

Cleveland Elementary School Site Redesign + Cleveland Ball Park Redesign  
+ Riverwalk Conceptual Designs



Prepared for the Town of Cleveland, VA

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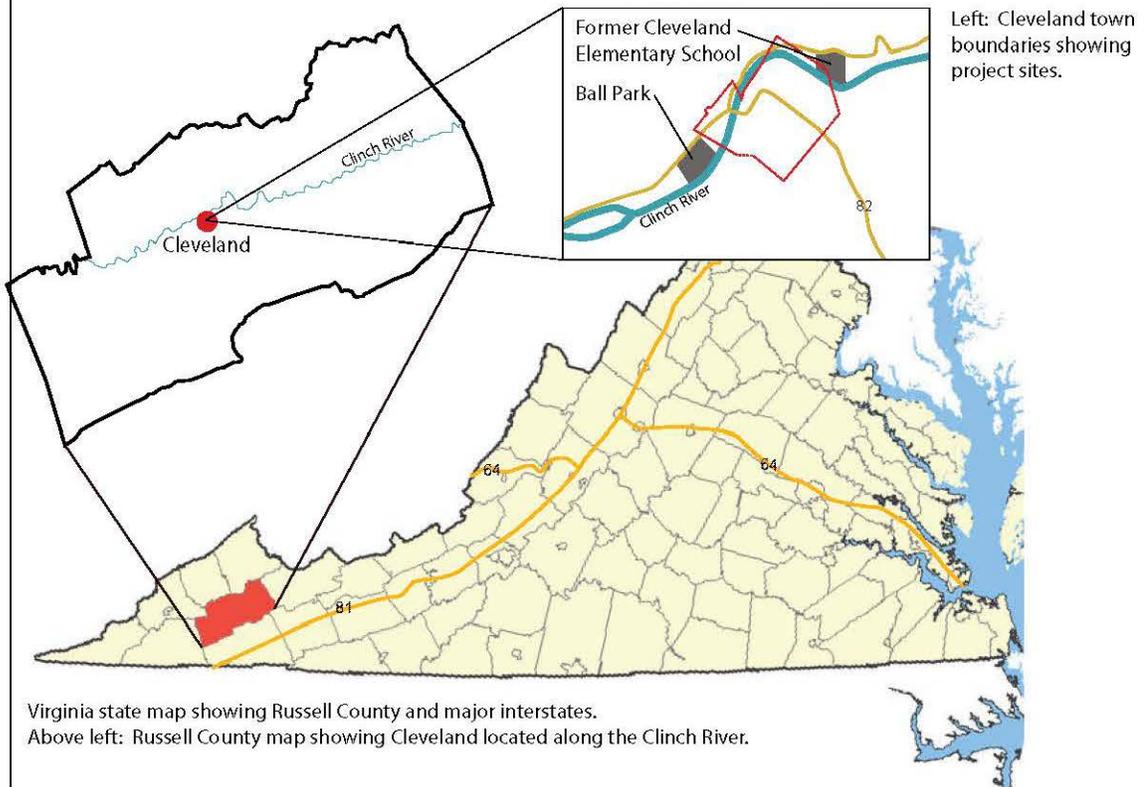
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# Cleveland Elementary School Site Redesign + Cleveland Ball Park Redesign + Riverwalk Conceptual Designs

## PROJECT DESCRIPTION



Virginia state map showing Russell County and major interstates.  
Above left: Russell County map showing Cleveland located along the Clinch River.

Cleveland is a community of approximately 130 people located in Russell County in southwest Virginia. The Town is situated on the Clinch River, one of most biodiverse rivers in North America. The Clinch has more species of endangered and rare freshwater mussels than anywhere else in the world. Cleveland recognizes the value of this unique river and hopes to utilize its natural assets to promote tourism and stimulate economic growth.

The Community Design Assistance Center (CDAC) was tasked with developing conceptual designs for upgrading the existing ball park and reusing the former Cleveland Elementary School site as an RV park and campground. In addition, the team explored the possibility of linking the project sites, downtown, and the Barrens waterfall with a river walk. CDAC worked closely with the community and stakeholder groups to develop these concepts which are discussed in further detail in the following report.

## DESIGN PROCESS & SITE VISIT

The design process began with an initial site visit to Cleveland in May 2013. The CDAC team walked the former Cleveland Elementary School site, the ball park, and the Barrens waterfall project sites. The team also toured the area with the community and located potential areas for a walking trail to connect all three sites. By gathering on-site data, documenting existing conditions, and taking soil samples, the team was able to understand the opportunities and constraints of each site. This analysis would later influence the design concepts.

In June 2013, the CDAC team had the opportunity to meet with stakeholders to discuss concerns and desires for the project. The team worked closely with the stakeholders group to better understand their vision for the community. After careful consideration of all the factors, a set of preliminary conceptual design alternatives was developed. These designs were presented at a community meeting where they were reviewed and commented on by stakeholders. The design alternatives were then revised and combined into a final conceptual master plan for each project site based on the comments made at the meeting.

The final master plans were presented at a second and final community meeting.



The CDAC team meeting with stakeholders.



The CDAC team touring project sites with local community members.



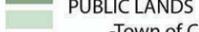
CDAC team member Jen Jessup presenting final conceptual designs at a community meeting.

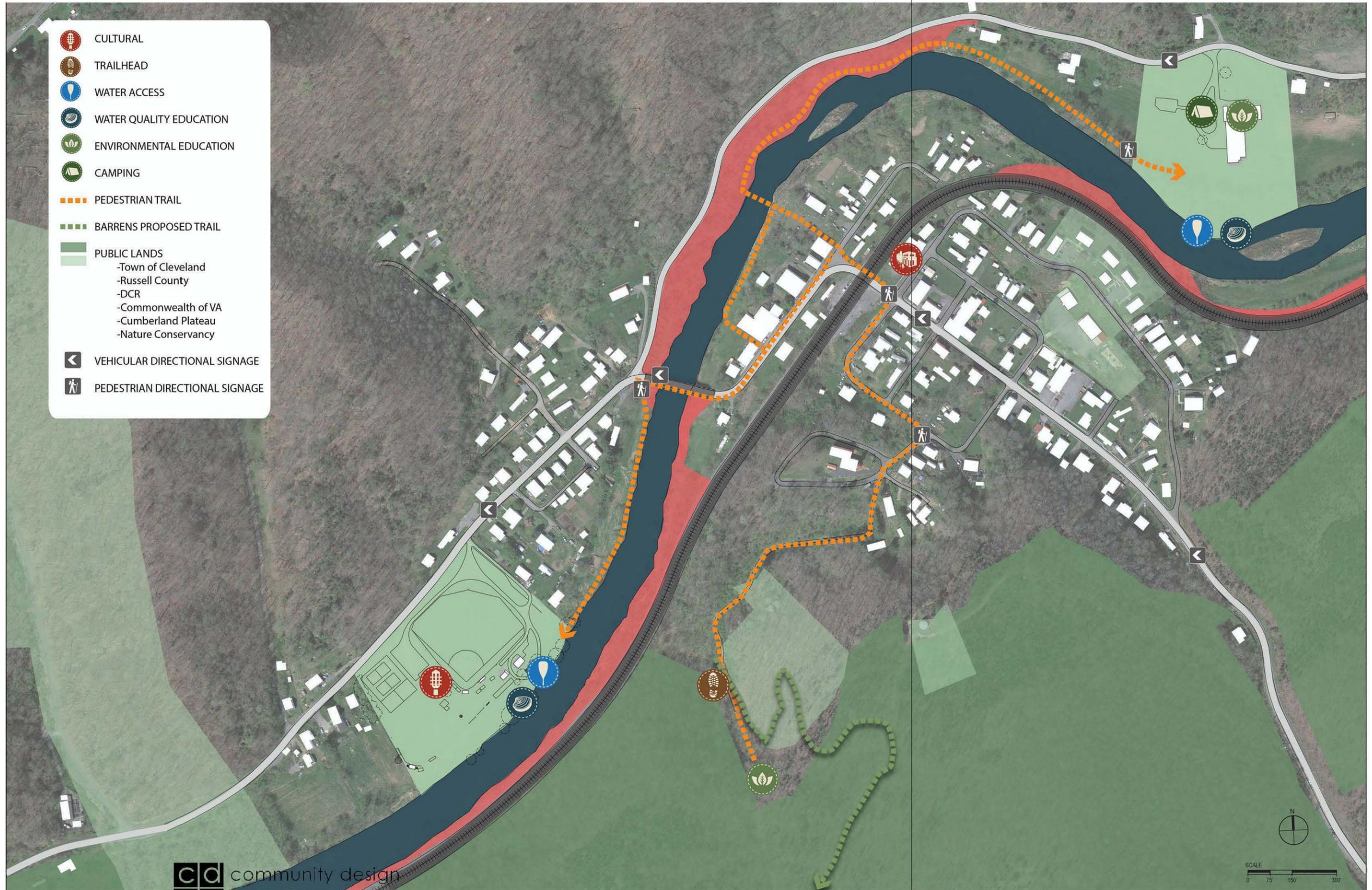
## OVERALL CONNECTIONS

The Community Design Assistance Center and the Town of Cleveland identified the ball park, elementary school site, the Barrens waterfall, and downtown as four sites that bring essential value to the Town. To better benefit the Town, CDAC explored the option of linking these sites with a pedestrian walking trail. At each site, potential activities were identified and shown on a map (see following page) utilizing the Arnett Muldrow branding icons. These icons were created by Arnett Muldrow, a marketing firm in Greenville, SC, and will correlate with future directional trail signage. In addition, CDAC explored locating potential vehicular directional signage throughout the Town. Placing these signs in key locations would allow visitors to navigate the area with ease. When connecting these spaces, it is important to consider steep slopes and limit private property crossings. This will minimize time and cost of implementation.

On the following page is an overall map showing public lands, the project sites, and the proposed connections between them.

**OVERALL CONNECTIONS**

-  CULTURAL
-  TRAILHEAD
-  WATER ACCESS
-  WATER QUALITY EDUCATION
-  ENVIRONMENTAL EDUCATION
-  CAMPING
-  PEDESTRIAN TRAIL
-  BARRENS PROPOSED TRAIL
-  PUBLIC LANDS
  - Town of Cleveland
  - Russell County
  - DCR
  - Commonwealth of VA
  - Cumberland Plateau
  - Nature Conservancy
-  VEHICULAR DIRECTIONAL SIGNAGE
-  PEDESTRIAN DIRECTIONAL SIGNAGE



## INVENTORY & ANALYSIS

### *Elementary School*

The former Cleveland Elementary School is located just outside of downtown along the Clinch River and Artrip Road. This site was identified as the location for a future campground focused around Clinch River recreation. During the initial site visit, the CDAC team met with local community members, recorded existing site elements, and analyzed site conditions. The process of inventorying the site consisted of taking photographs of the property, measuring grade changes throughout the site, collecting soil samples for analysis in the lab, identifying the most common tree species growing on the site, and walking potential trail locations. The Town of Cleveland requested that the Community Design Assistance Center address the following concerns and desires:

- Create a campground that can accommodate both tents and RVs
- Make a basic evaluation of the old school building for potential restoration or reuse.
- Provide new buildings that will support the campground
- Utilize existing water lines on the property for new buildings
- Include cabins in the plan
- Locate parking
- Widen entry street for RVs if needed
- Protect the riparian corridor along the river's edge
- Propose a river crossing

Currently, the only feature located on the site is the old school building. Information gathered during the inventory and analysis process was taken into consideration and directly influenced the development of conceptual designs.

On the following page is an inventory and analysis map.



## INVENTORY & ANALYSIS

### *Ball Park*

Cleveland's ball park is located just outside of downtown along the Clinch River and Ivy Ridge Road. During the initial site visit, the CDAC team met with local community members, recorded existing site elements, and analyzed site conditions. The process of inventorying the site consisted of taking photographs of the property, measuring grade changes between the existing buildings on the site, collecting soil samples for analysis in the lab, and identifying the most common tree species growing on the site. The Town of Cleveland requested that the Community Design Assistance Center address the following concerns and desires:

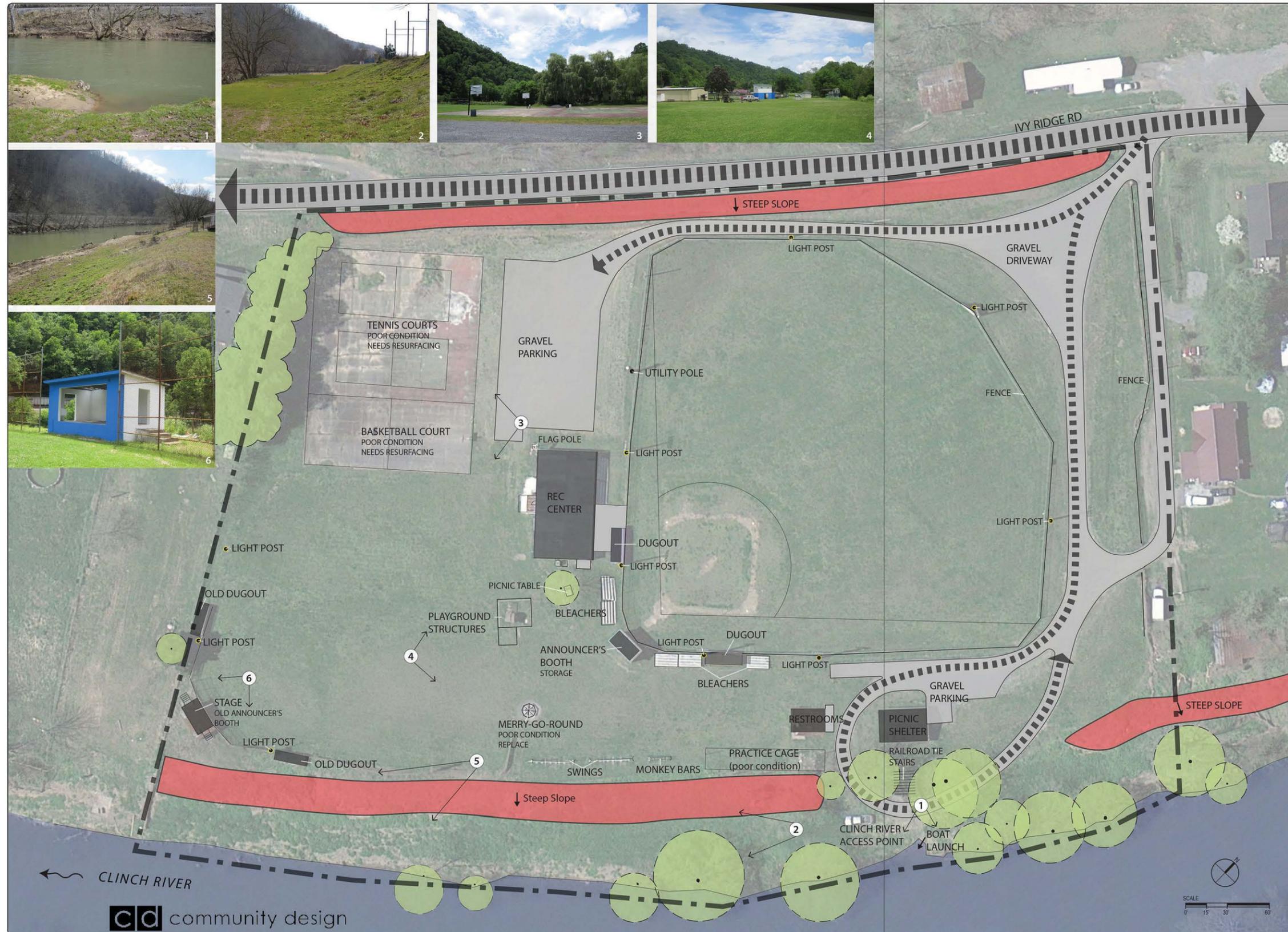
- Reuse existing tennis courts for track if in poor condition
- Add a new volleyball court
- Add a new fishing dock
- Incorporate a new walking trail connecting school site, ballpark, downtown, and the Barrens waterfall
- Retrofit the existing stage or design new stage area
- Provide a new awning/shade structure for the community center with seating
- Add a new 25'x 20' concrete pad at community center parking area to accommodate one handicap van and one regular car with handicap accessible concrete sidewalks connecting to the building
- Provide new playground equipment; explore separating into age groups
- Incorporate a new fitness trail loop with fitness stations
- Add a new horseshoe pit in the location of the batting cage
- Replace the tree leaning next to the picnic shelter
- Add trees along the upper river bank
- Renovate the existing kayak launch

Currently the park's amenities include the Town's community center, baseball field, and a picnic shelter. It is home to the Town's annual 4th of July celebration as well. The site is bound on the northwestern edge by a steep slope along Ivy Ride Road and on the southern edge by the Clinch River. All of these aspects were taken into consideration when moving forward through the conceptual development phase.

On the following page is the inventory and analysis map.

**INVENTORY & ANALYSIS**

Ball Park



## CAMPGROUND PRELIMINARY CONCEPTS

After completion of the analysis phase of the design process, the CDAC team developed two preliminary design concepts for the campground. With similar goals and objectives in mind, the two concepts have many commonalities; however, Concept 1 is designed to include primarily universal camp sites (sites designed to accommodate both tents and RVs) while Concept 2 has slightly more defined uses of spaces.

An important objective for the campground designs is to accommodate both tent campers and RVs. RVs require large turning radii in order to travel through sites so it is advised to keep curves to a minimum to reduce paved surfaces. With a small site to work with, both concepts are structured around a central, main loop with camping sites branching off the outer edge. This central loop creates a street that is easy for RVs to drive on while also defining spaces throughout both concepts. Tall native grasses are also used to define spaces that campers should or should not occupy.

Inside of the central loop, both concepts have an open lawn planted with shade trees around its edge. Group camp sites are located beneath these perimeter trees. This lawn acts as a field for outdoor recreation on an average day when the campground is experiencing low to medium occupancy during potential peak tourism seasons, however, the lawn area can double as overflow camping.

Structures are located in the eastern portion of the site. A small entry booth is located inside the entrance to the site where payment for camp sites and retrieval of cabin keys can be conducted. The main buildings, that house a multi-use space, community kitchen, laundry, as well as other functions, is located adjacent to a parking lot immediately past the entry booth. The restrooms are located centrally inside the main loop where they can easily be accessed by all camp sites. Finally, three cabins are located on the eastern side of the central loop.

## CAMPGROUND PRELIMINARY CONCEPTS

### *Concept 1*

While the two concepts have many similarities, there are a few key differences: Concept 1 is designed so all camping sites are universal. This means that their driveways are sized and angled to accommodate both cars and RVs. All universal camp sites are “back-in” sites, where a vehicle pulling a trailer or RV must back-in to access the camping area. While this is the most convenient use of space, the downside to universal camp sites is that RVs and tent campers will be mixed. This is generally a problem when noise and light produced by RVs interfere with the quiet and darkness often sought after by tent campers.

In addition, Concept 1 has a river access point located at the southeastern corner of the site where a proposed pedestrian bridge connects to the shore. Three walking paths connect various portions of the site to this river access point. The advantage of having the access point where the bridge connects to the shore is reduced disturbance to the sensitive riparian corridor they are located within. If the two features were in separate locations, there would be double the impact to the riparian corridor.

The following page illustrates Concept 1.

**CAMPGROUND PRELIMINARY CONCEPTS**

Concept 1



BACK-IN RV CAMPING



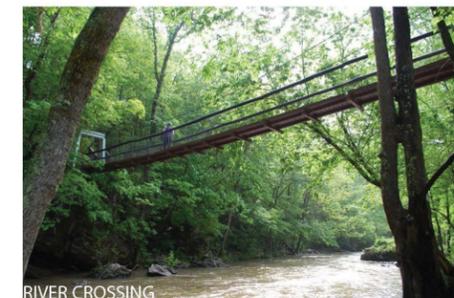
PRIVATE CAMP SITES



GROUP CAMP SITES



RIVER ACCESS



RIVER CROSSING

## CAMPGROUND PRELIMINARY CONCEPTS

### *Concept 2*

Concept 2 is designed with more specialized camp sites. In this concept, RVs and tent camping (still in the form of a universal camp site) are separate. The two uses are separated so that noise and light produced by the RVs don't interfere with the experience desired by tent campers. The RV sites take the form of "pull-through" camp sites. These sites don't require the vehicle to back in to a driveway but instead, simply pull through the same direction as it would park. This form is easier to use than a "back in" site however it requires more space. The RV spots are located on the western side of the site while the tent camping area is along the riparian corridor nearest the river. This layout allows more camping spots to fit along the riparian corridor, the most desirable portion of the site.

Concept 2 includes a river access point located in the center of the southern edge of the site. This access point is located centrally where it can easily be accessed from any part of the site. Campers from both the cabins and RV areas have equal walks to reach the river. The downside of this design is its impact on the riparian corridor. By splitting up the access point and river crossing, there will be two separate areas that will be affected by construction.

The following page illustrates Concept 2.

### CAMPGROUND PRELIMINARY CONCEPTS

Concept 2



PULL-THROUGH RV CAMPING



SEATING BY THE RIVER



RIVER ACCESS



RIVER CROSSING



ENTRANCE BOOTH

## CAMPGROUND BUILDING PRELIMINARY CONCEPTS

As part of the site assessment, the team made a basic evaluation of the old school building for its potential to be renovated and utilized for campground services. Based on the building's general condition, size, and layout, it was decided that the old school building should be removed and that the team should focus their efforts in creating new buildings that were of appropriate scale and tailored to the needs of a campground. The team decided to separate the campground services into smaller buildings to create an intimate environment and to provide varying degrees of accessibility. In the preliminary designs, three building types are proposed, including the main building, restrooms with showers, and cabins.

Despite proposing multiple buildings, it is important for all campground buildings to be consistent in character. The main building and restroom with showers share some common features. A horizontal wood screen creates a building envelope on both buildings, which is six inches away from external wall. The wood material was selected because it is more natural, and in harmony with nature. By using the same wood screen, these buildings are unified, making an impression as a whole.

The external wall and inside partition wall would reuse the bricks and concrete blocks from the old elementary school building and have a white stucco appearance.

In each building the section above normal people's height, which is eight feet, would be a clerestory. These windows provide natural ventilation and natural lighting during daytime, which not only creates a pleasant atmosphere but also cuts down on electricity costs. In addition, at nighttime, the interior lighting would shine through to the outside enhancing visibility in the space immediately surrounding the bathroom.

## CAMPGROUND BUILDING PRELIMINARY CONCEPTS

### *Community Center*

The main building offers a multi-purpose room, a dining hall with kitchen, a laundry room, and retail spaces for renting canoes, bikes, and fishing equipment. The multi-purpose room provides space for lectures, town meetings, and other types of formal events. The dining hall is a place where people can cook food, gather, meet, and play games. In between the multipurpose room and the dining hall, a covered outdoor sitting area creates a strong connection between the inside and the outside while providing space for activities. Because the building sits on the upper part of the slope, people will have views overlooking the campground. The multi-purpose room and dining hall could operate independently or together. The space could be rented out to hold bigger events such as weddings and family reunions.

