WEST CATARACT CREEK DAM

DAMsel in Distress Engineering

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PROJECT UNDERSTANDING

- Analyze the safety of the West Cataract Creek Dam
- There are many dams that have failed due to unforeseen circumstances, and now existing dams need to be analyzed to make sure they don't fail in the same ways
- Geotechnical and structural analysis will be required in order to determine if the dam is safe
- Whether action should be taken, and if so, what should be done

INTRODUCTION AND BACKGROUND

- The West Cataract Creek Dam is a dam located in Coconino County, AZ
  - In the City of Williams, West of I-40 at N35.25251° W112.21406° and at an elevation of 6781 feet.
  - Attached to Cataract Lake according to the state of Arizona
- The dam has been marked as being a "significant" safety concern, being recorded as having a "safety deficiency." State Inventory Database (SID) as 3.10 and National Inventory of Dams (NID) under the number AZ00039
- City of Williams is located only two miles downstream from this dam. A draft for an Emergency Action Plan (EAP) currently exists for immediate defensive action in case of a failure. no mapping has been created to determine the potential flood area in the event of a failure.

TECH. ADVISERS AND STAKEHOLDERS

- Dr. Odem and Dr. Schlinger
- City of Williams
  - A potential flood could damage infrastructure in the town.
  - The dam was built in 1947 to create Cataract Lake
- Land Owners
  - Cataract Lake is owned by the US Kaibab National Forest
  - Western shoreline of the lake is owned by Coconino County
  - A minor stakeholder in the project could be the Arizona Game and Fish Department since the lake is stocked with trout throughout the summer

PROJECT DESCRIPTION

- Project lifetime will be from September 2014 to December 2014
- Evaluation and assessment of the dam's current condition
- Various dam failure methods will need to be analyzed
- Dam breach analysis will be necessary to determine the impacts that a failure would have on the surrounding area.

SCOPE OF SERVICES

Task 1 - Project Management

Task 2 - Literature Review

Task 3 - Site Surveying/Inventory

Task 4 - Hydro Analysis

Task 5 - Geotechnical Analysis

Task 6 - Dam Failure Mode Analysis

Task 7 - Dam Breach Analysis

Task 8 - Final Reporting

TASK 1 – PROJECT MANAGEMENT

- DAMsel in Distress Engineering Team Meetings
  - Completed on a weekly basis
  - Discuss work completed
  - Divide work between members
  - Tackle and complications encountered throughout the week.
- Communication and Meetings with the Client
  - Receive further specifications about the project
  - Clarify complications that arise during the lifetime of the project.
- Communication and Meetings with Technical Advisers
  - When help on the analysis is needed.

TASK 2 – LITERATURE REVIEW

- Research on Dam Failures
  - Types of dam failures
  - Recent dam failures
- Background Information
  - West Cataract Creek Dam history
  - Operational history of dam
  - Contact various groups to receive more detailed data of the dam
- Relevant Document Procurement
  - Collect and take note of all documentation relevant to the dam
  - Create a summary of all the necessary information found about the history and operation of the dam

TASK 3 – SITE SURVEYING/INVENTORY

- Obtain Elevation Data
  - Contact Coconino County and City of Williams
  - Surveying by the team will be completed, if necessary
- Collect Soil Samples
  - Collect adequate soil samples around the dam site
  - Laboratory testing of the collected soil samples

TASK 4 – HYDRAULIC ANALYSIS

- Upstream Hydrological Data
  - Evaluate the surrounding watersheds
  - Find the peak flows for the 5-, 25-, 50-, and 100-year storms
- Hydrostatic Analysis on Dam
  - Evaluate lake depths based on each of the recurrence interval storms
  - Complete hydrostatic analysis on the dam using each of the depths found for each recurrence interval
  - Find the water pressure on the dam to help aid in the failure method analysis

TASK 5 – GEOTECHNICAL ANALYSIS

- Obtain Previous Soil Reports
  - The City/County
- Collect Soil Samples
- Analyze Soil Properties
  - In the lab
  - Compare to Previous Reports

