

Challenge exercise

Create a comprehensive site layout analysis in Forma Site Design for an arid climate

In the Module 3 challenge, *Create a site layout for an arid climate in Forma Site Design*, you created the massing of the new museum at Zion National Park. Now you will run simulations on this smaller project, within this arid environmental context. If you have not completed Challenge Exercise Module 3, you can quickly cover the building program and develop the building massing necessary to complete the simulation work in this challenge assignment. For reference, the building program included in that challenge is as follows:

- The building can be one or two stories tall – a total of 4,000 square feet (372 m²)
- The site layout should accommodate parking for 20 cars – provide trees/shade in or around the parking area.
- A successful site layout will take advantage of the scenery of the park, will manage sun and wind for protection of both humans and buildings, will introduce new trees to help balance temperatures, but will not interrupt the natural setting and views, will have clear path connections to parking, trails, and exterior spaces.
- Both existing buildings can be kept, or their spaces can be incorporated into the new design.
- The exterior will have two primary spaces:
 - A 500 square foot (46 m²) exterior pack and prep location for those preparing to, or returning from a hike. This is a location to layout gear, gain instruction from a guide or ranger, get access to water and restrooms.
 - A 500 square foot (46 m²) exterior space adjacent to the building with outdoor that frames views into Zion National Park.

Complete the required activities:

- Once your first pass is in place, run simulations on sun hours and daylight potential and answer the following questions:
 - Are there surface areas on the design that have either too much, or not enough sun exposure?
 - For this location, create a design strategy for vertical surfaces that allows for natural daylight, but limits the intensity of direct sunlight.

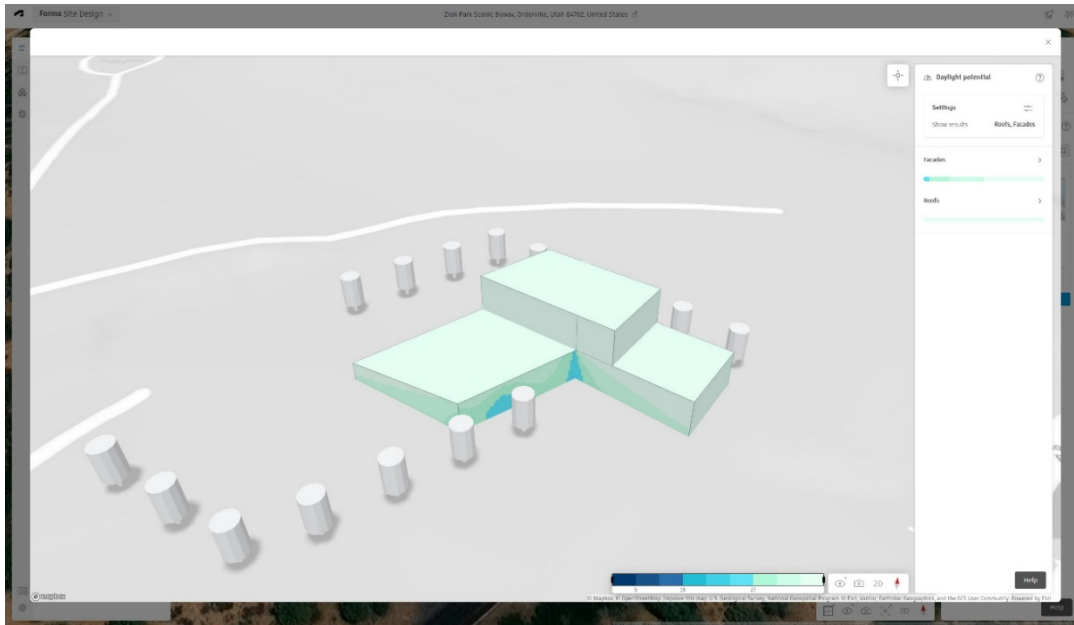


Figure 4. Zion National Park Museum - Daylight

- Run the wind simulation and answer the following questions based on your observation of the data:
- What is the predominant wind direction(s)? What are the opportunities to capture wind for passive cooling, both within the building and on the site?

