Harquahala Mine PA/SI Project Proposal

CENE 476C

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Table of Contents

List of Tables

List of Figures

List of Abbreviations

ALM	Adult Lead Model
AZ	Arizona
AZSRS	Arizona Soil Remediation Standards
BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of concern
Eco-SSL	Ecological Soil Screening Levels
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
FAAS	Flame Atomic Absorption Spectroscopy
ICP-OES	Inductively Coupled Plasma Optical Emission Spectroscopy
IEUBK	Integrated Exposure Uptake Biokinetic Model
IRIS	Integrated Risk Information System
RAO	Remedial action objective
PA	Preliminary assessment
PPE	Personal Protective Equipment
RAO	Remedial Action Objective
SAP	Sampling and Analysis Plan
SCM	Site Conceptual Model
SI	Site investigation
XRF	X-ray fluorescence

1.0 Project Understanding

1.1 Project Purpose

The goal of this project is to conduct a preliminary assessment (PA) and site investigation (SI) of Harquahala mine to evaluate possible threats to human health and the environment. Using information from the PA/SI, remedial actions can be evaluated for this site in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [1].

1.2 Project Background

The Harquahala Mine, also known as the Bonanza Mine, located off Harquahala Mine Road in La Paz County Arizona spans about 51 acres on undeveloped federal land and private land [2] [3]. Table 1.1 details the site's GPS locators.

Table 1.1: Site Location Details

Property location	Gila-Salt River Township 004N Range 013W Section 022
Latitude	N 33°40'03"
Longitude	W 113°35'26"

Figure 1.1 shows the Harquahala Mine is located 26 miles south of Salome and 95 miles northwest of Phoenix.

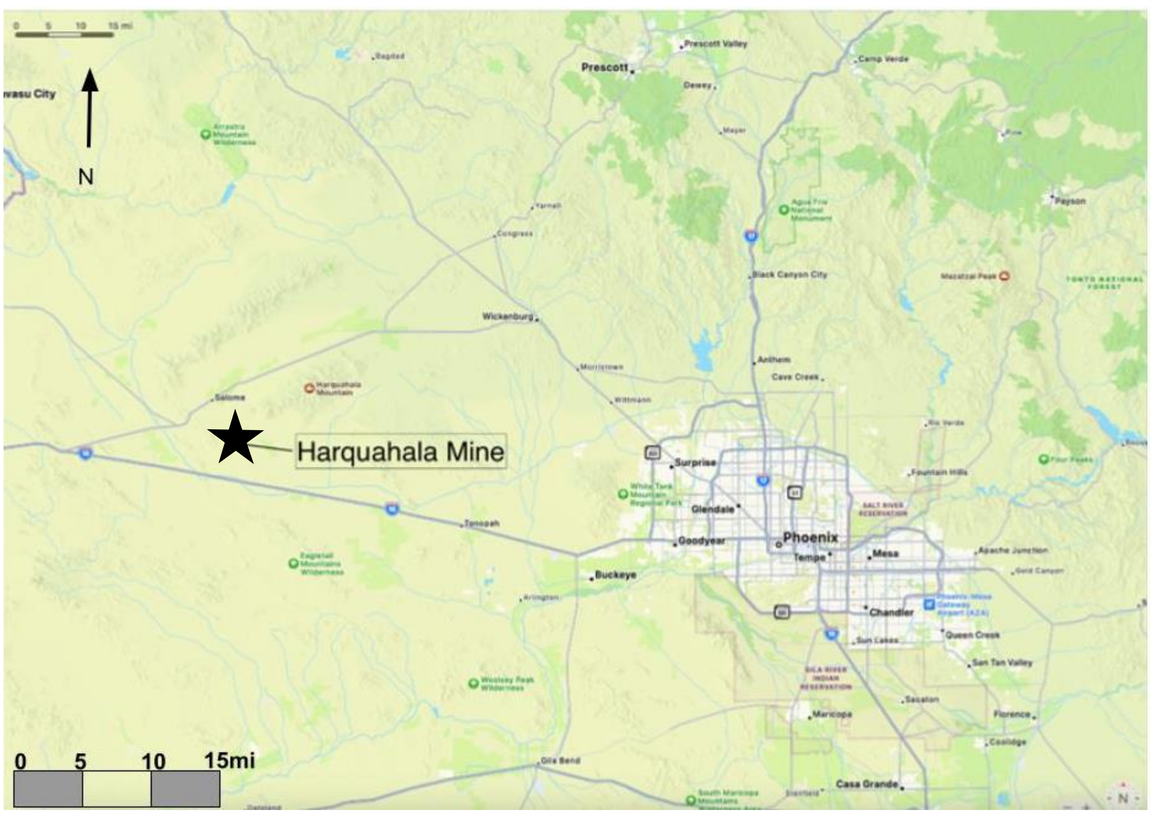

Figure 1.1: Location map of Harquahala Mine in reference to Phoenix, Arizona. [4]

Figure 1.2 shows the road access of the Harquahala Mine from I-10 with reference to Salome.

