

Civil and Environmental Engineering



# Emerald Isle Mine Preliminary Assessment & Site Investigation

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Client: Bureau of Land Management  
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Technical/Grading Advisor: Dr. Bridget Bero

# Introduction & Project Purpose

- *Purpose:* preliminary assessment and site investigation (PA/SI) of the Emerald Isle Mine in Northwest Arizona.



Figure 1: Open Pit



# Location

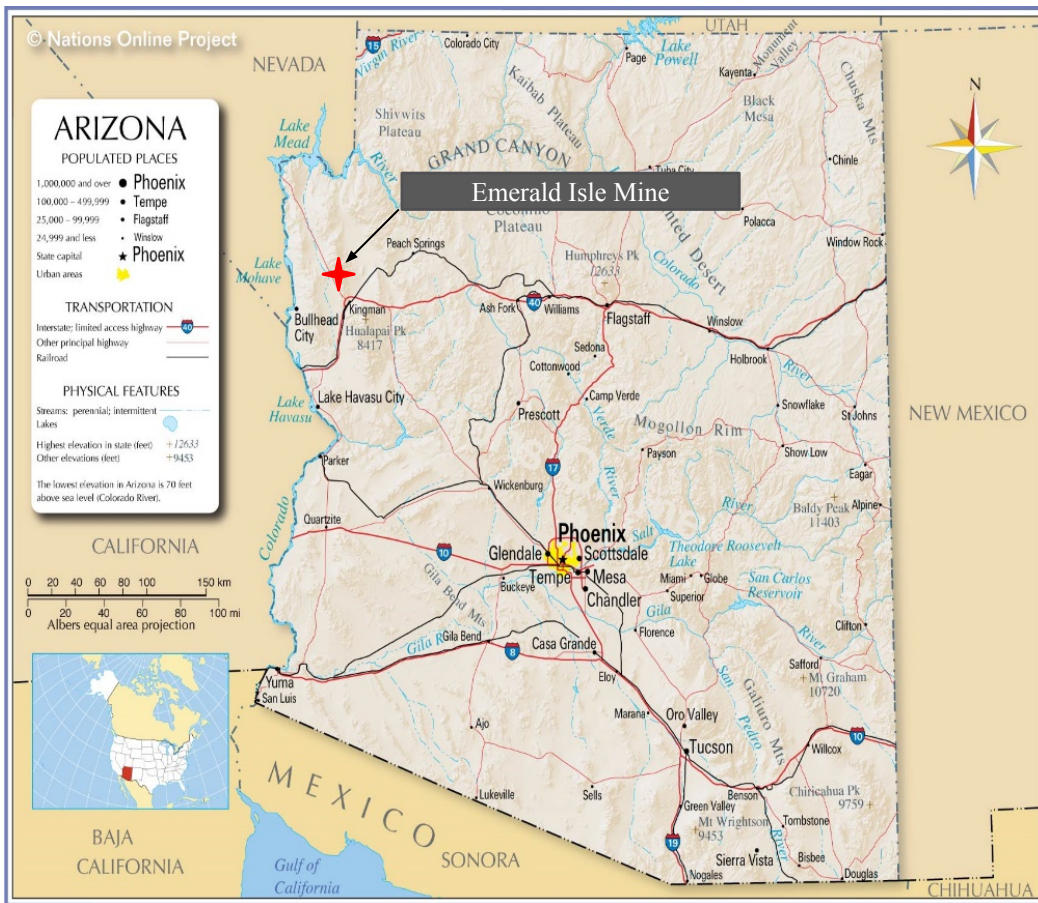


Figure 2: State Map [1]

