

# PROJEKT: KANDIDATPROJEKT THE SOUND RIBBON

Kandidatarbetet gjordes utefter ett tävlingsprogram från "Acoustical Society of America Student Design Competition". Uppgiften var att göra en koncerthall utomhus med 5000 sittande publik med tak och 20 000 stående publik. Vi samarbetade med aukustiker för att göra den naturliga akustiken i hos den sittande publiken så bra som möjligt samt ge den stående publiken bra blandning mellan elektro och naturlig akustik.

*Kurs: **Kandidatarbete***

*Av: Lisa Kollberg, Linda Xiao, Spencer Mason*

*Examinator: Morten Lund*

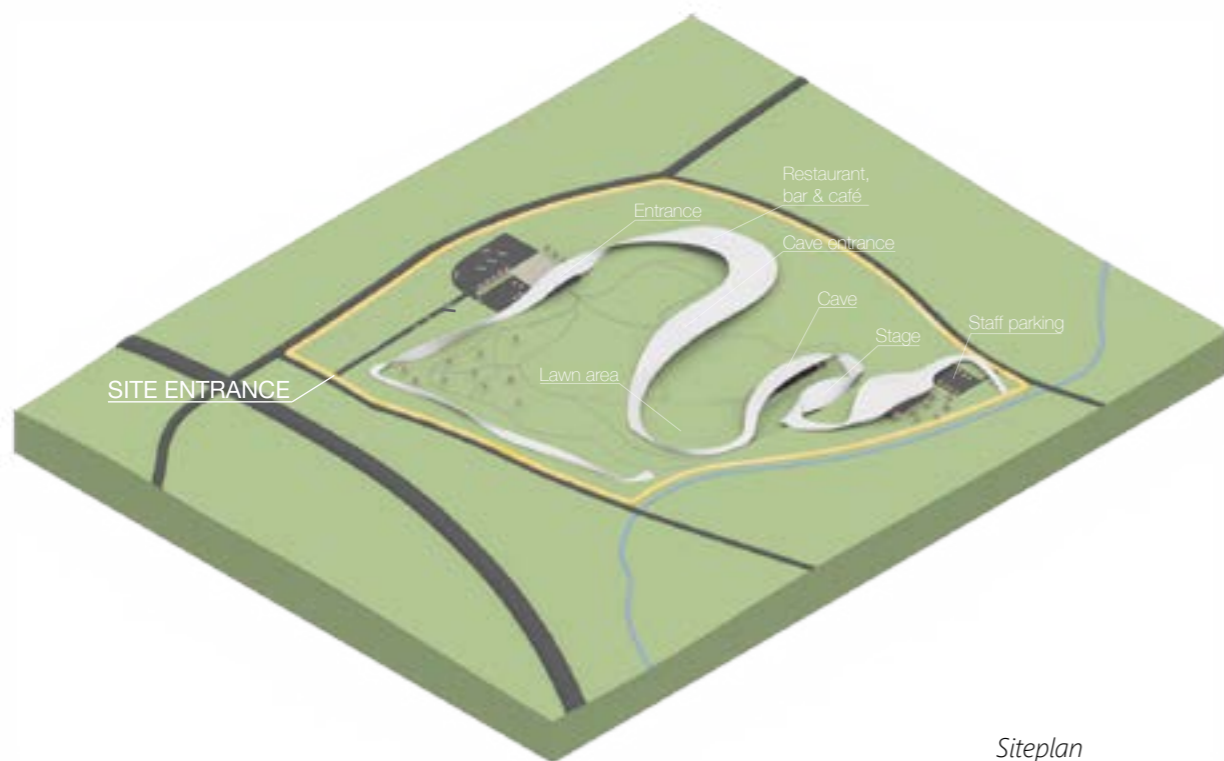
*Handledare: Morten Lund och Peter Christensson*

