PYRAMID HILL

IMS 440
FALL 2025

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OUR TEAM

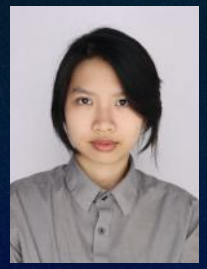
Alex Harrison
Technical Lead

Christian Smith
Installation + Tech

Mary Josten-Medina
Lighting Lead

Leo Nicholson
Fabrication + Installation

Lia Watt
Fabrication + Materials



Lihn Nyugen
Fabrication + Tech

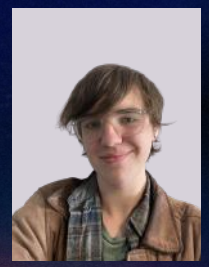
Max Vendely
Previs + Installation

Paige Falter
Fabrication + Animation

Stella Hudson
Fabrication Lead + Animation

Garland Weaver
Experience Deign Lead

Davis Cowper
Executive Producer



West Cannon
Animation + Installation

LEADS

Davis Cowper
Executive Producer

Davis is a Technical Producer and Project Manager in the immersive entertainment & games industries focused on the leadership of creatives and technocrats alike to help the world around us reach its highest potential. As the Executive Producer of the Pyramid Hill project, Davis spearheaded the direction of a team of twelve across five class departments and three site installations, coordinating site planning, budgeting, project proposals, and technical configuration of the sites, most notable of which being the installation at Age of Stone titled Celestial Current. Davis led implementation of a whole-site LAN configuration, remotely synced projection mapping, and lighting control while ensuring technical reliability and timely delivery of the project.

Alex Harrison
Technical Lead

Alex served as the Head of the Tech Team for Pyramid Hill, overseeing all technical systems and ensuring seamless coordination across the entire installation. She engineered, wired, and programmed multiple microcontroller systems to drive more than 10,000 addressable ground LEDs, integrating them with several high-capacity power supplies and the broader projection environment. Using DMX and custom control logic, Alex built a reliable, synchronized lighting network where each controller managed its own LED segment while staying perfectly aligned with the show's animated patterns and cues. Her work ensured the installation operated smoothly end-to-end—delivering cohesive visual effects, stable performance, and a polished final experience.

LEADS

Stella Hudson
Fabrication Lead

Stella is a multi-media designer focused on creative direction and motion design. Stella's work is characterized by an abundance of color and energy. As fabrication lead for Pyramid Hill, she led the creative direction and assemblage of the Flower CDs, spending long nights in the studio with her peers. Stella also contributed to the content for Age of Stone.

Garland Weaver
Experience Design Lead

Garland is an interdisciplinary immersive artist and self described "game designer, theatre maker, storyteller" focused on the integration of narrative and scenic design to develop unique immersive and theatrical experiences. As the experience designer for Pyramid Hill, they curated the overall aesthetics and creative ideas of each installation with special focus on the design of Celestial Current. They wrote the script and cue sheet for that installation, and oversaw the final creative implementation of all aspects of those designs.

Tools and Tech

Hardware

Optoma DLP Projector EH465

Rogue Outcast 1L Beam

Maverick Storm 1 Wash

Proteus Maximus moving head fixtures

ESP32 controllers for ground lights

MiniMAD media players for projection control

IP68 LED strands for ground lighting

Viper NT Look Solutions DMX Hazers

ETC EOS Puck

Black Netgear Network Switches

DMX gateway

Corrugated plastic, epoxy

Weatherproof boxes, pallets, power distribution equipment

Software

MadMapper – projection mapping and media playback

WLED – LED control firmware for ESP32

EOS – theatrical/concert lighting programming

Unreal Engine – lighting and projection previsualization

TouchDesigner – signal processing & realtime content

SACNView – network data verification

Adobe Creative Suite – content creation

Trello – project management & team coordination

EXECUTIVE SUMMARY

Pyramid Hill Sculpture Park partnered with Miami University's Emerging Technology in Business and Design Capstone to create a new, innovative installation for their annual Holiday Lights display. This is a holiday event for the Hamilton community that has become a tradition for over 30,000 visitors.

Our mission was to transform a traditional drive-through light show into a technical, interactive, immersive installation using the following as inspiration for our concepts:

- The sculptures at the sculpture park
- Nature and the encompassing trees that filled the park
- Technology and all of the accumulated student knowledge and skill to see how we can test the boundaries of what we know
- Storytelling to create cohesive theming and add importance to our installation

Over the course of 10 weeks, our team developed more than 100 original concepts, refined them into five core installations, researched materials and technology, engineered custom lighting systems, fabricated large-scale sculptural pieces, produced projection-mapped content, and built the entire show on-site in freezing November conditions.

The result is the most technically advanced light show Pyramid Hill has ever hosted, featuring synchronized projections, intelligent lighting, multimedia storytelling, and custom-fabricated sculptures — all designed, engineered, and installed by students.

OUR CLIENT

PYRAMID HILL SCULPTURE PARK & MUSEUM

Pyramid Hill's mission is to bring people to art in nature.

Pyramid Hill is a 470 acre nonprofit sculpture park founded in 1997. The Park is home to over 70 monumental outdoor sculptures nestled into a landscape of rolling hills, meadows, lakes, and hiking trails.

The Park provides an annual winter light show exposed to many member of the Hamilton County community and beyond and is a staple for creating ttraditions for many families that support the arts.

CONCEPTING

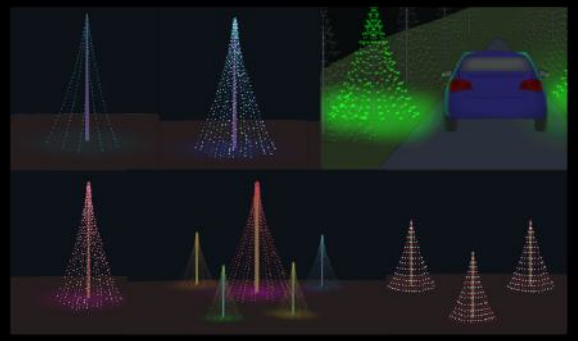
Our team generated **116** concepts across **12** zones of the park.

Ideas ranged from massive projection spectacles and drone shows to student fabricated light based installations:

- Drone shows
- Fiber-optic landscapes
- Programmable LED forests
- Projection-mapped sculpture gardens
- Floating orbs on the lake
- Fabric tunnels
- Constellation Matrix
- Interactive sensor-driven effects
- Ice-crystal tunnels
- Immersive narrative pathways
- Celestial worlds
- Growing light trees

These Phase 1 ideas were presented to Lize Eversole, and then condensed down and refined into our final five installations that our team has the capacity to complete within the 10 week timeframe.

Flash & Flicker - Pole Trees



Concept description:
The pole trees could be variegated sizes and/or animated in several ways. They could sit stagnant, animate to "grow" bigger, flash, etc. Combining a few of these techniques can add interest to the area without being overwhelming.