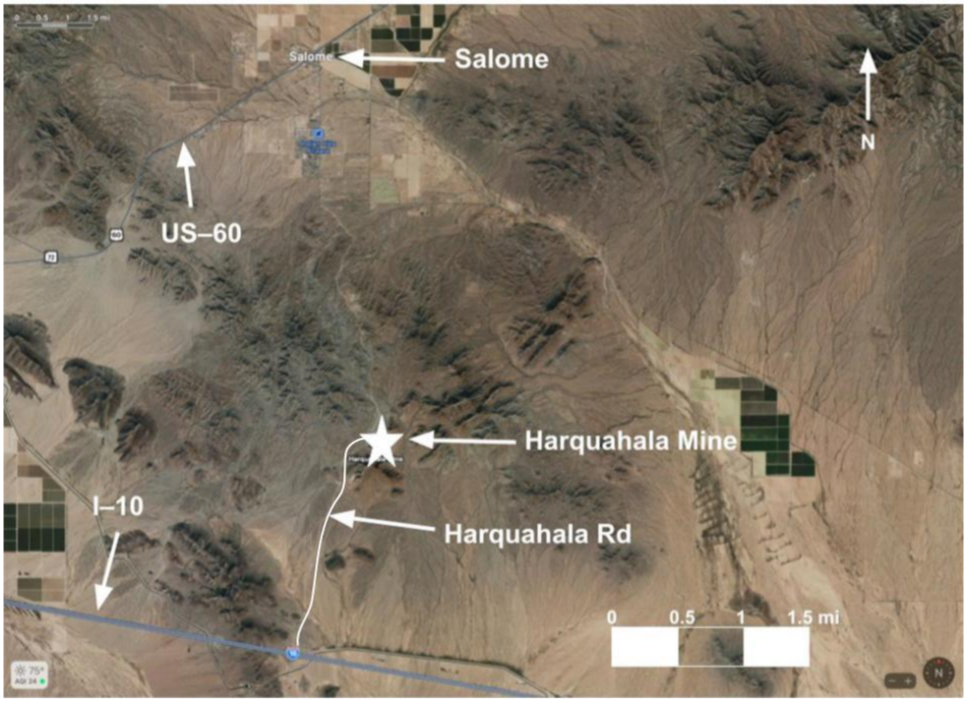

Figure 1.2: Harquahala Mine access road in reference to Salome [4]

The area surrounding the site is public BLM land accessible via 2-wheel drive access roads. The area is bound by Martin Peak to the south, a large hill to the northwest, Harquahala Mine Road to the west with internal access roads from the north. The current boundaries of the Bonanza Mining Company (private land) are estimated and shown in Figure 1.3 (yellow). An active leach pit can be seen on private land. Existing washes (blue) flow to the south and east from the site with one directly adjacent to a tailings pile (shown as a dark blue rectangle) on BLM land. The proposed site access route for the site investigation is highlighted in yellow with the proposed site investigation boundary highlighted in green and outlined in red.

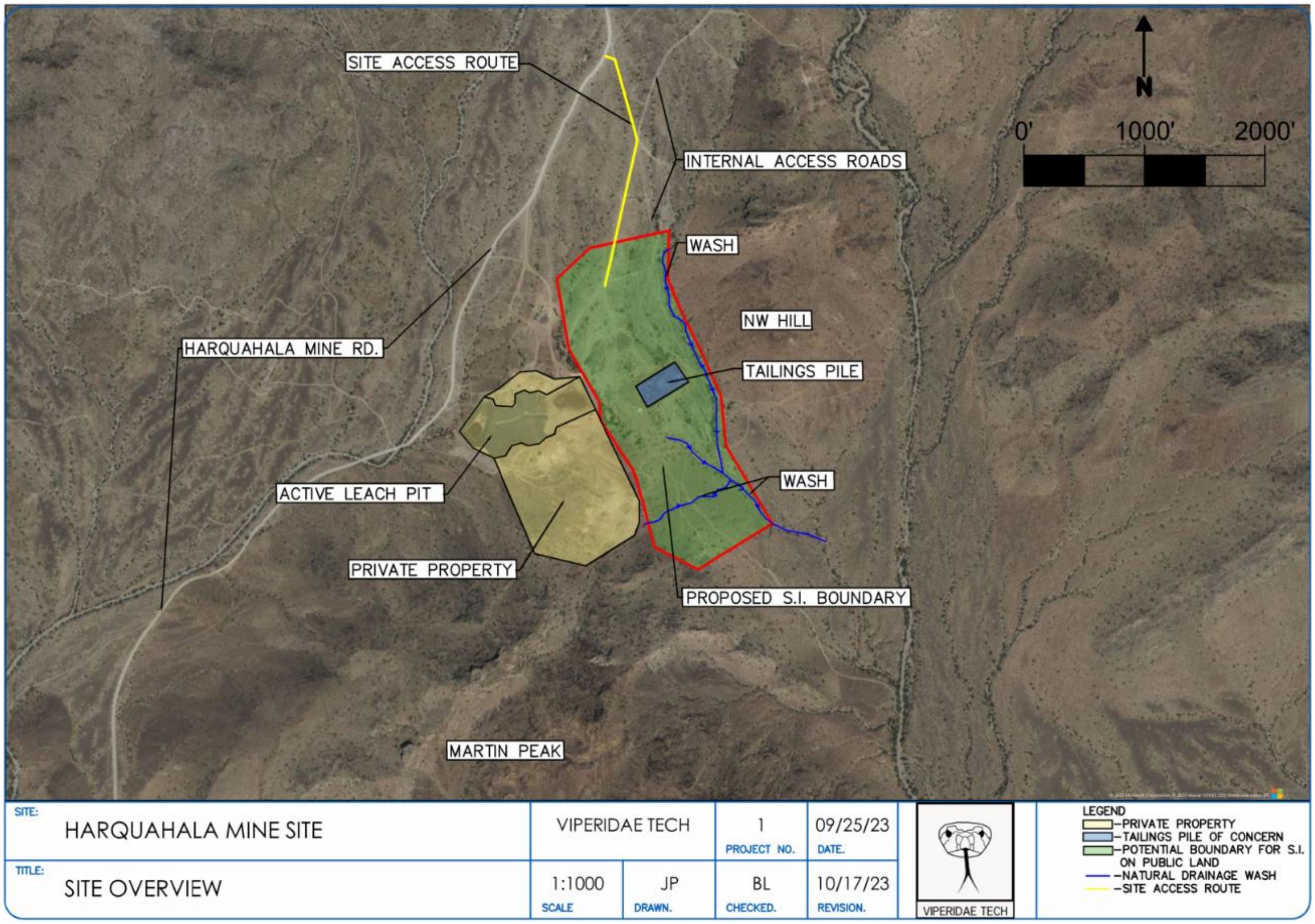

Figure 1.3: Site Features at the Harquahala Mine

Several wells are located in the area. Figure 1.4 shows the location of registered wells that surround Harquahala mine site [4].