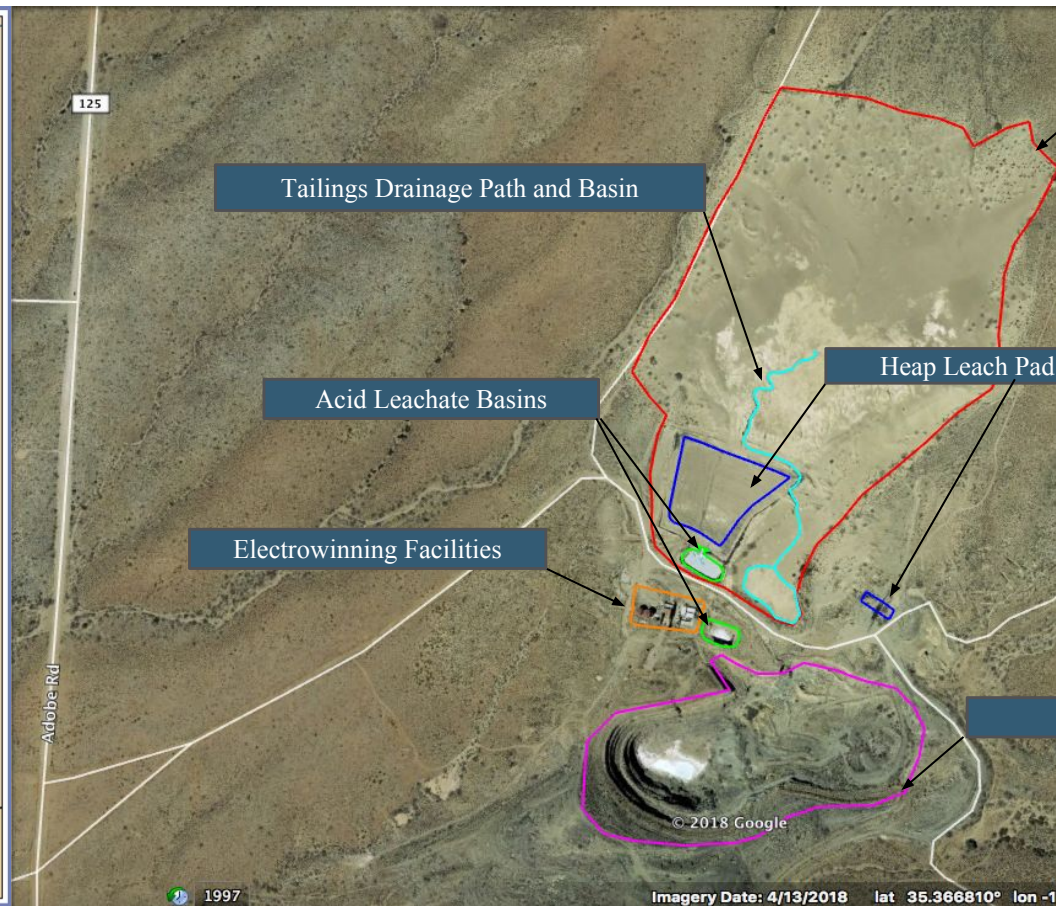


Figure 3: Emerald Isle Map



# Task 1: Work Plan

- 1.1: Sampling Analysis Plan (SAP)
- 1.2: Health and Safety Plan (HASP)

