

Reclaiming Altered Landscapes: The Bingham Canyon Mine Memorial

Dafer S. Haddadin

A thesis

submitted in partial fulfillment of the
requirements for the degree of

Master of Architecture

University of Washington

2012

Committee:

Brian McLaren

Brad Khouri

Program Authorized to Offer Degree:

Architecture

CONTENTS

1. INTRODUCTION	1
2. THEORETICAL FRAMEWORK	3
2.1 THE AMERICAN INDUSTRIAL SUBLIME	3
2.2 RECLAIMING THE MINING LANDSCAPE	7
2.3 THE RUIN	10
2.4 CONCLUSION	12
3. SITE ANALYSIS	15
3.1 HISTORY OF THE BINGHAM CANYON MINE	15
3.2 TOURISM AT THE BINGHAM CANYON MINE: INDUSTRIAL NOSTALGIA	20
3.3 DESIGN PROBLEM AND STRATEGIES	22
4. DESIGN PROPOSAL	25
4.1 OPEN PIT MINING AS NARRATIVE : FIVE INTERVENTIONS	25
4.2 WATER QUALITY MONITORING AND RESEARCH FACILITY	27
4.3 CIRCULATION PATH: REST STOPS & ORE TUNNEL REUSE	32
4.3.1 INTERVENTION ALONG HIKING PATH: MEDIATING SCALE	35
4.4 REUSE OF ORE TUNNEL: CONVEYING	35
4.5 MUSEUM	39
5. CONCLUSIONS	47
BIBLIOGRAPHY	49

LIST OF FIGURES

Figure 1.1 - Bingham Canyon Mine	2
Figure 1.2 - Bingham Canyon Mine Wasterock	2
Figure 2.1.1 - Natural Bridge of Virginia	4
Figure 2.1.2 - Hoover Dam.	5
Figure 2.1.3 - Grand Canyon	6
Figure 2.1.4 - SkyWalk at Grand Canyon	6
Figure 2.2.1 - Reclaimed wasterock dump in the foreground	7
Figure 2.2.2 - Bingham Pit USGS Map	8
Figure 2.2.3 - Lavender Mine, Bisbee, AZ	10
Figure 2.2.4 - <i>Above Below</i> , aerial rendering	10
Figure 2.3.1 - Saint-Ours Les Rouches, France	11
Figure 2.3.2 - Aerial view of Vulcania Museum	11
Figure 2.3.3 - Plaza of Vulcania Museum	12
Figure 2.3.4 - Pathway to extinct crater	12
Figure 3.1.1 - Satellite image of Bingham Canyon Mine	15
Figure 3.1.2 - Bingham Canyon Mine	14
Figure 3.1.3 - Bingham Canyon, 1926	16
Figure 3.1.4 - Bingham Canyon Mine, 1926	16
Figure 3.1.5 - Bingham Canyon Mine, 1941	16
Figure 3.1.6 - Bingham Canyon Mine, 1946	17
Figure 3.1.7 - Bingham Canyon Mine, 1973	17
Figure 3.1.8 - Bingham Canyon Mine, 2003	17
Figure 3.1.9 - Brief History of the Bingham Canyon Mine	18
Figure 3.1.10 - Existing conditions	19
Figure 3.1.11 - Bingham Canyon (left) vs Bingham Canyon Mine (right)	19
Figure 3.2.1 - Mine tourism in 1944	20
Figure 3.2.2 - Mine Tourism in 2012	21
Figure 3.3.1 - Drilling & Blasting	23
Figure 3.3.2 - Carving	23
Figure 3.3.3 - Loading & Hauling	23
Figure 3.3.4 - Crushing & Conveying	23
Figure 4.1.1 - Mining Process.	26
Figure 4.2.1 - Acid mine drainage (orange) at Bingham Canyon Pit	27
Figure 4.2.2 - Pit-Lake at Berkeley Pit in Butte, Montana.	27
Figure 4.2.3 - Engineers & Researcher access route (Yellow)	28
Figure 4.2.4 - Engineers & Researcher access route & future pit-lake	28
Figure 4.2.5 - Future pit-lake, research and monitoring facility and boat	29
Figure 4.2.6 - Research and Water monitoring facility	30
Figure 4.2.7 - North-south site section	31