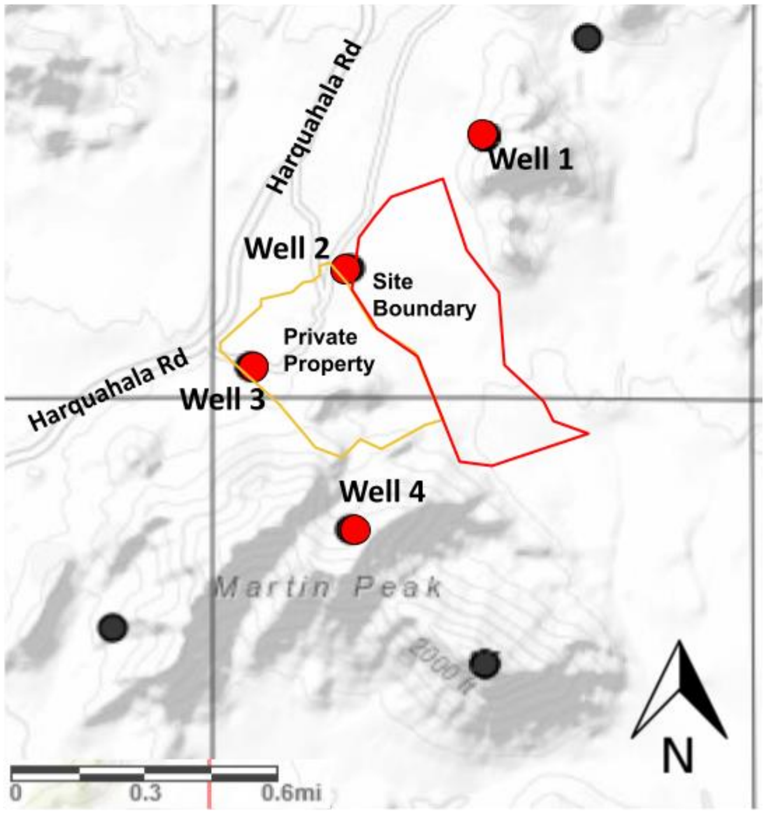

Figure 1.4: Registered Wells near Harquahala Mine [5]

Wells 2 and 4 were used for mineral exportation in 1984 and are now shown as abandoned. Well 1 has also been abandoned since 2007. Well 3 is shown to be the only active well on the site, but there is no information about Well 3 since the well is privately owned (since 2020). Well information is found in Table 1.2 below.

Table 1.2: Well Data [4]

	Well 1	Well 2	Well 3	Well 4
Registration No.	55-906449	55-509667	55-232402	55-509666
Active	No	No	Yes (Private)	No
Water Use	Other-Mineral	N/A	N/A	N/A

Mining operations began as early as 1888, with sporadic working until the 1980s; The mine was owned by David Oberstine of Golden Eagle Mining Co. during the 1960s [2]. Since 1985 the Bonanza Mining Company (Ray Wreggit) has owned the mine, and currently is performing heap leach operations. The Harquahala Mine was historically mined for gold, silver, lead, and copper using a stamp mill since 1888 and heap leaching since 1896. Approximately 180,000-200,000 ounces of gold have been mined since the late 1800's; the Bonanza Mining Company recovered another 150,000-300,000 ounces of gold with their most recent claim [2]. Most of the contamination at the site occurred in the 1970s and 1980s as cyanide heap leaching operations were common at the time. No documentation of cleanup operations was found.

Throughout the site there is extensive evidence of recreational use such as all-terrain vehicle tracks on tailings piles and target shooting. The use of all-terrain vehicles on the large tailings pile is contributing to erosion, allowing further migration of these tailings off private land and onto BLM land, Harquahala Mine Road, and the wash which runs south/southeast of the site [3].

The most recent field investigation at the Harquahala mine site took place on March 9, 2018 by the BLM. Nine in-situ x-ray fluorescence (XRF) surface soil readings were taken on the tailings pile and surface soils downwash. Figure 1.5 shows the sampling locations from the 2018 study and the proposed site boundary.