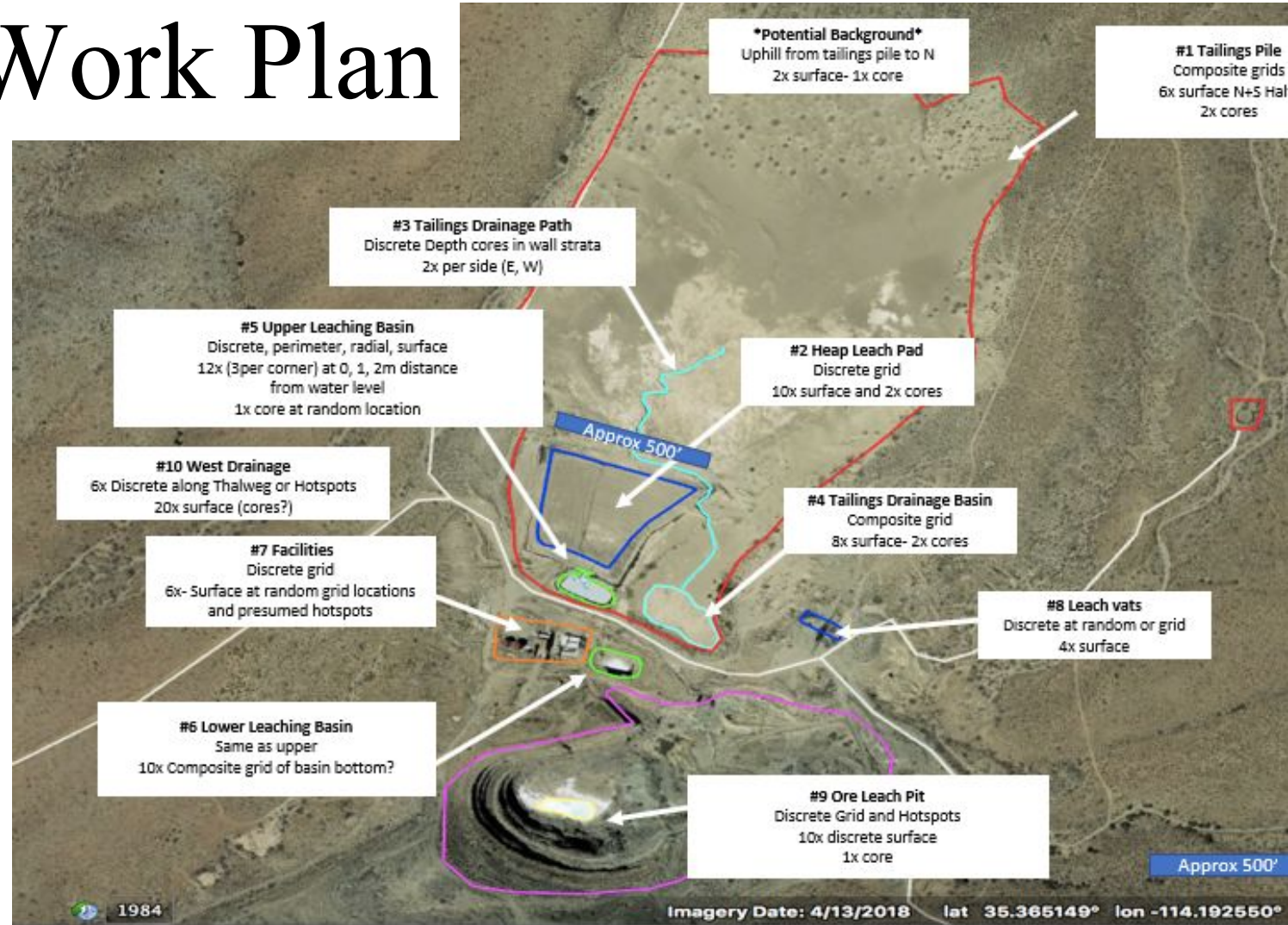


Figure 4: Decision Unit Map



# Task 2: Field Investigation

- Sampling will be done in accordance with the Work Plan



Figure 5: Empty  
Leach Pit [6]



Figure 6: Tailings

# Task 3: Analysis

- 3.1: Dry and Sieve the Samples
- 3.2: X-Ray Fluorescence (XRF) Analysis
- 3.3: Contaminant of Concern Determination
- 3.4: Acid Digestion of Soil and Sample Preparation
- 3.5: ICP-MS Analysis
- 3.6: Correlation of ICP-MS/XRF Data



Figure 7: Handheld XRF



Figure 8: ICP-MS



# Task 4: Risk Assessment

- 4.1: Human Health Risk Assessment (HHRA)
  - 4.3.1: Determine Exposure Point Concentrations
  - 4.3.2: Toxicity Assessment
  - 4.1.3: Exposure Assessment
  - 4.1.4: Risk Calculations

- 4.2: Ecological Risk Assessment
  - 4.2.1: Characterization of Ecology
  - 4.2.2: Toxicity Assessment
  - 4.2.3: Exposure Assessment
  - 4.2.4: Risk Characterization

