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FINAL DELIVERABLE

Title	Clinton - Eagle Point Park Primitive Campground
Completed By	Nicholas Hughes, Audrey Birk, Valerie Pardo, and Andrew Klinkrodt
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Instructor	Paul Hanley
Community Partners	City of Clinton

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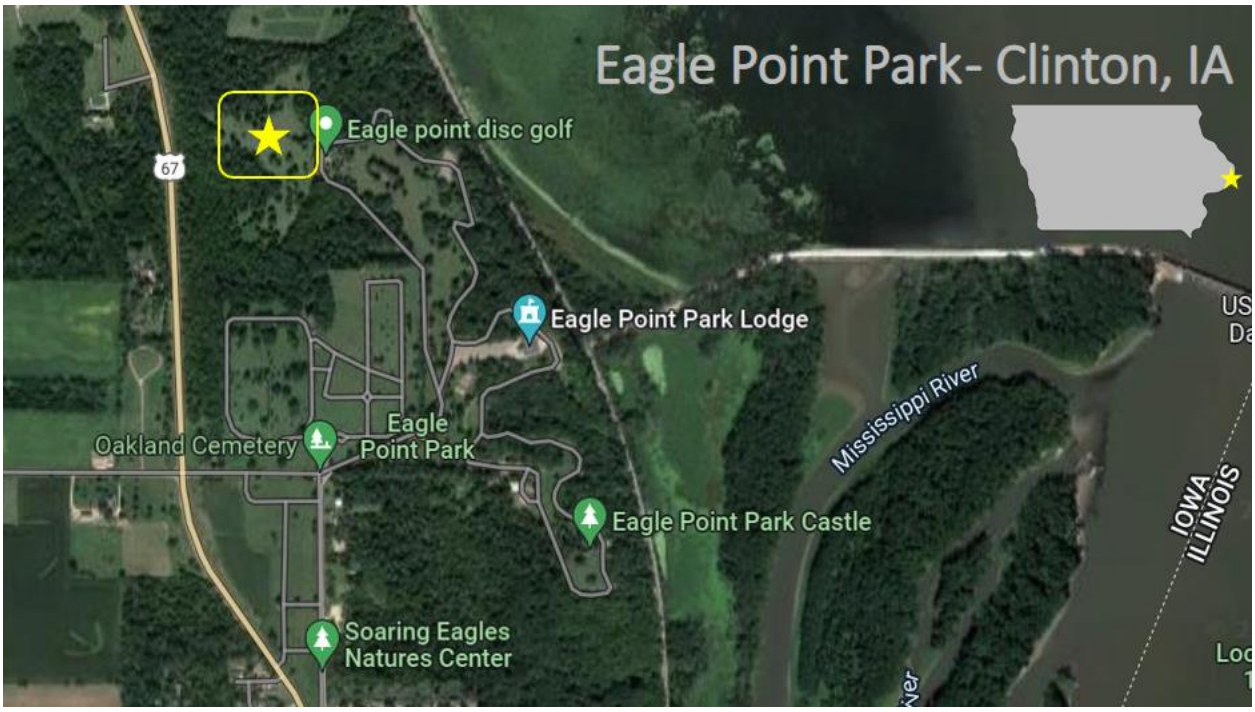
Eagle Point Park Primitive Campground
Spring 2023

Nicholas Hughes, Audrey Birk, Valerie Pardo, and Andrew Klinkrodt

Intended For: City of Clinton, IA

Joshua Eggers and Staff



UNIVERSITY OF IOWA

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

Project Design & Management

(CEE:4850)

Clinton Primitive Campground

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Dear Josh Eggers,

We are delighted to bring the City of Clinton's vision of a primitive campground to life. This report includes all our final design drawings, detailed decisions, and explanations, as well as our projected cost of the project. We have appreciated the opportunity to be a part of this project and it has been a pleasure working alongside you.

Audrey Birk, Project Manager

Section I Executive Summary

The following document is the final report for the Eagle Point Park Primitive Campground project in Clinton, Iowa. Our team includes Nicholas Hughes, Audrey Birk, Valerie Pardo, and Andrew Klinkrodt. All team members of will be graduating from the University of Iowa in the Spring of 2023.

The City of Clinton proposed a primitive campground to be designed within the Eagle Point Park limits, specifically on the south end of the disc golf course. The proposed site for the campground is located toward the northwest side of the park, just west of the covered pavilion near the existing restroom and look-out area that's north of the main lodge. The site is currently part of the park's disc golf course and a few of the holes will be manipulated to fit around the campground site. The new required basket holes for the course will be designed by local disc golf enthusiasts who understand the terrain of the area. The general scope of the project is to design a campground with 12-20 sites with limited amenities. This scope included designing individual camping sites with parking spots included, a restroom facility, running water and electricity from a nearby source, and managing front entrance gate access for after-hour use. Since the park opens at sunrise and closes at sunset daily, the current operations include manually unlocking and then relocking the gate manually each day. Part of our scope was to establish a system that would allow campers to have access to opening and closing this gate after park hours. More details about the scope of the project can be found in Section III.

Constraints of the project include the potential $100,000 budget, the 3-month design schedule, and the location itself. The main challenge of the project was working with the existing terrain of the land, which included rolling hills making it difficult to place relatively flat campsites in the park without much soil work. Originally, the existing land where the campground was intended to be designed was allegedly an ancient indigenous burial ground which posed a challenge for doing any work that involved the excavation of the land. Another challenge was getting potable water and electricity to the campsite because the closest power lines run only to the park's lodge, and the closest water line runs to the pavilion just east of the site.

Many design guidelines and inspiration for the campground were taken from the United States Forestry Service, "Recreation Facility Design Guidelines". Documents from the Iowa Department of Natural Resources were used as a reference for state codes and regulations. Using these sources, we designed a campground with sites accessible by vehicle with back-in parking and a few spots that are walk-in accessible to utilize as much of our project site as possible. Each campsite comes with amenities including a fire ring with a grill grate and a picnic table. New restrooms and a storm shelter facility will be available as well.

The team designed a restroom facility combined with a storm shelter for the campground. With the lack of an existing sewage system on-site, the restroom will utilize a waterless system. A vault toilet system was selected because it fits within the camping experience and there is already an existing vault toilet on site so maintenance would not be complex. Both restrooms will be ADA unisex stalls that also provide service as a storm shelter. Potable drinking water will be directionally bored/trenched to the site by connecting to the existing water line which flows to

the pavilion just east of the site. One water spigot was placed on-site with a runoff basin to prevent erosion surrounding this feature. Electricity has been designed to run to the campground from the main lodge since that is where the nearest power source is at the park. The electricity will be used to power lights on the restroom/storm shelter at each entrance door so that patrons can see them at sundown. Trash disposal at the campground will be available for users, with accessibility to trash receptacles/dumpsters. Park staff will most likely be responsible for collecting trash bags and properly disposing of them. The location for the campground is currently used for several holes of the frisbee golf course; the displaced frisbee golf holes will be redesigned and relocated elsewhere in the park with the help of local disc golf enthusiasts which is not within our scope.

We conducted a preliminary construction cost estimate for the campground that is broken down and explained in Section VII. The total cost has been estimated to be $246,500 which includes material, equipment, labor, overhead, profit, and contingencies. The remainder of this document includes all necessary design drawings, plans, and documents that the client has requested. Current available project funding is $100,000. With this in mind, we have broken the work into three chronological phases. Phase 1 includes all dirt work, furnishing each campsite, and the installation of an automatic opener to the existing gate ($95,900). Phase 2 is the addition of gravel to the roadway and parking area at each campsite as well as running water and electricity to the location of the future restroom and storm shelter, estimated at $57,000. Phase 3 is the entire construction of the restroom and storm shelter, estimated at $93,600.

Section II Organization Qualifications and Experience

Section II-A: Organization Location and Contact Information

Location: 3100 Seamans Center for Engineering Arts and Sciences, Iowa City, Iowa, 52242

Contact Information: Audrey Birk, Project Manager

Client Name: Josh Eggers

Client Email: joshuaeggers@cityofclintoniowa.us

Section II-B: Organization and Design Team Description

This report was completed by students from the University of Iowa College of Civil and Environmental Engineering graduating in May of 2023. The team includes Audrey Birk, Andrew Klinkrodt, Valerie Pardo, and Nicholas Hughes. Audrey took on the role of project

manager, Andrew, and Nicholas shared the responsibilities of report production, and Valerie was the technology service lead.

Section III Design Services

Section III-A: Project Scope

General Scope:

All design work required to complete the criteria of the project followed all local, state, and federal regulations and laws. The following document contains the final design parameters and educational explanations for the process used to design this campground. This includes designs of the campsites, earthwork, access to the front gate, restroom and storm shelter, potable water, and electricity to the campground. The team has provided a presentation and poster for the client consisting of final design layouts and visuals.

Campground Scope:

The campground has been designed to hold 17 campsites with up to 3 tents per site. Each campsite includes a fire ring with a cooking grate and a picnic table. Each site utilizes existing grassy land for tents and added gravel for parking spaces that are accessible via the looped gravel road connected to the main parking lot. Furthermore, the campground will include a dumpster and trash receptacles. Earthwork and grading were developed to maintain relative flatness throughout the campground for each campsite but maintain a relative slope to allow for rainfall to runoff efficiently.

Restroom and Storm Shelter Scope:

The client tasked the team with recommending an onsite restroom that does not require connection to a wastewater system since one does not exist out where the site is located. With 17 sites present, the restroom design consists of two ADA, gender-neutral vault toilets connected to a storm shelter facility. The restrooms are located between the entrance and exit of the looped gravel road with the restroom doors facing the campsite for easy access. The storm shelter doors are on the north and south sides of the building to protect from winds blowing from the west to the east.

Gate Access Scope:

The current entrance gate to Eagle Point Park is manually opened daily at sunrise and closed at sunset. As expected, this creates a constraint as to how the campers would be able to enter and exit the park when it is closed at night. The client tasked us with finding a solution to allow the camper's gate access so they can enter and leave the park as needed. After researching many options, we decided that the simplest and easiest way for campers to have this ability would be to use a punch-code lock box that can be reset after each weekend to keep the park safe.

Water and Electricity Scope:

The client requested potable water and electricity be routed to the site. With an existing water source located at the nearby covered pavilion, our design consists of extending the water pipe roughly 560-feet west of the pavilion. A water spigot will be installed on the south end of the restroom facility for the guests to have access to clean drinking water. Electricity will be routed to source power to the exterior lights located on the north, south, and west sides of the restroom/ storm shelter.

Section III-B: Work Plan

The work plan is documented using a Gantt chart in Figure III-B.1 below to describe major tasks and the timeline for this project. Table III-B.1 expresses which team member completed each of the tasks displayed in the Gantt chart and the total number of days it took to complete each task.

The plan began with preliminary work and research of the area, which took 10 days to complete. Information was gathered about the site after conducting a site visit and meeting with the client. Following the visit, layout options that were originally presented by the client were discussed. After coming to a decision as a group on where the campground would best fit for the terrain of the park, Audrey reached out to the Office of the State Archaeologist and confirmed that our proposed campground is not onn a potential historic Indian burial ground. For further information about this, please contact Dr. Lara Noldner, OSA Bioarchaeology Program Director.

The campground layout was the most time-consuming task because it consisted of the most elements. As a team, we came together to draft ideas and potential designs for our site. After finalizing the layout, Andrew used Civil 3D to design the entrance roadway, grade the surface, position campsites, and estimate how much cut or fill the site will require.

Audrey and Valerie collaborated to design the vault toilet and storm shelter structure. It was important that Valerie investigated the environmental impact of the vault toilet and suggested ways to keep it environmentally friendly. Audrey was able to create plans and elevations of the structure using Revit.

While all of this was going on, Nic researched materials and methods for extending the water to our site as well as running utilities to the site. He created an extensive cost-estimating spreadsheet for all materials and prices per unit for this part of the construction. An additional task that he completed was researching and determining the easiest way for the campers to enter and exit the campground after hours. Requesting quotes and getting pricing on that item made it easier to predict the cost of our solution.

While Valerie conducted a hydraulic survey of the land for pre- and post-construction, she was able to determine if there was pooling or not on our campground after a rainstorm to determine if the grading was to a proper elevation. The goal was to determine that the soil would drain properly so that campers would never sleep in puddles of water.

She also located costs for campground amenities like trash receptacles, fire rings and fire grills, gravel for the campsites, etc. Finally, everyone participated in putting together a detailed report and a client presentation, which was presented on April 26th, 2023, in Clinton, IA. This included a poster visual and a final set of drawings. Overall, as seen in the Gantt chart, the project took 160 days to complete the campground research, design, and final plans.

Table III-B.1: Assigned Tasks

Task #	Assigned To	Duration (days)
1	Everyone	10
2	Nic	10
3	Andrew	50
4	Valerie/Audrey	30
5	Nic	25
6	Nic	10
7	Valerie	10
8	Everyone	15

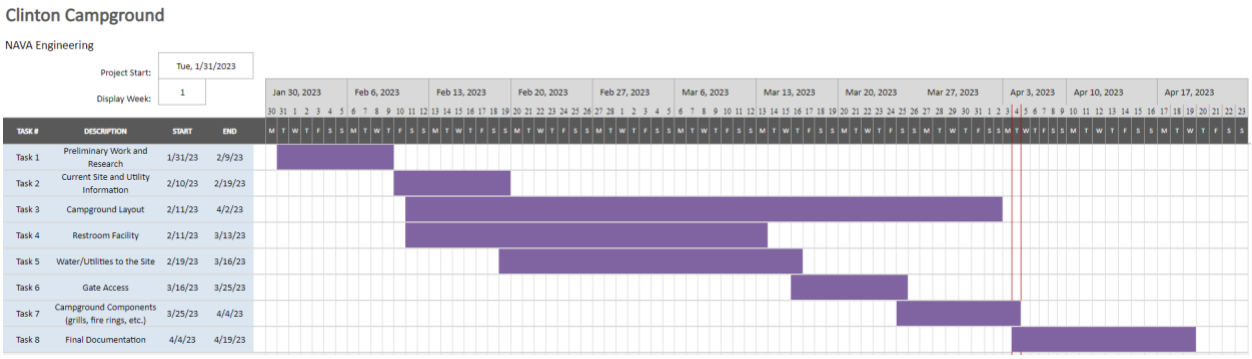


Figure III-B.1: Project Gantt Chart

Section IV Constraints, Challenges, and Impacts

Section IV-A: Constraints

The current approved budget for the Eagle Point Park Primitive Campground is $100,000, which can increase if uture grants are rewarded to the city. Although the current budget won't cover the total cost of this project, our team tried our best to be as cost-efficient as possible knowing the city would like the project completed in the near future. Our client also expressed that much of the work on this project may be performed by City staff.

Another constraint the team faced was the possibility of an Indian burial ground at the spot selected for the campground It this were the case, it would mean the soil could not be disturbed.

This would have created a major obstacle considering the surrounding terrain is very hilly and not fit for camping. However, we were able to confirm that there is not a burial ground at this site. Prior to this confirmation, we researched and discussed other possible locations for the campground that would best fit the community.

The additional scope of adding an entrance lock or key to the front entrance gate into the park was another constraint. It is within the city ordinance that the gate be opened and closed at sunrise and sunset every day with the exclusion of some holidays. Currently, a park keeper that lives on-site manually opens and closes it. We sought a way to make the gate easy for campers to use, allow the park keeper to regularly reset a passcode, and maintain safety.

Section IV-B: Challenges

The existing terrain is extremely hilly with varying elevations not fit for a campground without grading the land. Since campsites should be relatively flat for sleeping and recreation, it was challenging to accomplish this without earthwork.

The existing paved roadway that will be used to access the entrance of the campsite was considered a challenge as the current width of the pavement is too narrow to fit a garbage truck for pick up at the site. The client is confident park staff can collect the trash in the back of a pickup truck and transport it to the main dumpster near the main lodge.

The extension of the current power and water lines that exist at the park were another challenge. The existing placement of the power lines isn't ideal for our site and posed as a challenge because it is currently located at the main lodge, which is approximately 1,800 feet from our site. We researched best installation methods and costs and have provided options from which the client can decide. The water pipe is easier to solve for as it only needs to be extended about 500-feet from the existing spigot located at the nearby pavilion. Our client understands the necessity of both power and water to the site and the full extent of work and cost that is required to extend these utilities to the campground.

Safety is a challenge we considered when designing each aspect of the campground. The surrounding terrain is relatively steep, making exterior lighting placed on the restroom facility especially important for nighttime mobility.