The following pages include floor plans and perspectives of the community center.

**CAMPGROUND BUILDING PRELIMINARY CONCEPTS**

Community Center

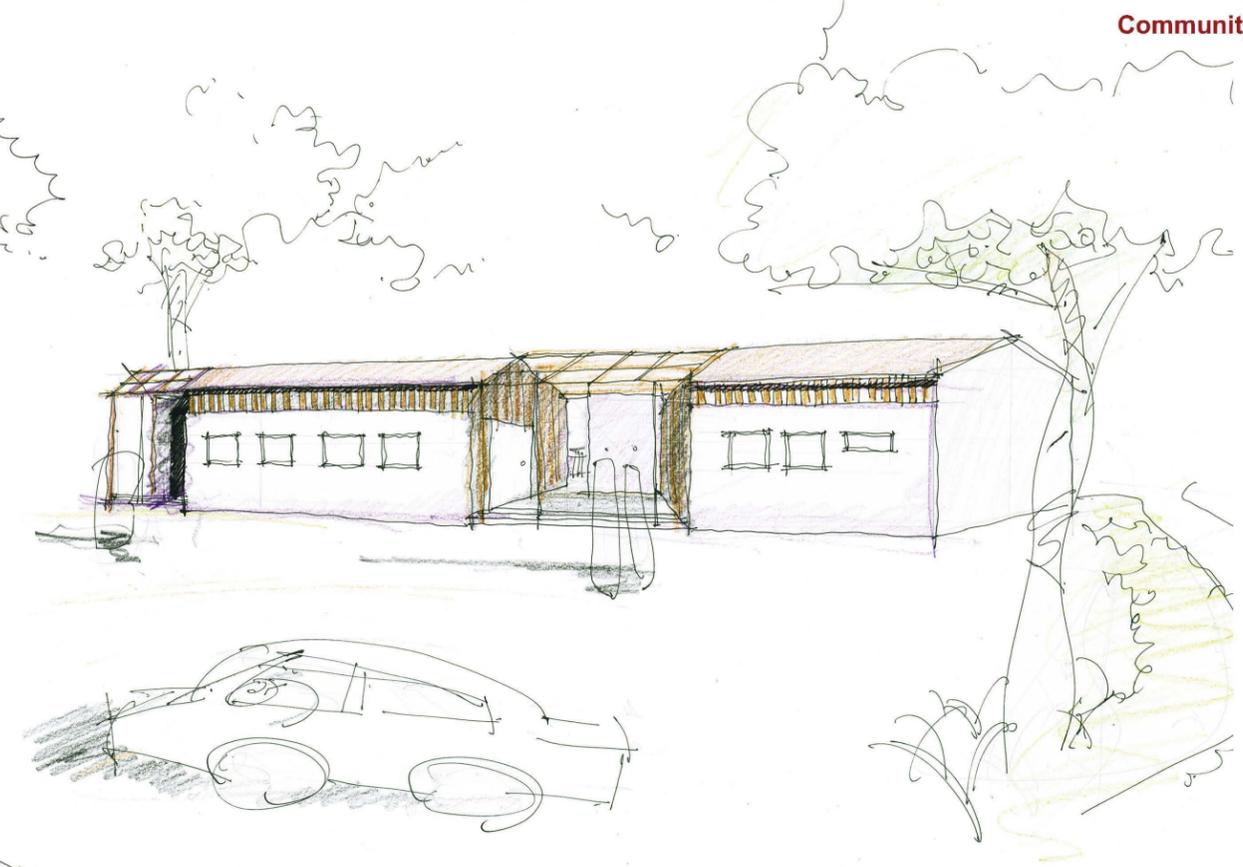


**CAMPGROUND BUILDING PRELIMINARY CONCEPTS**

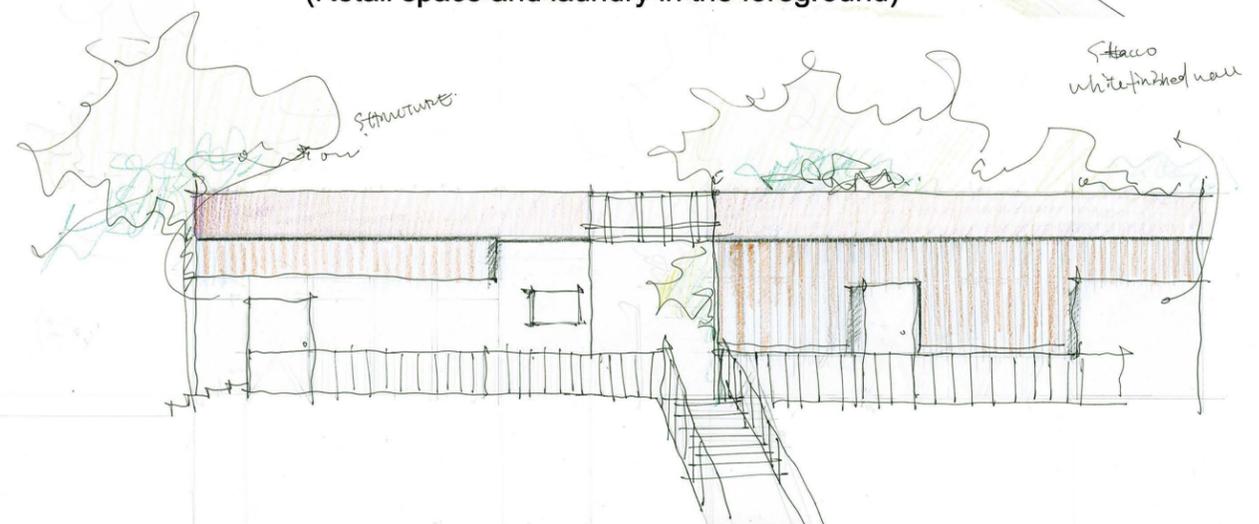
Community Center



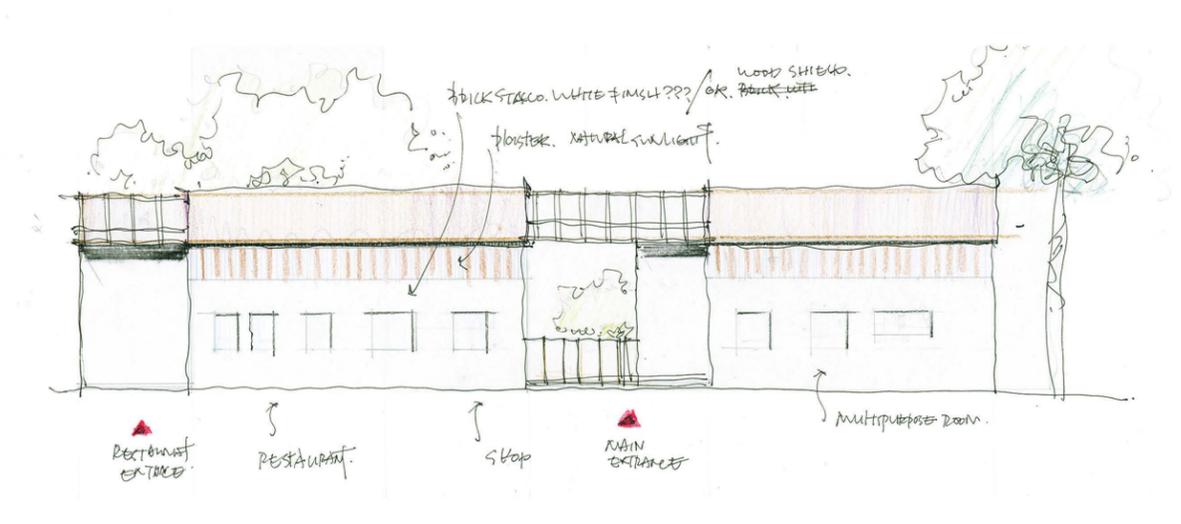
**BACK PERSPECTIVE OF MAIN BUILDING**  
(Retail space and laundry in the foreground)



**FRONT PERSPECTIVE OF UPPER PART OF MAIN BUILDING**



**BACK ELEVATION OF UPPER PART OF MAIN BUILDING**



**FRONT ELEVATION OF UPPER PART OF MAIN BUILDING**

## **CAMPGROUND BUILDING PRELIMINARY CONCEPTS**

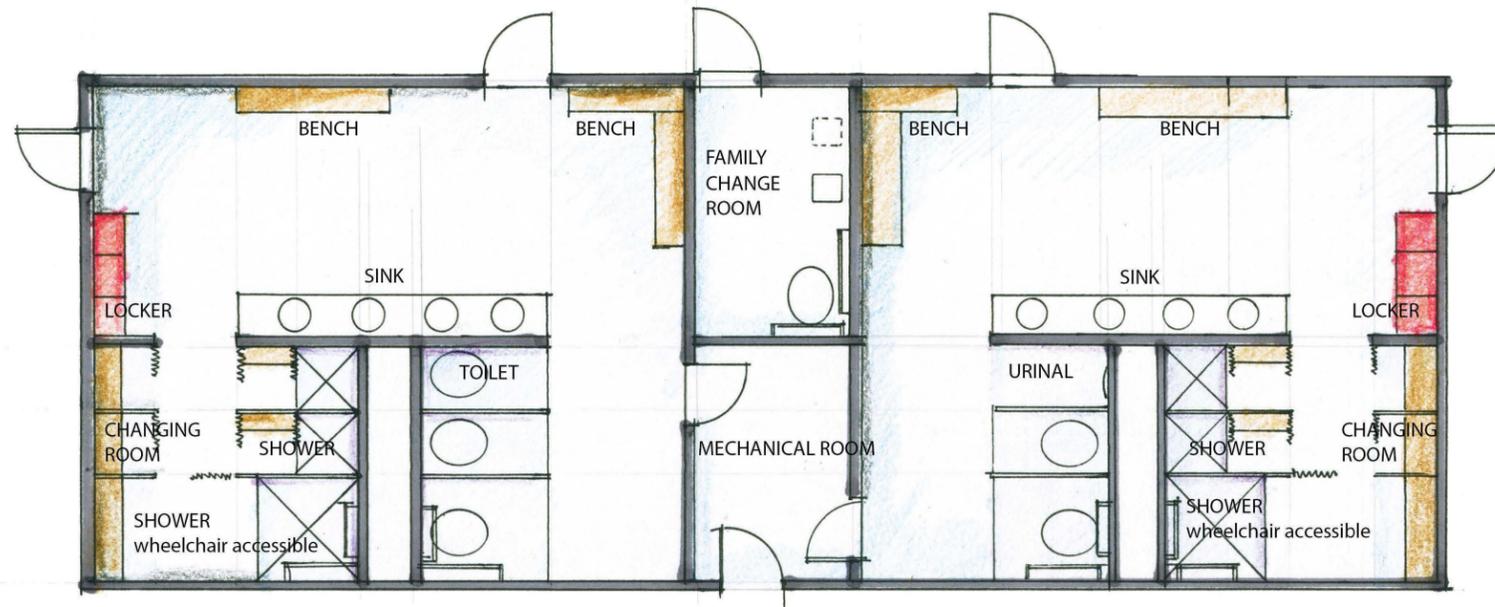
### *Restrooms*

The restrooms and showers are located opposite to the lower part of the main building. Main entrances to the men's, women's, and family changing room are on the side facing the street and other buildings. In addition, there are two entrances at each side of the building, making it easier to access the restrooms from the campground side of the property. The layout of the restroom and showers is efficient but still spacious, especially with the clerestory windows bringing in natural sunlight. The building is ADA accessible.

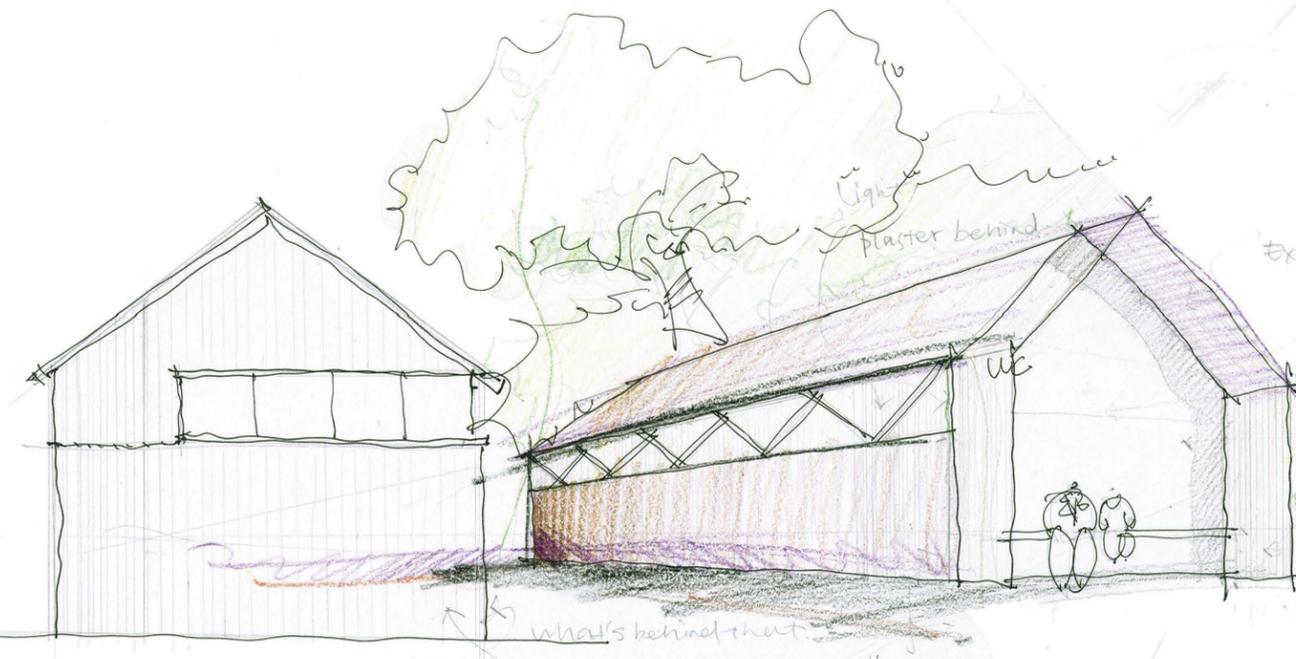
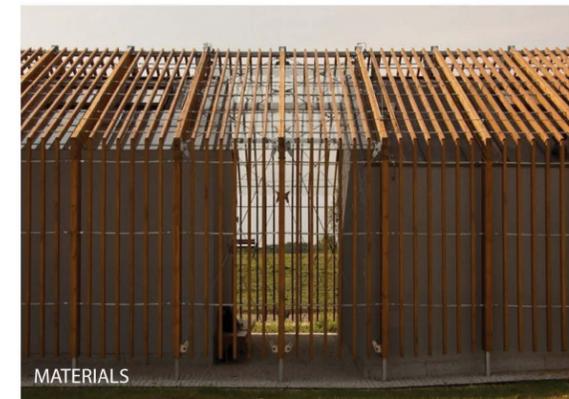
The following page includes a floor plan and perspectives.

**CAMPGROUND BUILDING PRELIMINARY CONCEPTS**

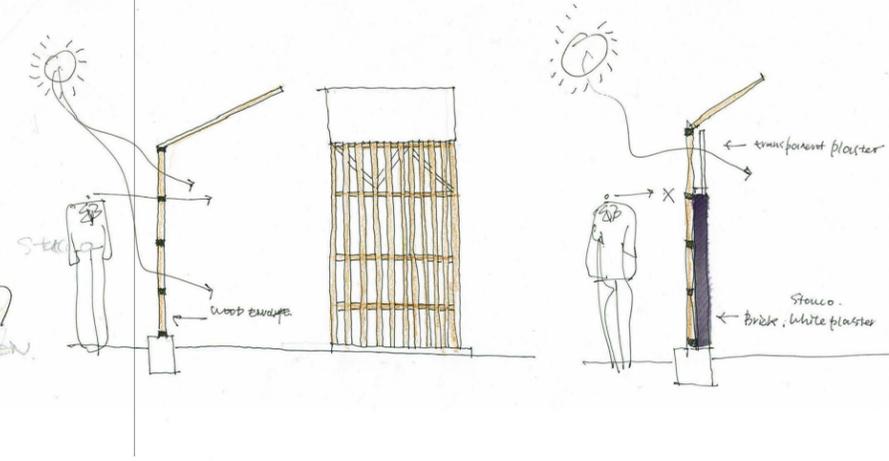
Restrooms



**RESTROOM AND SHOWERS PLAN**



**ELEVATION AND PERSPECTIVE**



**MATERIAL AND SKY LIGHT**

## CAMPGROUND BUILDING PRELIMINARY CONCEPTS

### *Cabins*

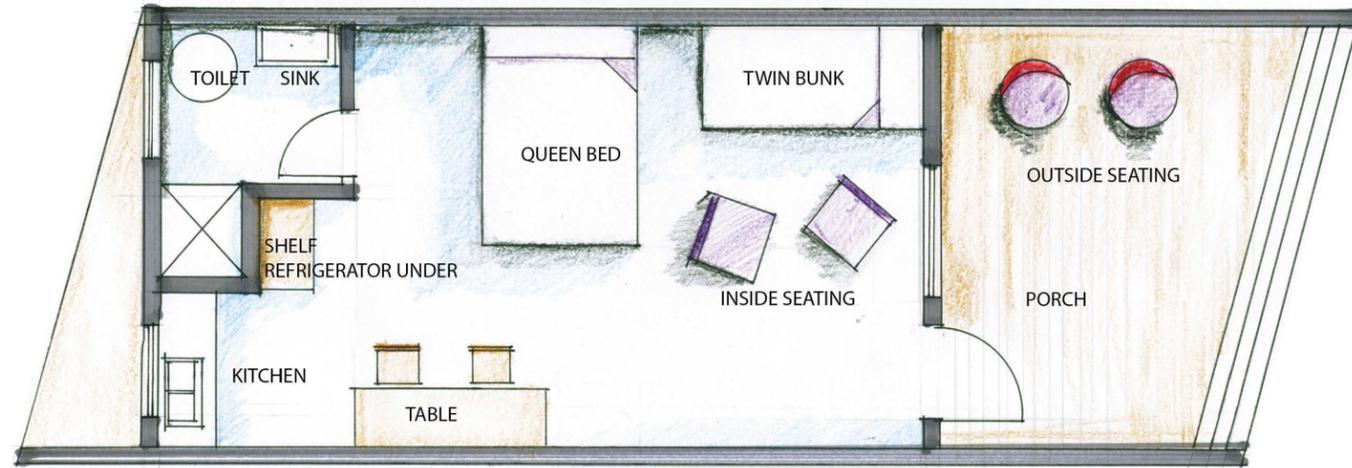
In the preliminary design, two styles of cabins were developed. The first type is ideal for families. It is more spacious, containing its own bathroom and a small kitchen. It offers one queen size bed and one twin bunk bed. The other cabin type is more efficient and economic. Aiming to make the room easy to be maintained, this cabin offers only the necessities: two twin bunk beds, a closet, and a table and chairs. Ideally, this cabin is designed for people traveling with friends. In this scheme, there is no bathroom in the cabin. Those staying in this cabin would use the campground restroom facility.

Both types of cabins use a light timber structure and a wood veneer wall, which is easy and affordable to build. In addition, similar to the wood screen on the main buildings and restroom showers, the material choice ensures the cabins maintain a natural aesthetic.

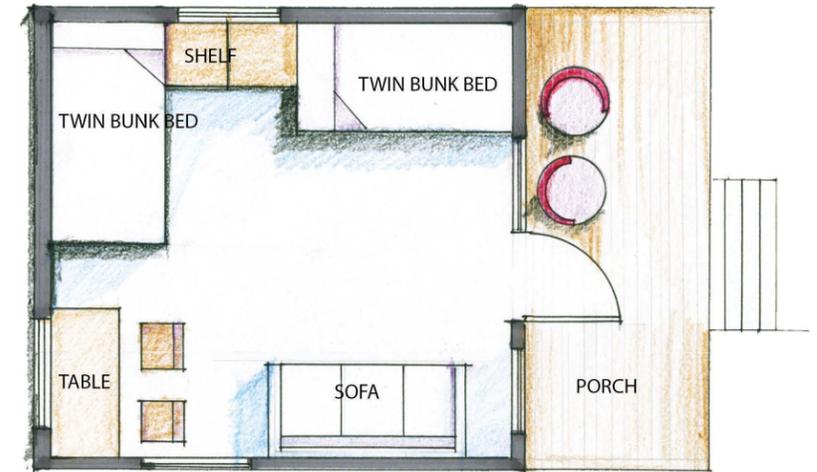
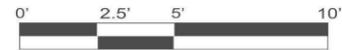
The following page includes floor plans and perspectives.

**CAMPGROUND BUILDING PRELIMINARY CONCEPTS**

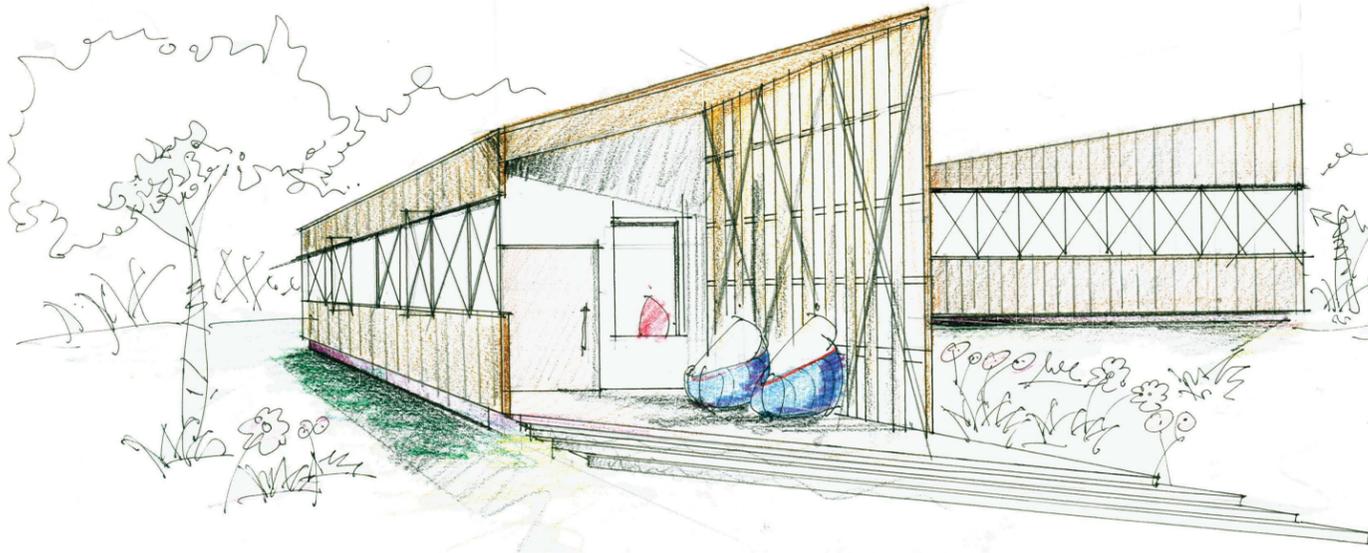
Cabins



**CABIN A PLAN**



**CABIN B PLAN**



**CABIN A PERSPECTIVE**



**CABIN B PERSPECTIVE**

## BALL PARK PRELIMINARY CONCEPTS

After meeting with the Town of Cleveland and stakeholder groups to determine the needs and desires of the community, two concepts were developed for the ball park. The CDAC team then presented these concepts to the community for review and feedback.