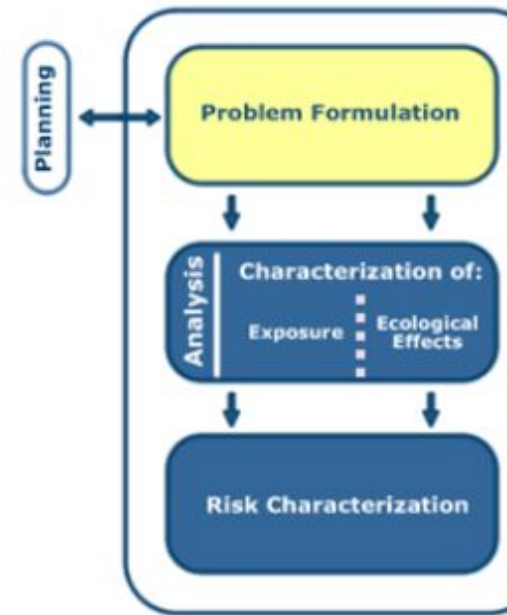


Figure 10: Ecological Risk Assessment

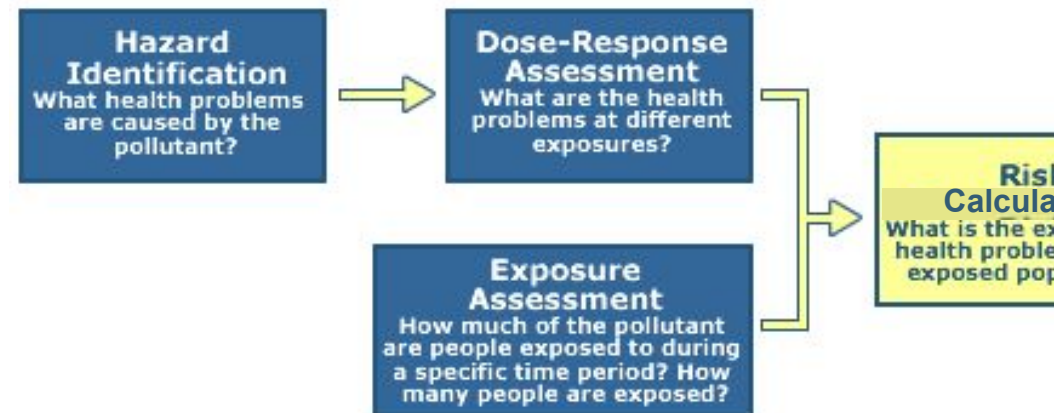


Figure 9: Human Health Risk Assessment Flowchart [5]

# Task 5: Impacts

- Environmental
- Economic
- Social
  - Recreational users
  - Health



Figure 11: Pregnant Leachate Pond [6]



Figure 12: Tailings canyon [6]



# Task 6: Project Management

- 6.1: Meetings
  - Client
  - Technical Advisor/Grading Instructor
  - Team
- 6.2: Scheduling and Resource Management
- 6.3: Project Deliverables
  - 30% Report and Presentation
    - Task 3.1 - Drying and Sieving of Soil
  - 60% Report and Presentation
    - Task 3.5 - XRF and ICP-MS Correlation
  - 90% Report and Presentation
    - Task 5.0 - Project Impacts
  - Final Report - PA/SI
  - Presentation
  - Website