Section IV-C: Societal Impact within the Community and/or the State of Iowa

Eagle Point Park is a popular park in Clinton that many people already enjoy for activities such as walking, biking, disc golf, and more. The addition of the campground to this park will bring in more visitors and families interested in connecting with the outdoors and the Mississippi.

In the past, Boy Scout troops have camped within the park, and the City of Clinton strives to create an inviting campsite for them and other groups. In addition to providing a wonderful outdoor entertainment site for local residents, the campground will also provide extra income for the park and the City of Clinton, as well as nearby businesses that campers might visit.

While environmental impacts are possible with the addition of restroom facilities and trash receptacles, we have sought sustainable solutions. The client said that every tree removed for the construction of the campsite would require two new trees to be planted elsewhere on the site. We've also tried to suggest grading that does not overly change the existing topography or alter the native vegetation too much. The main goal is to not take from the land but to add to its experience for everyone to enjoy.

Section V Alternative Solutions That Were Considered

Section V-A: Campground Layout

Multiple options were considered for the campground layout. As mentioned in Section IV, there were many also location options within Eagle Point Park. Some spots more enclosed and others in a more open space. The location that was selected for our design was the one that had the most open available space and enough surrounding forest to provide users with a primitive feel. The first major consideration was how campers would access the campground. The two ideas we decided between were either designing a road that would flow through the campsite or keeping the vehicles in the parking lot and having the campers walk to their site. We chose a design that included the roadway running through the campground so that campers can park at their individual campsites. We designed three additional camping sites that are walk-in only; the walk from the parking lot is roughly 350-feet long.

We considered various layouts for the road. The first alternative was to have a two-way road go past each site with a turnaround at the end of it. This would be less expensive as it would be a shorter stretch of roadway, but it would not create a middle space that can be used for gatherings and bonfires as compared to the horseshoe design. The design that utilized the maximum space was a horseshoe or loop-shaped single-lane design that goes past every site. This allows for a recreation area in the middle of the horseshoe for gatherings and can also hold additional campsites. We considered multiple road surface materials, including dirt, gravel, and asphalt. Ultimately, we selected gravel because it is the most cost-effective and durable material given the minimal traffic expected. Gravel will also help slow runoff from rainfall.

Section V-B: Restroom Facility and Storm Shelter

Our client expressed that this project should be a primitive campground and that there is an existing restroom in the park. We considered alternatives for the restroom facility with the primary goal of it being waterless and not requiring access to a sewer.

Per the client's suggestion, we considered porta-potties. A positive of this option is that porta-potties are easy to install and clean out; however, they would need frequent maintenance given Iowa's harsh weather. A composting toilet that would be more permanent was also considered. This environmentally friendly options turns human waste into a humus-like product. Ultimately, we did not go with this option because they necessitate a lot of maintenance, and the process of composting can take a long time before the results surpass the costs. Also, this type of toilet may require drainage of excess liquid which may pose additional challenges regarding design and wastewater regulations.

For the final design, we selected a vault toilet. The deciding factors for this decision came down to price, stability, and the fact that there is already a vault toilet on site. Regarding the cost of the restroom facility, this option incorporates every aspect that was requested by the client and

deemed valuable for the campers' comfort while on this site. The exterior aesthetic of this restroom fits better into the setting of the primitive campground compared to a porta-potty. Both restrooms will consist of 750-gallon tanks that only require maintenance cleanout after roughly 11,000 uses. Since there is already an existing vault toilet near the campsite, the maintenance truck that comes to clean it out will be able to add an additional stop at the campground making scheduling for maintenance easy. In addition to deciding what type of toilet would be placed on-site, the number of restrooms and accessibility were considered as well. If all campsites are reserved, there would be a maximum of 51 tents. Two restrooms seem appropriate for the number of potential campers. Based on the US Forestry Service and the City of Clinton code of ordinances, in this application, it is not legally required to design ADA restrooms; however, as a group, we decided that it was within the interest of every camper that both restroom stalls were designed to be ADA compliant. The stalls will be labeled unisex to allow usage by any camper.

Currently, a a covered picnic table pavilion is the only location for shelter from inclement weather. We chose to design a storm shelter to provide campers another option if a storm were to hit the area. We found a design from Romtec that incorporates a restroom and a storm shelter into one functioning facility. Although it will cost more than a standalone restroom, it provides a safe location for campers to go with the proper material to withstand storm parameters. As engineers, it is our responsibility to design and plan for the worst outcome even if it means a higher price.

Section V-C: Utilities

Due to limited knowledge about the existing underground utilities, exact recommendations could not be created. The City of Clinton was unable to provide plan sheets of the existing utilities in the area. General recommendations and cost estimates were provided using conditions that aligned with the International Code Council.

According to the International Plumbing Code Section 305.4, exterior water supply system piping shall be installed no less than 6-inches below the frost line, which in Clinton is 50 inches. Therefore, 1-inch PEX A water lines are to be installed in a 60-inch trench connecting from the existing water spigot located near the pavilion in the park to the new restroom and storm shelter near the campground. There were several alternatives for providing water at the campsite that were considered. Potable water will be piped from the existing waterline that currently ends at the neighboring covered pavilion. The most cost-efficient and effective place to locate the water spigot is next to the restroom facility with a drainage basin underneath to collect runoff and prevent erosion near the spigot. The basin will be made of the existing ground but will have a

gravel patch placed below the spigot to slow down and infiltrate the runoff that will be produced with usage.

Electricity does not extend beyond the Eagle Point Park Main Lodge, so it will have to be routed from the lodge to the campground. There are several alternatives for the path of the electric utility lines that will be installed underground. Code mandates nonmetallic raceways be buried at least 18 inches below grade. The team decided to examine both directional boring and trenching as there are benefits and drawbacks to each method. Ultimately, it was decided that it is most practical to install the utilities within trenches.

There are alternatives to trenching the power lines to the site, such as utility poles or directional boring. Electricity to power lights on the campsite will be minimal and only placed in areas that are of increased safety risk such as near the restroom. An alternative option would be to place solar power panels on the restroom and storm structure to power lighting instead of routing electric lines, but this decision would produce an unreliable source of lighting that would not have been in our client's best interest. There is always an option in the future to convert the power at the site to solar panels if that is preferred or desired. Another option considered is installing skylights into the roof of the structure to provide natural lighting in the bathroom. This wouldn't be FEMA P-361 approved for our storm structure for nighttime. We discussed where the lighting would be placed throughout the campground in addition to the restroom, however, it was decided that to maintain a primitive camping experience on the site, lighting only in and around the restroom would be adequate.

Section V-D: Gate Access

With the addition of the campground to Eagle Point Park, access to the park must be available around the clock. To allow this access, we considered modifications to the existing or an entirely different system. The addition of a commercial swing gate operator was considered to allow the gate to automatically be opened and closed between sunrise and sunset. Campers would be provided with a code that would allow them to access the gate after hours using a keypad. An induction loop would be installed on the pavement on the inside of the gate that would allow any vehicle to exit the park when the gate has already been closed for the night. The code would regularly be changed to ensure heightened security.

Another option is to utilize a resettable combination padlock and chain to allow campers to access the campsite with a provided code. This method seems to be the easiest for the campers to use and for the campground staff to manage. It is also the most cost-efficient. Using a traditional chain and padlock with a key on the gate is yet another option. The park caretaker currently locks the gate at night and unlocks it in the morning. Having a key to this lock system would require campers to gain access to a physical key from either the caretaker or via an electronic lockbox. This seems rife with possible problems, including improper use and loss of the key.

If the gate were to be replaced completely, there would be many variations of the front access gate available on the market that would provide the security our client is looking for, such as a slide or swing gate. These options would be appropriate in this application and would also include an automatic gate opener and keypad, which seems to be the newest and most reliable technology.

Section V-E: Campground Components

Campground components include picnic tables, fire rings with grates, and pedestal grills. For the tables, the client favored a hard polymer material that is weatherproof and resilient to vandalism. Wooden tables need to be replaced every few years due to their lack of durability. While concrete tables are very durable they are difficult to move and may pose a safety hazard. Additionally, the material is porous and absorbs liquid easily, which requires resealing maintenance every 1-3 years.

Fire rings are typicall made from stone or metal. Metal fire rings are less expensive and just as durable as stone. The cooking grates add cost but will likely please many campers wanting to cook over their campfire. Stone fire rings were considered for their aesthetic value but were determined too costly and less safe. The metal grills with the cooking grate seemed to fit the campground's needs best. A community fire ring in the center of the campground was added to the final design. Pedestal grills like ones in other parts of the park were considered but not ultimately chosen as they detract from the primitive quality.

Trash removal options included a dumpster in the nearby parking lot in which campers can dispose garbage. The other option is for campers to pack out their trash and dispose of it at another location such as near the Eagle Point Lodge. There was also an option to use typical residential cans, such as plastic 65-gallon cans. This idea was recommended to us by the parks and recreation director, as a solution that allows the park workers to easily remove the garbage by themselves with a pickup truck.

Section VI Final Design Details

Section VI-A: Campground Layout

Site Plan

The existing contours of the land on the site were difficult to work with for a campground design which needs flat spaces for comfortable sleeping. Because the site is all rolling hills, our team did its best to flatten parts of the site without having a large amount of cut or fill needed. After the final grading of the site, there is a net volume of 390 cubic yards of fill. After finalizing the grading plan, the average slope of each campsite is estimated to be 5%, but a note was made in the plans to fine-grade the tent, fire, and table areas. A runoff analysis was made to confirm that the earthwork did not negatively affect the runoff rates or create pooling of water. A concern of the client was the campground's interference with the existing disc golf course. The final site design only interferes with holes 1, 13, and 18. Further research for the replacement of these holes should be done by disc golf professionals; view drawing sheets 3-5 below for more details.

The layout of the campsites is provided below in the design drawings section, sheets 3-1 and 3-4. This layout was made to maximize the privacy of the campers by spreading out the sites. Each campsite occupies a 50’ x 30’ section, which includes the fire ring, table, and parking area for the non-walk-in sites. Walk-in sites were designed to be placed on the north side of the campground, connected to the gravel road by a small walking trail. The plan for these sites is to have campers drop their supplies off on the side of the gravel road, park in the existing parking lot on the main access road, and then walk to their campsite. Also, since these three campsites (#6, #7, and #8) are more secluded, the team imagines these would be a good option for group campers such as Boy Scouts. Lastly, the campsite layout enhances the space in the center of the campground, which can be developed into a community area if the park decides to put grills or a large campfire ring there.

The restroom will be placed near the existing asphalt road to allow pump trucks to come by to pump out the waste. Furthermore, grading was done so the restroom facility is not on a flat spot. The site was designed to have a water spigot just south of the restroom with a drainage basin under it to limit erosion. A typical design of the spigot is in the plan drawings on page 6-1. Only having one spigot located near the restroom will save construction costs but can extend the water line to the other side of the campground if they decide to install two water spigots.

After grading is completed, it is recommended that urban grass, like Kentucky bluegrass and perennial ryegrass, be planted in the areas that will be commonly used by campers. It is estimated that this area encompasses roughly 2.4 acres. Rural grass, like tall fescue, should be planted on the rest of the campground, which includes areas on the edges of the campground that will not be used by campers. This area is approximately 1.2 acres. Seeding will be required for the campground area to rapidly return to its original look since grading will remove the existing foliage. The entirety of the campground area should be covered with grass except for the roadway, parking areas, and restroom facility.

It is recommended that the campground take reservations for each campsite online. Allowing the campers to make reservations online simplifies the process of paying for each site and access to the code for the front gate. If the park wants to allow on-site payments, we included a design of a typical payment drop box in the typical sections of the plan drawings. It is up to the discretion of Eagle Point Park to decide how the reservation and payment system will work.

Road

The road was designed to have the entrance on the north side of the existing parking lot, with the exit on the south side into the existing access road. The road was designed to be 8-inches thick and be composed of ½" gravel to comply with AASHTO Road Design for gravel roads. The road must have a 14-foot-wide driving lane and 1-foot-wide shoulders on each side to follow the USBR campground guidelines. The road is designed to have a speed limit of 10 miles per hour, which correlates with a turning radius of 17.54 feet as seen in Appendix A. With that said, a Civil3D driving automation was made with a truck and trailer to check the road's ability to handle larger vehicles. A snapshot of this can be seen in Model 1 of Section X. The vertical alignment of the road was made with the existing elevations in mind to limit the amount of cut and fill needed. With this design of the road, approximately 404 cubic yards of ½" gravel will be required. Since 14 of the 17 sites have 20' x 20' gravel parking stalls, the total amount of gravel needed is 543 cubic yards. These gravel parking stalls were designed to be graded off the shoulder of the road to allow cars to pull into the stalls easily. The road uses the existing land and several curves to add aesthetics and safety to the campground. Looking at the road cross sections in drawing sheet 5-1 and 5-2, it shows a slight ditch on the left side in certain cross sections. In the construction of the site, this will not be the case. There should be no low points between the shoulder and dirt where water can collect and potentially flood.

Runoff Analysis

To ensure that the earthwork design would not affect the existing drainage areas and runoff discharges within the area, runoff analyses were done on the pre-and post-developed land. According to the Iowa Storm Water Management Manual (ISWMM) Chapter 3, Section 4, to determine runoff discharges in the three-acre area, the Rational Method is the most efficient. The Rational Method consists of finding the peak rate of runoff in cubic feet per second with the runoff coefficient, the average rainfall intensity, the area in acres, as well as the time of concentration. The runoff coefficient depends on the soil type of the site. The Web Soil Survey (WSS) by the United States Department of Agriculture website was used to classify the soil in Eagle Point Park. The survey stated that the hydrologic soil type is C: silt loam with a slower infiltration rate. The runoff coefficient was then determined by *Table VIII-B.1* in Appendix B for Lawns with 75% or more grass in good condition. The area for the equation is three acres.

To find the appropriate intensity for the equation, the time of concentration was needed. To find this, WinTR-55 was used based on the areas, the longest flow path length, and the weighted curve number.

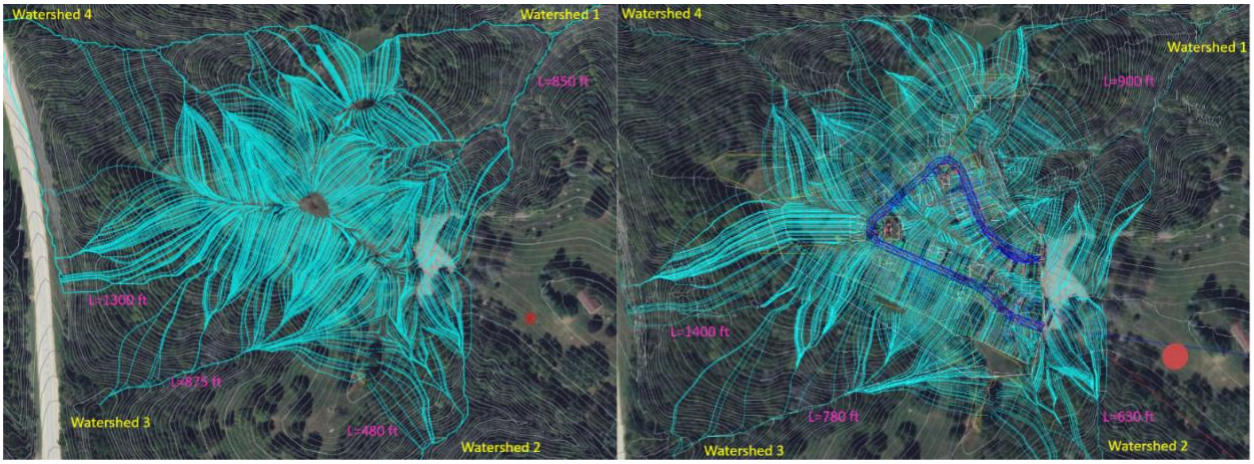


Figure VI-A.1: Pre-development (left) vs post-development (right) watersheds and longest peak flow paths

Splitting up the area into four watersheds with 0.75-acre areas each and inputting this into the program gives us weighted curve numbers of 72 for each watershed, staying consistent over the grassy type C soil. As seen in Figure VI-A.1 above, the lengths of the longest flow paths are labeled for the pre-and post-development. Breaking up into sheet flow and shallow concentrated flow (over grass versus branching into the wooded area), the slope of the land is also taken into consideration. The times of concentration were calculated and rounded to 5–10-minute travel times pre- and post-development. Using the rainfall intensity *Table VIII-B.2* for Section 6-East Central Iowa in Appendix B and matching up the durations, the intensity was used to calculate the discharges using equation $Q = CiA$. The pre-development peak runoff discharges for the 5-year return period are 3.63 cfs, the 10-year return period 4.22 cfs, and the 100-year return period 7.75 cfs for all four watersheds. The difference in the post-development data is that now the longest flow length for watersheds 1 and 2 are being pushed through the paved area of the parking lot due to grading and placement of the gravel road. This slightly adjusts the peak flow discharges for the 5-year return to 4.96 cfs, the 10-year return period to 5.79 cfs, and the 100-year return period to 10.53 cfs for watersheds 1 and 2. For watersheds 3 and 4, which are not over the paved areas, the data stays consistent with the pre-development discharges. Sample calculations are in Appendix A. To conclude the data, the grading does not strongly affect the runoff during various storm events. The natural drainage system is still being utilized, but due to the runoff flowing over the paved parking lot, the team suggests mulching the area or creating a vegetative filter strip alongside the North and South of the parking lot, between the wooded area. Mulching will require dry straw or woodchips placed on a downslope of the wooded area to reduce runoff and for sedimentation and erosion control, where a vegetative filter strip will require overseeding native grasses and plants that can also be integrated between the parking lot and the wooded area to slow down the runoff discharge.

