Project Plan / Proposal: Interactive Story Map for a Cultural Landscape Study

Vandenberg Space Force Base, California

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LOCATION
Vandenberg Space Force Base (SFB), Santa Barbara County, California

TYPE OF WORK
Interactive Story Map in support of a cultural landscape study

LEAD CLIENT
Vandenberg SFB Archaeologist

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1 Audience

The target audience for this project is the Vandenberg Space Force Base (SFB) Archaeologist (client) and the Santa Ynez Band of Chumash Indians (SYBCI). The client and SYBCI will use the final product of this project (interactive story map) on Vandenberg SFB to further the understanding of the prehistoric village of Lospe and related sites.

Locations of prehistoric cultural resources and tribal / traditional cultural resources / properties (culturally significant locations) are considered sensitive information not typically available to the public. Controlling this information protects significant cultural locations from looting and damage. The client has granted permission to use this data for academic purposes; however, no portion of this project will be published on any opensource platform.

2 Intention

Currently, there is insufficient documentation of traditional cultural properties, landscapes, and sites deemed culturally significant by the Santa Ynez Band of Chumash Indians on Vandenberg SFB, CA. To help correct this deficiency, the goal of this project will be to conduct a geographic analysis of the landscape around the prehistoric Chumash village of Lospe using geographical information systems (GIS) to help document the spatial relationships between Lospe and other culturally significant locations in the area. The compiled results will be presented to the client as an interactive story map that not only documents culturally significant locations, but will also aid in guiding future cultural resource investigations. Furthering our understanding of these culturally significant locations helps prevent the loss of cultural knowledge and also facilitates the protection of locations that are important to the indigenous population along the California coast. Definitions of what constitutes a significant cultural resource and landscape are provided below for additional clarification.

Definition of a Significant Cultural Resource

Under Section 106 of the National Historic Preservation Act, significant cultural resources are deemed so through an assessment in relation to relevant historic contexts, and the National Register of Historic Places (NRHP) criteria set forth in 36 CFR § 60. Significant cultural resources, also referred to as historic properties, are any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP. The term also includes artifacts, records, and remains related to and located within such properties.

Definition of Traditional / Tribal Cultural Resources, Properties, and Landscapes

Traditional cultural places or properties (TCPs) are traditional religious and culturally important resources to an Indian tribe or Native Hawaiian organization that meet the NRHP criteria [16 U.S.C. § 470w(5), 36 CFR § 800.16(l)]. TCPs and other cultural resources can be components of traditional or tribal cultural landscapes (TCLs). TCLs are any place in which a relationship, past or present, exists between a spatial area, resource, and an associated group of indigenous people whose cultural practices, beliefs, or identity connects them to that place. In the case of this project, the Chumash people. Therefore, TCLs recognize that small cultural components, such as archaeological artifacts, may have significance to an indigenous group through a relationship with a TCP (ACHP 2016).

Connection to place is a nearly universal concept held by indigenous groups throughout the United States. Archaeological sites, burial grounds, and traditional use areas are imbued with special meaning to past and present indigenous communities and intertwined with their cultural identity. Specific relationships may vary from group to group and may be defined temporally or geographically through oral traditions and cultural practices (NOAA 2023).

3   Geographic Extent

The project will be projected in North American Datum 1983 Universal Transverse Meridian Zone 11 North. Several geographical levels of analysis will be included within and around Vandenberg SFB in Santa Barbara County, California (see **Figure 3-1**):

1. A regional analysis that will include likely travel and trade corridors between Lospe and other village locations within a 30 mile radius of the site encompassing all of Vandenberg SFB and areas outside of the base.

2. A local analysis that will include travel routes between Lospe and nearby culturally significant locations such as rock art sites, natural springs, and promontories. These locations will be within 4-5 miles of Lospe, approximately 0.5-day travel.

