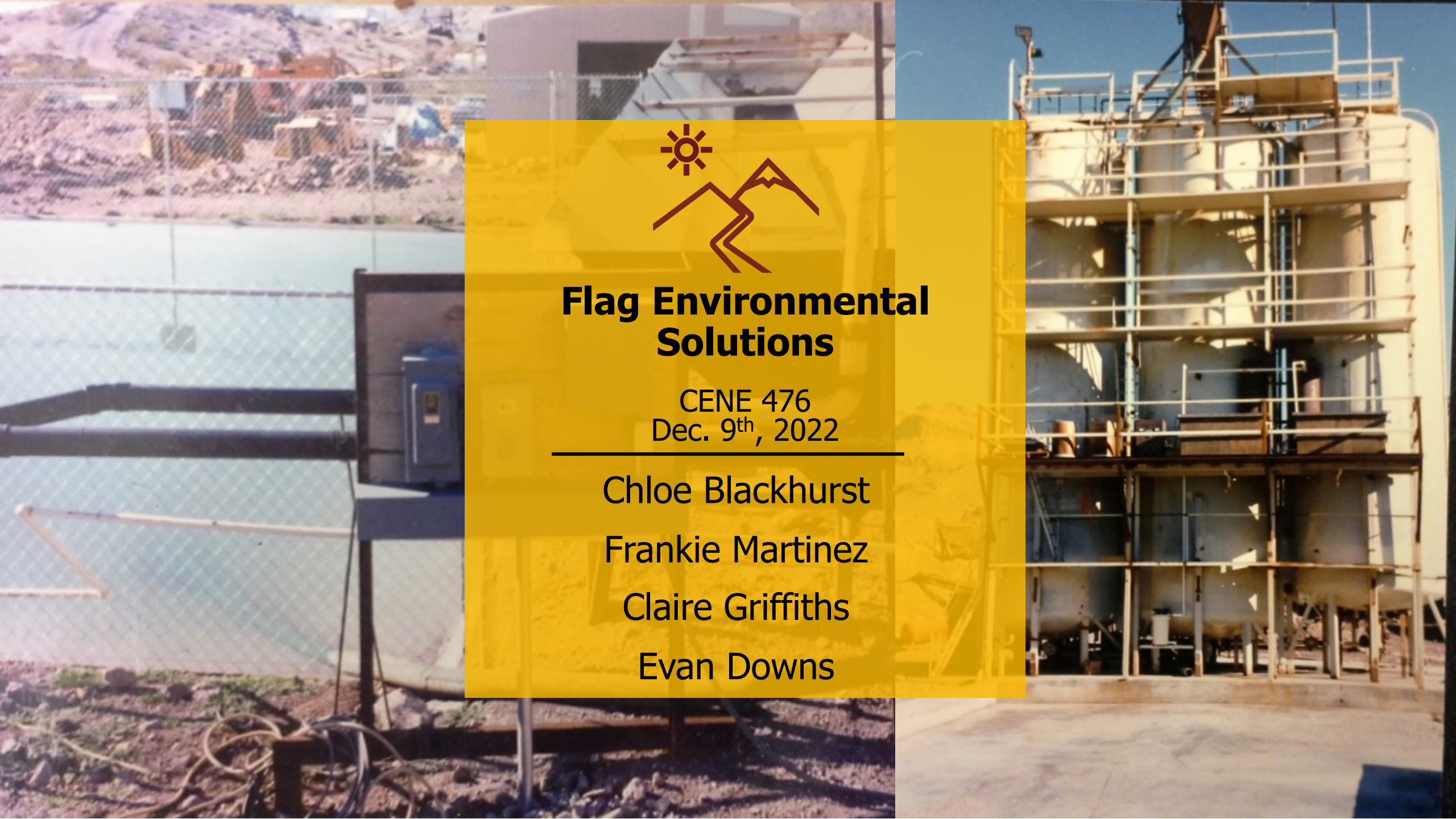


Flag Environmental Solutions

CENE 476
Dec. 9th, 2022

Chloe Blackhurst
Frankie Martinez
Claire Griffiths
Evan Downs

Introduction

Project Purpose:

Preliminary Assessment/Site Investigation to….