Section VI-B: Restroom and Storm Shelter

A restroom within the campground is one of the most necessary amenities in this design. Our team decided camper safety was a priority even though legally it is not a requirement. When designing for people to stay outdoors in the park, Iowa weather can be unpredictable and often harsh. The design includes two vault toilets and a storm shelter within a single building, located between the entrance and exit of the campground roadway. This location provides easy access from the main parking lot as well as all campsites within the campground. The restroom was designed to be a vault toilet system due to the lack of sewage connection in the area. This type of system is designed to hold all human waste in a cross-linked polyethylene vault tank below ground level. The 750-gallon tank requires the waste to be pumped out of the vault after roughly 11,000 uses. The park currently empties its existing vault toilet, which is just east of this site, roughly once per year and expects this facility to be maintained on the same schedule. To ensure accessibility of the maintenance vehicle, our design is consistent with the placement of the existing vault toilet, which allows the pump truck to reach the manhole covers on the sides of the facility from the roadway. This design saves unnecessary costs by not requiring any sanitary sewer pipes. The facility itself includes two separate unisex and ADA-accessible stalls. The US Forestry Service was used to find proper ADA measurements and requirements. For smell mitigation of the vault toilets, a 12-inch diameter PVC exhaust pipe is to be installed vertically. The facility is purposely placed with the bathroom doors facing west to allow normal wind flow to circulate through the vents, through the toilets, and out the pipe. This will ensure that the smell within the restroom remains pleasant and the air can naturally infiltrate the odor through the vents on the restroom doors. Within the restroom stalls, a typical vault-style toilet should be placed in the corner as seen in the architectural view of the drawings.

The entire structure of the restroom facility was designed to be FEMA P-361 approved. It is a 253-square-foot storm shelter connected to the restroom facility that can hold the approximated number of campers at one given time, which is 51 people. There are two separate entrances to this storm shelter that will be available through doors located on the north and south sides. The design standard for each entrance door is shown in Appendix B, Tornado 361 Door meets FEMA P-361 standards. This shelter was designed to provide shelter for campers and parkgoers in case of an unexpected storm, as there are no safe structures relatively close to the campsites. The design and research of this facility was influenced by the International Building Code and Standard Design and Construction of Storm Shelters (ICC 500) from FEMA’s website. From the same sources in addition to the Romtec design website, our team was able to find which appropriate wind and snow loads we needed to design for. The image below displays the category of wind speeds Clinton, IA, should design for, which is 250 mph.

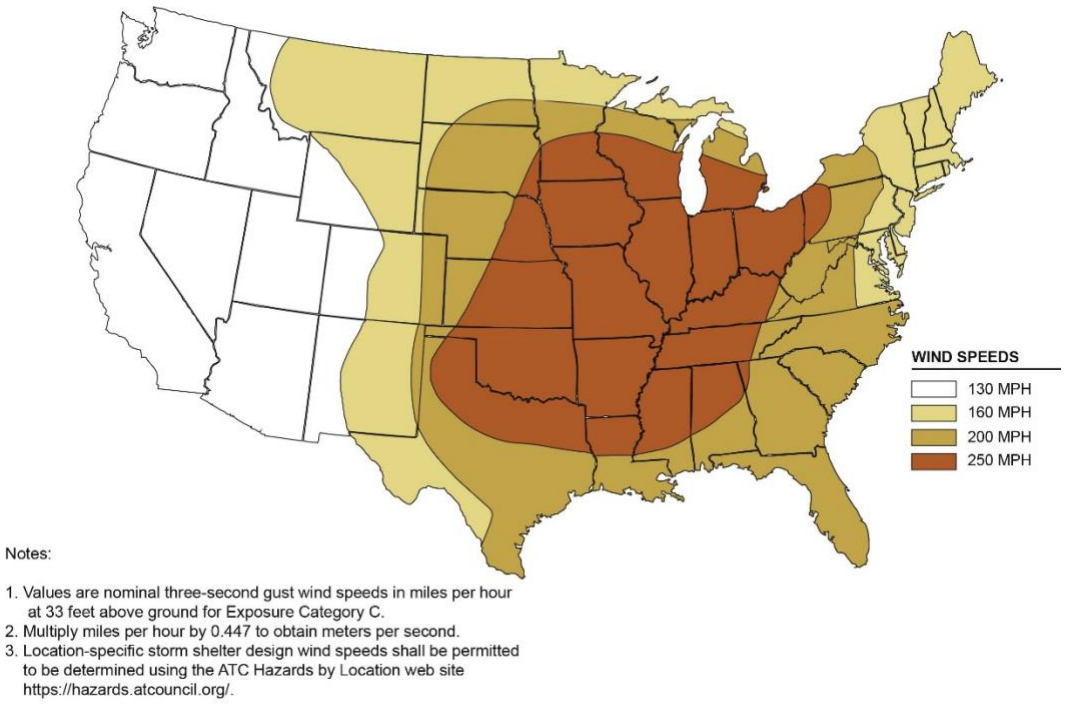


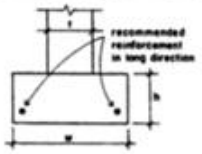
Figure VI-B.1: Design wind speeds for tornado storm shelters

The storm shelter itself includes two P-361 tornado-proof doors. Proper signage displaying that this entire facility is a storm shelter should be added to the doors. Eight-inch reinforced concrete masonry block will be used to reinforce the building walls. Both restroom doors and the East wall of the facility will have 16” by 16” Greenheck Aluminum FEMA P-361 Louver AFL-501 with an insect screen will be installed for proper ventilation within the facility. To ensure the storm shelter is only used for its intended purpose, both storm room doors will always be locked and only be unlocked in the case of a severe weather warning. This will be accomplished using a telemetry-based lock system that will communicate with the county emergency management system and be automatically unlocked in times of severe weather.

For the foundation of the structure, a strip footing design was used with a foundation-bearing wall above it. A book titled *Simplified Design of Building Foundations* by James Ambrose was used to decide the dimensions. From Table 3.1 "Allowable Loads on Unreinforced Wall Footings" specifies a minimum wall thickness of 8-inch masonry block is required for below-grade installation of this design. The red box below highlights the approved design parameters that should be used for this structure. It is also recommended that two steel reinforcement bars be used in the long-ward direction of the footing.

Table VI-B.1: Allowable Loads on Unreinforced Wall Footings

*For illustration and discussion of the process used to generate the table data, see Example 1 in the text. Allowable loads do not include the weight of the footing, which has been deducted from the total bearing capacity. Example: 1000 lb/ft² pressure, footing 6 in. thick by 18 in. wide; total capacity = 1000(1.5) = 1500 lb, footing weighs 75 lb/ft², allowable load = (1000 − 75)(1.5) = 1388 lb/ft.

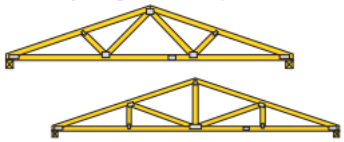


Maximum Soil Pressure	Minimum Wall Thickness: Concrete t (in.–mm)	Minimum Wall Thickness: Masonry t (in.–mm)	f'_c = 2 ksi [14 MPa]: Allowable Load on Footing (lb/ft–kN/m)	f'_c = 2 ksi [14 MPa]: h (in.–mm)	f'_c = 2 ksi [14 MPa]: w (in.–mm)	f'_c = 2 ksi [14 MPa]: Reinforcing Options	f'_c = 3 ksi [21 MPa]: Allowable Load on Footing (lb/ft–kN/m)	f'_c = 3 ksi [21 MPa]: h (in.–mm)	f'_c = 3 ksi [21 MPa]: w (in.–mm)	f'_c = 3 ksi [21 MPa]: Reinforcing Options
1000 psf [48 kPa]	4–102	8–203	925–13.5	6–152	12–305	1 No. 3				
	4–102	8–203	1156–16.9	6–152	15–381	2 No. 3				
	4–102	8–203	1388–20.2	6–152	18–457	2 No. 3	*Note:* Absence of entry under this section denotes that data are same as for f'_c = 2 ksi.			
	6–152	12–305	1850–27.0	6–152	24–610	2 No. 3				
	6–152	12–305	2280–33.3	7–178	30–762	3 No. 3 2 No. 4	2312–33.7	6–152	30–762	3 No. 3 2 No. 4
	6–152	12–305	2700–39.4	8–203	36–914	3 No. 4 2 No. 5	2736–39.9	7–178	36–194	3 No. 4 2 No. 5

When designing the truss for the structure's roof we used Alpine Engineered Product's website to gather a basic roof truss span table. A common truss design, shown in the table below, should be used. The full table provides simple calculations and ultimately led our group to choose a roof pitch of 5/12 because it was the best fit for the length of our structure. The full chart can be viewed in Appendix B.

Table VI-B.2: Truss Configurations

Common -- Truss configurations for the most widely designed roof shapes.



Pitch	Spans in feet to out of bearing											
2/12	24	24	33	27	27	37	31	31	43	33	33	46
2.5/12	29	29	39	33	33	45	37	38	52	39	40	55
3/12	34	34	46	37	39	53	40	44	60	43	46	64
3.5/12	39	39	53	41	44	61	44	50	65	47	52	70
4/12	41	43	59	43	49	64	46	56	69	49	57	74
5/12	44	52	67*	46	58	69*	49	66	74*	53	66	80*
6/12	46	60*	69*	47	67*	71*	51	74*	76*	55	74*	82*
7/12	47	67*	70*	48*	72*	72*	52*	77*	77*	56*	80*	83*

Section VI-C: Utilities

Potable water will be piped from the existing waterline that currently ends at the neighboring covered pavilion. We recommend digging a 60-inch trench that is 6-inches wide and installing a 1-inch PEX A water line from the existing water spigot to the new restroom and storm shelter near the campground. Locating the new frost-proof yard hydrant on the south side of the restroom facility with a drainage basin underneath will help collect runoff and prevent erosion near the spigot. The basin will be made from the existing ground but will have a gravel patch placed below the spigot to slow down and infiltrate the runoff that will be produced with the usage of the water spigot. The spigot should also include a back flow preventer.

Electricity will be extended from the Eagle Point Park Main Lodge to the new restroom and storm shelter. We recommend digging an 18-inch trench that is 6-inches wide beside the southern portion of the road loop and installing 2-inch Schedule 40 High-Density Polyethylene, HDPE, duct with a 6-gauge wire within to allow for current electrical demand and adequate capacity for future needs. The electricity will be used to power the light fixtures inside and outside the restroom and storm shelter.

Section VI-D: Gate Access

We recommend the addition of an automatic opener to the existing gate. Each side of the current gate would be retrofitted with a gate operator and made into an automatic electric gate. With this system, an access control keypad would be installed on the exterior of the gate that would be accessible by campers in their vehicles after hours. Campers would be provided with a code at the time of their online reservation. On the interior side of the gate will be a vehicle induction loop that will detect a vehicle and open the gate to allow campers to easily leave when the park is closed. The code would regularly be changed to ensure heightened security.

A solution to keep project costs low is using the existing chain and lock system, with the lock being a resettable combination padlock. If campers plan on arriving or leaving outside of park hours when the gates are closed, they may call the park attendant ahead of time to request the code for the lock. A similar system is used at Scott County Park just south of Clinton. If the park feels comfortable, they may provide campground users with this lock combination at the time of their reservation to increase safety if they need to leave the campground and park in the event of an emergency. A downside to this gate access option is that the park would have to trust the campground guests with properly closing the gate after using it. The code would regularly be changed to ensure heightened security.

Section VI-E: Campground Components

Each campsite was designed to have two main amenities for primitive camping: a fire ring and a picnic table. The recommended fire ring is a 30” x 9” with a grill grate and a picnic table that is 6-feet long and made of 100% recycled plastic. Furthermore, we recommend a 54” x 9” community fire ring to be placed in the center of the campground to promote group camping and interaction within the campground. It should be noted that the fire rings should not be placed directly under any trees. It was noted in the design plans that each site should be fine graded during construction to keep the high point of the site located where the fire ring, table, and tents will be placed. The design sheets included 8’ parking blocks to surround the parking areas at each campsite. We are leaving this up to the park’s discretion in whether they want to include this component. One positive to including some sort of parking block is to better separate the gravel parking area to help keep the grass healthy, but these might take away from the aesthetics of a primitive campground. Each campground should have a 4” x 4” post with the campsite number written on it to allow campers to find their site easily.

The campground will also include a trash disposal system. A recommendation for this was made in Sheet 6-1, with four 65-gallon trash cans in an enclosed fence. Using small trash cans will allow the park crews to dispose of the trash using a pickup truck, compared to using a front-loading dumpster truck, which may have issues accessing the campsites. Another component outside the individual campsites includes an information board. The information board should include any necessary information for the campground as found necessary by the park.

Section VII Engineer's Cost Estimate

Our team developed a preliminary construction cost estimate that includes the cost of material, labor, equipment, overhead, profit, and contingencies. We included a 20% markup for overhead and profit as well as a 10% markup for contingencies. Engineering and administration costs were omitted as this work is to be completed in-house by the City of Clinton. The total cost of the Eagle Point Park Campground is estimated at $246,500. This cost is broken down into subsections of utilities, site & roadwork, restroom & storm shelter, campsites, and gate access. This general breakdown is shown within the estimate. The cost estimate then breaks each subsection down into individual line items with descriptions for the client's needs. The cost estimating was done using RSMeans data as well as manufacturers and suppliers provided costs. Each section is rounded in accordance with RSMeans rounding standards.

Table VII.1: Project Breakdown

Project Breakdown	**Cost**
Utilities	$13,200
Site & Road Work	$77,400
Restroom & Storm Shelter	$93,600
Campsites	$53,300
Gate Access	$9,000
Total Cost	**$246,500**

The City of Clinton currently has a budget of $100,000, so the project has been broken into three chronological phases to account for this constraint. Phase 1 includes all dirt work, furnishing each campsite and the installation of an automatic opener to the existing gate. Phase 2 is the addition of gravel to the roadway and each parking area at the campsites as well as running water and electricity to the location of the future restroom and storm shelter. Phase 3 is the construction of the restroom and storm shelter.