LIST OF FIGURES (CONTINUED)

Figure 4.2.8 - Section through housing units	31
Figure 4.3.1 - Part of the existing ramp	32
Figure 4.3.2 - Hiking path (Black)	33
Figure 4.3.3 - Hikers & cyclists access route	33
Figure 4.3.4 - 1	34
Figure 4.3.5 - 2	34
Figure 4.3.6 - 3	34
Figure 4.3.7 - 4	34
Figure 4.3.8 - 5	34
Figure 4.3.9 - Site plan showing path, and future pit-lake	34
Figure 4.3.1.1 - Hiking path and aged terraces after closure	35
Figure 4.3.1.2 - Approaching the Rest Stop: Mediating scale	36
Figure 4.3.1.3 - Going up into the carved space: Mediating scale	36
Figure 4.4.1 - Light-wells marking the tunnel on the landscape	38
Figure 4.4.2 - Interior of tunnel	38
Figure 4.5.1 - Car access (Red)	40
Figure 4.5.2 - Descending down towards lobby	41
Figure 4.5.3 - North-South site section	41
Figure 4.5.4 - Upper level floor plan	42
Figure 4.5.5 - Section through exhibit and lower floor plan	42
Figure 4.5.6 - Approach to cantilevered bridge	44
Figure 4.5.7 - Freight elevator (left), underground exhibit (right)	44
Figure 4.5.8 - Section model through exhibit space	45
Figure 4.5.9 - Exterior stairs leading to exhibit	45
Figure 4.5.10 - Exterior View	46
Figure 5.1 - Museum, research facility and rest stops	48

ACKNOWLEDGEMENTS

The author wishes to thank the architecture graduate faculty, specifically professors Brian McLaren, Brad Khouri , Louisa Iarocci for their time and efforts. A thank you for Joshua Distler from LMN Architects for taking the time to give continuous feedback for this thesis. Thanks to the generosity of Stefan Georgi, Sam Scholes and Ryan Houston for sharing their photographic work that helped visualize this thesis. Finally, a special thanks for family and friends for their support and encouragement.

1. INTRODUCTION

The mining of nonrenewable resources in America has created landscape alterations that are vast and permanent. These landscapes have created and erased entire communities in order to extract ore for human use. Despite their destructive character, working open-pit mines have also become tourist attractions to the public. When abandoned, mines often take on qualities of repulsion and attraction as nature reclaims such sites. These ruined landscapes have been open to interpretation, often misread as “natural” even when they are undeniably artificial. This thesis will explore the reclamation of the lost memories of these altered landscapes through a narrative architecture.

The Bingham Canyon Mine near Salt Lake City is the site of this investigation (see figures 1.1-2). The project offers a vision of the site after the closure of the mine in 2036. The term “narrative architecture” is used to describe how the project will recover the stories of past use of the site and relate them to its future use. The project will explore the site as a ruin and remain to memorialize the site and educate the visitor about the mine in its industrial and natural past while projecting it into its future state. These qualities will be demonstrated in the form of a memorial park



Figure 1.1-Bingham Canyon Mine. Courtesy of author



Figure 1.2-Bingham Canyon Mine Wasterock. Courtesy of author

that will include architectural interventions addressing the broad set of future users. In so doing, it will address its physical scale, the historical references of erased communities and the practicality of circulating in the present site. These interventions include a museum, a research and water monitoring facility and other interpretive structures that the visitor can experience through trail paths that reuse existing mine circulation infrastructure.

The goal of this thesis is to explore how architecture can be utilized to reclaim the past and restore a new meaning to the lost landscape of the Bingham Canyon Mine. I will use the notion of the American technological sublime to understand the attraction people have to industrial landscapes. Then specific attention will be given to reading and perceiving the mined landscape as a ruin. Various spatial strategies will be examined through an analysis of built and proposed precedents on sites of similar nature.