3. A local analysis that will identify the spatial distribution of known resources locations within 4-5 miles of Lospe.

The interactive map will give the user the ability to pan, zoom, and explore at their discretion if they do not wish to follow the story map panels in sequence. However, the primary focus will be constrained to the 4-5 mile study area surrounding Lospe.
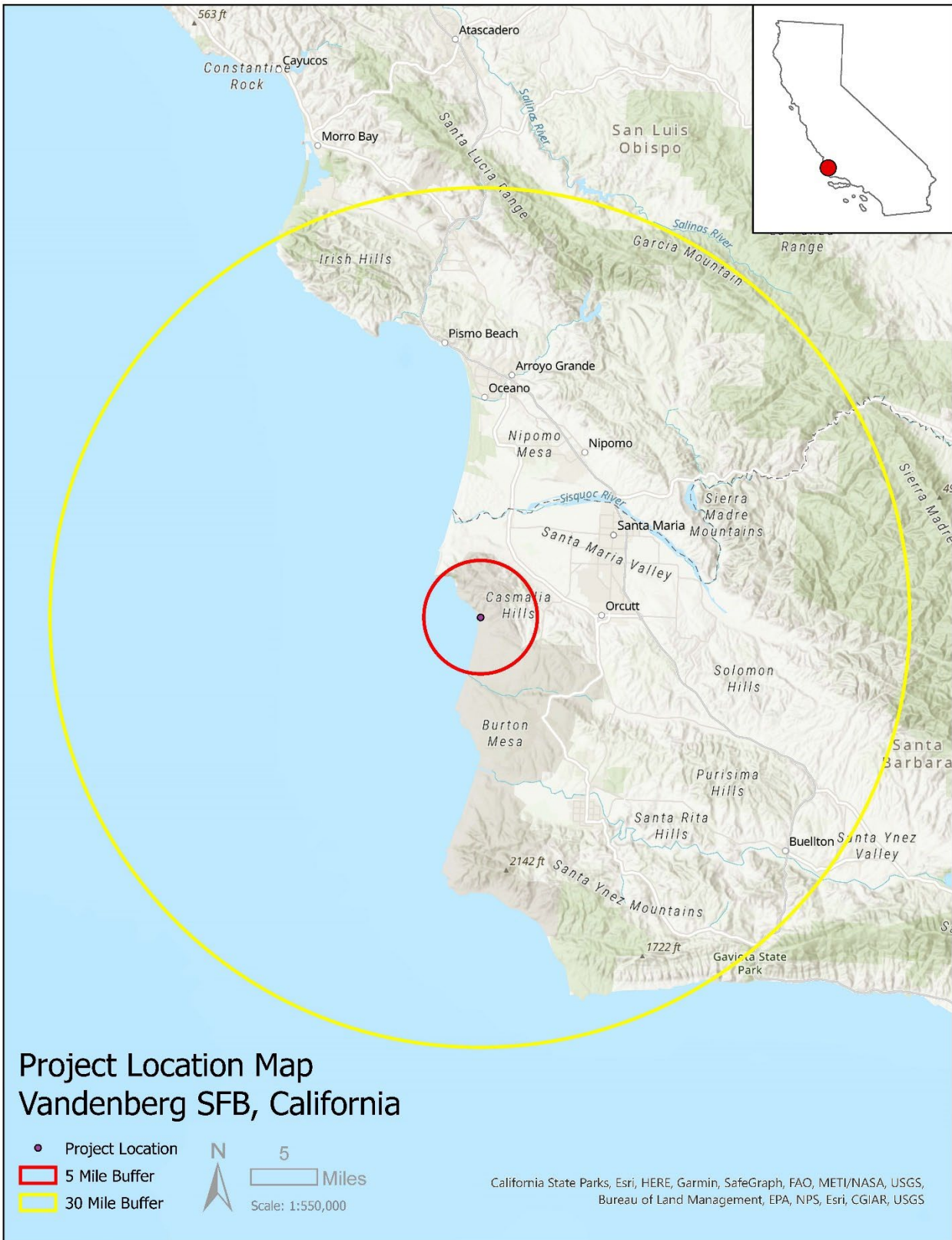
Figure 3-1. Project Location with Study Area Buffers.

4   Deliverables

The primary deliverable will be an interactive Leaflet story map designed for use on a secure local server. The source code and all associated data will be provided to the client in a zip file to use at their discretion. The source code and data for a D3 interactive bubble chart for site comparisons will also be included in the package. The story map and chart will be accompanied by a report documenting the study processes and methods, as well as the conclusions. **Table 4-1** below outlines the list of required deliverables.

Table 4-1. Description of Deliverables

Deliverable	Description
1	Leaflet Story Map and Chart with Source Code and Associated Data (zip file).
2	Technical Report with Abstract / Executive Summary (pdf.).