### *Concept 1*

The first concept, shown on the following page, focuses on creating a play area that concentrates on natural, sensory, and motorized play. The area is separated into three different age groups, six months to two years, two years to five years, five years to twelve years, while also utilizing the existing natural slope along the river for play. Incorporating elements such as grass berms and a tree house allows the community ease of construction at a minimal cost.

A fitness trail, with lighting and three fitness stations, follows the perimeter of the park area. A lower trail connects a proposed fishing dock to an access point and further to the downtown area. This connection will allow visitors easy access to all key elements of the Town (ball park, proposed campground, downtown, and the Barrens waterfall). Along the lower trail, children can play on the slide/climbing wall area or lounge on the open grass seating. Adjacent to the fishing dock is a mowed path that meanders through a meadow to a more intimate seating area.

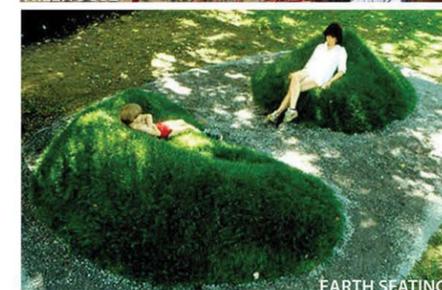
In addition to a new volleyball court and relocated basketball court, a new stage is located to better utilize the natural acoustics of the valley.

Handicap parking is located throughout the park. At the recreational center, a concrete pad and handicap accessible sidewalks are proposed to accommodate each egress and entry to the building. Handicap access is also located along the fitness trail in a proposed parking area located on the northern portion of the entry drive to the access point.

Concept 1 allows for a large play area while still maintaining an expansive lawn space to be used during events. The following page illustrates Concept 1.

**BALL PARK PRELIMINARY CONCEPTS**

Concept 1



## **BALL PARK PRELIMINARY CONCEPTS**

### *Concept 2*

Concept 2 differs from the first concept by focusing more on natural play and utilizing elements found in nature. The play area is separated into two age groups: two years to five years and five years to twelve years. This allows for two larger play areas and still provides a third space for parents to sit and congregate in the shade while keeping a close eye on their children. The play area is bound by a figure eight track for kids to ride bikes and still be within close proximity to overseeing parents.

The fitness trail, with stations, has a continuous upper loop and a lower connecting trail. The lower trail connects a bird sanctuary, on the southwestern side of the property, to an open lawn area where tents could be set up and used during events. The sloped hillside could accommodate terraced seating for any activities being held along the river.

In the second concept, handicap parking is eliminated along the access road and the stage location has remained in its current location.

Concept 2 accommodates a different configuration for similar activities shown in concept one but still allows for park users to exercise, hold events, and experience the Clinch River. The following page illustrates Concept 2.

**BALL PARK PRELIMINARY CONCEPTS**

Concept 2



INTERACTIVE PLAY



PLAY



NATURAL PLAY



NATURAL PLAY



TERRACED SEATING



BIRD SANCTUARY

## **BALL PARK BUILDING PRELIMINARY CONCEPTS**

### *Stage*

During the site analysis, two potential sites for the stage were located. One is the current stage site, which takes advantage of the beautiful mountains as a background and could incorporate the concrete platform of the former stage. The second location is in the center of the west edge of the park, which is also the “center” of the valley. Ideally this could amplify sound and music, creating an acoustic feature for the stage.

Two options of the stage were developed. Design A has a large main platform, with additional multi-level platforms reaching down toward the audience. This design takes a minimal approach, with only four columns supporting a steel frame open roof. There are stone walls creating the back stage area.

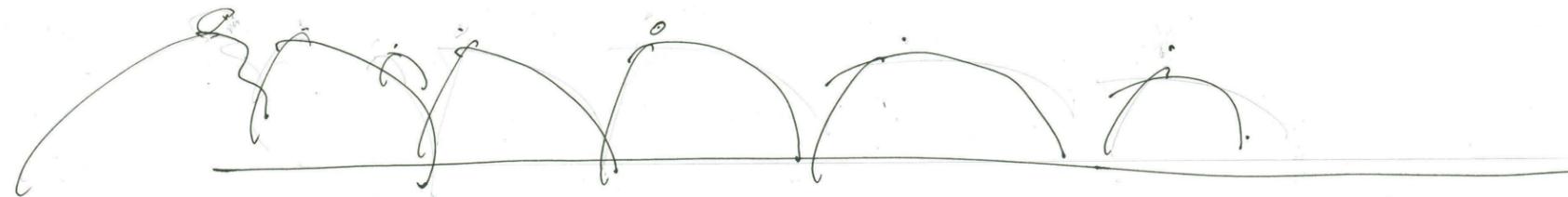
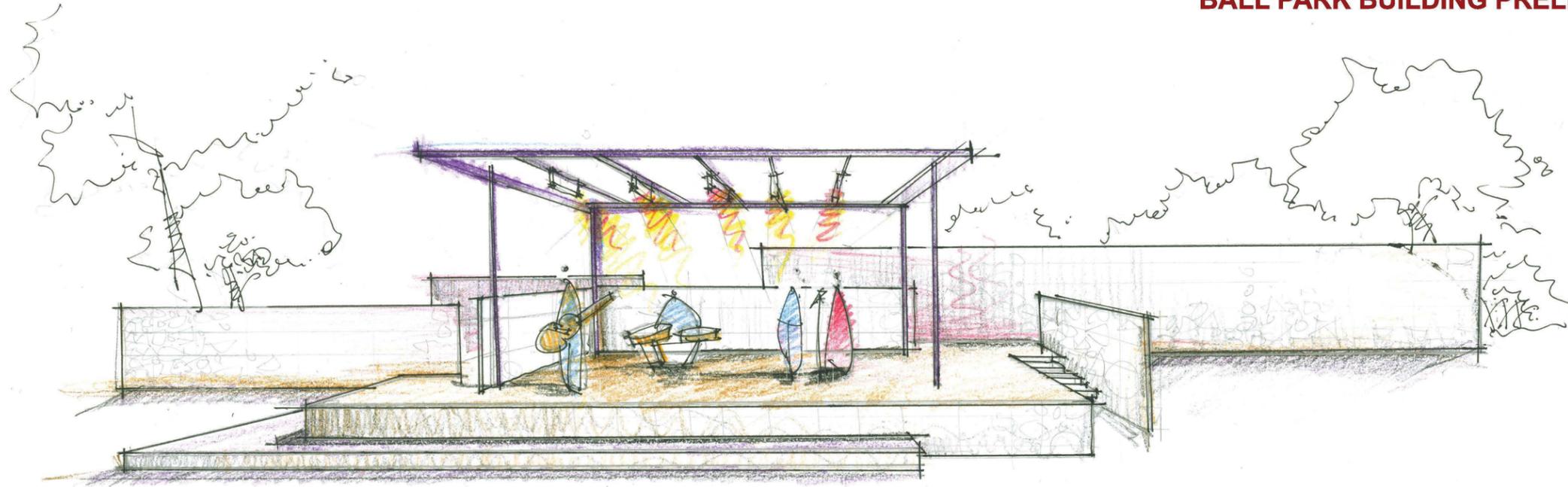
Design B has a butterfly roof and a rectangular platform with steps reaching toward the audience. Also in this case, there is a short stone wall forming the back stage area.

Both Designs A and Design B should be easy to construct and affordable. The stone wall for both concepts are made of steel or an iron cage, filled with rocks or stones.

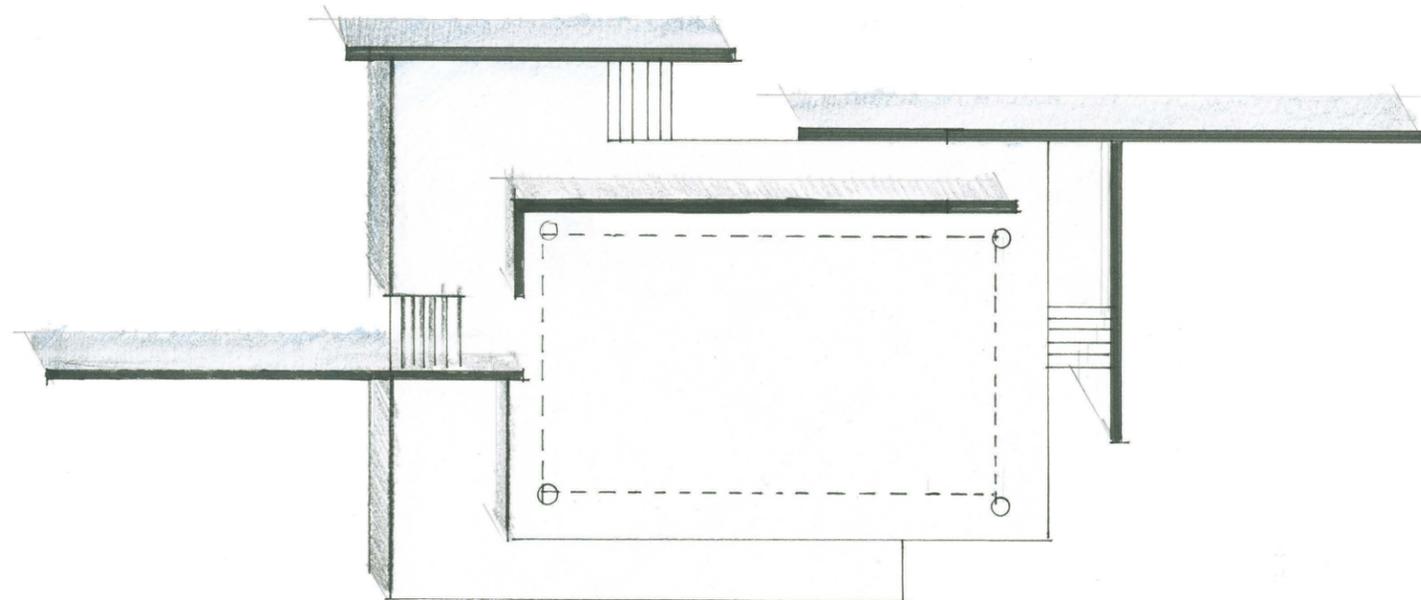
The following pages include sketches of the two alternatives.

**BALL PARK BUILDING PRELIMINARY CONCEPTS**

Stage



**STAGE A PERSPECTIVE**

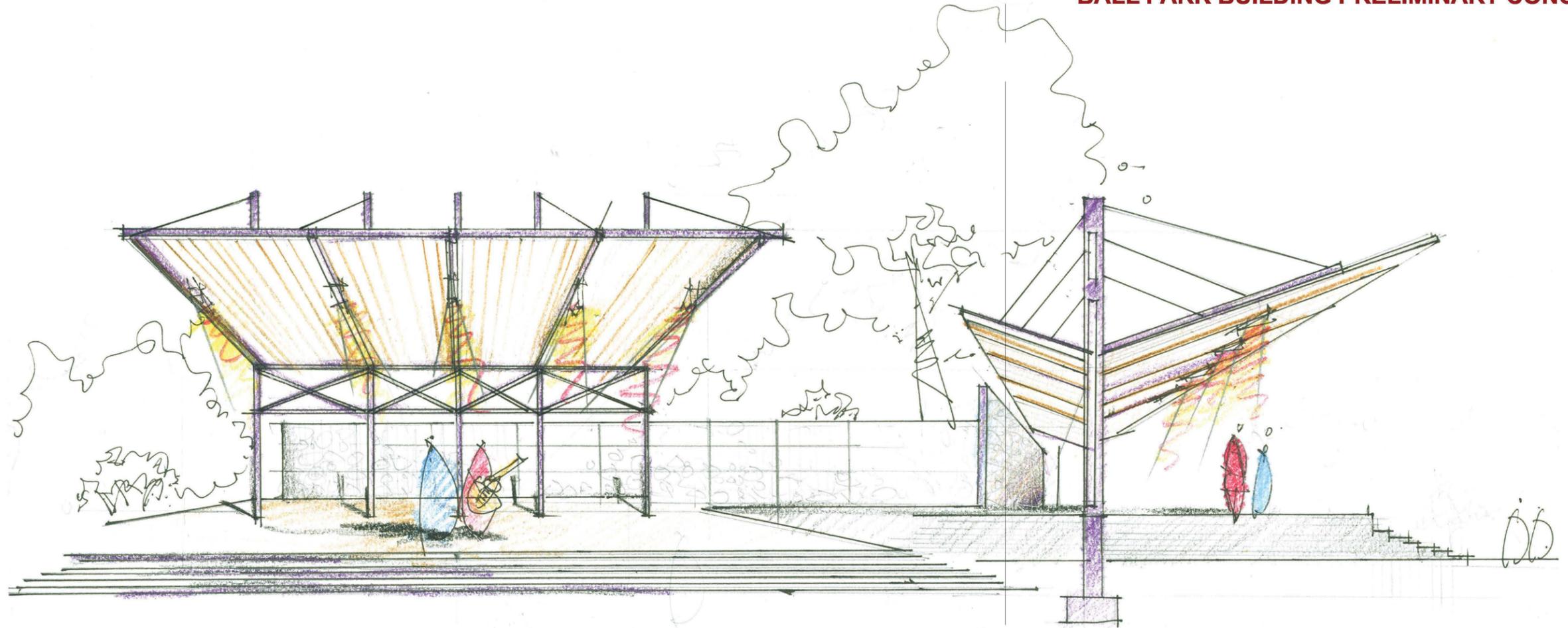


**STAGE A PLAN**



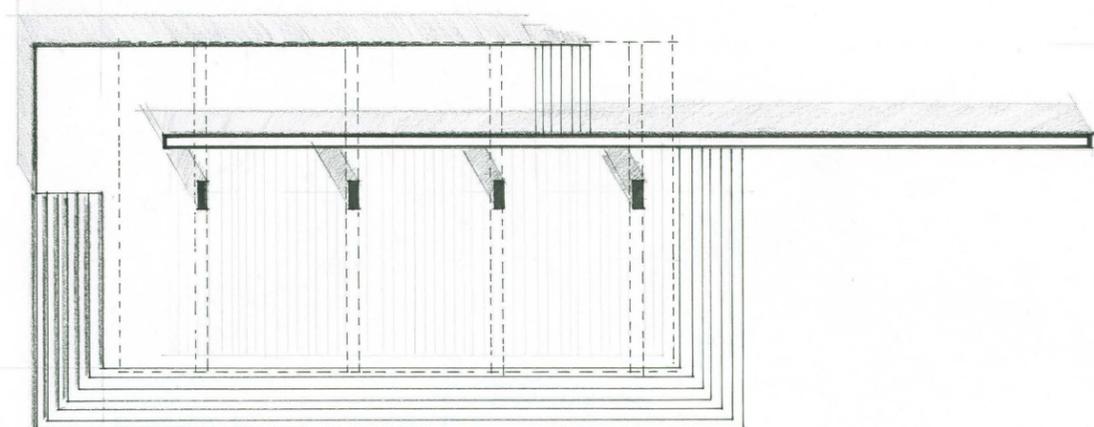
**BALL PARK BUILDING PRELIMINARY CONCEPTS**

Stage



**STAGE B PERSPECTIVE**

**STAGE B ELEVATION**



**STAGE B PLAN**



## **BALL PARK BUILDING PRELIMINARY CONCEPTS**

### *Shelter*

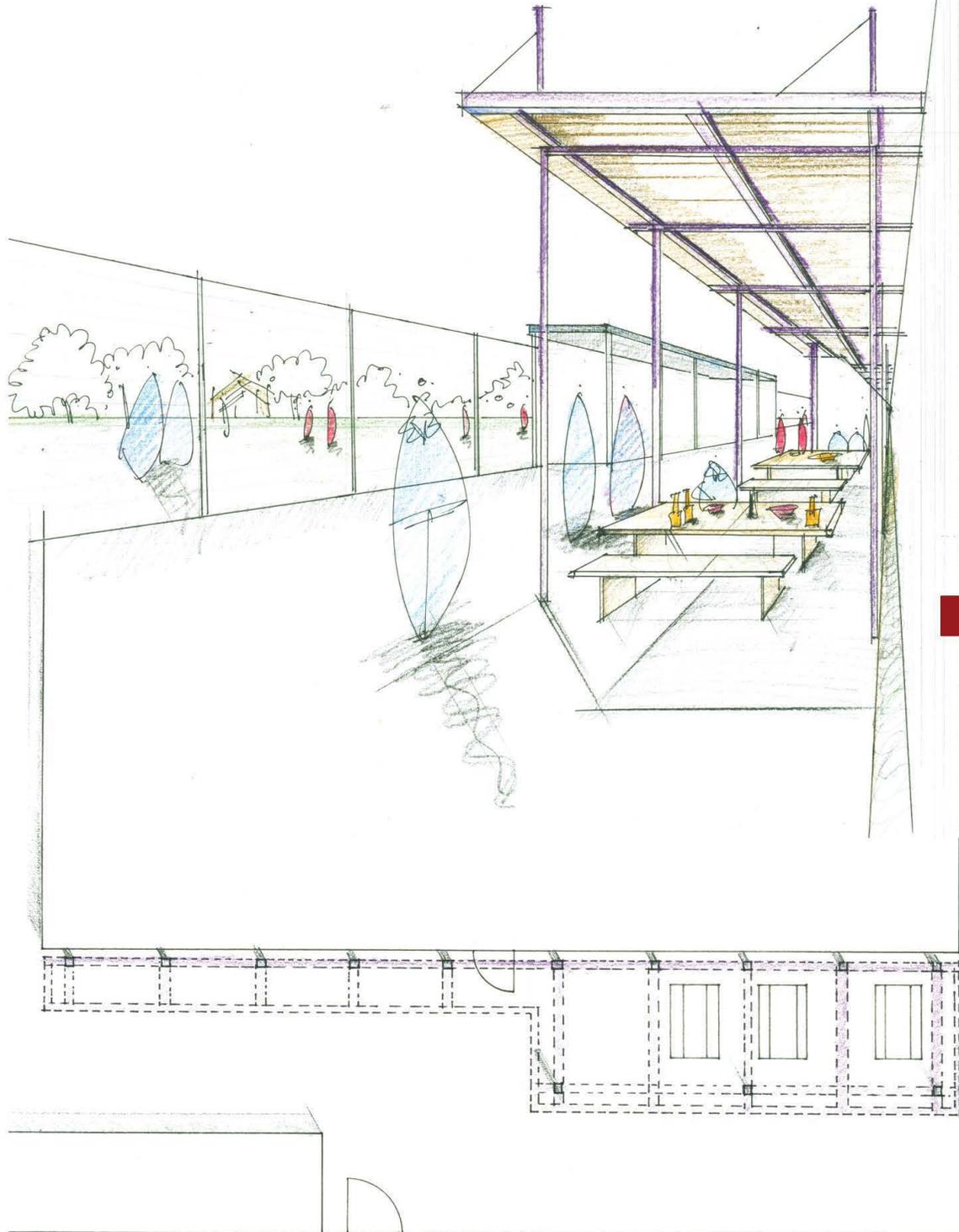
The team presented two alternative designs for an overhang to create a picnic area next to the community recreation center.

Design A is a more traditional overhang, with a solid roof covering the picnic area. This design also provides protection from water and could be used on rainy days.

Design B employs the use of tension fabric to act as a roof and provides shade from the sun. This fabric could easily be taken down and could change according to different seasons or different events. Since the site is very narrow and would be extremely crowded during baseball game, the overhang covers the entire area between the building and the baseball fence to avoid putting post sand structures in the middle of space.

To avoid an overwhelming structure in this narrow space, steel is used in both designs to make the structure as light as possible. The following pages illustrate the designs for the shelter.

