

**Final Report**

**ULARA PROJECT**

**Phase I:**

**Geospatial Data Inventory and Collection for the ULARA Project**

**CSUN-Geography**

**(Contract #04-227-554-0)**

**By**

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## *Introduction*

This document provides a review of the work performed by the CSUN-Department of Geography for the ULARA project during the months of December 2005 through August 2006. The purpose of this document is to explain the methodology used in collecting the data, the appropriate uses of the data, and the general structure of the geodatabase and raster datasets created. All metadata presented in this document has been incorporated into the ULARA master geodatabase (*ULARA\_master.mdb*).

The primary goals of the ULARA project are:

- 1) To identify undeveloped areas in the western section of the Upper Los Angeles River Area that currently provide quality native water recharge to the San Fernando Valley Groundwater Basin (SFVGWB), a local water resource.
- 2) To identify opportunities to increase infiltration of the native water to the groundwater basin.
- 3) To integrate science-based data into the existing plans of jurisdictional agencies and local watershed groups.

As such, CSUN-Geography was contracted to complete the following tasks:

2.4 During the first year of this project CSUN will initiate data collection and assist with the overall design of the recharge suitability analysis. Tasks outlined are specific to the first year of this project only. As such CSUN will perform the following tasks:

- 2.4.1.1 CSUN will assist with the compilation of existing applicable data from government agencies and other reputable sources. Data will include existing base maps, regional land use planning documents, watershed plans, parcel lines, groundwater, hydrology, soils and geology, water quality monitoring, and biology. This data will be stored in electronic format on a secure server within the Geography Department at CSUN. A data catalog will be maintained and updated weekly. Data will be downloaded to a DVD and delivered to the MRT Data Coordinator on a monthly basis.
- 2.4.1.3 A geodatabase of all spatial data will be created. In cases where relevant data is not available in digital format, CSUN will assist with digitizing the data and include it in the geodatabase (such as Dibblee maps and groundwater maps). In addition, CSUN will conduct an inventory of wetlands across the study and include this data in the geodatabase. The wetlands inventory will be in accordance with the National Wetlands Inventory data standards and will include an assessment of water regime, a likely key element to the recharge analysis. This geodatabase will be updated monthly and delivered to MRT as part of the items identified in 2.4.1.1.

2.4.1.4.1 CSUN will assist with a riparian survey of the Focus Area (this survey will include both NWI riparian area classification and vegetation classification as defined by Sawyer, Keeler-Wolf in *A Manual of California Vegetation*). This task will involve using a GPS and two field surveys (dry and wet season surveys) to determine the water regime of all wetland features (a necessary component of the recharge suitability analysis). In addition, conditions such as artificial stream bank modifications, illegal dump sites, impacting land uses, and discharge points and outfalls.

The project with CSUN-Geography initiated in mid-December, 2005. The first 3 months of the project were spent initiating research and developing a data list for the recharge suitability analysis. In addition, CSUN-Geography started collecting pre-existing data and initiated wetlands mapping in late January. During the month of March 2006, CSUN-Geography presented a list of potential data requirements to the RAC for the recharge analysis. This list was reviewed by the RAC, further variables were added creating a final priority list for the recharge suitability analysis. Table 1 represents this list:

<b>Table 1: Data requirements for the recharge suitability analysis.</b>
Soils
Slope
Dibblee maps
Current land-use
Land Ownership
Vegetation
Wetland maps
Water quality
Flow rate
Flow direction
Historical land-use
Future land-use
Storm Drain locations / paths
Ground water elevation
Ground water flow direction
Depth to water table
Permeability of geologic layers

This list served as the focus for pre-existing data collection by CSUN-Geography. In addition, another goal of the ULARA project is to integrate science-based data into the existing plans of jurisdictional agencies and local watershed groups. As such, CSUN-Geography also prioritized the search for any pre-existing GIS data layers that may be of use for land managers in the study area. The goal being to provide a comprehensive

geodatabase with geospatial datasets containing a large number and variety of geographic features or shapes (i.e. points, lines, pixels, polygons) and their attributes to support land management and other environmental research projects within the Focus Area.

Using the various data themes listed in Table 1 as a guide, we first checked the geospatial data housed at CSUN and then conducted an internet search to identify additional geospatial data sources. Numerous leads identified from the internet search were followed up via e-mail and telephone calls. This search targeted those agencies and organizations that are likely to collect and distribute publicly available data sets. The entities searched and/or contacted included a variety of federal agencies (e.g. Bureau of Census, Park Service, USGS), state agencies (e.g. California Spatial Information Library), county departments (e.g. County of Los Angeles Department of Water and Power), and GIS clearinghouses (e.g. GIS Data Depot).

