ELEVATION ENGINEERING

Chiricahua National Monument Site Design Project Proposal

CENE 476

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Site Background & Purpose

- 1.5 acres of undeveloped land inside the National Monument
- Client is Sam Bell, Chiefs of Facilities Management for NPS at Chiricahua
- Provides additional forms of nearby housing for volunteer/seasonal staff
- Benefits park service employees and creates additional jobs.

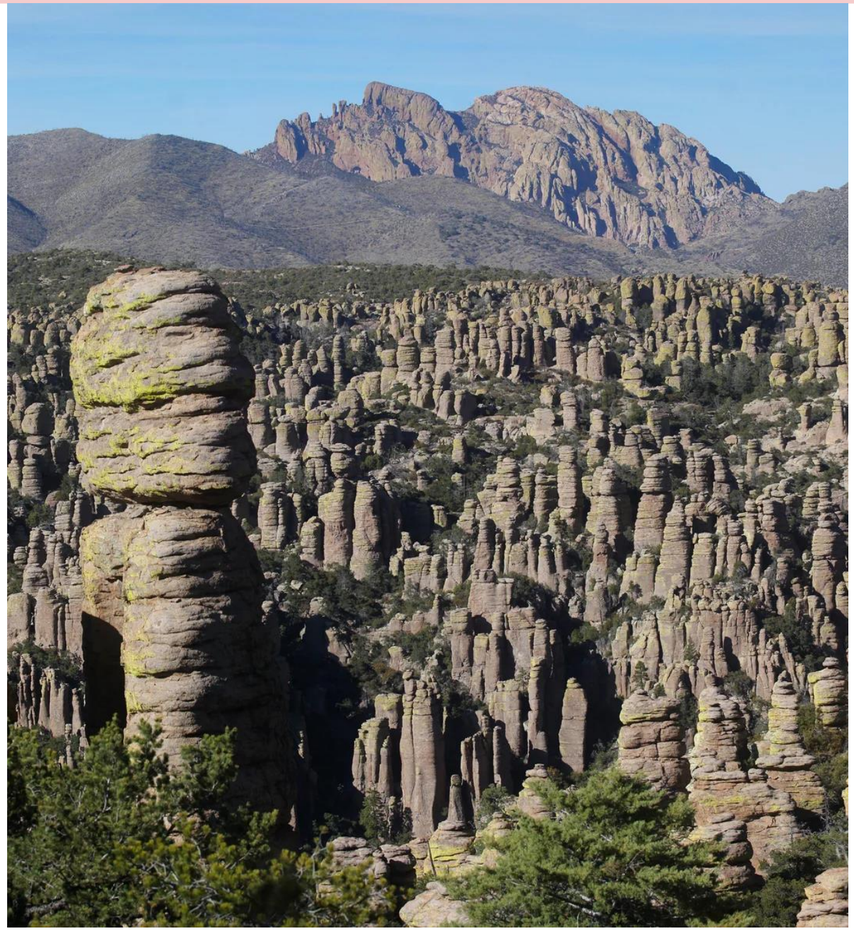


Figure 1: Chiricahua National

Project Location