Table VII.2: Phase Breakdown

Phase Breakdown	**Cost**
Phase 1 – Dirt work, Campsite Features & Automatic Gate	$95,900
Phase 2 – Gravel & Utilities	$57,000
Phase 3 – Restroom & Storm Shelter	$93,600
Total Cost	**$246,500**

Table VII.3: Detailed Project Breakdown

Project Name: **Clinton Campground**

Location: **Clinton, IA**

Description	Qty	Unit	Price/Unit	Total	Overall Total
6" wide trench and backfill, 60" deep	560	LF	$ 1.43	$ 800.94	$ 1,057.24
6" wide trench and backfill, 18" deep	2210	LF	$ 0.93	$ 2,061.43	$ 2,721.09
1" PEX A	560	LF	$ 2.00	$ 1,120.00	$ 1,478.40
2500' 6 Gauge Wire	1	EA	$ 3,072.60	$ 3,072.60	$ 4,055.83
2" SCH 40 HDPE Duct	2210	LF	$ 1.28	$ 2,833.91	$ 3,740.76
6' Bury Depth Frost-Proof Yard Hydrant	1	EA	$ 59.43	$ 59.43	$ 78.45
Utilities Subtotal				$ 10,000.00	**$ 13,200.00**
Selective Tree Removal 24" - 36" w/ Stump Removal	15	EA	$ 275.11	$ 4,126.59	$ 5,447.10
Topsoil, Remove and Stockpile On Site	2292	CY	$ 2.67	$ 4,927.80	$ 6,504.70
Rough Grading Site (<100,000 SF)	1	EA	$ 4,819.33	$ 4,819.33	$ 6,361.51
Class A Crushed Stone	404	CY	$ 57.70	$ 23,310.80	$ 30,770.26
Asphalt Patching	55	SF	$ 5.94	$ 326.97	$ 431.60
Finish Grading Gravel	1816	SY	$ 0.68	$ 1,122.72	$ 1,481.98
Finish Grading Topsoil	2292	CY	$ 7.90	$ 11,635.85	$ 15,359.32
Urban Seed	2.4	AC	$ 2,866.09	$ 6,878.62	$ 9,079.77
Rural Seed	1.2	AC	$ 1,177.05	$ 1,412.46	$ 1,864.45
Site & Road Work Subtotal				$ 58,600.00	**$ 77,400.00**
Vault Toilet Tank Excavation	14	CY	$ 36.69	$ 380.45	$ 502.19
18" x 6" Strip Footing w/ 2 No. 3 Rebar + Excavation + Backfill	88	LF	$ 24.19	$ 2,128.71	$ 2,809.90
8" x 8" x 16" Solid Concrete Block Foundation Bearing Wall	352	SF	$ 12.84	$ 3,850.88	$ 5,083.16
6" Slab on Grade	480	SF	$ 8.11	$ 3,892.49	$ 5,138.09
8" x 8" x 16" Solid Concrete Block Wall	1037	SF	$ 12.84	$ 12,134.94	$ 16,018.12
2" x 6", 12" OC Roof Truss w/ 5/16" CDX	632	SF	$ 3.97	$ 2,506.16	$ 3,308.13
Aluminum Roofing	632	SF	$ 4.66	$ 2,509.04	$ 3,311.93
1/2" FR Drywall Ceiling Painted	480	SF	$ 4.25	$ 2,039.19	$ 2,691.73
Painting on Masonary w/ Primer + 2 Coats	1037	SF	$ 2.00	$ 2,068.88	$ 2,730.93
Polyethylene Toilet Riser w/ Seat + Lid	2	EA	$ 282.72	$ 565.44	$ 746.38
Interior LED Fixtures	4	EA	$ 447.11	$ 1,788.44	$ 2,360.74
Exterior LED Fixtures	3	EA	$ 636.15	$ 1,908.45	$ 2,519.16
3' x 7' Steel 18 Ga. Doors	2	EA	$ 3,843.44	$ 7,686.87	$ 10,146.67
3' x 7' FEMA 361 Heavy Duty 12 Ga. Doors w/ Hardware	2	EA	$ 6,487.00	$ 12,974.00	$ 17,125.68
Telemetry Lock System	1	EA	$ 5,000.00	$ 5,000.00	$ 6,600.00
750 Gallon Polyethylene Vault	2	EA	$ 1,300.00	$ 2,600.00	$ 3,432.00
16" x 16" FEMA 361 Greenheck Alumium Louver	4	EA	$ 1,525.00	$ 6,100.00	$ 8,052.00
12" Vent Pipe	24	LF	$ 29.04	$ 696.96	$ 919.99
12" Vent Pipe Screen Cover	2	EA	$ 38.00	$ 76.00	$ 100.32
Restroom & Storm Shelter Subtotal				$ 71,000.00	**$ 93,600.00**
30" x 9" Campsite Fire Ring w/ Cooking Grate + Anchors	17	EA	$ 288.00	$ 4,896.00	$ 6,462.72
6' Plastic Picnic Table	17	EA	$ 1,328.00	$ 22,576.00	$ 29,800.32
54" x 9" Community Fire Ring w/ Cooking Grate + Anchors	1	EA	$ 482.00	$ 482.00	$ 636.24
65 Gallon Trash Container	4	EA	$ 125.95	$ 503.80	$ 665.02
Class A Crushed Stone	139	CY	$ 57.70	$ 8,020.30	$ 10,586.80
Finish Grading Gravel	623	SY	$ 0.68	$ 426.15	$ 562.52
Campsite Sign - 4 x 4 Cedar w/ Numbers	17	EA	$ 45.00	$ 765.00	$ 1,009.80
Information Board	1	EA	$ 880.00	$ 880.00	$ 1,161.60
Deposit Box	1	EA	$ 1,029.40	$ 1,029.40	$ 1,358.81
Trash Area Fence	24	LF	$ 32.15	$ 771.60	$ 1,018.51
Campsites Subtotal				$ 40,400.00	**$ 53,300.00**
Electric Opener System	1	EA	$ 6,500.00	$ 6,500.00	$ 8,580.00
Gate Access Subtotal				$ 6,500.00	**$ 9,000.00**
Estimate Subtotal				**$ 186,500.00**	**$ 246,500.00**

Table VII.4: Detailed Phase 1 Breakdown

Description	Qty	Unit	Price/Unit	Total	Overall Total
Selective Tree Removal 24" - 36" w/ Stump Removal	15	EA	$ 275.11	$ 4,126.59	$ 5,447.10
Topsoil, Remove and Stockpile On Site	2292	CY	$ 2.67	$ 4,927.80	$ 6,504.70
Rough Grading Site (<100,000 SF)	1	EA	$ 4,819.33	$ 4,819.33	$ 6,361.51
Finish Grading Topsoil	2292	CY	$ 7.90	$ 11,635.85	$ 15,359.32
Urban Seed	2.4	AC	$ 2,866.09	$ 6,878.62	$ 9,079.77
Rural Seed	1.2	AC	$ 1,177.05	$ 1,412.46	$ 1,864.45
Subtotal				$ 33,900.00	**$ 44,700.00**
30" x 9" Campsite Fire Ring w/ Cooking Grate + Anchors	17	EA	$ 288.00	$ 4,896.00	$ 6,462.72
6' Plastic Picnic Table	17	EA	$ 1,328.00	$ 22,576.00	$ 29,800.32
54" x 9" Community Fire Ring w/ Cooking Grate + Anchors	1	EA	$ 482.00	$ 482.00	$ 636.24
65 Gallon Trash Container	4	EA	$ 125.95	$ 503.80	$ 665.02
Campsite Sign - 4 x 4 Cedar w/ Numbers	17	EA	$ 45.00	$ 765.00	$ 1,009.80
Information Board	1	EA	$ 880.00	$ 880.00	$ 1,161.60
Deposit Box	1	EA	$ 1,029.40	$ 1,029.40	$ 1,358.81
Trash Area Fence	24	LF	$ 32.15	$ 771.60	$ 1,018.51
Subtotal				$ 32,000.00	**$ 42,200.00**
Electric Opener System	1	EA	$ 6,500.00	$ 6,500.00	$ 8,580.00
Subtotal				$ 6,500.00	**$ 9,000.00**
Estimate Subtotal				$ 72,400.00	**$ 95,900.00**

Table VII.5: Detailed Phase 2 Breakdown

Description	Qty	Unit	Price/Unit	Total	Overall Total
6" wide trench and backfill, 60" deep	560	LF	$ 1.43	$ 800.94	$ 1,057.24
6" wide trench and backfill, 18" deep	2210	LF	$ 0.93	$ 2,061.43	$ 2,721.09
1" PEX A	560	LF	$ 2.00	$ 1,120.00	$ 1,478.40
2500' 6 Gauge Wire	1	EA	$ 3,072.60	$ 3,072.60	$ 4,055.83
2" SCH 40 HDPE Duct	2210	LF	$ 1.28	$ 2,833.91	$ 3,740.76
6' Bury Depth Frost-Proof Yard Hydrant	1	EA	$ 59.43	$ 59.43	$ 78.45
Subtotal				$ 10,000.00	**$ 13,200.00**
Class A Crushed Stone	404	CY	$ 57.70	$ 23,310.80	$ 30,770.26
Asphalt Patching	55	SF	$ 5.94	$ 326.97	$ 431.60
Finish Grading Gravel	1816	SY	$ 0.68	$ 1,122.72	$ 1,481.98
Class A Crushed Stone	139	CY	$ 57.70	$ 8,020.30	$ 10,486.80
Finish Grading Gravel	623	SY	$ 0.68	$ 426.15	$ 562.52
Subtotal				$ 33,300.00	**$ 43,800.00**
Estimate Subtotal				$ 43,300.00	**$ 57,000.00**

Table VII.6: Detailed Phase 3 Breakdown

Description	Qty	Unit	Price/Unit	Total	Overall Total
Vault Toilet Tank Excavation	14	CY	$ 36.69	$ 380.45	$ 502.19
18" x 6" Strip Footing w/ 2 No. 3 Rebar + Excavation + Backfill	88	LF	$ 24.19	$ 2,128.71	$ 2,809.90
8" x 8" x 16" Solid Concrete Block Foundation Bearing Wall	352	SF	$ 12.84	$ 3,850.88	$ 5,083.16
6" Slab on Grade	480	SF	$ 8.11	$ 3,892.49	$ 5,138.09
8" x 8" x 16" Solid Concrete Block Wall	1037	SF	$ 12.84	$ 12,134.94	$ 16,018.12
2" x 6", 12" OC Roof Truss w/ 5/16" CDX	632	SF	$ 3.97	$ 2,506.16	$ 3,308.13
Aluminum Roofing	632	SF	$ 4.66	$ 2,509.04	$ 3,311.93
1/2" FR Drywall Ceiling Painted	480	SF	$ 4.25	$ 2,039.19	$ 2,691.73
Painting on Masonary w/ Primer + 2 Coats	1037	SF	$ 2.00	$ 2,068.88	$ 2,730.93
Polyethylene Toilet Riser w/ Seat + Lid	2	EA	$ 282.72	$ 565.44	$ 746.38
Interior LED Fixtures	4	EA	$ 447.11	$ 1,788.44	$ 2,360.74
Exterior LED Fixtures	3	EA	$ 636.15	$ 1,908.45	$ 2,519.16
3' x 7' Steel 18 Ga. Doors	2	EA	$ 3,843.44	$ 7,686.87	$ 10,146.67
3' x 7' FEMA 361 Heavy Duty 12 Ga. Doors w/ Hardware	2	EA	$ 6,487.00	$ 12,974.00	$ 17,125.68
Telemetry Lock System	1	EA	$ 5,000.00	$ 5,000.00	$ 6,600.00
750 Gallon Polyethylene Vault	2	EA	$ 1,300.00	$ 2,600.00	$ 3,432.00
16" x 16" FEMA 361 Greenheck Alumium Louver	4	EA	$ 1,525.00	$ 6,100.00	$ 8,052.00
12" Vent Pipe	24	LF	$ 29.04	$ 696.96	$ 919.99
12" Vent Pipe Screen Cover	2	EA	$ 38.00	$ 76.00	$ 100.32
Subtotal				$ 71,000.00	**$ 93,600.00**
Estimate Subtotal				$ 71,000.00	**$ 93,600.00**

Section VIII Appendices

Appendix A – Design Calculations

Appendix B – Design Standards/Assumptions

Appendix C – Bibliography

Appendix A – Design Calculations

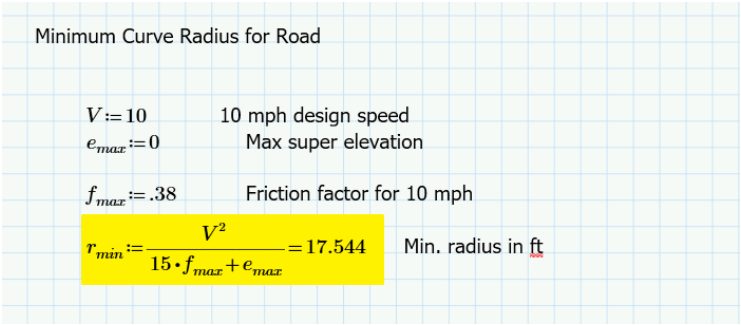


Figure VIII-A.1: Design calculations for gravel road

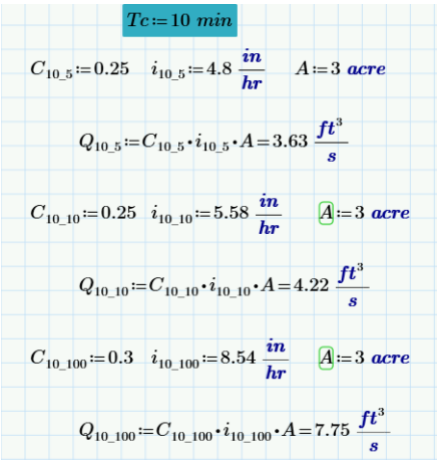


Figure VIII-A.2: Design calculations for Rational Method

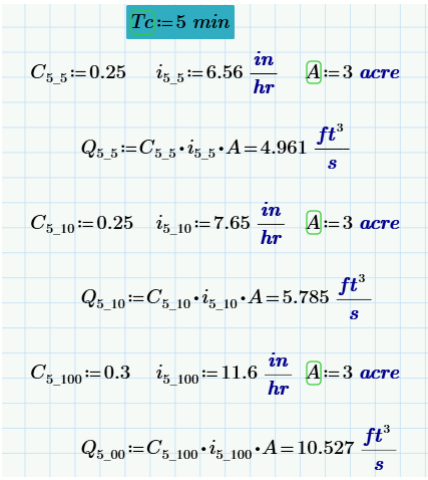


Figure VIII-A.3: Design calculations for Rational Method

Cost Estimate Calculations

$Site_{Area} := 153000\ ft^2 = 3.512\ acre$

$Road_{Length} := 1021.5\ ft$
$Road_{Width} := 16\ ft$
$Road_{Depth} := 8\ in$

$Road_{Volume} := Road_{Length} \cdot Road_{Width} \cdot Road_{Depth} = 10896\ ft^3$

$Road_{Volume} = 403.556\ yd^3$

$Road_{Area} := Road_{Length} \cdot Road_{Width} = 16344\ ft^2$

$Road_{Area} = 1816\ yd^2$

$Parking_{Length} := 20\ ft$
$Parking_{Width} := 20\ ft$
$Parking_{Depth} := 8\ in$

$Campsites_{Total} := 17$
$Parking.Sites_{Total} := 14$

$Parking_{Volume} := Parking_{Length} \cdot Parking_{Width} \cdot Parking_{Depth} = 266.667\ ft^3$

$Parking_{Volume.Total} := Parking_{Volume} \cdot Parking.Sites_{Total} = 3733.333\ ft^3$

$Parking_{Volume.Total} = 138.272\ yd^3$

$Parking_{Area.Total} := Parking_{Length} \cdot Parking_{Width} \cdot Parking.Sites_{Total} = 5600\ ft^2$

$Parking_{Area.Total} = 622.222\ yd^2$

$Topsoil_{Depth} := 6\ in$

$Topsoil_{Volume} := Site_{Area} \cdot Topsoil_{Depth} = 2833.333\ yd^3$

$Topsoil_{Stockpile} := Topsoil_{Volume} - Road_{Volume} - Parking_{Volume.Total} = 2291.506\ yd^3$

$Seeding_{Urban} := 103000\ ft^2 = 2.365\ acre$
$Seeding_{Rural} := 50000\ ft^2 = 1.148\ acre$

$Tank_{Length} := 84\ in$ $\quad\quad$ $Tanks_{Total} := 2$

$Tank_{Width} := 64\ in$

$Tank_{Depth} := 60\ in$

$Tank_{Volume} := Tank_{Length} \cdot Tank_{Width} \cdot Tank_{Depth} = 6.914\ yd^3$

$Tank_{Volume.Total} := Tank_{Volume} \cdot Tanks_{Total} = 13.827\ yd^3$

$Restroom_{Length} := 20\ ft$ $\quad\quad$ $Restroom_{IntWallLength} := 6.5\ ft$

$Restroom_{Width} := 24\ ft$

$Restroom_{Height} := 8.75\ ft$

$Int.Wall_{Area} := Restroom_{Width} \cdot Restroom_{Height} + Restroom_{Height} \cdot Restroom_{IntWallLength} = 266.875\ ft^2$

$Ext.Wall_{Area} := 2 \cdot \left(Restroom_{Length} \cdot Restroom_{Height}\right) + 2 \cdot \left(Restroom_{Width} \cdot Restroom_{Height}\right) = 770\ ft^2$

$Total.Wall_{Area} := Int.Wall_{Area} + Ext.Wall_{Area} = 1036.875\ ft^2$

$Roof_{Area} := 632\ ft^2$

$Floor_{Area} := Restroom_{Length} \cdot Restroom_{Width} = 480\ ft^2$

$Ceiling_{Area} := Floor_{Area} = 480\ ft^2$

Appendix B – Design Standards/Assumptions

Table VIII-B.1: Runoff coefficient identification by soil group for Rational Method