A total of 75 geospatial datasets matched one or more of the data requirements listed in Table 1 and were representative of baseline data for the Focus Area. These data themes were organized into thirteen categories – base data (imagery and derived raster data), cultural data, fire data, general hydrology, geology, groundwater data, natural hazards, infrastructure (including transportation and water related), land use, wetlands data, soils, vegetation, and weather data – and when available, key information describing the geographic coverage, format, map scale and/or resolution, year of coverage, data source, and distribution details for each dataset was recorded. This information is summarized in Table 2. The highlights and some of the subtleties involved in using these datasets are discussed in the paragraphs about each category below.

Some geospatial datasets collected are proprietary and have been indicated as such in the ULARA\_master.mdb. Under no circumstances should these layers be distributed to anyone other than Mountains Restoration Trust and USC. Likewise, these geospatial datasets should not be used for any other purpose than the recharge suitability analysis. These datasets are marked “PROPRIETARY” throughout the data inventory list and within the ULARA\_master geodatabase itself. Data marked “PROPRIETARY” should not be reproduced and given away, nor should they be used for any graphical purpose.

### ***Base Data (Imagery and Derived Raster Data)***

Base data collected for this project include several data sources. Mountains Restoration Trust provided true color imagery from the spring of 2005 for this project. This imagery has been used to update the land use data and to create wetlands inventory. In addition, to this true color imagery, CSUN collected DOQQ's (Digital Orthophoto Quarter Quadrangles) and Digital Elevation Models for the study area.

DOQQ's provided moderately high resolution (1 meter) aerial views of the Focus Area (Bolstad 2005). We were able to acquire black and white DOQQ's for the entire Focus Area and color-infra red DOQQ's for two quads (Calabasas and Canoga Park) within the Focus Area. This imagery provides relatively recent coverage ( $\leq 5$  years old) of the Focus Area and the black and white DOQQ's are readily available to the public unlike

the aerial photography provided by Mountains Restoration Trust. The color-infra red (CIR) imagery is particularly useful for wetlands mapping as reflectance in CIR is generally high for wetlands vegetation and low for water bodies. As such, delineation for wetlands is made easier with this additional collateral data.

Digital Elevation Models (DEM's) at 10 meter resolution were collected for the contiguous four quadrats covering the Focus Area. These elevation data are critical because they can be used to: (1) divide the Focus Area into a hierarchical network of watersheds and sub-watersheds, and (2) compute a series of topographic attributes that can be used to help describe the variations in hydrologic, geomorphic, and ecological characteristics and opportunities across the Focus Area (see Wilson and Gallant (2000) for details). CSUN-Geography created two critical datasets from the DEM's for the Focus Area. These datasets include flow direction and flow accumulation models. Each model is compiled in a raster data set. With the flow direction model, each cell in the raster data set represents the direction in which water would flow if poured at that cell onto the terrain. The flow accumulation model is created from the flow direction model and is an index which estimates the surface runoff for each cell in the terrain (Jenson and Domingue 1988). These models will likely be important in the recharge suitability analysis and can be used to identify potential site for native groundwater recharge.

### *Cultural Data*

The cultural data collected for the Focus Area include 2000 census tracts and associated demographic data, congressional districts, government land ownership, private water districts, and senate districts. The census data was provided by the U.S. Census Bureau and represents a compilation of data for census tracts within the study area based on the 2000 census data. Included in the ULARA Master Reports folder is documentation on the use of this data. All other data collected in this category were collected from the California Spatial Information Library and may not be directly useful to the recharge analysis, but are likely to provide useful contact information for the final recommendations documentation for this project. Likewise, this data may be useful for stakeholders performing other research within the Focus Area.

