the description could be interpreted reasonably either by a route or by air, use the method under **More Than One Possibility**. Otherwise, assume that the heading is "by air" and note this assumption in **georeferenceRemarks**. In this case use the coordinates of the geographic center of the named place as a starting point in the Georeferencing Calculator. These are not the coordinates of the locality, which will be given in the fields to the left of the **Calculate** button when it is clicked after all the fields above it have been entered. **Extent**: As for **Named Places – Bounded Area** or **Named Places – Undefined Area**, as appropriate.

MaNIS: Locality Type

Locality Type: Distance at a heading.

Offset at a Heading: 5 km N of Baní

MaNIS: Coordinate Source, Format, Datum, Precision

Coordinate Source: **Google Maps > 2008**

Coordinates must to be added to Offset at a Heading localities so the Calc. can find offset coordinates

Coordinate Format: Based on coordinate source (Google Maps) = **decimal degrees**

Datum: **WGS84** (Google Maps)

Precision (of the coordinates): **exact** (Google Maps)

Offset at a Heading: 5 km N of Baní

MaNIS: Offset

Offset Direction: **N**

Offset Distance: **5 (km)** – according to locality description.

Radial of Feature: (Starting point of offset)
City of Baní = **2.72 (km)**

Measurement Error:
Always use **10 m (**or **0.01 km*)**

Distance Precision:
precision of 5 km distance is **1 km**!

*Enter **all measurements** in the
same unit as the offset distance
to maintain consistency!

Distance		Precision
8 km	→	**1 km**
8.5 km	→	0.5 km
8.25 km	→	0.25 km
8.75 km	→	0.25 km
8.6 km	→	0.1 km
8.0 km	→	0.1 km
8.16 km	→	0.01 km
--------------------------------		
80 km	→	10 km
800 km	→	100 km
1000 km	→	500 km

Offset at a Heading: 5 km N of Baní

MaNIS: Calculate

Calculate!

Offset coordinates and **uncertainty** radius (in meters) are provided.

Offset at a Heading: 5 km N of Baní

Offset – Offset along a Path

Example: 3 km along Monte Plata – Bayaguana Road, D.R.

- Use Google Maps to locate road between the cities
- Measure 3 km along road in specified direction from starting location, obtain coordinates
- Find radial for road segment within starting city
- Input information into the MaNIS Georef. Calc. to find the uncertainty radius