- Understand the extent of the contamination lead (Pb) and arsenic (As) at the Canyon City Mill
- Determine the risk to human and environmental health
- Determine if further remedial action is required at the site
- **Client**: Bureau of Land Management (Eric Zielske)

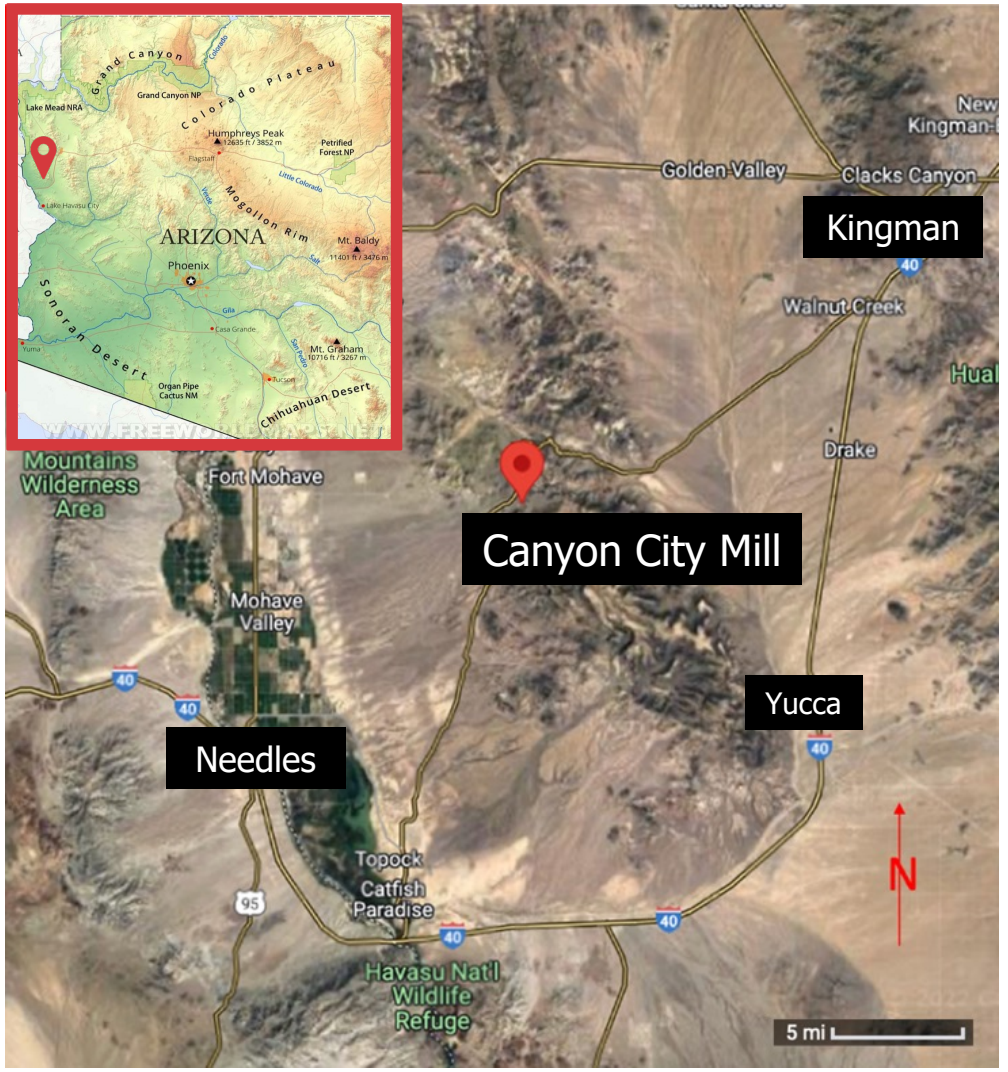


Figure 1: Geographical Location [1]