Figure 13: SPNG Company Logo

# Exclusions

- Remediation Alternatives
- Hydrology and Water Sampling



Figure 14  
Leachate



# Project Schedule

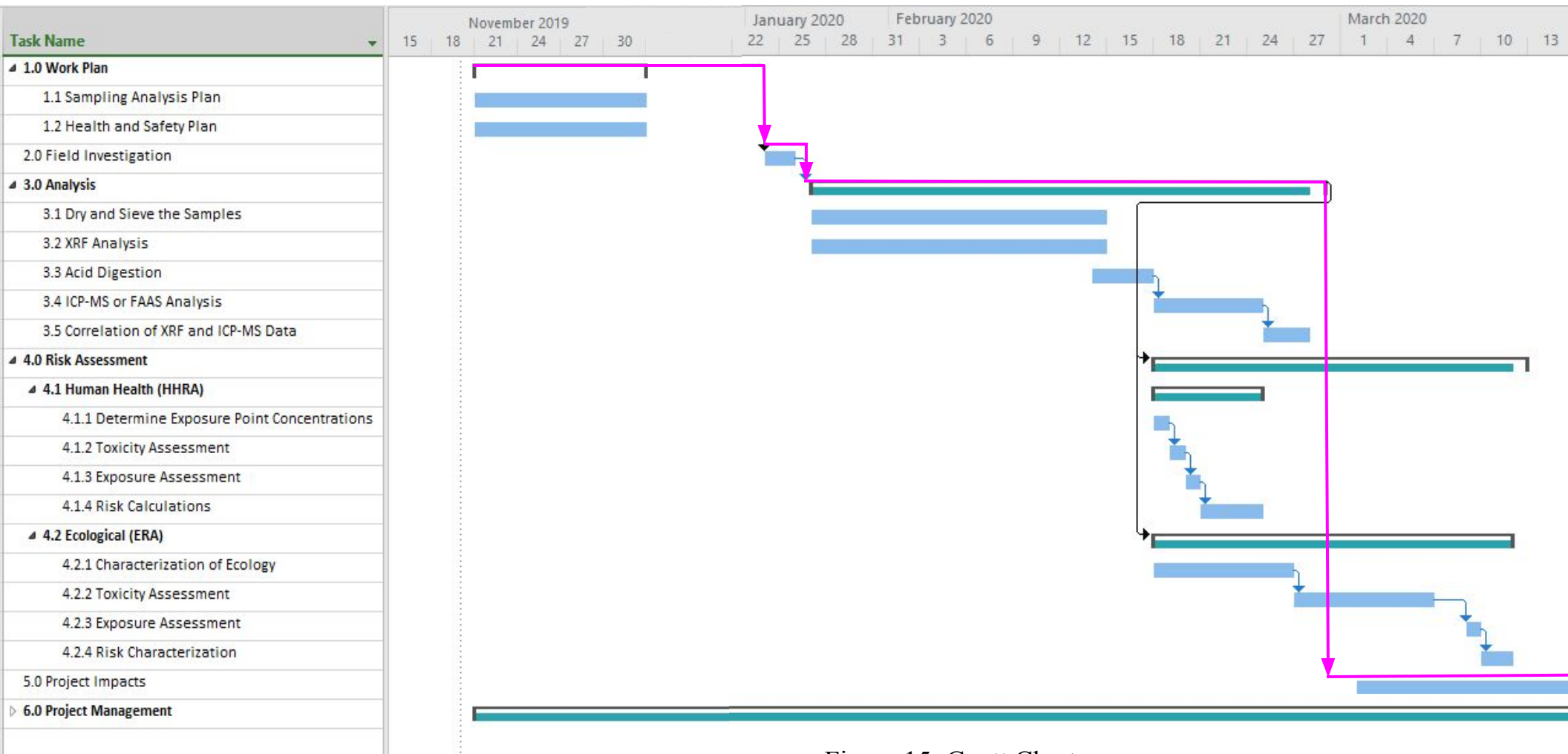


Figure 15: Gantt Chart

Table 1: Staffing Overview

# Staffing Plan

- Personnel and Titles
- Personal Qualifications
- Total Estimation of Work
- Staffing Summary