5   Budget

Completion of the Leaflet Story Map and all associated tasks will take approximately 176 hours to complete including a D3 Interactive Bubble Chart for comparison of site data and technical report. Estimated cost to complete the project is approximately $20,000. Seven tasks have been identified with estimated hours to ascertain the approximate costs for each task outlined in **Table 5-1** below.

Table 5-1. Project Tasks with Estimated Hours and Costs.

Task No.	Task Description	Hours
1	Project Planning and Background Research.	20
2	GIS Analysis; georeferencing, least-cost paths, point pattern analysis.	24
3	Writing Historical Background Sections for Resource Locations to be included within the story map panels.	30
4	Coding the Leaflet story map to include all points of interest, functions, and event listeners. Includes debugging.	40
5	Technical Report.	24
6	D3 Interactive Bubble Chart, including gathering and formatting data, and debugging.	30
7	Quality Assurance / Quality Control; Agency Coordination.	8
	Total Hours	**176**

6   Technology and Extraneous Costs

To identify culturally significant locations, the analysis will include the digitization of historical maps, aerial photographs, shapefiles of known archaeological locations, and relevant remote sensing data such as digital elevation models (DEM) or light detection and ranging (LiDAR) imagery. Additionally, a least-cost path analysis will be conducted to identify potential prehistoric travel routes connecting Lospe with other culturally significant locations, as well as an analysis of the spatial context and distribution of these significant locations using point pattern analysis.

The technology and data required for this project will be obtained from Vandenberg SFB and opensource databases. No extraneous costs or direct expenses are anticipated for the completion of this project. Data sources are discussed in more detail below and sources that have already been obtained are outlined in **Table 6-1** at the end of this section.

Digital Imagery and Shapefiles

Portions of the data will be obtained from the Vandenberg SFB Archaeologist including shapefiles of known archaeological resource locations, site record documentation of these resources, and associated cultural resources reports from past projects conducted within the study area. Existing cultural reports will be a source of historical and ethnographic information. A significant amount of research will be necessary to find and extract the information necessary for this study. Some imagery layers like a 10-meter DEM and 0.5-meter resolution LiDAR imagery have been requested from the client because imagery over military installations is strictly controlled. If the high-resolution imagery is not provided by the Vandenberg SFB, lower resolution imagery (30-meter DEM) has been obtained from the National Land Cover Database ([TNM Download v2 (nationalmap.gov)](#)). The National Land Cover Database also includes digital downloads of some historical topographic maps that could potentially be utilized in the study.

Historical Maps

Other sources of historical maps are all open source databases like the NOAA Historical Map & Chart Collection ([Coast Survey's Historical Map & Chart Collection (noaa.gov)](#)), the David Rumsey Historical Map Collection ([David Rumsey Historical Map Collection | The Collection](#)), and the Library of Congress Map Collection ([Available Online, Geography and Map Division | Library of Congress (loc.gov)](#)). Numerous historical maps will be analyzed for relevant features and only those containing useful data will be digitized and used in the study after initial analysis. Additionally, the Chumash Village Map obtained from the Museum of Ventura County ([Patterns on the Land - Museum of Ventura County (venturamuseum.org)](#)) will be cross referenced with other existing studies such as Whitaker et al. (2019) to narrow down and locate Chumash villages with kinship ties to Lospe.

Technology Stack for the Interactive Story Map and Charts

The story map and D3 chart will be constructed using the Visual Studio Code platform. All necessary data libraries and templates are opensource and available on the internet for download. The basic story map template will be obtained from GitHub (https://github.com/slead/leaflet-storymap). It already contains some of the desired functionality (click to zoom, panels linked to map points) but will need to be reconfigured with additional functionality and style. Data libraries required for the story map and D3 chart include:

- the standard Leaflet library, leaflet.extra-markers.min, bootstrap.min.js, topojson.min.js, and jquery.js, d3.min.js, and d3-legend.min.js.

Most of these library files have already been obtained from previous classes like Geography 575 and are on file in the host computer. Some file updates may be required.

