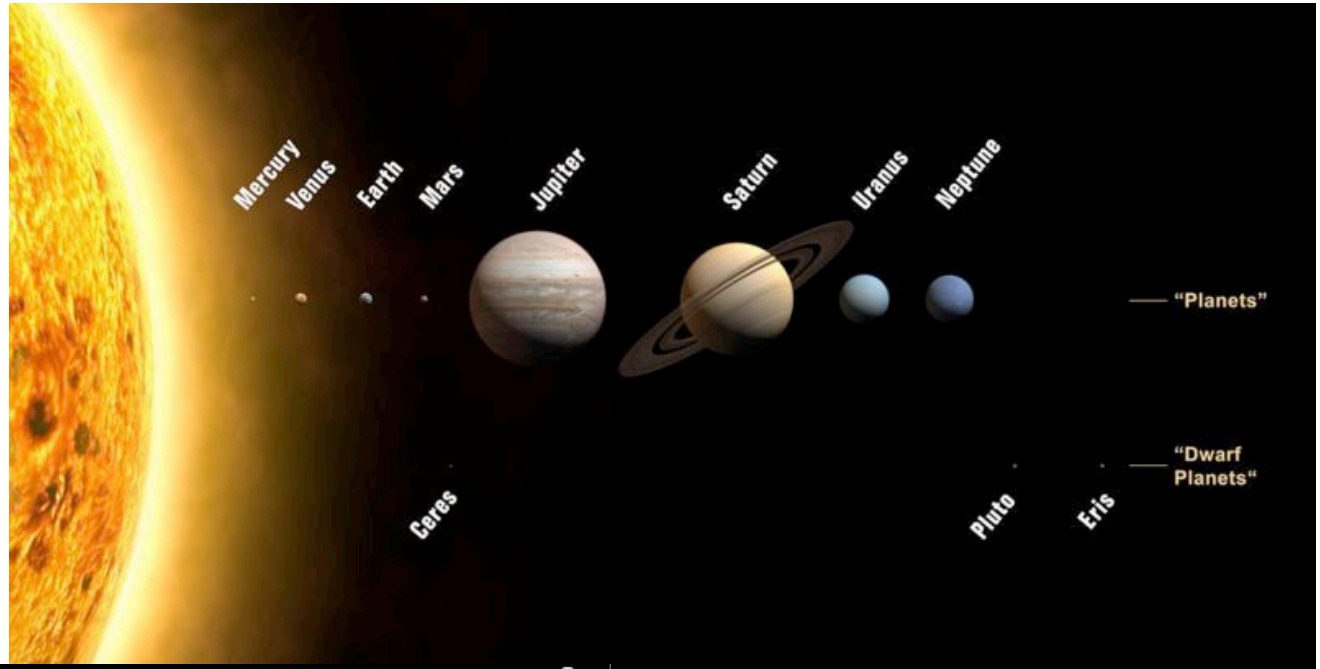
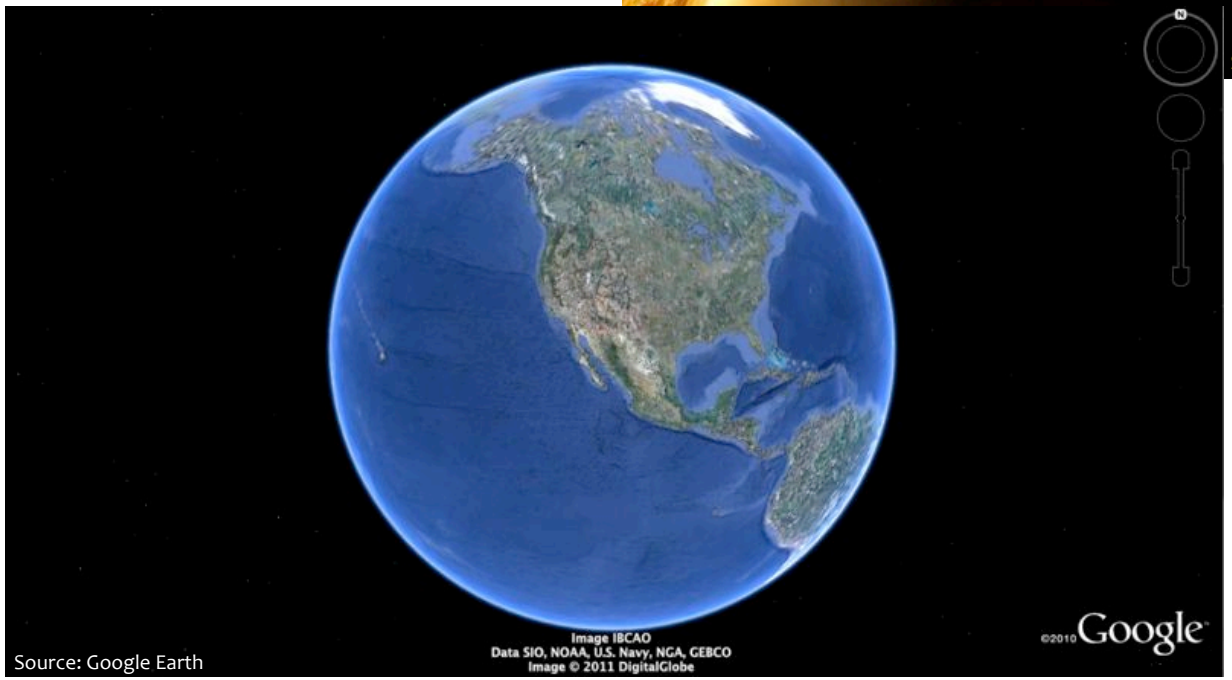
Site Assessment Report in Context: 813 N 9th Ave, Tucson AZ 85705

Source: www.pbs.org/wgbh/nova/universe/tour_map03.html

The property at 813 N 9th Ave, Tucson, Arizona, USA, is located in the Milky Way Galaxy (one of possibly hundreds of billions of galaxies in the universe), in the Solar System, on planet Earth.