## BALL PARK BUILDING PRELIMINARY CONCEPTS

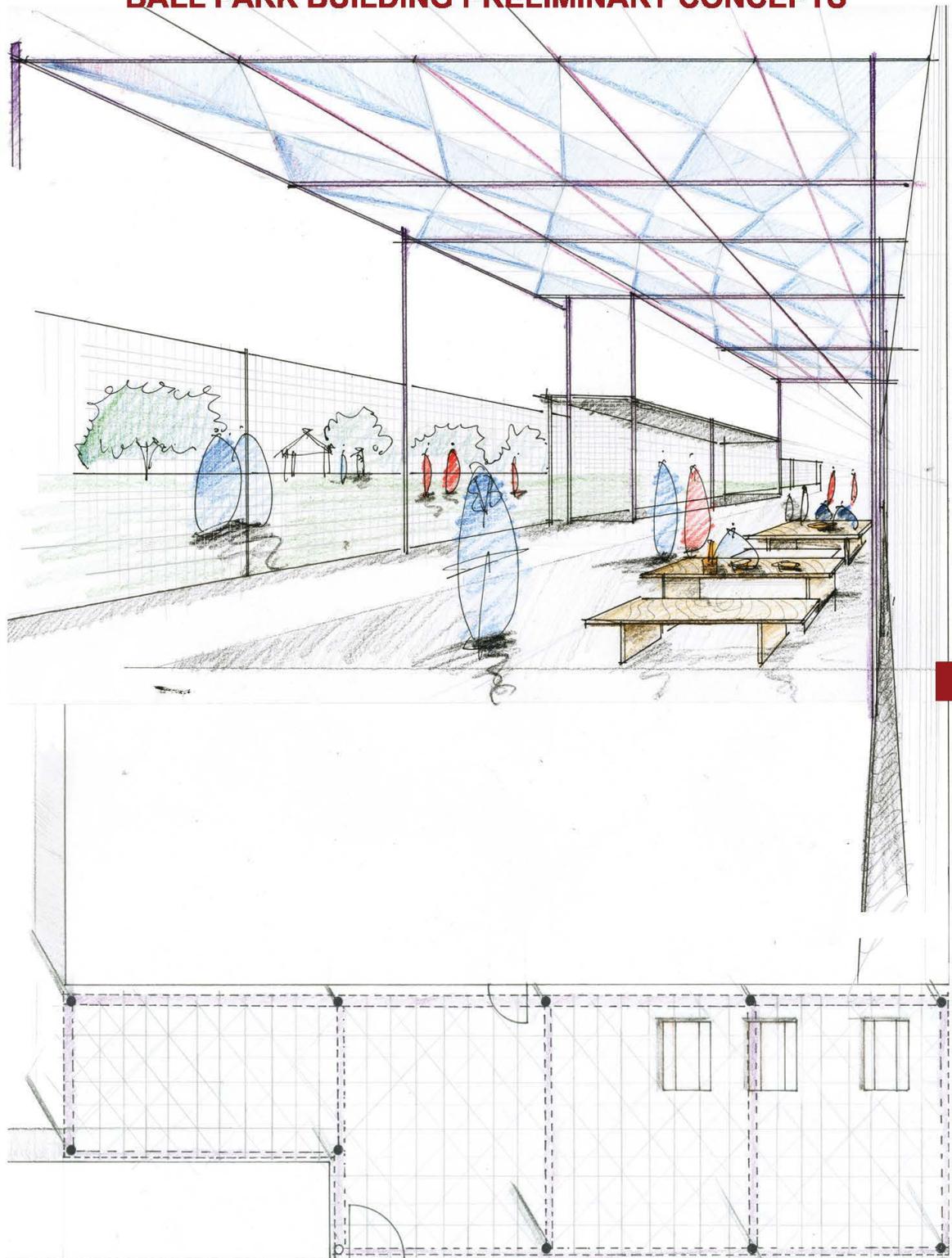


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*Shelter*

**DESIGN A**

## BALL PARK BUILDING PRELIMINARY CONCEPTS



Shelter

DESIGN B

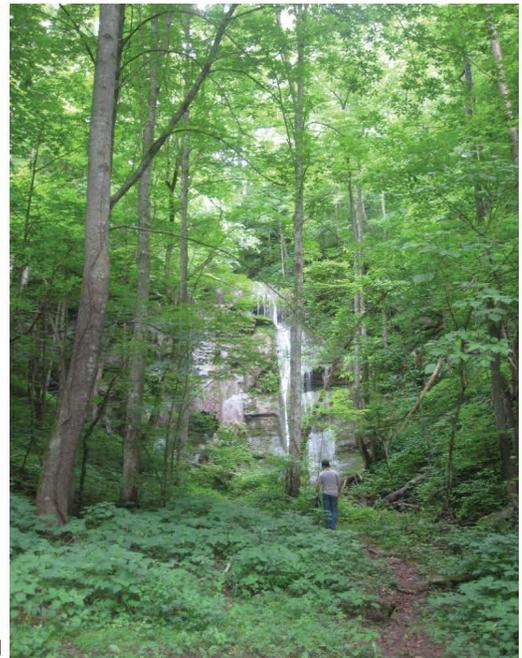
## WATERFALL PRELIMINARY CONCEPT

The CDAC team toured the waterfall at the Cleveland Barrens Natural Area Preserve, a globally significant natural area preserve, with community members to address parking and vehicular circulation issues. The existing road leading to the waterfall is extremely narrow, allowing only one car in either direction, and there is no designated parking. Currently, one of the Town's pump stations is located on site and is regularly maintained. It was requested that the design team explore the possibility of locating a trailhead, parking, and pull-offs. The following page shows a diagram with these options.

While on site, CDAC took gps coordinates of the best possible locations for vehicle pull-offs and conducted a visual analysis for a potential parking area. Due to the sensitive species located on this site, further analysis may need to be completed.

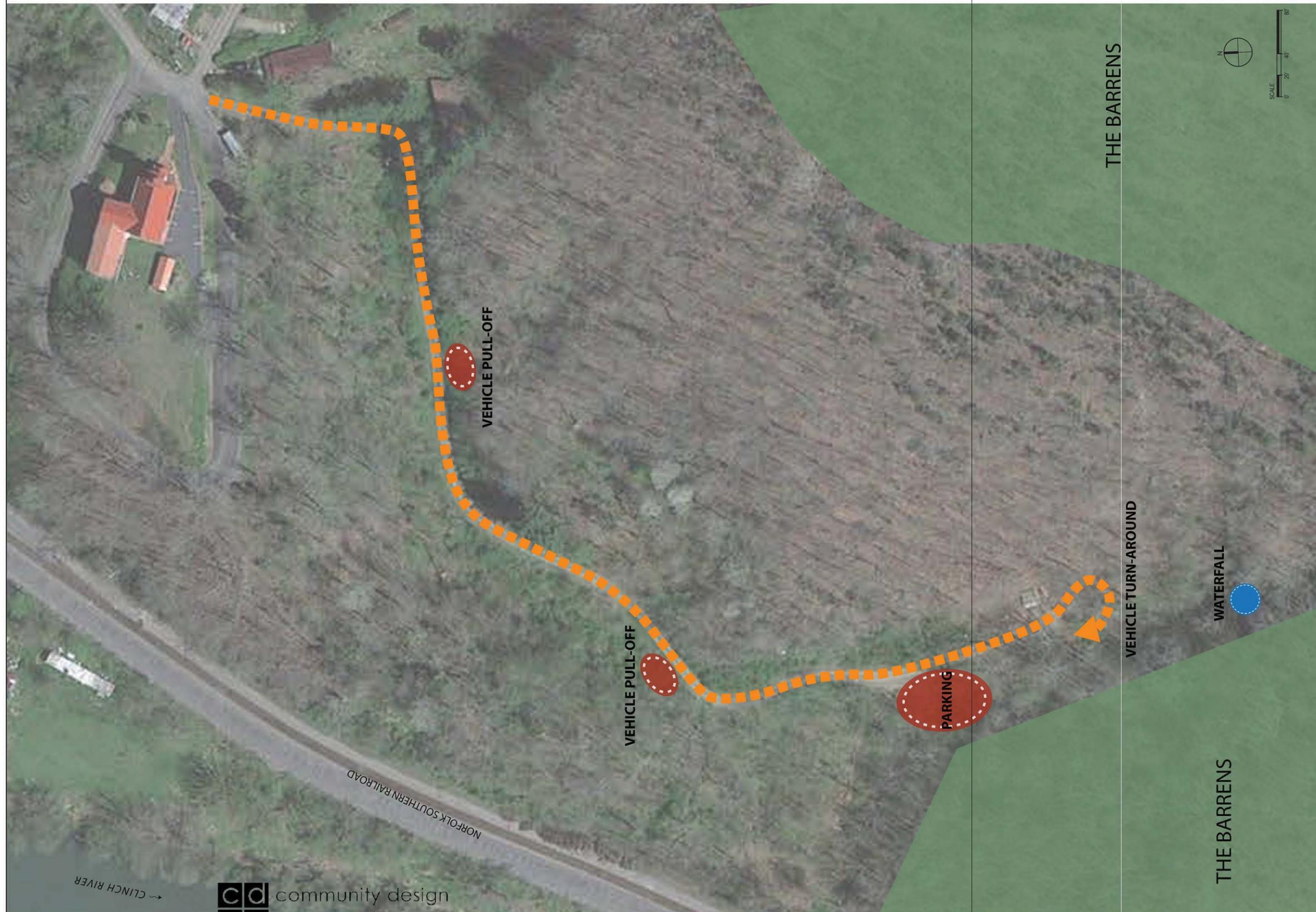


The road to the Barrens waterfall



The Barrens waterfall

**WATERFALL PRELIMINARY CONCEPT**



CLINCH RIVER

## CAMPGROUND FINAL CONCEPT

Both preliminary design concepts were presented at a community meeting where Cleveland residents reviewed and commented on which features they liked and disliked from each. The goal of this meeting was to let the community decide how to move forward with the designs. After the community meeting, the CDAC team revised and combined the two preliminary concepts into a final conceptual master plan.

The final conceptual master plan (see following pages) adopted the universal camp site layout from Concept 1. All camp sites are accessed by back-in driveways that are scaled to accommodate both RVs and cars. All camp sites, including cabins, are uniformly laid out around the central vehicle loop.

The final conceptual master plan has two river access points. The access point location from Concept 1 was found desirable by the community and adopted into the final design concept as the primary river access point. A secondary access point further down-river, yet still on the site, provides the opportunity for children to enjoy a short float down the river.

A concern that was identified during the community meeting was where group campers will park. The final conceptual master plan provides informal parking along the inner edge of the vehicle loop. An 8.5' wide strip of grass pavers runs along the inner edge of this loop, providing parallel parking for cars accessing the group camp sites. The following pages illustrate the final campground design.

A planting plan was also created for the campground. Species were selected for their ability to withstand flooding, thrive in acidic soils, and for their aesthetic value. Plants selected provide year-around interest thru interesting bark, berries, flowers, and fall color. In addition, the design team felt it was important to provide a visual screen along the eastern edge of the property where the campground abuts a private residence. The combination of prairie fire crabapple and American hophornbeam provide a screen with seasonal interest. Information on soils tests for this property is available in the appendix.

**CAMPGROUND FINAL CONCEPT**



BACK-IN RV CAMPING



PRIVATE CAMP SITES



GROUP CAMP SITES



LOW PATH LIGHTING



GRASS PAVERS



Entry into the campground would be monitored by a small gate house where visitors would pay for camp sites. The community center and parking lot would be located just inside the entrance where they can easily be accessed by members of the community. All paved roads in the campground must be wide enough to accommodate an RV.



The restrooms would be centrally located on the site to be easily accessible from the tent, cabin, and RV areas. A strip of grass pavers runs along the inner edge of the vehicle loop for informal parallel parking.



The primary river access point is located by the proposed river crossing. Located in a riparian corridor, this access point is designed as a raised wooden walkway that leaves a small environmental impact on the surrounding landscape.

**CAMPGROUND FINAL CONCEPT**

**Planting Plan**



Swamp Oak  
*Quercus palustris*

River Birch  
*Betula nigra*  
CAMP SITES

ENTRANCE BOOTH

PARKING

MAIN BUILDINGS

RESTROOM

CABIN

CABIN

CABIN

CABIN

KIOSK

RIVER ACCESS

CAMP SITES

STONE DUST TRAIL

SEATING BY THE RIVER

RIVER ACCESS

RIVER ACCESS SIGN

CLINCH RIVER

PEDESTRIAN BRIDGE

Washington Hawthorn  
*Crataegus viridis 'Winter King'*

Sweet Gum  
*Liquidambar styraciflua 'Rotundiloba'*

Red Maple  
*Acer rubrum*

American Yellowwood  
*Cladrastis lutea*

White Oak  
*Quercus alba*

Red Horsechestnut  
*Aesculus x carnea*

Prairiefire Crabapple  
*Malus x 'Prairiefire'*

American Hophornbeam  
*Ostrya virginiana*

Black Gum  
*Nyssa sylvatica*

(1) Red Horsechestnut  
*Aesculus x carnea*

(5) Prairiefire Crabapple  
*Malus x 'Prairiefire'*

(9) Sweet Gum  
*Liquidambar styraciflua 'Rotundiloba'*

(3) American Hophornbeam  
*Ostrya virginiana*

(9) Black Gum  
*Nyssa sylvatica*

(11) White Oak  
*Quercus alba*

(12) Red Maple  
*Acer rubrum*

(5) American Yellowwood  
*Cladrastis lutea*

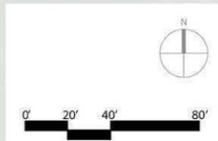
(8) River Birch  
*Betula nigra*

(3) Swamp Oak  
*Quercus palustris*

(4) Washington Hawthorn  
*Crataegus viridis 'Winter King'*

Note: Shrubs around camp sites to be:

- Virginia sweetspire  
*Itea virginica*
- Southern Arrowwood  
*Viburnum dentatum*



## COMMUNITY CENTER FINAL CONCEPT

The final design includes three types of buildings: a main building, restroom with showers, and cabins. Similar to the preliminary concepts, each building is consistent with a general building character. The main building and restroom with showers share some common features.

A horizontal wood screen creates a building envelope, which is six inches away from the external wall. The wood material was selected because it is more natural and in harmony with nature. By using the same wood screen, these buildings are unified, making an impression as a whole.

The external wall and inside partition wall would reuse the bricks and concrete blocks from the old elementary school building and have a white stucco appearance.

In each building, the section above normal people's height, which is eight feet, would be a clerestory. These windows provide natural ventilation and natural lighting during daytime, which not only creates a pleasant atmosphere but also cuts down on electricity costs. In addition, at nighttime, the interior lighting would shine through to the outside enhancing visibility in the space immediately surrounding the restroom facility.

## COMMUNITY CENTER FINAL CONCEPT

The main building complex offers a multi-purpose room, a dining hall with kitchen, a laundry room, and retail spaces for renting canoes, bikes, and fishing equipment.

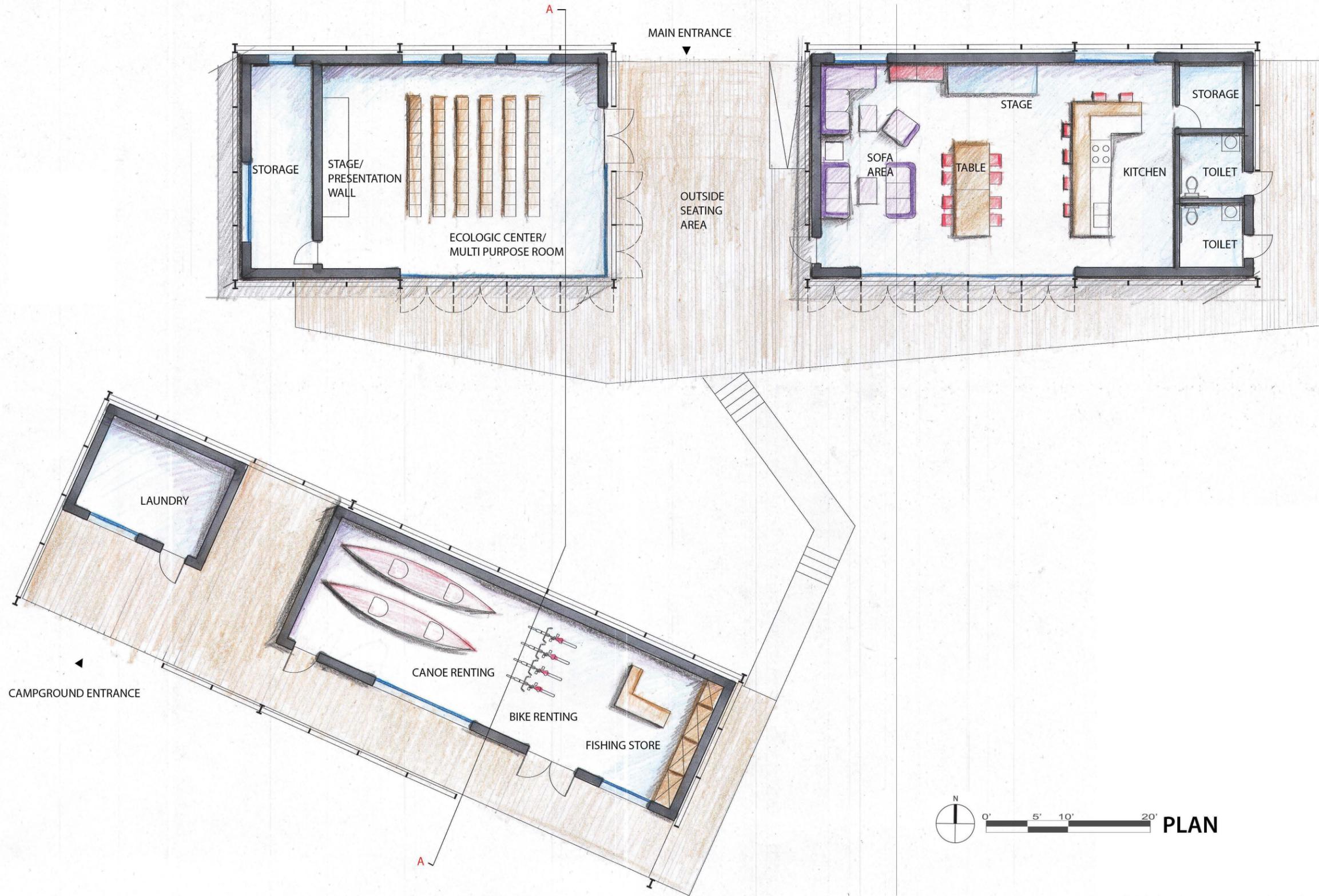
After returning from the initial presentation, the buildings' layouts were improved and finalized. In the main building, restrooms are placed in the west end of the building. This makes them equally accessible from both the multipurpose room and the dining hall. In the lower building, all the rooms that are used for renting entertainment equipment were combined into one big open space. This allows for more flexibility in the use of the space.

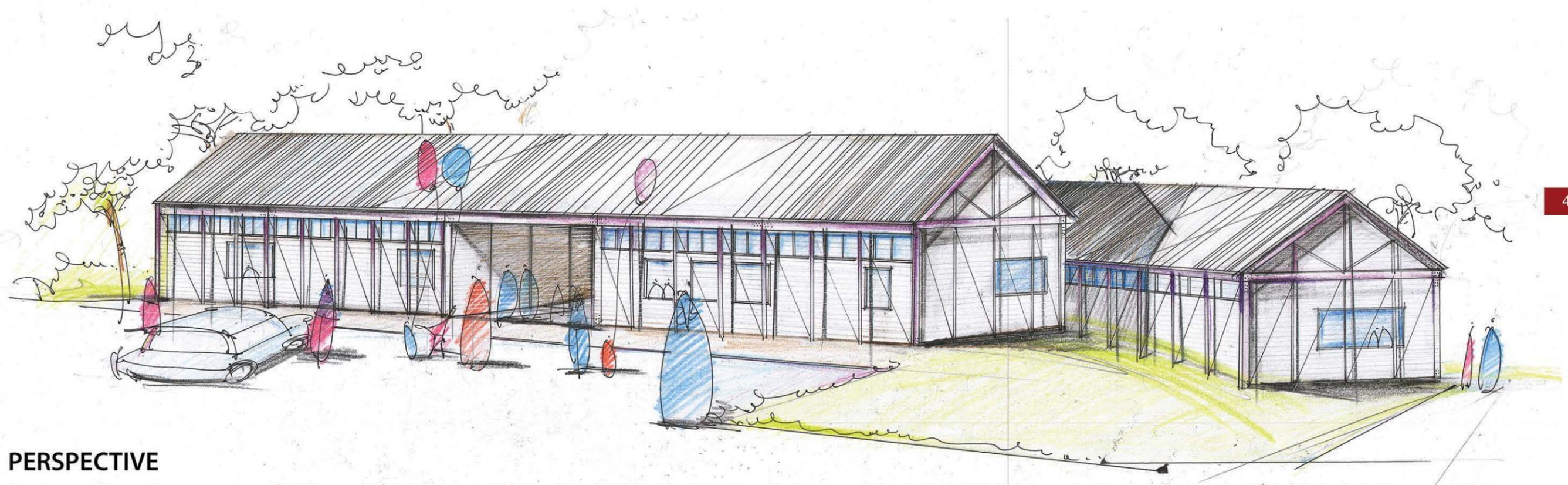
Similar to the preliminary concepts, the multi-purpose room provides space for lectures, Town meetings, and other types of events. The dining hall is a place where people can cook food, gather, meet, and play games. In between the multipurpose room and the dining hall, a covered outdoor sitting area creates a strong connection between the inside and the outside, and provides space for activities. Because the building sits on the upper part of the slope, people will have views overlooking the campground. The multi-purpose room and dining hall could operate independently, or together, and could be rented out to hold larger events like weddings, family reunions, etc.

The lower building of the main building complex contains a laundry room and a retail space for an outfitter that could provide bikes, canoes, and fishing equipment. This retail space is directly on the circular drive making it a convenient location for campers.

The floor plans and perspectives can be found on the following pages.

**COMMUNITY CENTER FINAL CONCEPT**





**PERSPECTIVE**

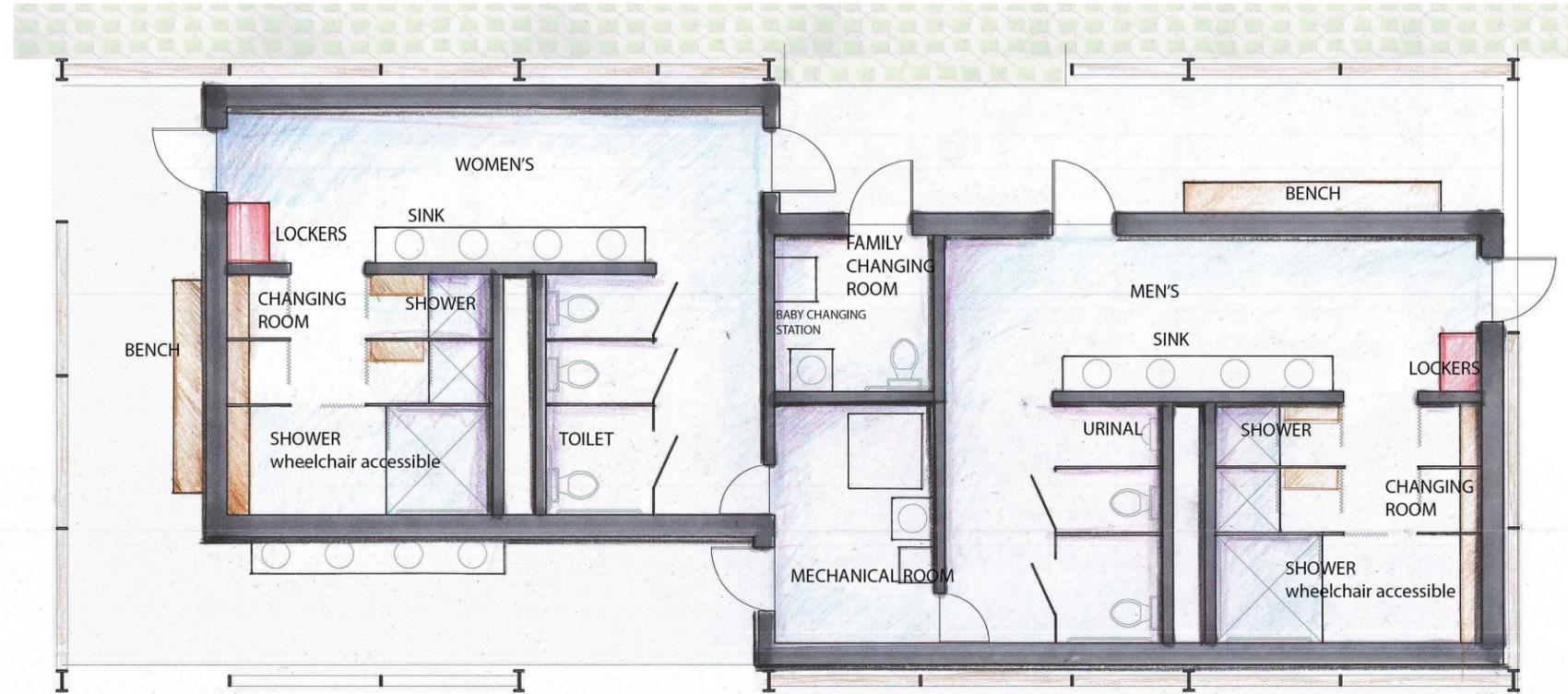
## RESTROOMS FINAL CONCEPT

The restrooms and showers are located opposite to the lower part of the main building. Main entrances to the men's, women's, and family changing room are on the side facing the street and other buildings. In addition, there are two entrances at each side of the building, making it easier to access the restrooms from the campground side. The layout of the restrooms and showers is efficient but still spacious, especially with the clerestory windows bringing natural sunlight. The entire building is ADA accessible.