# THE SOUND RIBBON

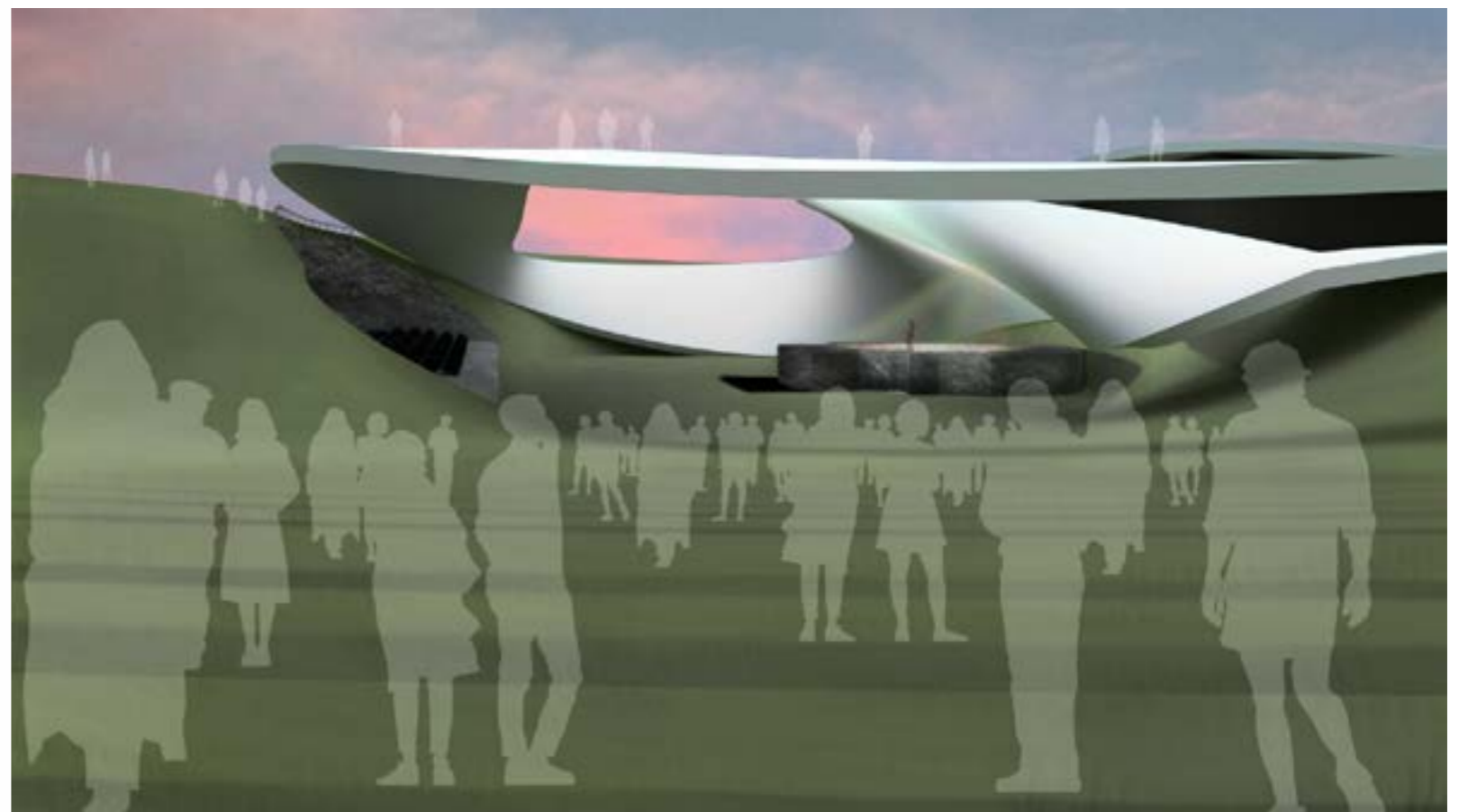
Like sound waves the ribbon spreads across the site, providing a pleasant acoustical environment for everyone. The ribbon flows up and down, intertwining every function on the site and creating natural paths to walk along, beneath and upon, all the way from arriving at the site to the stage area where the performance will be enjoyed. Along the way, the ribbon provides several different functions to create a unique experience for the visitors interacting with it.