Offset along a Path
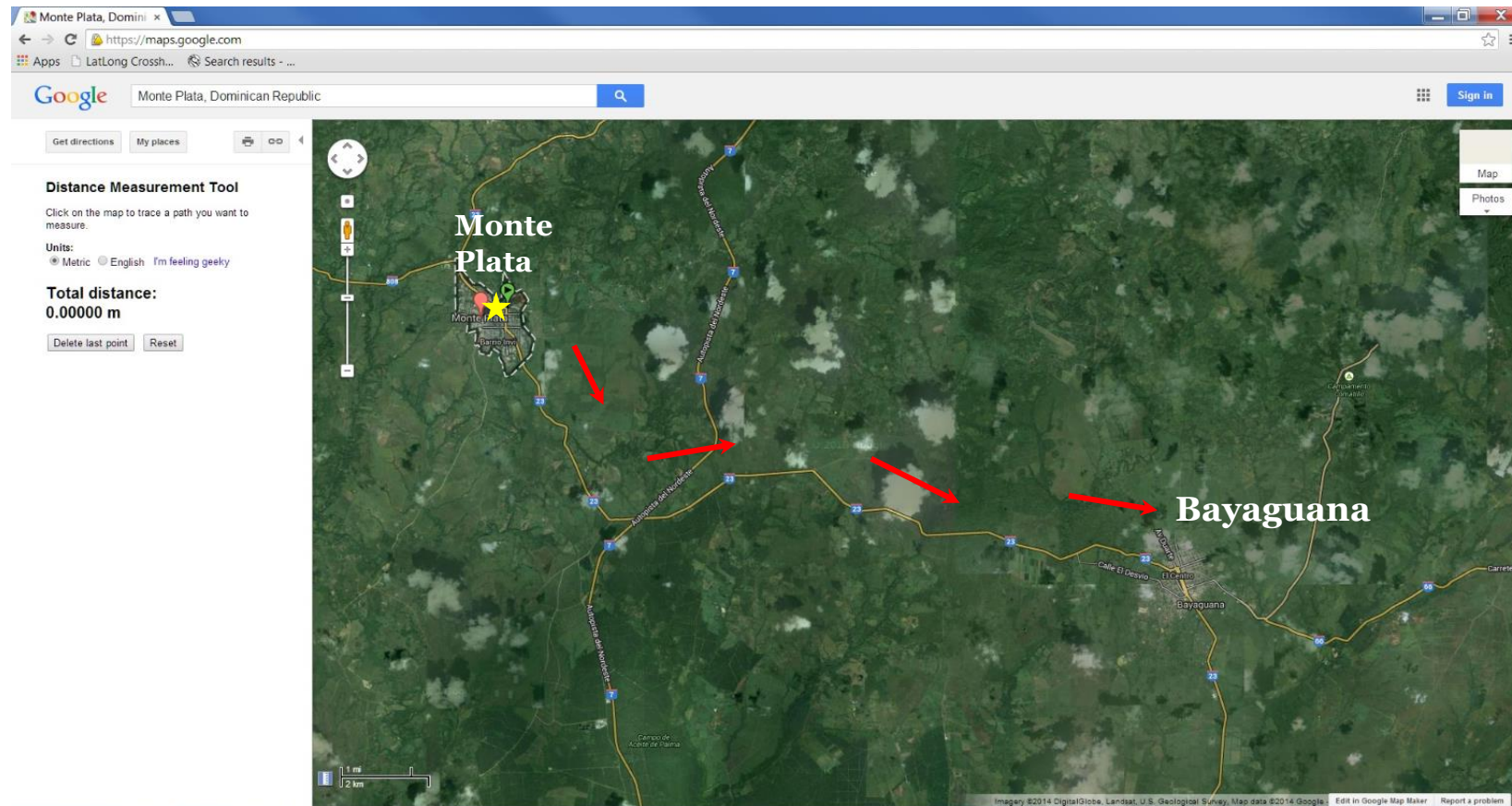
Locate road connecting the cities. Begin measuring offset from approximate center of road segment within Monte Plata