Project Background

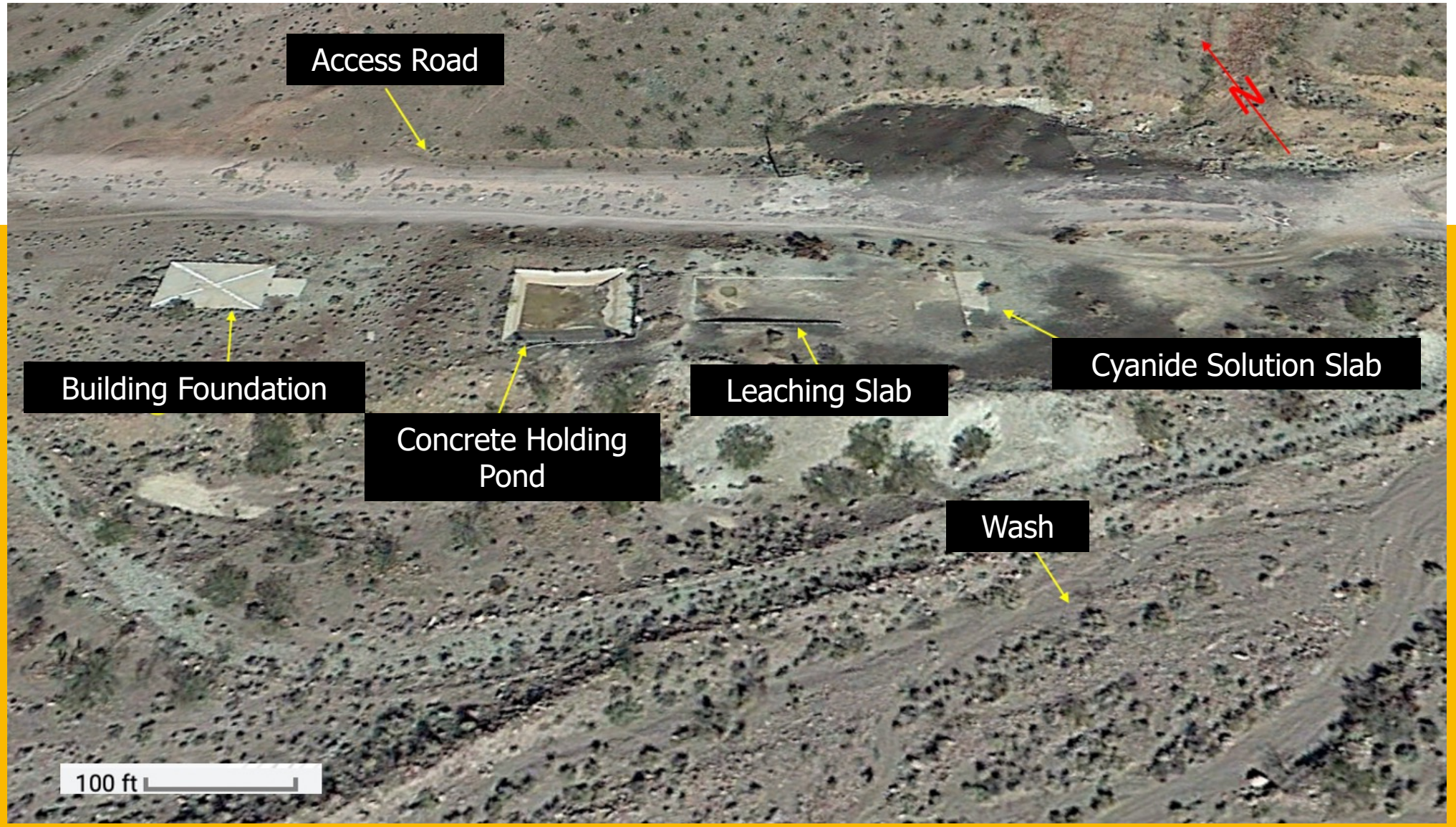


Figure 2: Aerial View of Project Site

Task 1.0 - 2.0: Work Plan and Site Investigation

Task 1.0: Work Plan

Task 1.1: Sampling and Analysis Plan (SAP)