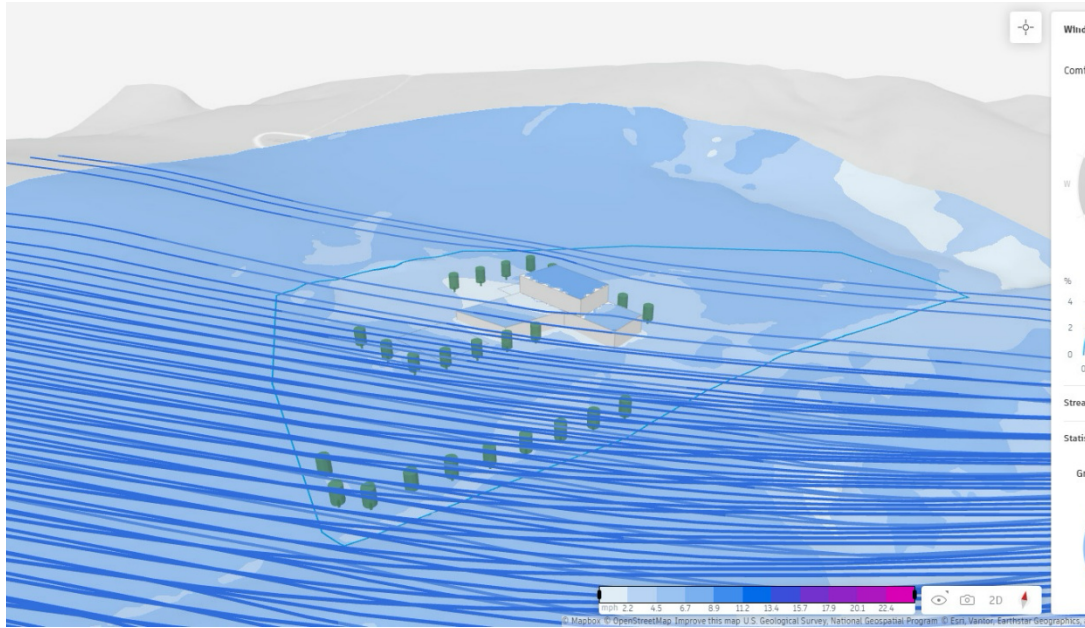


Figure 5. Zion National Park - Wind

- On your first pass at the site layout, run the microclimate analysis and observe the times that the largest groups will be at the trail head: September a 8am (departing for a hike for the day), 12pm (average museum visitor, not a day hiker), and evening at 6pm when parties would be returning from day hikes and answer the following questions:
- What is the temperature swing, and where (and why) is the maximum temperature swing on site from the 8am through 6pm time? Does the current layout work with the temperature swings, or could it create zones and spaces to take advantage of the different temperatures at different times of day?



Figure 6. Zion National Park - Microclimate

- After studying the sun, wind, and microclimate simulations, build one more site layout options focusing on the following conditions:
 - Create a solution with your site layout that uses passive cooling, allowing wind to move through the building?
 - In climates like Utah, thermal mass walls are often used to help control temperature swings (these walls use thermal lag to cool down slowly in the night, and warm up slowly during the day). Where on site could a thermal mass wall help with the building design? How should it be angled, and incorporated into the overall layout? Use the sun simulation toolset to optimize the configuration of this wall.
 - Explore the site, and develop an understanding of views to and from this location. Where should features and spaces be placed on the site layout to create views into Zion National Park, what locations can frame view from inside of the building? Work these ideas into your final site layout and explain their intent.

Grading Rubric:

	Advanced	Proficient	Basic	Emerging
Questions resolved	Well thought out response connecting design intent with data	Correct answers not implicitly tied to the design ideas.	Answers completed, but little to no application to the design	Answers are incomplete and/or incorrect
Is the data presented accurately	Accurate, applied, and presented with understanding	Completed, correct	Minor errors or missed interpretations	The data is either not completed, presented, nor available
Explanations provided with clarity (graphic and/or written)	Design ideas and design data are presented clearly and creatively	Clear responses and graphics	The information and graphics are presented, but not connected or composed	Incomplete or not legible
Creativity in the design solution	The site layout design is innovative, an appropriate response, and is informed by the data in Forma Site Design	The layout is appropriate, but the connection to the simulation data is not clear	Quality design, but not connected to the simulation data created by Forma	The site layout design proposal does not meet the design criteria