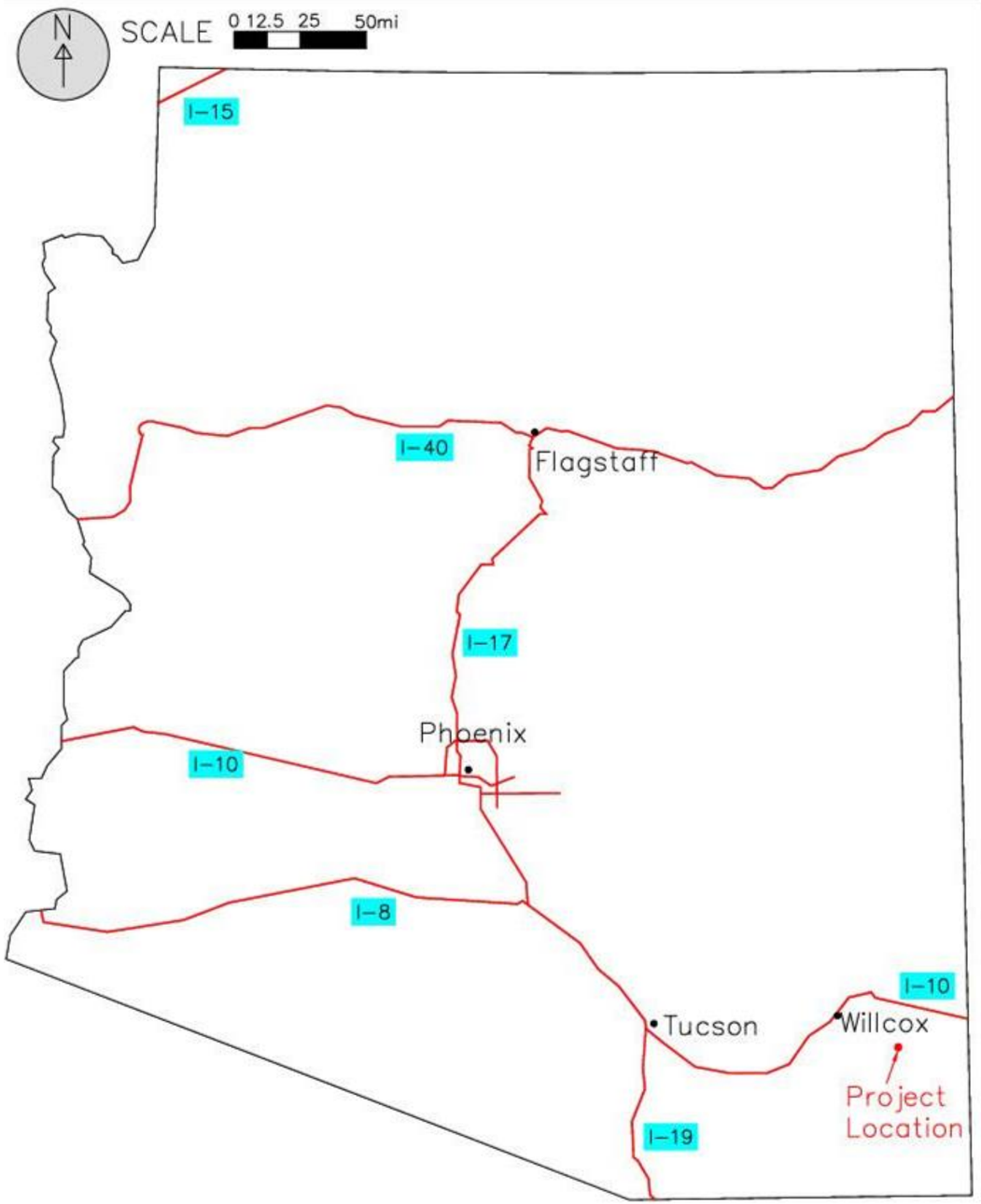


Figure 2: Location Map

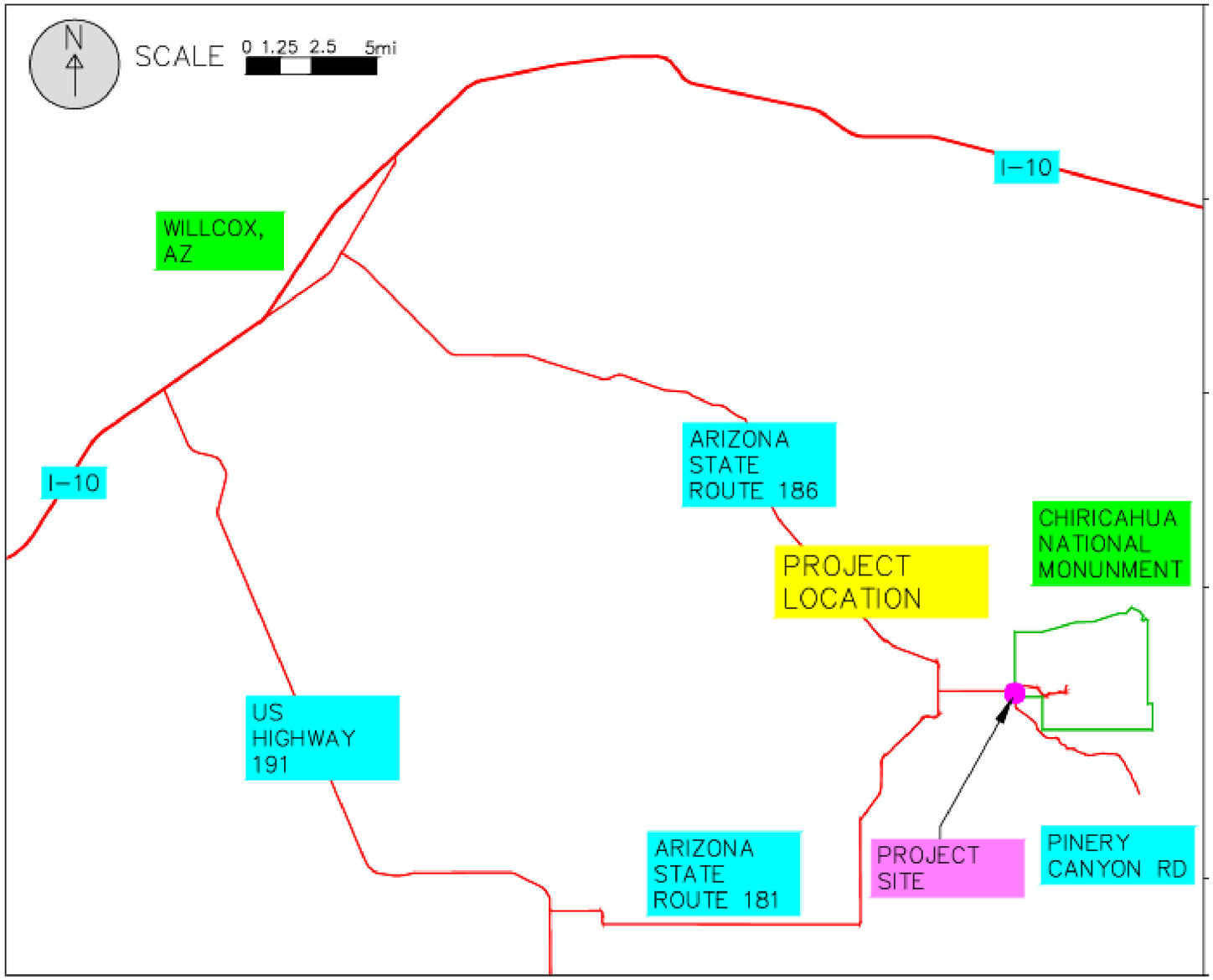


Figure 3: Vicinity Map

Project Site Map

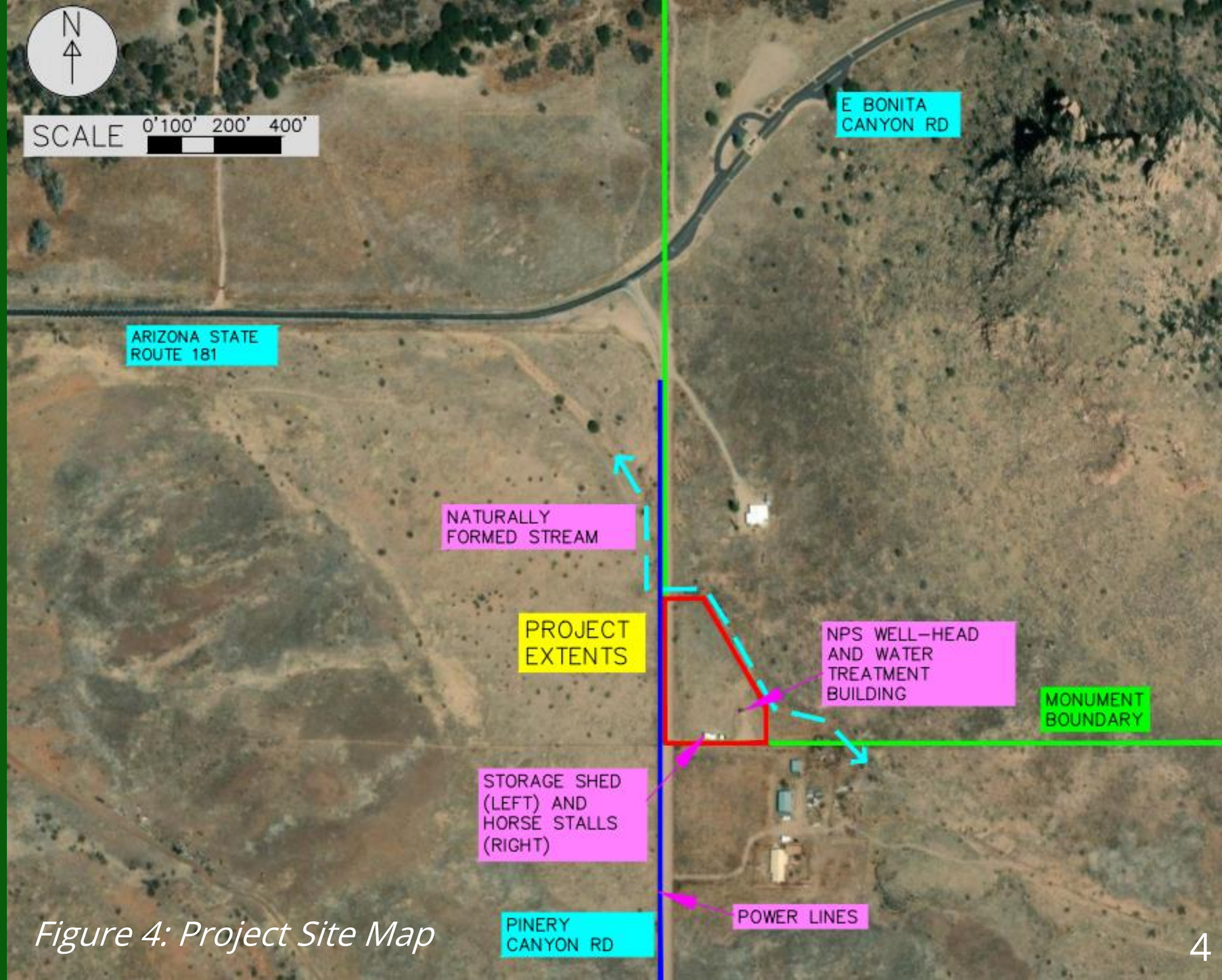


Figure 4: Project Site Map

Task 1: Site Visit

Task 1.1: Pre-visit Planning

- One trip to collect data
- registration for drivers
- Lab room & equipment access

Task 1.2: Surveying

- GPS surveying
- Existing grading, design for compliant grading

Task 1.3: Existing Infrastructure

- Two removable structures
- Geometry of existing infrastructure will be documented

Task 1.4: Soil Sample Collection

- Multiple samples across site

Task 2: Geotechnical Analysis

- Task 2.1: Lab Access
- Task 2.2: Soil Proctor Compaction Test
- Task 2.3:Sieve Test

Task 3: Survey Data Analysis

All data retrieved from site will be utilized for the purpose of analysis, planning, and modeling.

Task 4: Hydrologic Analysis

Task 4.1: Watershed Delineation

- Identify the boundary of watershed

Task 4.2: Determine Runoff Parameters

- Factors influencing the water flow through the site.

Task 4.3: Determine Runoff

- Calculate precipitation at the site over specific over a period of time.

Task 5: Preliminary Design Development

Task 5.1: Develop Alternatives

- Develop a final conceptual design
- This design should meet all requirements.
- Will be in the early phase with abstract ideas to be refined later.

Task 5.2: Identify Selection Criteria

- Will include:
  - cost-effectiveness
  - sustainability
  - compliance with regulations
  - will meet the project's functional requirements and safety standards.

Task 5.3: Best Alternative

- Best solution will be chosen based on decision matrix.