In the final design, the core part of the building is no longer symmetrical: the women's bathroom is offset six feet from the men's bathroom. This creates transitional spaces between the inside and outside of the building, both in front and in the back.

The rectangular wooden screen is still used as a building envelope but extends outward in areas to strengthen and define the transitional space. These transitional spaces include benches and basins for washing dishes or equipment.

**RESTROOMS FINAL CONCEPT**



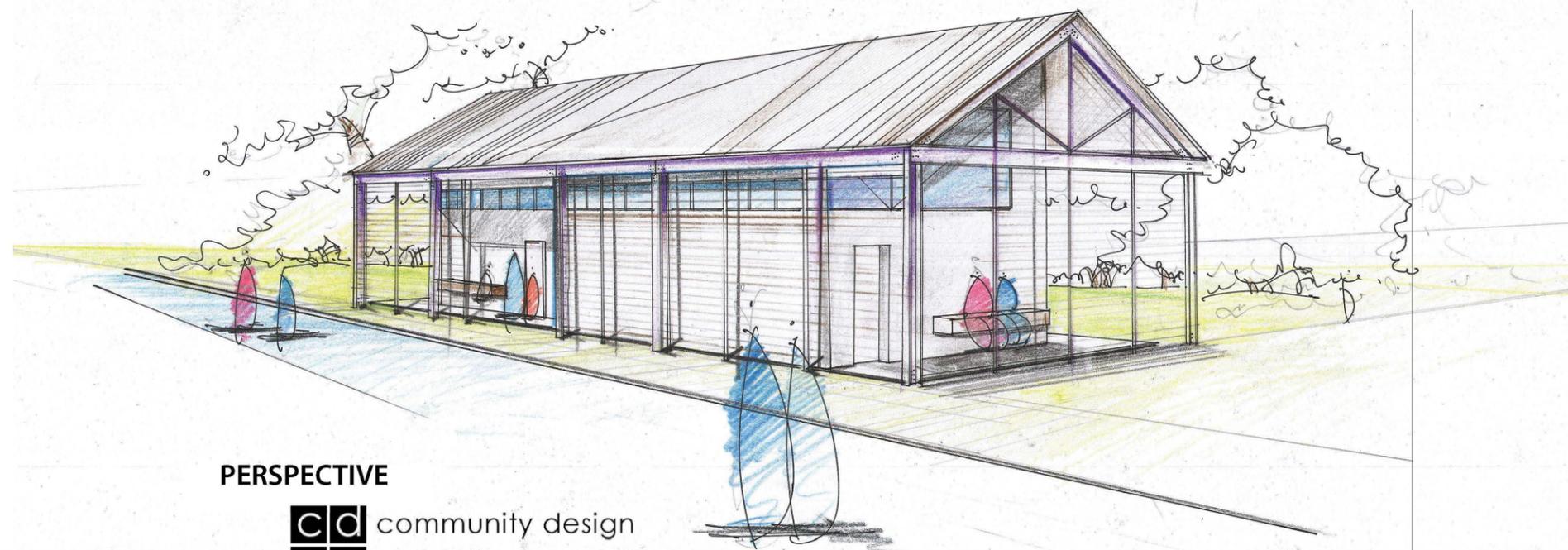
**PLAN**



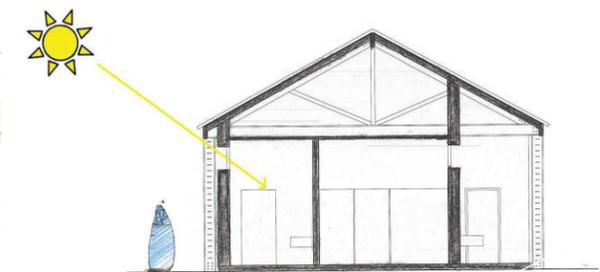
**OUTSIDE SITING REFERENCE**



**WOOD SCREEN REFERENCE**



**PERSPECTIVE**



**SECTION**

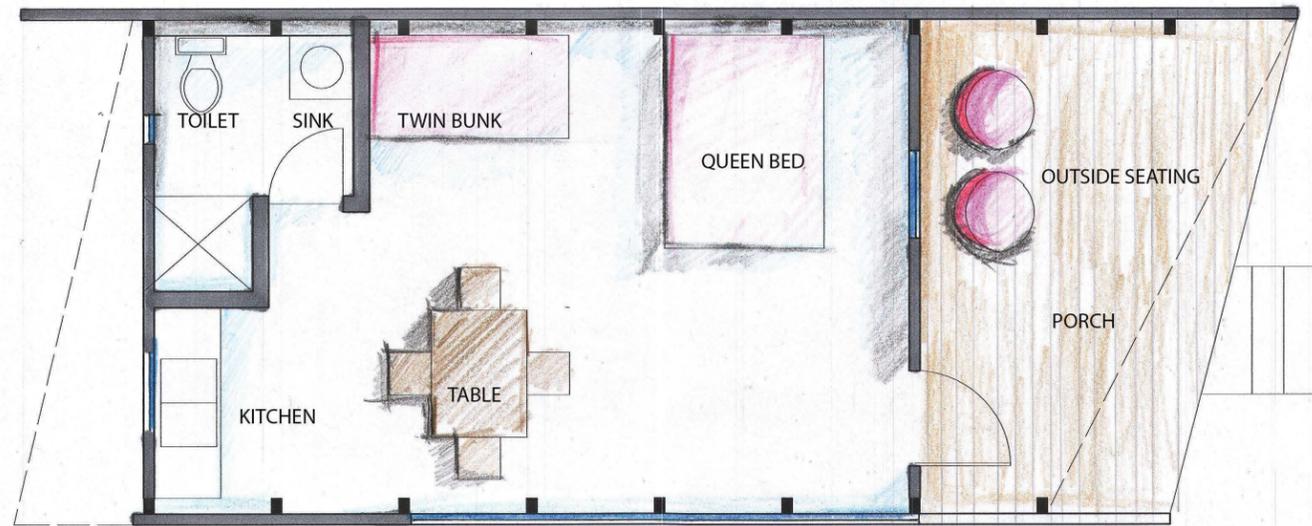
## CABINS FINAL CONCEPT

In the preliminary design meeting, participants agreed to keep both cabin types. The main change to the cabins was in the second, more economic type (Plan B). In this cabin, closets are used to divide rooms within the cabin and allow for more privacy and flexibility for cabin users. This cabin still contains two twin bunk beds, a closet, and a table and chairs. Ideally this cabin is designed for people who come with friends. In this scheme, there is no private bathroom.

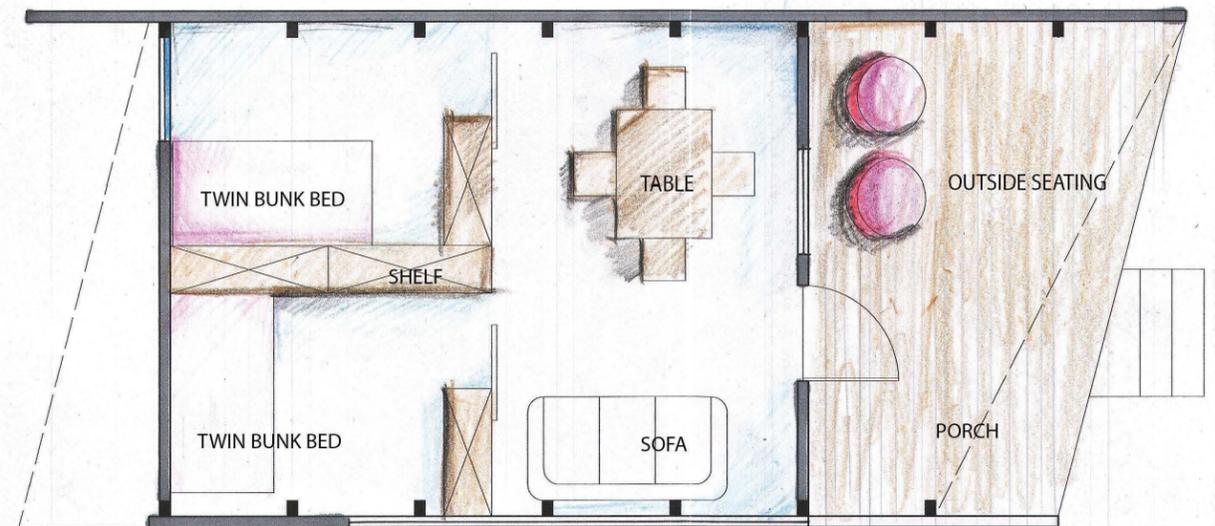
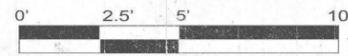
The other type (Plan A), mainly for family use, is more spacious, containing its own bathroom and a small kitchen. It offers one queen size bed and one twin bunk bed.

Both types of cabins use light timber structure and wood veneer, which is easy and affordable to build. In addition, similar to the wood screen on the main buildings and restroom/showers, the material choice ensures the cabins maintain a natural aesthetic.

The two cabin types have the same style, form, and material. By keeping the construction methods similar, the process could be more efficient and economic.



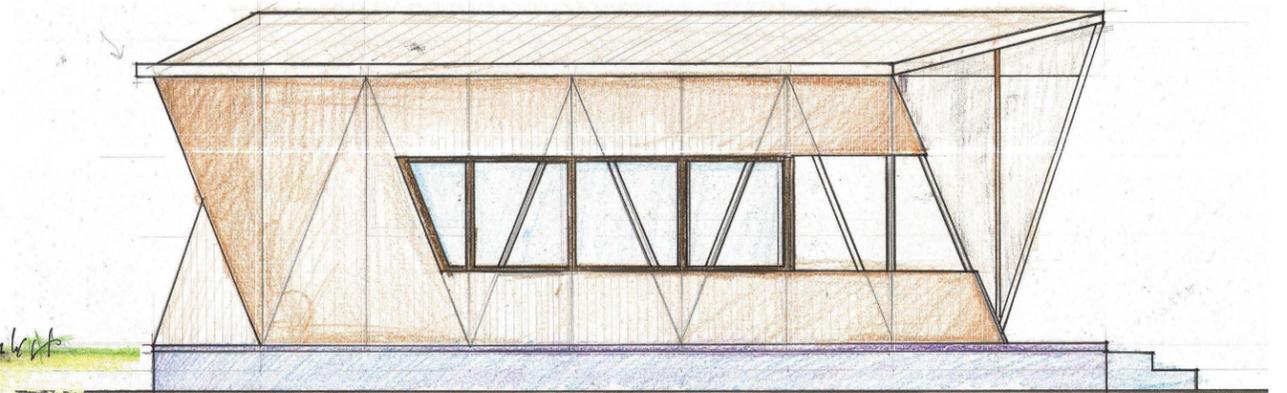
**PLAN A**



**PLAN B**



**PERSPECTIVE**



**ELEVATION**

## BALL PARK FINAL CONCEPT

During the presentation of the preliminary concept alternatives, the CDAC team gathered comments from stakeholders and community members. The team then revised and combined the concepts into one final conceptual master plan. The following drawings are the result of that collaboration.

In the final master plan, the play area is separated into two age specific play zones: two to five years and five to twelve years with a third space that provides shaded seating. Within the two to five year old play area are grassed berms and colorized asphalt representing the Clinch River. This configuration would resemble Cleveland's location along the Clinch, giving children an educational opportunity to learn the geography of their Town. (Refer to the playground perspective on page 55)

The fitness trail, with stations, completes a tree-lined upper loop allowing users the ability to have a balanced exercise routine. The trail could be constructed of rubberized asphalt creating a "cushioned" running surface. The concept maintains a lower trail connecting the bird sanctuary to the access point and beyond to downtown. The fishing dock would be located away from the access point to allow for more privacy. Farther along the lower trail is grass seating and an open lawn space for event tents. Keeping this space flexible would allow for a multitude of activities to occur along the river.

It was determined by the community to keep the current stage location as to allow for maximum use of the open lawn space during events. Handicap parking along the access drive, adjacent to the access point, and at the recreation center was desired. The design team also proposed two handicap accessible sidewalks connecting the parking lot of the recreational center to each of the building's exits.

A planting plan was developed for the ball park. Species were selected for their ability to withstand flooding and alkaline soils and for their seasonal interest. Ginkgo and dawn redwood provide both a visual and physical barrier between the park and Ivy Ridge Road, while large canopy trees, such as London planetree and honeylocust, provide shade along the fitness trail. Information on soil tests for this property is available in the appendix.

The final conceptual design was received well by the community. The following drawings illustrate the design in more graphic detail.

**BALL PARK FINAL CONCEPT**



TRAIL



EARTH SEATING



BIRD SANCTUARY



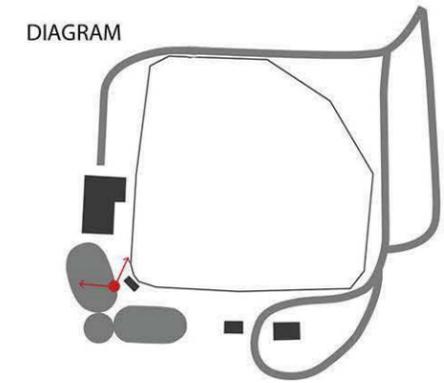
TRAIL LIGHTING



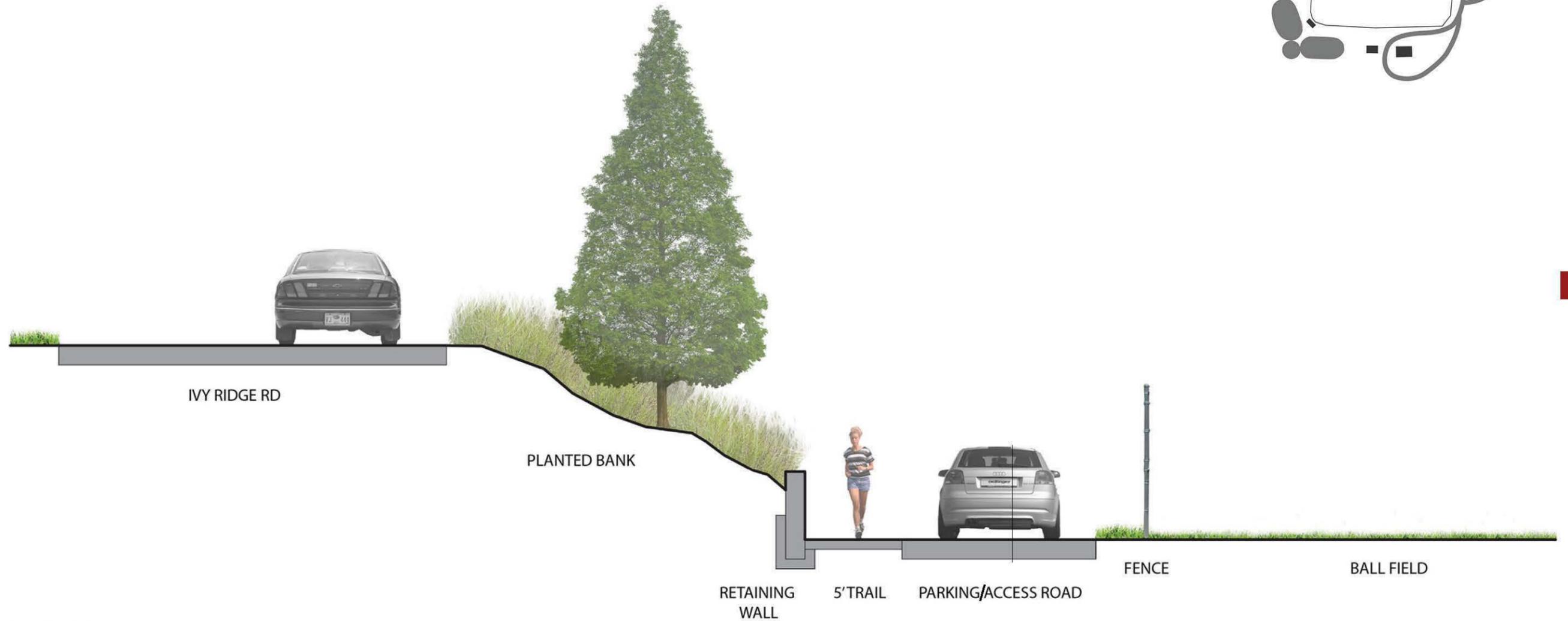
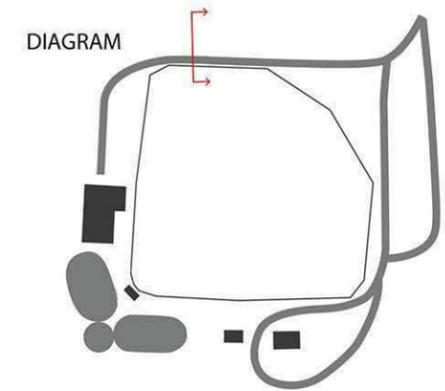
BENCH



**PLAYGROUND**



**BALL PARK FINAL CONCEPT**



TRAIL SECTION

**BALL PARK FINAL CONCEPT**

**Planting Plan**



- (7) Dawn Redwood  
*Metasequoia glyptostroboides*
- (12) London Planetree  
*Platanus x acerifolia*
- (12) Honey Locust  
*Gleditsia tricanthos var. inermis*
- (7) Sweet Gum  
*Liquidambar styraciflua 'Rotundiloba'*
- (8) Tulip Poplar  
*Liriodendron tulipifera*
- (1) Burr Oak  
*Quercus macrocarpa*
- (7) Ginkgo  
*Ginkgo biloba*
- (2) Kentucky Coffeetree  
*Gymnocladus dioicus*
- (2) American Linden  
*Tilia americana*
- (4) Littleleaf Linden  
*Tilia cordata*
- (1) American Yellowwood  
*Cladrastis lutea*
- (1) River Birch  
*Betula nigra*
- (1) Colorado Blue Spruce  
*Picea pungens*
- (1) Washington Hawthorn  
*Crataegus viridis 'Winter King'*



## STAGE FINAL CONCEPT

In the preliminary design meeting, the community selected the original stage location to create a new stage, which takes advantage of the beautiful mountain scenery.

At this meeting, the idea of shooting fireworks from the roof was mentioned. After researching this possibility, we were strongly discouraged from incorporating the use of fireworks into our stage design.

After reviewing the preliminary design concepts for the stage, it was decided to attempt a new design with a similar aesthetic to the picnic shelter.

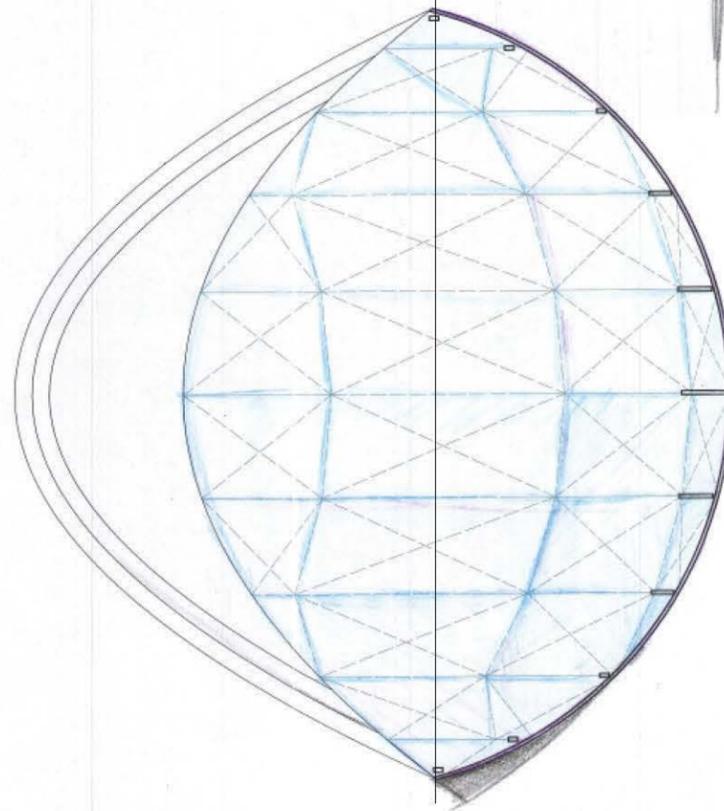
The seashell shape is simple and pure in form. This geometry, relating to a simple circle, contrasts against the organic undulating form of the mountains, giving the architecture a powerful presence. In addition, the round shape helps to amplify the sound and improves the sound quality.

The shell covers most of the platform: to protect equipment from water and to make it usable on rainy days.

The new platform incorporates the concrete platform of the former stage. The new platform extends beyond the shell cover and steps down to reach the audience. This friendly gesture offers a better connection between the musicians and their audience.