Photographs and Supporting Visual Materials

Photographs used in the story map for supporting visualization will be taken from recent surveys of Lospe and the surrounding area. One of the landscape photos has been included on the cover page as an example – Point Conception, to the south of the project study area. The photographs will need to be carefully selected to ensure they do not contain any sensitive information and will be agreed upon for use with the client prior to inserting into the story map. Additional photos and drawings can be derived from local museum exhibits like the La Purisima Mission.[1]

Table 6-1. Current Sources of Data to be Used in the Study

Data Type	Data Source	Use
Chumash Village Map	Map created in 2016 for the Museum of Ventura County's Chumash exhibit.	Will provide known locations of Chumash villages
Map of Chumash Villages	Map created by Kaitlin Brown, UC Santa Cruz; for a study of villages connected with the Purisima Mission.	Will provide known locations of Chumash villages
Map of Chumash Villages	Map created by Chambers Consultants to demonstrate kinship ties to Lospe based on mission records.	Will provide Chumash villages with ties to Lospe
1889 Map of Santa Barbara County	Library of Congress; survey map depicting 19th century locations of relevant terrain features	Provide locations of features before modern alteration
30 meter DEM	Obtained from the National Land Cover Database	Will be used to create slope and cost surfaces
Archaeological Site Shapefiles	Obtained from Vandenberg SFB	Used to help select cultural features
Area Photographs	Obtained from HDR, Inc.	Used for supplemental visuals in story map
Site Records and Reports	Obtained from Vandenberg SFB	To derive historic and ethnographic information

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[1] La Purisima Mission exhibit photos have been obtained from a past site visit.

7   Product Development and Delivery

GIS Analyses

The GIS least-cost path and point pattern analyses will be developed using ArcGIS Pro. A workflow for the least-cost path analysis will include creating a cost surface for the region from a DEM (slope Layer, selecting Lospe as the source location, digitizing target point locations for other villages, accounting for any barriers, and running the analysis. Several iterations of the analysis will need to be executed to ensure accuracy and the correct weighting of variables. The paths will be exported so they can be added to the story map with the source and target points (villages). The point pattern analysis will include all of the known archaeological site locations within the study area. The work flow will include setting and adjusting the parameters over several iterations to identify and examine areas with site clustering. The final point pattern output will be exported to be included as a layer in the story map.

Story Map, Chart, and Report

The story map and chart will be created and built on a restricted GitHub repository. Invites to access the repository will be sent on an as needed basis so others can access the data for critiques and project input. The story map and chart source code will be packaged as a zip file and delivered to the client along with a pdf. of the technical report containing the methodology used for the processes and an interpretation of the results. Static maps may be included in the report for additional visualization.

8   Timeline

The timeline for completion of this project is limited to six weeks. The target goals or milestones for completion of tasks listed in **Table 5-1** above are discussed in further detail below and outlined by week. Additionally, work flow diagrams associated with each task are provided.[2]

*Weeks 1 and 2 – February 15 to February 28*

- Completion of Task 1: Project Planning and Background Research. This includes final selection and georeferencing of maps to be used in the GIS analyses, selection and import of sites and locations that will be included in the map (**Figure 8-1**), relevant sources of historical information to be included in the story map panels, and wire frames for the story map and bubble chart.

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[2] This timeline is a general guide, the actual process will likely include working on all the different portions of the project based on necessity, available time, and unforeseen issues like coding problems. Some portions of the process will be easier than anticipated while others will be more difficult and take longer.

Weeks 3 and 4 – March 1 to March 14

- Completion of Task 2: GIS analyses – least-cost paths (**Figure 8-2**) and point pattern (**Figure 8-3**). This includes digitization of the source point for Lospe, target points for relevant village locations, and target points for significant cultural locations identified during the historic map analysis. Several iterations of each analyses will be executed to ensure accuracy of the results.