- Procedures and analytical requirements

Task 1.2: Health and Safety Plan (HASP)

- Occupational Safety and Health Administration (OSHA) compliance

Task 1.3: NAU Binder

- Will gain access the lab at Northern Arizona University (NAU)

Task 2.0: Site Investigation

- Site Investigation (SI) to determine the Contaminants of Concern (COCs)

Figure 3: Soil Sampling [3]

Task 3.0: Analysis of Samples

Task 3.1: Sample Preparation

- Before conducting the X-Ray Fluorescence (XRF) analysis…

  Task 3.1.1: Drying of Soil

  - Samples dried according to ASTM Method D2216

  Task 3.1.2: Soil Sieving

  - Samples sieved according to ASTM Method D6913

Task 3.2: XRF Analysis

- The XRF Analysis (EPA Method 6200)

Figure 4: XRF Analyzer [4]

Task 3.0: Analysis of Samples

Task 3.3: Identify Contaminants of Concern

- XRF compared to Arizona Soil Remediation Levels (AZSRL) to identify human health COCs
- Ecological Soil Screening Levels (Eco-SSLs) to identify ecological COCs

Task 3.4: Acid Digestion

- If COC's other than Pb and As are found, confirmatory analysis needed
- Samples digested to prepare for Flame Atomic Absorption (FAA) or Inductively Coupled Plasma (ICP)

Task 3.5: FAA or ICP Analysis

- To confirm concentrations of As and other COCs
- FAA or ICP analysis done by subcontracted lab

Task 3.6: Correlate Data

- Correlation curves between XRF results and FAA/ICP results
- XRF data corrected based on correlations

Task 4.0: Contaminant Distribution

Task 4.1: Contaminant Distribution Maps

- Spatial distribution of the identified COC's- concentration and location

Task 4.2: Migration Pathway Analysis

- The possible migration pathways of the COC's will be assessed
- The pathways will be characterized by creating a site conceptual model