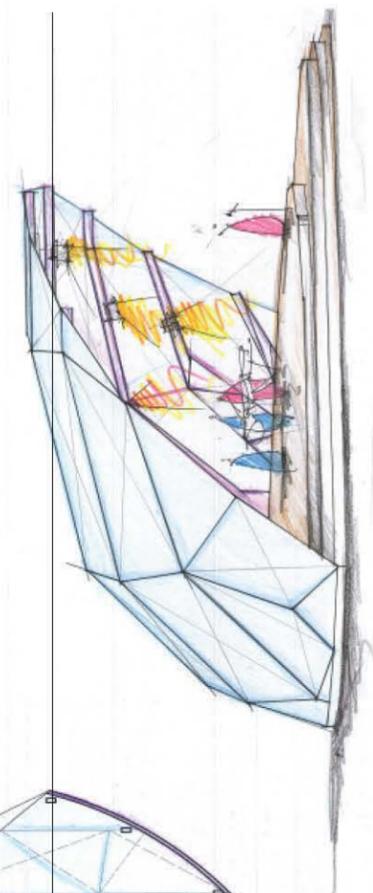
**FRONT PERSPECTIVE**



**PLAN**



**SIDE PERSPECTIVE**

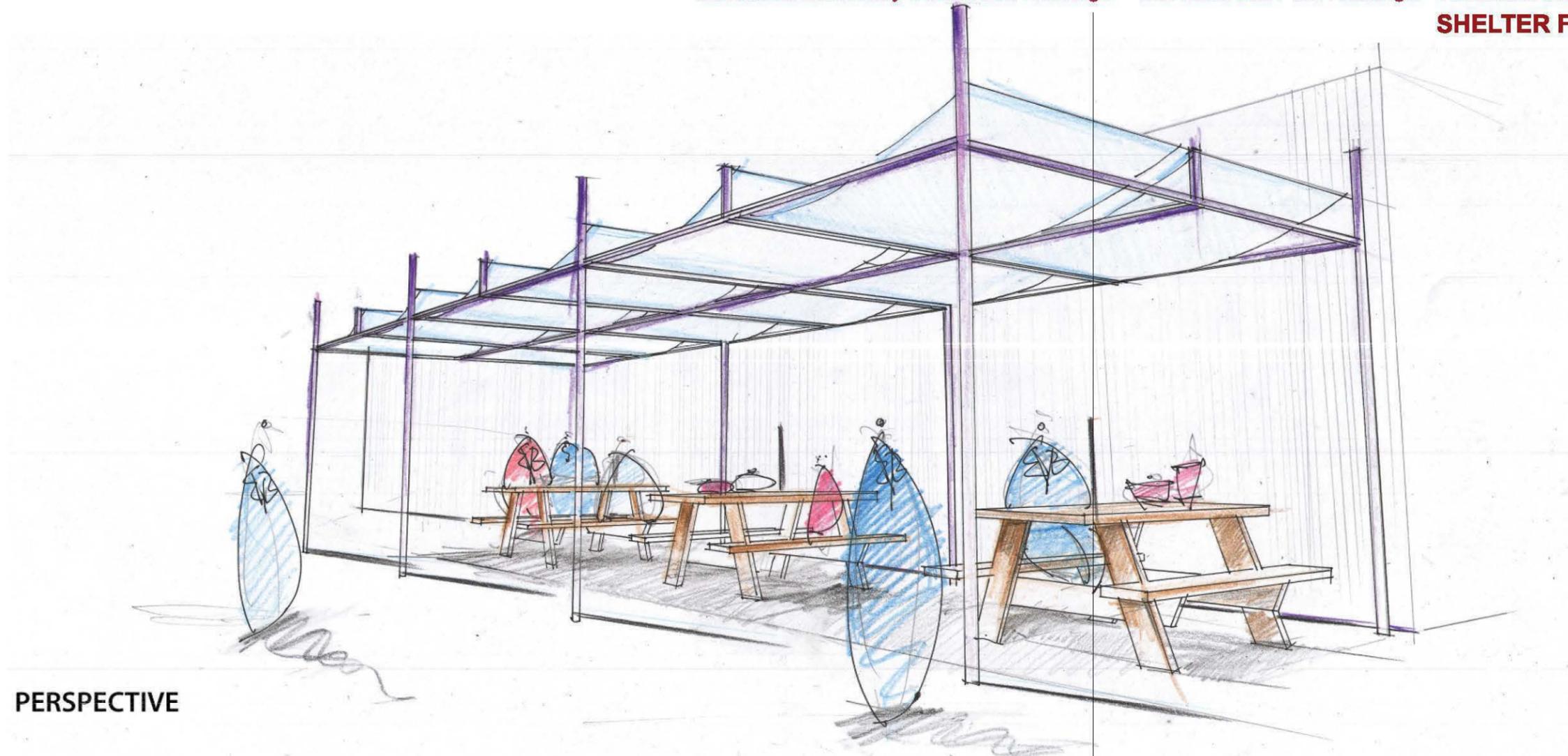


## **SHELTER FINAL CONCEPT**

In the preliminary design meeting, the team presented two designs for an overhang to create a picnic shelter area next to the community recreation center. The community liked Design B which uses tension fabric that can be changed and removed easily. They also preferred a design that only covered the picnic area and didn't extend all the way to the ball park fence, so the two options were combined.

In the final version, normal fabric is employed instead of tension fabric. This is easier for maintaining and more convenient for taking down and changing. The fabric hangs loose on the steel skeleton, which is higher on the south side to provide shade from the sun. The canopy should be sloped away from the building to allow for positive drainage during an event of rain. The ground under the canopy and picnic tables would also need to be sloped away from the building. Pervious ground materials should be considered in this area to allow for proper drainage.

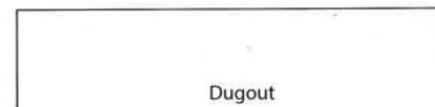
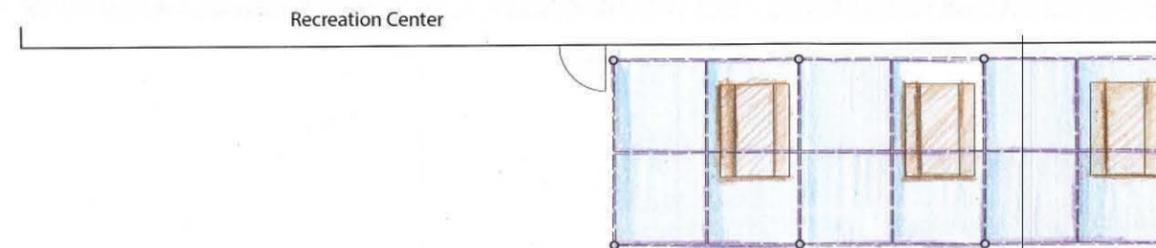
Since the site is very narrow, steel is used in the design to make the structure as light as possible.



**PERSPECTIVE**



**PLAN**



## WATERFALL FINAL CONCEPT

After receiving comments and feedback from the community and stakeholder groups, a more refined conceptual plan was developed for the waterfall. (Refer to the following page for plan) Vehicular pull-offs are located along the drive into the site. In addition, a parking area containing five spaces plus one additional space for a turn-around is located. Through feedback, it was determined that no vehicles should go beyond this point so that the area closest to the waterfall would remain natural and undisturbed.

A trailhead was not located due to lack of information. The Barrens is a globally significant natural area with a rare community type known as dolomite barrens. An environmental study would have to be conducted before locating a trail through the area.

**WATERFALL FINAL CONCEPT**



## ACCESS POINT CONCEPTS

In addition to developing the Cleveland ball park and campground concepts for the Town of Cleveland, access points were developed for the Clinch River Valley Initiative as pilot sites for the Clinch River Access Point Design Guidelines. The following pages outline these concepts.

### *Ball Park*

The existing ball park in Cleveland is an ideal location for an access point. Current amenities available at the park are restrooms, a picnic shelter, parking, and a drop-off with vehicular circulation that will accommodate a full circle turning radius for one truck/van and boat trailer. Locating an access point in an existing recreational area minimizes construction and the damage to sensitive environmental areas. At this particular site, the mowed grass along the riverbank/riparian corridor should be replaced with plant material that is found in the local riparian corridors to restore habitat and minimize runoff and erosion.

Directional signage is added along the access road into the park to direct users of circulation patterns. An educational kiosk with information about the Clinch River and the ecology of the site is located next to the trail and launch area. All signage in the area is to maintain a consistency of materials and character. In addition to the five parking spaces located at the picnic shelter, additional handicap accessible parking is added in two locations: two truck/boat spaces are located closer to the launch area and twelve additional car parking spaces further along the access road. These parking areas will be connected with a hard surfaced fitness trail that runs through the park. Parking surface material should be pervious such as gravel, stonedust, or permeable pavers to minimize runoff and protect the waterway.

Additional amenities added at the access point are picnic tables and trashcans. These furnishings should be flood proof. As shown in the images on the following pages, we recommend using furnishings that are permanently secured to prevent loss or damage during a flood event.

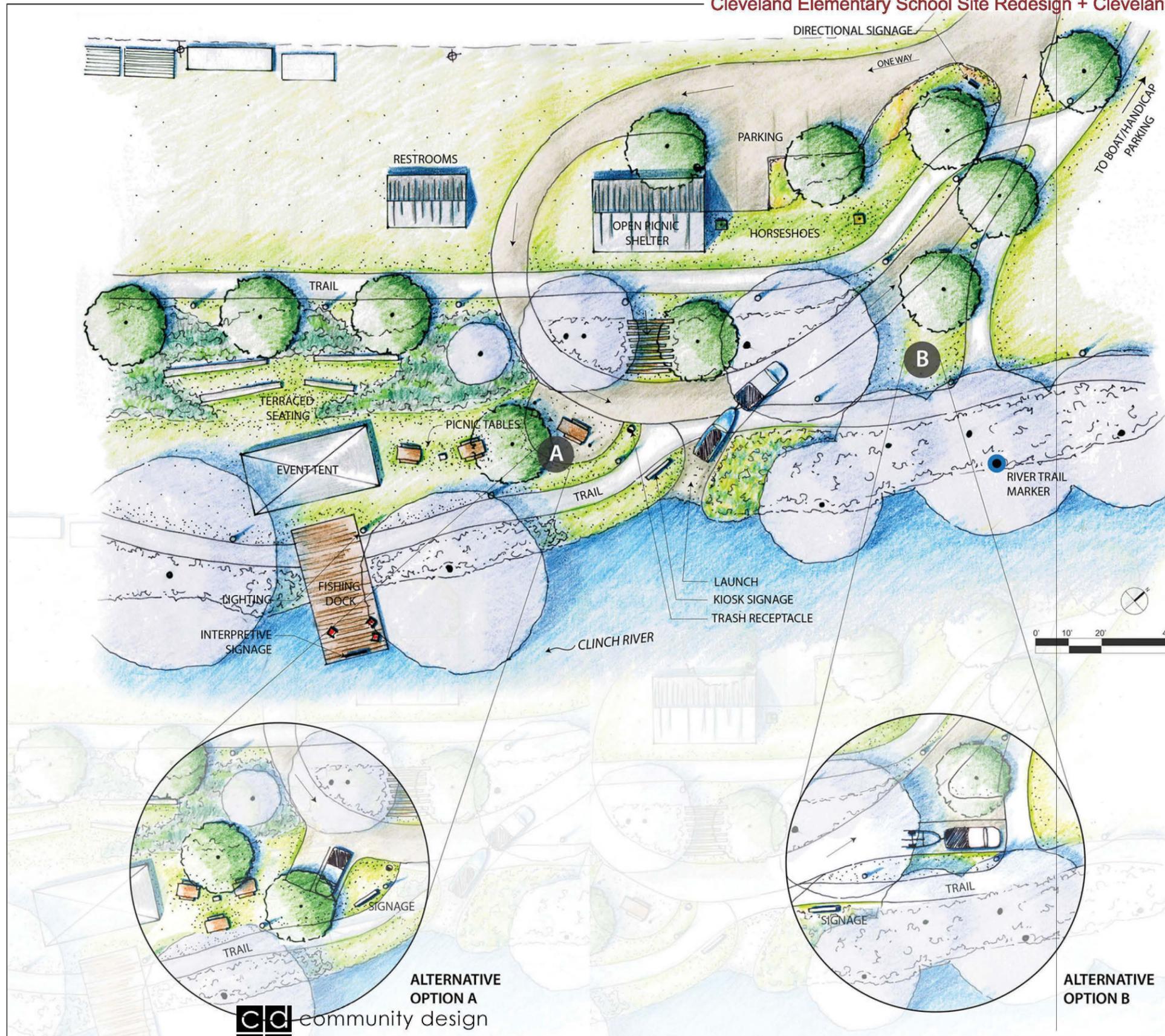
This particular launch is proposed to accommodate a kayak/canoe trailer. The ramp is to be a minimum of twelve foot wide with a slope of 12-15%. The ramp should extend into the turning and staging area enough for the trailer wheels to clear the sloped section of the ramp before the towing vehicle's pulling wheels leave the ramp. Materials are to be concrete plank to allow for permeability and ease of construction/maintenance.

## **ACCESS POINT CONCEPTS**

The following pages include the preliminary access point concept for the Cleveland Ball Park site, the final access point concept, and a perspective of the access point with examples of signage and site elements.

**PRELIMINARY ACCESS POINT CONCEPT**

Ball Park Site



SEATING



GRAVEL LAUNCH



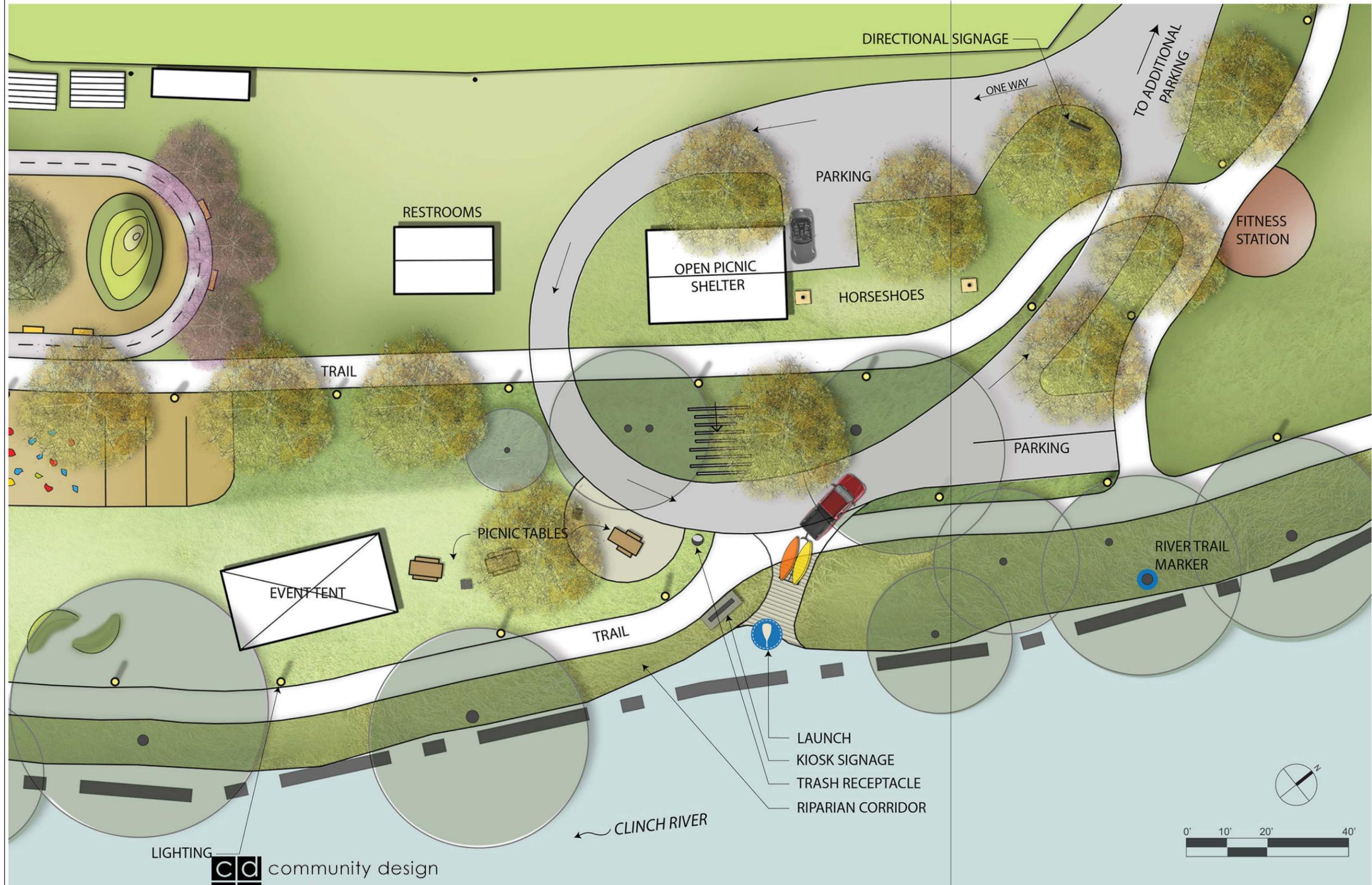
CONCRETE PLANK LAUNCH

**ACCESS POINT GUIDELINES TO INCLUDE:**

- ACCESS LAUNCH
- PARKING
- AMENITIES
- CHARACTER
- SIGNAGE
- MATERIALS
- RIPARIAN BUFFERS & EROSION
- MAINTENANCE
- HOURS OF OPERATION
- ADA ACCESSIBILITY

**FINAL ACCESS POINT CONCEPT**

Ball Park Site



**FINAL ACCESS POINT CONCEPT**

Ball Park Site



PERSPECTIVE OF TRAIL & ACCESS POINT

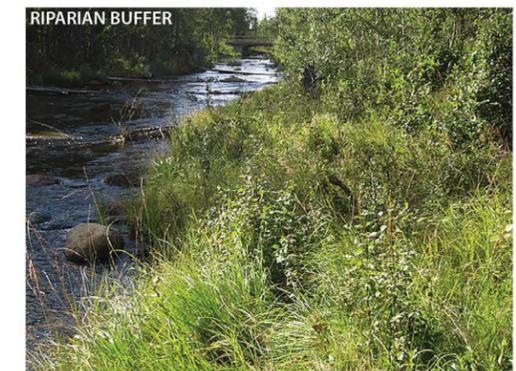


TRASH

PICNIC TABLE



FURNISHINGS



RIPARIAN BUFFER



CONCRETE PLANK LAUNCH



GRAVEL LAUNCH

## ACCESS POINT CONCEPTS

### *Campground*

The proposed campground on the former Cleveland Elementary School site is proposed to support outdoor recreation on the Clinch River. The site currently has no amenities that allow access to the river and the construction of a new access point at this site would be restricted by several environmental constraints. A river access point at the campground must be located in the riparian corridor. Special measures need to be taken while designing and constructing the access point to reduce the ecological impact it will have in such an environmentally sensitive area.

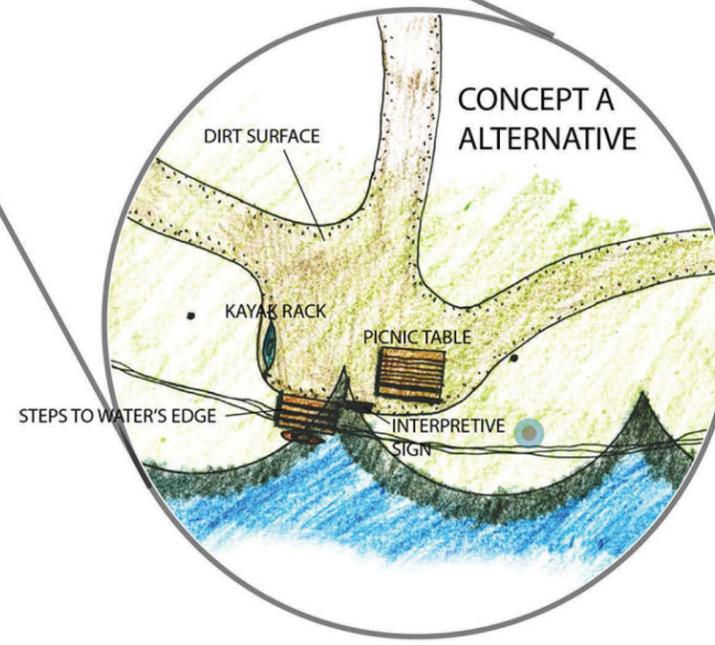
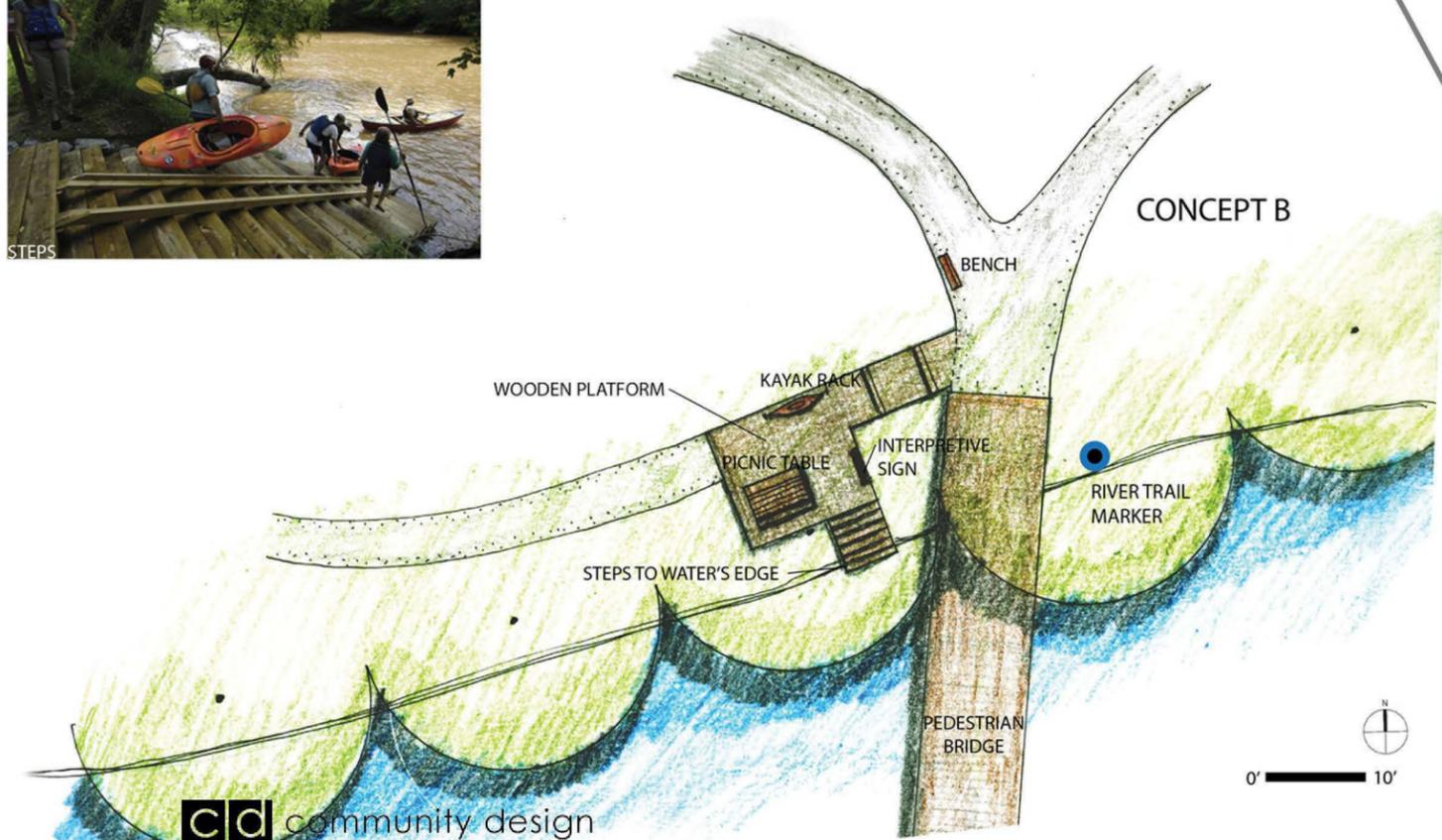
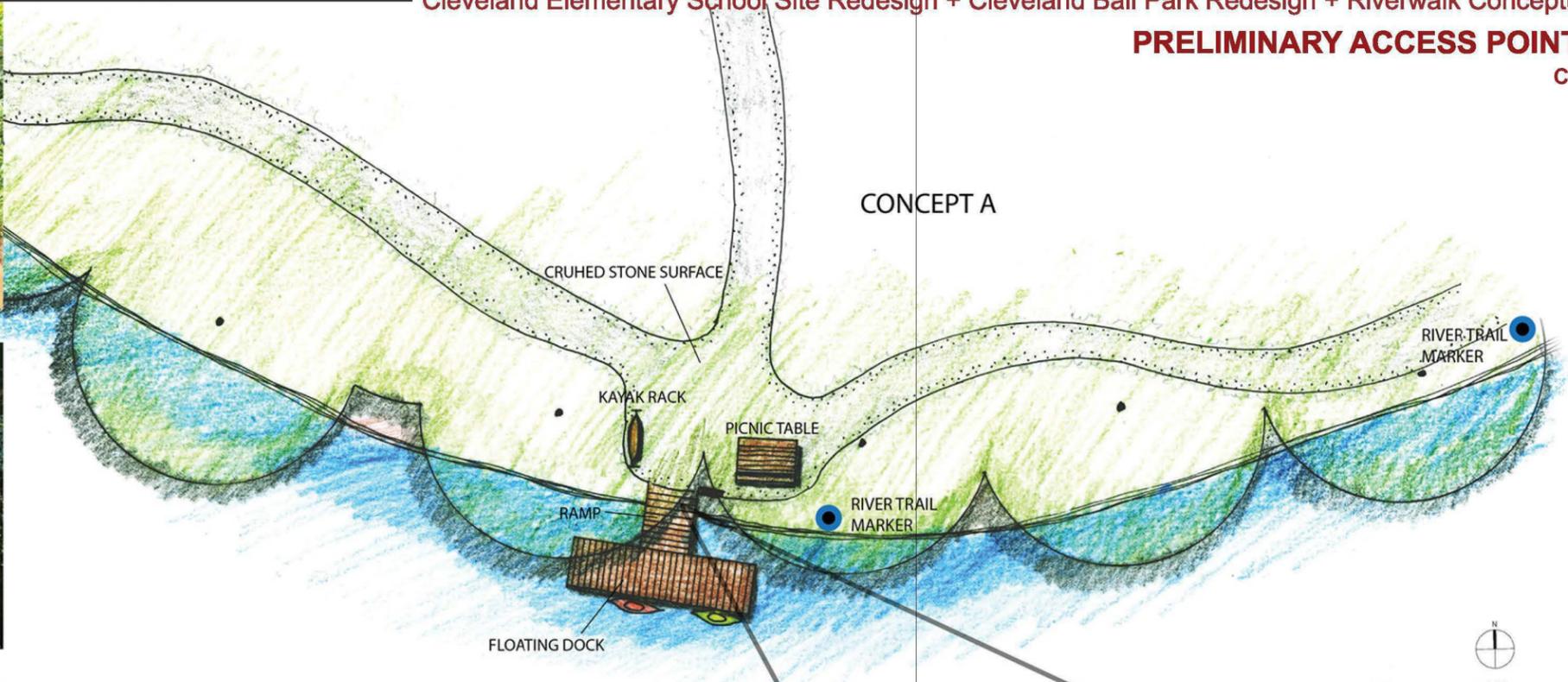
The river access point at the campground site is designed with a minimal approach that will both reduce the size of its footprint on the riparian corridor and reduce the amount of grading needed during construction. Rather than cutting a ramp into the river's bank, this access point will be built as a wooden platform and minimum six foot wide staircase leading down to the water. This wooden structure is raised a few inches off of the ground so that it can cross over uneven ground and have less impact on the soil beneath it than an asphalt path would. Having a slightly raised path in the riparian corridor also allows small critters and insets to pass beneath the walkway without potentially being stepped on by portaging kayakers.

