Fanning Wash Flood Prevention

CENE 476

Fanning Four Water Design (F4) : Maria Jauregui, Sneha Joshi, and Caleb Smith

Date: 12/9/2022

Project Location

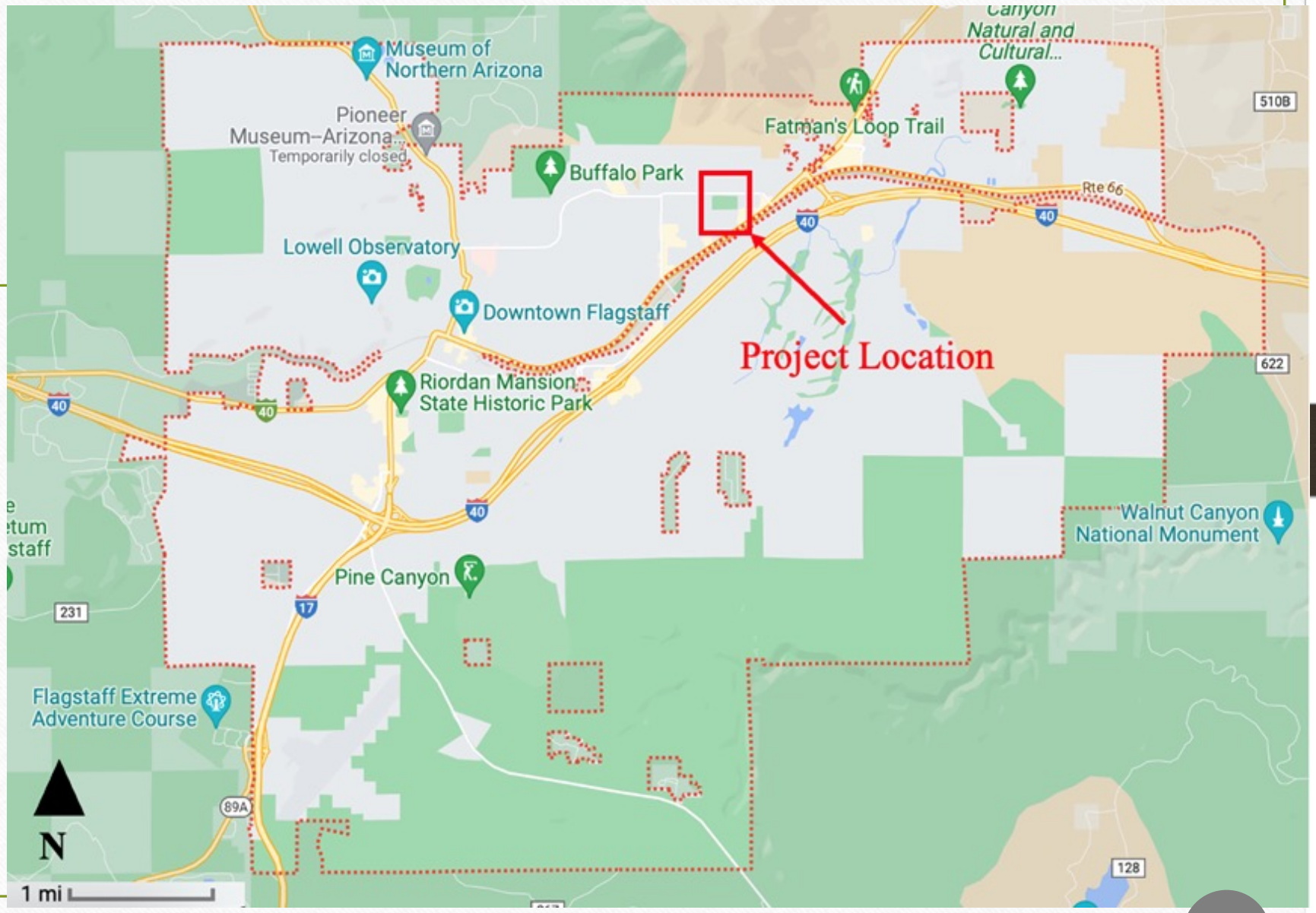

Fig 1: Project Location
Credit: Google Maps

Project Overview

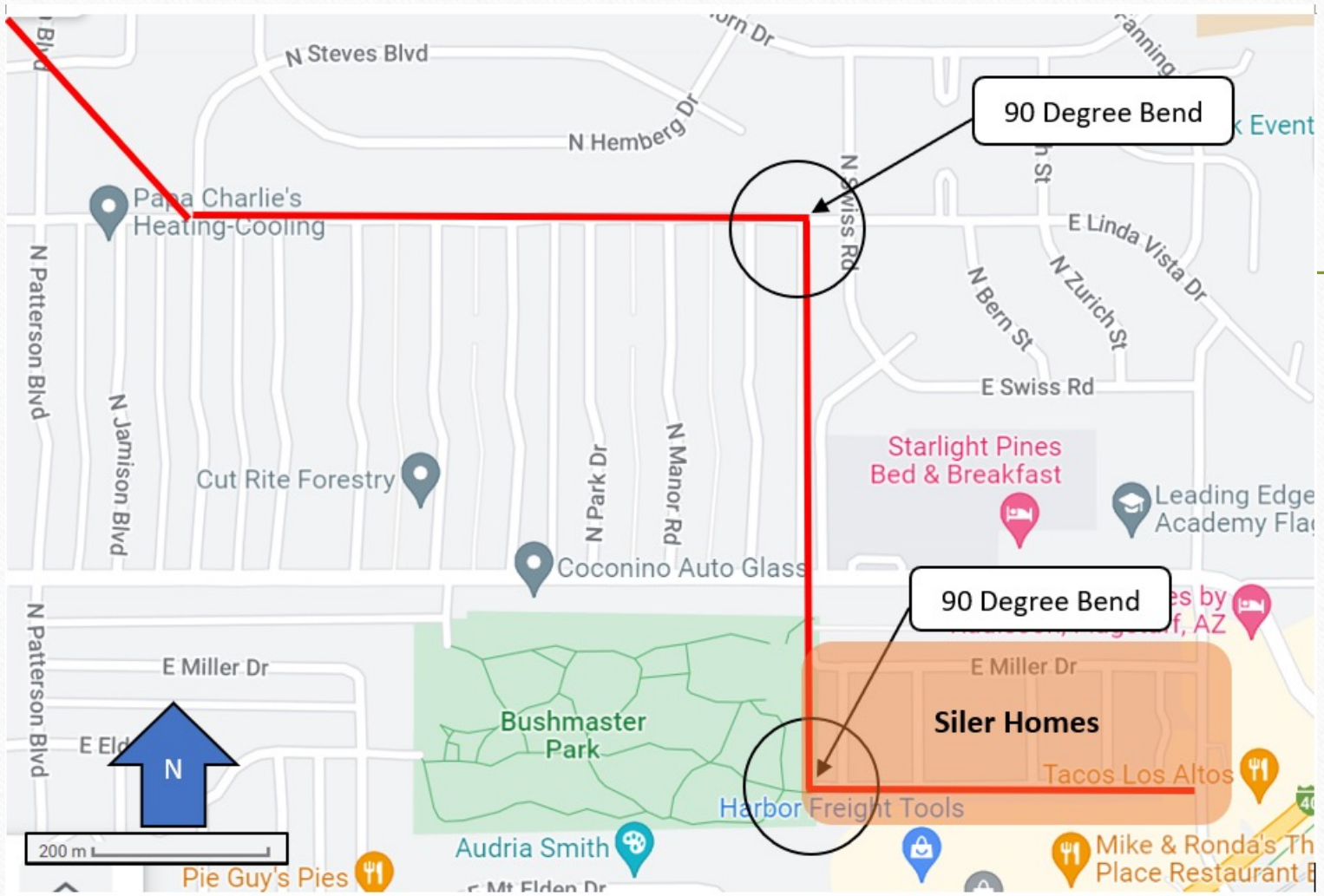

Fig 2: Fanning Wash Problem Points Credit: Client, Sharon Lopez

Stakeholders

- Client: City of Flagstaff
  Sharon Lopez (Hydrologist)
- Siler Homes
- Homeowners

Fig 3: Siler Homes Wash Section
Credit: Sneha Joshi

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Task 1: Research

- Task 1.1: Code Research
- Task 1.2: Research Existing Topography
- Task 1.3: Review Existing Plans/ Studies
- Task 1.4: FEMA Floodplain Info

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Task: 2 Site Investigation

- Task 2.1 Site Visit
  - Task 2.1.1 Documentation of Existing Conditions and Structures
  - Task 2.1.2 Land Surveying
- Task 2.2 Topographic Map

