

Sustainable Nature Center

Client: Tanner J. Scheuermann
Director of Boone County Conservation Board

HAWK Engineering

Ruijie Wang | Han Gao | Logan Kirby | Xinyu Hu

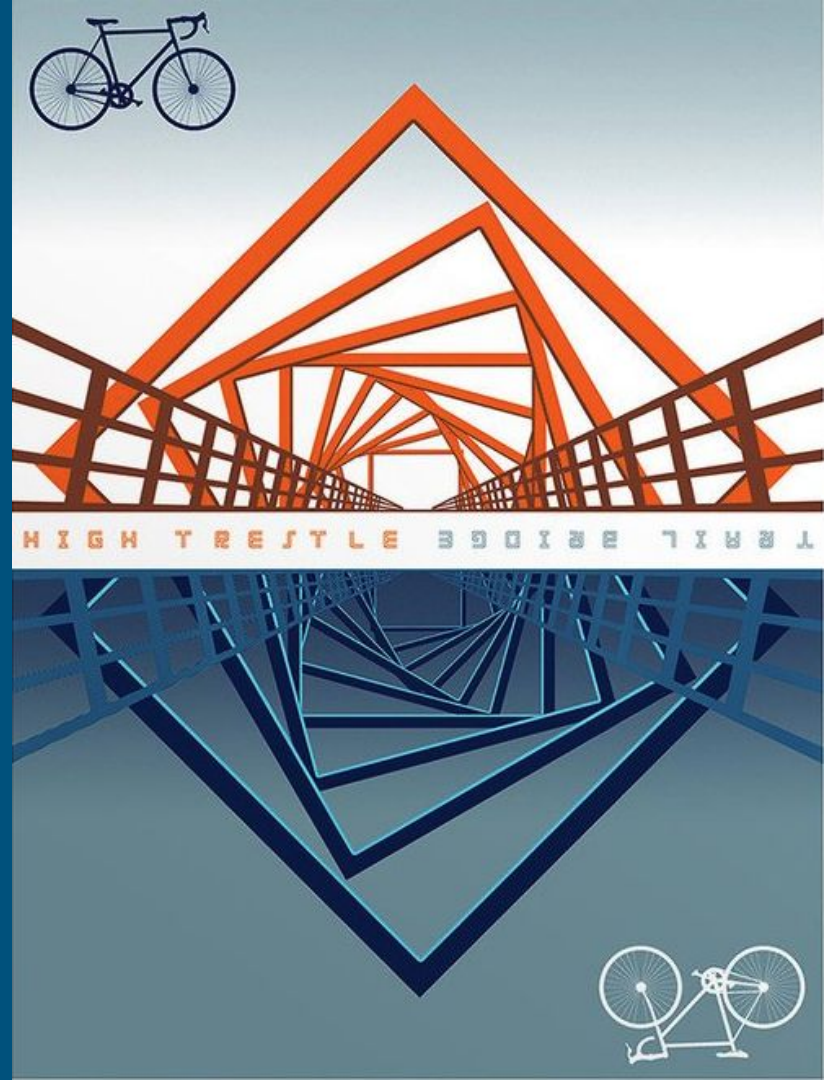
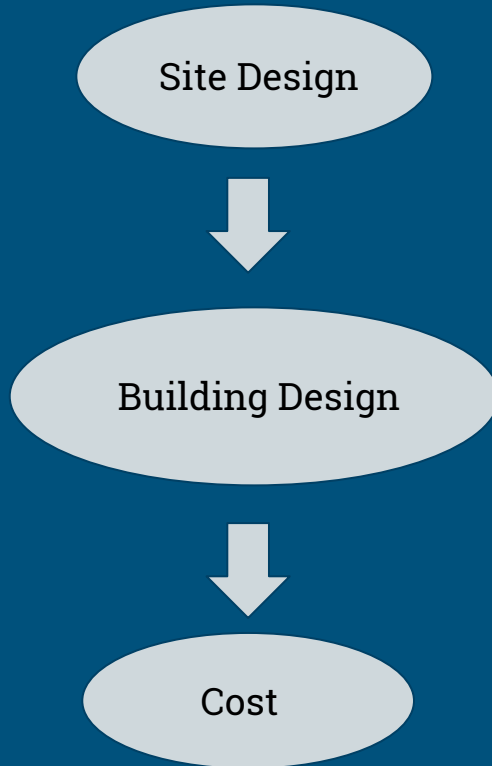