A roughly six foot change in grade marks the floodway that runs parallel to the Clinch River. This is a major obstacle that prevents vehicles from entering the riparian corridor and reaching the river's edge. Canoeists and kayakers must portage from the river access point to either their campsite or public parking further into the campground site.

This minimal access point design will include few amenities compared to other access points along the Clinch. It will include wooden stairs to access the water's edge, a picnic table, and a rack to hold canoes and kayaks. Directional signage is located along the access road in the campground directing people to a path leading to the access point. An educational kiosk is located next to the entrance of the path and will include information about the Clinch River. Two river markers will be located on trees at the river's edge. These markers function as signals that help canoeists find the access point on the river. One marker is located 100' up-stream from the access point to notify users that it is coming up on the right and a second marker is located at the actual access point.

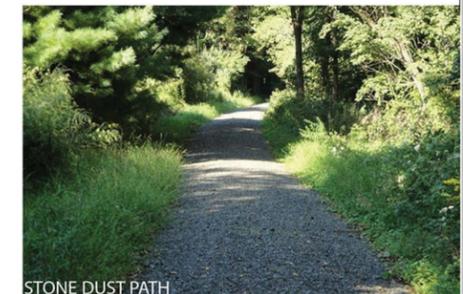
**PRELIMINARY ACCESS POINT CONCEPT**

Campground Site



**FINAL ACCESS POINT CONCEPT**

Campground Site



**FINAL ACCESS POINT CONCEPT**

Campground Site



**PERSPECTIVE OF ACCESS POINT**

## SIGNAGE

The Clinch River Valley Initiative (CRVI) is working extensively with the marketing firm Arnett Muldrow to create branding material for the Clinch River Valley. This brand will promote the Clinch River Valley as a regional tourist destination in Southwest Virginia. The signage along the Clinch River and at each access point should be consistent with the brand created by the CRVI and Arnett Muldrow team. Signage along the Clinch should maintain a consistency of materials and character.

A pallet of materials to be used in signage was chosen as a result of a study identifying the primary building materials found along the Clinch. Railroads and brick buildings, found in downtown areas, were the main identifying elements. The result of the study was a materials pallet of wood and metal.

Four different types of signage were determined as being needed in different scenarios along the Clinch River area: directional signage, informational kiosks, interpretive signage, and river markers. Using the same pallet of materials for all four types of signage provides a set of signage that creates a sense of continuity along the entire Clinch and supports the Arnett Muldrow branding effort.

The following pages include examples of preliminary and final conceptual designs for signage.

## SIGNAGE

### *Directional Preliminary Signage Concepts*

The directional sign developed by Arnett Muldrow for the Clinch River communities was adopted into the access point signage; however, its detailed metal post was replaced with a wooden and metal alternative that fits better outside town. The directional signage also adopts the language of symbols developed by Arnett Muldrow for representing various types of destinations.



Arnett Muldrow



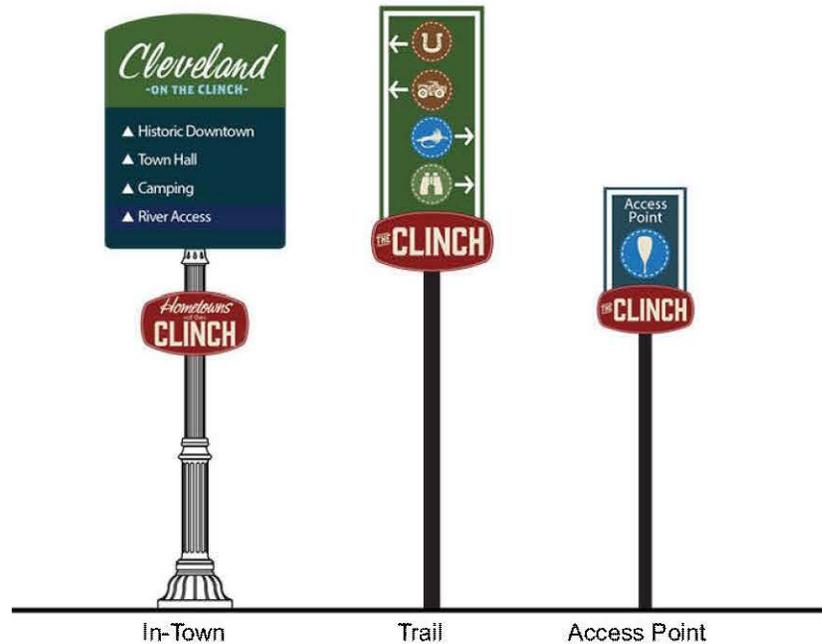
Wood & Steel Initial Concepts

## SIGNAGE

### Directional Final Signage Concepts



Outside of Town



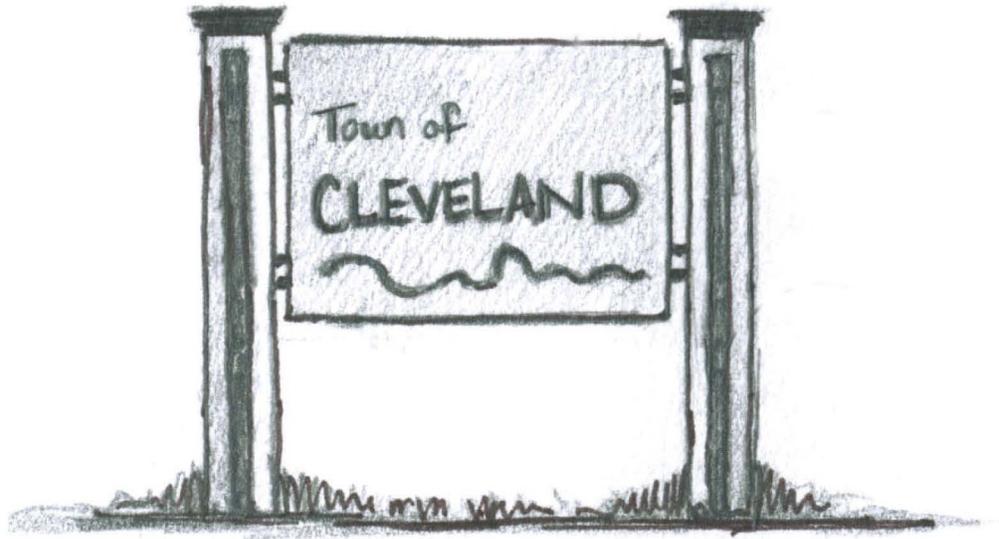
In-Town

Trail

Access Point

## SIGNAGE

### Welcome Sign Concept



Preliminary Sketch



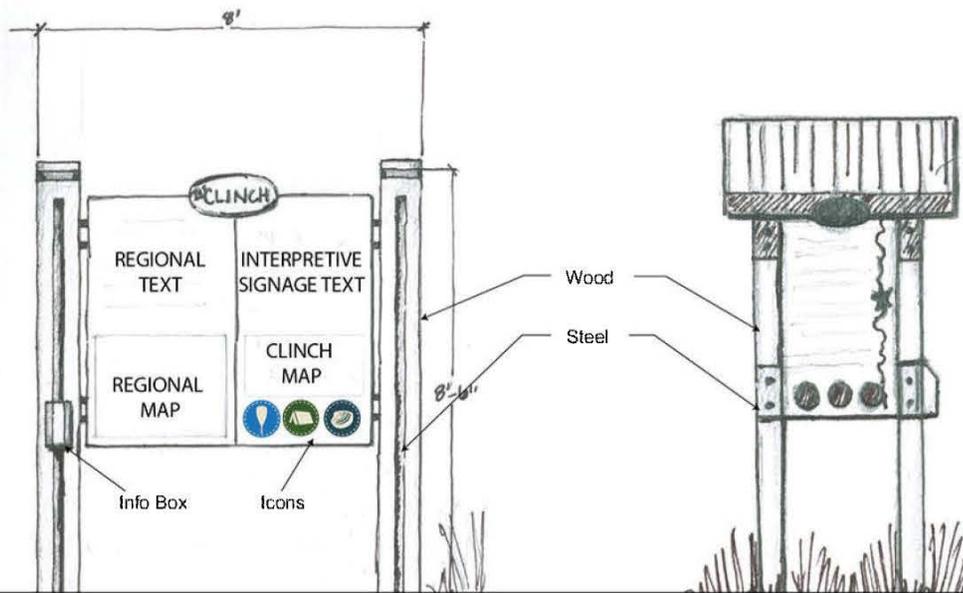
Final Design



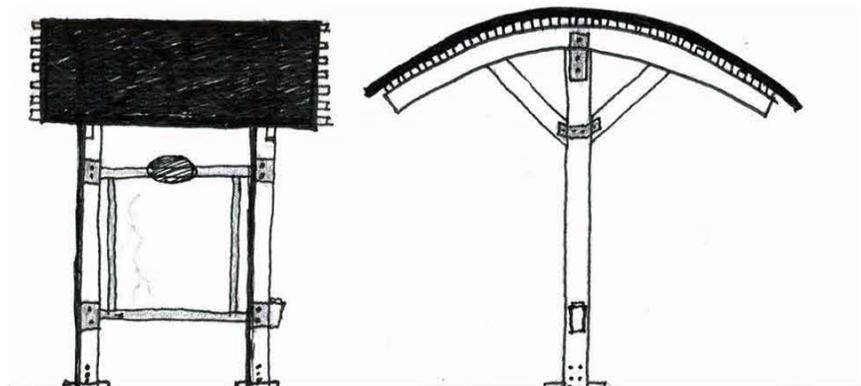
## SIGNAGE

### *Informational Kiosks Preliminary Concepts*

Three variants of the informational kiosk were designed: double-sided, arc-roofed, and angle-roofed. Each design achieves the desired degree of consistency within the set, but by providing three options, information can be displayed in a number of ways and at different sizes. In the case of the kiosks, consistency is created not only with material, symbols, and color but also with the profile of the Clinch River which is located on each kiosk. This diagram of the Clinch acts as a symbol unifying the kiosks but also provides the opportunity to include a "you are here" feature.



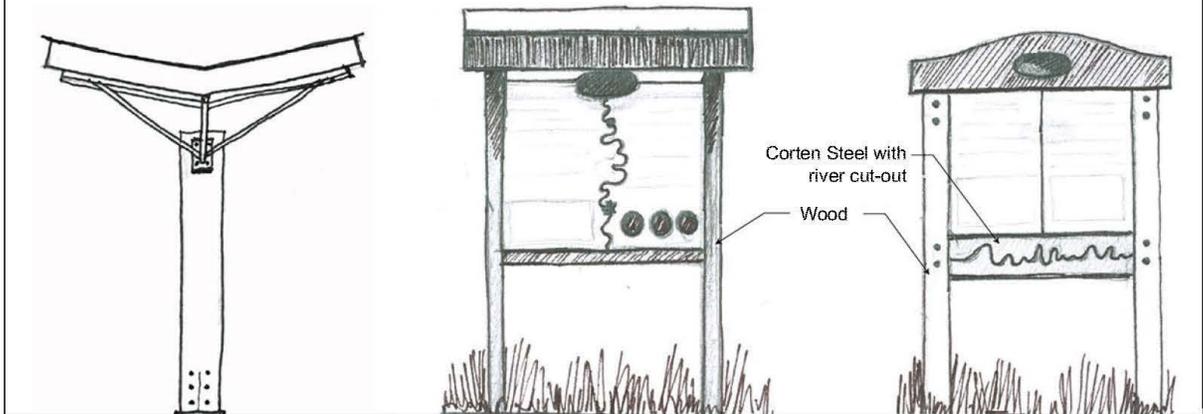
Initial Double-sided Kiosk Concepts



Initial Arc Roof Kiosk Concepts

## SIGNAGE

### Informational Kiosks Preliminary Concepts



Initial Angle Roof Kiosk Concepts



Arc Roof Informational Kiosk



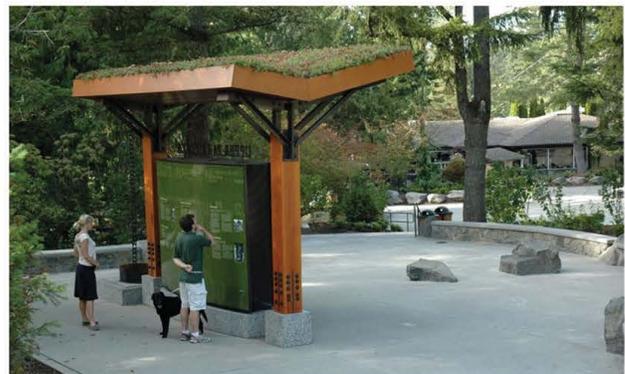
Traditional Informational Kiosk



Simple Construction Informational Kiosk



Cut Metal Informational Kiosk



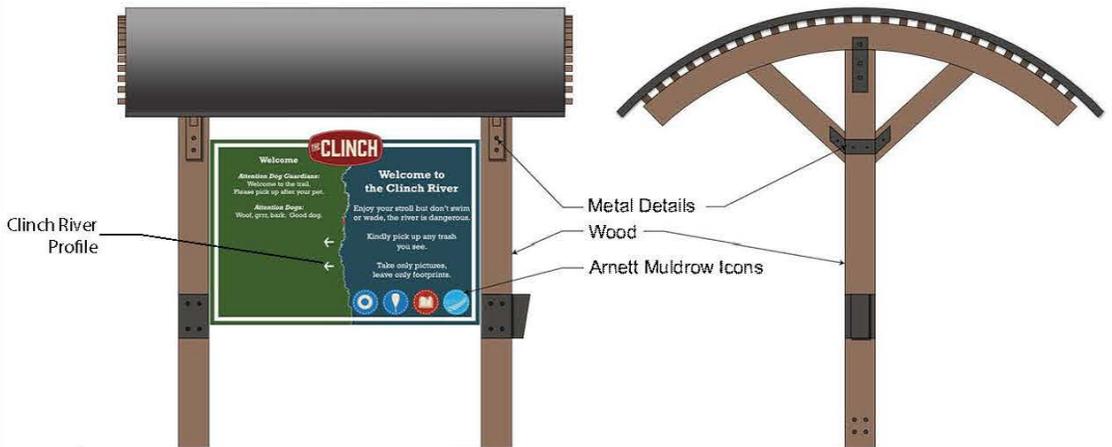
Angle Roof Informational Kiosk

## SIGNAGE

### Informational Kiosks Final Concepts



Double-Sided Kiosk



Arc Roof Kiosk

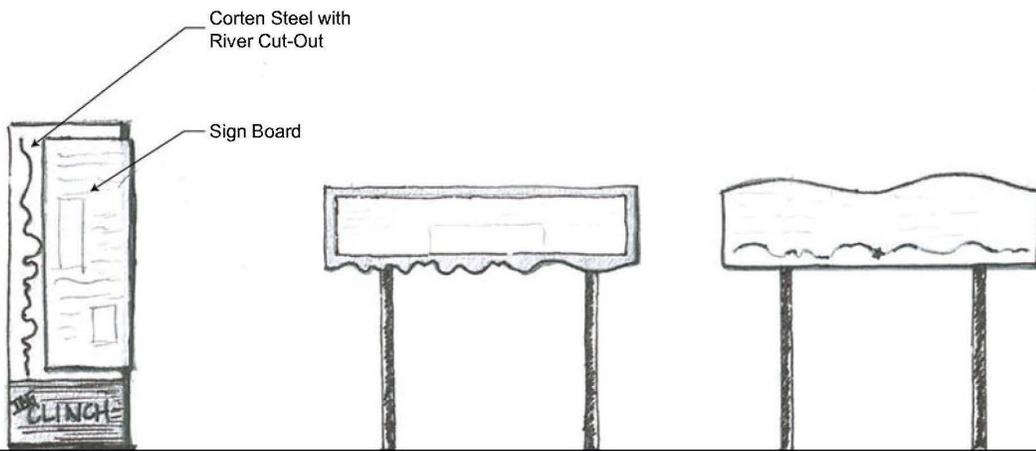


Angle Roof Kiosk

## SIGNAGE

### *Interpretive Signage Preliminary Concepts*

Interpretive signage is used as a tool to convey information where an entire kiosk is not necessary. Two variants of interpretive signage were designed with the same guiding factors as the kiosks. The two variants include a portrait and landscape option.