**Table 2. Geospatial Data Collected By CSUN- Geography.**

Theme	Geographic Coverage	Data Format	Scale or Resolution	Temporal Coverage	Data Source	Distributor and Location
Base Data (Imagery and Derived Raster Data)						
Aerial True Color Imagery	Study Quadrangles	Raster	> 1 meter	2005	Air Photo USA	PROPRIETARY
Color Infra-Red Imagery	Calabasas and Canoga Park Quadrangles	Raster	1 meter		U.S.G.S.	U.S.G.S. <b>PROPRIETARY</b>
Digital Elevation Models	Study Quadrangles	Raster	10 meter		U.S.G.S.	<a href="http://seamless.usgs.gov/">http://seamless.usgs.gov/</a>
Digital Raster Graphics	Study Quadrangles	Raster	1:24,000		California Spatial Information Library	<a href="http://gis.ca.gov">http://gis.ca.gov</a>
Flow Direction Models	Study Quadrangles	Raster	10 meter		CSUN Derived from Digital Elevation Models	CSUN
Hillshade Maps	Study Quadrangles	Raster	8 meter		CSUN Derived from Digital Elevation Models	CSUN
Slope Maps	Study Quadrangles	Raster	9 meter		CSUN Derived from Digital Elevation Models	CSUN
Flow Accumulation Models	Study Quadrangles	Raster	10 meter		CSUN Derived from Digital Elevation Models	CSUN
Cultural Data						
2000 Census Tracts (and population parameters)	Study Quadarangle	Vector (polygon)		2000	U.S. Census Bureau	<a href="http://www.census.gov">http://www.census.gov</a>
Congressional Districts	Study Quadrangles	Vector (polygon)		2000	California Spatial Information Library	<a href="http://gis.ca.gov">http://gis.ca.gov</a>
Government Land Ownership	Study Quadrangles	Vector (polygon)		2001	California Spatial Information Library	<a href="http://gis.ca.gov">http://gis.ca.gov</a>

**Table 2. Geospatial Data Collected By CSUN- Geography.**

Theme	Geographic Coverage	Data Format	Scale or Resolution	Temporal Coverage	Data Source	Distributor and Location
Private Water District	Study Quadrangles	Vector (point)		2000	LA County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Senate Districts	Study Quadrangles	Vector (polygon)		2000	California Spatial Information Library	<a href="http://gis.ca.gov">http://gis.ca.gov</a>
Fire Data						
Fire Perimeter	Study Quadrangles	Vector (polygon)	10 acre MMU	1950 – 2003	California Dept. of Forestry	<a href="http://frap.cdf.ca.gov">http://frap.cdf.ca.gov</a>
General Hydrology						
Subwatershed Flow Direction	Study Quadrangles	Vector (polyline)			Los Angeles County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Subwatersheds	Study Quadrangles	Vector (polyline)			Los Angeles County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Watersheds	Study Quadrangles	Vector (polyline)			Los Angeles County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
NHD_Area	Study Quadrangles	Vector (line)	1:100,000	1998	National Hydrography Dataset	<a href="http://nhdgeo.usgs.gov/viewer.htm">http://nhdgeo.usgs.gov/viewer.htm</a>
NHD Flowline	Study Quadrangles	Vector (line)	1:100,000	1998	National Hydrography Dataset	<a href="http://nhdgeo.usgs.gov/viewer.htm">http://nhdgeo.usgs.gov/viewer.htm</a>
NHD Water Bodies	Study Quadrangles	Vector (polygon)	1:100,000	1998	National Hydrography Dataset	<a href="http://nhdgeo.usgs.gov/viewer.htm">http://nhdgeo.usgs.gov/viewer.htm</a>
NHD well points	Study Quadrangles	Vector (point)	N/A	1998	National Hydrography Dataset	<a href="http://nhdgeo.usgs.gov/viewer.htm">http://nhdgeo.usgs.gov/viewer.htm</a>
NHD Sub basins	Study Quadrangles	Vector (polygon)	1:100,000	1998	National Hydrography Dataset	<a href="http://nhdgeo.usgs.gov/viewer.htm">http://nhdgeo.usgs.gov/viewer.htm</a>

**Table 2. Geospatial Data Collected By CSUN- Geography.**

Theme	Geographic Coverage	Data Format	Scale or Resolution	Temporal Coverage	Data Source	Distributor and Location
NHDWells	Study Quadrangles	Vector (polygon)	1:100,001	1999	National Hydrography Dataset	<a href="http://nhdgeo.usgs.gov/viewer.htm">http://nhdgeo.usgs.gov/viewer.htm</a>
SF_Basin	Groundwater basin	Vector		1965	Los Angeles County Dept. of Water and Power	PROPRIETARY/CSUN and LACDWP
Stream Walk Survey Data	Throughout Study Area	Vector (points and lines)		2006	CSUN	CSUN
<b>Geology</b>						
Geology	Study Quadrangles	Vector (polygon)	1:24,000	1998	USGS/CSUN	<a href="http://geology.wr.usgs.gov/wgmt/scamp/la/laquad.html">http://geology.wr.usgs.gov/wgmt/scamp/la/laquad.html</a> (Southern edge of Canoga digitized by CSUN)
Major Faults	Study Quadrangles	Vector (line)		1998	USGS/CSUN	No longer available other than via CSUN.
Quaternary Valley	Study Quadrangles	Vector (polygon)		Last 1.6 million years	USGS	<a href="http://gldims.cr.usgs.gov">http://gldims.cr.usgs.gov</a>
Quaternary Faults	Study Quadrangles	Vector (polygon)		Last 1.6 million years	USGS	<a href="http://gldims.cr.usgs.gov">http://gldims.cr.usgs.gov</a>
Quaternary Sediments	Study Quadrangles	Vector (polygon)		Last 1.6 million years	USGS	<a href="http://gldims.cr.usgs.gov">http://gldims.cr.usgs.gov</a>
<b>Groundwater</b>						
Groundwater Elevation 1958	Groundwater basin	Vector		1958	Los Angeles County Dept. of Water and Power	<b><u>PROPRIETARY/CSUN and LACDWP</u></b>
Groundwater Elevation Fall 1977	Groundwater basin	Vector		1960	Los Angeles County Dept. of Water and Power	<b><u>PROPRIETARY/CSUN and LACDWP</u></b>
Groundwater Elevation Fall 1988	Groundwater basin	Vector		1962	Los Angeles County Dept. of	<b><u>PROPRIETARY/CSUN and LACDWP</u></b>