- Begin Task 3: Writing Historical Background Sections for Resource Locations to be included within the story map panels. This task must be started early in the process to allow for several review and edit sessions.
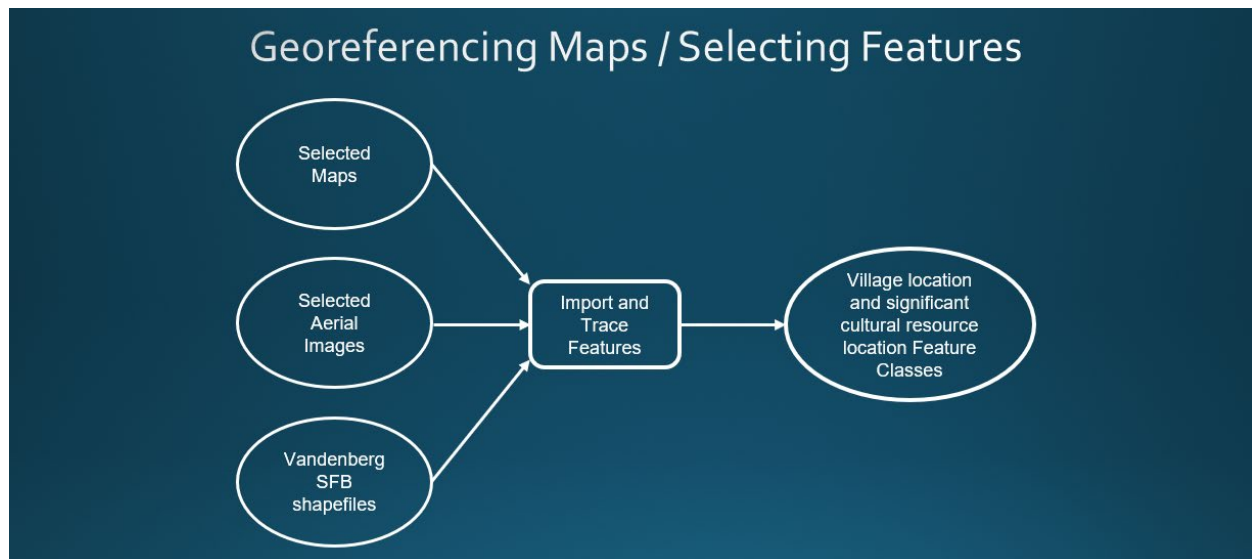
Figure 8-1. Task 1 – Importing, Selecting, and Creating Significant Cultural Feature Classes.
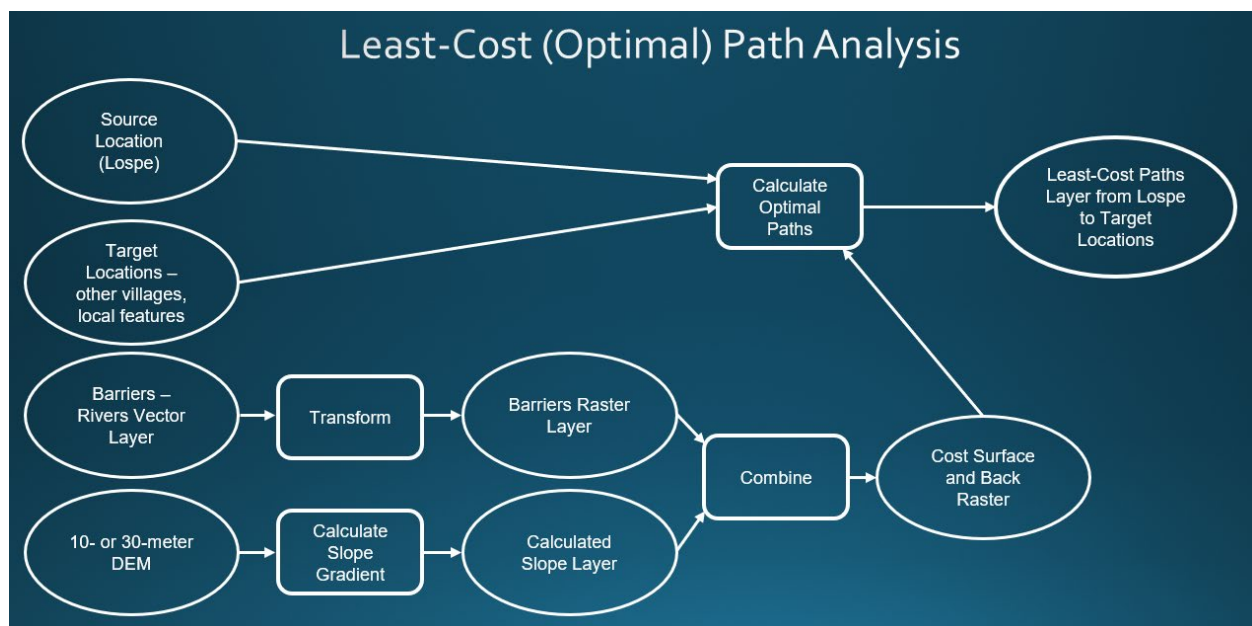