Corten Steel with  
Clinch River Profile

Sign Board Material



Interpretive signage attached to railing along boardwalk



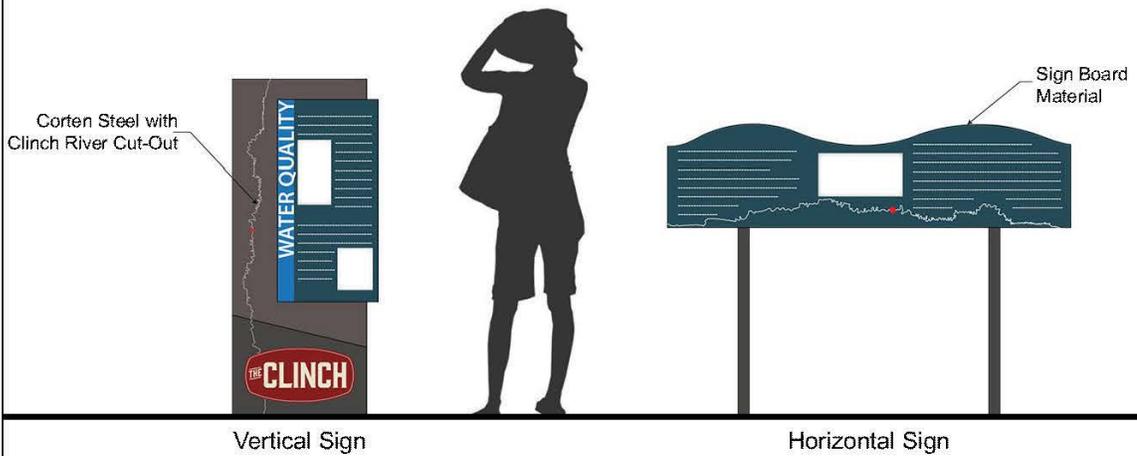
Interpretive signage, sign board material shaped to mimic the flow of water



Vertical interpretive signage, cut metal & sign board material

## SIGNAGE

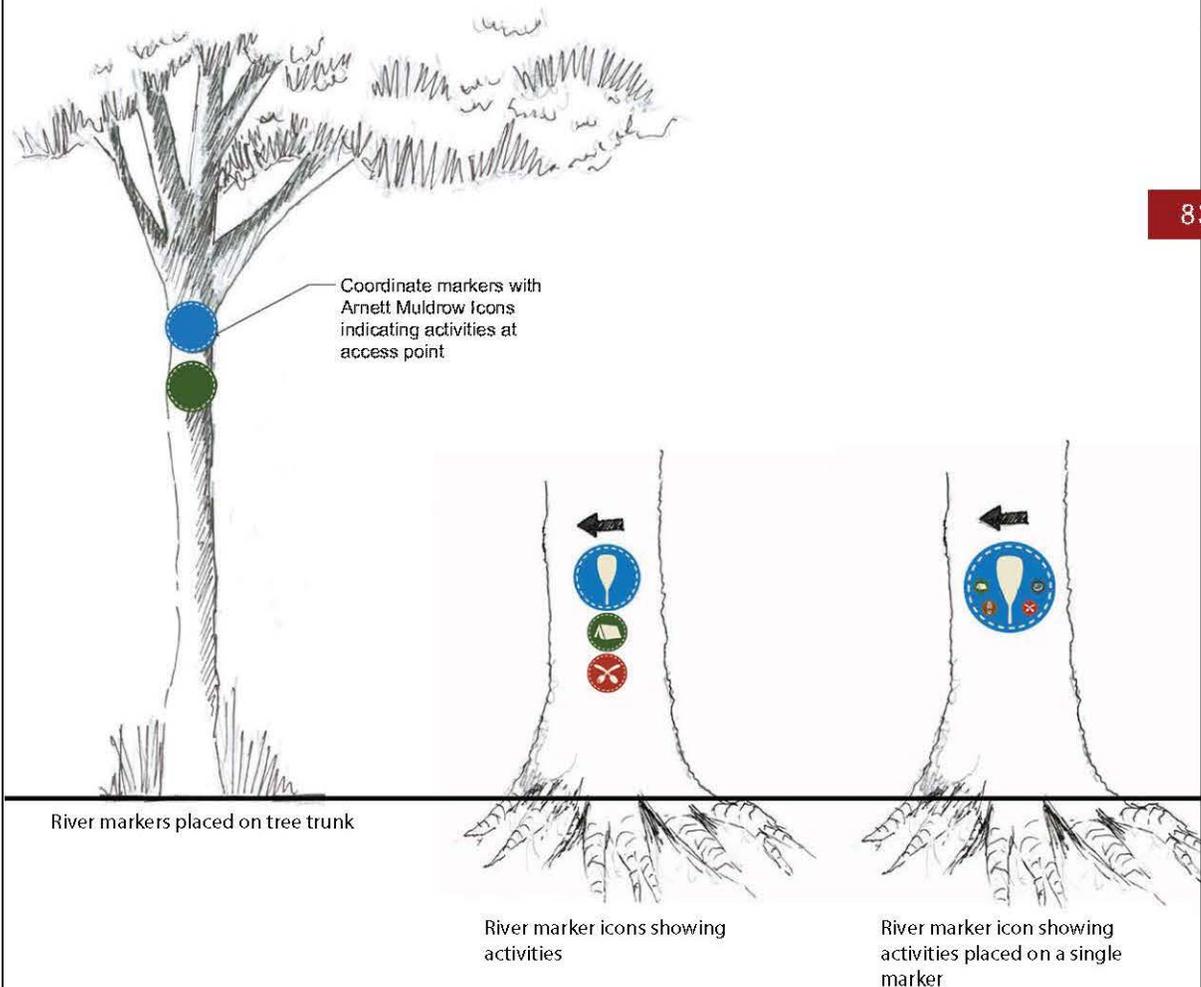
### *Interpretive Signage Final Concepts*



## SIGNAGE

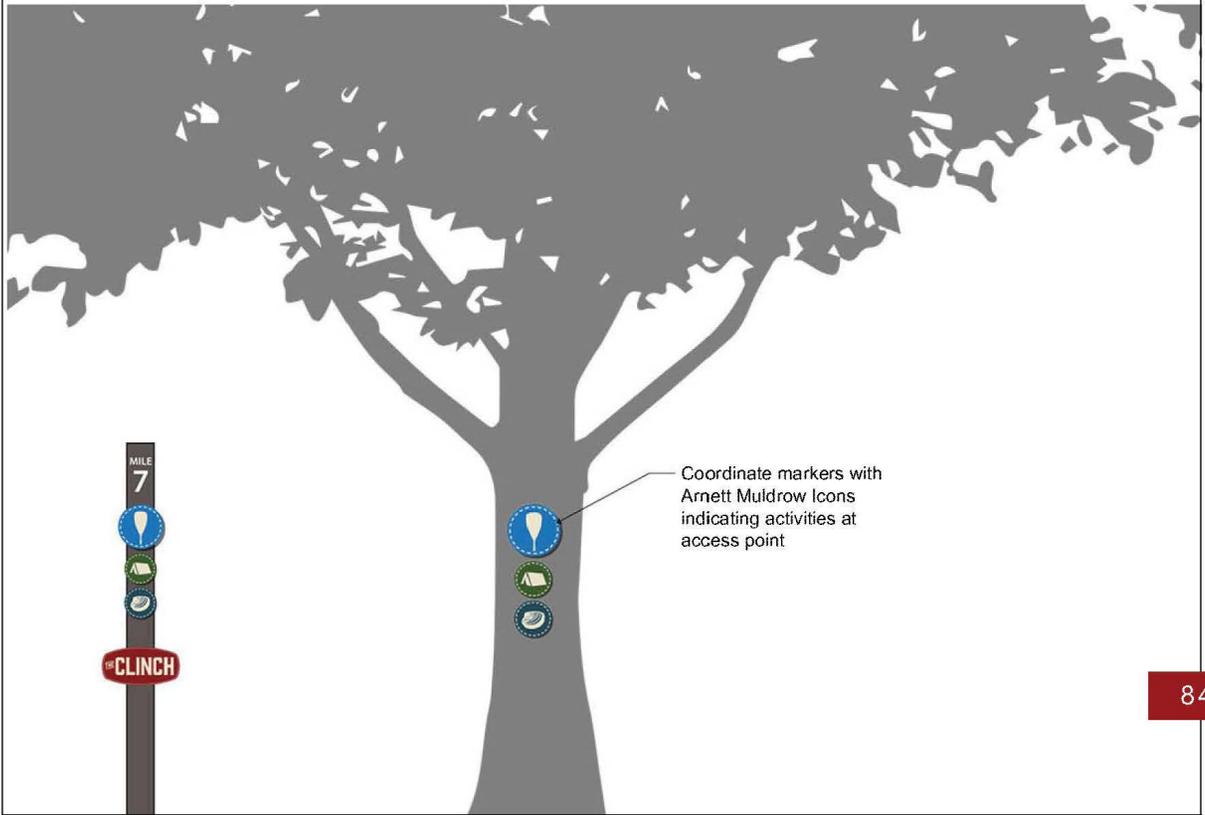
### *River Markers Preliminary Concepts*

River markers were created in response to the potential difficulty of finding an access point from the water while on an unfamiliar river. Markers using the symbols developed by Arnett Muldrow should be located at the river's edge to notify canoeists that an access point is coming up. These markers should be located at least 100 feet before the upcoming access point on trees where possible and on posts where there are not any appropriately located trees. Areas around these markers must be maintained to preserve clear views of the signs from the river. Markers should also be placed at the access point designated its location.



## SIGNAGE

### River Markers Final Concepts



Free-standing river marker with icons

River markers placed on tree trunk



Free-standing river marker



River marker visible from vegetated river bank



River marker placed on tree trunk

## CONCLUSION

The Community Design Assistance Center worked closely with the Cleveland community to upgrade the existing ball park and create a new campground for the former elementary school site. These upgrades will give Cleveland the unique opportunity to take advantage of the Clinch River's many natural resources. Connecting these project sites to downtown will also create opportunities for increased health and education and economic growth. It is our hope that this work will help the community in its next steps toward fruition.

## APPENDIX

### Online Resources:

*Restroom and shower*

[http://www.archdaily.com/387751/public-toilets-piotr-musialowski-lukasz-przybylowicz/51b9cdd1b3fc4b76c10000aa\\_public-toilets-piotr-musialowski-lukasz-przybylowicz\\_\\_dsc3987-jpg/](http://www.archdaily.com/387751/public-toilets-piotr-musialowski-lukasz-przybylowicz/51b9cdd1b3fc4b76c10000aa_public-toilets-piotr-musialowski-lukasz-przybylowicz__dsc3987-jpg/)

[http://www.archdaily.com/387751/public-toilets-piotr-musialowski-lukasz-przybylowicz/51b9cdb0b3fc4b30580000b3\\_public-toilets-piotr-musialowski-lukasz-przybylowicz\\_\\_dsc3945\\_-\\_copy-jpg/](http://www.archdaily.com/387751/public-toilets-piotr-musialowski-lukasz-przybylowicz/51b9cdb0b3fc4b30580000b3_public-toilets-piotr-musialowski-lukasz-przybylowicz__dsc3945_-_copy-jpg/)

### Reference Materials:

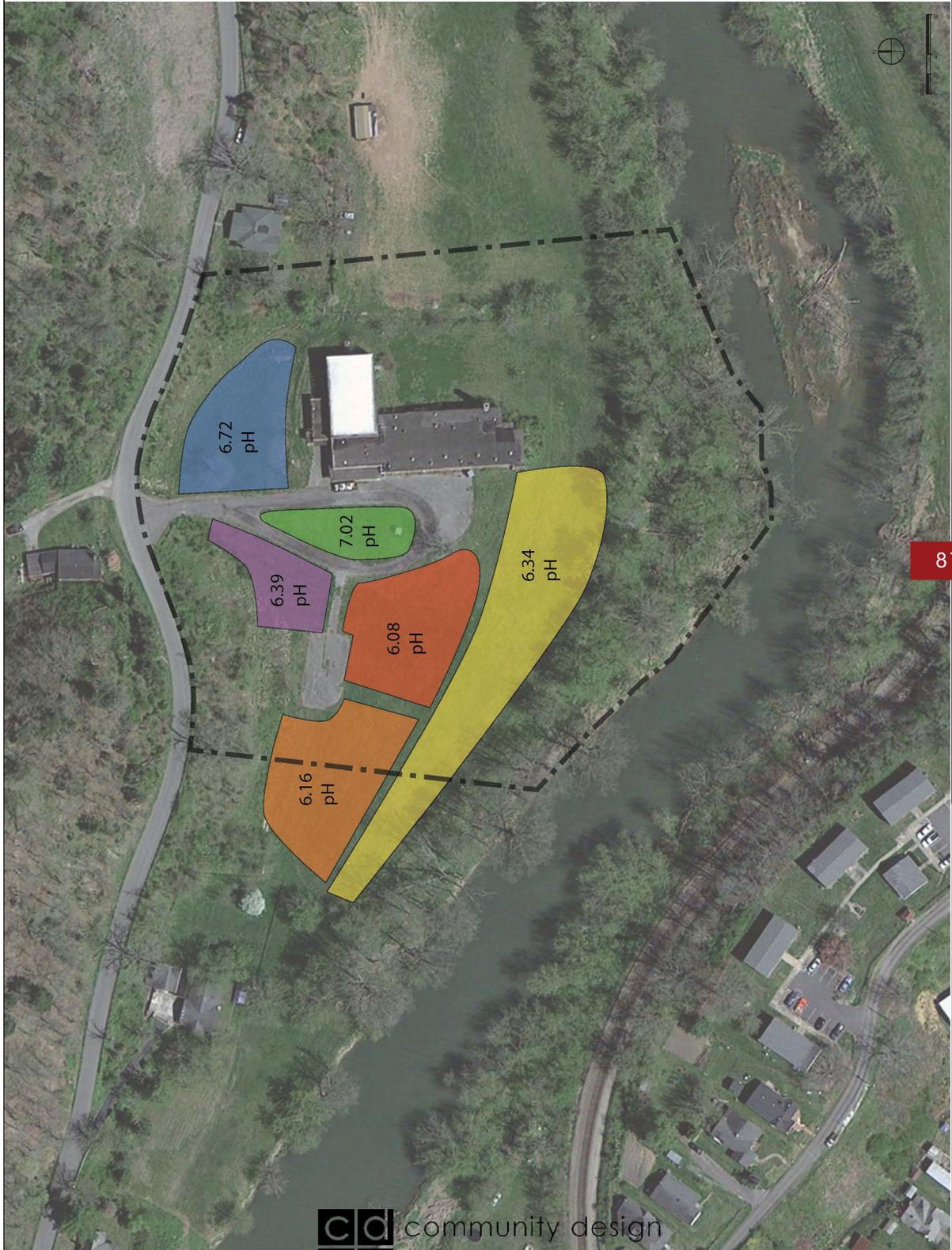
*Soil Samples: Elementary School Site*

*Soil Samples: Ball Park Site*

*Explanation of Soil Tests*

**APPENDIX**

*Soil Samples: Elementary School Site*



**APPENDIX**

Soil Samples: Ball Park Site



## APPENDIX

### Soil Test Note #1

# Virginia Cooperative Extension

PUBLICATION 452-701

## Explanation of Soil Tests

Rory Maguire, *Extension Nutrient Management Specialist, Virginia Tech*

Steve Heckendorn, *Soil Test Laboratory Manager, Virginia Tech*

The accompanying Soil Test Report (and supplemental Soil Test Notes, when provided) will help you assess your plant's need for fertilizer and lime.

The "History of Sampled Area" section restates the information you filled in on the Soil Sample Information Sheet you submitted with the soil sample.

The "Lab Test Results" section shows the relative availability of nutrients numerically and if appropriate, as a rating. The rating may be interpreted as follows: L=Low, M=Medium, H=High, VH=Very High, EH=Excessively High (soluble salt test only), DEF=Deficient, or SUFF=Sufficient, and sometimes a "+" or "-." When soils test Low, plants almost always respond to fertilizer. When soils test Medium, plants sometimes respond to fertilizer and a moderate amount of fertilizer is typically recommended to maintain fertility. When soils test High to Very High, plants usually do not respond to fertilizer. If there is no rating for a nutrient, the adequacy of that nutrient in the soil for the plant you specified has not been determined.

The following is an explanation of the symbols and abbreviation used in the report:

### Report Symbols and Abbreviations

P = phosphorus	K = potassium
Ca = calcium	Mg = magnesium
Zn = zinc	Mn = manganese
Cu = copper	Fe = iron
B = boron	SS = soluble salts
lb/A = pounds per acre	ppm = parts per million
meq = milliequivalent	g = gram
pH = acidity	Sat. = saturation
N = nitrogen	P <sub>2</sub> O <sub>5</sub> = phosphate
K <sub>2</sub> O = potash	% = percent
Est-CEC = estimated cation exchange capacity	
AG = agricultural limestone (dolomitic or calcitic)	

### Fertilizer Recommendation

The fertilizer recommendations may be used for the same crop for two to three years. After this time, it is advisable to retest the soil to determine if significant changes have occurred in nutrient levels. When the soil tests Very High for phosphorus or potassium and no fertilizer for these nutrients is recommended, you should retest the following year to determine if fertilizer will be needed. Due to the variability associated with sampling, fertilizer application rates may be varied by a plus or minus 10 percent.

No soil test is performed for **nitrogen** because this element is too mobile in the soil for laboratory results to be useful. Nitrogen fertilizer recommendations are based on the crop/plant to be grown, the previous crop, and when applicable, the soil's yield potential. Comments on the report and other enclosed Notes, if any, will have further information regarding nitrogen.

### Lime Recommendation

If needed, a lime recommendation is given to neutralize soil acidity and should last two to three years. After that time, you should have the soil retested. The measured soil test levels of calcium and magnesium are used to determine the appropriate type of limestone to apply. If neither dolomitic nor calcitic lime is mentioned, or "Ag" type or "agricultural" limestone is stated on the report, then it does not matter which type is used. When no information on the Soil Sample Information Sheet was provided regarding the last lime application, the lab assumed you have not applied lime in the past 18 months. If this is not correct, contact your Extension agent for advice on adjusting the lime recommendation to take into consideration recent lime applications. Do not over lime! Too much lime can be as harmful as too little. For best results, apply lime, when possible, several months ahead of the crop/plant to be planted to allow time for more complete soil reaction.



[www.ext.vt.edu](http://www.ext.vt.edu)

Produced by Communications and Marketing, College of Agriculture and Life Sciences,  
Virginia Polytechnic Institute and State University, 2010

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College of Architecture + Urban Studies  
Virginia Polytechnic Institute and State University

## APPENDIX

### Methods and Meanings

For more detail on the lab procedures used, visit [www.soiltest.vt.edu](http://www.soiltest.vt.edu) and click on “Laboratory Procedures.”

**Soil pH** (or soil reaction) measures the “active” acidity in the soil’s water (or hydrogen ion activity in the soil solution), which affects the availability of nutrients to plants. It is determined on a mixed suspension of 1:1, volume to volume ratio of soil material to distilled water.

Virginia soils naturally become acidic, and limestone periodically needs to be applied to neutralize some of this acidity. A slightly acid soil is where the majority of nutrients become the most available to plants, and where soil organisms that decompose organic matter and contribute to the “overall health” of soils are the most active. When a soil is strongly acidic (< 5.0-5.5), many herbicides lose effectiveness and plant growth is limited by aluminum toxicity. When soils are over-limed and become alkaline (> 7.0), micronutrients, such as manganese and zinc, become less available to plants.

For most agronomic crops and landscaping plants, lime recommendations are provided to raise the soil pH to a slightly acid level of between 5.8 and 6.8. Blueberries and acid-loving ornamentals generally prefer a 4.5 to 5.5 pH, and an application of liming material is suggested when the soil pH drops below 5.0. For the majority of other plants, lime may be suggested before the pH gets below 6.0. This is to keep the soil pH from dropping below the ideal range, since lime is slow to react and affects only a fraction of an inch of soil per year when the lime is not incorporated into the soil. If the soil pH is above the plant’s target pH, then no lime is recommended. If the pH is well above the ideal range, then sometimes an application of sulfur is recommended to help lower the pH faster; however, most of the time, one can just let the soil pH drop on its own.

A Mehlich buffer solution is used to determine the **Buffer Index** to provide an indication of the soil’s total (active + reserve) acidity and ability to resist a change in pH. This buffer measurement is the major factor in determining the amount of lime to apply. The Buffer Index starts at 6.60 and goes lower as the soil’s total acidity increases and more lime is needed to raise the soil pH. A sandy soil and a clayey soil can have the same soil pH; however, the clayey soil will have greater reserve acidity (and a lower Buffer Index) as compared to the sandy soil, and the clayey soil will require a greater quantity of lime to be applied in order to raise the soil pH the same amount as the sandy soil. A reported

Buffer Index of “N/A” means that it was not measured since the soil (water) pH was either neutral or alkaline and not acidic (soil pH  $\geq$  7.0) and therefore requires no lime.

**Nutrients** that are available for plant uptake are extracted from the soil with a Mehlich 1 solution using a 1:5 vol:vol soil to extractant ratio, and are then analyzed on an ICP-AES instrument. An extractable Mehlich 1 level of phosphorus from 12 to 35 pounds per acre (lb/A) is rated as medium or optimum. A medium level of potassium is from 76 to 175 lb/A. Medium levels of calcium and magnesium are 721 to 1440 and 73 to 144 lb/A, respectively. Calcium and magnesium are normally added to the soil through the application of limestone. It is rare for very high fertility levels of P, K, Ca and Mg to cause a reduction in crop yield or plant growth. Levels of micronutrients (Zn, Mn, Cu, Fe and B) are typically present in the soil at adequate levels for plants if the soil pH is in its proper range. See Soil Test Note 4, at [www.soiltest.vt.edu/stnotes](http://www.soiltest.vt.edu/stnotes), for documented micronutrient deficiencies in Virginia.

Soluble Salts (**S.Salts**) or fertilizer salts are estimated by measuring the electrical conductivity of a 1:2, vol:vol ratio of soil material to distilled water. Injury to plants may start at a soluble salts level above 844 ppm when grown in natural soil, especially under dry conditions and to germinating seeds and seedlings. Established plants will begin to look wilted and show signs related to drought. This test is used primarily for greenhouse, nursery and home garden soils where very high application rates of fertilizer may have led to an excessive buildup of soluble salts.

**Soil Organic Matter (SOM)** is the percentage by weight of the soil that consist of decomposed plant and animal residues, and is estimated by using either the weight Loss-On-Ignition (LOI method) from 150° to 360°C, or a modified Walkley-Black method. Generally, the greater the organic matter level, the better the overall soil tilth or soil quality, as nutrient and water holding capacities are greater, and improved aeration and soil structure enhance root growth. The percent of organic matter in a soil can affect the application rate of some herbicides. Soil organic matter levels from 0.5% to 2.5% are ordinary for natural, well-drained Virginia soils. A soil organic matter greater than 3% would be considered very high for a cultivated field on a farm, but can be beneficial. Due to relatively large amounts of organic materials being commonly added to gardens, the soil organic matter in garden soils can be raised into the range of 5% to 10%.

## APPENDIX

**The remaining values that are reported under the “Lab Test Results” section are calculated from the previous measured values and are of little use to most growers.**

Estimated Cation Exchange Capacity (**Est-CEC**) gives an indication of a soil’s ability to hold some nutrients against leaching. Natural soils in Virginia usually range in CEC from 1 to 12 meq/100g. A very sandy soil will normally have a CEC of 1 to 3 meq/100g. The CEC value will increase as the amount of clay and organic matter in the soil increases. This reported CEC is an estimation because it is calculated by summing the Mehlich 1 extractable cations (Ca + Mg + K), and the acidity estimated from the Buffer Index and converting to units commonly used for CEC. This is also an Effective CEC since it is the CEC at the current soil pH. This value can be erroneously high when the soil pH or soluble salts level is high.

The percent **Acidity** is a ratio of the amount of acid-generating cations (as measured by the Buffer Index) that occupy soil cation exchange sites to the total CEC sites. The higher this percentage, the higher the amount

of reserve acidity in the soil, and the higher the amount of acidity there will be in the soil solution and the lower the soil pH will be. A reported Acidity% of “N/A” means that a buffer index was not determined, and the acidity is probably less than 1 meq/100g and/or 5%, and the soil pH is alkaline (greater than 7.0).

The percent **Base Saturation** is the ratio of the quantity of non-acid generating cations (i.e., the exchangeable bases, Ca, Mg, and K) that occupy the cation exchange (CEC) sites.

The percent **Ca, Mg, or K Saturation** refers to the relative number of CEC sites that are occupied by that particular nutrient and is a way of evaluating for any gross nutrient imbalance.

### Additional Information

For questions and more information, contact your local Virginia Cooperative Extension (VCE) office or go to [www.ext.vt.edu](http://www.ext.vt.edu). Contact information for your local Extension office appears on the upper left of your soil test report.

### Conversion Factors

(Some Values are Approximate)

1 acre = 43,560 square feet

1 pound of 5-10-5, 5-10-10 or 10-10-10 fertilizer = 2 cups

1 pound of ground limestone or ground dolomitic limestone = 1.5 cups

1 pound of aluminum sulfate or magnesium sulfate = 2.5 cups

1 pound of sulfur = 3.3 cups

1 quart = 2 pints = 4 cups

1 pint = 2 cups = 32 tablespoons

1 tablespoon = 3 teaspoons

1 bushel = 35.24 liters = 1.25 cubic feet

Pounds per 100 square feet x 0.54 = lbs per cubic yard

100 square feet = 5 feet x 20 feet, 10 feet x 10 feet, or 2 feet x 50 feet

1,000 square feet = 50 feet x 20 feet, 10 feet x 100 feet, or 25 feet x 40 feet

Pounds per 100 square feet x 436 = pounds per acre

Pounds per 1,000 square feet x 43.6 = pounds per acre

Pounds per acre x 0.0023 = pounds per 100 square feet

Pounds per acre x 0.023 = pounds per 1,000 square feet