TASK 6 – DAM FAILURE MODE ANALYSIS

- Use Geotechnical and Hydraulic Engineering to Analyze:
  - Overtopping
  - Sliding
  - Bearing Capacity Failure
  - Internal Erosion
  - Earthquake Failure

TASK 7 – DAM BREACH ANALYSIS

- Hazard Analysis Downstream
  - To determine effects on the public
  - Use HEC-RAS and HEC-HMS software

TASK 8 – FINAL REPORTING

- Recommendation Report
- Website
  - Updated throughout the project
- Final Presentation

DISTRIBUTION OF TASKS

Task	Contributing Engineers	Hours per Person	Total Hours
Literature Review	Dustin, Ethan, Jaclyn, and Kallam	6	24
Website	Dustin, Ethan, Jaclyn, and Kallam	10	40
Site Surveying and Inventory	Jaclyn and Kallam	24	48
Geotechnical Analysis	Jaclyn and Kallam	32	64
Hydro Analysis	Dustin and Ethan	32	64
Dam Breach Analysis	Dustin and Ethan	32	64
Overtopping and Erosion Analysis	Dustin and Ethan	16	32
Sliding and Earthquake Analysis	Jaclyn and Kallam	16	32
Bearing Capacity Analysis	Dustin, Ethan, Jaclyn, and Kallam	8	32
Final Report	Dustin, Ethan, Jaclyn, and Kallam	30	120
		Total:	520

BUDGET BASED ON HOURS

Task	Total Hours	Total Cost per Task	Billable Rate
Site Surveying and Inventory	48	$3,600	$4,320
Geotechnical Analysis	64	$4,800	$5,760
Hydro Analysis	64	$4,800	$5,760
Dam Breach Analysis	64	$4,800	$5,760
Overtopping and Erosion Analysis	32	$2,400	$2,880
Sliding and Earthquake Analysis	32	$2,400	$2,880
Bearing Capacity Analysis	32	$2,400	$2,880
		Billed Total:	$30,240

BUDGET BASED ON PERSON

Person	Position	Base Pay	Benefits	Actual Pay	Profit	Billable Rate
Dustin	Hydraulic Engineer	50	50	75	20	90
Ethan		50	50	75	20	90
Jaclyn	Geotechnical Engineer	50	50	75	20	90
Kallam		50	50	75	20	90
Units		$ per hour	% of Base Pay	$ per hour	% of Actual Pay	$ per hour