Outline

- Project Scope
- Design Details
- Cost Analysis
- Social Impacts



Project Scope

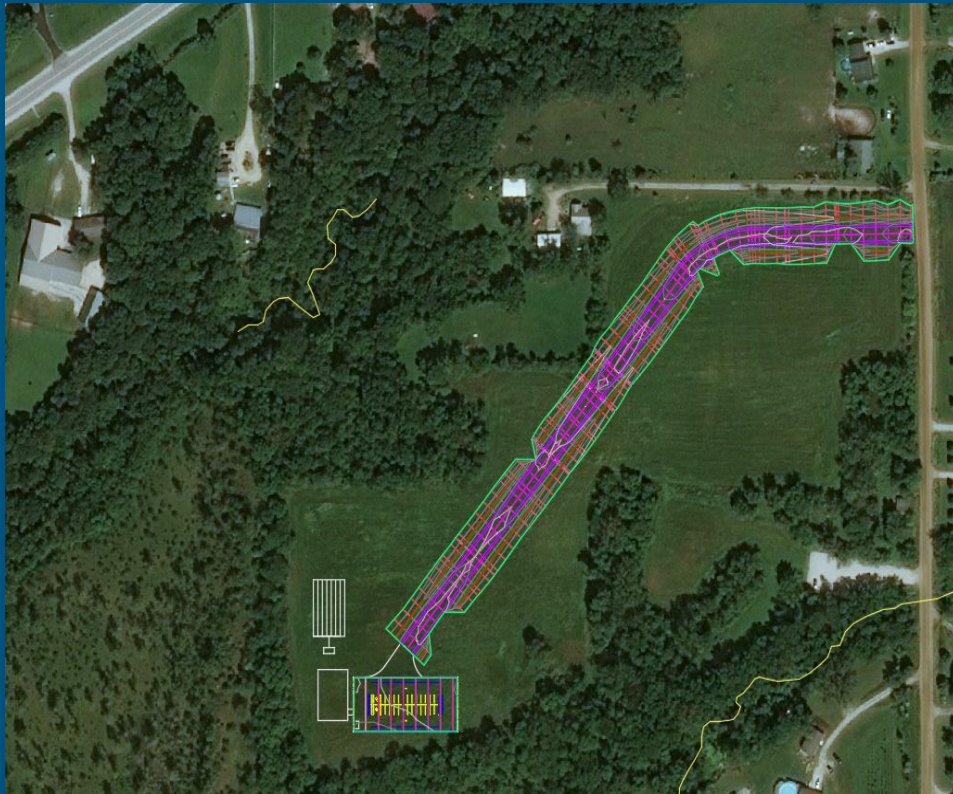


Constraints and Challenges



- Iowa DOT Design Manual
 - SUDAS

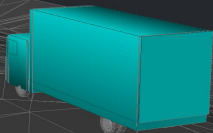
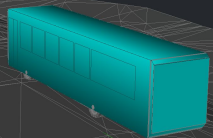
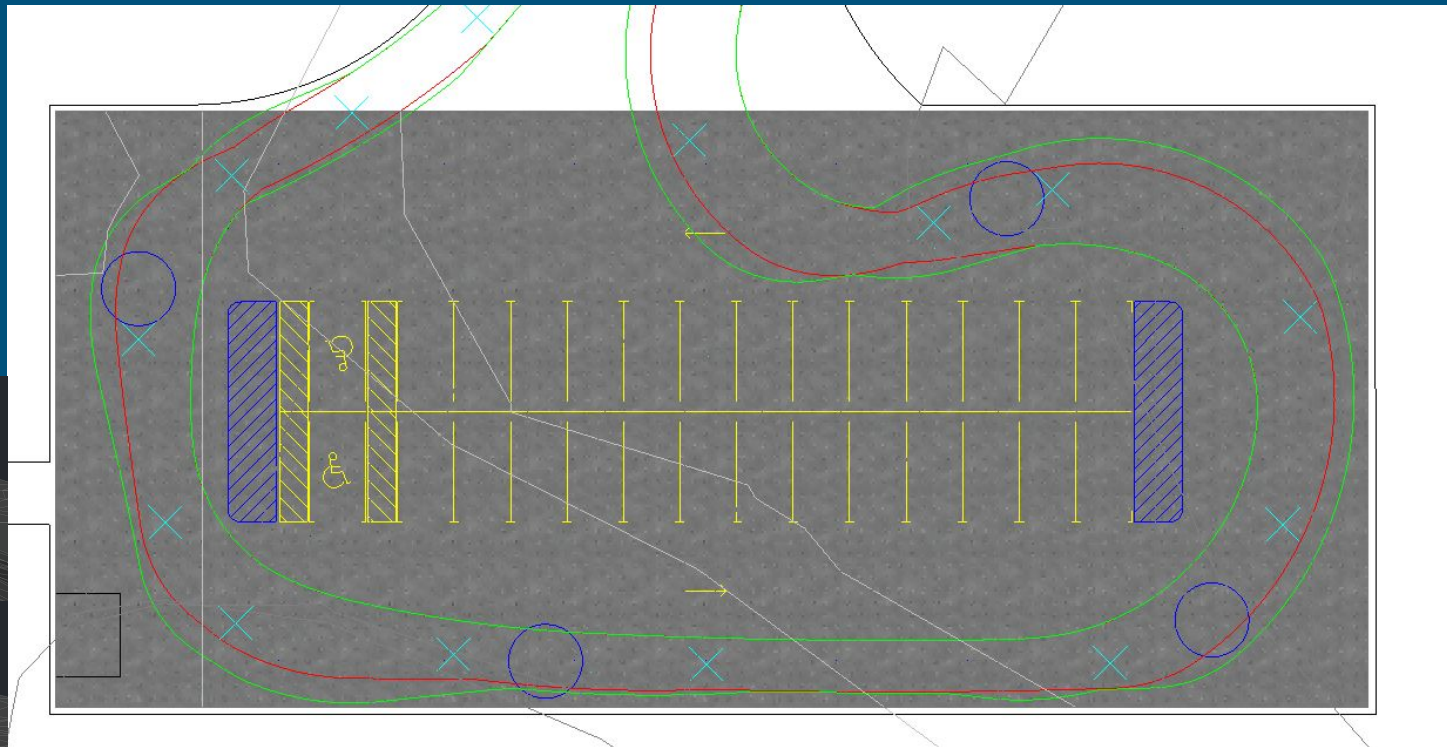
Site Plan