Source: img40.picoodle.com/img/img40/5/11/21/f_UpdatedPlanm_13d517d.jpg



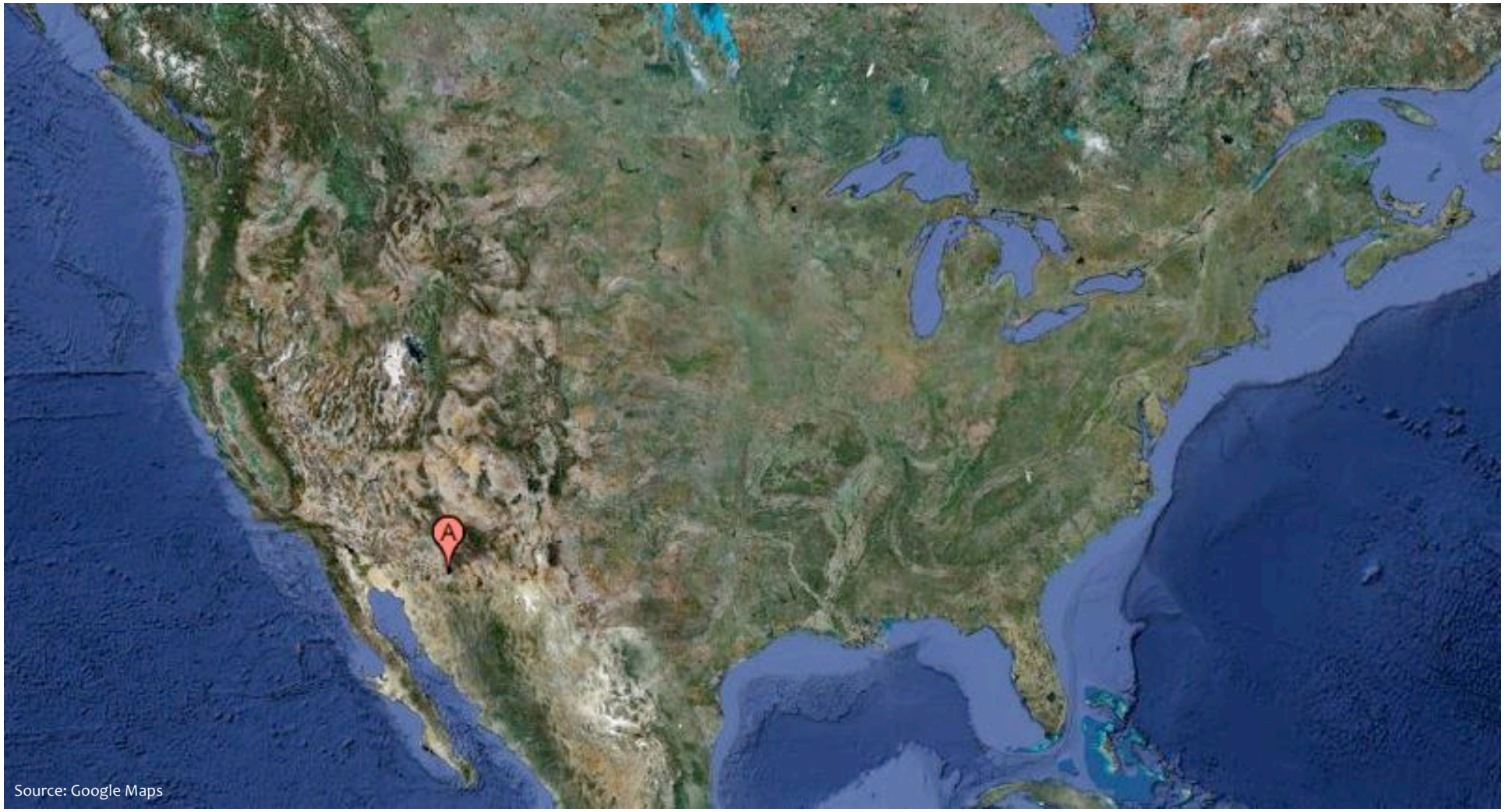
Source: Google Earth

This property is located in the northwest hemisphere of planet Earth, north of the Equator and west of the Prime Meridian, on the North American continent.

If you look closely, you can see a tiny red dot in the center of at the image to the left, representing the location on the Earth's surface of 813 N 9th Ave, Tucson, Arizona, USA.

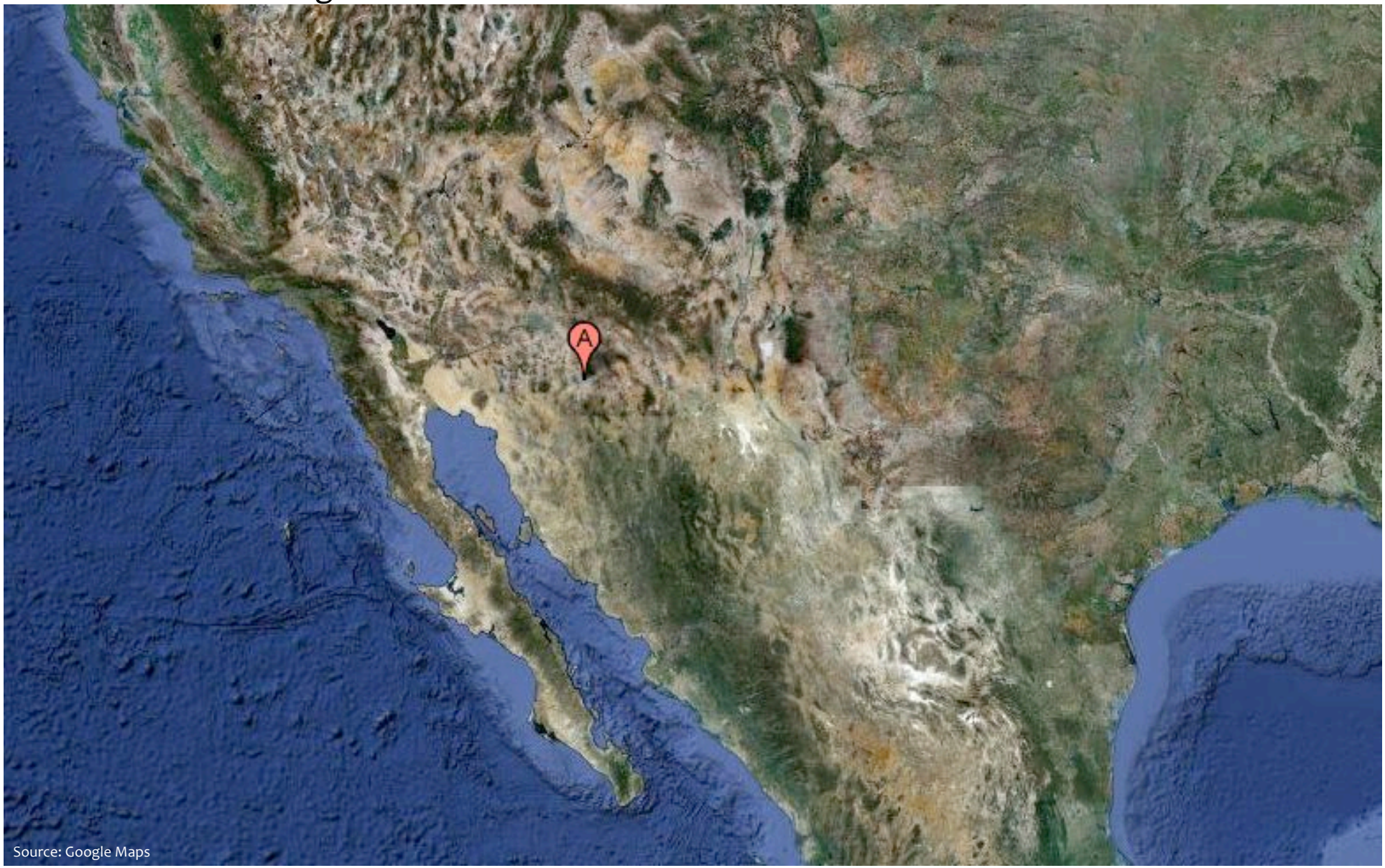
This gives you an overall sense of the larger context of which this property is a part.