Hydrologic Soil Group	A			B			C			D		
Recurrence Interval	**5**	**10**	**100**	**5**	**10**	**100**	**5**	**10**	**100**	**5**	**10**	**100**
Land Use Or Surface Characteristics Business:												
A. Commercial Area	.75	.80	.95	.80	.85	.95	.80	.85	.95	.85	.90	.95
B. Neighborhood Area	.50	.55	.65	.55	.60	.70	.60	.65	.75	.65	.70	.80
Residential:												
A. Single Family	.25	.25	.30	.30	.35	.40	.40	.45	.50	.45	.50	.55
B. Multi-Unit (Detached)	.35	.40	.45	.40	.45	.50	.45	.50	.55	.50	.55	.65
C. Multi-Unit (Attached)	.45	.50	.55	.50	.55	.65	.55	.60	.70	.60	.65	.75
D. ½ Lot Or Larger	.20	.20	.25	.25	.25	.30	.35	.40	.45	.40	.45	.50
E. Apartments	.50	.55	.60	.55	.60	.70	.60	.65	.75	.65	.70	.80
Industrial												
A. Light Areas	.55	.60	.70	.60	.65	.75	.65	.70	.80	.70	.75	.90
B. Heavy Areas	.75	.80	.95	.80	.85	.95	.80	.85	.95	.80	.85	.95
Parks, Cemeteries Playgrounds	.10	.10	.15	.20	.20	.25	.30	.35	.40	.35	.40	.45
Schools	.30	.35	.40	.40	.45	.50	.45	.50	.55	.50	.55	.65
Railroad Yard Areas	.20	.20	.25	.30	.35	.40	.40	.45	.45	.45	.50	.55
Streets												
A. Paved	.85	.90	.95	.85	.90	.95	.85	.90	.95	.85	.90	.95
B. Gravel	.25	.25	.30	.35	.40	.45	.40	.45	.50	.40	.45	.50
Drives, Walks, & Roofs	.85	.90	.95	.85	.90	.95	.85	.90	.95	.85	.90	.95
Lawns												
A. 50%-75% Grass (Fair Condition)	.10	.10	.15	.20	.20	.25	.30	.35	.40	.30	.35	.40
B. 75% Or More Grass (Good Condition)	.05	.05	.10	.15	.15	.20	.25	.25	.30	.30	.35	.40
Undeveloped Surface[1] (By Slope)[2]												
A. Flat (0-1%)	0.04-0.09			0.07-0.12			0.11-0.16			0.15-0.20		
B. Average (2-6%)	0.09-0.14			0.12-0.17			0.16-0.21			0.20-0.25		
C. Steep	0.13-0.18			0.18-0.24			0.23-0.31			0.28-0.38		

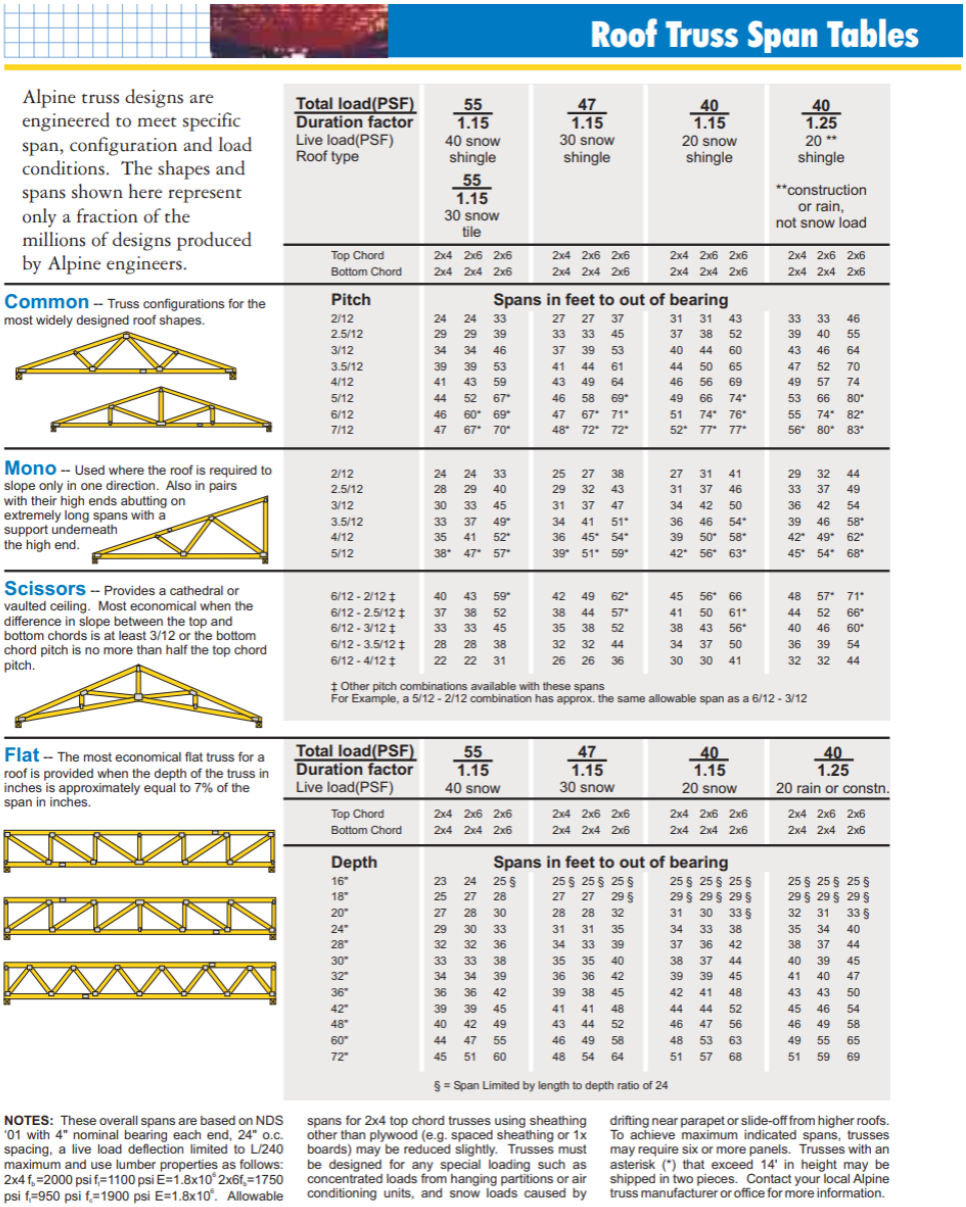
[1]Undeveloped Surface Definition: Forest and agricultural land, open space.
[2]Source: Storm Drainage Design Manual, Erie and Niagara Counties Regional Planning Board.

Table VIII-B.2: Rainfall intensity table for East Central Iowa

		Return Period							
	Duration	1-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Section 6 – East Central Iowa	6-hr	0.32	0.38	0.48	0.57	0.71	0.83	0.96	1.31
	3-hr	0.56	0.65	0.82	0.97	1.21	1.40	1.61	2.16
	2-hr	0.75	0.88	1.11	1.31	1.61	1.85	2.12	2.80
	1-hr	1.23	1.44	1.80	2.11	2.58	2.96	3.36	4.37
	30-min	1.90	2.22	2.76	3.22	3.88	4.40	4.95	6.29
	15-min	2.70	3.14	3.88	4.53	5.45	6.18	6.94	8.81
	10-min	3.33	3.87	4.80	5.58	6.70	7.60	8.54	10.8
	5-min	4.56	5.30	6.56	7.65	9.18	10.3	11.6	14.8

Table VIII-B.3: RSMeans Rounding Standards

Prices From	To	Rounded to Nearest
$0.01	$5.00	$0.01
5.01	20.00	0.05
20.01	100.00	1.00
100.01	1,000.00	5.00
1,000.01	10,000.00	25.00
10,000.01	50,000.00	100.00
50,000.01	Up	500.00



Roof Truss Span Tables

Alpine truss designs are engineered to meet specific span, configuration and load conditions. The shapes and spans shown here represent only a fraction of the millions of designs produced by Alpine engineers.

Common -- Truss configurations for the most widely designed roof shapes.

Total load(PSF) / Duration factor / Live load(PSF) / Roof type	55 / 1.15 / 40 snow / shingle			55 / 1.15 / 30 snow / tile			47 / 1.15 / 30 snow / shingle			40 / 1.15 / 20 snow / shingle			40 / 1.25 / 20 ** / shingle **construction or rain, not snow load		
Top Chord	2x4	2x6	2x6				2x4	2x6	2x6	2x4	2x6	2x6	2x4	2x6	2x6
Bottom Chord	2x4	2x4	2x6				2x4	2x4	2x6	2x4	2x4	2x6	2x4	2x4	2x6
Pitch	**Spans in feet to out of bearing**														
2/12	24	24	33				27	27	37	31	31	43	33	33	46
2.5/12	29	29	39				33	33	45	37	38	52	39	40	55
3/12	34	34	46				37	39	53	40	44	60	43	46	64
3.5/12	39	39	53				41	44	61	44	50	65	47	52	70
4/12	41	43	59				43	49	64	46	56	69	49	57	74
5/12	44	52	67*				46	58	69*	49	66	74*	53	66	80*
6/12	46	60*	69*				47	67*	71*	51	74*	76*	55	74*	82*
7/12	47	67*	70*				48*	72*	72*	52*	77*	77*	56*	80*	83*

Mono -- Used where the roof is required to slope only in one direction. Also in pairs with their high ends abutting on extremely long spans with a support underneath the high end.

2/12	24	24	33				25	27	38	27	31	41	29	32	44
2.5/12	28	29	40				29	32	43	31	37	46	33	37	49
3/12	30	33	45				31	37	47	34	42	50	36	42	54
3.5/12	33	37	49*				34	41	51*	36	46	54*	39	46	58*
4/12	35	41	52*				36	45*	54*	39	50*	58*	42*	49*	62*
5/12	38*	47*	57*				39*	51*	59*	42*	56*	63*	45*	54*	68*

Scissors -- Provides a cathedral or vaulted ceiling. Most economical when the difference in slope between the top and bottom chords is at least 3/12 or the bottom chord pitch is no more than half the top chord pitch.

6/12 - 2/12 ‡	40	43	59*				42	49	62*	45	56*	66	48	57*	71*
6/12 - 2.5/12 ‡	37	38	52				38	44	57*	41	50	61*	44	52	66*
6/12 - 3/12 ‡	33	33	45				35	38	52	38	43	56*	40	46	60*
6/12 - 3.5/12 ‡	28	28	38				32	32	44	34	37	50	36	39	54
6/12 - 4/12 ‡	22	22	31				26	26	36	30	30	41	32	32	44

‡ Other pitch combinations available with these spans
For Example, a 5/12 - 2/12 combination has approx. the same allowable span as a 6/12 - 3/12

Flat -- The most economical flat truss for a roof is provided when the depth of the truss in inches is approximately equal to 7% of the span in inches.

Total load(PSF) / Duration factor / Live load(PSF)	55 / 1.15 / 40 snow			47 / 1.15 / 30 snow			40 / 1.15 / 20 snow			40 / 1.25 / 20 rain or constn.		
Top Chord	2x4	2x6	2x6	2x4	2x6	2x6	2x4	2x6	2x6	2x4	2x6	2x6
Bottom Chord	2x4	2x4	2x6	2x4	2x4	2x6	2x4	2x4	2x6	2x4	2x4	2x6
Depth	**Spans in feet to out of bearing**											
16"	23	24	25 §	25 §	25 §	25 §	25 §	25 §	25 §	25 §	25 §	25 §
18"	25	27	28	27	27	29 §	29 §	29 §	29 §	29 §	29 §	29 §
20"	27	28	30	28	28	32	31	30	33 §	32	31	33 §
24"	29	30	33	31	31	35	34	33	38	35	34	40
28"	32	32	36	34	33	39	37	36	42	38	37	44
30"	33	33	38	35	35	40	38	37	44	40	39	45
32"	34	34	39	36	36	42	39	39	45	41	40	47
36"	36	36	42	39	38	45	42	41	48	43	43	50
42"	39	39	45	41	41	48	44	44	52	45	46	54
48"	40	42	49	43	44	52	46	47	56	46	49	58
60"	44	47	55	46	49	58	48	53	63	49	55	65
72"	45	51	60	48	54	64	51	57	68	51	59	69

§ = Span Limited by length to depth ratio of 24

NOTES: These overall spans are based on NDS '01 with 4" nominal bearing each end, 24" o.c. spacing, a live load deflection limited to L/240 maximum and use lumber properties as follows: 2x4 f_b=2000 psi f_c=1100 psi E=1.8x10^6 2x6f_b=1750 psi f_c=950 psi f_c=1900 psi E=1.8x10^6. Allowable spans for 2x4 top chord trusses using sheathing other than plywood (e.g. spaced sheathing or 1x boards) may be reduced slightly. Trusses must be designed for any special loading such as concentrated loads from hanging partitions or air conditioning units, and snow loads caused by drifting near parapet or slide-off from higher roofs. To achieve maximum indicated spans, trusses may require six or more panels. Trusses with an asterisk (*) that exceed 14' in height may be shipped in two pieces. Contact your local Alpine truss manufacturer or office for more information.

Figure VIII-B.1: Design Table for Truss Roof

Appendix C – Bibliography

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Section VIIII Design Drawings

IOWA CIVIL & ENVIRONMENTAL ENGINEERING

PRIMITIVE CAMPGROUND PROJECT

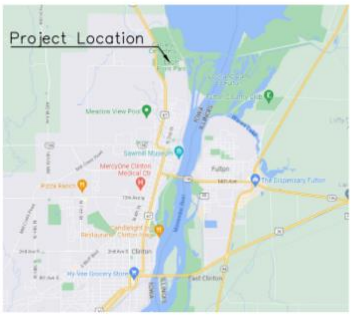
3900 N 3RD ST, CLINTON, IA 52732

UNIVERSITY OF IOWA, COLLEGE OF ENGINEERING

DEPARTMENT OF CEE, SENIOR DESIGN 2023

DRAWING INDEX

BEGIN STA. 0+00
END STA. 10+21.50
DESIGN SPEED 10 MPH



PROJECT: Iowa CEE Senior Design
DATE: 3/21/2023
DRAWN BY: Andrew Kilcarrett
REVISION:

THE UNIVERSITY OF IOWA
CIVIL AND ENVIRONMENTAL ENGINEERING
405 SEAMANS CENTER FOR THE ENGINEERING ARTS AND SCIENCES
103 S CAPITOL ST
IOWA CITY, IA 52242
PHONE: 319.335.5647
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EMAIL: dl-cee-seniordesign@uiowa.edu

EDUCATIONAL - NOT FOR CONSTRUCTION

Clinton Campground

3900 N 3rd St, Clinton, IA 52732

SHEET NAME: Cover Sheet

SHEET NO. 1

General Information

- The road going through the site will be a single lane road 14 feet in width with 1 foot shoulders. The traffic on the road will go counterclockwise around the campground. The road will be made of 8" thick gravel and will maintain a 2% cross slope for the entirety of the road.
- Each site will be 50 feet long and 30 feet wide. There will be a 20'x20' parking area with covered gravel that will be graded of the road for parking for each site. Sites 6, 7, and 8 will be made as walk in sites with no parking areas. Parking for these sites will be available near the existing access road. Access to sites 6, 7, and 8 will be made possible by a grass walking path graded off of the campground road. Each individual campsite shall be graded so the tent areas are on the high ground.
- Recommended placing for each campsite is shown in the General Layout sheet. Each site shall be graded off the road to allow for easy vehicle access to the parking areas. Each site will have one fire ring and on table as recommended in the plans.
- Existing water pipes are located at the pavilion east of the site and electric is located in the lodge south of the site. Water pipes shall be branched off of the existing and be placed 50" below the top soil. 1" PEX A shall be used for the water pipes. Electric lines shall be a minimum of 18" below the topsoil.
- Water will be piped to a water spigot south of the restroom facility
- Electric lines will go to the new restroom facility for lights outside and inside the building
- The restroom facility was designed for no running water, but in the case that sinks are wanted, gray water can run into the hillside. The restrooms were designed to be gender neutral and ADA compliant. There is a built in storm shelter connected the the restrooms, with entrances on the North and South sides of the building.
- A trash area was included in sheet 6–3. This shall be placed where seen best fit near the restroom facility to allow easy access for disposal.
- After completion of grading, topsoil and grass seeding should be placed to allow grass to grow back. Near the campsites, urban grass seeds shall be used. Other areas should use rural grass seeds.