2. THEORETICAL FRAMEWORK

2.1 THE AMERICAN INDUSTRIAL SUBLIME

According to the Oxford English Dictionary the sublime is an object “of such excellence, grandeur, or beauty as to inspire great admiration or awe.” In his book *American Technological Sublime*, David Nye analyzes the American fascination with the sublime that has found expression in forms that are both natural and man-made. Nye notes that the fascination with sublime landscapes is evident in tourism, as millions of Americans travel the country to visit parks and forests that have become a source of identity and pride.

In discussing the effects of the sublime, Nye states that the observer usually receives conflicting messages in the form of attraction and repulsion, and of delight and horror. This opposition suggests a contradiction at the core of the sublime experience that invites people to interpret a sudden expansion of aesthetic experience that represents human power but at the same time evokes the sense of individual insignificance and powerlessness (Nye, 1994).

The traditional sites of sublimity in the United States are natural places of extreme grandeur and power like the Grand Canyon and Niagara



Figure 2.1.1-Natural Bridge of Virginia.
<http://www.virginiaplaces.org/cave/index.html>

Falls. Not only do these sites inspire feelings of awe and intense emotion due to their scale, they also evoke a sense of mystery. These places question how things are made since they exceed our understanding. Nye argues that ideally the sublime is an experience that is unexpected and sudden. Many travelers had been familiar with such sites before visiting through images.

In his essay, “Notes on the State of Virginia”, Thomas Jefferson describes a natural bridge he encountered near Glasgow, Virginia in 1767 (see figure 2.1.1): “It is impossible for the emotions arising from the sublime to be felt beyond what they are here; so beautiful an arch, so elevated, so light, and springing as it were up to heaven, the rapture of the spectator is really indescribable” (Nye,1994,p.19). Jefferson notes that the formation of the bridge seems to have been a result of a great convulsion in the Earth. The aesthetic experience of the natural sublime is described as an emotional one that transcends rationality yet at the same time provokes thoughtful questions.

Nye argues that in nineteenth century America, the sublime experience became increasingly focused on man-made objects. This fascination with technology from factory machinery to engineered works like bridges and dams

might be argued to be not just an American phenomenon. These technological works are both utilitarian and symbolic; evoking a sense of beauty and terror at the same time. The industrial environment can therefore offer a unique combination of technological processes in natural settings; producing the complex aesthetic response Nye calls the technological sublime.

The phenomenon of tourism linked to the sublime has been evident in what Nye calls “the consumerist sublime”, which has emerged as people look for new sensations of empowerment by using both the natural and man-made as a commodity. Modern transportation infrastructures provide tourists today with easy and convenient access to these sites. In addition, growing interest in heritage history has become popular ever since the American Bicentennial in 1976 (Francaviglia,1991). Natural parks and man-made sites are being appreciated not as just icons of nature’s power but as places of refuge from the stressful life of the city. The Hoover Dam (see figure 2.1.2) for example received around 750,000 visitors in the mid-thirties, to witness it at night, illuminated with artificial lighting (Nye, 1994). Visitors of the Grand Canyon have also sought out more than the natural site offers, with events like light shows and boat rides and amenities like elevators and luxury hotels.



Figure 2.1.2-Hoover Dam.
<http://www.visitingdc.com/las-vegas/hoover-dam-directions.asp>



Figure 2.1.3 Grand Canyon
<http://travelblog.viator.com/grand-canyon-national-park-happy-90th-birthday/>



Figure 2.1.4 SkyWalk at Grand Canyon
<http://www.telegraph.co.uk/news/worldnews/northamerica/usa/9713127/Grand-Canyon-64-million-years-older-than-previously-thought.html>

The recently built Grand Canyon Skywalk in Arizona is an example of a consumerist sublime experience. The tourists of the Grand Canyon (see figure 2.1.3) are not so much concerned with its history but rather with how to enhance their personal experience of the site. The design of the skywalk itself is a complex work of engineering, as it cantilevers out into the air 70 ft. providing a more dramatic view of the Canyon (see figure 2.1.4). As the visitor walks on the skywalk, he/she is faced with a glass floor that looks down on the base of the canyon. The tourist experience has been made even more awe inspiring and thrilling than from the typical view. The skywalk has not necessarily added any meaning or explanation, but instead acts as a catalyst for consumerist sublimity, the experience Nye describes.