Task 6: Final Site Design

Task 6.1: Roadway Alignment and Geometry

- Development of the roadway in accordance to ADOT, FHWA, and other roadway standards.

Task 6.2: RV Pad Design

- Creation of an RV Pad that is large and strong enough to support larger vehicles.

Task 6.3: Post Development Hydrologic Analysis

- Includes an assessment of the hydrologic impact of the proposed development, focusing on changes in runoff, peak discharge rates, and water quality.

Task 6.4: Drainage

- If needed, a drainage plan will be produced.

Task 6.5: Utility Coordination

- Coordination with a second team for utility placements for the concrete pads will be critical.

Task 7: Develop Construction Cost Estimate

- Will be estimated based off of potential labor, material, and equipment costs
- Specific costs to be estimated off average equipment renting/material costs and similar projects

	Cost Estimate						Page 2
	Description	Qty	Price	UM	Draw	Me	Total
51	**SITE PREPARATION**						
52	• Rough Stake	1	125.00	Lump Sum	0.00	125.00	125.00
53	• Clearing, Grading, Hauling	6	115.00	Hour	0.00	690.00	690.00
54	• Fill Dirt	5	75.00	Load	375.00		375.00
55	• Locate Corners	1	275.00	Lump Sum	275.00		275.00
56					0.00		0.00
57	**TOTAL SITE PREP (LINES 52-55)**				650.00	815.00	1,465.00
58							
59	**FOOTINGS**						
60	• Layout, Dig, and Pour	225	1.10	LF	247.50		247.50
61	• Steel	45	5.40	EA	243.00		243.00
62	• Concrete	15	115.00	CY	1,725.00		1,725.00
63	• Drains				0.00		0.00
64	**TOTAL FOOTINGS (LINES 60-63)**				2,215.50	0.00	2,215.50
65							
66	**FOUNDATIONS**						
67	• Concrete	20	115.00	CY	2,300.00		2,300.00
68	• Brick				0.00		0.00
69	• Block				0.00		0.00
70	• Mortar				0.00		0.00
71	• Sand	5	85.00	CY	425.00		425.00
72	• Steel	75	5.40	EA	405.00		405.00
73	• Vents				0.00		0.00
74	• Damp Proofing	1	375.00	Lump Sum	375.00		375.00
75	• Backfill				0.00		0.00
76	• Labor	1	1,000.00	Lump Sum	0.00	1,000.00	1,000.00
77	• Foundation Survey	1	475.00	Lump Sum	475.00		475.00
78					0.00		0.00
79	**TOTAL FOUNDATIONS (LINES 67-77)**				3,980.00	1,000.00	4,980.00
80							
81	**PAGE TOTALS (LINES 57, 64, 79)**				6,845.50	1,815.00	8,660.50
82							
83							
84							

Figure 5: Example Construction Cost Estimate

Task 8: Construction Plan Set

Task 8.1: Proposed Site Plans

- General plan of site
- Location of roadway and RV pads
- Notes leading to detail sheets

Task 8.2: Road Details

- Plan and profile view of roadway
- Station callouts for RV pads and other important objects
- Callouts to detail sheets

Task 8.3 Misc. Details

- Detail sheets on important objects called out
  - RV Pads
  - Road cross section
- Dimensions of objects
- Construction/installation details
- Material callouts

Task 9: Project Impacts

- Social Impacts
- Environmental disruption
  - Disturbances to flora & fauna
  - Stormwater impacts
- Green property development
- Resource-efficiency