**Table 2. Geospatial Data Collected By CSUN- Geography.**

<b>Theme</b>	<b>Geographic Coverage</b>	<b>Data Format</b>	<b>Scale or Resolution</b>	<b>Temporal Coverage</b>	<b>Data Source</b>	<b>Distributor and Location</b>
Groundwater Elevation Spring 1989	Groundwater basin	Vector		1962	Water and Power Los Angeles County Dept. of Water and Power	<b><u>PROPRIETARY/CSUN and LACDWP</u></b>
Groundwater Elevation Spring 1990	Groundwater basin	Vector		1964	Los Angeles County Dept. of Water and Power	<b><u>PROPRIETARY/CSUN and LACDWP</u></b>
ULARA Wells	Groundwater basin	Vector		1966	Los Angeles County Dept. of Water and Power	<b><u>PROPRIETARY/CSUN and LACDWP: Contains lithology of wells, depth to water table, date of drill, etc.</u></b>
<b>Hazards</b>						
Landslides	Study Quadrangles	Vector (polygon)	> 40 foot	2002	National Atlas	<a href="http://gmv.consrv.ca.gov">http://gmv.consrv.ca.gov</a>
Liquefaction	Study Quadrangles	Vector (polygon)	> 40 foot	2002	National Atlas	<a href="http://gmv.consrv.ca.gov">http://gmv.consrv.ca.gov</a>
<b>Infrastructure</b>						
All Roads	Study Quadrangles	Vector (line)		2002	California Spatial Information Library	<a href="http://gis.ca.gov">http://gis.ca.gov</a>
Catch Basins Retrofit	Study Quadrangles	Vector (point)			LA County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Construction Catch Basins	Study Quadrangles	Vector (point)			LA County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Debris Basins	Study Quadrangles	Vector (points)			LA County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Debris Basin Right of Way	Study Quadrangles	Vector (points)			LA County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Debris Potential Areas	Study Quadrangles	Vector (polygon)			LA County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Water Pipelines	Study Quadrangles	Vector			CSUN	<b>PROPRIETARY, CSUN</b>

**Table 2. Geospatial Data Collected By CSUN- Geography.**

Theme	Geographic Coverage	Data Format	Scale or Resolution	Temporal Coverage	Data Source	Distributor and Location
Rain Gage auto reporting	Study Quadrangles	(polygon) Vector (point)			LA County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Rain Gage standard reporting	Study Quadrangles	Vector (point)			LA County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Storm Drain annotated	Study Quadrangles	Vector (point)			LA County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Storm Drains	Study Quadrangles	Vector (polyline)			LA County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Stream Gage Stations	Study Quadrangles	Vector (point)			LA County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
<b>Land-Use</b>						
Land-Use	Study Quadrangles	Vector (polygon)	1 acre MMU or 2.5 acre MMU	1993	Southern California Association of Governments	<b>PROPRIETARY, CSUN</b>
Land-Use	Study Quadrangles	Vector (polygon)	1 acre MMU or 2.5 acre MMU	2001	Southern California Association of Governments	<b>PROPRIETARY, CSUN</b>
Land-Use	Study Quadrangles	Vector (polygon)	1 acre MMU or 2.5 acre MMU	2006	Updated by CSUN via aerial photography using SCAG methodology.	<b>PROPRIETARY, CSUN</b>
<b>Wetlands &amp; Riparian Areas</b>						
Old Wetlands	Canoga Park, Calabasas, & Malibu Quadrangles only	Vector (polygons)	varies	1971 - 1997	National Wetlands Inventory	ftp://ftp.nwi.gov/arcdata
New Wetlands & Riparian	Study Quadrangles	Vector (polygon)	0.1 acre or more	2006	CSUN/National Wetlands	<b>CSUN/NWL..PROPRIETARY UNTIL NWI QC APPROVAL.</b>