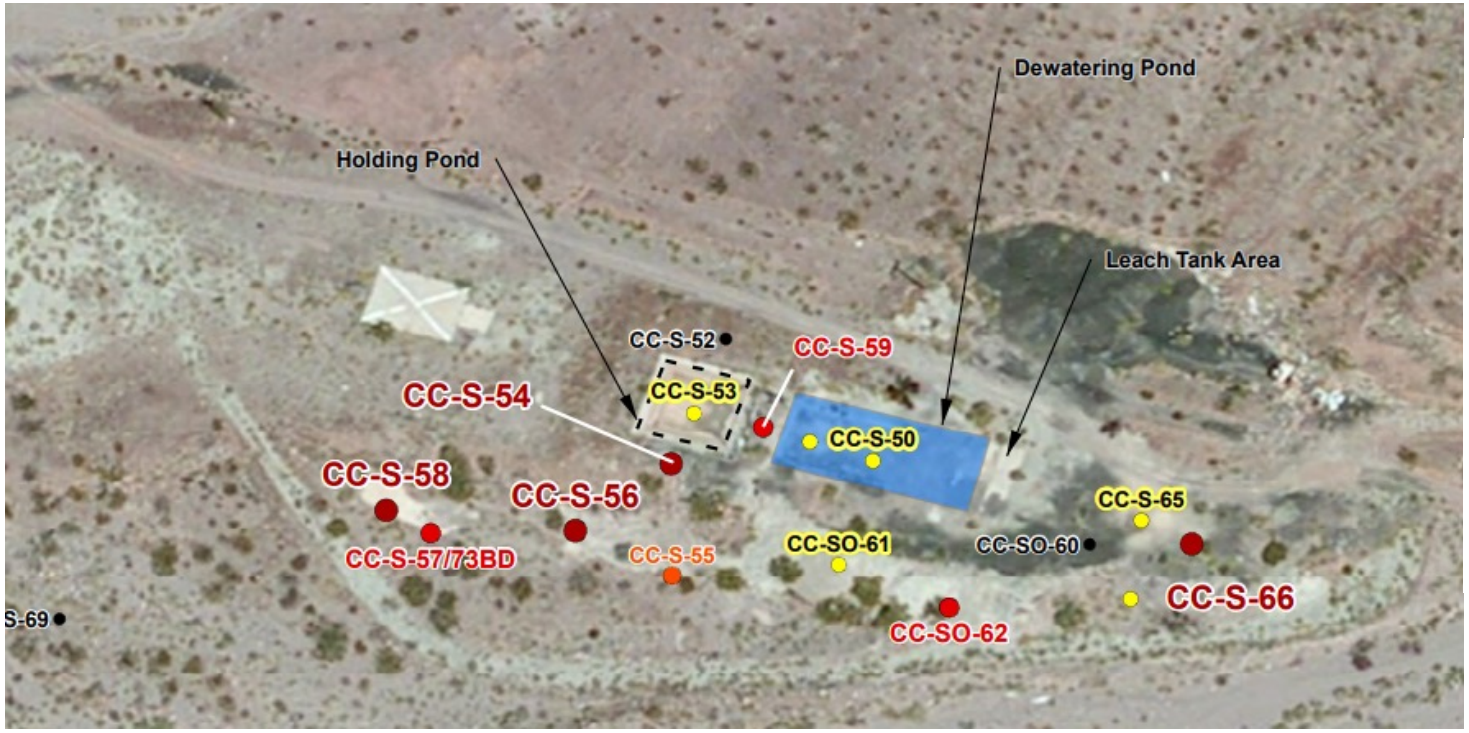


Figure 5: Contaminant Distribution Map [4]

Task 5.0: Human Health Risk Assessment

Task 5.1: Exposure Point Concentrations:

- Use sample data to determine 50% and 95% Exposure Point Concentrations (EPCs)

Task 5.2: Exposure Assessment:

- Identify potential exposure scenarios and estimates for the site; use with EPCs to compute intake doses

Task 5.3: Toxicity Assessment:

- Retrieve toxicity data from Integrated Risk Information System (IRIS) database for COCs (non-Pb COCs)

Task 5.4: Risk Calculations:

- Determine carcinogenic and non-carcinogenic risk (for non-Pb COCs)
- Model lead risk using Integrated Exposure Uptake Biokinetic Model (IEUBK) and Adult Lead Model (ALM) models

Task 6.0 - Task 7.0 : Ecological Risk Assessment and Project Impact Analysis

Task 6.0: Ecological Risk Assessment

- Based on qualitative data and knowledge of sensitive/endangered/threatened species at site
- Compared to Ecological Soil Screening Levels (Eco-SSL) from the EPA Ecotoxicology Database (ECOTOX)

Task 7.0: Project Impact Analysis

- Environmental, social, and economic impacts

Task 8.0: Project Deliverables

Task 8.1: 30% Deliverable

- Task 8.1.1: 30% Milestone: 30% Report and Presentation
  - Includes Tasks 1.0, 2.0, and 3.0 through 3.1

Task 8.2: 60% Deliverable

- Task 8.2.1: 60% Milestone: 60% Report and Presentation
  - Includes Tasks 3.0, 4.0, and 5.0 through 5.3

Task 8.3: 90% Deliverable

- Task 8.3.1: 90% Milestone: 90% Report and Website
  - Includes Tasks 5.0 through 7.0

Task 8.4: Final Submittal

- Task 8.4.1: Final Report
  - Includes final report (PA/SI), final presentation, and final website.