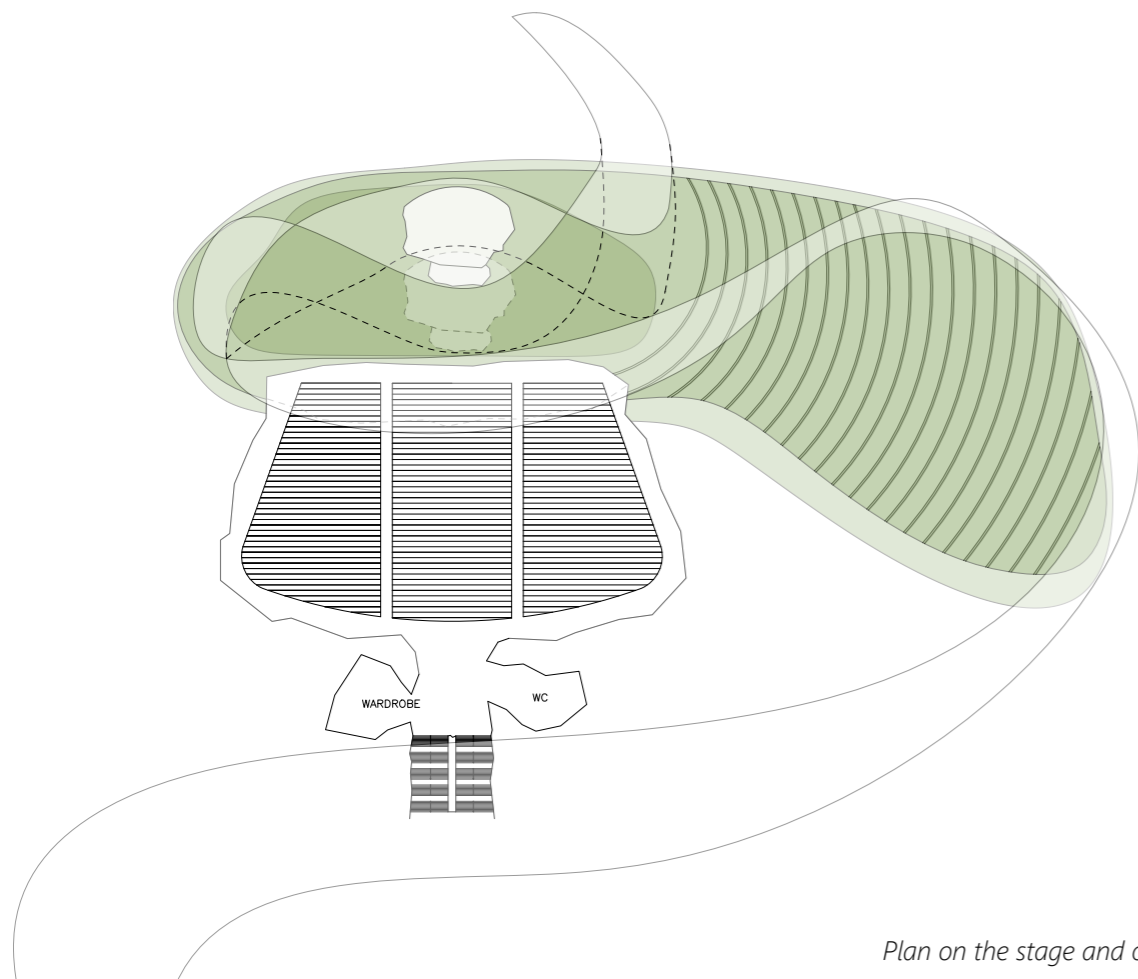
*Perspective over the "ribbon walk"*



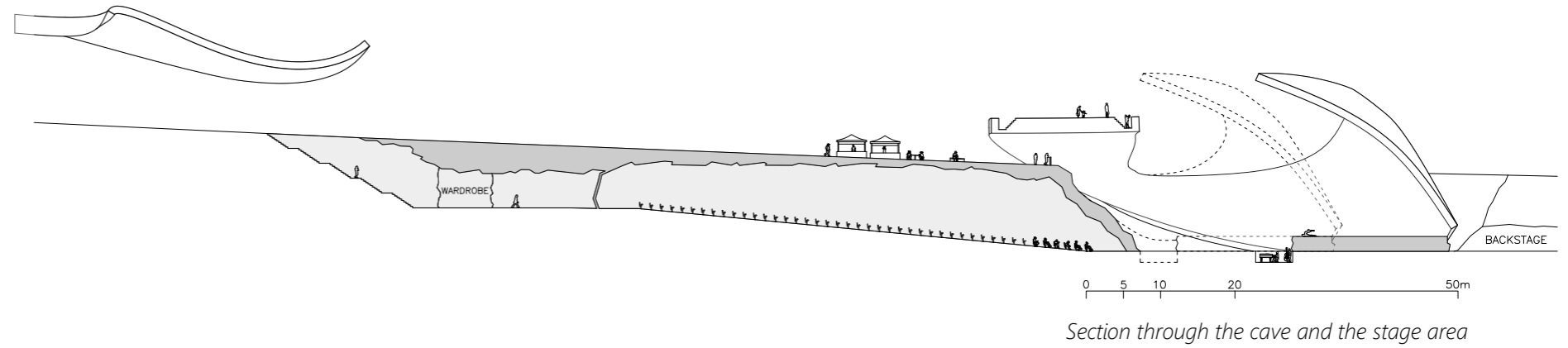
*Siteplan*



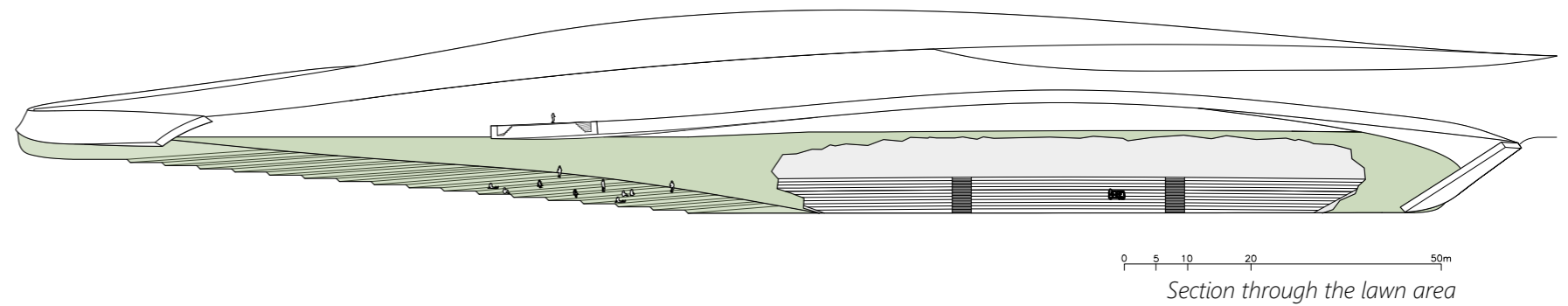
*Moneyshot of the stage and audience*



*Plan on the stage and cave*



*Section through the cave and the stage area*



*Section through the lawn area*

The stage area is situated in an excavation, located 12 meters under the ground. The walls of the excavation provide shelter from noise from the traffic surrounding the site as well as from the wind. The area provides several different experiences for different desires.

The stage and the ribbon enclosing it are flexible and can be moved backwards and forwards depending on the acoustical demands. For a smaller concert requiring natural acoustics, the stage can be moved closer to the cave to create a more intimate and enclosed experience for the audience. For a large concert with a much larger anticipated crowd, the stage can be pushed back to provide a good sight for more people and for the acoustics to spread further across the site.

There are 4 different areas where you can stand as a visitor. The first one is inside the cave, where you can stand on if you want good sight on the stage while still being outside. If you want to enjoy the performance while talking to your friends, taing a beer and dancing, you can stand on the mingle area on top of the cave.

The most unique experience is only for the fearless patrons. The zone is accessed by walking onto the ribbon and provides a good sight of the whole site and an adrenaline rush. On top of the ribbon, the concert can be enjoyed coming from beneath the feet while feeling the breeze 15 meters up in the air.