In their essay in *Technologies of Landscape: From Reaping to Recycling*, Peter Goin and Elizabeth Raymond describe the relationship between tourism and mining landscapes based on the term previously coined by Richard Francaviglia -“technostalgia”. Goin and Raymond point that mining landscapes are so vast and complex that making them appealing to the modern viewer requires a lot of imagination. In industrial tourism, the tourist requires more instruction to comprehend what they observe. They note that mining companies now seek to present their history in a way that is educational and recreational. This is done through historic markers, photographic

exhibitions and displays of mining equipment often in a park setting (Nye, 1999). As Goin and Raymond argue, the land is perceived as a symbol of the nation even while it is being transformed into a manufactured landscape.

2.2 RECLAIMING THE MINING LANDSCAPE

The American West has around 200,000 abandoned and active mines covering millions of acres (Berger, 2002). In his book *Reclaiming the American West*, Allen Berger documents the immense scope of the surreal landscapes left by mining in the west, revealing the scale of the environmental problem and the complexity of the ambiguous aesthetic perceptions. Mining companies are responsible for reclaiming the landscapes, that bear the scars of years of mining legacy. But these reclaimed landscapes seem natural even though they have been radically altered, (see figure 2.2.1) (Berger, 2002). Acting as icons of our cultural habits of consumerism, Berger poses the question as to whether the history and legacy of mining should be acknowledged or concealed. He raises the question as to whether these post-mine industrial topographies should be kept and integrated into a new landscape narrative or returned to their original conditions.

Mining landscapes consist of both the land formations that are the site of excavation and the mining towns built to house the workers. In his



Figure 2.2.1-Reclaimed wasterock dump in the foreground. Allen Berger, *Reclaiming the American West*

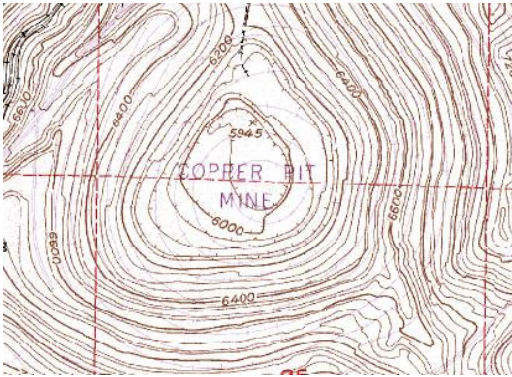


Figure 2.2.2-Bingham Pit USGS Map
<http://www.topozone.com/map.asp?lat=40.52222&lon=-112.14861>

book *Hard Places* Richard Francaviglia argues that both the natural and man-made fabric has historic traces in their topography, town planning and architecture. These sites are the product of altered topographies, vegetation, and of engineering structures and habitable buildings (Francaviglia, 1991). While situated according to recognizable street patterns, transportation lines and industrial infrastructures, these landscapes are visually complex and hard to understand. Francaviglia argues that the spatial character of mining districts can be analyzed to their site, layout and architecture.

Francaviglia notes that the best way to understand the complexity of mining districts is through United State Geological Survey (USGS) maps which can capture the entire site and still show details of the terrain, transportation lines, and industrial infrastructure (see figure 2.2.2). In mining sites the contour lines are a particularly important indicator of the extent of how much man has interfered with the land. Open pit mines are usually categorized by a series of benches or terraces, forming the sides of the pit each around 40 to 50 ft. high. Open-pit mining usually removes a large amount of overburden, or waste material in order to expose and remove the ore itself. As the ore is removed, this waste rock is dumped around the pit to create spectacular man-made mountains that dominate the horizon of mining districts. At times measuring up to a thousand feet, these huge walls

of rock can identify a mining site from a vast distance (Francaviglia, 1991).