Task 9.0: Project Management

Task 9.1: Meetings

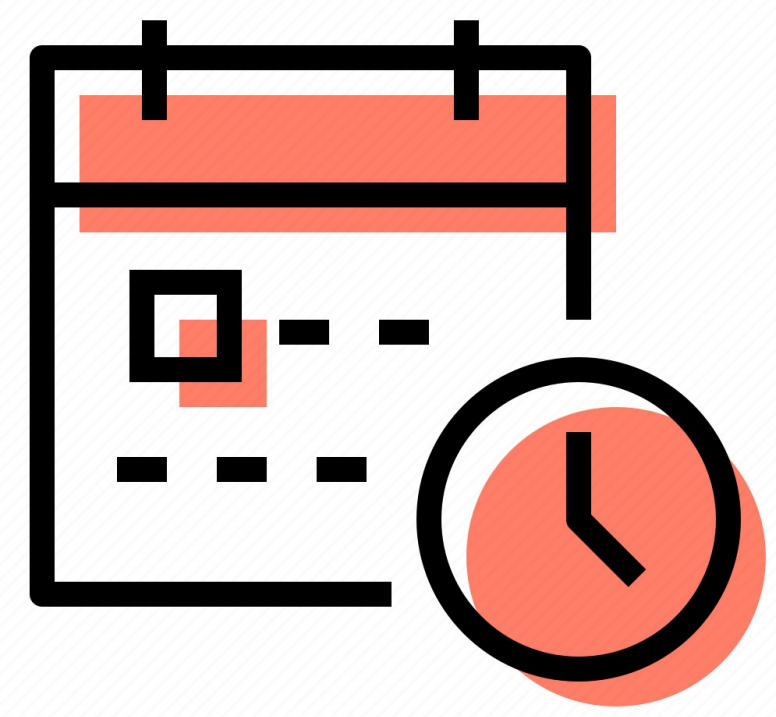
- Team, Grading Instructor, Technical Advisor meetings
- Meeting agendas to identify goals, tasks, minutes
- Client meetings as deemed necessary or requested

Task 9.2: Schedule Management

- Guarantee highest quality and on time

Task 9.3: Resource Management

- Ensure project budget is not exceeded



Exclusions

Exclusions

- No groundwater or air sampling will be conducted
- The human health risk assessment will not consider inhalation exposure
- No remedial action objectives will be determined

Schedule: Gantt Chart

ID	Task Name
1	**TASK 1: Work Plan and Lab Binder**
2	1.1 Sampling and Analysis Plan
3	1.2 Health and Safety Plan
4	1.3 NAU Lab Binder
5	**TASK 2: Site Investigation**
6	**TASK 3: Analysis of Samples**
7	3.1 Sample Preparation
8	3.2 XRF Analysis
9	3.3 Identify COCs
10	3.4 Acid Digestion
11	3.5 FAA/ICP Analysis
12	3.6 Correlation of Data
13	**TASK 4: Contaminant Distribution**
14	4.1 Spacial Distribution Maps
15	4.2 Migration Pathway Analysis
16	**TASK 5: Human Health Risk Assessment**
17	5.1 Exposure Point Concentration
18	5.2 Exposure Assessment
19	5.3 Toxicity Assessment
20	5.4 Risk Calculations
21	**TASK 6: Ecological Risk Assessment**
22	**TASK 7: Project Impact Analysis**
23	**TASK 8: Project Deliverables**
24	8.1 30% Deliverable
25	8.2 60% Deliverable
26	8.3 90% Deliverable
27	8.4 Final Submittal
28	**TASK 9: Project Management**
29	9.1 Meetings
30	9.2 Schedule Management
31	9.3 Resource Management