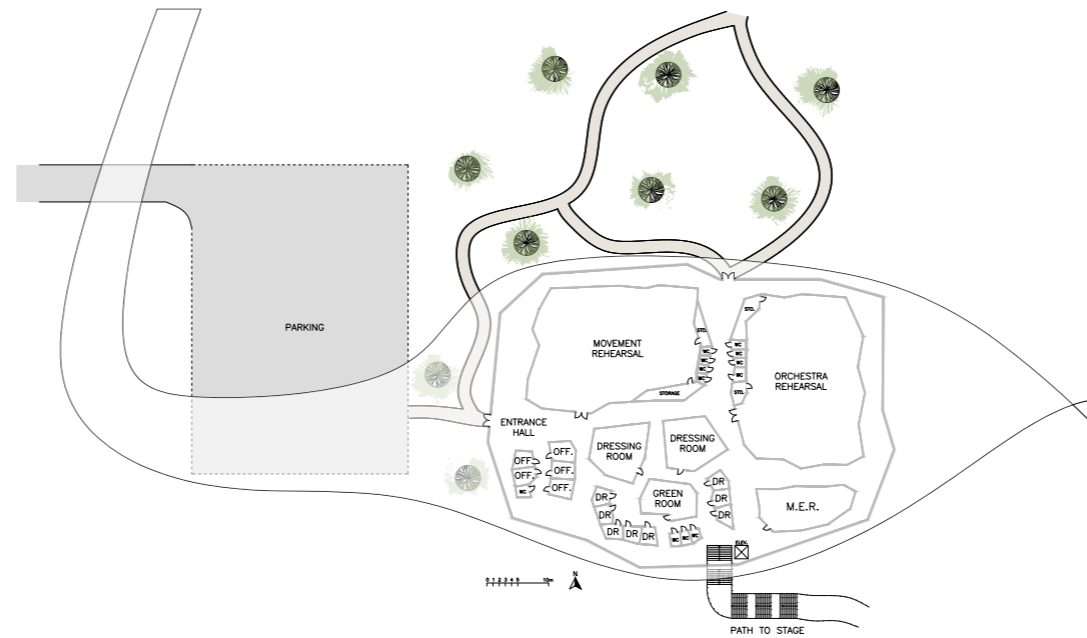
REFLECTIVE/  
ABSORBING DIAGRAM



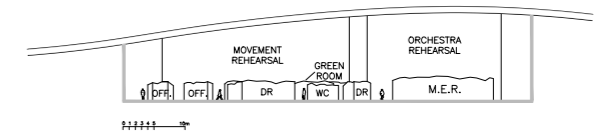
SPEAKERS DIAGRAM



AUDIENCE ZONES  
DIAGRAM

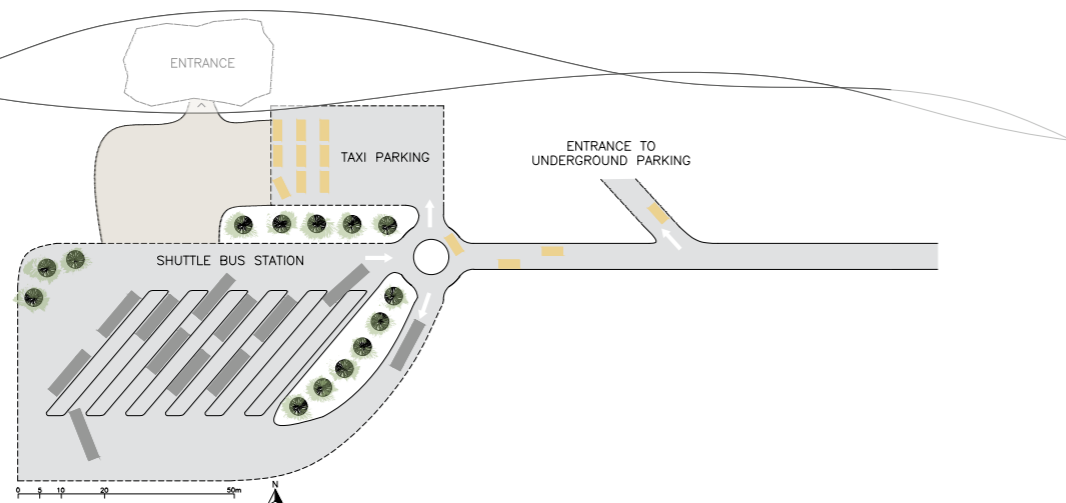


## THE REHEARSAL BUILDING



The staff and performers' entrance is located one end of the ribbon, separated from the visitors' entrance. The different functional areas for the staff and performers are designed to resemble the structure of the cave in the stage area with small rock-like volumes and are placed inside a building beneath the ribbon with glass walls, allowing people outside to catch a glimpse of the inside. All the areas are accessible through passages between the rock structures and are connected with the ribbon as the roof.