Parking Lot

- SUDAS
- ADA

28 Parking
Spaces



Drainage

Method

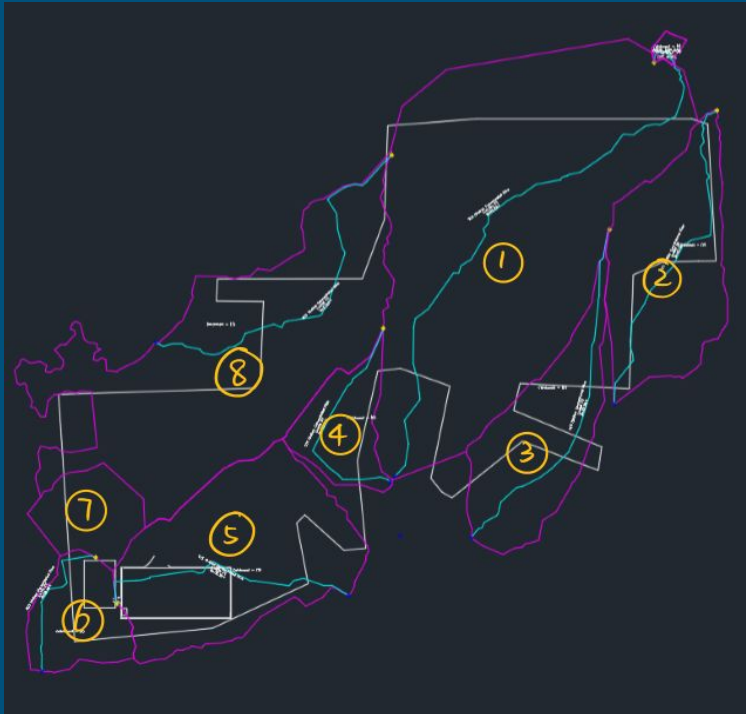
- The Rational Method

Assumption

- Catchment areas remain constant
- Time of concentration remain constant
- 10 years and 100 years return period



Drainage



$$Q = CIA$$

C = Runoff Coefficient

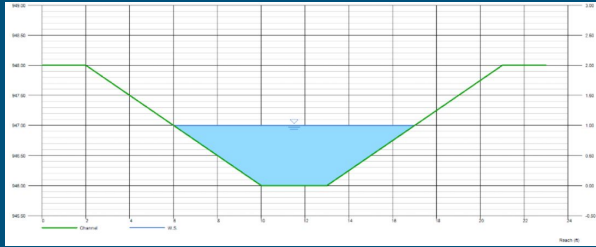
I = Rainfall Intensity

A = Area

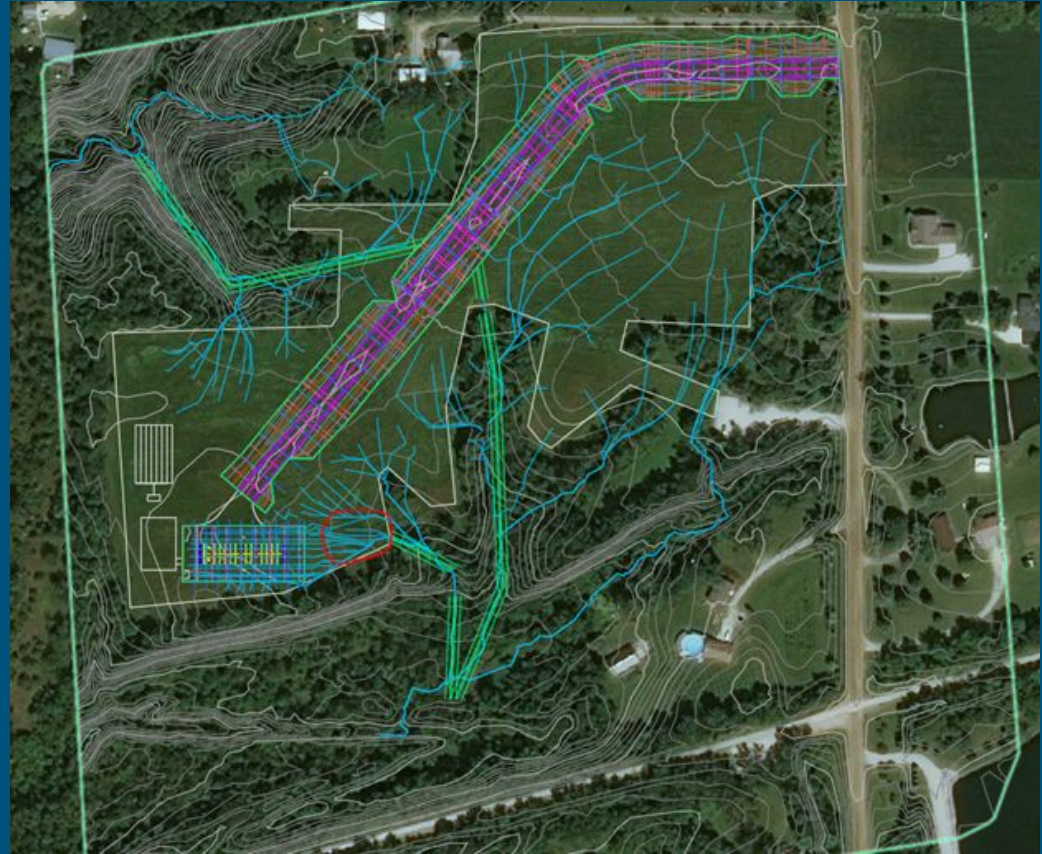
	Area 1		Area 2		Area 3		Area 4	
	Before	After	Before	After	Before	After	Before	After
Q ₁₀	11.97	12.58	5.37	5.49	3.62	3.62	1.96	2.13
Q ₁₀₀	22.53	23.32	10.05	10.22	6.78	6.78	3.67	3.89
	Area 5		Area 6		Area 7		Area 8	
	Before	After	Before	After	Before	After	Before	After
Q ₁₀	7.19	8.83	2.51	2.79	1.66	1.68	14.60	16.17
Q ₁₀₀	13.47	15.62	4.69	5.05	3.12	3.14	27.33	29.39