The Continental United States of America in Context of Southern Canada and Northern Mexico



Also of some relevance is 813 N 9th Ave's present location within the political territories of the United States of America, and the state of Arizona. These political territories exert certain temporal influences on the property. Other location data include that 813 N 9th Ave is located at about 32° North latitude, and at an elevation of 2544 feet above sea level. Knowing a site's latitude is important in determining its seasonal sun paths and sun angles. Also, latitude and altitude are among the factors used to create an *analog climate assessment*. As described by Dave Boehnlein of Bullocks' Permaculture Homestead (www.permacultureportal.com), this process entails "creating a profile for the climate for which we are creating a design. This is based on precipitation, temperatures, seasonality, etc. Then we try to find other places around the world with profiles that match very closely: analog climates. Once we've found these different places we can start to analyze them in terms of native vegetation, agricultural products, medicines, architectural styles, cuisine, and a variety of other factors (especially with regard to traditional or indigenous peoples). As these people usually live in ways that are highly responsive to their environment (e.g. they design smart buildings instead poor buildings that require air conditioning), we can look at what they grow and how they live as a source of inspiration for what types of design features we might use to best approach sustainability."

Sonoran Desert Bioregion in Context of the Southwestern United States and Northern Mexico

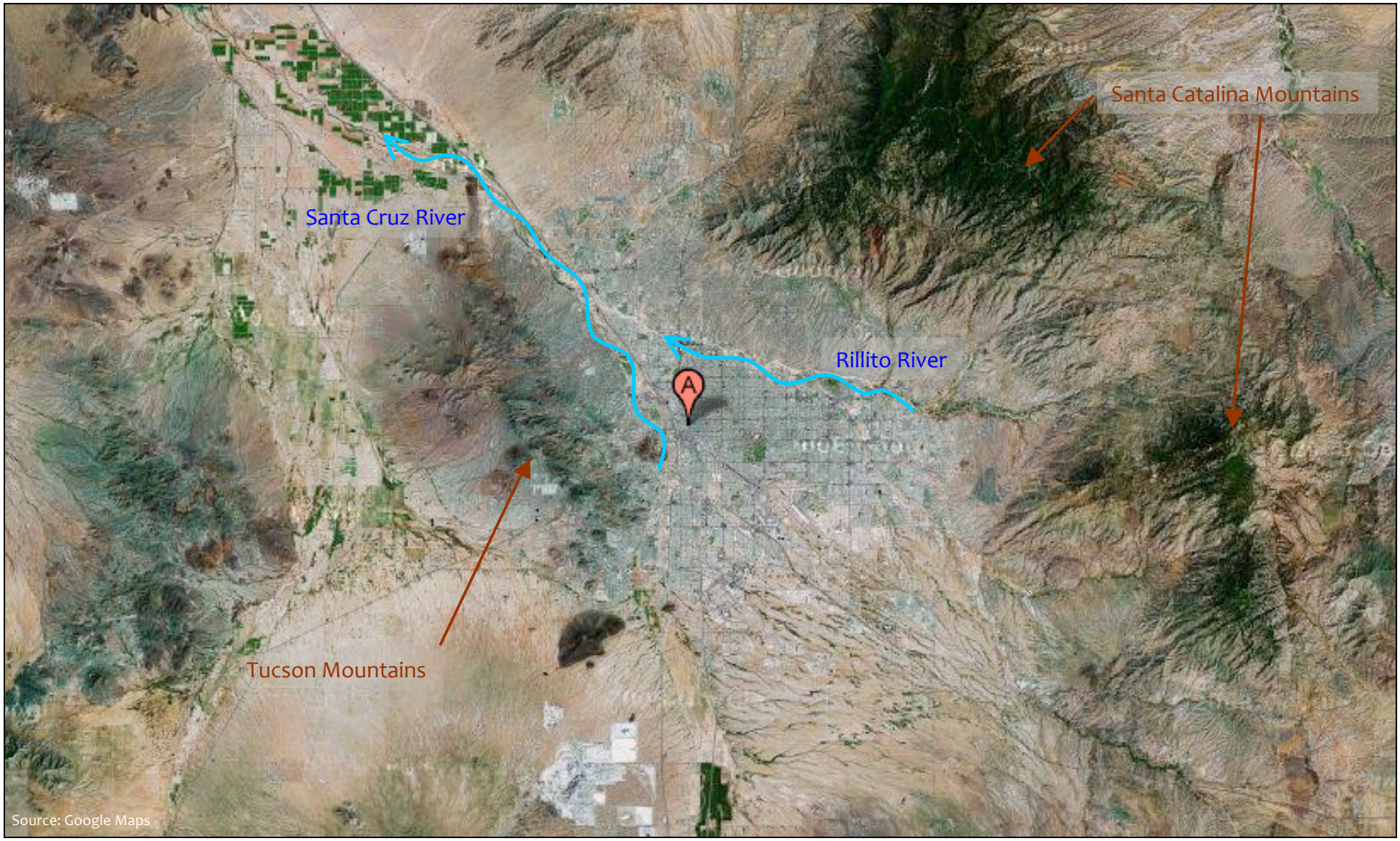


More lasting influences are due to 813 N 9th Ave's location within the Sonoran Desert bioregion — the western portion of the satellite image above. On the map on the following page, the boundaries of the Sonoran Desert Bioregion are clearly shown — the region is depicted in a gold color. Note on that map the location of the Santa Cruz River, which originates outside the bioregion and feeds the Gila River, which passes through the bioregion. Note as well the city of Tucson near the eastern edge of the bioregion.