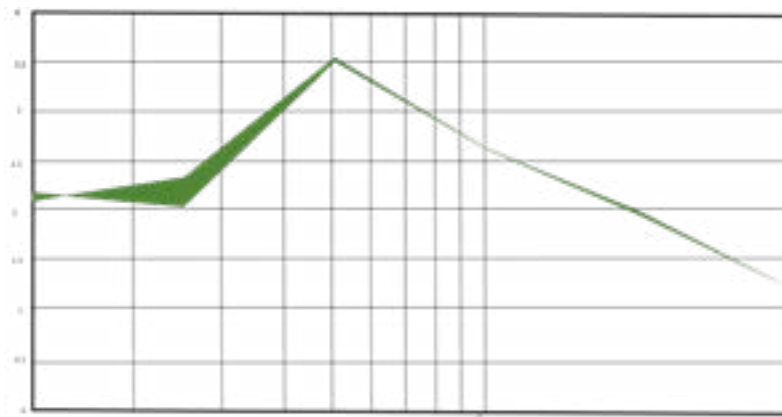
## THE ENTRANCE



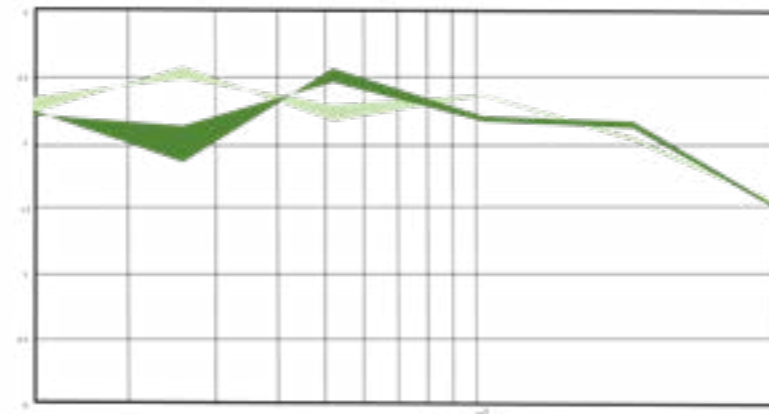
By arranging shuttle bus transportation and taxi services on the site, the visitors are encouraged to leave their cars at home and to arrive and depart from the site collectively for environmental purposes. A large shuttle bus station is situated right outside the entrance building in order to facilitate the arrival and departure of large crowds of visitors, as well as a taxi parking lot for convenient transportation. However, there is a large underground garage in case anyone would prefer to arrive by car.

# ACOUSTICS

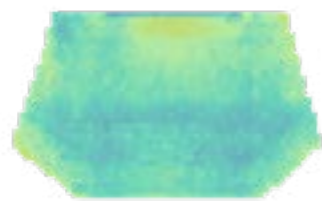
Reverberation time (T-30)  
Inside the cave



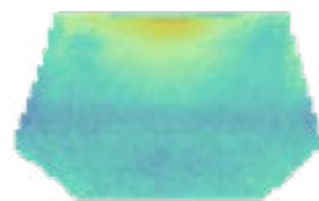
Reverberation time (T-30)  
Rehearsal room and stage



The acoustical properties in the rehearsal room resemble the acoustics of the stage in order for the performers to rehearse in a familiar environment. The main materials in the rehearsal room are plywood and curtains with stone floor to resemble the stage. As seen in the graph, the reverberation time in the rehearsal room is similar to the reverberation time on stage.



Clarity (C-80)  
Forward position

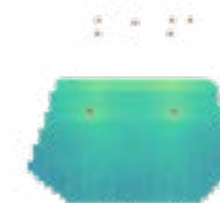


Sound pressure level (SPL)  
Forward position

When the stage is in the forward position, the natural acoustics fill the entire cave that holds the seated audience. The interior is covered with a porous stone material which absorbs some sound to reduce the reverberation time. For the lower frequencies the inside of the walls are constructed with Helmholtz absorbers. This leads to a reverberation time of 2.3 seconds, and the acoustics resemble that found inside a natural cave

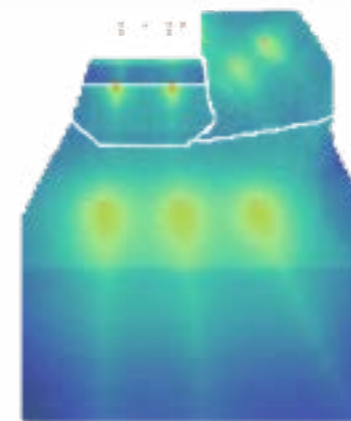
With the reflective and rough stone walls inside the cave the sound pressure level and clarity are quite even throughout the space, with only about a 5 dB difference in sound pressure level between the front and the back. By increasing the absorption on the stage wall, the stage roof, and the underside of the ribbon, late reflections are reduced, improving the clarity within a range of 0 to 5 dB which is ideal for concert halls.

Sound pressure level (SPL)  
Back position with speakers

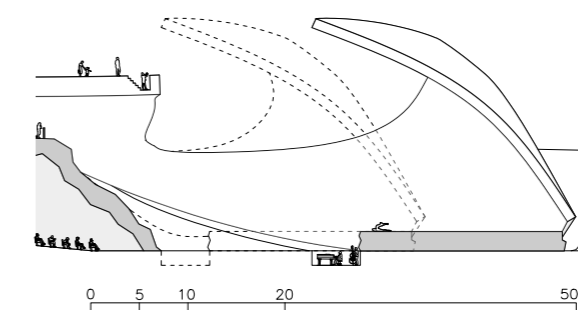
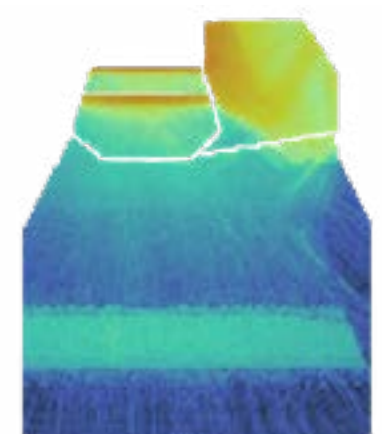