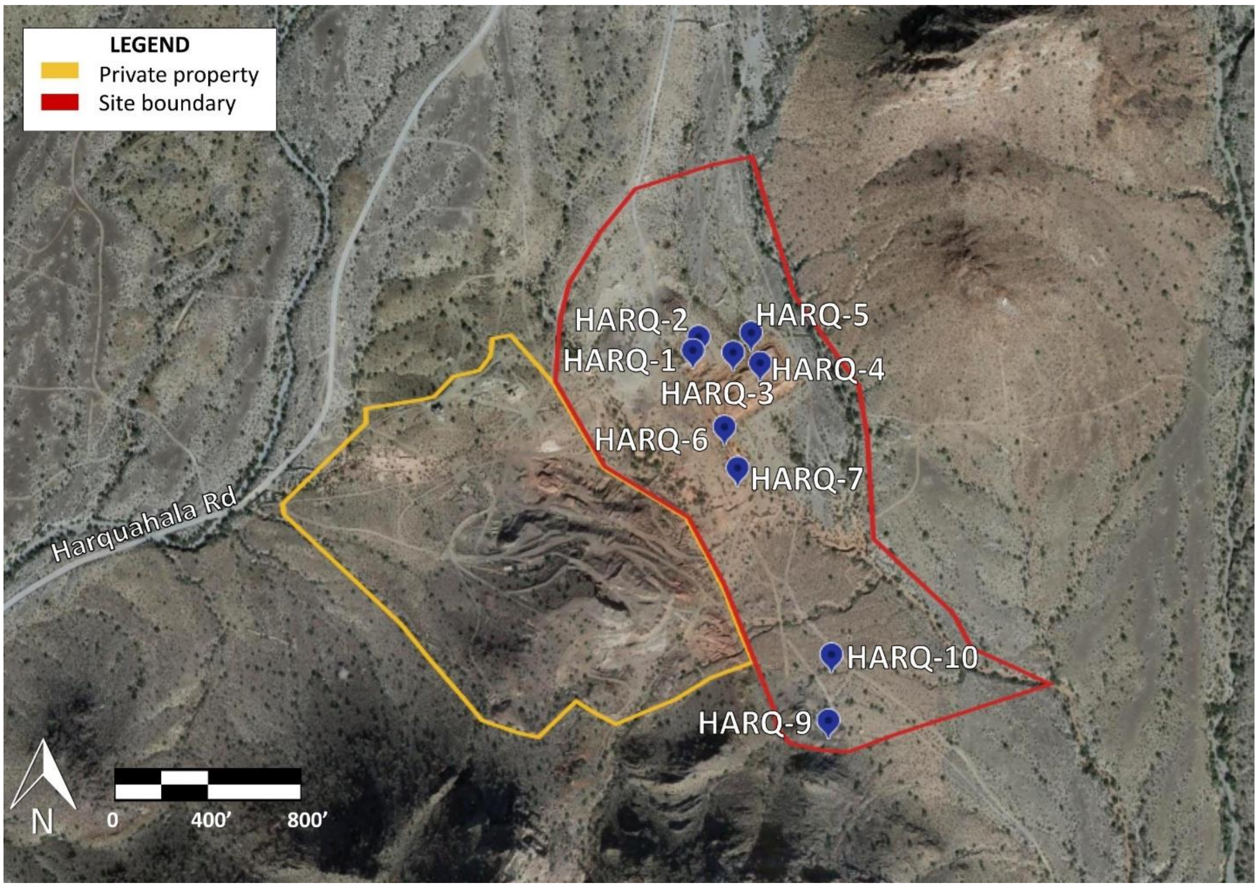

Figure 1.5: Sampling locations of 2018 field study [6]

The XRF results are shown in Table 1.3, where cells highlighted in red exceed the Arizona non-residential soil remediation standard and those in yellow lie between the Arizona residential and non-residential standards. Lead and arsenic readings are in excess of the nonresidential standards, indicating significant contamination on the public land.

Table 1.3: X-ray fluorescence results from 2018 field study [3]

SAMPLE	Units	Latitude	Longitude	Pb	Pb Error	As	As Error	Sb	Sb Error
AZ Remediation Standard **(Residential/Non-Residential)**				400/800		10/10		31/410	
harq-1	ppm	33.670573	-113.589056	3467.73	132.82	<LOD	148.02	219.02	18.79
harq-2	ppm	33.670424	-113.589009	1228.35	25.93	56.3	19.32	55.24	8.12
harq-3	ppm	33.670291	-113.588466	2519.63	55.18	196.72	41.76	160.96	15.15
harq-4	ppm	33.670428	-113.588136	2517.86	57.9	133.29	43.29	195.47	23.15
harq-5	ppm	33.670774	-113.588257	2522.42	41.9	160.47	31.48	134.11	10.95
harq-6	ppm	33.669696	-113.588618	1764.09	30.04	82.69	22.38	79.5	7.61
harq-7	ppm	33.669225	-113.588437	4578.83	59.46	356.07	44.95	184.39	12.06
harq-9	ppm	33.666342	-113.587199	693.26	20.02	<LOD	22	33.92	8.03
harq-10	ppm	33.667088	-113.587147	1885.54	33.51	99.14	25.05	74.59	8.49

1.3 Technical Considerations

This project will involve the development of a Work Plan, including a Sampling and Analysis Plan (SAP) and a Health and Safety Plan (HASP), specific to the Harquahala Mine area prior to a site visit. Soil sampling will be conducted and samples will be analyzed with in-situ and ex-situ XRF analysis to quantify the concentration of elements and determine Contaminants of Concern (COC) for both human health risk and ecological risk. Additional analysis under different instrumentation than XRF is likely to be conducted to confirm concentrations of arsenic. The data will then be arranged to demonstrate the spatial extent and concentration of each COC across the site.

Carcinogenic and non-carcinogenic human health risk and ecological risk will be determined for various exposure scenarios. The risk assessment for lead will use the Integrated Exposure Uptake Biokinetic Model (IEUBK) and Adult Lead Model (ALM) provided by the Environmental Protection Agency [5]. A remedial design for site cleanup will be developed.

1.4 Potential Challenges

Unexpected weather conditions at the site could disrupt the team's sampling visit. The site investigation will be scheduled to include alternate dates to minimize this risk. In the event of wet soil conditions that could impact in-situ XRF analysis onsite, XRF analysis of the dried, un-sieved soil samples will be performed in the lab to mimic in-situ XRF analysis.

1.5 Stakeholders

The primary stakeholders to this project are the BLM and the Bonanza Mining Company. Secondary stakeholders include the public engaging in recreation at the site as well as nearby private property owners.