Sonoran Desert Region

The Sonoran Desert Region consists of the Sonoran Desert itself plus the surrounding biological communities, including the Sea of Cortez (Gulf of California) and its islands

The Tucson Metro Region Section of the Santa Cruz River Watershed



813 N 9th Ave is located in Tucson, Arizona, east of the Tucson Mountains and west of the Santa Catalina Mountains, in a section of the Santa Cruz River Watershed.

PATTERNS OF CLIMATE, WATER PER CAPITA, WATERGY, & SUN: TUCSON, ARIZONA

CLIMATE

AVERAGE HIGH & LOW TEMPERATURES: [1] 1893 - 2009 *Source:* www.wrcc.dri.edu

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
	66.7	69.8	74.9	83.0	91.6	100.4	100.7	98.7	96.2	86.9	75.0	66.8	84.2	°F HIGH
	34.3	36.6	40.8	46.3	54.1	63.4	71.8	70.4	64.3	51.7	40.0	34.2	50.7	°F LOW
	19.3	21.0	23.8	28.3	33.1	38.0	38.2	37.1	35.7	30.5	23.9	19.3	29.0	°C HIGH
	1.3	2.6	4.9	7.9	12.3	17.4	22.1	21.3	17.9	10.9	4.4	1.2	10.4	°C LOW

HIGHEST TEMP ON RECORD: 115 °F | 46.1 °C | June 26, 1990 — LOWEST TEMP ON RECORD: 9 °F | -12.8 °C | January 6, 1950

Source: www.wrcc.dri.edu for both statistics

WATER PER CAPITA

AVERAGE RAINFALL: [1] 1893 - 2009 *Source:* www.wrcc.dri.edu

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
	0.97	0.87	0.83	0.39	0.18	0.24	2.03	2.27	1.08	0.88	0.68	1.14	11.56	INCHES
	24.6	22.1	21.1	9.9	4.6	6.1	51.6	57.7	27.4	22.4	17.3	29.0	293.6	mm

WETTEST YEAR'S RAINFALL: [2] 26.22 INCHES | 666.0 mm | 1983 — DRIEST YEAR'S RAINFALL: [3] 5.1 INCHES | 128.8 mm | 1924

Source: www.wrcc.dri.edu for both statistics

LONGEST # OF DAYS W/ NO MEASURABLE PRECIPITATION: 155: 12/26/1971 - 5/29/72 *Source:* see note 4

AREA: [5] 195.1 SQ MILES / *Wikipedia* 505 km^2

POPULATION: [5] 541,811 *Source/Year:* census.gov, 2008 est

RAINFALL INCOME: 198 GPCD / 750 ℓpcd

WATERGY

PERCENTAGE OF CITY'S TOTAL MUNICIPAL ENERGY CONSUMPTION USED TO MOVE AND TREAT WATER: [6] 44% (2007-8)

MUNICIPAL USE: 112 GPCD / 424 ℓpcd

Source/Year: see note 7

SUN

LATITUDE: 32 *Source:* Google Earth

ELEVATION: 2598 FT / 792 m

WINTER-SOLSTICE SHADOW RATIO:* 1:1.49

	ON MAR 21	ON JUN 21	ON SEP 21	ON DEC 21
[A] DEGREES N or S of DUE E THE SUN RISES:	0	29N	0	29S
[A] DEGREES N or S of DUE W THE SUN SETS:	0	29N	0	29S
[B] # of DEGREES SUN IS ABOVE THE SOUTHERN HORIZON AT NOON:	58	81	58	34

To find current magnetic declination for location: HarvestingRainwater.com/books/volume1/volume-1-resource-pages-appendix-6/#magdec

**Object height:length of shadow cast at noon (Dec 21's is longest noontime shadow of year). Source: Rainwater Harvesting for Drylands & Beyond, Vol 1 or 2*