Inside the cave

Sound pressure level (SPL)  
Back position without speakers

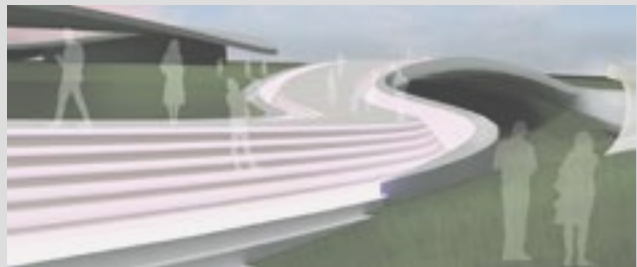


Outside the cave



The forward and back position of the stage

# PRESENTATION POSTERS



Walk on the ribbon

## ZONES



### THE CAVE

For a lush and peaceful experience, the widest section of the ribbon creates a cave in back of the stage. With a capacity of 5,000 people, the cave provides the best sight and natural acoustics for the seated patrons.

### THE LAWN

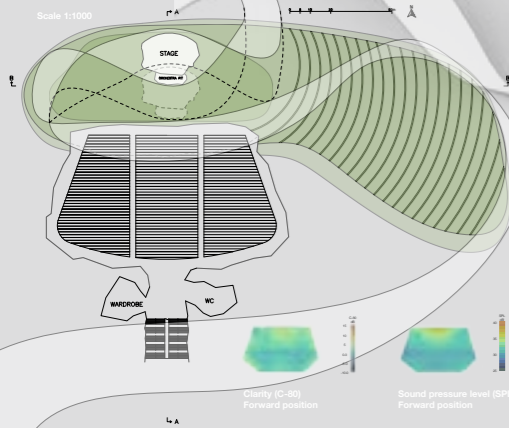
The lawn in the slope to the left of the stage provides a large area for the patrons who want to enjoy the music while having the freedom to move around during and have a chat with people.

### THE FEARLESS ZONE

The most unique experience is only for the fearless patrons. The zone is accessed by walking onto the ribbon and provides a good sight of the whole site and an adrenaline rush. On top of the ribbon, the concert can be enjoyed coming from beneath the feet while feeling the ground to vibrate up to the site.

### THE MINGLE ZONE

For a more relaxed experience, the mingle zone provides a large area for the patrons who want to enjoy the music while having the freedom to move around during and have a chat with people.



## ACOUSTICAL PROPERTIES



The ribbon functions as both a reflector and an absorber in different parts of the structure to ensure the best acoustic properties in different areas. The reflective and absorbent properties are achieved using different surface materials.

The absorbing parts are covered with different types of acoustic panels and are made above the stage and the cave to prevent too much echoing for the seated audience inside the cave. It is also used on the ribbon near the road to prevent the road from entering the site.

For the reflecting parts of the ribbon and the roof that do not require any specific acoustic properties, the surface is made of smooth concrete. The area ribbon is painted white to create a seamless and uniform appearance.

## SPEAKER SETTING



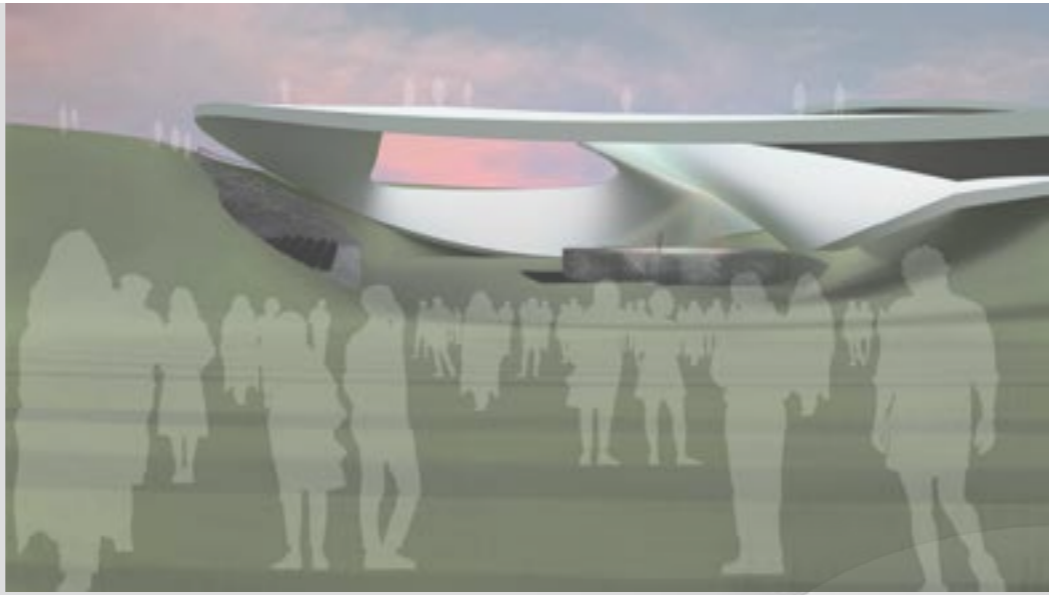
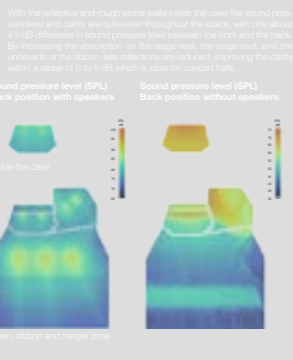
One of the many properties of the ribbon is to function as a guitar for speakers. These are permanently placed on various parts of the ribbon, aimed in the most optimal angles to create a pleasant acoustic environment for the areas that will not be populated with natural acoustics. There are speakers located on the ribbon above the large stage area for the people who want to enjoy the performance at a distance. For the people walking on top of the ribbon above the stage area, the speakers are located at the bottom, creating a unique effect of music coming from beneath their feet. Furthermore, there are speakers located above the stage to support the acoustics during performances with a stage audience.

