JOY CONE
INDUSTRIAL WASTEWATER PRETREATMENT SYSTEM

CENE 476
12/9/2022

HONEYCOMB ENGINEERING INC.

GABBY SANDHU, GABRIELLE LEBLANC, RACHAEL HANEYSMITH, AND MEGAN EISENACH

INTRODUCTION

- Joy Cone Ice Cream Cone Factory
  - Produces 5.85 million cones per year
  - 500,000 gallons per year of industrial wastewater
  - Wastewater currently discharged to public sanitary sewer
- Client: Lane Fisher (Plant Engineer)

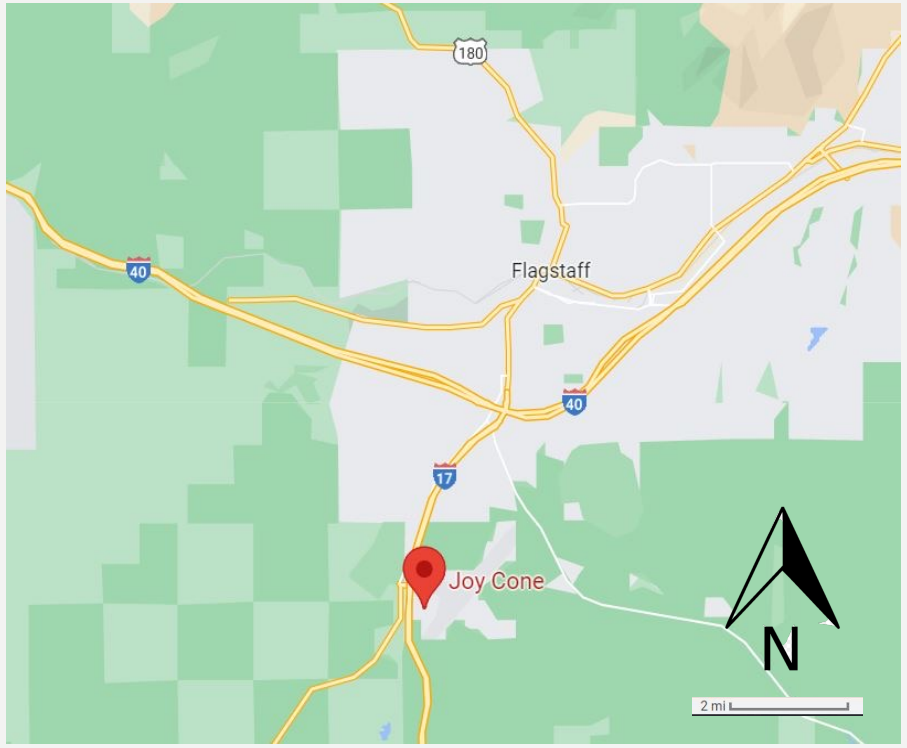


Figure 1: Joy Cone Factory Location in Flagstaff [2]

Figure 2: Joy Cone Ice Cream Cone [1]