Goal for the concept:
This is an area where people tend to sit for a few dozen minutes. The scenery look full and get the audience excited for the rest of the show.

Tech requirements:
- String lights
- Arduino nano
- 3/4" PVC, various heights
- ½" Rebar, various heights
- Rope loops
- Carabiners
- Landscaping stakes

NEW/OWNED

Lia Watt & Alex Harrison

Park Augments - Car Headlights

Concept description:
Use mirrors to reflect and bounce and "use" car headlights to either cause light refractions across a wide area or to active a hidden light sensor to active something interactive.

Alternative tech for similar interaction to this: Weight Sensor, Camera with Blob tracker

Goal for the concept:
Interact with each visitor as each one is in a car and provides their own light with headlights. Play with the given constant of people providing their own light to know when and where someone is.

Tech requirements:
Light sensor

Christian Smith

Zone 6 - Space Forest - Smoke and Lasers

RENT

Concept description:
Cars will go through fog at the beginning of the zone. The fog will be lit up with an array of colors to make it feel mystical. (cooler toned color palette for this) Once the audience drives through the fog they are met with this spectacle of light and lasers almost resembling a night sky.

Goal for the concept:
The goal for this concept is to create a new idea for this zone that is flexible enough to blend into any theme we decide to come up with for the full light show.

Tech requirements:
- Outdoor star/laser projector
- Smoke machine
- LED DMX controlled light

Mary Johnston-Medina

Miami University VAS 440

Zone 4 - Celestial

Concept description:
Euclid's Cross is a prime opportunity to deliver a captivating yet distant beacon as guests enter the park's core. "Celestial" aims to represent the Sun's calm yet powerful presence.

Goals for the concept:
1. To resolve the stated issue of Zone 4 being less engaging for guests as they wait for traffic to proceed.
2. To produce a thematic tie-in to Zone 5 concepts as well a thematic opposite to Zone 4's crystal concept.
3. To broadly illuminate the surrounding fields of Zone 4.

Tech requirements:
- Large Venue Projector
- Independent power runs
  - Pull from Visitor Ctr.
- LED Controllers (Novastar)
- Live Content Visuals (Touch/Notch)
- Media Server Rentals
  - Disguise / Pixera

FUNDRAISER

Davis Cowper

Zone 7 - Winter Creatures

1

Concept description:
Through projection mapping and lighting, turn the individual stones into snow capped "standing stones" wreathed in yuletide magic. We can then build and plant simple physical folkloric silhouettes of various winter based creatures in and around the stones that we cast light onto, creating a shadow puppet effect filling the spaces between the stones.

Goal for the concept:
Right now, there's a lot of unused space in this area as well as fairly minimal decor to enhance the stones. This concept draws the eye of the viewer to the central stone and lets the imagination do some work on what lies in the darker spaces

Tech requirements:
- Multiple projectors
- DMX lights
- Constructed silhouettes

RENT

Garland R Weaver

Zone 7 - Geometric Light

Concept description:
Play into the scattering feel of the Stonehenge sculpture, disperse rock-shaped light sculptures to light up a path leading to the Stonehenge. These sculptures acts like a lantern, shining abstract patterns onto the ground.

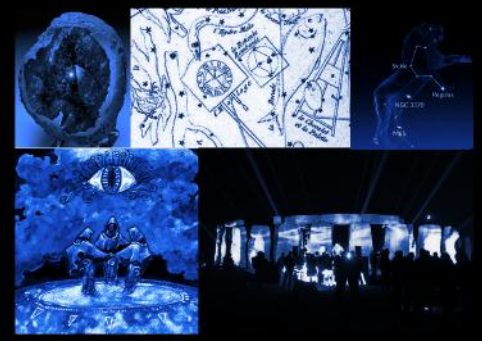
Goal for the concept:
Being a large and level field, we should take advantage of the fact that the ground can be clearly seen from afar.

Tech requirements:
- Big lights
- Plastic Sheet
- Wood

NEW/MAKE

Linh Nguyen

Zone 7 - Rock Stars



Concept Description
In the flat shapes of the sculpture appear constellations like a galaxy within a geode. Ambient light and fog illuminate the center of the ring like druids conducting a ritual. The "geodes" would be created via projection, everything else would just be interesting lighting.

Goal for the Concept
Meant to be viewed from a distance to have a sense of wonder and mystery. The "galaxy geodes" should have depth and for the constellations to reveal themselves at different times, and each rock should have a different constellation.

Tech Requirements
- More Projectors
- Fog Machine
- Ambient Lights

RENT

West Connon

Zone 6 - Troll Zone

Concept description:
PH currently just lights up this zone and has the candy cane trees, but we could transform a section of the forest into the "Troll Zone". Using projectors aimed at the trees, we can animate faces, creatures, and animals that appear to live within the forest.

Goal for the concept:
The goal is to bring the forest to life, surprising visitors as they drive past with unexpected animations. This zone builds engagement and gives a sense that the forest is watching and responding to them.

Tech requirements:
- Projectors (existing or rental)
- IR break beam sensors
- Arduino nano
- IR sensor detects when car is in range and eyes follow

SPONSORED

Alex Harrison

Zone 6 - Dandelion Field

Concept description:
We can wrap white weatherproof circles with sheets of reflective rainbow film and projection map upward onto tall PVC pipe poles. Around the base, smaller poles wrapped in cellophane flowers catch and reflect the light refracted from the rainbow film above. To amplify the effect, the floor would be covered with reflective materials, while colored cotton would create a soft, hazy glow.

Goal for the concept:
Have the families drive through an "infinity mirror" forest of dandelions between the trees, bringing them into the coming spring and creating a memorable yet simple and inexpensive passage between Main Zones.

Tech requirements:
- PVC pipe
- Likely two or three projectors

NEW/MAKE

Paige Falter

Zone 2 - Star Lanterns

Concept description:
These paper star lanterns are a common decoration, they are artsy and could be made semi-festive. Large outdoor versions could be made using a waterproof material and a CNC mill.

Goal for the concept:
Somewhat simple structures that could be as impactful as we need them to be. Low electrical needs.

Tech requirements:
- Thermoplastic polyurethane sheets
- CNC Mill-Rent
- Strong adhesive
- Floodlights
- Thin colored plastic

NEW/MAKE

Lia Watt

Zone 7 - Frozen Tundra

Concept description:
In accompaniment with the projecting onto the sculpture, "Age of Stone", we can project onto the grounds surrounding the sculpture and create dancing swirls of light that make the ground look frozen. Projector would be have to be mounted to tree or other elevated area through hidden metal rigging.

Goal for the concept:
Engage the surrounding area near the sculpture "Age of Stone" to guide viewer's eye to the sculpture.

Tech requirements:
- Projector
- 3D Scan of sculpture

RENT

Stella Hudson

Zone 2 - Constellation Trail

Concept description:
PH has a large open area between the front entrance and the start of the line to enter the park. In this space, we could suspend curtain lights above the cars. The curtain fabric would have different constellations outlined using meteor shower lights and ball lights, creating the effect of a glowing night sky. While guests wait in line, they could play a guessing game by trying to identify which constellations are displayed above them.