PROJECT: Iowa CEE Senior Design
DATE: 3/21/2023
DRAWN BY: Andrew Kilcarrett
REVISION:

THE UNIVERSITY OF IOWA
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EDUCATIONAL - NOT FOR CONSTRUCTION

Clinton Campground

3900 N 3rd St, Clinton, IA 52732

SHEET NAME: General Information

SHEET NO. 2

PROJECT: Iowa CEE Senior Design
DATE: 3/21/2023
DRAWN BY: Andrew Klinkrott
REVISION:

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FAX: 319.335.5660
EMAIL: civil-issue@lists.uiowa.edu

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Clinton Campground

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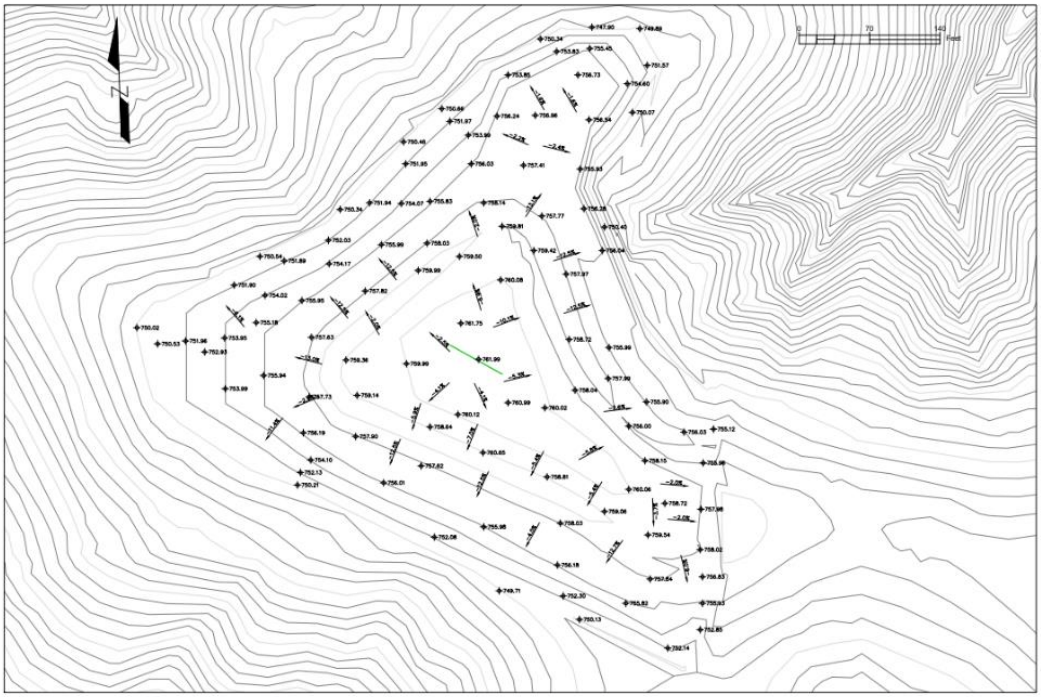
SHEET NAME
Campsite Layout

SHEET NO.
3-1



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DATE: 3/21/2023
DRAWN BY: Andrew Klinkrott
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SHEET NAME
Grading Plan

SHEET NO.
3-2

PROJECT: Iowa GEE Senior Design
DATE: 3/21/2023
DRAWN BY: Andrew Kilkenny
REVISION:

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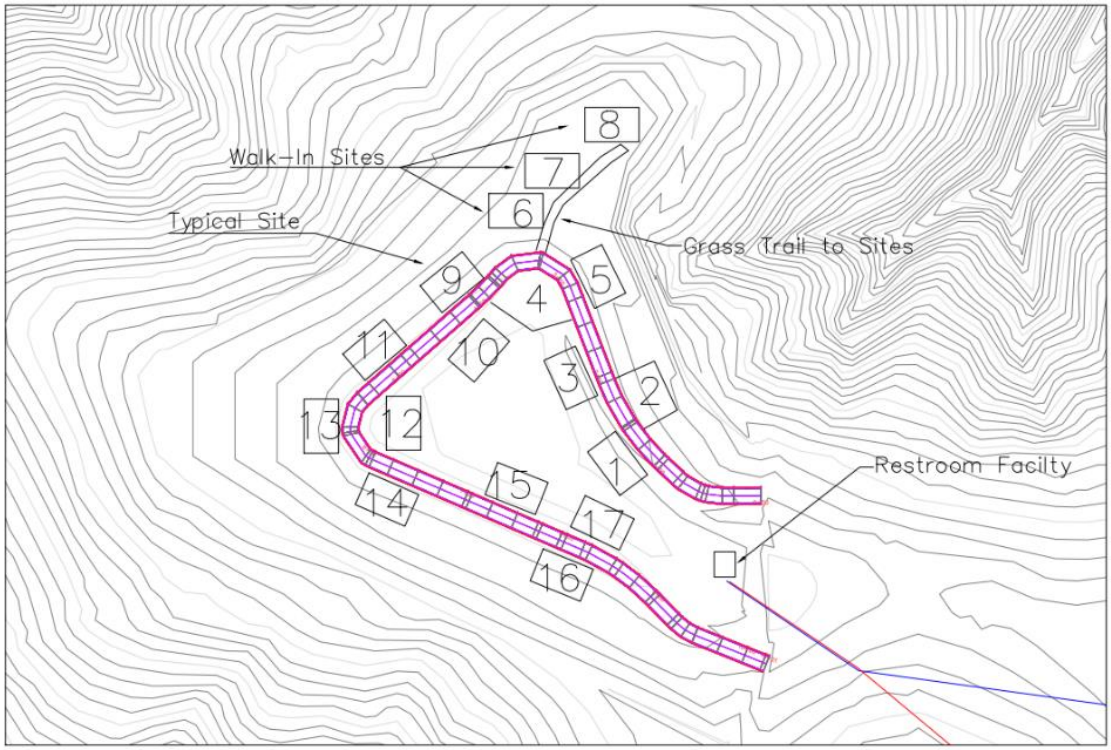
SHEET NAME
Utility Locations

SHEET NO.
3-3



PROJECT: Iowa GEE Senior Design
DATE: 3/21/2023
DRAWN BY: Andrew Kilkenny
REVISION:

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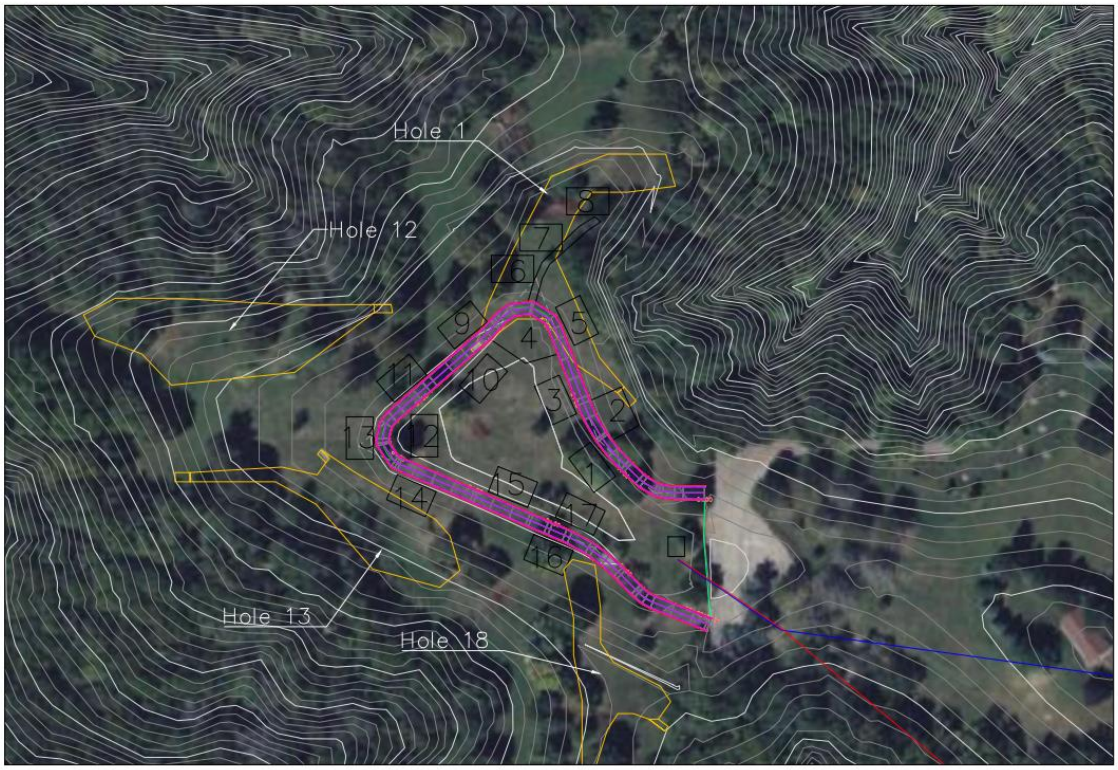
SHEET NAME
Campsite Layout Grayscale

SHEET NO.
3-4



PROJECT: Iowa CEE Senior Design
DATE: 3/21/2023
DRAWN BY: Andrew Klinkrott
REVISION:

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CIVIL AND ENVIRONMENTAL ENGINEERING
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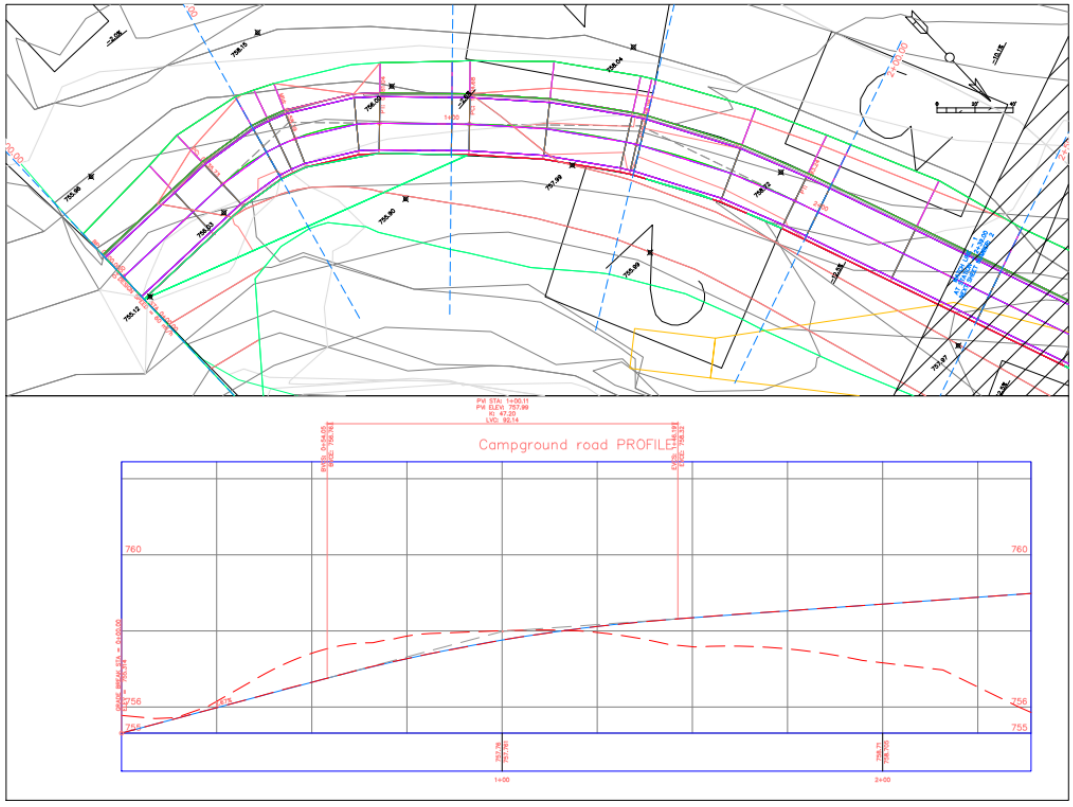
SHEET NAME
Disc Golf Course Overlay

SHEET NO.
3-5



PROJECT: Iowa CEE Senior Design
DATE: 3/21/2023
DRAWN BY: Andrew Klinkrott
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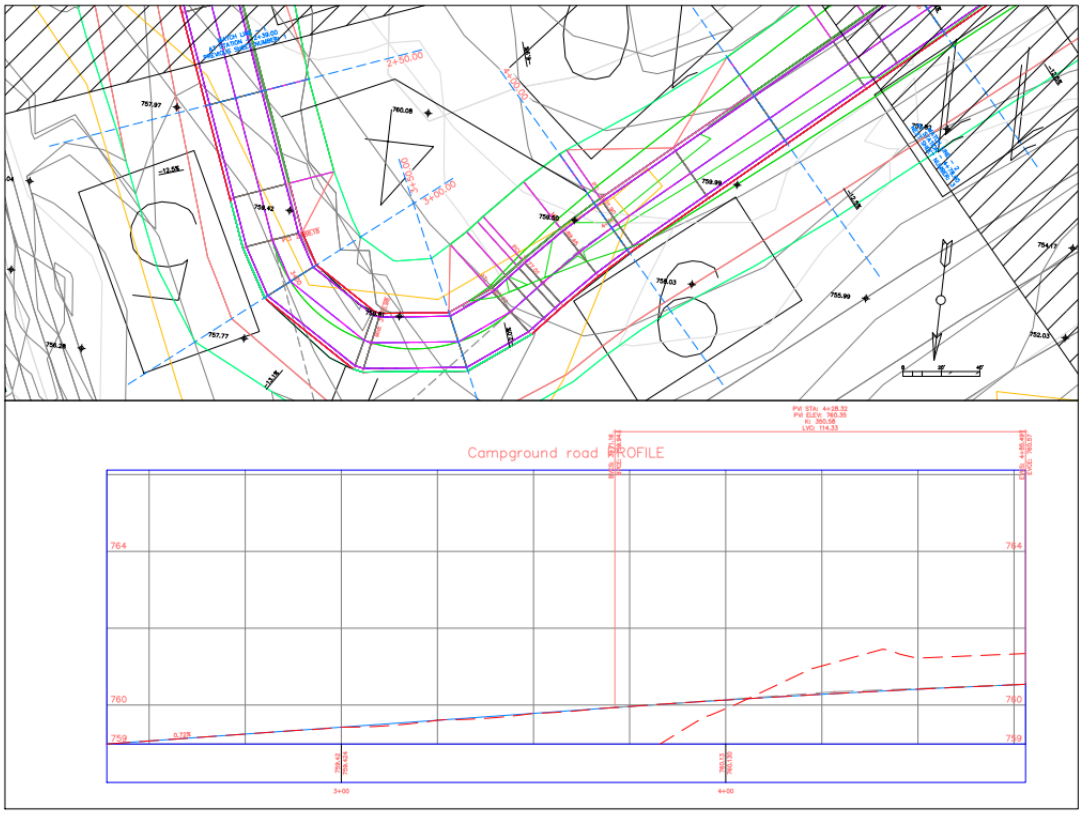
SHEET NAME
Plan and Profile View 0+00 to2+50

SHEET NO.
4-1



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PROJECT: Iowa CEE Senior Design
DATE : 3/21/2023
DRAWN BY: Andrew Kilsrud
REVISION:

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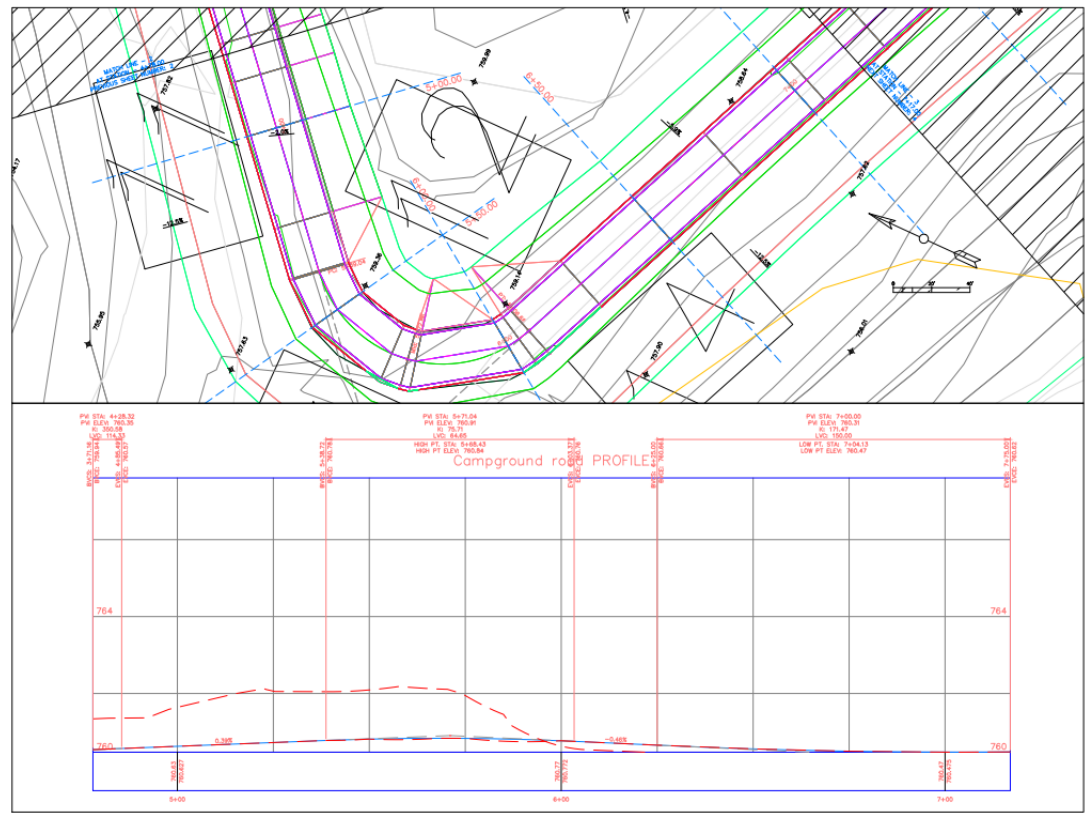
Clinton Campground

3900 N 3rd St, Clinton, IA 52732

SHEET NAME
Plan and Profile View
2+50 to 4+75

SHEET NO.
4-2



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PROJECT: Iowa CEE Senior Design
DATE : 3/21/2023
DRAWN BY: Andrew Kilsrud
REVISION:

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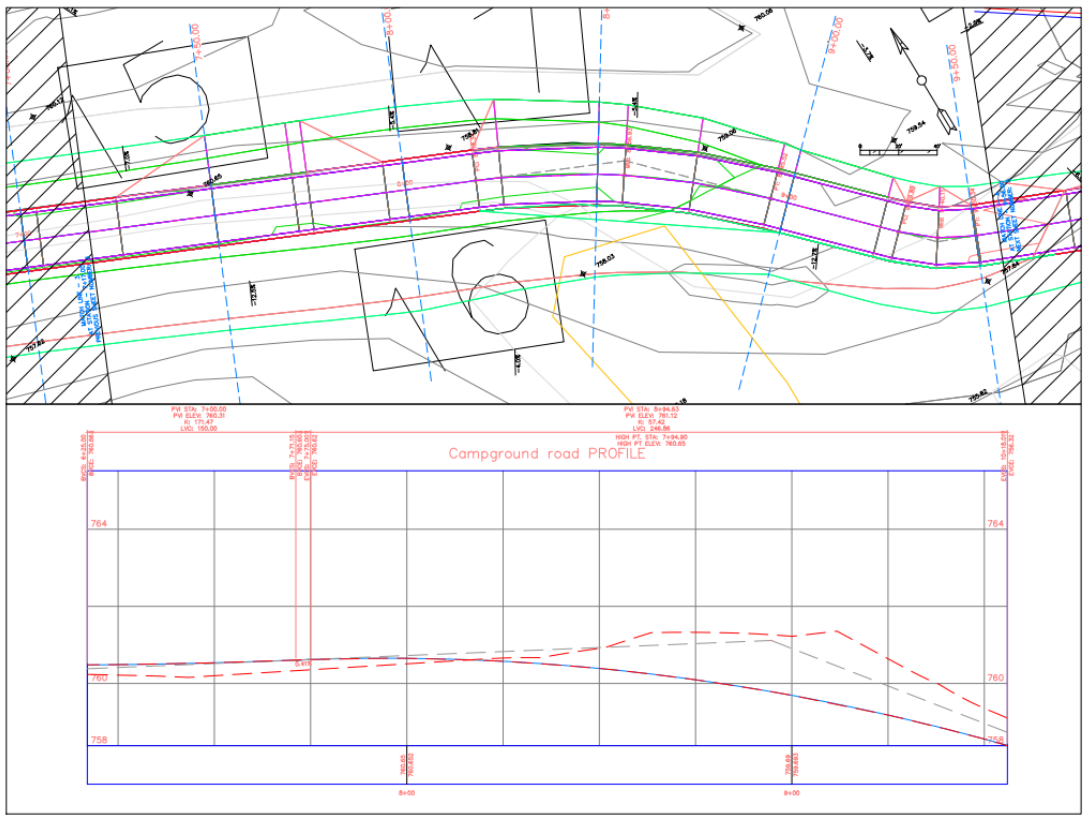
Clinton Campground

3900 N 3rd St, Clinton, IA 52732

SHEET NAME
Plan and Profile View
4+75 to 7+25

SHEET NO.
4-3



PROJECT: Iowa CEE Senior Design
DATE : 3/21/2023
DRAWN BY: Andrew Klinkradt
REVISION:

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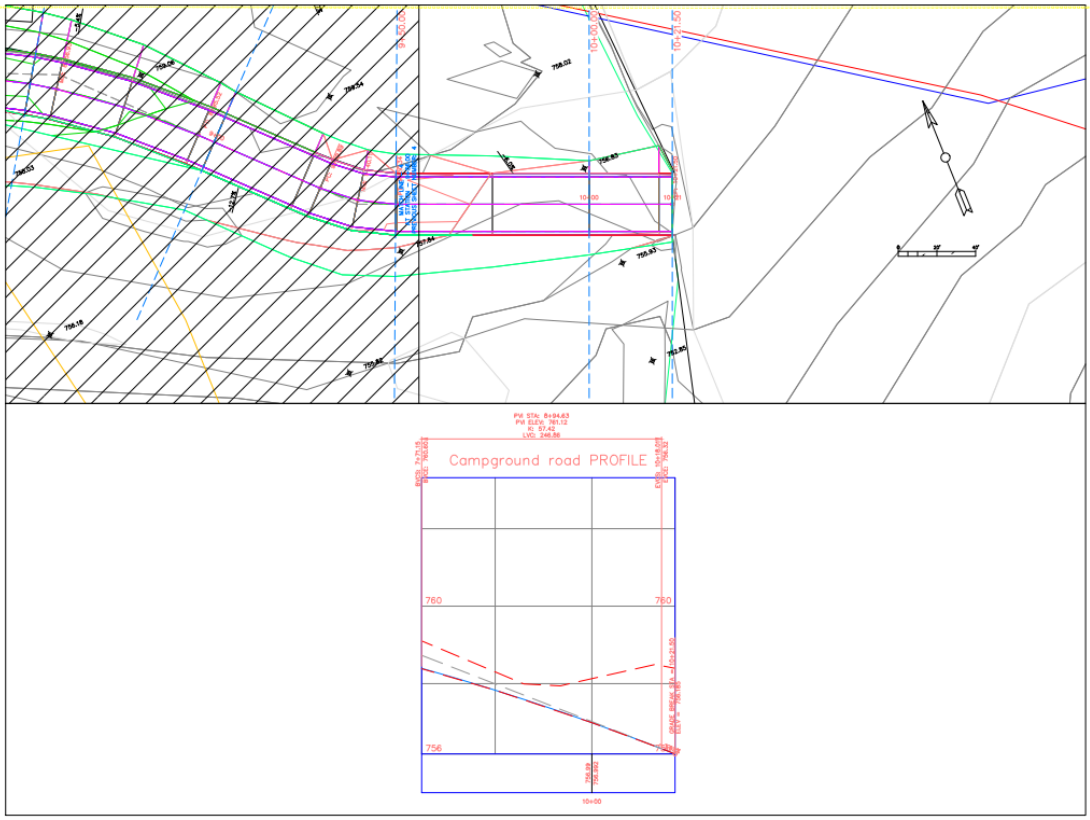
3900 N 3rd St, Clinton, IA 52732

SHEET NAME
Plan and Profile View
7+25 to 9+50

SHEET NO.
4-4



PROJECT: Iowa CEE Senior Design
DATE : 3/21/2023
DRAWN BY: Andrew Klinkradt
REVISION:

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SHEET NAME
Plan and Profile View
9+50 to 10+50

SHEET NO.
4-5

PROJECT: Iowa GEE Senior Design
DATE: 3/21/2023
DRAWN BY: Andrew Klikovski
REVISION:

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EMAIL: civil-hydraulics@uiowa.edu

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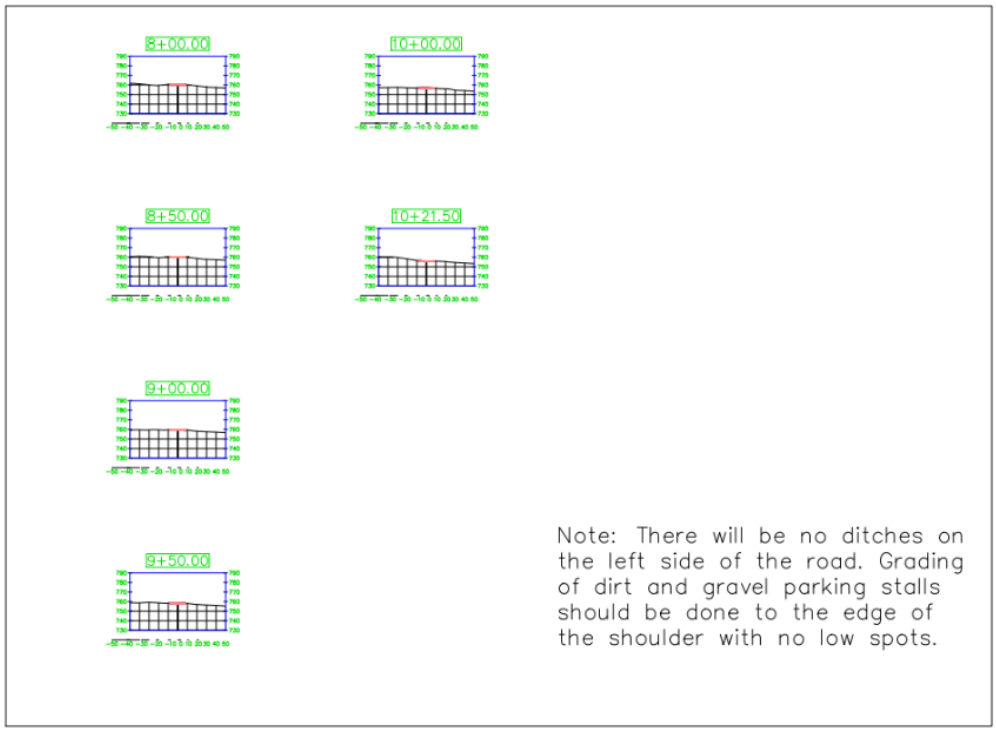
Clinton Campground

3930 N 3rd St, Clinton, IA 52732

SHEET NAME
Section Views
0+00 to 7+50

SHEET NO.
5-1



Note: There will be no ditches on the left side of the road. Grading of dirt and gravel parking stalls should be done to the edge of the shoulder with no low spots.

PROJECT: Iowa GEE Senior Design
DATE: 3/21/2023
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REVISION:

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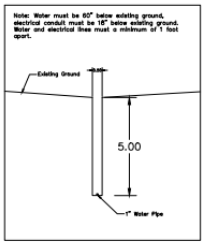
Clinton Campground

3930 N 3rd St, Clinton, IA 52732

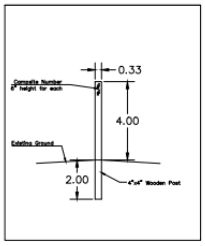
SHEET NAME
Section Views
8+00 to 10+50

SHEET NO.
5-2

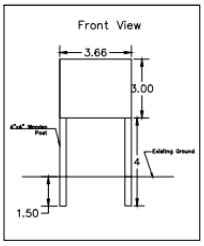
Trench

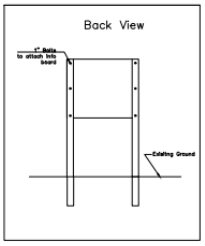


Campsite Sign

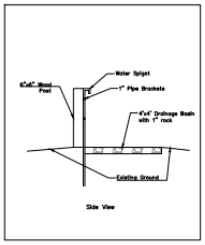


Information Board

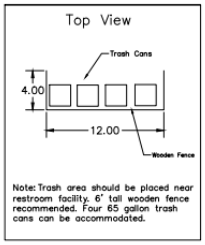




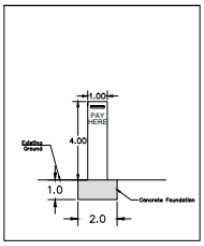
Water Spigot



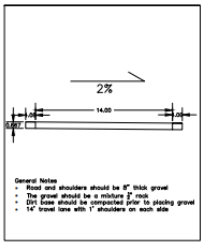
Trash Area



Deposit Box



Road Assembly



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PROJECT: Iowa CEE Senior Design
DATE: 3/21/2023
DRAWN BY: Andrew Kilkenzell
REVISION:

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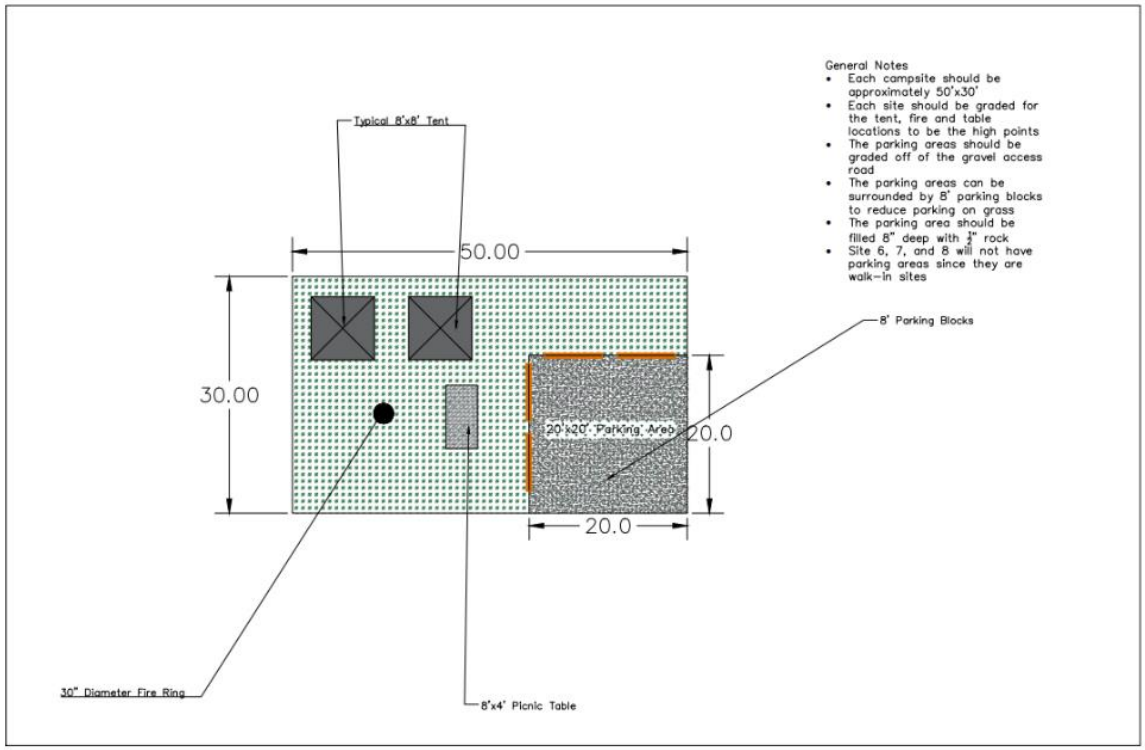
Clinton Campground

3900 N 3rd St, Clinton, IA 52732

SHEET NAME
Typical Sections
Typical Sections

SHEET NO.
6-1



General Notes
- Each campsite should be approximately 50'x30'
- Each site should be graded for the tent, fire and table locations to be the high points
- The parking areas should be graded off of the gravel access road
- The parking areas can be surrounded by 8' parking blocks to reduce parking on grass
- The parking area should be filled 8" deep with $\frac{3}{4}$" rock
- Site 6, 7, and 8 will not have parking areas since they are walk-in sites