Fig 4: Siler Homes Culvert Section
Credit: Sneha Joshi

Task 3: Hydrologic Analysis

- Task 3.1: Watershed delineation
- Task 3.2: Time of concentration
- Task 3.3: Determine Rainfall Intensity
- Task 3.4: Determine Runoff

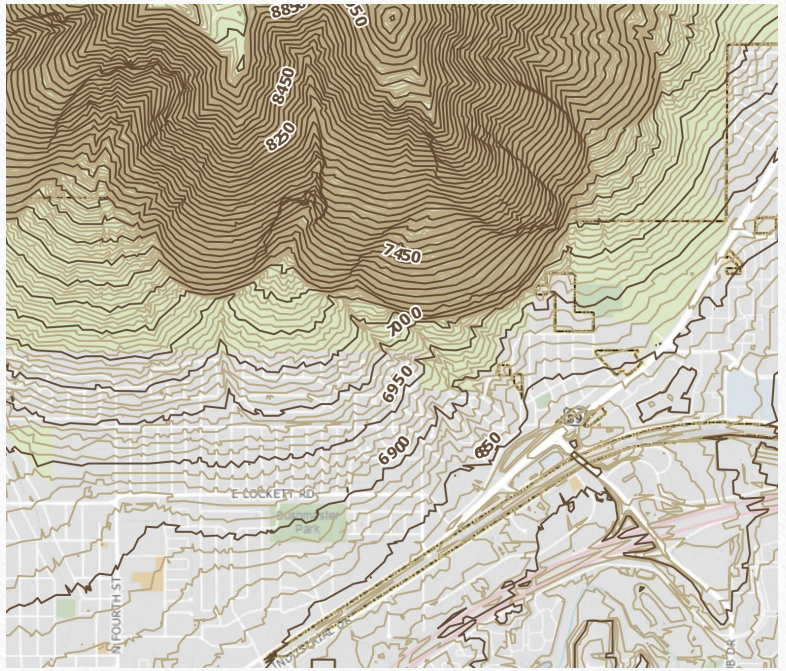

Fig 5: Site watershed delineation
Credit: Client-City of Flagstaff (Sharon Lopez)

Task 4: Hydraulic Analysis

- Task 4.1: Open Channel Analysis
- Task 4.2: Culvert Analysis

Fig 7: Culvert and open channel in project site
Credit: Sneha Joshi

Task 5: Design Analysis

- Task 5.1 Identify Constraints and Criteria
- Task 5.2 Develop Design Alternative
- Task 5.3 Select Best Alternative

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Task 6: Final Design Construction Plans

- Task 6.1: Cover Sheet
- Task 6.2: Profile Views
- Task 6.3: Cross-Section Views
- Task 6.4: Details Sheet and General Notes
- Task 6.5: Extra Sheets

Task 7: Construction Cost Estimate

Upon deciding the design, a cost estimate of the project construction cost will be performed. The cost will be based off materials, labor, and efficiency of work.

Task 8:
Impacts Analysis

Will determine the positive and negative environmental, economic and social impacts of the design.

Fig 8 : Flooding near Fanning Wash
Credit: https://carbuzz.com/news/watch-a-toyota-prius-being-washed-away

Task 9 Deliverables

- 30% Submittal
  - 30% Proposal, Presentation, Design Report, and Design Plans
- 60% Submittal
  - 60% Report, Presentation & Design Plans, Design Report, and Project Website
- 90% Submittal
  - 90% Report/ Presentation & Project Website
- Final Submittal
  - Final Proposal, Final Presentation, Website and Final Report

Task 10 Project Management

- Task 10.1 Meetings
  - Team Meetings
  - GI Meetings
  - TA Meetings
  - Client Meetings
- Task 10.2 Schedule Management
- Task 10.3 Resource Management

Exclusions

- Geotech Analysis
- Roadway and Traffic Analysis
- Surveying on Streets or Private Property