Goal for the concept:
The goal would be to create an immersive/interactive guessing game to keep people entertained in their cars while they wait for their turn to see the light show.

Tech requirements:
- Programmable Curtain Lights
- Classic Streak Lights

NEW

Paige Falter

Zone 1 - Beams Abright

Concept description:
Surround the PH sculpture with DMX beam lights to elevate the structure's existing form and accentuate its hard edges/straight lines.

Goal for the concept:
1. Use DMX beam lights to illuminate Passage according to a winter theme.
2. Amplify the existing geometry's visual style and presence.

Tech requirements:
- DMX Beam Lights
- Control machine (laptop/server)

NEW/RENT

Stella Hudson

Zone 12 - Snowflake Tunnel

Concept description:
Over a wireframe tunnel, we stretch neon mesh cloth that takes the shapes of snowflakes and crystals. Flood lights on the ground are shooting at the tunnel so colors of cloth pop.

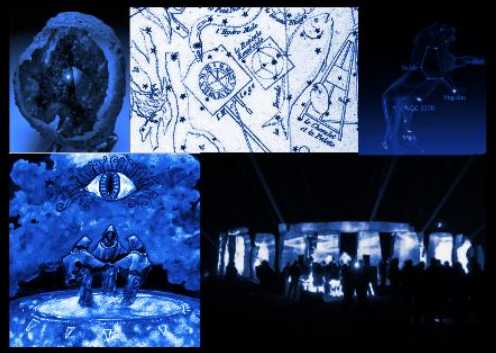
Goal for the concept:
Use neon/ bright materials to activate the space as much as the lights that we are replacing would have. Use black light flood lights to make the materials really pop.

Tech requirements:
- Handmade Props
- Cloth
- flood lights/ Black lights

NEW/MAKE

Stella Hudson

Zone 7 - Rock Stars



Concept Description
In the flat shapes of the sculpture appear constellations like a galaxy within a geode. Ambient light and fog illuminate the center of the ring like druids conducting a ritual. The "geodes" would be created via projection, everything else would just be interesting lighting.

Goal for the Concept
Meant to be viewed from a distance to have a sense of wonder and mystery. The "galaxy geodes" should have depth and for the constellations to reveal themselves at different times, and each rock should have a different constellation.

Tech Requirements
- More Projectors
- Fog Machine
- Ambient Lights

RENT

West Cannon

Zone 10 - Racing Wisps of Light

Concept description:
Highlight the shape of Garden of Sculpture (George Sugarman) with bright edges. Points that are extra bright speed along these edges, tracing the interesting contours and bringing movement to the massive statues.

Goal for the concept:
The effect will accentuate the fascinating shape language of these statues and breathe life through simple, artistic movement.

Tech requirements:
- Projectors like those in Zone 4 "Celestial" Concept

RENT

Max Vendely

REFINEMENT

After presenting to our Signature Events Liaison Liz Eversole, we gained several key insights. Pyramid Hill loved all of our ideas, but this also meant our scope needed to be internally defined.

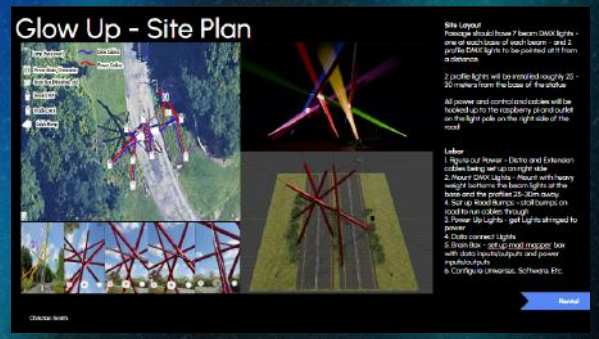
This led to our next challenge: narrowing the scope.

Phase 2: Refinement
With their feedback, we reduced 116 → 40 → 5 final installations we moved forward with implementing:

1. Passage (lighting transformation)
2. Age of Stone (projection + lighting environment)
3. Dandelion Forest (fabricated light-refraction sculptures)
4. Constellation Curtain (later cut)
5. Field of Color (re-scoped for future use)

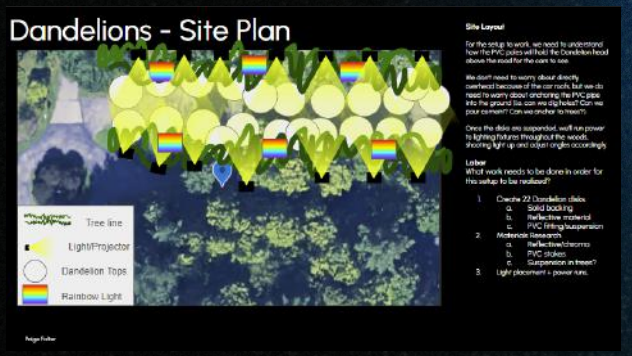
The core theme that emerged:
Celestial, reflective, moving light show.

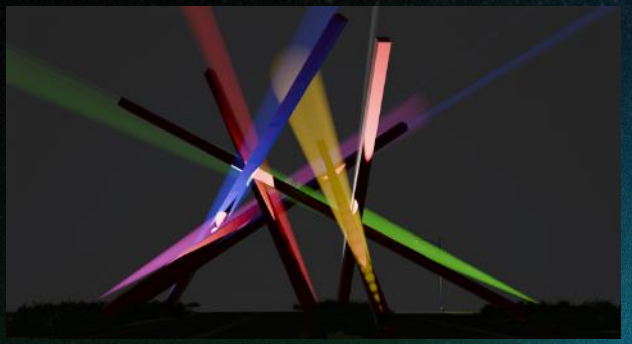
DESIGN DOCS



After the board approved our final direction, we transitioned into the **Design Documentation Phase**, which formalized each concept into something that could be fabricated, programmed, budgeted, and installed.
Each design doc functioned as a professional production plan, including:

1. Detailed Concept Description
2. Technical Specifications
3. Site Plans
4. Equipment Lists & Budgets
5. Safety, Durability & Feasibility Notes
7. Visual References