2.0 Scope of Services

2.1 Task 1.0 Work Plan and Laboratory Use

2.1.1 Task 1.1: Sampling and Analysis Plan

As part of the Work Plan, the team will develop a Sampling and Analysis Plan (SAP) that will incorporate the following elements: identification of the responsible agency, creation of a project organizational table, an overview of sampling procedures, project goals, data quality objectives, and quality assurance and quality control measures for both field and laboratory processes [6]. In addition, the SAP will outline field sampling guidelines, covering selection of sampling locations, soil sampling techniques, equipment usage and calibration, sample container specifications, proper sample labeling, preservation methods, packaging guidelines, shipping procedures, equipment decontamination protocols, hazardous and non-hazardous waste management, and the necessary documentation (i.e., field notes, photographs, and custody records). Finally, the SAP will outline analysis procedures: sample drying, sample sieving, XRF analysis, acid digestion, confirmation via FAAS and ICP-OES methods, as well as the proper field and laboratory disposal procedures [6].

2.1.2 Task 1.2: Health and Safety Plan

As a part of the Work Plan, the team will develop a Health and Safety Plan (HASP) that encompasses the following: job name and location, hazard assessment, safety and health administration and personal protective equipment (PPE) for biological, chemical, and physical hazards in both the field and the lab, decontamination and disposal of PPE, and locations of nearest emergency rooms. The team will be trained to use NAU XRF.

2.1.3 Task 1.3: Soils Lab Binder

The team will compile a lab binder outlining lab procedures and waste management for responsible use of the NAU Soils Laboratory. This binder must be approved prior to accessing the lab.

2.2 Task 2.0: Site Investigation

The team will conduct a site visit January 19-20, 2024. Should weather conditions pose a problem, the site visit will be changed to January 26-27, 2024. The team will collect soil samples and complete a flora and fauna photo survey as outlined in the Work Plan during the site visit.

2.3 Task 3.0: Sample Analysis and Identification of COCs

Sample analysis in the laboratory will be conducted according to the Work Plan and consists of the following subtasks.

2.3.1 Task 3.1: Sample Drying

To complete an XRF analysis, each soil sample must first be dried using ASTM Method D2216-10 [7].

2.3.2 Task 3.2: Sample Sieving

The dry soil samples will be sieved before conducting the XRF analysis to remove any large particles using ASTM Method D6913-04 [8]. Samples may be crushed prior to sieving to assure that clays are not clumped into larger particles. Material passing the #60 (0.25mm) sieve will be retained for further analysis, as metals are typically not associated with the larger sand fractions.

2.3.3 Task 3.3: In-lab XRF Analysis

After drying and sieving, XRF analysis will be performed to identify and measure concentrations of elements in each sample and will be conducted using ASTM guide E1621-22 [9].

2.3.4 Task 3.4: Identification of Human Health COCs

XRF Analysis will be compared to data from Arizona Soil Remediation Standards (AZSRS) to identify the Human Health COCs.

2.4 Task 4.0: Confirmatory Testing, Mapping, and Identification of EPCs

2.4.1 Task 4.1: Atomic Absorption or Inductively Coupled Plasma Spectroscopy

Because lead can interfere with arsenic measurements in XRF, and both elements were found in excess in the 2018 field study [3], additional flame atomic absorption spectroscopy (FAAS) or inductively coupled plasma optical emission spectroscopy (ICP-OES) instrumentation to confirm these concentrations is necessary. This work will be performed by an externally contracted laboratory.

This analysis entails an acid digestion of sieved soil samples in nitric acid solution per ASTM E1726-21 so that the metals are in their elemental states prior to analysis [10].

2.4.2 Task 4.2: Statistical Analysis & EPCs

Results from the FAAS/ICP-OES analysis will be used to develop a correlation curve to correct XRF arsenic results.

Statistical analysis on the COC datasets will be performed to determine the distribution of the data, and then the 50% and 95% Exposure Point Concentrations (EPC) for the COCs will be computed.

2.4.3 Task 4.3: Spatial Distribution Mapping

Maps displaying the spatial distribution of the COCs will be created to clearly define the location and respective concentrations of each COC. Migration pathways of contaminants will be identified on the maps.

2.5 Task 5.0: Human Health Risk Assessment

A human health risk assessment will be performed to determine potential health risks due to exposure to the site. The human health risk assessment consists of the following subtasks.

2.5.1 Task 5.1: Human Health Toxicity Assessment

Using the Environmental Protection Agency's (EPA) Integrated Risk Information System (IRIS) database, carcinogenic and non-carcinogenic toxicity data for each COC apart from lead will be retrieved [11].

2.5.2 Task 5.2: Human Health Exposure Assessment

Realistic exposure scenarios will be identified for both adults and children. Using factors including the duration of exposure, estimates of incidental soil consumption and contact, and coupled with the EPCs from Task 4.2, the computation of intake doses for each exposure scenario will be determined. Both ingestion and dermal contact will be considered. Inhalation will not be considered due to the inability to obtain COC air concentration data.

2.5.3 Task 5.3: Computation of Risk

To determine if there is a heightened risk at the site for non-lead COCs, a standard risk assessment calculation of both carcinogenic and noncarcinogenic health risks will be performed for each EPC and exposure scenario.

To characterize the risk due to lead contamination, the team will use the EPA's Adult Lead Model (ALM) and Integrated Exposure Uptake Biokinetic Model (IEUBK) for lead in children ages 6 months to 7 years. The ALM will evaluate lead distribution and supply adult blood lead levels for people over the age of 7 as well as the probability that fetal blood lead concentrations will exceed a target limit. The IEUBK model will be utilized for determining lead risk in children, providing child lead blood levels as well as the likelihood that blood lead levels in children exposed to comparable conditions will exceed the target limit. Because the IEUBK model was designed for residential exposures, the IEUBK exposure input data will be adjusted to account for non-residential exposures.