The process of mining has an aesthetic component in itself. In describing the surface mining of the copper ore deposits in the West, Mesabi Range, the president of the Homestake Mining Company wrote: "Even from an aesthetic standpoint, the result is not distasteful, for the terraced walls resulting from the removal of ore in successive benches have a peculiar beauty of their own." Although reflecting a corporate bias, the company's statement shows that they are aware of the aesthetic impact of their industry and seek to promote it as a positive one. But the creators of these landscapes are faced with a dilemma in trying to argue for the land art they have created and dealing with its environmental consequences at the same time. Francaviglia observes that documented conversations with travelers and residents in the West show that people cannot tell the difference between natural and man-made topography (Francaviglia, 1991). For example the abandoned Berkeley pit in Montana, has been filled with toxic water creating an emerald green lake that has attracted visitors as a tourist site (Francaviglia, 1991).

Francaviglia observes that the spectator needs to pay attention to the impact of both the temporal and spatial interventions on the mined landscape.



Figure 2.2.3 - Lavender Mine, Bisbee, AZ
<http://www.legendsofamerica.com/weminingtypes2.html>

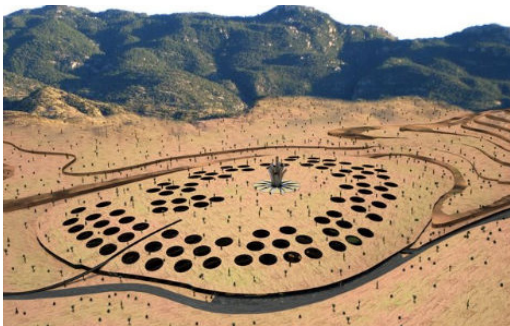


Figure 2.2.4 - *Above Below*, aerial rendering. Courtesy of Mathieu Fromboluti
<http://artnectar.com/2010/10/architecture-above-below-subterranean-sufficient-skyscraper-city/>

With time nature softens open pit mines, so they take on a character very similar to the natural vertical cliffs of a site like the Grand Canyon. He notes that the mining landscapes can evolve in a way that allows them to suggest natural features especially after they are abandoned. One approach to the reuse of abandoned pits is seen in *Above Below* - a student project in the Lavender Mine in Bisbee Arizona (see figure 2.2.3).

This project consists of an underground city which would be illuminated by skylights from a roof that covers the 300-acre open-pit mine. The roof houses all the functions of this self-sustaining community- farming, green spaces, and housing. The farming happens on the terraced benches of the mine, which likely fail due to the toxicity of the soil (see figure 2.2.4). This speculative project raises issues related to the visibility of the altered landscape. It proposes erasing the industrial sublime with all of its history and covering it with a complete superficial “oasis.” This kind of design strategy of concealment ignores the ruin and leaves no room for interpretation in order to confront the past.

2.3 THE RUIN

In *Spatial Recall: Memory in Architecture and Landscape* Marc Treib discusses the validity of post-industrial objects in today’s society through

the lens of the “remain” versus the “ruin.” According to Trieb: “A ruin is a fragment of a whole that somehow, some way, embodies a sense of prior times. Even in its incompleteness the fragment suggests a greater entity once whole. The ruin provokes our memories.” In contrast, Treid notes that the remain feels as a whole in itself, therefore open to interpretation. So the question remains as to how to deal with the industrial remain in isolation as an educational and historical site?

One answer can be found in Saint-Ours les Rouches, France (see figure 2.3.1). The Vulcania Museum designed by Hans Hollein shows how architecture can play a role in adding a layer of meaning to the ruin of the natural sublime (see figure 2.3.2). The extinct volcanoes that dominate the landscape of the area including volcanic rock and craters are left as natural scars on the earth. The architecture of the museum has a pedagogical aspect to it- the visitor here does not go there to wonder or look for clues and explanations, but instead to learn.