RESEARCH & DESIGN

R&D

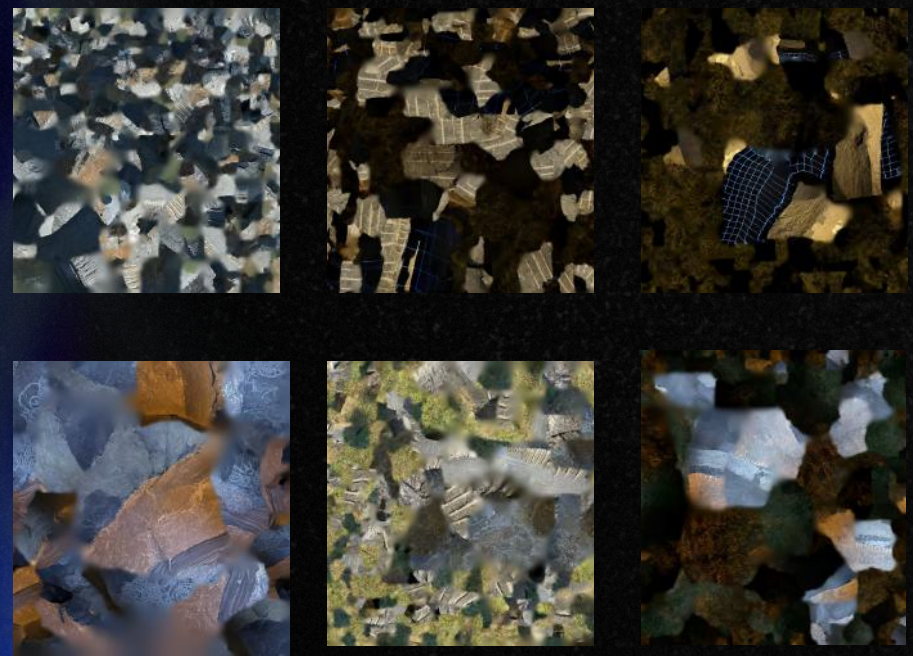
A clear look at how we developed the ideas, tested them, and turned them into our final installations.

Technical Research and Previsualizations

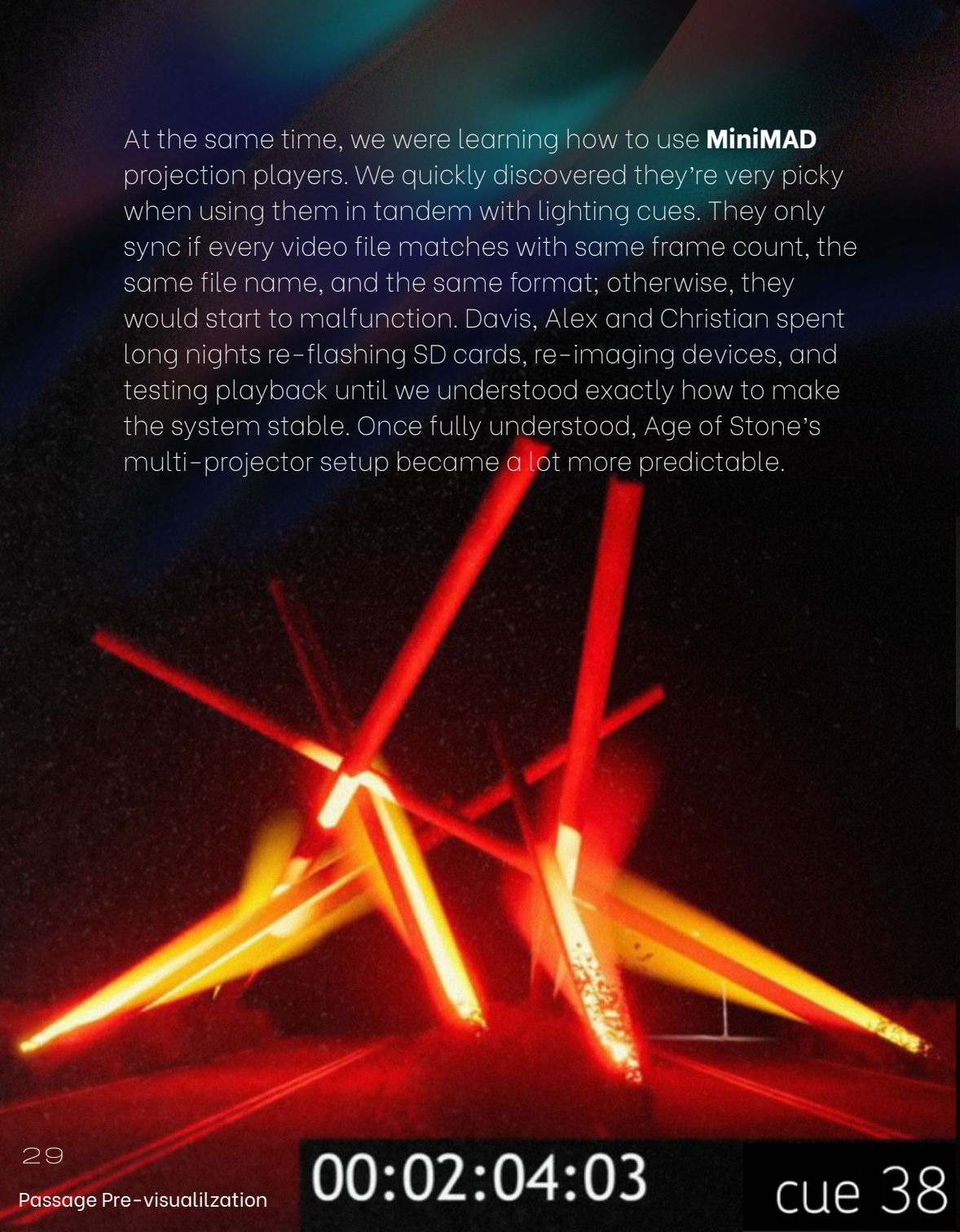
As soon as our final concepts were selected, we jumped straight into figuring out how to make them work in the field, especially **Age of Stone**, which became the most technically challenging part of the entire project.

Stonehenge Pre-visualilzation

For both Age of Stone and Passage, we needed a digital visual for how we wanted the programmed light shows to look. To do this, our team built digital models of the rocks using **LIDAR scans** and photo mapping. This gave us accurate 3D shapes that we could load into **Unreal Engine**. From there, Christian and Max built a **full previsualization**: a virtual version of Age of Stone and Passage where we could test projector placement, lighting, fog, timing, color, and transitions long before we installed anything on-site.



At the same time, we were learning how to use **MiniMAD** projection players. We quickly discovered they're very picky when using them in tandem with lighting cues. They only sync if every video file matches with same frame count, the same file name, and the same format; otherwise, they would start to malfunction. Davis, Alex and Christian spent long nights re-flashing SD cards, re-imaging devices, and testing playback until we understood exactly how to make the system stable. Once fully understood, Age of Stone's multi-projector setup became a lot more predictable.



Passage Pre-visualilzation

Meanwhile, Alex was designing the ground-lighting system from scratch. She tested different controllers, wiring options, and power layouts across multiple prototypes. The final solution used **ESP32 microcontrollers** running **WLED**, which gave us reliable network control and effects that synced and aligned with the larger show lights. This research set the foundation for the entire lighting ecosystem in Age of Stone.

The technical research phase was a mix of problem-solving, testing unfamiliar tools, and building systems we'd never built before. By the end of this phase, we had a clear technical plan, experts in its implementation, and a solid goal to strive towards in getting the show rolling.