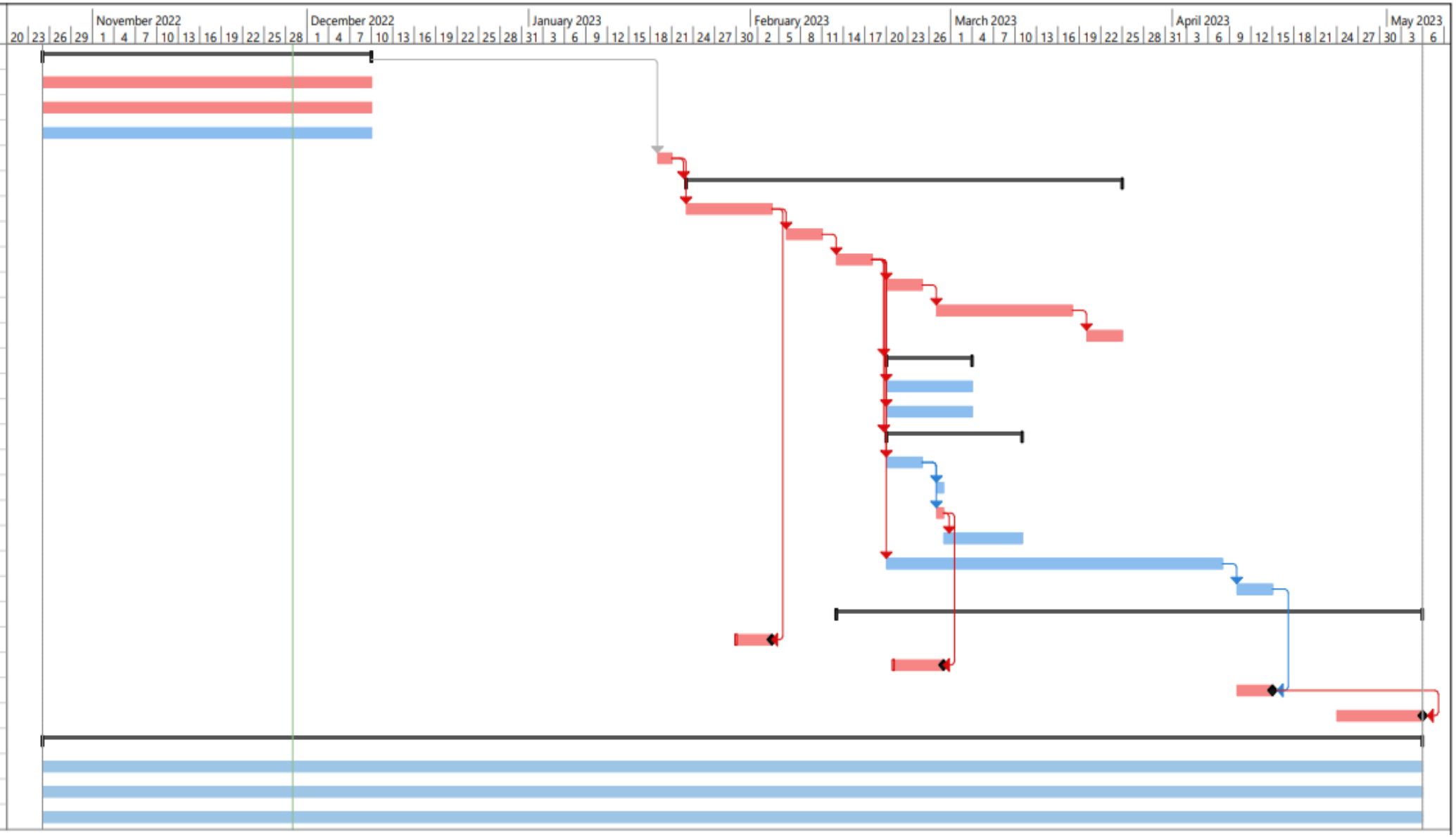


Figure 6: Gantt Chart

Staffing Plan

Senior Engineer (SENG)

- Registered Professional Engineer & 10 years of professional experience
- Will oversee deliverables

Engineer (ENG)

- Primary worker on the project

Lab Technician (TECH)

- Perform analysis on collected samples

Intern (INT)

- Upperclassmen from ABET accredited university
- All work must be reviewed by other team members