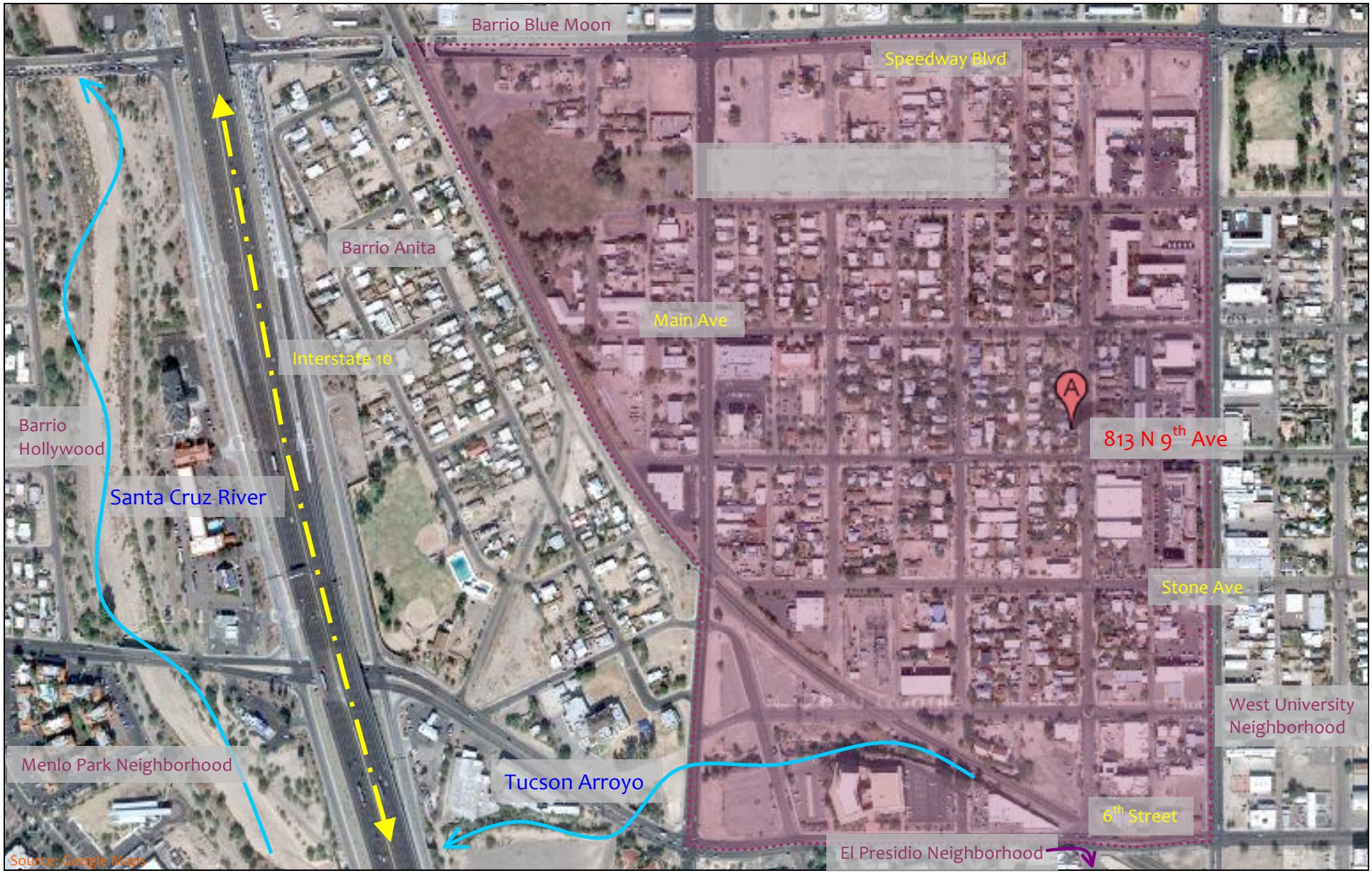
Notes: 1. For station with longest period of record (Campbell Ave U of A Ag Ext) / 2. At Tucson Magnetic Observatory Station / 3. At U of A Station / 4. Michelle Breckner, Service Climatologist, WRCC, by telephone 4/23/2010 / 5. City proper / 6. Bruce Plenk, City of Tucson Solar Energy Coordinator / 7. Homeowner's Guide to Using Water Wisely, Tucson Water, rev 2009 / A. Rainwater Harvesting for Drylands & Beyond, Volume 1 // B. www.esrl.noaa.gov/gmd/grad/solcalc/

Available online at: www.harvestingrainwater.com/watergy-climate/water-conservation-and-climate-overview-data-sheets/

For more on the water-energy connection, see *Water Costs of Electricy in Arizona*, Pasqualetti et al, available from Arizona Water Institute or HarvestingRainwater.com

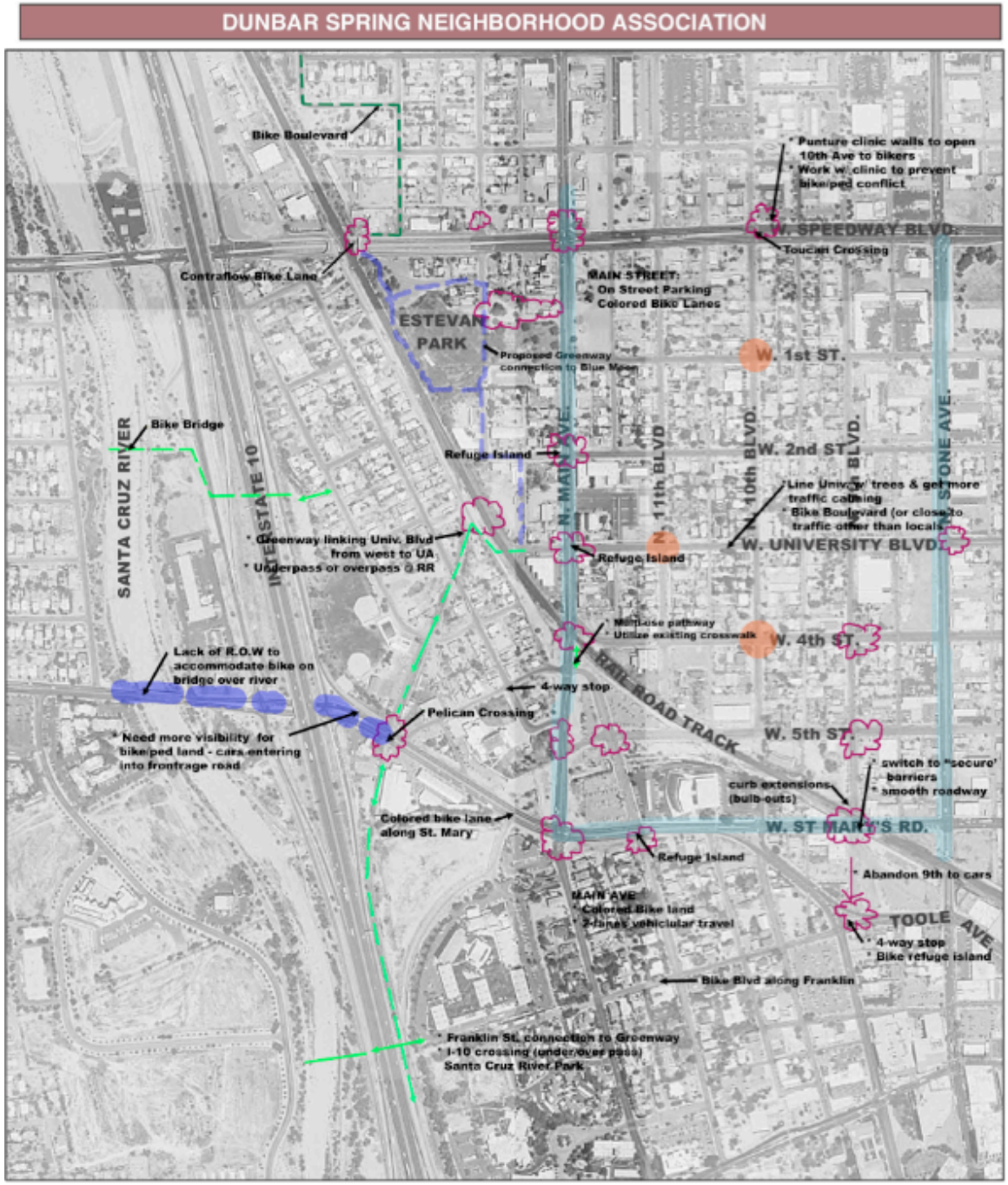
This information can be downloaded from the Arizona section of the website indicated above.