Materials Research and Fabrication Testing

While the tech team was mapping rocks and wiring LEDs, the fabrication team was deep into hands-on material testing. The concept for the Dandelion Forest sounded simple on paper with a stunning effect: glowing disks mounted to PVC pipe that hang over the audience and reflect rainbow patterns below. Well, in reality, figuring out how to build them took weeks of experimenting.

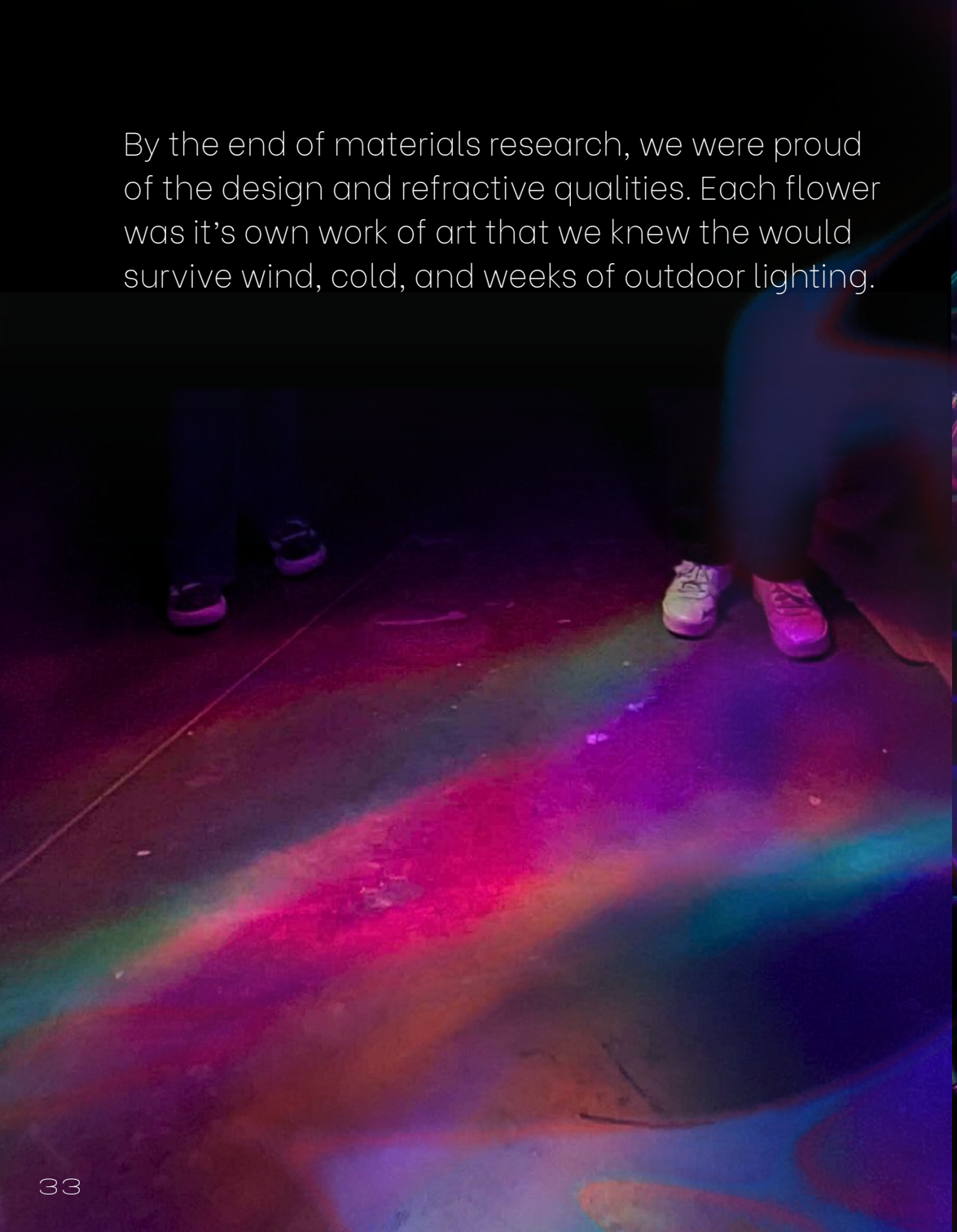
We started by testing every reflective or translucent material we could get our hands on: cellophane, holographic paper, vinyl, mylar, prismatic sheeting, diffusers, acrylic pieces... you name it, we tested it.

Everything either tore, wrinkled, or didn't produce the visual effect we wanted when shown under bright light.
The breakthrough came by accident:
CDs.

Their natural rainbow refraction gave us the exact visual effect we were looking for. Once we realized how good they looked under focused light, the we started experimenting with the material to make an installation.
We melted, scored, snapped, sanded, and epoxied hundreds of discs to see how they held up under the light. Through trial and error, we learned:

- CDs melt into brittle pieces if overheated
- Corrugated plastic makes a strong, lightweight base
- Hanging from branches is safer and more stable than PVC stems

By the end of materials research, we were proud of the design and refractive qualities. Each flower was it's own work of art that we knew the would survive wind, cold, and weeks of outdoor lighting.



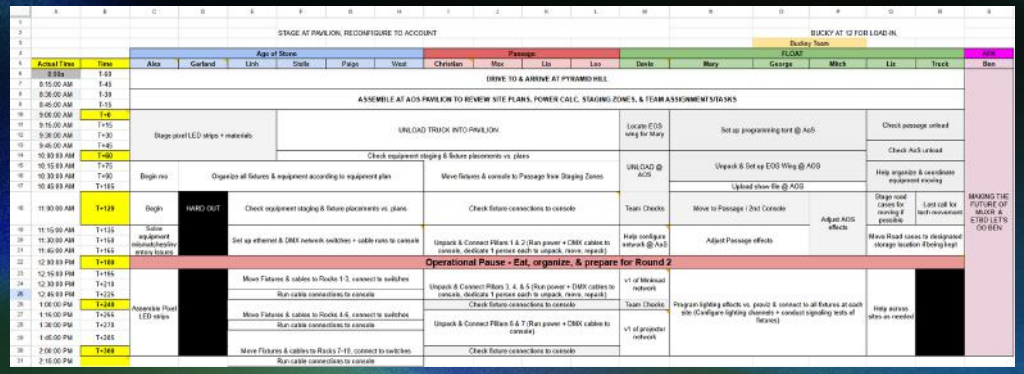
Lighting Research and Load In Scheduling