* Q in cfs

Drainage



Detention Basin Volume:
11250 cubic feet (84110 gallons)

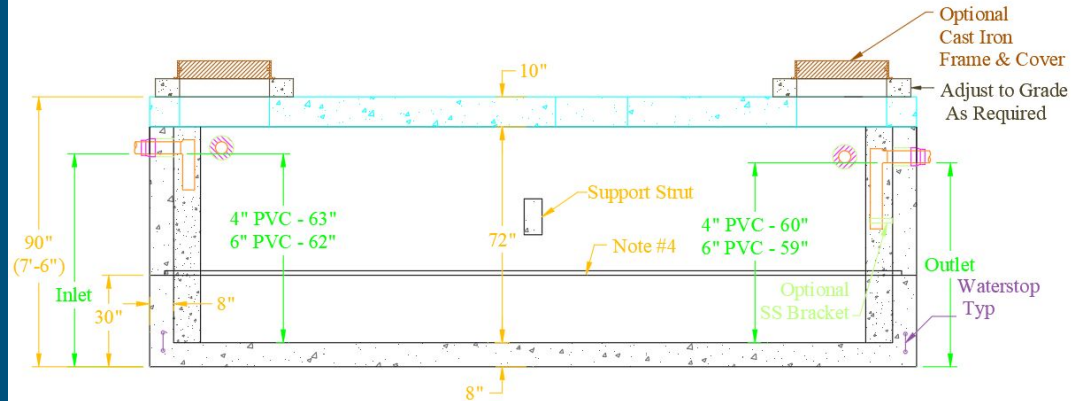
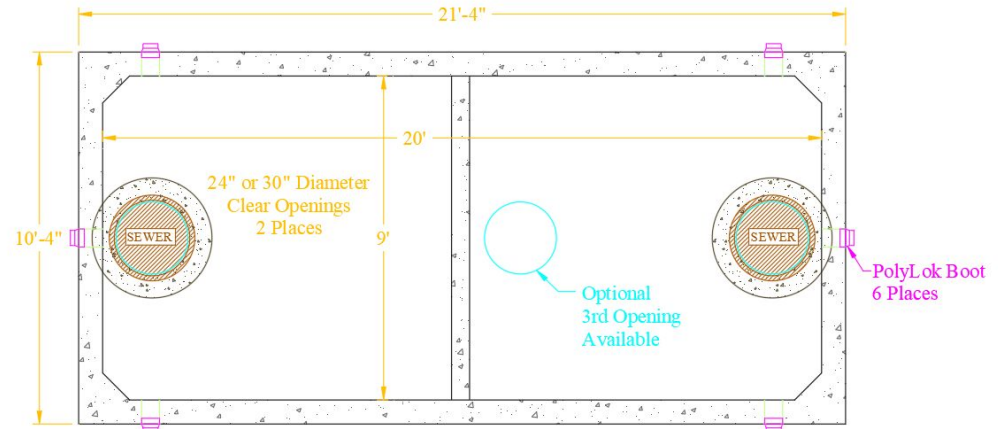


Septic System

- IAC

Assume 2 staffs and 100 visitors per day.