Task	PE (hrs)	EIT (hrs)	LAB (hrs)
<b>TASK 1: Work Plan</b>			
1.1 Sampling Analysis Plan (SAP)	8	24	12
1.2 Health and Safety Plan (HASP)	8	24	12
<b>TASK 2.0: Field Investigation</b>	16	16	16
<b>TASK 3.0: Analysis</b>			
3.1 Dry and Sieve the Samples	2	4	12
3.2: X-Ray Fluorescence (XRF) Analysis	4	20	40
3.3: Acid Digestion of Soil and Sample Prep	1	4	10
3.4 ICP-MS or FAAS Analysis	2	8	16
3.5: Correlation of ICP/FAA and XRF/FAA Data	1	2	8
<b>TASK 4.0: Risk Assessment</b>			
4.1: Human Health Risk Assessment			
4.1.1: Determine Exposure Point Concentrations	1	6	
4.1.2: Toxicity Assessment	1	6	
4.1.3: Exposure Assessment	1	6	
4.1.4: Risk Calculations	1	6	
4.2: Ecological Risk Assessment			
4.2.1: Characterization of Ecology	4	12	
4.2.2: Toxicity Assessment	4	12	
4.2.3: Exposure Assessment	2	6	
4.2.4: Risk Characterization	2	6	
<b>TASK 5.0: Project Impacts</b>	4	8	4
<b>TASK 6.0: Project Management</b>			
6.1: Meetings			
6.1.1: Client Meetings	4	16	8
6.1.2: Technical Advisor and Grading Instructor Meetings	4	16	8
6.1.3: Team Meetings	16	32	32
6.2: Scheduling and Resource Management	8	16	8
6.3: Project Deliverables			
6.3.1: 30% Report and Presentation	4	16	8
6.3.2: 60% Report and Presentation	4	16	8
6.3.3: 90% Report and Website	2	8	16
6.3.4: PA/SI Final Report	2	8	4
6.3.5: Final Presentation	2	8	4
6.3.6: Final Website	2	8	16
<b>TOTALS (hrs)</b>	<b>110</b>	<b>314</b>	<b>242</b>



Table 2: Cost of Engineering Services

# Cost of Engineering Services

- Personnel Costs
- Travel Costs
- Supplies & Lab Fees

1.0 Personnel	Classification	Hours/Quantity	Rate, \$/hr
	PE	110	195
	EIT	314	67
	LAB TECH	242	48
	TOTAL	666	
2.0 Travel			
	Mileage, 1 trip	652	\$0.58/mile
	Hotel Rooms in Kingman	3 Rooms for 1 Night	\$94/room,night
	Meals	7 persons, 2 days	\$55/day/person
3.0 Supplies			
	Ziplocks	4	\$18/152 count Freezer Bag, Gallon
	Lab Disposable Gloves	4	\$10/100 ct. box
	1 1/2" X 5' Plastic Liner for Auger/Samples	8 (= 40 1 ft tubes)	\$4/liner
	Buckets	15	\$3.25/bucket
	Sample Marker Flags	Bundle of 100	\$8/bundle
	Garbage Bags	55 Gallon, 80 Count, heavy duty	\$24/Box
	Trowels	7	\$10/trowel
	Pens	box of 36	\$7/box
	Tape Measure	7	\$8 each
	Water	2.5 Gallon Jug (x7)	\$3/jug
	GPS Unit Rental	7	\$20/day
	Lab Notebooks	Individual	
Chemistry Lab	Acid Digestion Reagents/Materials + ICP-MS Analysis (including reagents)	20 Samples	\$50/sample
CENE Lab Access	Soil Sieving	7 days	\$100/day
ENE Lab Use	XRF Analysis	7 days	\$100/day
5.0 TOTAL			

# References

- [1] <https://www.mapsofworld.com/usa/states/arizona/arizona-map.html>
- [2] [https://www.forestry-suppliers.com/product\\_pages/products.php?mi=31171&itemnu=67351](https://www.forestry-suppliers.com/product_pages/products.php?mi=31171&itemnu=67351)
- [3] <https://www.azom.com/equipment-details.aspx?EquipID=444>
- [4] [txscientific.com/icp-ms-x-series-c69.aspx](https://txscientific.com/icp-ms-x-series-c69.aspx)
- [5] <https://nepis.epa.gov/Exe/ZyPDF.cgi/20012GDU.PDF?Dockey=20012GDU.PDF>
- [6] Sydney Adamonis