2.6 Task 6.0: Ecological Risk Assessment

2.6.1 Task 6.2: Ecological Species identification

Ecological species (plants, animals, avian and invertebrate) that may be found at the site will be identified by both research and observations during the site visit. Endangered, threatened, and sensitive species known to inhabit the area will be documented.

2.6.2 Task 6.3: Ecological Toxicity Assessment

The ecological COCs for each type of species (plants, animals, avian and invertebrates) will be identified by comparing the concentrations of metals from Task 3.4 with the EPA Ecological Soil Screening Levels (Eco-SSL) from the EPA ecotoxicology database ECOTOX [12].

2.6.3 Task 6.4: Ecological Exposure Assessment

Ecological exposure scenarios will be based on migration pathways determined in Task 4.3.

2.6.4 Task 6.5: Qualitative Analysis of Risk

A qualitative analysis of ecological risk will be performed with regards to identified species on site.

2.7 Task 7.0: Potential Remedial Actions

2.7.1 Task 7.1: Site Conceptual Model

A Site Conceptual Model (SCM) showing the contaminants' migration pathways within and from the site will be developed. The SCM will include contamination sources, release and transport mechanisms, exposure pathways, and receptors.

2.7.2 Task 7.2: Remedial Action Objectives

Remedial Action Objectives (RAOs) detailing assessable cleanup criteria will be developed. RAOs may be defined based on the AZSRS, results from the human health risk assessment and/or the ecological risk assessment, and/or best practice technologies.

2.7.3 Task 7.3: Development of Alternatives

Potential remedial technologies will be screened for applicability at the site. Selected technologies will be combined to create several remedial alternatives that meet the RAOs.

2.7.4 Task 7.4: Selection of Preferred Alternative

A decision matrix identifying the important criteria for the remedial action will be developed. Each alternative from Task 7.3 will be evaluated according to the decision matrix in order to select the preferred alternative.

2.7.5 Task 7.5: Preliminary Design of Selected Alternative & Cost to Construct

A preliminary design of the selected alternative and estimate of probable cost to construct and implement the selected alternative will be developed.

2.8 Task 8.0: Project Impact Assessment

The environmental, social, and economic impacts of the project will be discussed in the final report.

2.9 Task 9.0: Project Deliverables

2.9.1 Task 9.1: 30% Deliverable

The 30% submittal includes the 30% report and presentation. Tasks 1 – 3.2 will be complete at this deliverable.

2.9.2 Task 9.2: 60% Deliverable

The 60% submittal includes the 60% report and presentation. Tasks 3.3 – 5 will be complete at this deliverable.

2.9.3 Task 9.3: 90% Deliverable

The 90% submittal includes a draft of the final report and draft website. Tasks 6 – 8 will be complete at this deliverable.

2.9.4 Task 9.4: Final Deliverable

The final submittal will contain all required project deliverables and includes the final report, website, and presentation.

2.10 Task 10.0: Project Management

This section describes how the project will be managed through scheduled meetings with the team, the grading instructor/technical advisor, and the client. Details on the management of the project schedule and resources are also included in this section.

2.10.1 Task 10.1: Meetings

There will be regularly scheduled meetings with the grading instructor/technical advisor, and the team. Meetings with the client will be as needed. A draft agenda will be created for each scheduled meeting and distributed to all invitees 24 hours beforehand. Minutes of the meeting will be compiled, shared, and approved by everyone within 24 hours after each meeting. All agendas and meeting notes will be kept for archival and reference purposes in a digital Memo Binder. Team meetings will be held on a regular basis to make sure the project is on track, and each assignment is finished on time, and to ensure that the project's requirements are being met. The team will meet with the grading instructor/technical advisor to ensure that the project is following the proper technical guidelines. Client meetings will be scheduled and held at request by the client to review the progress of the project.

2.10.2 Task 10.2: Schedule Management

The schedule will be regularly tracked in accordance with the Gantt Chart (see Section 3.0). The Gantt Chart will be revised/updated as needed to assure the project stays on schedule.

2.10.3 Task 10.3: Resource Management

To ensure the project budget is not exceeded, staffing hours will be tracked on weekly basis using an Hours Log. Expenses will also be tracked.

2.11 Exclusions

This project does not include water or air sampling. The project will also not cover the regulatory consequences and limitations of the remediation efforts that are recommended as a result of the PA/SI.

3.0 Schedule

The total duration of the project will be 142 days, beginning October 22nd, 2023, and ending May 7th, 2024. The major tasks include:

- Task 1: Work Plan and Laboratory Access (45 days)
- Task 2: Site Investigation (2 days)
- Task 3: Sample Analysis and Identification of COCs (22 days)
- Task 4: Confirmatory Testing, Mapping, and Identification of EPCs (29 days)
- Task 5: Human Health Risk Assessment (17 days)
- Task 6: Ecological Risk Assessment (15 days)
- Task 7: Potential Remediation Actions (23 days)
- Task 8: Project Impact Assessment (4 days)
- Task 9: Project Deliverables (81 days)
- Task 10: Project Management

Project deliverables with their respective finish dates include the 30% (Feb. 13, 2024), 60% (Mar. 19, 2024), 90% (Apr. 23, 2024), and final submittal (May 7, 2024). A Gantt Chart showing the project schedule is attached as Appendix A.