6500 gallons Septic Tank

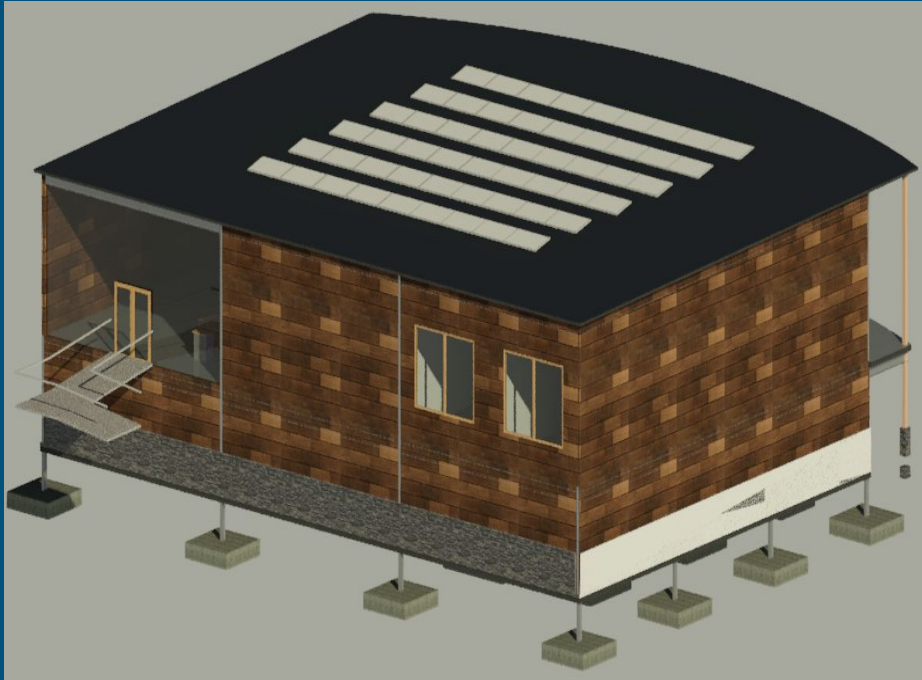
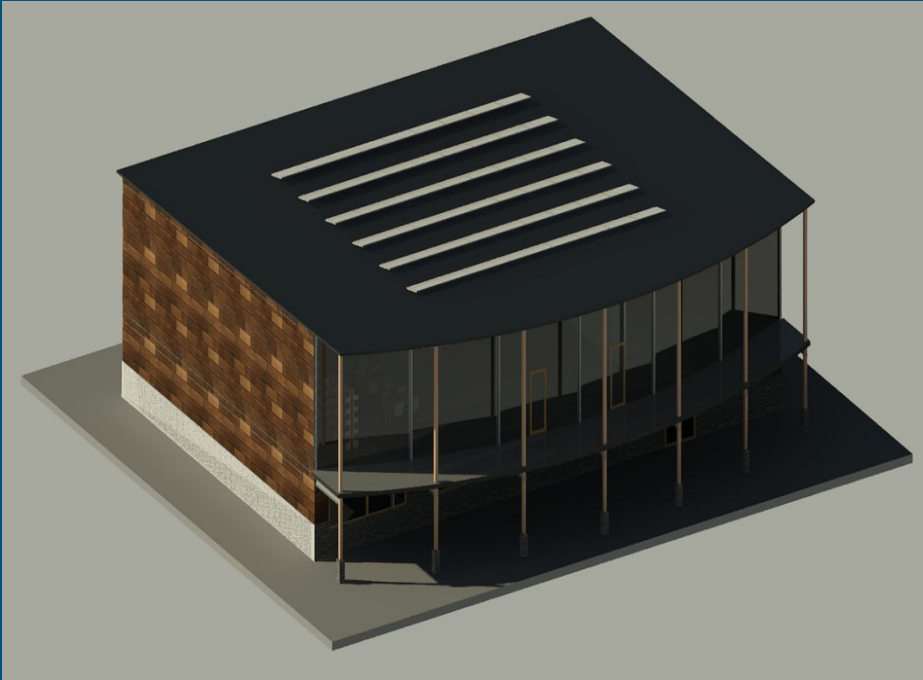


Exterior Design

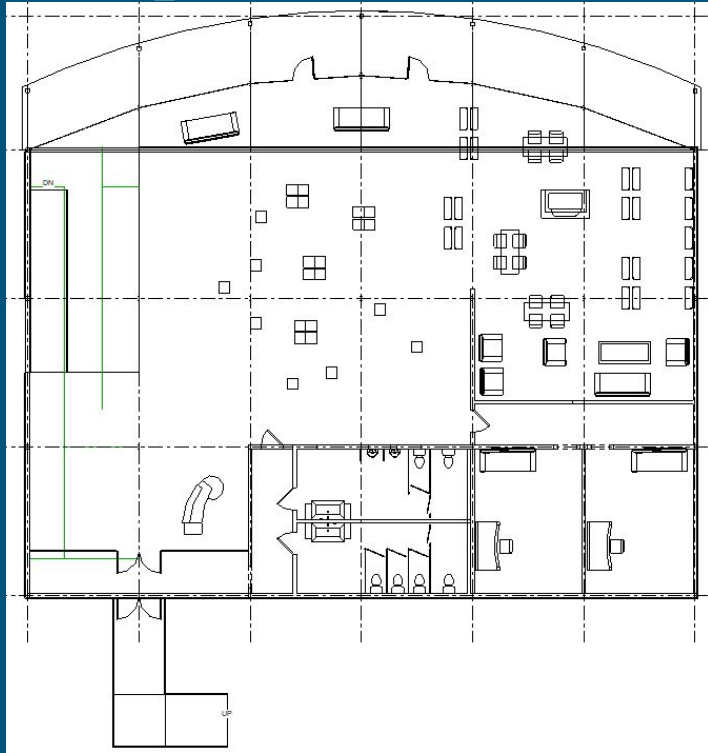
- Stone and wood
- Sleek
- Modern
- Suitable