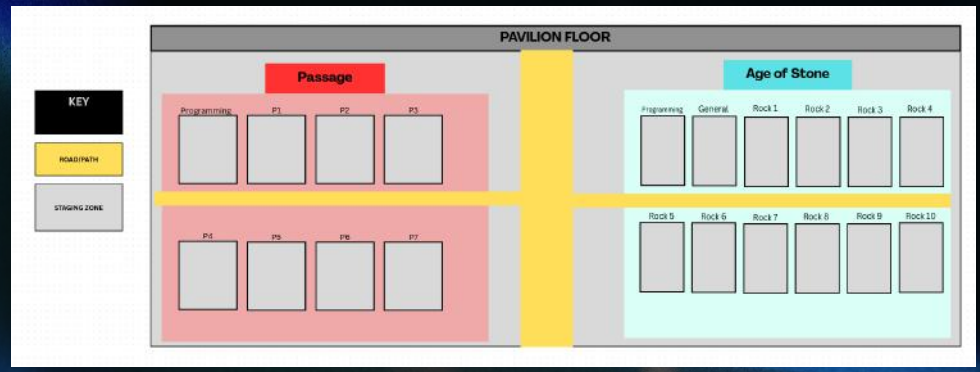
Lighting the park was its own challenge. Outdoor lighting behaves differently than indoor lighting, and we needed something that could cut through fog, weather, and long distances without washing out the projection work. In the R&D phase, we researched outdoor fixtures, IP ratings, and color mixes that stay vibrant. Teams tested how light color shifts depending on the colors of the surfaces being lit. This helped us choose a palette that felt right but still worked with the projections in Age of Stone and both the strengths and limitations of our lighting systems in Passage.

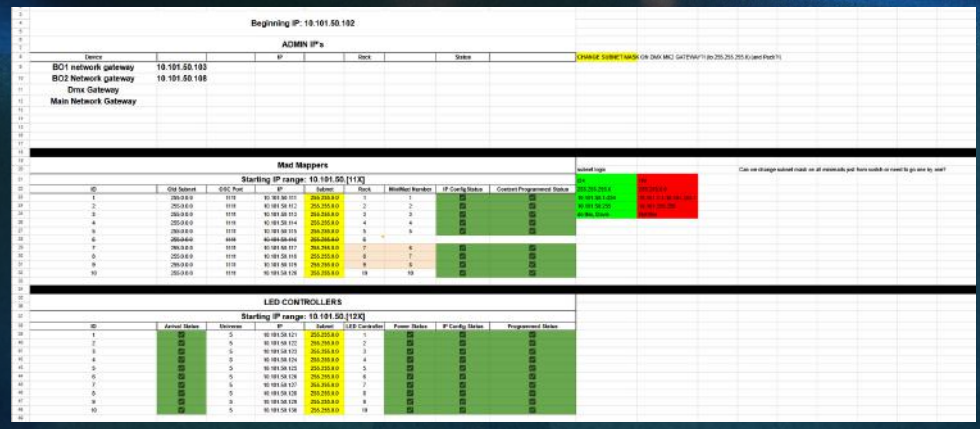
Meanwhile, our load-in schedule took shape. Davis handled our master timeline, balancing:

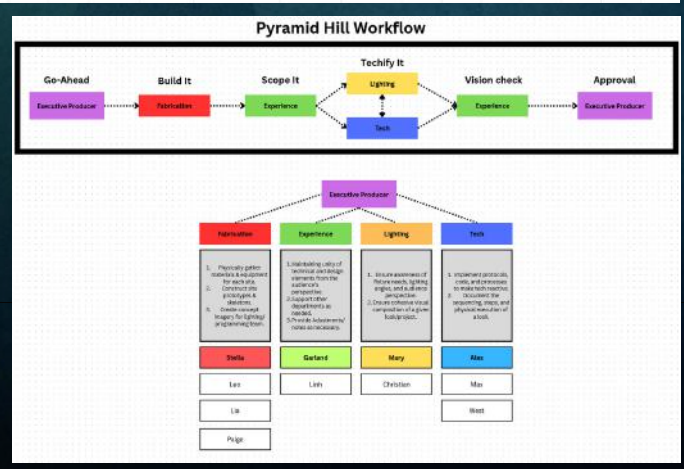
- When projectors would be set up.
- When the hazers could be installed.
- When lighting could be programmed.
- How long our network configuration would take.
- How late we needed to stay for nighttime testing.
- How the team's morale & resolve would be maintained.

Project Management & Load-in Coordination









Site Power Calculations - Age of Stone

Fixture	Quantity	Wattage	Total (W)	Amperage	Total (A)
Elation Proteus Maximus	9	1,000	9,000	8.33	75
ETC Nomad Puck 6k	1	192	192	1.60	1.6
Maverick Storm 1 Wash	4	477	1,908	3.98	16
Allitove Pixel Lights	20	300	6,000	2.50	50
Optoma Projectors	9	370	3,330	3.08	28
Garage Cube Minimad	9	240	2,160	2.00	18
Heating Pad	9		0	0.00	0

Total Site Wattage	22,590	Total Site Amperage	188
		Total Circuits Req'd	13

Site Voltage
120

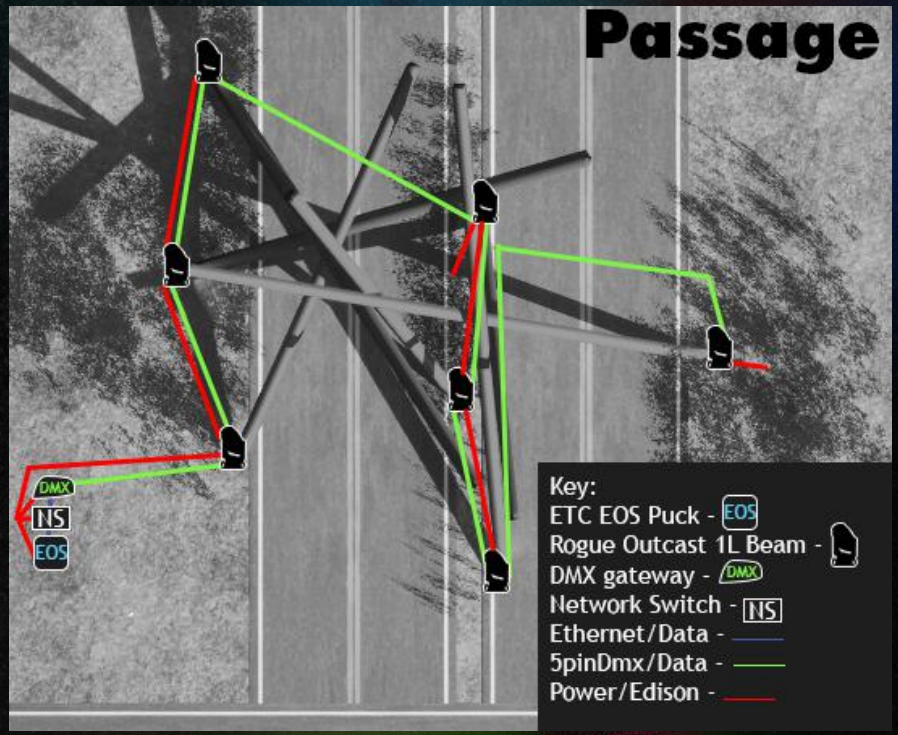
Amp Limit / Circuit
15

Questions to resolve:

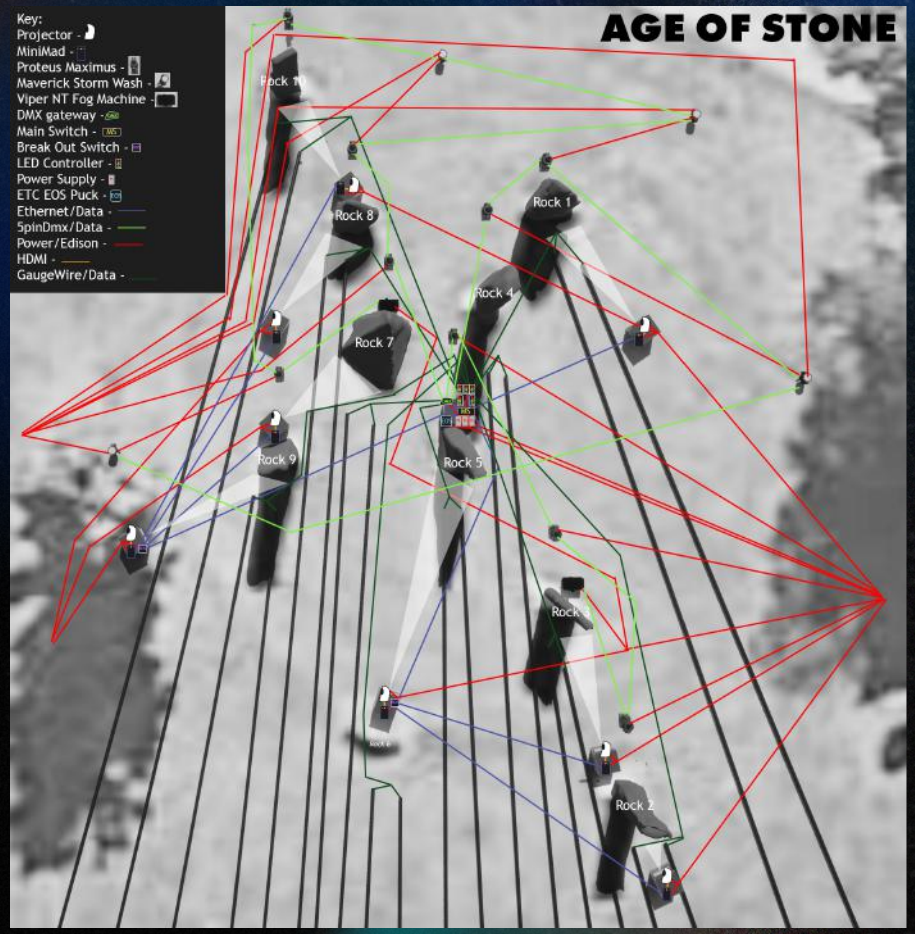
1. How much power will the whole site draw?
2. How much current is being handled?
3. How many circuits will need to be used in order to draw it?

1	Roughly 22,400 watts on average.
2	187 Amps across all circuits.
3	12 circuits assuming a 15 amp limit on each.

Because lighting can only be judged at night, our schedule shifted toward late evenings and early mornings. Many frigid nights went well past 2 or 3 AM. Lighting research also uncovered hidden challenges. Some LEDs flickered unexpectedly when put at full intensity. MiniMADs would occasionally play the wrong content or couldn't switch between animations. No matter the case, testing through these conditions helped us shape cues that matched our inital vision.



This phase set the stage for a smooth installation, even though nothing could fully prepare us for the real conditions ahead. Little did we know we needed to be prepared for critical networking and hands-on technical work during one of the coldest weeks of the year.

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A week of early mornings, late nights, frozen fingers, big wins, and the moment everything finally came together.

“Once we stepped onto the field, the real work began.”

This was the week when our ideas left the MUXR stage and became physical installations within Pyramid Hill.

Fast-paced and freezing weather, we didn’t have much time before show day. This was also the week where we rose to the occasion.

Part 1: Load In

We kicked off load-in with a truck from 4Wall rolling in first thing in the morning, packed with projectors, fixtures, cables, and weatherproof housings. As soon as we unloaded, the field became a temporary construction zone.

A major priority was running power across the installation areas. Because the park’s electrical grid is spread out and unevenly distributed, we had to map circuits carefully to avoid overloading anything. This meant laying hundreds of feet of extension lines, testing outlets, and balancing loads across multiple circuits.

Once the power was set, we began placing projector boxes behind rocks. At the same time, the team worked on labeling and assigning IP addresses for every controller, projector, MiniMAD, and switch. Getting the IP system right early saved us from major networking headaches later.

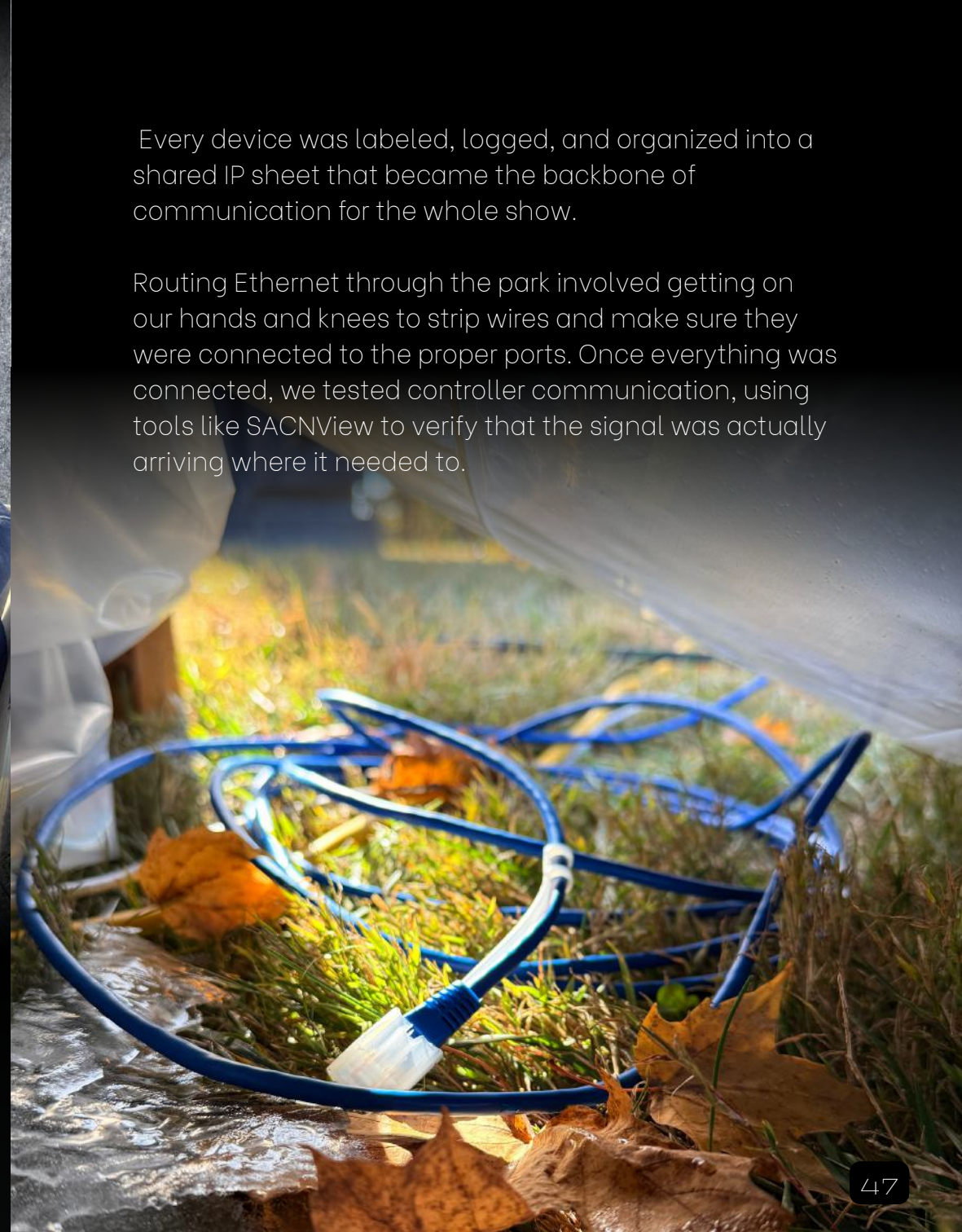
Meanwhile, we stabilized wooden pallets, secured weatherproof boxes, taped down cables, and double-checked that every outdoor enclosure was sealed tight against rain and frost. By the end of Day 2, the skeleton of the show was officially in place.