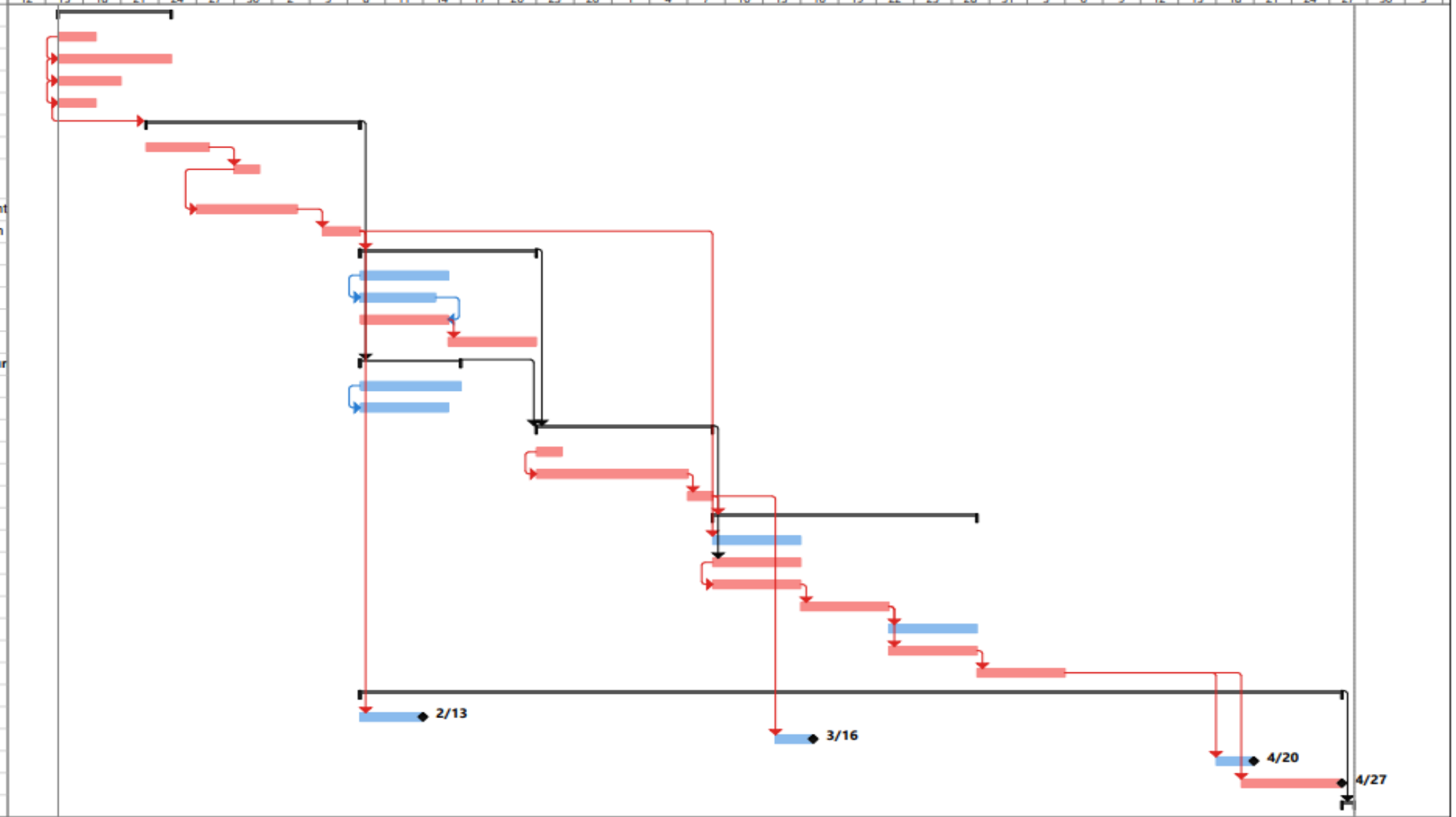
Fig 9: Roadway Analysis
Credit: https://www.rsandh.com/projects/

Fig 10: Geotech Investigation
Credit: https:pilebuck.com/engineering/

Fig 11: Private Property Analysis
Credit: https://pixabay.com/images/search/private%20property/