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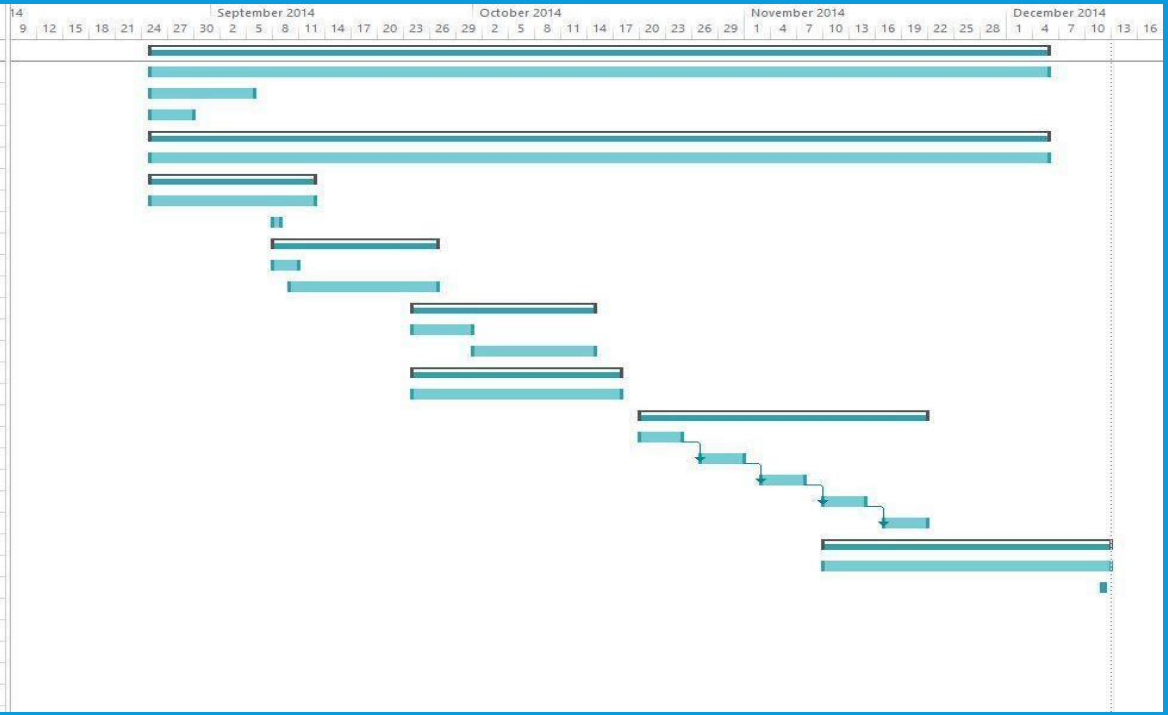
	Task Name	Duration	Start	Finish
1	**Literature Review**	**75 days**	**Mon 8/25/14**	**Fri 12/5/14**
2	Research on Dam Failures	75 days	Mon 8/25/14	Fri 12/5/14
3	Background Information	10 days	Mon 8/25/14	Fri 9/5/14
4	Document Procurement	5 days	Mon 8/25/14	Fri 8/29/14
5	**Website**	**75 days**	**Mon 8/25/14**	**Fri 12/5/14**
6	Website	75 days	Mon 8/25/14	Fri 12/5/14
7	**Site Surveying/Inventory**	**15 days**	**Mon 8/25/14**	**Fri 9/12/14**
8	Obtain Elevation Data	15 days	Mon 8/25/14	Fri 9/12/14
9	Collect Soil Samples	1 day	Mon 9/8/14	Mon 9/8/14
10	**Geotechnical Analysis**	**15 days**	**Mon 9/8/14**	**Fri 9/26/14**
11	Obtain Pervious Soil Reports	3 days	Mon 9/8/14	Wed 9/10/14
12	Analyze Soil Properties	13 days	Wed 9/10/14	Fri 9/26/14
13	**Hydro Analysis**	**15 days**	**Wed 9/24/14**	**Tue 10/14/14**
14	Collect Upstream Data	5 days	Wed 9/24/14	Tue 9/30/14
15	Hydrostatic Analysis	10 days	Wed 10/1/14	Tue 10/14/14
16	**Dam Breach Analysis**	**18 days**	**Wed 9/24/14**	**Fri 10/17/14**
17	Hazard Analysis Downstream	18 days	Wed 9/24/14	Fri 10/17/14
18	**Dam Failure Mode Analysis**	**25 days**	**Mon 10/20/14**	**Fri 11/21/14**
19	Overtopping Analysis	5 days	Mon 10/20/14	Fri 10/24/14
20	Sliding Analysis	5 days	Mon 10/27/14	Fri 10/31/14
21	Bearing Capacity Analysis	5 days	Mon 11/3/14	Fri 11/7/14
22	Earthquake Failure Analysis	5 days	Mon 11/10/14	Fri 11/14/14
23	Internal Erosion Analysis	5 days	Mon 11/17/14	Fri 11/21/14
24	**Final Report**	**25 days**	**Mon 11/10/14**	**Fri 12/12/14**
25	Report	25 days	Mon 11/10/14	Fri 12/12/14
26	Presentation	0.13 days	Fri 12/12/14	Fri 12/12/14



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OTHER SCHEDULING INFORMATION

- Geotechnical analysis begins once all soil samples and data have been collected
- Hydraulic analysis begins once the upstream data is collected
- Final Documentation completed in conjunction with the final stages of the analysis

QUESTIONS?