**Table 2. Geospatial Data Collected By CSUN- Geography.**

Theme	Geographic Coverage	Data Format	Scale or Resolution	Temporal Coverage	Data Source	Distributor and Location
Inventory						
<b>Soils</b>						
Soils (LADWP_Soils)	Study Quadrangles	Vector (polygon)			LA County	<a href="http://dpwgis.co.la.ca.us/website/oia/index.cfm">http://dpwgis.co.la.ca.us/website/oia/index.cfm</a>
Potential Hydric Soils (LA_poten_hydric)	Study Quadrangles	Vector (polygon)	County		NRCS/CSUN	<a href="http://soils.usda.gov/use/hydric/">http://soils.usda.gov/use/hydric/</a>
Potential Hydric Soils	West San Fernando Valley	Report	County	2005	NRCS/Query by CSUN	Hydric soils extracted by CSUN <a href="http://soils.usda.gov/use/hydric/">http://soils.usda.gov/use/hydric/</a>
Impervious Surfaces	Study Quadrangles	Raster	County		National Land Cover Data (NLCD)	<a href="http://www.mrlc.gov/">http://www.mrlc.gov/</a>
SSURGO (NRCS Soils)	Los Angeles County Study Quadrangles	Vector (polygon)	County		NRCS	<a href="http://soildatamart.nrcs.usda.gov/Default.aspx">http://soildatamart.nrcs.usda.gov/Default.aspx</a>
<b>Study Area</b>						
Township & Range	Study Quadrangles	Vector (polygon)		1890's to present day	California Spatial Information Library	<a href="http://gis.ca.gov">http://gis.ca.gov</a>
Project Area	Project Area	Vector (polygon)		2006	Mountains Restoration Trust	Mountains Restoration Trust
Project Quadrangles	Project Quadrangles	Vector (polygon)	1:24,000	2006	USGS/CSUN	<a href="http://www.usgs.gov">http://www.usgs.gov</a>
<b>Vegetation</b>						
Calveg	Project Quadrangles	Vector (polygon)	1:1,000,000, 400 acre MMU	1977	California Spatial Information Library	<a href="http://gis.ca.gov">http://gis.ca.gov</a>
Land Cover	County	Raster		2001	National Land Cover Data (NLCD)	<a href="http://www.mrlc.gov/">http://www.mrlc.gov/</a>

**Table 2. Geospatial Data Collected By CSUN- Geography.**

<b>Theme</b>	<b>Geographic Coverage</b>	<b>Data Format</b>	<b>Scale or Resolution</b>	<b>Temporal Coverage</b>	<b>Data Source</b>	<b>Distributor and Location</b>
Existing vegetation (eveg)	Project Quadrangles	Vector (polygon)		2006	USDA Forest Service	<a href="http://www.fs.fed.us/r5/rs1/about/sitemap.shtml">http://www.fs.fed.us/r5/rs1/about/sitemap.shtml</a>
Fveg	County	Raster		2001	California Department of Forestry and Fire Protection (Compilation of existing vegetation data)	<a href="http://frap.cdf.ca.gov">http://frap.cdf.ca.gov</a>
Forest Cover	County	Raster		2001	National Land Cover Data (NLCD)	<a href="http://www.mrlc.gov/">http://www.mrlc.gov/</a>
<b>Weather Data</b>						
Precipitation	Project Quadrangles	Vector (polygon)	Statewide	1961 - 1990	Oregon State University	<a href="http://www.ocs.orst.edu/prism/prism_new.html">http://www.ocs.orst.edu/prism/prism_new.html</a>
Study Area Weather Stations	Study Area	Vector (point)	Local	2006	LA County Dept. Water & Power	

### ***Fire Data***

The Fire Perimeters data consists of fires 300 acres and greater in size identified by the California Department of Forestry and Fire Protection (CDF) and fires 10 acres and greater as identified by the U.S. Forest Service throughout the Focus Area from 1950 to 2003. Some fires before 1950, and some CDF fires smaller than 300 acres are also included. In 2002 criteria expanded for new CDF fires to include timber fires greater than 10 acres, brush fires greater than 50 acres, grass fires greater than 300 acres, wildland fires destroying three or more structures, and wildland fires causing \$300,000 or more in damage. As such, the 2003 fire data may contain more detailed information than historical fire data. The purpose of this data is to ensure high quality fire perimeters data are available to the public and to cooperating agencies. However, care should be taken when using this data as it is likely only 90% accurate and is continuously modified by CDF. See the associated metadata in the geodatabase for more information about accuracy and updates.