Fanning Wash Schedule

ID	Task Name
1	**Task 1 Research**
2	Task 1.1 Code Research
3	Task 1.2 Research Existing Topography
4	Task 1.3 Review Existing Plans/Studies
5	Task 1.4 FEMA Floodplain Research
6	**Task 2 Site Investigation**
7	Task 2.1Site Visit
8	Task 2.1.1 Documentation of Existing Conditions and Structures
9	Task 2.1.2 Land Surveying/ Site Assessment
10	Task 2.2 Topographic Map Documentation
11	**Task 3 Hydrologic Analysis**
12	Task 3.1 Watershed Delineation
13	Task 3.2 Time of Concentration
14	Task 3.3 Determine Rainfall Intensity
15	Task 3.4 Determine Runoff
16	**Task 4 Hydraulic Analysis of Existing Structur**
17	Task 4.1 Open Channel Analysis
18	Task 4.1 Culvert Analysis
19	**Task 5 Design Analysis**
20	Task 5.1 Identify Constraints and Criteria
21	Task 5.2 Develop Design Alternative
22	Task 5.3 Select Best Alternative
23	**Task 6 Construction Plans**
24	Task 6.1 Site Plan
25	Task 6.2 Profile Views
26	Task 6.3 Cross Section Views
27	Task 6.4 Details Sheet and General Notes
28	Task 6.5 Extra Sheets
29	Task 7 Cost Estimate
30	Task 8 Impact Analysis
31	**Task 9 Class Deliverables**
32	Task 9.1 30% Submittal
33	Task 9.2 60% Submittal
34	Task 9.3 90% Submittal
35	Task 9.4 Final Submittal
36	**Task 10 Project Management**



Project: Ghannt Chart for Capst
Date: Wed 12/7/22

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

Staffing Plan

Table 1: Staff Qualification

Staff Titles	Experience	Qualification
Senior Engineer	+10 years	• Bachelor's degree • Professional Engineering License (PE)
Engineer	+4 years	• Bachelor's degree • Passed the fundamentals of engineering (FE) exam
Lab Tech	2-4 years	• Bachelor's degree
Engineer Intern	+1 years	• Students(Enrolled or Graduated)

Table 2: Estimated Personnel Hours

Task	SENG Hr.	ENG Hr.	LAB Hr.	INT Hr.
1.0 Research	***0***	***11***	***14***	***9***
1.1 Code Research		4		4
1.2 Research Existing Topography			5	5
1.3 Review Existing Plans		7		
1.4 FEMA Floodplain Research			9	
2.0 Site Investigation	***1***	***14***	***25***	***36***
2.1 Site Visit	0	5	17	23
2.1.1 Documentation of Existing Conditions and Structures	0	3	2	8
2.1.2 Land Surveying	0	2	15	15
2.2 Data Analysis	1	9	8	13
2.2.1 Topographic Map Documentation	1	5		6
2.2.2 Documentation of Survey Data	1	4	7	7
3.0 Hydrologic Analysis	***2***	***10***	***12***	***20***
3.1 Watershed Delineation	0	3	3	5
3.2 Time of Concentration	1	2	3	5
3.3 Determine Rainfall Intensity	0	3	3	5
3.4 Determine Runoff	1	2	3	5
4.0 Hydraulic Analysis of Existing Structures	***2***	***10***	***8***	***14***
4.1 Open Channel Analysis	1	5	4	7
4.2 Culvert Analysis	1	5	4	7
5.0 Design Analysis	***2***	***15***		***19***
5.1 Identify Constraints and Criteria		4		6
5.2 Develop Design Alternatives		8		9
5.3 Select Best Alternative	2	3		4
6.0 Final Design Construction Plan	***5***	***27***	***0***	***29***
6.1 Cover Sheet	1	3		4
6.2 Site Plan	1	5		6
6.3 Profile Views	1	5		5
6.4 Cross Section Views	1	5		5
6.5 Details Sheets and General Notes	1	6		6
6.6 Extra Sheets	0	3		3
7.0 Cost Estimate	***2***	***5***		***2***
8.0 Impact Analysis	***1***	***7***		***5***
9.0 Deliverables	***7***	***25***	***0***	***15***
9.1 30% Submittal	1	5		3
9.2 60% Submittal	1	5		3
9.3 90% Submittal	2	6		4
9.4 Final Submittal	3	9		5
10.0 Project Management	***20***	***46***	***20***	***25***
10.1 Meetings	15	20	20	25
10.2 Schedule Management	1	20		
10.3 Resource Management	4	6		
Total Task Hours	42	170	79	174
Total Person Hours	**465**			

Cost of Engineering Services

Table 3: Cost of Engineering Services

1.0 Personnel	Classification	Hours	Rate ($/hr.)	Cost
	SENG	42	196	$8,231
	ENG	170	121	$20,577
	LAB	79	46	$3,666
	INT	174	30	$5,265
	Total Personnel			$37,740
2.0 Supplies	Surveying Equipment/Lab Rental	6 days	$100/day	$600
3.0 Total				$76,079

Any Questions ?