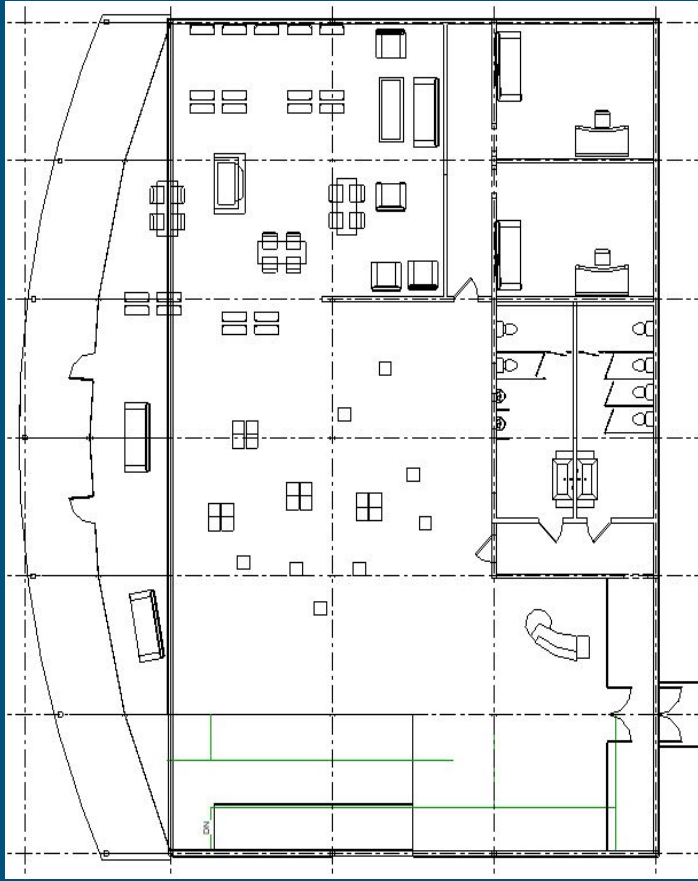


Final Design

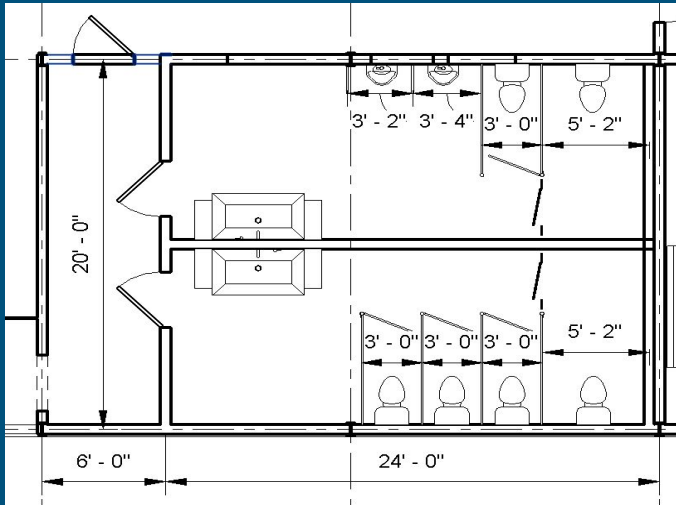
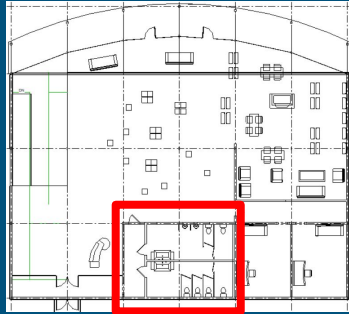


Top Level

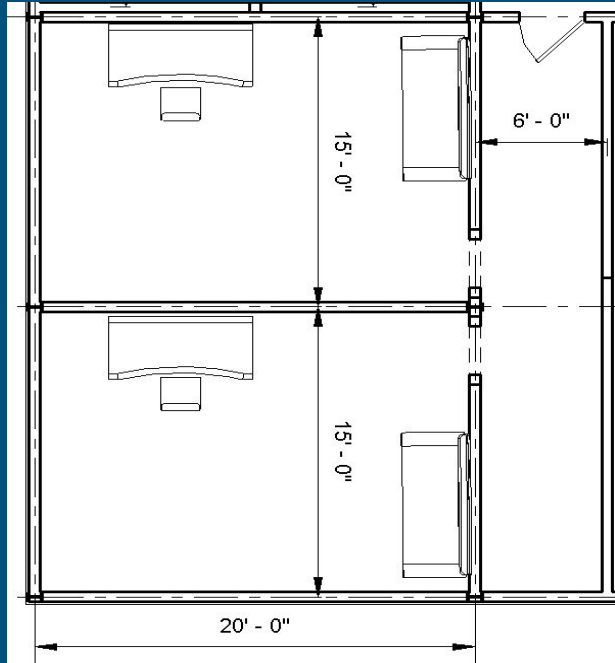
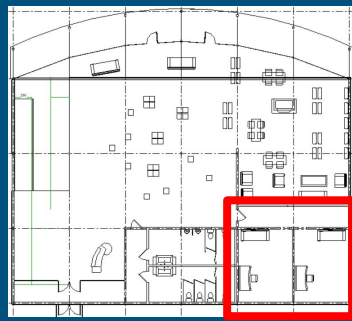