The complex consists of exhibit halls, research and conference facilities, greenhouses and restaurants that provide amenities for visitors while educating them about volcanism. The circular configuration of this complex, the underground exhibit space and the cone shaped tower all symbolize



Figure 2.3.1 - Saint-Ours Les Rouches, France
<http://www.life-semeau.eu/en/node/86>



Figure 2.3.2 - Aerial view of Vulcania Museum.
<http://www.hollein.com/eng/Architecture/Typology/museums-cultural-buildings/Vulcania>



Figure 2.3.3 - Plaza of Vulcania Museum.
<http://www.hollein.com/eng/Architecture/Typology/museums-cultural-buildings/Vulcania>

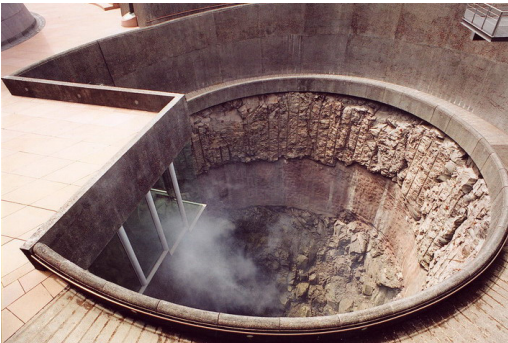


Figure 2.3.4 - Pathway to extinct crater.
<http://www.hollein.com/eng/Architecture/Typology/museums-cultural-buildings/Vulcania>

the elements of the terrain associated with the extinct volcanoes (Wines, 2000). Hollein orchestrates this learning experience space by taking the visitor through a long ramp down towards a metaphorical Volcano- a cone shaped artificial crater, which is the focal point of the museum (see figures 2.3.3). In this complex the visitor can literally see what happens under the earth as they descend into the top of the extinct crater.

The Integration of the architecture into the remains of the volcano immerses the visitor in what otherwise exists as separate ruin in the landscape (see figure 2.3.4). The natural imagery and iconography evident in the cone-shaped elements gives an identity and sense of place to the volcanic site. The buildings and landscape here respond together to the curiosity of the visitor about the eruptions that have formed the earth. This narrative allows the visitor interpret this aesthetic sublime, an experience otherwise would remain incomplete.

2.4 CONCLUSION

Mining landscapes in America play an integral part of modern life. Dominating the landscapes of the west, they evoke feelings of attraction and repulsion, in the viewer. The fascination with these sites of industry is related to the experience of the aesthetic sublime, the feeling of

powerlessness and awe when encountering these symbolic yet utilitarian landscapes. This industrial nostalgia has given rise to tourism of these mining sites and towns. Once abandoned, these places have become ruins that with time take on qualities of natural sites, and hence are open to interpretation and misreading of their original historic meaning.

Through the study of architectural precedents on sites of sublimity, architecture can be seen to have a role in narrating events related to the sublime. Architectural iconography and symbolism can be used to allude to the natural imagery of the site or the industrial processes related to them. In addition, the integration of buildings with the landscapes of the sublime can offer the viewer an educational experience that provides the didactic experience the visitor requires and the sites deserve.



Figure 3.1.2 - Bingham Canyon Mine. Photo courtesy of Stefan Georgi

3. SITE ANALYSIS

3.1 HISTORY OF THE BINGHAM CANYON MINE

The Bingham Canyon Mine is located in the Oquirrh Mountains, southwest of Salt Lake City (see figure 3.1.1). The site is an open pit mine that produces copper as the main product, and gold, silver and molybdenum as by-products. Around six billion tons of earth has been removed from the pit, leaving a scar in the earth that is approximately 3 miles wide and 1 mile deep (see figure 3.1.2) (Goin & Raymond, 2004). According to a report released in 2009 by the U.S Environmental Protection Agency, the mine is considered to be the second most polluting mine in the US in terms of toxic releases. Kennecott Utah Copper, a subsidiary of the global mining company Rio Tinto, owns the mine. The complex is considered to be a vital economic asset for the state of Utah, as it currently employs around 2,400 of the state's residents. The mining site was designated a National Historical Monument in 1972 (Goin & Raymond, 2004).