Offset along a Path
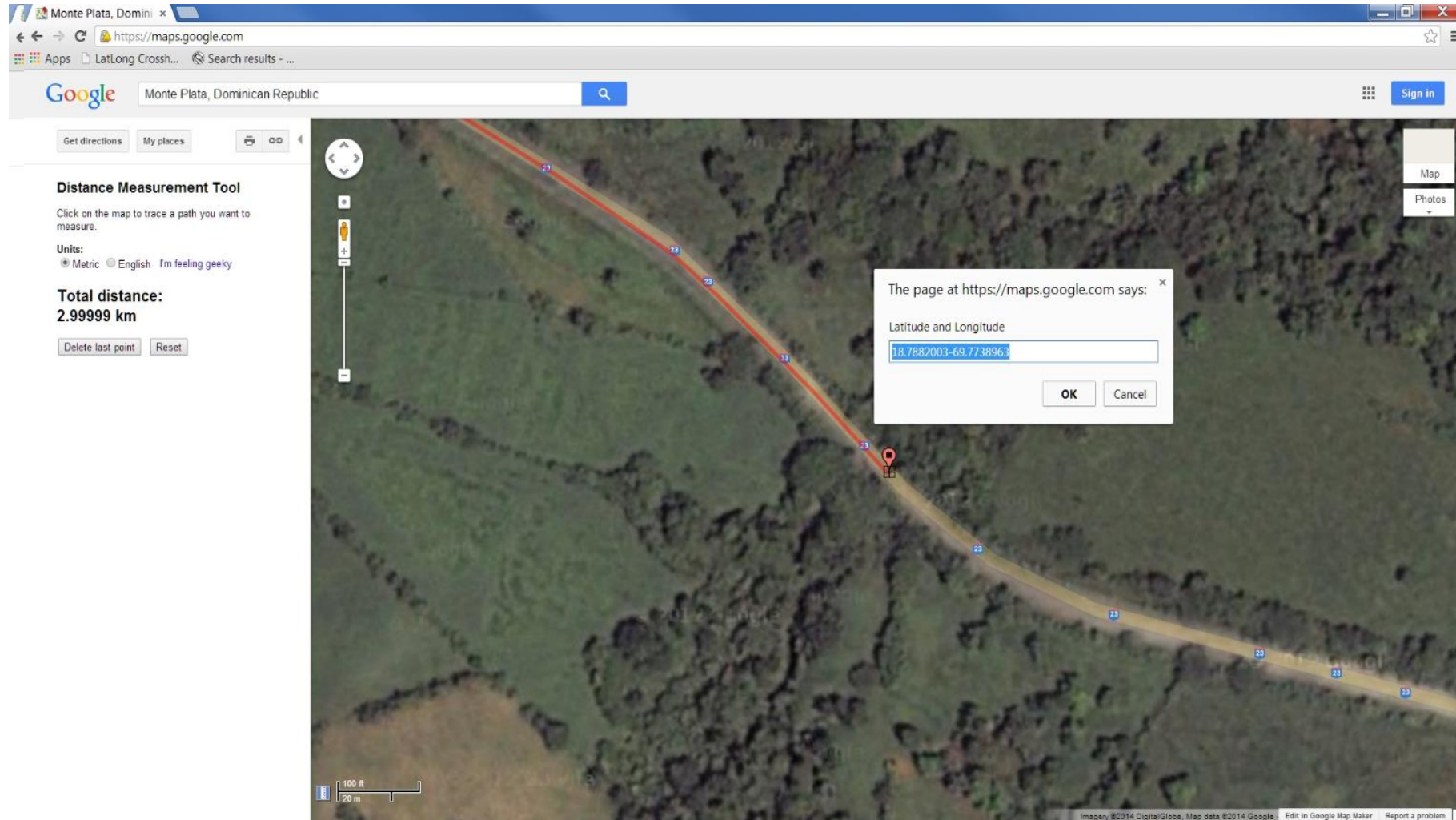
Zoom in and precisely measure along the road to the offset distance stated (toward the city of Bayaguana)