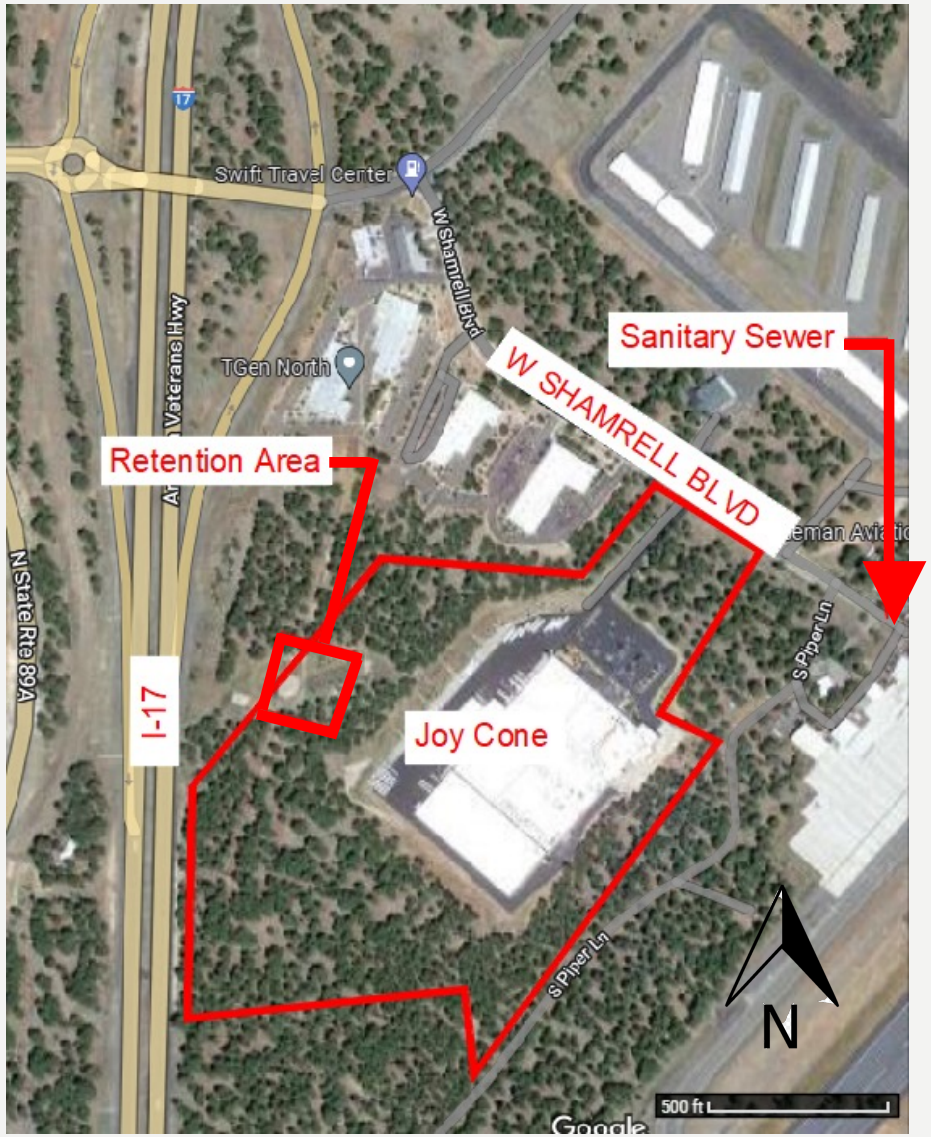


Figure 3: Joy Cone Factory Land Parcel

PROJECT PURPOSE

- Purpose: Design a new pretreatment system to reduce:
  - Total Kjeldahl Nitrogen (TKN)
  - Biological Oxygen Demand (BOD)
  - Total Suspended Solids (TSS)
- Regulated under City of Flagstaff Industrial Pretreatment Permit
- Exceedances of TKN
- Interested in using existing retention basin in new treatment design

Figure 4: Joy Cone Factory Sign [1]

CONSTRAINTS

- Land Use
  - Located adjacent to Forest Service and public land
  - Maintain integrity of the land and trees with minimally invasive design
  - Reduce noise during construction as much as possible
- Cleaning Process
  - Cleaning chemicals used to maintain batter transportation lines
    - Chlorinated detergent and liquid acid sanitizer
  - Could impact biological treatment processes

Figure 5: Joy Cone Factory [1]

SCOPE

- Task 1.0 Preliminary Project Setup
  - Task 1.1 Regulations Research
  - Task 1.2 Treatment Process Research
  - Task 1.3 Laboratory Preparation
- Task 2.0 Site Investigation
  - Task 2.1 Facility Investigation
  - Task 2.2 Surveying
  - Task 2.3 Sampling
- Task 3.0 Analytical Testing
  - ASTM D2329 (BOD), ASTM D5907-18 (TSS), HACH 10242 (TKN)
- Task 4.0 Hydrological Analysis
  - Task 4.1 Creation of Topographic Map
  - Task 4.2 Watershed Delineation
  - Task 4.3 Collection of Rainfall Data
  - Task 4.4 Determination of Time of Concentration (TOC)
  - Task 4.5 Determination of Peak Flow and Retention Volume

SCOPE

- Task 5.0 Selection of Preferred Alternative
  - Task 5.1 Creation of Decision Matrix
  - Task 5.2 Creation of Design Alternatives
  - Task 5.3 Evaluation of Alternatives
- Task 6.0 Final Design
  - Task 6.1 Completed Final Design
  - Task 6.2 Cost Analysis
  - Task 6.3 Evaluation of Impacts
    - Social, Economic, and Environmental
- Task 7.0 Deliverables
  - Task 7.1 30% Submittal
    - Tasks 1.0-3.0
    - Presentation and Report
  - Task 7.2 60% Submittal
    - Tasks 4.0-5.0
    - Presentation and Report
  - Task 7.3 90% Submittal
    - Task 6.0
    - Website and Report
  - Task 7.4 Final Submittal
    - Final Presentation, Report, and Website