### ***General Hydrology***

General hydrological data is likely to be important for the recharge suitability analysis. Therefore, this data collection effort was identified as a priority. Key sources for this collection effort were the Los Angeles County Department of Public Works and the National Hydrography Dataset (NHD). The Los Angeles County Department of Public Works (LADPW) has made several priority datasets for the ULARA project available to the public (<http://dpwgis.co.la.ca.us/>). These datasets include boundary files for sub-watersheds, watersheds, and the flow direction of water within each sub-watershed for the Focus Area. These datasets are not proprietary, however the data agreement statement located on the LADPW website should be reviewed before using this data. NHD data is provided by the United States Geological Survey (<http://nhdgeo.usgs.gov/viewer.htm>). NHD is a comprehensive set of digital spatial data that contains information about surface water features such as lakes, ponds, streams, rivers, springs and wells. Within the NHD, surface water features are combined to form "reaches," which provide the framework for linking water-related data to the NHD surface water drainage network. These linkages enable the analysis and display of these water-related data in upstream and downstream order. The NHD is based upon the content of USGS Digital Line Graph (DLG) hydrography data integrated with reach-related information from the EPA. While initially based on 1:100,000-scale data, the NHD is designed to incorporate and encourage the development of higher resolution data required by many users. Consequently, this data does not represent the location of wetlands and other detailed features on the landscape, but does represent a general understanding of the hydrology within the focus area. See associated metadata within the ULARA Master geodatabase for details on each layer included.

### ***Geology***

Five sets of geologic data were collected for the Focus Area. The most important dataset is the geology layer which represents digitized Dibblee maps from the United States

Geological Survey (U.S.G.S.). Each quadrangle within the Focus Area has separate digital data layers available describing the bedrock and superficial geology, structural geology, and paleontological resources of the area. Four other datasets were obtained from the CSUN-Geography webserver. These datasets include major earthquake faults, quaternary valley formations, updated quaternary faults, and quaternary sediments. These datasets were provided to CSUN by the U.S.G.S. and are no longer available on their website without specific request. However, these data are not proprietary and can be used for the recharge suitability analysis or other analyses. See associated metadata within the ULARA Master geodatabase for details on each layer included.

### *Groundwater*

Any pre-existing groundwater datasets were considered high priority for this data collection effort. Table 1 identifies several key datasets for the recharge analysis including well locations, groundwater elevation, and permeability of geologic layers. Besides having proprietary access to some of these datasets, CSUN-Geography was able to collect several of these key datasets from the Los Angeles County Department of Water and Power (LACDWP). Well data was obtained by LACDWP and includes the location of groundwater wells within the Focus Area. A given well may be a public supply well, a water quality monitoring well, a water level monitoring well (piezometer), or some combination thereof. Well information includes data pertaining to well construction, lithology, aquifer characteristics, pumpage, and water levels. This data will provide key information on the permeability of geologic layers at well locations and may be useful for additional modeling of subsurface lithology. In addition, groundwater elevation data was obtained from several time periods. The Watermaster monitors the groundwater levels in the Upper Los Angeles River Area and produces groundwater contour maps for fall and spring each year. The maps at a scale of 1 inch = 4,160 feet and 25-foot contour interval appear in their annual report, Watermaster Service in the Upper Los Angeles River Area. The item ELEV contains the elevation of each contour line in feet (msl). The name of each coverage represents a year of water level measured and part of year (e.g., POT82S for potentiometric surface for Spring of 1982, and POT90F for potentiometric surface for Fall of 1990). All of this data is PROPRIETARY and should not be distributed beyond Mountains Restoration Trust and USC. Likewise, this data represents historical data from 1958 through 1998. A data request has been made for more current data, this request will need to be followed up by USC. CSUN-Geography will distribute the data should it come to directly to CSUN. See associated metadata within the ULARA Master geodatabase for details on each layer included.

### *Hazards*

Seismic hazard data was collected for the Focus Area. This data represents areas where liquefaction and landslides may occur during a strong earthquake. Three types of geological hazards, referred to as seismic hazard zones, may be featured on the map: 1) liquefaction, 2) earthquake-induced landslides, and 3) overlapping liquefaction and earthquake-induced landslides. Developers of properties falling within any of the three zones may be required to investigate the potential hazard and mitigate its threat during

the local permitting process. While not directly relevant to the recharge suitability analysis, this data may be useful for other purposes and may suit general stakeholder needs within the Focus Area.

