

City of Flagstaff Switzer Wash Regional Drainage Plan

Celine Bannourah, Kara Coffel, Gindiri Paul, Noah Tison

CENE 476 Proposal Presentation

December 6, 2019



*Figure 1: Switzer Canyon Wash Site Visit
Photo Credit: Kara Coffel*

Switzer Canyon Wash Introduction

Purpose

- To decrease the frequency and severity of flooding in the Hospital Hill neighborhood by means of additional stormwater control.

Background

- City of Flagstaff Stormwater Division requested flood control designs.
- Some flood control exists.

Clients

- City of Flagstaff
- Douglas Slover and Ed Schenk

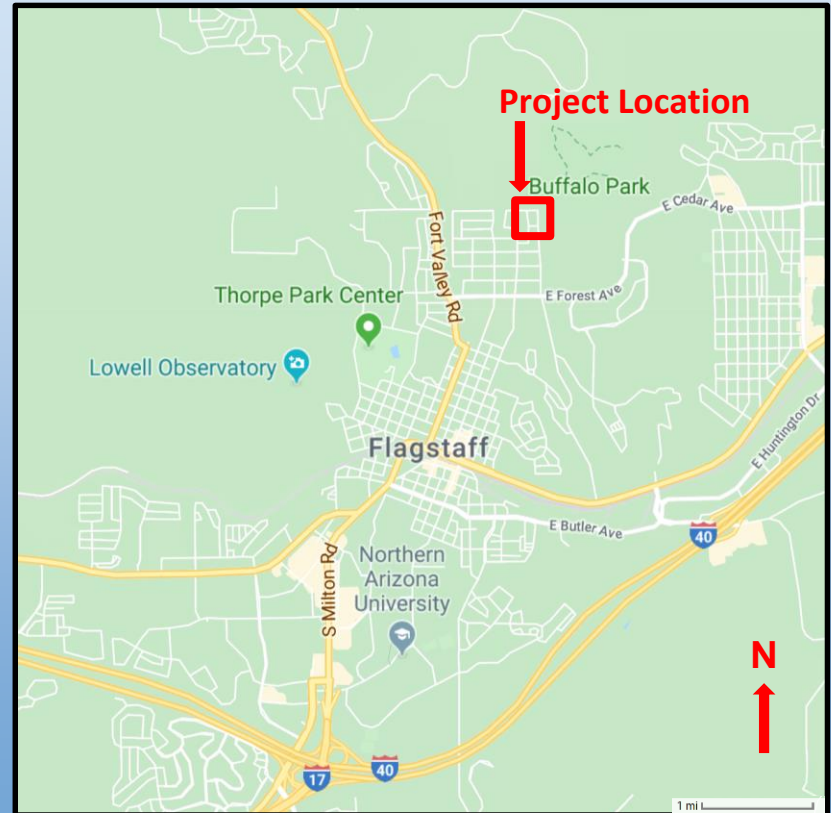


Figure 2: Project Location in Relation to Flagstaff, Arizona [2]

Switzer Canyon Wash Location



Figure 3: Aerial Map of Project Location and Floodplain [1]



Figure 4: Aerial Map of Project Location and Area of Focus [2]