The Dunbar/Spring Neighborhood of Tucson, Arizona



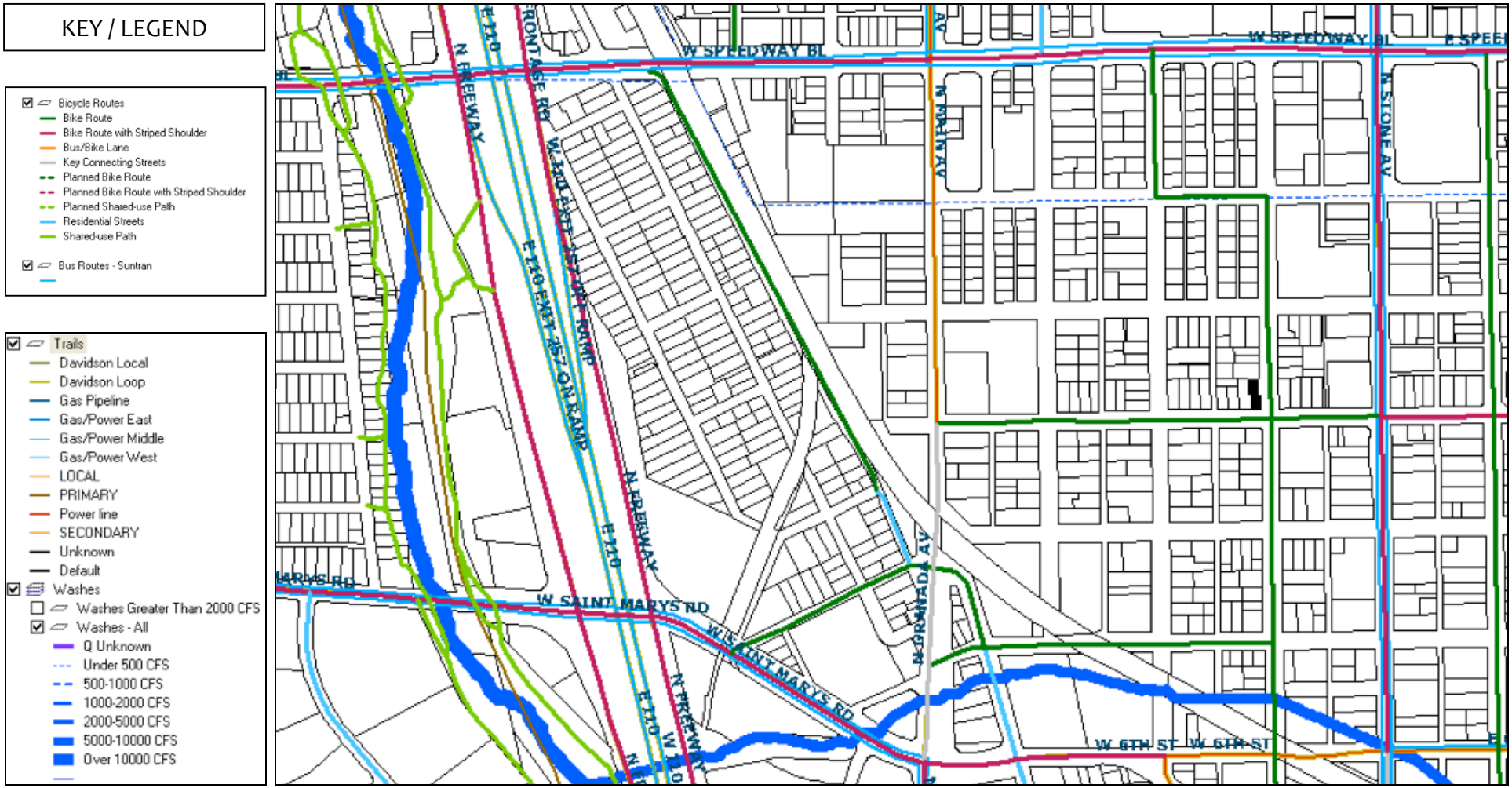
813 N 9th Ave is in the Dunbar/Spring Neighborhood just north of Downtown Tucson. The Santa Cruz River is just west of the neighborhood, just beyond Interstate 10. Tucson Arroyo is at the south end of the neighborhood. The surrounding barrios/neighborhoods are labeled above.

Building Bridges Project Map of Dunbar/Spring Neighborhood



This is a map from the 2006 *Building Bridges Project*, a multi-neighborhood-based (Dunbar/Spring, Blue Moon, Barrio Anita, Downtown, Downtown Arts District, El Presidio, West University, Menlo Park, Barrio Hollywood, Barrio Viejo, and beyond) effort to identify barriers (high speed/high volume auto traffic, lack of ADA-approved ramps, etc) to inter-neighborhood connections, and to turn them into "bridges" with infrastructure improvements that support such non-motorized modes of transport as foot, bicycle, wheelchair, and baby carriages. The idea is to enable all residents of all ages to safely, enjoyably, and conveniently transport themselves under their own power to visit friends, family, and neighbors as well as get to school, after school programs, work, entertainment, and recreation without the use and cost of an automobile. Our downtown and central neighborhoods are all close, dense, and flat enough for thriving and convenient pedestrian and bicycle transportation – that's why many of us live here. In fact, all these neighborhoods began before the automobile.

Pima County MapGuide: Bike & Bus Routes, Trails, Washes of Dunbar/Spring Area



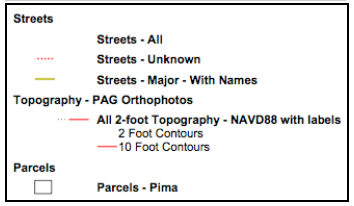
Similar to the Building Bridges map on the previous page, this map illustrates where there are recognized pedestrian/bike/public transportation routes, and where they are missing, so the neighborhood can strategize improvements, such as bicycle boulevards and water-harvesting traffic-calming structures. Washes can serve as triple corridors — corridors of water, wildlife, and pedestrians. Buried washes and waterways can be made visible with signage and artwork. Plans can be made to daylight them in the future, which will reduce flooding and improve multi-use access. Impervious, paved waterways can be made pervious again.