Restrooms



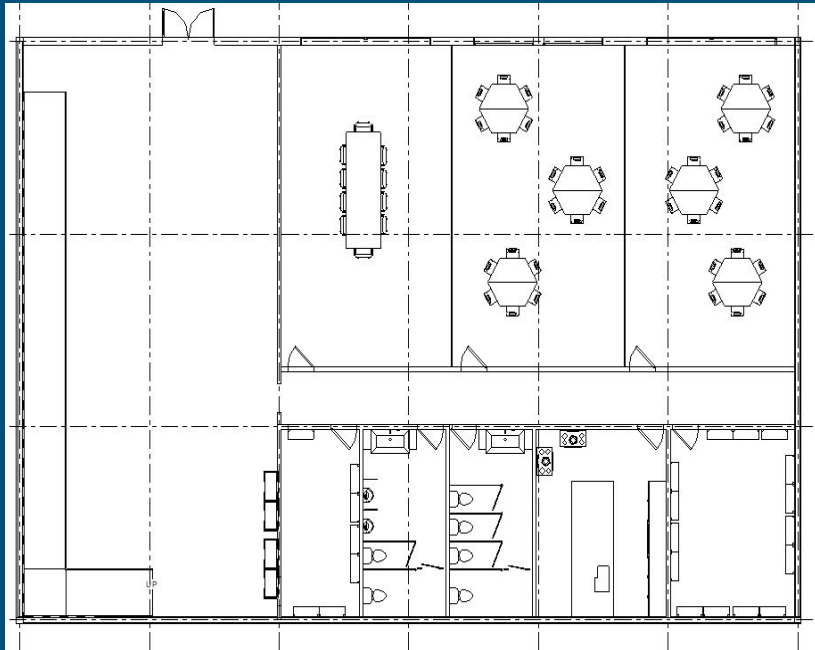
Offices

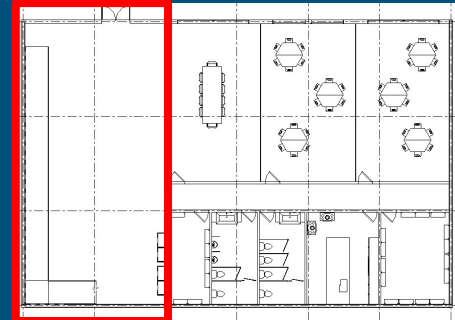
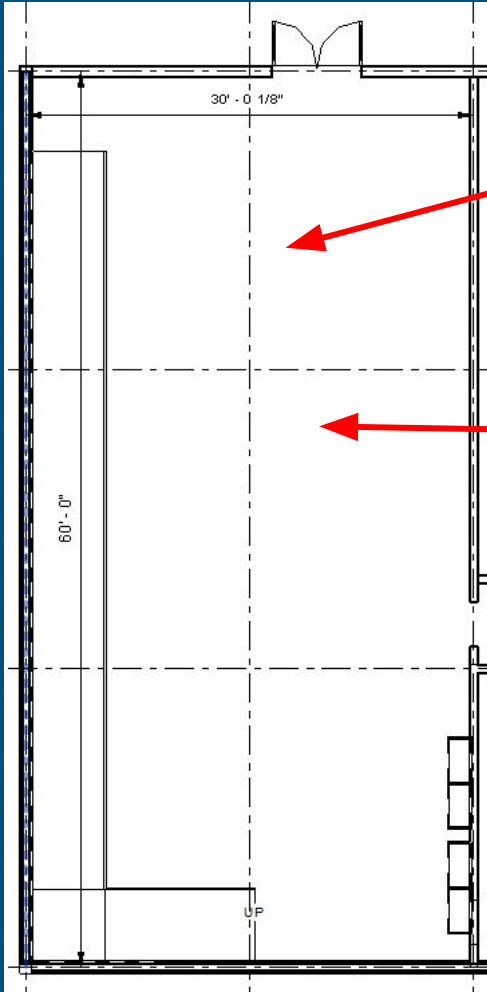