## ACOUSTICS

**CAVE FEATURES**

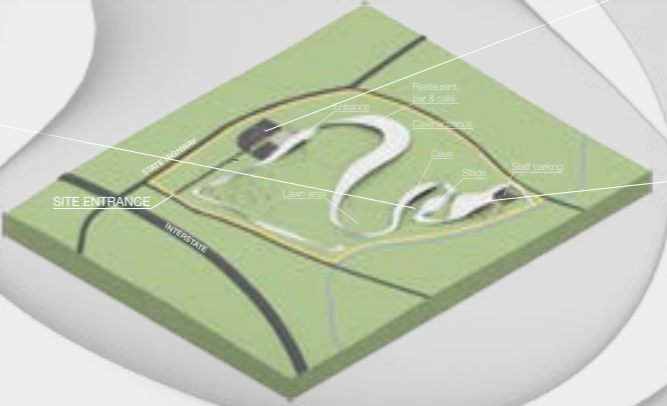
For the stage in the forward position, the natural acoustics fill the entire cave that holds the seated audience. The stage is covered with a porous stone material which absorbs some sound to reduce the reverbation time. For the lawn frequents the sides of the walls are constructed with fiberoptic absorbers. This leads to a reverbation time of 2.2 seconds, and the acoustic materials that sound inside a natural cave.

With the reflective and rough stone walls inside the cave the sound pressure level and clarity are consistent throughout the space, with only about a 5 dB difference in sound pressure level between the front and the back. By lowering the absorption on the stage wall, the stage roof, and the underside of the stage, side reflections are reduced, improving the clarity within a range of 0 to 5 dB which is ideal for concert halls.



# THE SOUND RIBBON

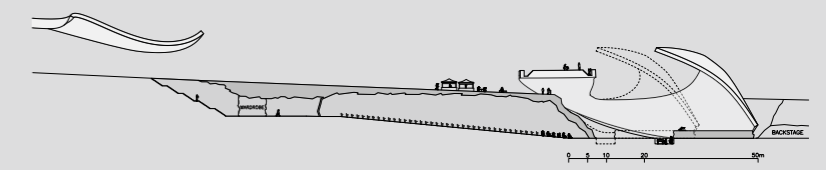
Linda Yoko  
Lisa Kolberg  
Spencer Mason



Like sound waves the ribbon spreads across the site, providing a pleasant acoustic environment for everyone. The ribbon flows up and down, intertwining every function on the site and creating natural paths to walk along, beneath and upon, all the way from arriving at the site to the stage area where the performance will be enjoyed. Along the way the ribbon provides several different functions to create a unique experience for the visitors interacting with it.

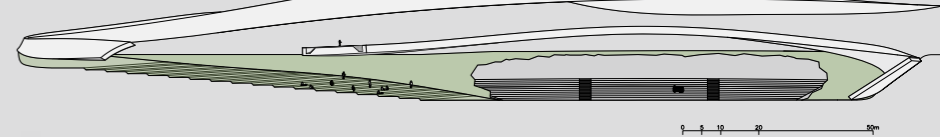
## STAGE AREA

Section A-A



## LAWN AREA

Section B-B



## ENTRANCE AREA

Section C-C

Section D-D

Section E-E

Section F-F

Section G-G

Section H-H

Section I-I

Section J-J

Section K-K

Section L-L

Section M-M

Section N-N

Section O-O

Section P-P

Section Q-Q

Section R-R

Section S-S

Section T-T

Section U-U

Section V-V

Section W-W

Section X-X

Section Y-Y

Section Z-Z

Section AA-AA

Section BB-BB

Section CC-CC

Section DD-DD

Section EE-EE

Section FF-FF

Section GG-GG

Section HH-HH

Section II-II

Section JJ-JJ

Section KK-KK

Section LL-LL

Section MM-MM

Section NN-NN

Section OO-OO

Section PP-PP

Section QQ-QQ

Section RR-RR

Section SS-SS

Section TT-TT

Section UU-UU

Section VV-VV

Section WW-WW

Section XX-XX

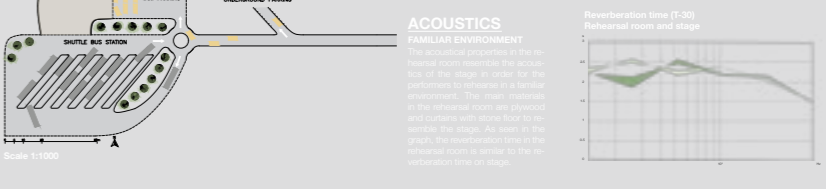
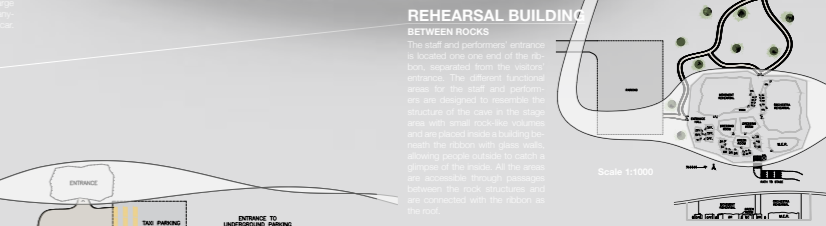
Section YY-YY