SCOPE AND EXCLUSIONS

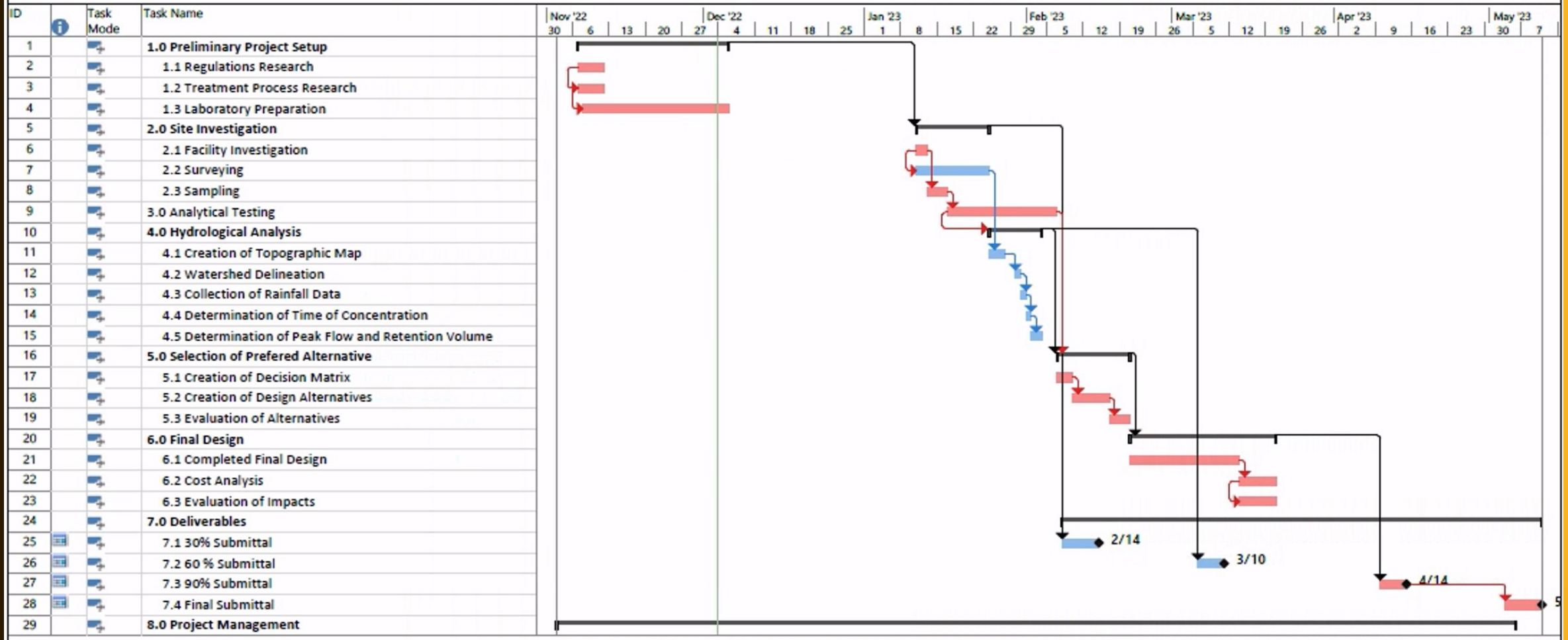
- Task 8.0 Project Management
  - Task 8.1 Schedule and Resource Management
  - Task 8.2 Meetings

- Exclusions
  - Changes to potable water infrastructure
  - Change of discharge locations to sanitary sewer
  - Treatment of any contaminants not regulated by City of Flagstaff

Honey Comb Engineering Inc.