The Bingham area was Utah's first mining district, founded when lead was discovered in 1863 in a canyon that had been named after the two brothers Thomas and Sanford Bingham who first settled the area in 1848 (Crump). Gold was also discovered, but was not mined for religious reasons. Lead and silver were produced in the area for the rest of the century until

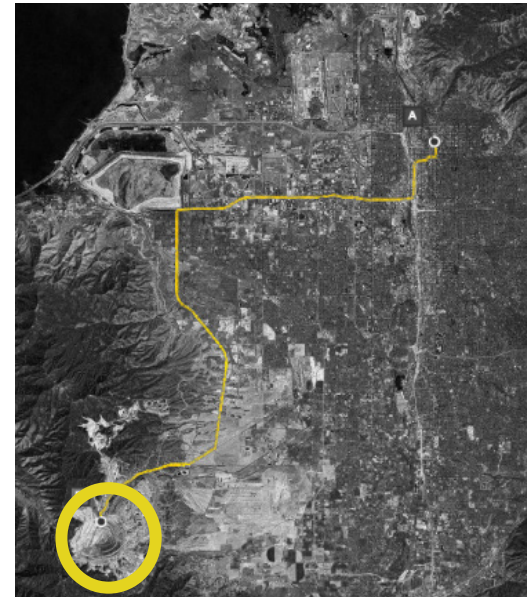


Figure 3.1.1 - Satellite image of Bingham Canyon Mine



Figure 3.1.3 -Bingham Canyon, 1926. Photograph courtesy of Special Collections Department J. Willard Marriott Library University of Utah



Figure 3.1.4 -Bingham Canyon Mine, 1926. courtesy of Eldon Bray, *Copperfield Remembered*



Figure 3.1.5 -Bingham Canyon Mine, 1941. courtesy of Eldon Bray, *Copperfield Remembered*

mining came to a stop at the cusp of the 1893 depression (Goin & Raymond, 2004). The existence of copper was well known, but mining copper was not profitable due to the high costs of underground mining at that time. But as the demand for electricity increased, so did copper production at Bingham.

Steam shovels began digging Bingham Canyon ore in 1906. With financing from the Guggenheim family, the Utah Copper Company claimed many copper sources on the mountain, building their processing facilities near the area (Goin & Raymond, 2004). In 1899 the company did studies that predicted profitability in an open-pit method. Since this mining method did not require highly skilled labor, the company recruited workers from around the world. Towns for these workers were divided into neighborhoods according to ethnicity throughout the narrow canyon. Some settlements like Copperfield and Highland Boy were well established communities with proper infrastructure, while others remained temporary camps and informal settlements such as “Japtown” and “Frog Town”, reflecting the racial biases of the time.

The communities that arose over the years to serve the mine have been gradually destroyed as the need for ore and space to store waste rock took precedent over the need to house the company’s employees. Since very little of the material mined contains copper, the remaining waste rock that

contains no ore, and tailings that remain after the processing of the ore, need to be stored somewhere. As a result over the years, a huge man-made waste rock hills now tower 1000 feet above the valley, covering around 9000 acres (Goin & Raymond, 2004) (see figure 3.1.10). In the late 1950s, Kennecott Copper began destroying the historic towns of Bingham Canyon intentionally, a strange sign of success (Goin & Raymond, 2004).

The towns that once served the company have been sacrificed to extend the life of the mine. By the 1970's all traces of the old towns had disappeared, (see figures 3.1.3-8), many workers either moved to Copperton- a nearby town built by the Company, or to Salt Lake City. As mining technology has advanced, fewer workers are needed, especially with the introduction of the big hauling trucks and electric shovels. As of today the mine is still active with plans for it to remain in operation until 2036.