Figure 6: Photo within Chiricahua National Monument

Task 10: Project Deliverables

- 30% Submittal
- 60% Submittal
- 90% Submittal
- Final Submittal

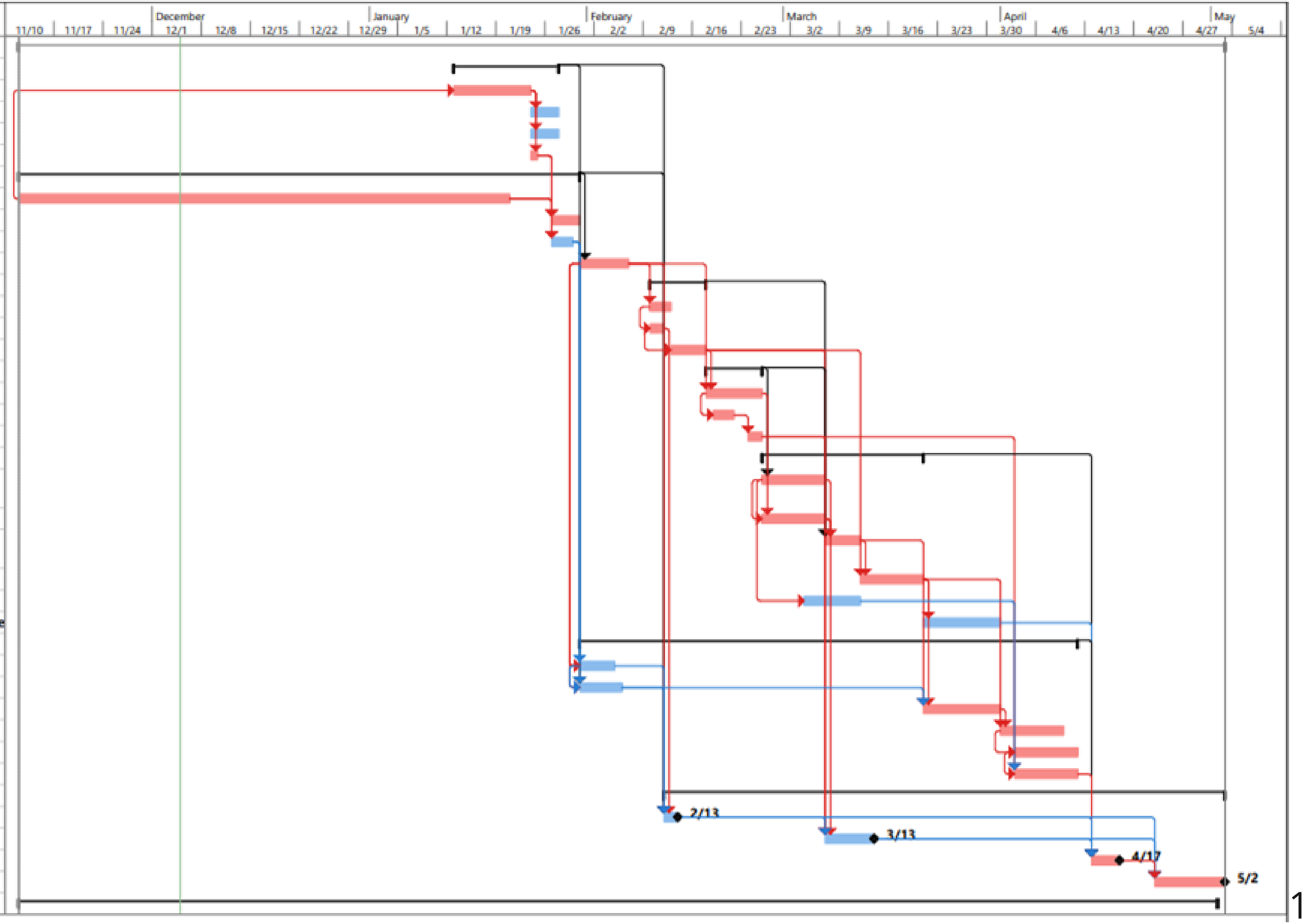
Task 11: Project Management

- Task 11.1: Schedule Management
- Task 11.2: Resource Management
- Task 11.3: Meetings