The critical path is the sequence of tasks that must be completed on time for the project to stay on schedule; the critical path is indicated on the Gantt chart by the color red. The critical path contains tasks 1.0 – 5.0 and 9.0. There is slack time inherently built into the schedule by only scheduling work during business days, allowing weekends if needed.

4.0 Staffing Plan

This section details the project staffing, including personnel, qualifications, and hours needed to finish the project.

4.1 Staffing Positions and Qualifications

Each staff member will be assigned responsibilities that are appropriate for their training and qualifications. The project team will consist of the four positions listed as follows:

- Senior Engineer (SENG)
  The Senior Engineer will serve as project manager, overseeing the project's progress in accordance with the stated timeframe and deliverables. The SENG holds a master's degree in environmental engineering from an ABET-accredited university, has more than 15 years of experience, and is a registered Professional Engineer (PE). The SENG is well-versed in all technical aspects of the project and has a track record of successful projects performed as a PE.

- Engineer (ENG)
  The Engineer will perform most of the project work; the SENG will review their work. The ENG has a bachelor's degree in environmental engineering and has completed the Environmental Engineering Fundamentals of Engineering (FE) exam. They will have three years of experience in soil analysis and risk assessment.
- Lab Technician (TECH)
  The Lab Technician will conduct all sampling and laboratory-related procedures using established methods and procedures per the Work Plan. The TECH will be supervised by the ENG and has received training in lab safety and equipment operation.
- Intern (INT)
  The intern is an environmental engineering student enrolled in an ABET-accredited university with a minimum GPA of 3.5. The INT will assist the team in any capacity needed but will not complete any duties unsupervised.

4.2 Project Staffing

Table 4.1 shows the hours of work expected for each staff member per task. Total project hours are estimated at 760.

Table 4.1: Estimated hours per position and task

Task No.	Task Name	SENG	ENG	LAB	INT
1.0	**Work Plan and Laboratory Use**				
1.1	Sampling and Analysis Plan	5	32		
1.2	Health and Safety Plan	5	30		
1.3	Soils Lab Binder		4	8	5
2.0	**Site Investigation**	20	20	20	20
3.0	**Sample Analysis and Identification of COCs**				
3.1	Sample Drying		2	24	24
3.2	Sieving		2	32	32
3.3	In-lab XRF Analysis		2	60	40
3.4	Identification of Human Health COCs	2	2		
4.0	**Confirmatory Testing, Mapping, and Identification of EPCs**				
4.1	FAAS or ICP Analysis			10	10
4.2	Statistical Analysis & EPCs		4		2
4.3	Spatial Distribution Mapping		4		2

5.0	**Human Health Risk Assessment**				
5.1	Human Health Toxicity Assessment		8		10
5.2	Human Health Exposure Assessment		8		10
5.3	Computation of Risk	2	8		8
6.0	**Ecological Risk Assessment**				
6.1	Identification of ecological COCs		3		4
6.2	Ecological Species identification		3		3
6.3	Ecological Toxicity Assessment		2		3
6.4	Ecological Exposure Assessment		2		3
6.5	Qualitative Analysis of Risk	2	2		3
7.0	**Potential Remediation Actions**				
7.1	Site Conceptual Model		8		4
7.2	Remedial Action Objectives		8		5
7.3	Development of Alternatives	2	6		5
7.4	Selection of Preferred Alternative		6		
7.5	Preliminary Design of Selected Alternative & Cost to Construct	4	10		
8.0	**Project Impact Assessment**	1	2		
9.0	**Project Deliverables**				
9.1	30% Submittal				
9.1.1	30% Report	2	8		6
9.1.2	30% Presentation	2	2		4
9.2	60% Submittal				
9.2.1	60% Report	2	8		6
9.2.2	60% Presentation	2	2		4
9.3	90% Submittal				
9.3.1	90% Report	2	8		6
9.3.2	90% Website	2	2		4
9.4	Final Submittal				
9.4.1	Final Report	2	8		4
9.4.2	Final Presentation	2	2		4
9.4.3	Final Website with Video	2	2		4
10.0	**Project Management**				
10.1	Meetings	15	15	15	15
10.2	Schedule management	10	5		
10.3	Resource management	10	5		
	Subtotal hours	96	245	169	250
	Total hours	760			

5.0 Cost of Engineering Services

Table 5.1 details the project's cost breakdown. The total cost is estimated to be $91,079. The cost of the site visit includes a van rental and lodging and meals for five persons to cover two working days. The cost for supplies covers all items needed for both the site visit and laboratory work.

Table 5.1: Project costs summary

Subsection	Classification	Quantity	Rate	Unit	Cost
1.0 Personnel	SENG	96	$321.00	$/hr	$30,816
	ENG	245	$137.00	$/hr	$33,565
	LAB	169	$49.00	$/hr	$8,281
	INT	250	$26.00	$/hr	$6,500
				Total Personnel	**$79,162**
2.0 Travel	NAU Mileage Rate	466	$0.40	$/mile	$186
	NAU Suburban	2	$65.00	$/day	$130
	Hotel 1 Night; 3 Rooms	3	$100.00	$/night	$300
	PerDiem; 5 persons	2	$30.00	$/day-person	$300
				Total Travel	**$916**
3.0 Supplies	Ziplock Gallon Freezer Bags, 152 ct	1	$20.00	$/pack	$20
	Trowel	10	$5.00	EA	$50
	GPS	3	$175.00	$/day	$525
	Dish Soap	1	$2.00	EA	$2
	Marking Flags	90	$2.00	EA	$180
	Bins	4	$10.00	EA	$40
	50 gal Buckets	3	$5.00	EA	$15
	Water	10	$1.00	$/gallon	$10
	Paper Towels, pack of 2	1	$9.00	$/pack	$9
	Pens/Markers, pack of 6	1	$5.00	$/pack	$5
	Nitrile Gloves, 1000 ct	1	$45.00	$/pack	$45
	Trash Bags, 40ct	1	$14.00	$/pack	$14
	Clipboards	4	$8.00	EA	$32
	Logbooks	2	$5.00	EA	$10
	Measuring Tapes	2	$20.00	EA	$40
	Scrub Brushes	4	$3.00	EA	$12
	Sample cups, pack of 20	3	$11.00	EA	$33
				Total Supplies	**$1,042**
4.0 Analysis	Rental: NAU Soils Lab	20	$100.00	$/day	$2,000
	Rental: XRF	5	$300.00	$/day	$1,500
				Total Analysis	**$3,500**
5.0 Subcontract	Western Technologies	10	$100.00	$/sample	$1,000
6.0 Total					**$91,079**