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PROJECT: Iowa CEE Senior Design
DATE: 3/21/2023
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Clinton Campground

3900 N 3rd St, Clinton, IA 52732

SHEET NAME
Typical Sections
Typical Campsite

SHEET NO.
6-2

Gravel Required for Road (CY)

Material Table			
Station	Area	Volume	Cumulative Volume
0+00.00	10.72	0.00	0.00
0+50.00	10.72	19.85	19.85
1+00.00	10.72	19.85	39.70
1+50.00	10.72	19.85	59.55
2+00.00	10.72	19.85	79.40
2+50.00	10.72	19.85	99.25
3+00.00	10.72	19.85	119.10
3+50.00	10.72	19.85	138.95
4+00.00	10.72	19.85	158.80
4+50.00	10.72	19.85	178.66
5+00.00	10.72	19.85	198.51
5+50.00	10.72	19.85	218.36
6+00.00	10.72	19.85	238.21
6+50.00	10.72	19.85	258.06
7+00.00	10.72	19.85	277.91
7+50.00	10.72	19.85	297.76
8+00.00	10.72	19.85	317.61
8+50.00	10.72	19.85	337.46
9+00.00	10.72	19.85	357.31
9+50.00	10.72	19.85	377.16
10+00.00	10.72	19.85	397.01
10+21.50	10.72	8.54	405.55

Gravel Required for Sites (CY)

Material Table		
Site	Volume	Cumulative Volume
1	9.88	9.88
2	9.88	19.75
3	9.88	29.63
4	9.88	39.51
5	9.88	49.39
6	9.88	59.26
7	9.88	69.14
8	9.88	79.02
9	9.88	88.89
10	9.88	98.77
11	9.88	108.65
12	9.88	118.52
13	9.88	128.40
14	9.88	138.28
15	9.88	148.16
16	9.88	158.03
17	9.88	167.91

Cut/Fill for Entire Site (CY)

Volume Summary

Name	Type	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Cutfillate	full	1.000	1.000	2914100291.67	7826.62	8217.96	391.34<Fill>

PROJECT: Iowa CEE Senior Design
DATE : 3/21/2023
DRAWN BY: Andrew Kliewer
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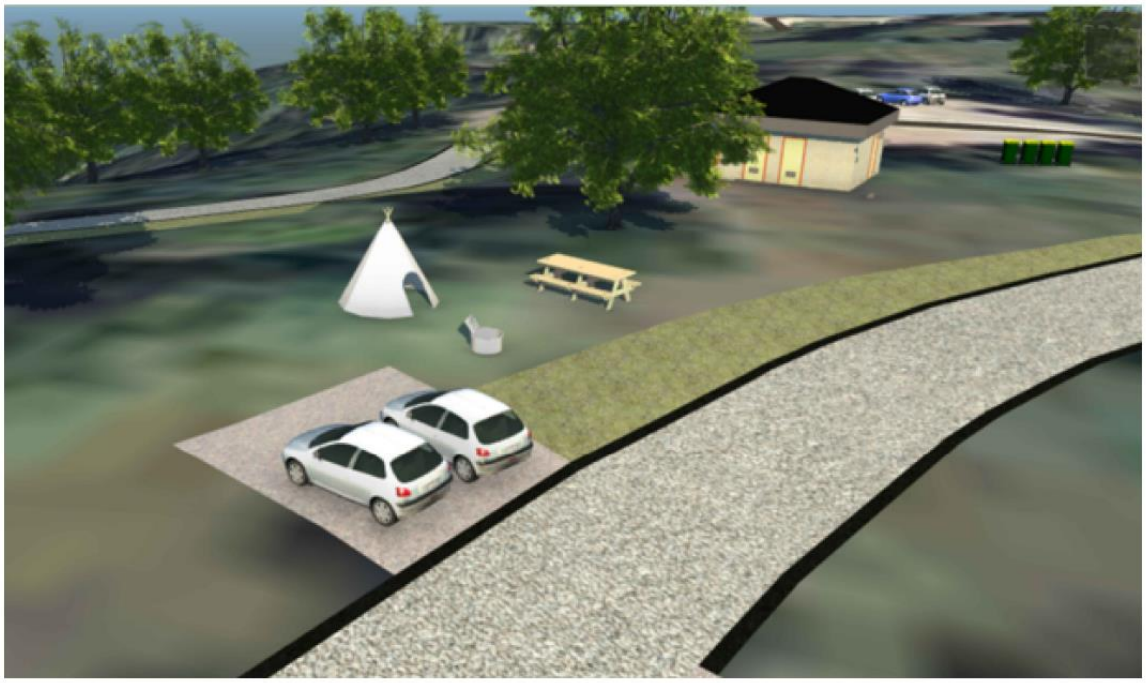
SHEET NAME
Typical Sections
Material Tables

SHEET NO.
6-3



PROJECT: Iowa CEE Senior Design
DATE : 3/21/2023
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Clinton Campground

3900 N 3rd St, Clinton, IA 52732

SHEET NAME
Typical Layout
Campsite

SHEET NO.
6-4

PROJECT: CEE 4810 Senior Design Project

DATE: 3/31/2023

DRAWN BY: ADD

REVISION

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Eagle Point Park Campground

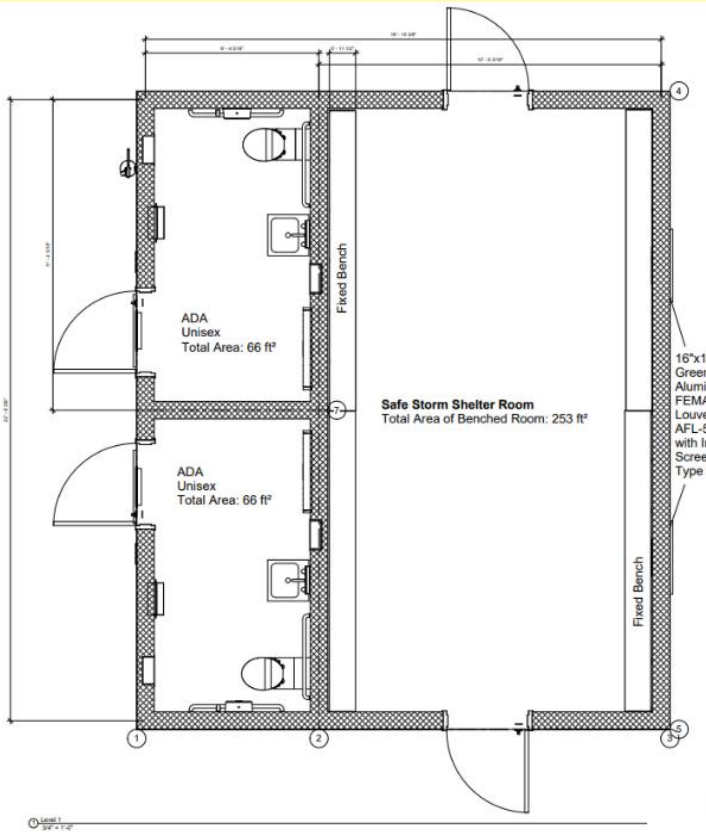
3633 N 3rd St
Clinton, IA 52732

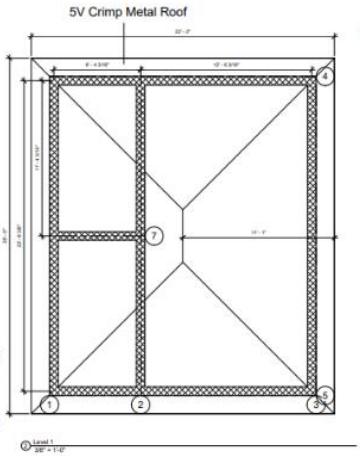
SHEET NAME

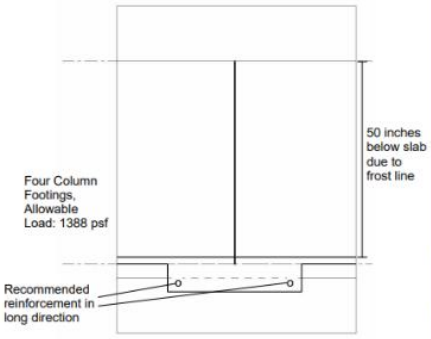
ARCHITECTURAL VIEW

SHEET NO.

7.1







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Eagle Point Park Campground

3823 N 3rd St.
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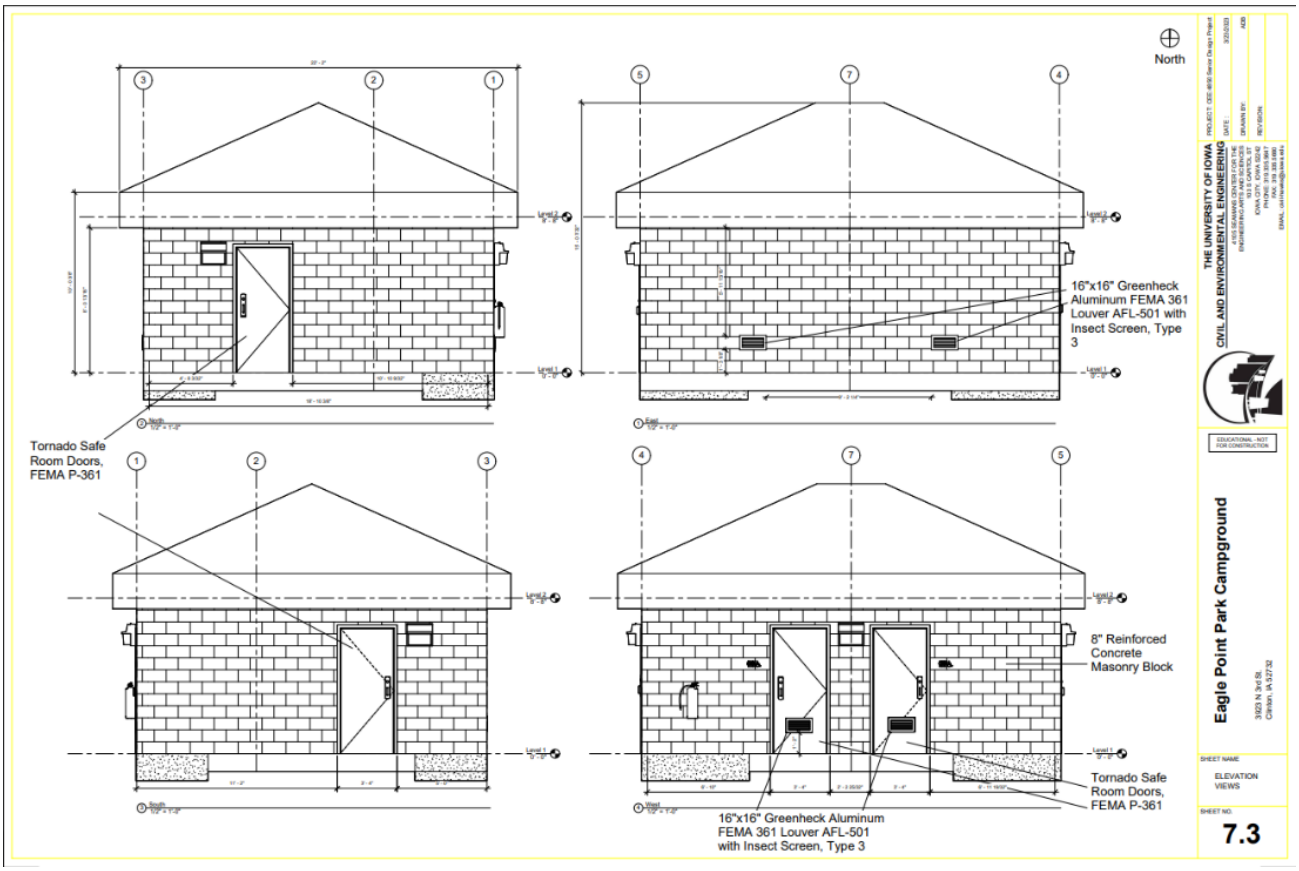
SHEET NAME
LAYOUT VIEW

SHEET NO.
7.2



PROJECT: CEE 4908 Senior Design Project

DATE: 3/3/2023

DRAWN BY: ADB

REVISION:

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3920 N 3rd St
Clinton, IA 52732

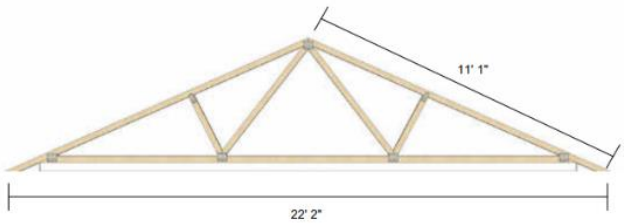
SHEET NAME

ELEVATION VIEWS

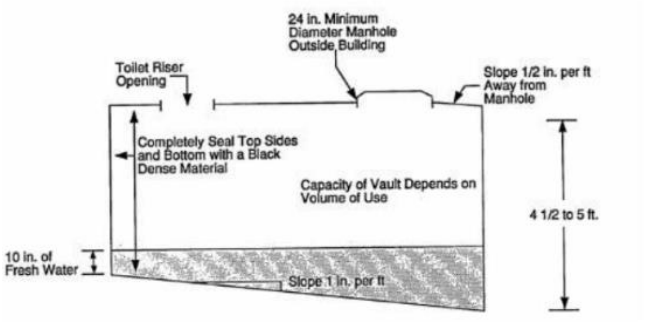
SHEET NO.

7.3

Common Truss Roof Style
Pitch: 5/12



Vault Toilet Cross Section Pit, QTY 2



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3923 N 3rd St
Clinton, IA 52732

SHEET NAME
CROSS SECTION VIEWS

SHEET NO.
7.4

Section X Design Renderings and Models

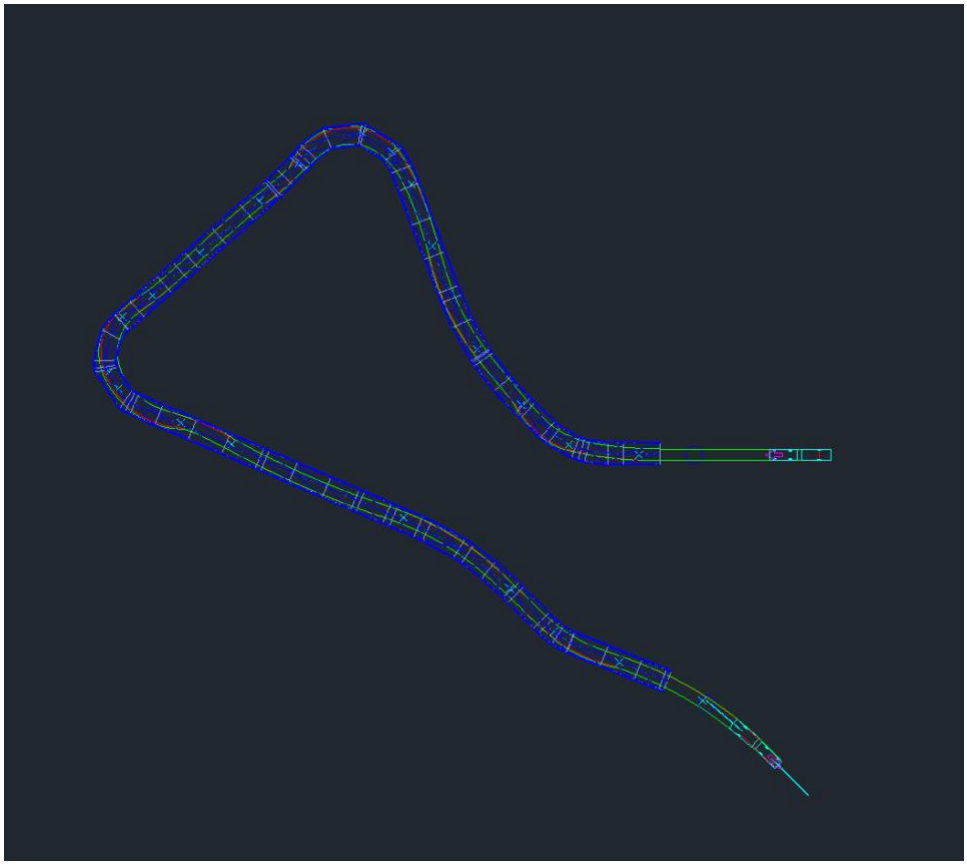

Figure X-1: Vehicle Tracking on Road (Truck and Boat Trailer)

Figure X-2: Campground Rendering