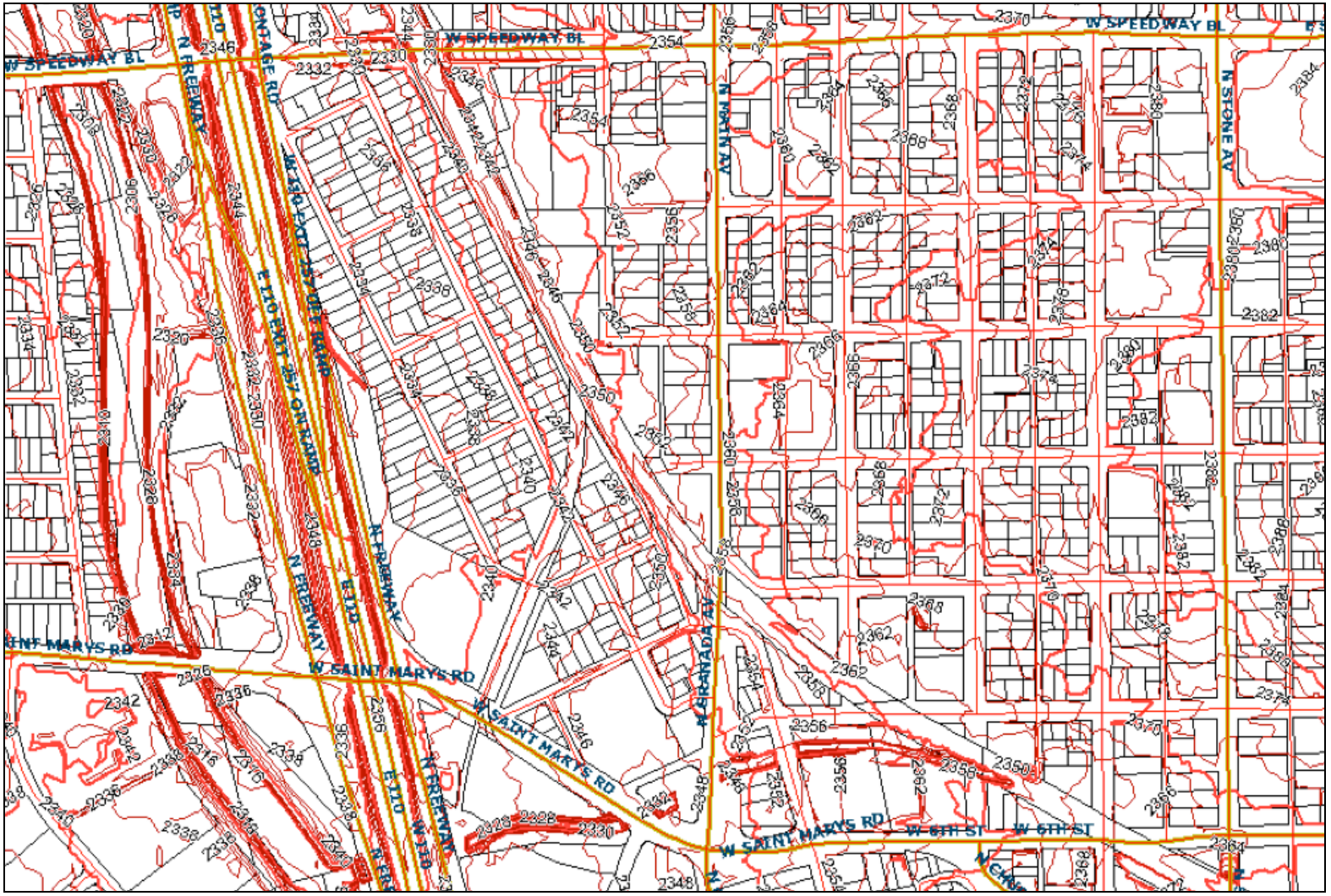
See the Contours page for a note about MapGuide and scale.

Pima County MapGuide: Topographic Contour Map of Dunbar/Spring Area

A topomap such as this one can help illustrate watershed and subwatershed boundaries & sizes, along with *expected* stormwater flow. However, you will always want to double check what *actually* happens on the land by doing on-site observation during heavy rain events. Remember, the map does not define the territory, reality does.

KEY / LEGEND





Note: *Although MapGuide does not seem to provide an on-screen scale ruler, you can figure out the scale on your own for this and other maps. One way to do this is by using Google Maps to check the distance between two adjacent intersections along the same street, and calculating the scale from there. You want to choose two very close intersections so that you will get a more nearly exact result, one that reads in feet rather than in tenths of a mile. For example, according to Google Maps, the distance between "N Stone Ave at University Blvd" and "N Ninth Ave at University Blvd" is 472 feet, or 5664 inches. Divide 5664 by the number of inches this block measures on this map on your screen or paper to calculate x in the scale ratio 1:x. Recheck and recalculate your scale as necessary whenever you change your zoom level, open this file on a new computer, or print out a new paper copy of your map.*