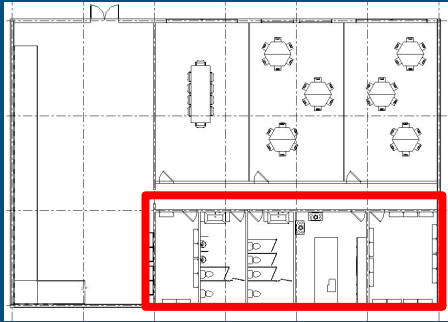
Library and Display Area

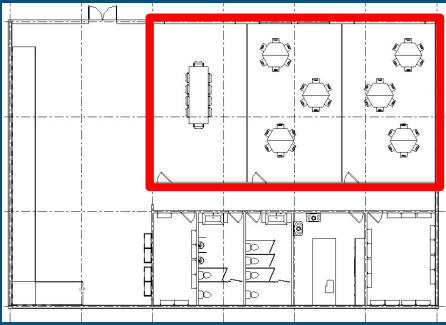


Bottom Floor

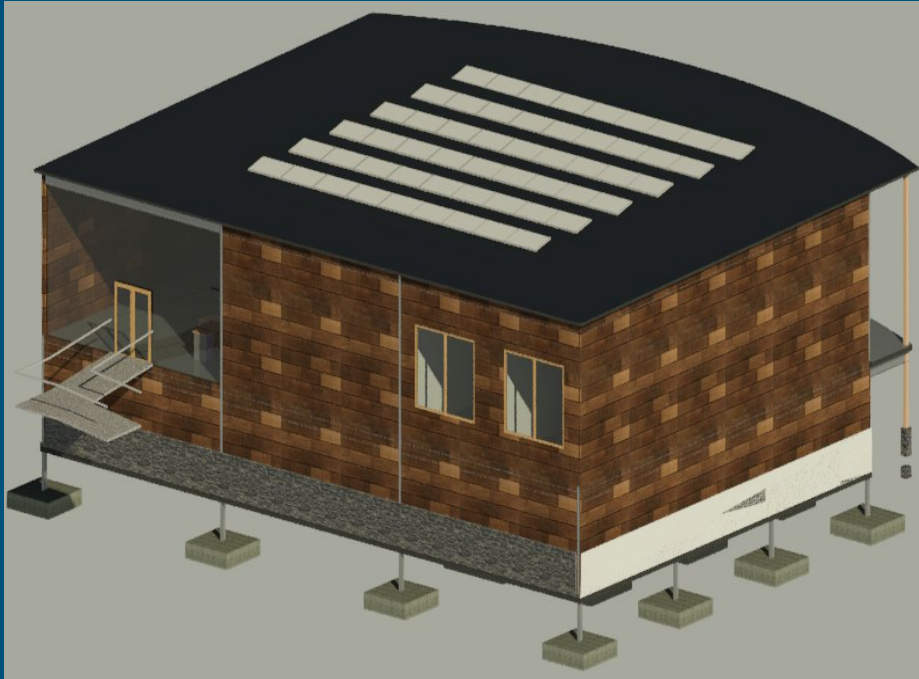








COST ESTIMATION



	Cost
Building Components	\$1,106,000.00
Building Appliances	\$45,110.00
Siteworks	\$220,625.00
Contractor Fee	\$339,582.50
Architect Fee	\$108,666.40
Total	\$1,820,000.00

Social Impacts

Community - opportunity for learning about the environment

Traffic - increase in trial use and traffic

Environment - limited

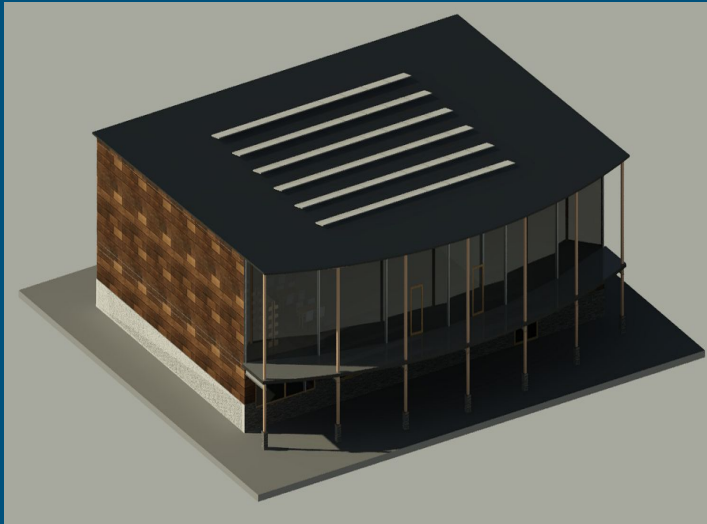
Economy - expected to accelerate due to tourist attractions

Public - improve the public perception of Boone County



CONCLUSION

We designed an access route, a parking lot, a sustainable nature center building, a septic system, and we did cost estimation.





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Sustainable Nature Center

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 Civil & Environmental Engineering Department
 University of Iowa



Site Location

The site location is in Grants' Woods Park of Boone county, IA.

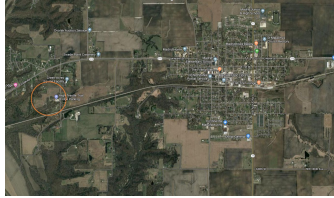


Figure 1. Site location

Site Plan

Since our sustainable nature center building will locate at the left corner of the Grants' Woods Park. We need to design an access route which connects existing road "Qf lane" with our building. A parking lot will be designed to associate with building. A preliminary septic system design will also be included. The parking lot and access route will use hot mixed asphalt (HMA) pavement.

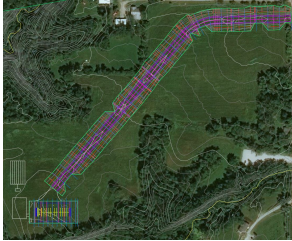


Figure 2. Site Plan



Figure 3. HMA pavement design

Due to the asphalt paved areas like road and parking lot, the runoff rate slightly increased in those areas. Vegetative Open channels are considered and designed to lead the water in ditches and parking lot to streams.

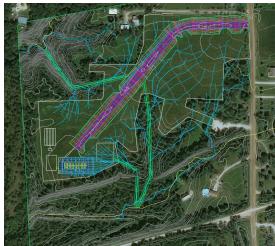


Figure 4. Drainage

Nature Center Design

The nature center was designed as a 60'x90', two-story steel structure, with a curved wall of windows and balcony facing the nearby river. The building contains amenities such as a library, interactive display area, classrooms, office space, and a kitchen. The nature center will incorporate sustainable technologies, such as solar panels and geothermal energy

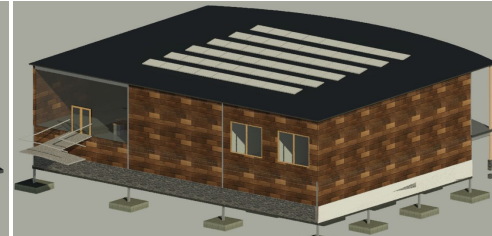
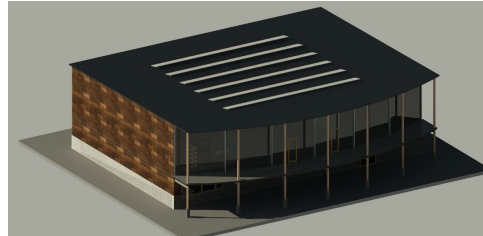


Figure 5. Nature Center Models

Cost Estimation

	Cost
Building Components	\$1,106,000.00
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References

Iowa DOT Design Manual. SUDAS. Iowa DNR. ACI 318-14, ASCE 7-16, NDS 2015, AISC