Part 2: Networking

With the infrastructure down, it was time to bring everything online. Christian , Alex, and Davis designed the entire local area network (LAN) on-site, configuring switches and eliminating DHCP entirely. DHCP caused devices to grab random IPs and fall out of sync during earlier tests, so we rebuilt the system to run on strict static IP assignments.

Every device was labeled, logged, and organized into a shared IP sheet that became the backbone of communication for the whole show.

Routing Ethernet through the park involved getting on our hands and knees to strip wires and make sure they were connected to the proper ports. Once everything was connected, we tested controller communication, using tools like SACNView to verify that the signal was actually arriving where it needed to.



Then came OSC and sACN configuration, the protocols that allowed lighting, projections, and LEDs to speak the same language. Once the network was stable, we moved on to syncing projection content across all the MiniMAD players. This required cleaning up video naming conventions, adjusting resolutions, and testing playback until all nine projectors for Age of Stone hit the same frame at the same time.
During this period, we also reviewed and gave feedback on the Age of Stone projection content, making adjustments to timing, color, and contrast based on how the rocks reacted in real conditions.

Part 3: Programming

Mary programmed EOS lighting cues for Passage and Age of Stone, building timing and transitions that matched the previsualizations Christian and Max worked on. She worked closely with Christian and Alex to ensure every lighting look synced cleanly with the network and ground lighting.

At the same time, Alex configured the WLED and Mary programmed the sequences for all ground lights to match the Proteus Maximus movement and coloring.

Hours were spent on projection-mapping all nine rock surfaces, adjusting masks, and troubleshooting changes from working with MiniMADs and EOS.

Fog machines were added to the mix next, and we tested fog timing and airflow to avoid over-saturating the field.

As all three systems (lighting, projection, and fog) came together, we began show integration.

So we tested, tweaked, adjusted, and repeated. On-site tuning continued late into the night and into the freezing cold of the coming winter. We worked to make the show look exactly how we had envisioned it back in the previsualization stage, following Alice's experience design direction.


FINAL
RESULT

FINAL RESULT

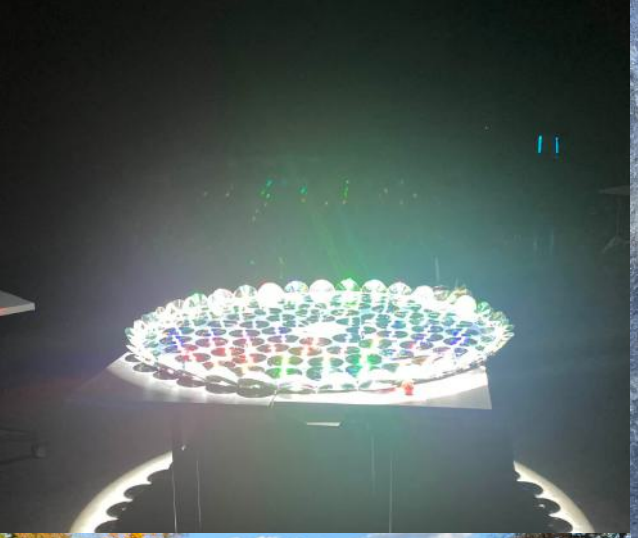
3 fully completed light based installations engineered, fabricated, programmed, and implemented by students.

Dandelions

Passage

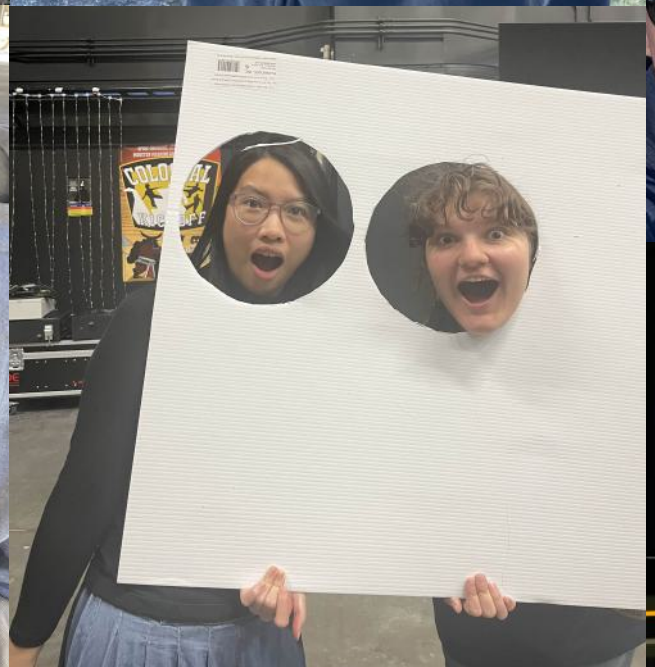

Age of Stone

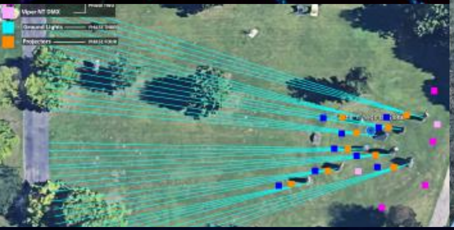
BEHIND THE SCENES







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