Pima County MapGuide: Hydrologic Soils Groups of Dunbar/Spring Area

KEY / LEGEND

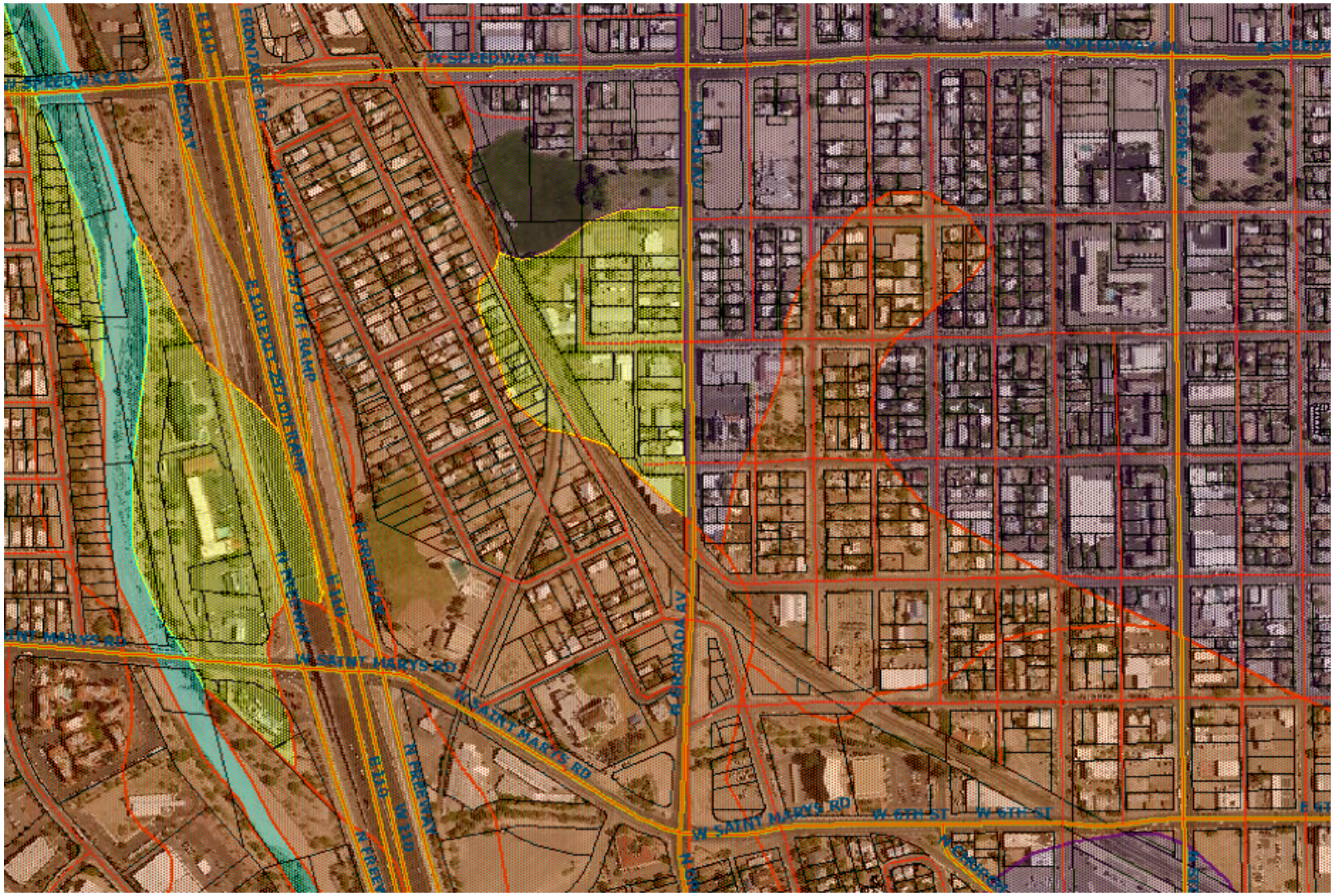
Hydrologic Soils Groups - NRCS
- Soil Group: A (100%)
- Soil Group: B (100%)
- Soil Group: C (100%)
- Soil Group: D (100%)
- Soil Group: Mixed

Group A soils have low runoff potential. They have both high infiltration rates and high permeability rates and consist mainly of deep sands or gravels.

Group B soils have moderately low runoff potential and moderate rates of infiltration and permeability. They consist mainly of silt loams, silty clay loams, loams, clay loams, and sandy loams that are more than 20 inches deep.

Group C soils have moderately high runoff potential. Slow rates of infiltration and permeability are caused either by clayey textures or by a slowly permeable subsoil layer.

Group D soils have high runoff potential because of very slow rates of infiltration and permeability. Because they drain so slowly, they remain wet for long periods and cannot absorb much additional water. High shrink-swell clays, soils with a permeable high water table, those with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material are in this group.



This Pima County MapGuide image shows the distribution of different soil types in the neighborhood and adjacent areas. Such maps can help identify better or worse soils for growing food, building on, building with (good adobe soil), etc. They can also help identify old and current floodplains.

NOTE: Other Pima County MapGuide layer/image options include: neighborhood associations and boundaries, historic districts, aerial photographs, city-owned parcels, census data, political districts, stress index, and more. See the Site Assessment in Context instructions for more information.

Google Earth Imagery of 813 N 9th Ave, Tucson AZ

Surface Areas and Average Annual Rainfall Income (See Appendix A for calculations):

Total Roof Catchment:	1766 square feet	—>	12,718 gallons of rainwater
Lot Ground Catchment:	3009 square feet	—>	21,674 gallons of rainwater
Right-of-Way Catchment:	4070 square feet	—>	29,316 gallons of rainwater
Street Drainage Catchment:	4356 square feet	—>	31,376 gallons of rainwater
PROPERTY'S TOTAL CATCHMENT:	***13,201 SQUARE FEET***	**—>**	***95,084 GALLONS OF RAINWATER***

813 N 9th Ave, Tucson AZ

Rainwater Catchment Areas & Their Average Annual Rainfall Incomes

Givens:		
	Tucson's average annual rainfall (inches):	11.56
	Tucson's average annual rainfall (feet):	0.963
	Gallons in one cubic foot:	7.48
	Gallons of rain that fall on one square foot of Tucson in a year:	7.203

Rainwater Catchment by Location (see map) (**bold** indicates triangular catchment area)

	Scale Height	Scale Width	Scale Area	Square Feet*	Rain (gal/yr)
A1	0.25	0.5	0.13	46	331
A2	1.32	0.58	0.77	282	2031
A3	0.21	0.63	0.13	49	353
A4	0.35	0.35	**0.06**	**11**	79
A5	0.35	0.35	**0.06**	**11**	79
A6	0.35	0.7	0.25	90	648
A7	0.35	0.35	**0.06**	**11**	79
A8	0.35	0.35	**0.06**	**11**	79
A9	0.21	0.77	0.16	60	432
A10	0.13	0.2	0.03	10	72
A11	0.78	0.39	0.30	112	807
A12	1.32	0.58	0.77	282	2031
A13	0.25	0.5	0.13	46	331
B1	1.24	0.37	0.46	169	1217
B2	1.24	0.37	0.46	169	1217
C1	0.55	0.82	0.45	166	1196
C2	0.47	0.18	0.08	31	223
D	0.58	0.98	0.57	210	1513
Total *Roof* Catchment Area & Rainfall:				1766	12,718
1. (not incl A, B, C)	2.38	7.03	12.38	3009	21,674
2. (not incl area 1)	3.42	8.13	11.07	4070	29,316
3. (not incl areas 1 & 2)	4.38	9.11	11.85	4356	31,376
Total *Ground* Catchment Area & Rainfall:				11,435	82,366
PROPERTY TOTALS:				13,201 square feet	95,084 Rain (gal/yr)

Measured length of scale ruler (in): 2.5 *Number of feet represented:* 48

**Therefore, one square inch represents* 368.64 *square feet*

APPENDIX A

For an Excel version of this spreadsheet that can be adapted for use on other sites, visit www.harvestingrainwater.com/rainwater-harvesting-inforesources/water-harvesting-handouts/.