Project Exclusions

- RV Hookups
- Utilities
- Structures
- Permitting

ID	Task Name
0	**Chiricahua Site Design**
1	**Task 1: Site Visit**
2	Task 1.1: Pre-Visit Planning
3	Task 1.2: Exisiting Infastructure
4	Task 1.4: Surveying
5	Task 1.5: Soil Sample Collection
6	**Task 2: Geotechnical Analysis**
7	Task 2.1: Lab Access
8	Task 2.2: Soil Proctor Compaction Test
9	Task 2.3: Sieve Test
10	**Task 3: Survey Data Analysis**
11	**Task 4: Hydrologic Analysis**
12	Task 4.1: Watershed Delineation
13	Task 4.2: Determine Runoff Parameters
14	Task 4.3: Determine Runoff
15	**Task 5: Preliminary Design Development**
16	Task 5.1: Develope Alternatives
17	Task 5.2: Identify Selection Criteria
18	Task 5.3: Best Alternative
19	**Task 6: Final Site Design**
20	Task 6.1: Roadway Alignement and Geometry
21	Task 6.2: RV Pad Design
22	Task 6.3: Post Development Hydrologic Analysis
23	Task 6.4: Drainage
24	Task 6.5: Utility Coordination
25	**Task 7: Develop Construction Cost Estimate**
26	**Task 8: Construction Plan Set**
27	Task 8.1: Cover Sheet
28	Task 8.2: Existing Site Plans
29	Task 8.3 Proposed Site Plans
30	Task 8.4: Road Alignment and Profile
31	Task 8.5: Details
32	**Task 9: Project Impacts**
33	**Task 10: Project Deliverables**
34	Task 10.1: 30% Submittal
35	Task 10.2: 60% Submittal
36	Task 10.3: 90% Submittal
37	Task 10.4: Final Design Submittal
38	**Task 11: Project Management**



Project Staffing Plan

Senior Engineer (SENG)

- Responsible for overview of the project
- Key decision maker
- Client communicator

Engineer (ENG)

- Surveying and data analysis
- Detail/site design
- CAD drafting

Engineer in Training (EIT)

- Editing and revision of submissions
- Aid ENG where needed

Engineering Intern (EI)

- Assisting ENG and EIT
- Report drafting
- Smaller CAD drawings
- Surveying and geotechnical work

Project Staffing Hours Table

Figure 7: Summary Staffing Table

Task	SENG	ENG	EIT	EI	Total
Task 1: Site Visit	2	8	30	20	60
Task 2: Geotechnical Analysis	2	12	18	6	38
Task 3: Survey Data Analysis	2	3	10	6	21
Task 4: Hydrologic Analysis	6	17	26	16	65
Task 5: Preliminary Design Development	4	23	35	21	83
Task 6: Final Site Design	4	35	48	11	98
Task 7: Develop Construction Cost Estimate	2	2	8	2	14
Task 8: Construction Plan Set	7	10	18	13	48
Task 9: Project Impacts	2	6	0	0	8
Task 10: Project Deliverables	13	29	30	18	90
Task 11: Project Management	20	50	20	45	135
TOTAL	**64**	**195**	**243**	**158**	**660**

Cost of Engineering Services Table

	Classification	Hours	Rate	Cost
1.0 Personnel	Senior Engineer	64	$280	$ 17,920
	Engineer	195	$195	$ 38,025
	Engineering in Training	243	$145	$ 35,235
	Engineer Intern	158	$70	$ 11,060
	Total Personnel			**$ 102,240**
	Classification	**Quantity**	**Rate**	**Cost**
2.0 Travel	Large AWD vehicle	3 days	$52.8/day	$ 158
	Mileage	750 miles	$0.31/mile	$ 233
	Hotel	3 rooms, 2 nights	$145/day/room	$ 870
	Per Diem	4 people, 3 days	$54/day/person	$ 648
	Total Travel			**$ 1,909**
	Classification	**Quantity**	**Rate**	**Cost**
3.0 Supplies & Equipment	Nikon/Topcon 3D Total Station	3 days	$35/day	$ 105
	Tripod	3 days	$10/day	$ 30
	GPS Rover (includes accessories)	3 days	$50/day	$ 150
	4 Reflective Vests	3 days	$5/day	$ 15
	Soil Storage Container	3 units	$4/unit	$ 12
	Compaction Lab access/testing	2 days	$100/day	$ 200
	Sieve Lab access/testing	2 days	$100/day	$ 200
	Computer Lab Access	10 days	$100/day	$1000
	Total Supplies			**$ 1,712**
4.0 Total Cost of Engineering Services				**$ 105,861**

Figure 8: Cost of Engineering Services

References

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Questions?

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