Figure 8-2. Task 2 – Least-Cost Path Analysis.
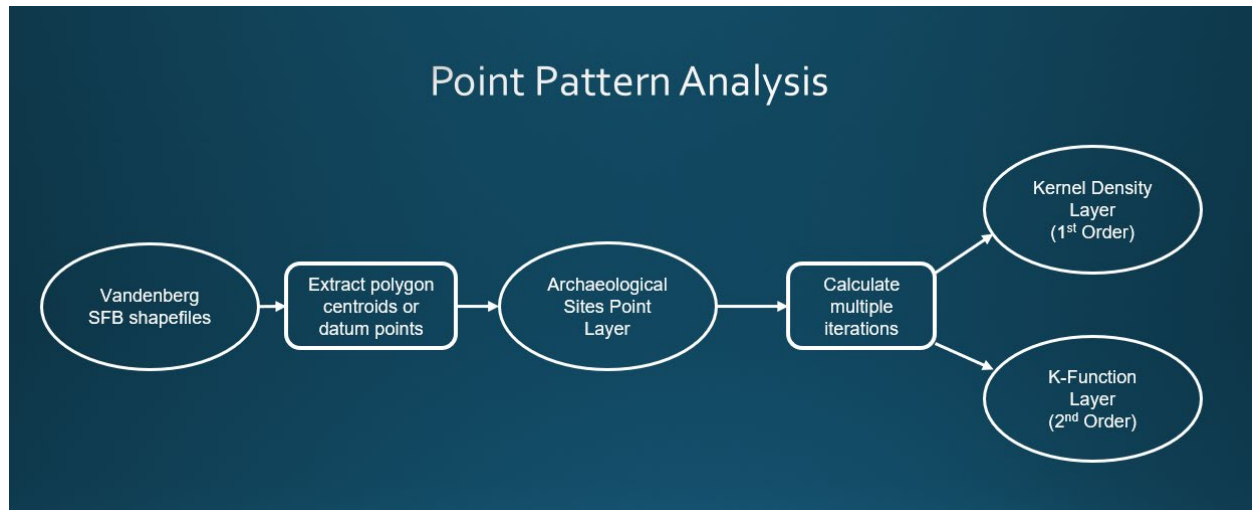
Figure 8-3. Task 2 – Point Pattern Analysis.

Weeks 5 and 6 – March 15 to March 28

- Completion of Task 3: Version 1 of the Historical Background Panel Sections. This also includes final selection of photographs, historic maps, and other visuals to accompany the text.

- Begin Task 4: Creation and Coding of the Leaflet Map, and Task 6: Creation and Coding of the D3 Bubble Chart (**Figure 8-4**). This includes creation of the base map tile for the map; basic interactive functions and styling; formatting, import and visualization of data from the GIS analyses; creation of an svg. or tab for the D3 chart, formatting of data for the chart, and debugging.
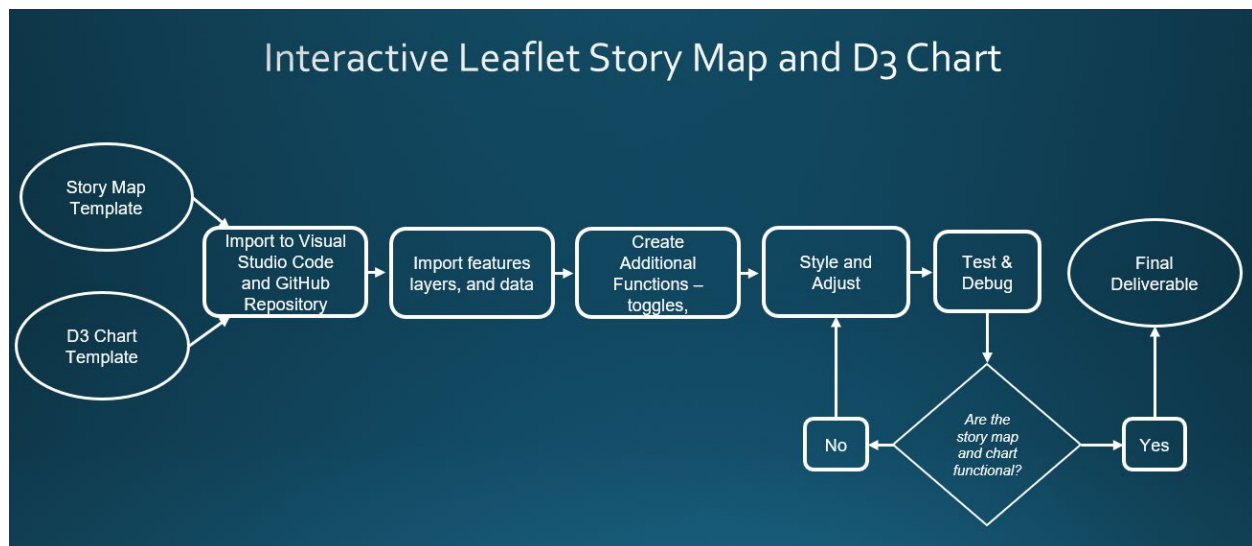
Figure 8-4. Tasks 4 and 6 – Workflow for Story Map and Bubble Chart.