References

[1] E. P. Agency, "Summary of the Comprehensive nvironmental Response, Compensation, and Liability Act (Superfund)," EPA, 26 Sep 2023. [Online]. Available: www.epa.gov/laws-regulation.

[2] Mindat, "Bonanza Mine (Harquahala Mine), Bonanza and Golden Eagle Mine group, Martin Peak, Salome, La Paz County, Arizona, USA," Mindat, [Online]. Available: https://www.mindat.org/loc-3402.html. [Accessed 26 Sep 2023].

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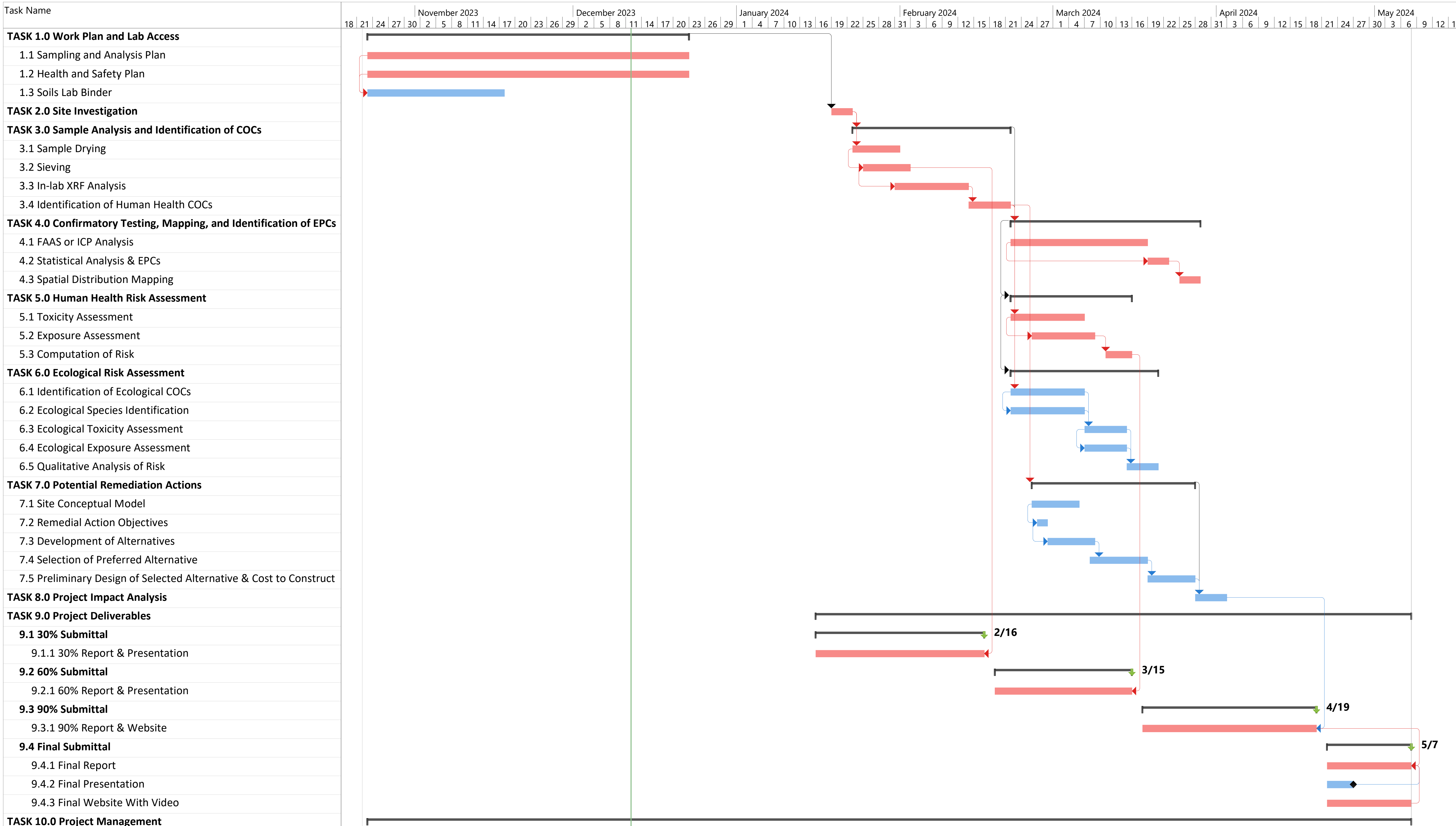
Appendix A Gantt Chart



Project: Gantt Chart
Date: Tue 12/12/23

Task	Summary	Inactive Milestone	Duration-only	Start-only	External Milestone	Critical Split	
Split	Project Summary	Inactive Summary	Manual Summary Rollup	Finish-only	Deadline	Progress	
Milestone	Inactive Task	Manual Task	Manual Summary	External Tasks	Critical	Manual Progress	