### ***Infrastructure***

Infrastructure data includes transportation infrastructure and water related infrastructure (such as debris basins, catch basins, etc.). Transportation infrastructure was provided by the California Spatial Information Library and was updated in 2002. Water related infrastructure was provided primarily by the Los Angeles County Department of Public Works (LADPW). These data include debris basins, catch basins, debris basin right of ways, rain gage stations, storm drain locations, and stream gage locations. These datasets are not proprietary, however the data agreement statement located on the LADPW website should be reviewed before using this data.

### ***Land Use***

Land use data was obtained for three time periods, 1993, 2001, and 2005. Land use data from 1993 and 2001 was obtained from the Southern California Association of Governments (SCAG). CSUN-Geography has a license for access to this data. As such, this data is considered PROPRIETARY and should not be used by any other organization besides Mountains Restoration Trust and USC for the ULARA Project. The 2005 land use data represents an update of the 2001 land use data within the Focus area. The 2005 aerial photography purchased by Mountains Restoration Trust was used to create new polygons and update land use codes as per SCAG methodology by CSUN-Geography.

## *Wetlands and Riparian Areas*

Wetland maps were created using the NWI mapping protocol and the Cowardin classification system for wetlands and deepwater habitats (Cowardin, Carter, Golet, and Laroe 1979). This is a hierarchical system describing the ecological nature of wetlands that share the same attributes. The classification system develops in structure from Systems (Marine, Estuarine, Riverine, Lacustrine, and Palustrine) at the top of the order to Subsystems (e.g., Perennial, Intermittent, Limnetic, and Littoral) to Classes, Subclasses and Dominance Types (Scrub-Shrub, Unconsolidated Bottom, Emergent Vegetation) along with modifiers that are added to describe wetland habitat (i.e. water regime and soils) and human impact (Cowardin, Carter, Golet, and Laroe 1979).

For the inventory process, we utilized a variety of methods to document wetlands in a GIS including interpretation of aerial photography, wetland classification, ground-truthing, and standardized mapping protocols for wetland delineation as identified by NWI (U.S.F.W.S. 1994). The process of inventorying wetlands was initiated by the creation of an ArcGIS 9.0 (ESRI 2004) geodatabase containing collateral data that was used as a guide for identifying potential sites where wetlands may be present. The collateral data included old NWI wetland maps where available and Focus Area boundaries of the area to be mapped. In addition, land use data (S.C.A.G., 2000), pre-existing National Hydrography Data (U.S.G.S., 2004), hydric soils data (N.R.C.S., 2005), and USGS topographic maps (1:24,000) were used. Because dirt roads may resemble tertiary streams on aerial photography, data on roads and railroads were included as collateral data.

Once the geodatabase was created, we used ArcGIS 9.0 (ESRI 2004) software and orthorectified 6-inch resolution true color aerial photographs to delineate and classify wetlands. All wetlands were mapped as polygons including small streams previously mapped by NWI as linear features. These streams were mapped as polygons by creating a 2.5 meter buffer around lines that followed the stream meander. Interpretation of aerial photographs followed NWI protocol for photointerpretation (U.S.F.W.S., 1995). For all sites mapped, wetlands were delineated primarily based on spectral signature from aerial photography and/or collateral data. When possible, field visits were made to wetlands that were difficult to identify from the aerial photography. Upon completion of stakeholder review, this data will be submitted to NWI and reviewed under their quality control process. Subsequent corrections will be made before the data are compiled into the national NWI database. Until NWI approval, this dataset is also considered proprietary and should not be used for any reason beyond the defined project interests.

Riparian areas were mapped using a minimum mapping unit of 2 acres in accordance with *A System for Mapping Riparian Areas in the Western United States* (U.S. F.W.S. 1997). Classification of riparian areas followed federal mapping procedures. However, at this time, the state of California is in the process of adopting updated methods for mapping riparian areas that meet the requirements as identified by the U.S. Fish and Wildlife Service (1997). San Francisco Estuary Institute is working closely with the state and National Wetlands Inventory to refine riparian mapping as a part of this effort. In April, CSUN-Geography students working on the project were trained by San Francisco Estuary Institute using this refined methodology. This

methodology includes using spectral signature in addition to drainage patterns as identified with 10 meter DEM's to identify riparian areas. This methodology is different from previous riparian mapping efforts in that it includes a focus on drainage pattern and not just spectral signature. This methodology likely will include more riparian areas as sometimes spectral signature is difficult to distinguish riparian vegetation alone. San Francisco Estuary Institute is in the process of publishing this information so a formal citation for their methodology is not available at this time.