Offset along a Path
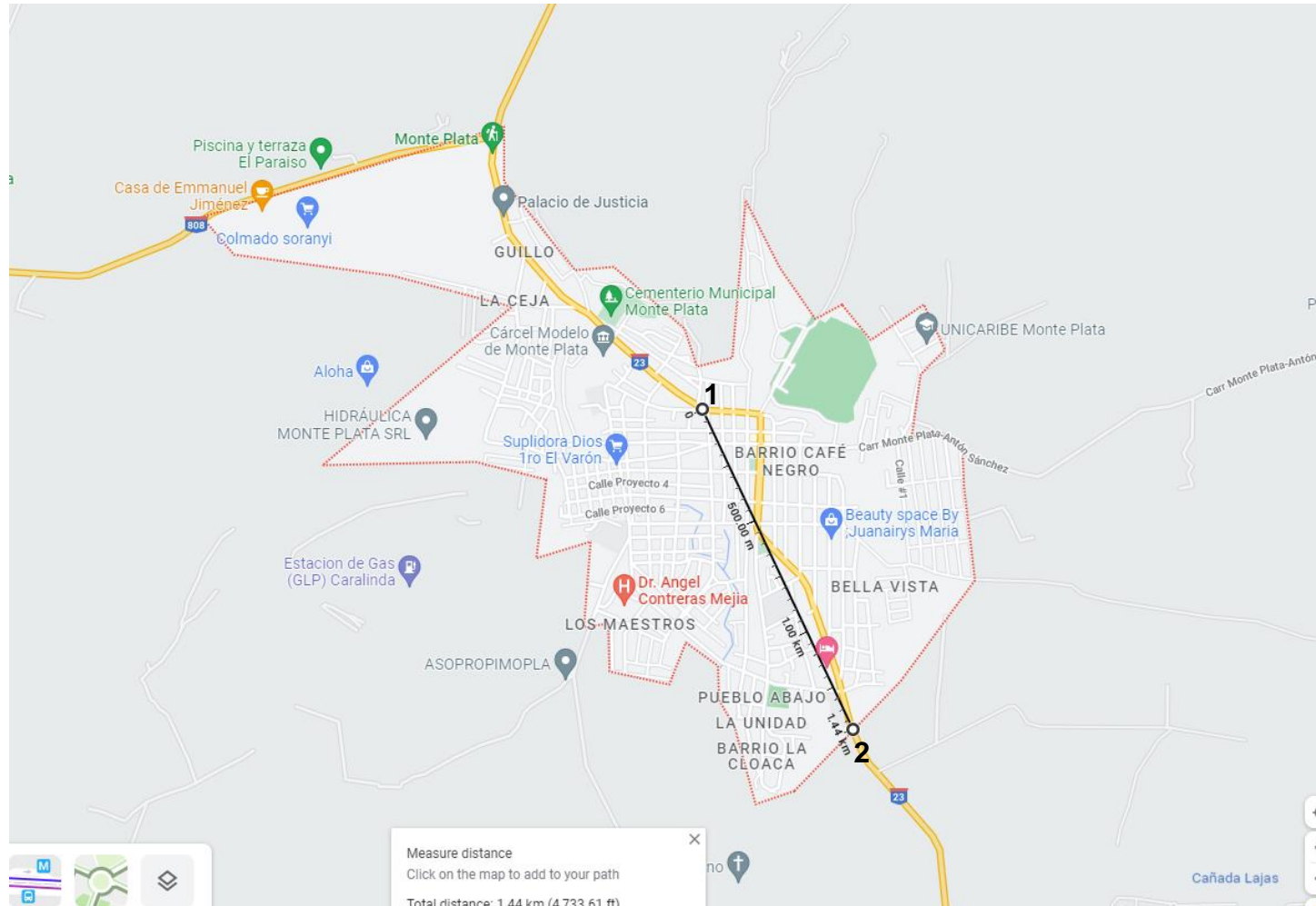
The starting node of the ruler (1) denotes the starting location of the offset, the second node (2) represents the farthest reaches of the road within the city limits.

Offset along a Path

LOCALITY TYPE	CALCULATION PROCEDURE (instructions on how to use the Georeferencing Calculator)
Offset **Offset along a path** *Examples: "7.9 mi N Beatty, on US 95", "3 km en el Rio Jimenez arriba de Anita Grande", "left bank of the Mississippi River, 16 mi downstream from St. Louis", "Ruta Nacional 81, 8 km W de Ingeniero Guillermo Nicasio Juárez"*	~~Calculation Type: "Error only - enter Lat/Long for the actual locality"~~ **Locality Type**: "Distance along a Path" ← **Coordinates**: Find the center of the named place as you would for **Named Place – Bounded Area** or **Named Place – Undefined Area**, as appropriate. Use a measuring tool on a printed or digital map to follow the specified route for the given distance. Use the end point as the coordinates. If no specific path is specified in the locality description, be sure to note in **georeferenceRemarks** which path was measured. **Extent**: As for **Named Place – Bounded Area** or **Named Place – Undefined Area**, as appropriate.

MaNIS: Locality Type

Locality Type: Distance along a path.

Offset Along a Path: 3 km along Monte Plata – Bayaguana road (road 23) in Dominican Republic.

MaNIS: Coordinate Source, Format, Datum, Precision

Coordinate Source: Google Maps > 2008

The basis of how the coordinates were located.

Coordinate Format: Based on coordinate source (Google Maps) = decimal degrees

Datum: WGS84 (Google Maps)

Precision (of the coordinates): exact (Google Maps)

Offset Along a Path: 3 km along Monte Plata – Bayaguana road (road 23) in Dominican Republic.

MaNIS: Locality Type

<u>Radial of Feature</u>: Extent of the linear feature within the bounds of the starting location (city of Monte Plata). Enter extent in the same units as the offset distance (consistency!)