Section ZZ-ZZ

Section AA-AA

Section BB-BB

Section CC-CC



## REHEARSAL BUILDING

Section A-A

Section B-B

Section C-C

Section D-D

Section E-E

Section F-F

Section G-G

Section H-H

Section I-I

Section J-J

Section K-K

Section L-L

Section M-M

Section N-N

Section O-O

Section P-P

Section Q-Q

Section R-R

Section S-S

Section T-T

Section U-U

Section V-V

Section W-W

Section X-X

Section Y-Y

Section Z-Z

Section AA-AA

Section BB-BB

Section CC-CC

Section DD-DD

Section EE-EE

Section FF-FF

Section GG-GG

Section HH-HH

Section II-II

Section JJ-JJ

Section KK-KK

Section LL-LL

Section MM-MM

Section NN-NN

Section OO-OO

Section PP-PP

Section QQ-QQ

Section RR-RR

Section SS-SS

# PROCESS



The idea about a band linking the different places on the site together came pretty early in the process. We thought that the site was really large and we wanted to use all of the space with something. Therefore, we made the band flow around the whole site, to intertwine the different functions.



We made the band to a "red thread", where you as a visitor could follow the band from the entrance to the restaurant, the lawn area to lastly the stage. We wanted to have the performers get the same experience, so we placed the performers entrance at the other end of the band.



The next big design process we had was to fix how we wanted to have the seated audience. We both didn't want to put the standing audience behind the seated audience. This would make them be too far from the stage to be able to see something. We also wanted the seated audience to have more of a luxurious experience, where they would not get distracted by the standing audience talking and dancing. Therefore we had the idea to have the seated audience beneath the standing audience, so that the seated could have a peaceful experience while the people on top could party. This gave complications with the sight, so we had to make analyses, making sure that as many people as possible could see the stage.



One idea we had that later disappeared was to have water on the excavation. This was to have natural drainage of the pit as well as be an acoustical feature. When we had to have a moving stage, the water had to be sacrificed. Since it wasn't a big part of our concept, it didn't matter that much.

# REFLEKTION

Jag är väldigt nöjd med vårt projekt och tycker det var en bra uppgift för att knyta an de kunskaper vi lärt oss under dessa tre åren. Vi började verkligen med en blank kanvas, där vi inte hade någon aning vad vi skulle kunna göra. Vi började fundera på om vi kunde använda ett möbiusband som koncept, där hela planen var sammanlänkad. Därifrån kom konceptet om bandet som vi utgick ifrån. I hela processen försökte vi förhålla oss till att bandet skulle få så mycket utrymme i konceptet som möjligt och att alla övriga funktioner skulle integreras i detta bandet.

Det andra conceptet vi höll fast vid var att ha olika typer av upplevelser beroende på vad du är för person. Detta var hur iden av grottan kom fram. Grottan gav även många komplikationer, som att få den stående publiken att kunna se scenen lika bra. Vi ville inte släppa grottan, då det var en del av vårt concept att få de sittande separerade från de stående. Vi valde att ha de bra ståplatserna på sidan av scenen och göra platsen över grottan till en festivalzon, där tanken inte är att titta på scenen utan att njuta av musiken.

Jag tycker samarbetet mellan oss gick bra. Vi båda har liknande tankar och ambitioner vilket underlättade i projektet. Med omständigheterna på grund av Covid-19 arbetade vi mesta tiden hemifrån och videosamtalade via zoom. Det gick för det mesta bra, då vi kunde dela med oss av arbetet genom att dela skärm och skicka över filer. Det negativa blev att vi inte hade samma möjlighet att tillsammans undersöka och experimentera.

Vi komplementerade varandra bra med våra svagheter och styrkor. Jag arbetar väldigt snabbt och har enkelt för att få fram ideer och visioner snabbt. Däremot är jag sämre på att färdigställa ritningar och det blir ofta väldigt rörigt när jag arbetar själv. Linda, som jag arbetade med, är bättre på att göra snygga ritningar och förbättra idéer.

Vi hade mycket planer och tankar kring parkering och hur gången till platsen skulle vara och hur man som besökare på platsen kan utnyttja den till fullo. Detta tror jag vi båda hade mycket i åtanke men inte fick med i sista presentationen.

Vi hade ett bra samarbete med akustikern och behövde inte ändra något stort i vårt koncept för att få akustiken att fungera. Vi hade lite otur i att inte ha en akustiker när vi skulle börja med akustikern då vår akustiker hoppade av, men vi gick snabbt in i akustikern när vi väl fick vår akustiker. Detta gjorde att vi inte fick integrerat akustikern så mycket. Den största förändringen vi gjorde var att få scenen att kunna flytta på sig, så den kan stå nära grottan. Detta då vi ville att scenen fortsatt kunde vara längre bak vid stora konsärer så att fler personer kan se.

Vi diskuterade hurvida bandet skulle vara reflekterande eller absorberande. Innan vi pratade med akustikern var min uppfattning att ha de mesta ytor reflekterande för att "stutsa in ljudet i grottan". Det jag lärde mig var att ju mer ljudet studsar, desto mer eko blir det. Därav bör de flesta ytor längre bort från publiken vara absorberande. I slutändan var de mesta av ytorna absorberande, med något undantag.