Task 1: Site Investigation

1.1 Field Visit and Preliminary Assessment

1.2 Field Surveying

1.2.1 Land Surveying

1.2.2 Survey Data Processing

1.3 Document Existing Infrastructure

1.4 Review As-Builts for Existing Infrastructure

Task 2: Hydrology

2.1 Research Previous Master Drainage Studies

2.2 Basin Delineation

2.2.1 Major Basin Delineation

2.2.2 Sub-Basin Delineation

2.3 Sub-Basin Variables

2.3.1 Time of Concentration

2.3.2 Flow Routing

2.3.3 Weighted Curve Number Determination

2.4 Hydrograph Development



Figure 5: Switzer Canyon Wash Flow Route Example

Photo Credit: Celine Bannourah

Task 3: Develop Conceptual Stormwater Management Approaches

3.1 Development of Conceptual Designs

3.1.1 Design Alternative 1

3.1.2 Design Alternative 2

3.1.3 Design Alternative 3

3.1.4 Design Alternative 4

3.2 Selection of Final Alternative

Task 4: Hydraulics

4.1 Proposed Open Channel Modeling

4.1.1 HEC-RAS Modeling

4.1.2 FlowMaster Modeling

4.1.3 CulvertMaster Modeling

4.1.4 Proposed Erosion Protection Designs

4.1.5 Proposed Design Inlet/Outlet Protection Designs

4.2 Proposed Stormwater Drain Design

4.3 Conceptual Final Design Plan

Task 5: Impacts

5.1 Environmental

5.2 Social

5.3 Economic



Figure 6: Switzer Canyon Wash Project Location View

Photo Credit: Celine Bannourah

Task 6: Deliverables

6.1 30% Submittal

6.1.1 30% Report

6.1.2 30% Presentation

6.2 60% Submittal

6.2.1 60% Report

6.2.2 60% Presentation

6.3 90% Submittal to GI for Final Comments

6.4 90% Website

6.5 Final Design Plans

6.6 Final Presentation

6.7 Final Website

6.8 Final Report

Task 7: Project Management

7.1 Meeting Binder

7.1.1 Grading Instructor

7.1.2 Technical Advisor/Client

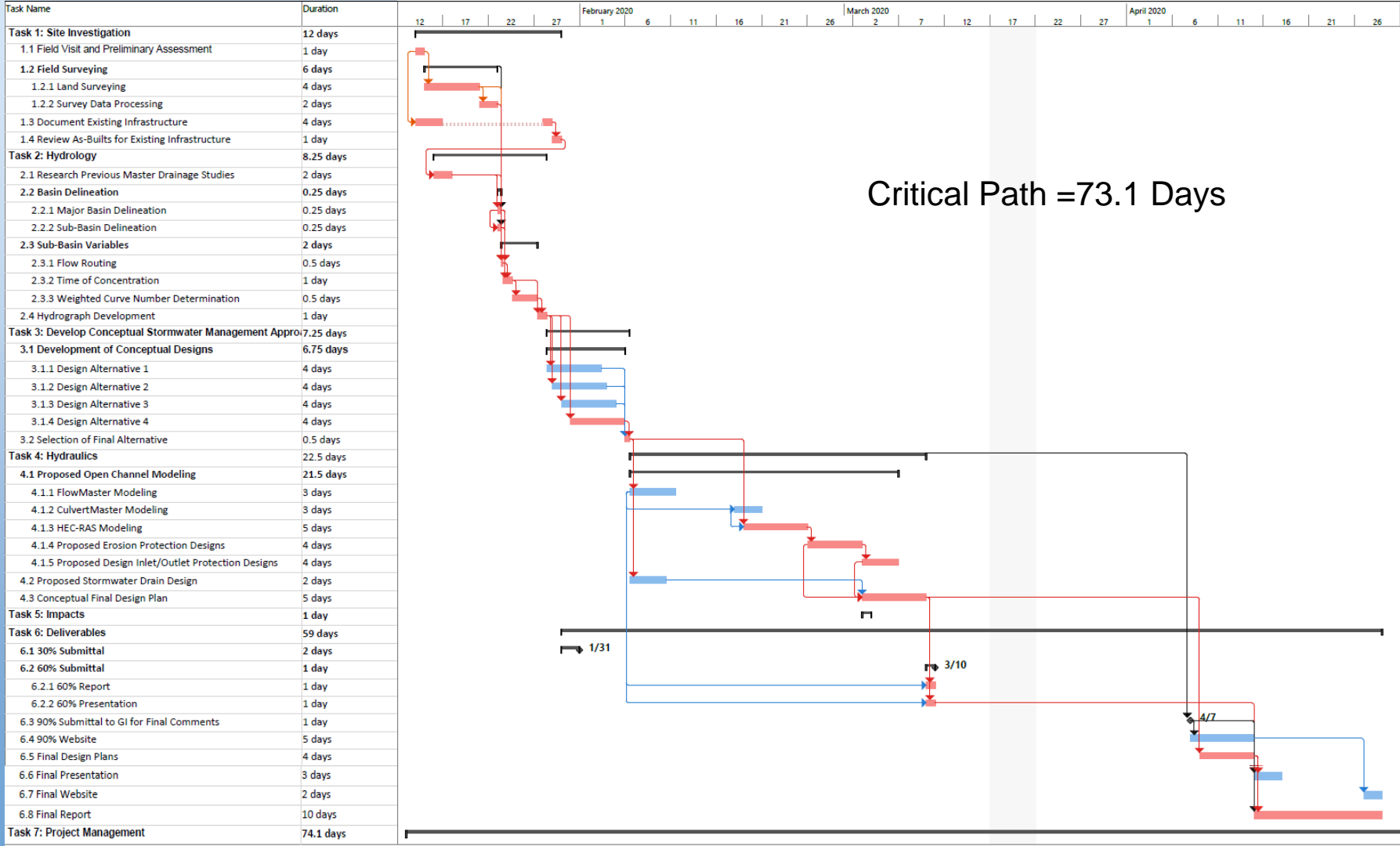
7.1.3 Team Minutes

7.2 Schedule (Critical Path) Management

7.3 Resource Management

Exclusions

1. Construction Management
2. Construction Plans
3. Geotechnical Engineering
4. Traffic Analysis
5. Roadway Design



Staffing Plan

Task	Hours				
	SENG (Senior Engineer)	ENG (Engineer)	EIT (Engineer in Training)	TECH (Technician)	Total
1.0 Site Investigation	1	2	22	22	47
2.0 Hydrology	3	6	16	16	41
3.0 Develop Conceptual Stormwater Management Approaches	10	18	18	10	56
4.0 Hydraulics	5	13	28	28	74
5.0 Impacts	5	12	6	0	23
6.0 Deliverables	26	48	62	56	192
7.0 Project Management	48	48	48	48	192
Total	98	147	200	180	625

Cost of Services

	Classification	Hours	Rate, \$/hr	Cost, \$
Personnel	SENG	98	200	19600
	ENG	147	135	19845
	EIT	200	80	16000
	TECH	180	60	10800
	Total Personnel	625		66245
Travel	12 Meetings	100 Miles	0.58 \$/Mile	58
Supplies	Surveying Equipment	8 Hours	100 \$/hr	800
Cost of Engineering Services Total				67103

References

- [1] "Switzer Canyon Floodplain", FEMA, 2019. [Online]. Available <https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd>. [Accessed: 23- Sep- 2019].
- [2] Google Maps, *Google*, Elk's Lodge, 2019. [Online]. [Accessed: 4-Nov- 2019].
- [3] Lamer, M. "*Scope of Work II*", Scope Example, 2019.

Thank you for listening!
Any Questions?