<u>Measurement Error</u>: Determined to be 10 m (= 0.010 km)

<u>Distance Precision</u>: Dependent on the offset distance. The 3 km offset = 1 km distance precision.

Distance		**Precision**
3 km	→	**1 km**

Offset Along a Path: 3 km along Monte Plata – Bayaguana road (road 23) in Dominican Republic.

MaNIS: Calculate

Calculate!

Offset Along a Path: 3 km along Monte Plata – Bayaguana road (road 23) in Dominican Republic.

QUESTIONS?

[Google Maps](#)
[GEOLocate Web Application](#)
[MaNIS Georef. Calculator](#)
[Georef. Quick Ref. Guide](#)

Credits

This is an updated compilation of information provided by the iDigBio's first Train-the-Trainers Georeferencing Workshop (put together by K. Watson, S. Gottschalk, S. Ascencio, 2013), altered to fit NYBG georeferencing needs over the years (https://www.idigbio.org/content/idigbios-first-train-trainers-georeferencing-workshop)

Georeferencing Quick Reference Guide (2020)
Zermoglio PF, Chapman AD, Wieczorek JR, Luna MC & Bloom DA. 2020. Georeferencing Quick Reference Guide. Copenhagen: GBIF Secretariat. https://doi.org/10.35035/e09p-h128

Georeferencing Quick Reference Guide (2012): consolidated guide for inputs for the MaNIS Georeferencing Calculator
Wieczorek J, Bloom D, Constable H, Fang J, Koo M, Spencer C & Yamamo K (2012) Georeferencing Quick Reference Guide, version 2012-10-08. https://www.idigbio.org/wiki/images/1/1e/GeoreferencingQuickReferenceGuide.pdf

BioGeomancer Guide to Best Practices for Georeferencing (2006) is a basis for documentation of collecting & georeferencing protocols:
Chapman, A.D. and J. Wieczorek (eds). 2006. Guide to Best Practices for Georeferencing. Copenhagen: Global Biodiversity Information Facility. https://www.gbif.org/document/80536/biogeomancer-guide-to-best-practices-in-georeferencing (2006 version). Chapman AD & Wieczorek JR (2020) Georeferencing Best Practices. Copenhagen: GBIF Secretariat. https://doi.org/10.15468/doc-gg7h-s853 (2020 version)

The MaNIS Georeferencing Calculator is a JavaScript application used in finding an uncertainty radius that incorporates all possible sources of error in the georeferencing process (tool: http://georeferencing.org/georefcalculator/gc.html, manual: lhttp://georeferencing.org/georefcalculator/docs/GeoreferencingCalculatorManual.pdf)

Other Resources

Bloom DA, Wieczorek JR & Zermoglio PF (2020) Georeferencing Calculator Manual. Copenhagen: GBIF Secretariat. https://doi.org/10.35035/gdwq-3v93

Chapman AD & Wieczorek JR (2020) Georeferencing Best Practices. Copenhagen: GBIF Secretariat. https://doi.org/10.15468/doc-gg7h-s853

Spencer C, Yamamoto K, Fang J, Constable H, Koo M, & Wieczorek J (2008) Georeferencing for Dummies. http://georeferencing.org/docs/georeffordummy.xls

TDWG (2018) Darwin Core quick reference guide. Biodiversity Information Standards (TDWG). https://dwc.tdwg.org/terms/

Wieczorek J (2001) MaNIS/HerpNET/ORNIS Georeferencing Guidelines. University of California, Berkeley: Museum of Vertebrate Zoology. http://georeferencing.org/georefcalculator/docs/ 52 GeorefGuide.html

Wieczorek J & Bloom DA (2015) Manual for the Georeferencing Calculator. University of California, Berkeley: Museum of Vertebrate Zoology. http://georeferencing.org/gci2/docs/ GeoreferencingCalculatorManualv2.html

Wieczorek J, Guo Q & Hijmans R (2004) The point-radius method for georeferencing locality descriptions and calculating associated uncertainty. International Journal of Geographical Information Science. 18: 745-767. https://doi.org/10.1080/13658810412331280211