Staffing Plan

Table 1: Staffing Matrix

TOTAL HOURS: 600

Task	Hours SENG	ENG	TECH	INT
1.0 Work Plan				
1.1 Sampling and Analysis Plan	12	30		
1.2 Health & Safety Plan		16		4
1.3 Lab Binder			6	10
2.0 Site investigation	20	20	20	20
3.0 Analysis of Samples				
3.1 Sample Preparation				
3.1.1 Soil Drying			12	10
3.1.2 Soil Sieving			16	10
3.2 XRF Analysis			60	10
3.4 Acid Digestion			8	
3.5 FAA or ICP Analysis				
3.6 Correlate Data		6		6
4.0 Contaminant Distribution				
4.1 Spatial Distribution Maps		4		5
4.2 Migration Pathway Analysis		10		14

Task	Hours SENG	ENG	TECH	INT
5.0 Human Health Risk Assessment				
5.1 Exposure Point Concentrations	2	10		14
5.2 Exposure Assessment	2	4		
5.3 Toxicity Assessment	2			
5.4 Risk Calculations	2			
6.0 Ecological Risk Assessment	2	16		14
7.0 Project Impact Analysis	2	5		2
8.0 Project Deliverables				
8.1.1 30% Milestone	4	8	8	10
8.2.1 60% Milestone	2	4	4	4
8.3.1 90% Milestone	4	6	6	6
8.4 Final Submittal	6	6	6	6
9.0 Project Management				
9.1 Meetings	20	20	20	20
9.2 Schedule Management	8	4		
9.3 Resource Management	8	4		
Total:	**96**	**173**	**166**	**165**

Cost of Services

Table 2: Cost of Engineering Services Breakdown

Classification	Hours	Rate	Cost ($)
Personnel			
SENG	96	$205/hr	$19,680
ENG	173	$170/hr	$29,410
TECH	166	$60/hr	$9,960
INT	165	$30/hr	$4,950
Total:			$64,000
Travel			
NAU Mileage	395 miles	$0.445/mile	$176
NAU 12 Passenger Van	2 days	$68/day	$136
Hotel, 1 nights, 4 rooms per night	4 rooms	$94/room	$376
Meals	2 days, 5 people	$45/day/person	$450
Supplies			
Ziplock bags	2 packs	$15	$30
Trowel	5	$6	$28
Soil Core Sleeves	2	$5	$10
GPS (RENTAL)	2 days	$75	$150
Dish Soap	1	$5	$5
Marking Flags (100 pack)	1 pack	$2	$2

Classification	Hours	Rate	Cost ($)
Supplies Cont.			
5-gallon Buckets	3	$5	$15
Large Bins	3	$16	$48
Water (gallons)	25	$0.35	$9
Water Jug	1	$10	$10
Paper Towels (pack)	1	$10	$10
Pens (pack)	1	$6	$6
Field Logbooks	4	$10	$40
Gloves (packs)	3	$4	$12
Trash bags (1 pack)	1	$15	$15
Clip boards	5	$3	$15
Scrub brushes	2	$5	$10
Analysis			
NAU Env. Eng Labs/Soils Labs (per day)	15 days	$100/day	$1,500
XRF	5 days	$654/day	$3,270
Subcontract			
Western Tech (per sample)	10 samples	$100/sample	$1,000
TOTAL:			**$71,322**

Questions?

References

- [1] *Google Maps.* [Online]. Available: https://www.google.com/maps . [Accessed: 19-Sept-2022].
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- [3] Deep Green Permaculture. [Online]. Available: https://deepgreenpermaculture.com
- [4] Eco-Rental Solutions. [Online]. Available: https://eco-rentalsolutions.com/product/other-equipment/xrf- analyzers/thermo-niton-xrf-analzyer/. [Accessed: 1-Dec- 2022].
- [5] ECM Consultants, "Preliminary Assessment and Site Inspection Report," 2016. [Accessed 19-Sept-2022].