Weeks 7 and 8 – March 29 to April 11

- Completion of Tasks 4 and 6. The story map and chart will have all data visualized and most of the interactive functions will be completed – toggle switches for layers, hover and retrieve; should only require minor adjustments, debugging, and styling based on user feedback.

- Begin Task 5: Technical Report. This Project Plan will be used for the technical report template as most of the formatting has been developed. The report will include project background and introduction, methodologies used for the development of all components, a discussion of the results, and recommendations for future investigations and analyses. Like the background sections for the story map, the technical report will go through several sessions of review and edit.

Week 9 – April 12 to April 18

- Review and user testing for Tasks 4 and 6. Receive final comments on the story map and chart interfaces and style to direct final adjustments, debug as needed.

- Review for Task 5 Technical Report. Complete final edits, develop any static maps and figures as necessary to support the results / analysis.

Week 10 – April 19 to April 25

- Completion of Task 7: Quality Assurance / Quality Control. Final review of all deliverables to make any last adjustments before submittal.

Week 11 – April 26 to May 5

- Submit story map and chart code and data packaged in a zip file, a pdf. of the technical report, and an executive summary.

Last Updated: February 15, 2023

9   References

Advisory Council on Historic Preservation (ACHP)

2016   Informational Paper on Cultural Landscapes: Understanding and Interpreting Indigenous Places and Landscapes. https://www.achp.gov/sites/default/files/whitepapers/2018-06/InformationPaperonCulturalLandscapes.pdf. Accessed on 12 February 2023.

Brown, Kaitlin, Marirose Meyer, Elena Hancock, Nicolasa Sandoval, and Glenn Farris

2022   Map of Chumash villages affiliated with Mission La Purisima Concepcion. Status and Social Stratification at Mission La Purisima Conception: An Intra-Site Investigation of Residential Space within the Chumash Rancheria Amuwu. In: International Journal of Historical Archaeology · May 2022.

Chambers Consultants and Planners

1984   Map Depicting Frequency of Kinship Ties Between Lospe and Other Villages. Report VAFB-1984-26 Archaeological Investigation of the San Antonio Terrace. On file at Vandenberg SFB, California.

David Rumsey Map Collection

2023   Luna Viewer. www.davidrumsey.com. Accessed 1 February 2023.

Museum of Ventura County

2023   Chumash Village Map. https://venturamuseum.org/virtual-exhibits/patterns-on-the-land/. Accessed on 1 February 2023.

National Oceanic and Atmospheric Administration (NOAA)

2023a   Cultural Resources from and Indigenous Perspective. https://sanctuaries.noaa.gov/tribal-landscapes/cultural-resources.html. Accessed on 12 February 2023.

2023b   Office of the Coast Survey Historical Map and Chart Collection. https://historicalcharts.noaa.gov/#searchInput. Accessed on 1 February 2023.

Section 106 of NHPA

1966   36 Code of Federal Regulations (CFR) part 60.4. 54 U.S.C. § 306108.

United States Geologic Survey (USGS)

2023   National Land Cover Base. https://apps.nationalmap.gov/downloader/#/. Accessed 31 January 2023.

Whitaker, Adrian, Jack Meyer, Timothy Slowik, Nathan Stevens, and Christopher Parker

2019   Map of Ethnographic Groups and Languages on the Central Coast. Report VAFB-2019-12 Archaeological Testing and Evaluation for the B1/B6 Electrical Feeder Line Corridor, San Antonio Terrace and Burton Mesa. On file at Vandenberg SFB, California.