### ***Soils***

Four soils layers were collected for the ULARA project. The STATSGO database listed under the soils category in Table 2 provides generalized information for the entire Focus Area and can be supplemented with more detailed information from the other products listed in Table 2 provided by the Los Angeles County Department of Public Works. The soils databases listed in Table 2 must be used with care because they incorporate represent regional scale mapping efforts. These products are frequently used to support regional scale planning activities (e.g. Bliss and Reybold 1989) but they will often need to be supplemented with field measurements in site-specific assessments. Hydric soils were extracted from the STATSGO database and used as collateral data for mapping wetlands. A report on hydric soils was generated from the NRCS and is included in the ULARA Master Reports folder.

### **Vegetation**

Several pre-existing vegetation datasets were included in the ULARA Master geodatabase. These datasets were collected by federal, state, and regional government agencies. Each dataset should be used with care as they represent different scales of vegetation assessment at different time periods. See associated metadata within the ULARA Master geodatabase for details on each layer included.

### **Weather Data**

Pre-existing weather data was collected from two primary data sources. Precipitation data covering the entire Focus Area was collected from Oregon State University. This precipitation data is also posted on the California Spatial Information website. While a useful tool for large scale analysis, this data does not provide sufficient information for the study area. The location of weather stations as identified by the Los Angeles County Department of Public Works are included in this geodatabase. CSUN-Geography was able to obtain five year precipitation averages for each station from the LADPW. This data is provided in tabular format which can be linked to the station identifications in the geospatial data layer. See associated metadata within the ULARA Master geodatabase for details on each layer included.

## **Stream Walk Survey Data**

The streamwalk surveys were done in an effort to collect data on the potential human impacts that would affect the water quality of the perennial streams of the Upper Los Angeles River (ULARA) project area. Four streams (Aliso Canyon Wash, Browns Canyon Creek, Devils Canyon Creek and Limekiln Canyon Creek) were selected for study in the Santa Susana Mountains. Additionally, one stream in the Santa Monica Mountains (Dry Canyon Creek) was selected for streamwalking. The streams chosen for this initial survey were selected in conjunction with water quality sampling points being taken on these same water courses by the geology team affiliated with this project. Other factors also contributed to the selection of these particular stream and the areas of the streams surveyed. Such factors included; private property issues, accessibility to the stream channel, the perennial nature of the streams in question and the proximity of the stream walk survey routes to the boundary of the San Fernando Groundwater Basin.

The streamwalks were conducted by teams of two trained associates over approximately one month (May 25, 2006 to June 29, 2006). One associate in each team was responsible for recording the GPS coordinates of each survey point and its observed attributes associated with that point. The other associated was tasked with plotting those points on a printed map and recording any linear features observed. Both associates were trained to spot and record features based on a streamwalking model developed by Heal the Bay. This model was modified and appended to reflect conditions found in the streams we surveyed.

As the name implies, streamwalking entailed physical contact with the stream. Associates were directed to walk the stream channel wherever possible and to only record potential impacts that could be observed from the stream channel. Impediments such as dams, channelization, debris, and the presence of noxious weeds did result in some small and unavoidable gaps in coverage.

When a potential impact was identified by a streamwalk team, a GPS coordinate was taken (UTM Zone 11N, NAD 1927) and the attribute was recorded. This became the primary attribute and is reflected in the data by the designation ATTRB\_1. Additional attributes may have been noted for certain points where warranted. These additional attributes (ATTRB\_2 through ATTRB\_5) are logged in descending significance. Once the attributes of the point of interest were taken down, collateral information regarding ecosystem and habitat were also recorded. In later, surveys, photographs were also taken of a sampling of points, these photographs are included in the ULARA\_Master Photos folder.

## ***Conclusion***

This report summarizes the results of the GIS data search that was conducted as a part of Phase I of the ULARA Project. The search focused on freely available, pre-existing, public domain data sources. The results in Table 2 indicate that many GIS datasets that meet these criteria were found for parts or all of the Focus Area. However, there were

data gaps that affect the overall implementation of the ULARA project goals. These data gaps were filled in part by the CSUN-Geography team such as wetlands inventory, riparian areas inventory, and initiation of field stream surveys. The compilation of data provided by various agencies, particularly from Los Angeles County Department of Public Works and the Los Angeles County Department of Water and Power has helped to fill these gaps as well. Further stream walk surveys and the potential use of groundwater modeling is likely to provide a significant additional source of data for the recharge suitability analysis. This stage of the project is being completed by the University of Southern California at this time. As such, all data collected and described herein will be passed on to the University of Southern California and Mountains Restoration Trust.

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