CENE 476
Joy Cone Project Schedule

Wed 12/4/22 6:0 PM



Project: CENE476CapstoneSche
Date: Sun 12/4/22

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

STAFFING

- Senior Engineer (SENG)
  - Bachelor of Science (BS) degree from an Accreditation Board for Engineering and Technology (ABET) accredited university
  - Professional Engineer's (PE) license
  - Min. 8 years of experience
- Engineer (ENG)
  - Has BS from an ABET accredited university
  - PE license
  - Min. 5 years of experience
- Engineer in Training (EIT)
  - Passed Fundamentals of Engineering Exam (FE)
  - Process of receiving/already received a BS from an ABET accredited university
- Survey Technician (S Tech)
  - Has Certified Survey Technician (CST) certification
- Lab Technician (Lab Tech)
  - BS degree
  - Has experience with laboratory testing methods

STAFFING

Table 1: Staffing Hours by Task

Task	Hours					
	SENG	ENG	S TECH	LAB TECH	EIT	Total Hours
Task 1.0 Preliminary Project Setup						
Task 1.1 Regulations Research	2	5	0	0	5	12
Task 1.2 Treatment Process Research	2	5	0	0	5	12
Task 1.3 Laboratory Preparation	0	8	0	40	16	64
Task 2.0: Site Investigation:						
Task 2.1 Facility Investigation	8	8	8	0	8	32
Task 2.2: Surveying	0	2	16	0	2	20
Task 2.3: Sampling	0	4	0	8	4	16
Task 3.0: Analytical Testing	0	16	0	40	20	76
Task 4.0 Hydrological Analysis						
Task 4.1: Creation of Topographic Map	0	5	2	0	5	12
Task 4.2: Watershed Delineation	0	1	0	0	5	6
Task 4.3: Collection of Rainfall Data	0	1	0	0	2	3
Task 4.4 Determination of Time of Concentration (TOC)	0	4	0	0	4	8
Task 4.5: Determination of Peak Flow and Retention Volume	2	4	0	0	4	10
Task 5.0: Selection of Preferred Alternative						
Task 5.1: Creation of Decision Matrix	4	4	0	0	4	12
Task 5.2: Creation of Design Alternatives	10	20	0	0	20	50
Task 5.3: Evaluation of Alternatives	1	2	0	0	2	5
Task 6.0: Final Design						
Task 6.1: Completed Final Design	20	60	0	0	40	120
Task 6.2: Cost Analysis	4	2	0	0	2	8
Task 6.3: Evaluation of Impacts	1	2	0	0	2	5
Task 7.0: Deliverables						
Task 7.1: 30% Submittal	5	8	0	0	8	21
Task 7.2: 60% Submittal	5	8	0	0	8	21
Task 7.3: 90% Submittal	5	8	0	0	8	21
Task 7.4: Final Submittal	8	8	0	0	8	24
Task 8.0: Project Management						
Task 8.1: Schedule and Resource Management	16	4	2	2	4	28
Task 8.2: Meetings	15	10	2	2	10	39
Total Hours	108	199	30	92	196	625

TOTAL COST

Table 2: Cost of Engineering Services

Cost of Engineering Services				
Item	Description	Quantity	Rate	Cost
1.0 Personnel Cost		hours	$/hr	$
Personnel	SENG	108	155	16,740.00
	ENG	199	120	23,880.00
	STECH	30	50	1,500.00
	LAB TECH	92	50	4,600.00
	EIT	196	25	4,900.00
			Total	$ 51,620.00
2.0 Laboratory Facilities		days	$/day	
Lab Rental	NAU ENE Laboratory	5	100	500.00
			Total	$ 500.00
3.0 Supplies		-	-	
Lab Supplies	See Table 3	-	-	488.00
			Total	$ 488.00
Total Cost of Engineering Services:				**$ 52,608.00**

SUPPLIES

Table 3: Itemized Supplies List

Item	Description	Quantity	Unit Cost ($/ea.)	Cost ($)
Glass Fiber Filters	100 per pack	1	57.00	57.00
Gloves	100 per box Disposable	1	12.00	12.00
Goggles	Laboratory goggles	4	1.50	6.00
ASTM D5907-18	TSS test document	1	57.00	57.00
ASTM D2329	BOD5 test document	1	69.00	69.00
HACH TKN Test Kit	25 samples per kit	1	220.00	220.00
Pipettes	Disposable 250 per pack	1	67.00	67.00
			Total:	$ 488.00

REFERENCES

[1] Joy Cone, "Joy Cone Co.: Our company: Learn about joy cone's history," *Joy Cone*, 02-Dec-2020. [Online]. Available: https://joycone.com/our-company/#. [Accessed: 29-Nov-2022].

[2] Google, "Joy Cone Factory Flagstaff," [Online]. Available: https://www.google.com/maps/place/Joy+Cone/@35.163294,-111.7042132,13z/data=!4m5!3m4!1s0x872d8545871493b1:0xc6542499f789062e!8m2!3d35.1350737!4 d-111.6811641. [Accessed 24 Sept. 2022].

QUESTIONS?

THANK YOU