Figure 3.1.6 -Bingham Canyon Mine, 1946. courtesy of Eldon Bray, *Copperfield Remembered*



Figure 3.1.7 -Bingham Canyon Mine, 1973. courtesy of Eldon Bray, *Copperfield Remembered*



Figure 3.1.8 -Bingham Canyon Mine, 2003. courtesy of Eldon Bray, *Copperfield Remembered*

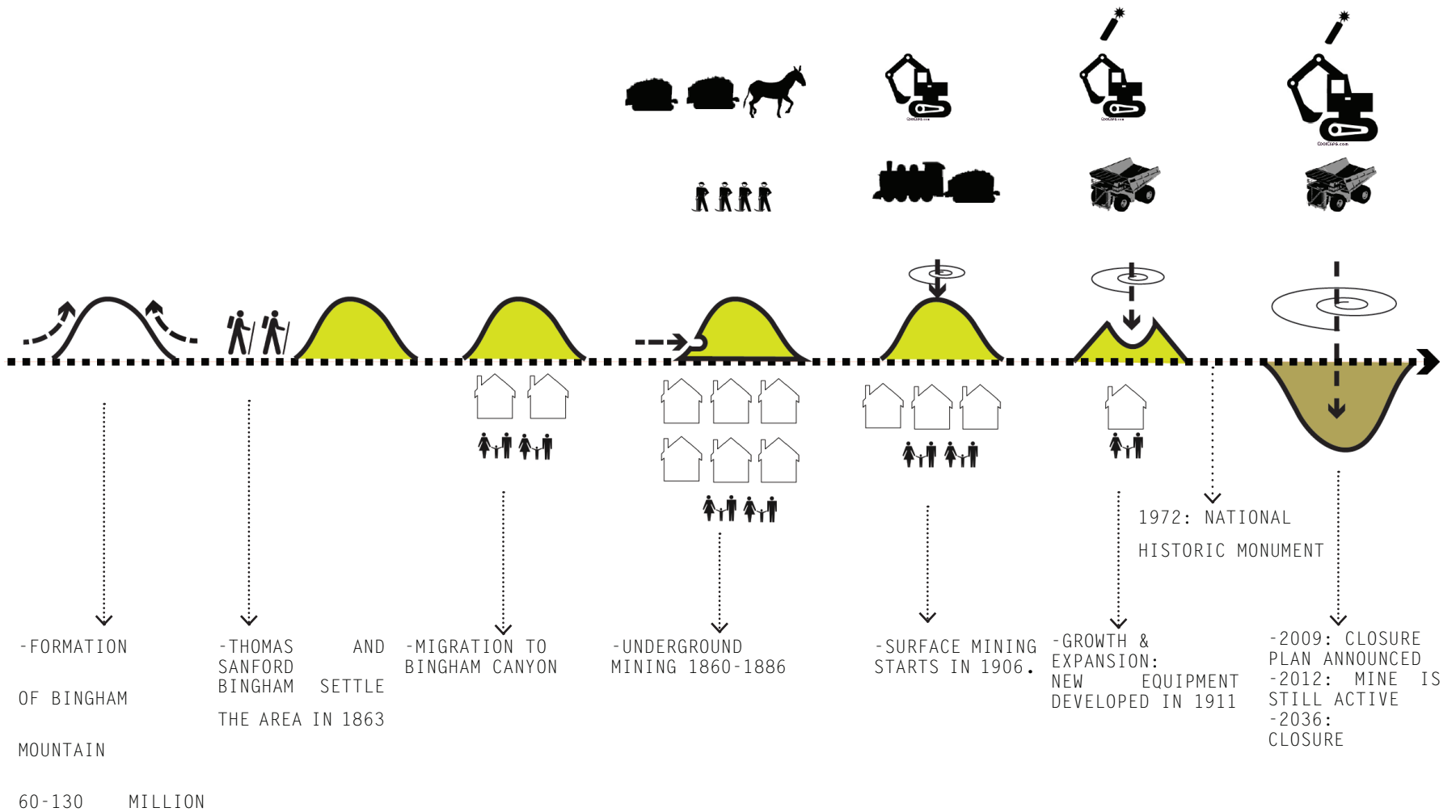


Figure 3.1.9 - Brief History of the Bingham Canyon Mine. Illustrations courtesy of author. Historical facts are courtesy of Eldon Bray, *Copperfield Remembered*

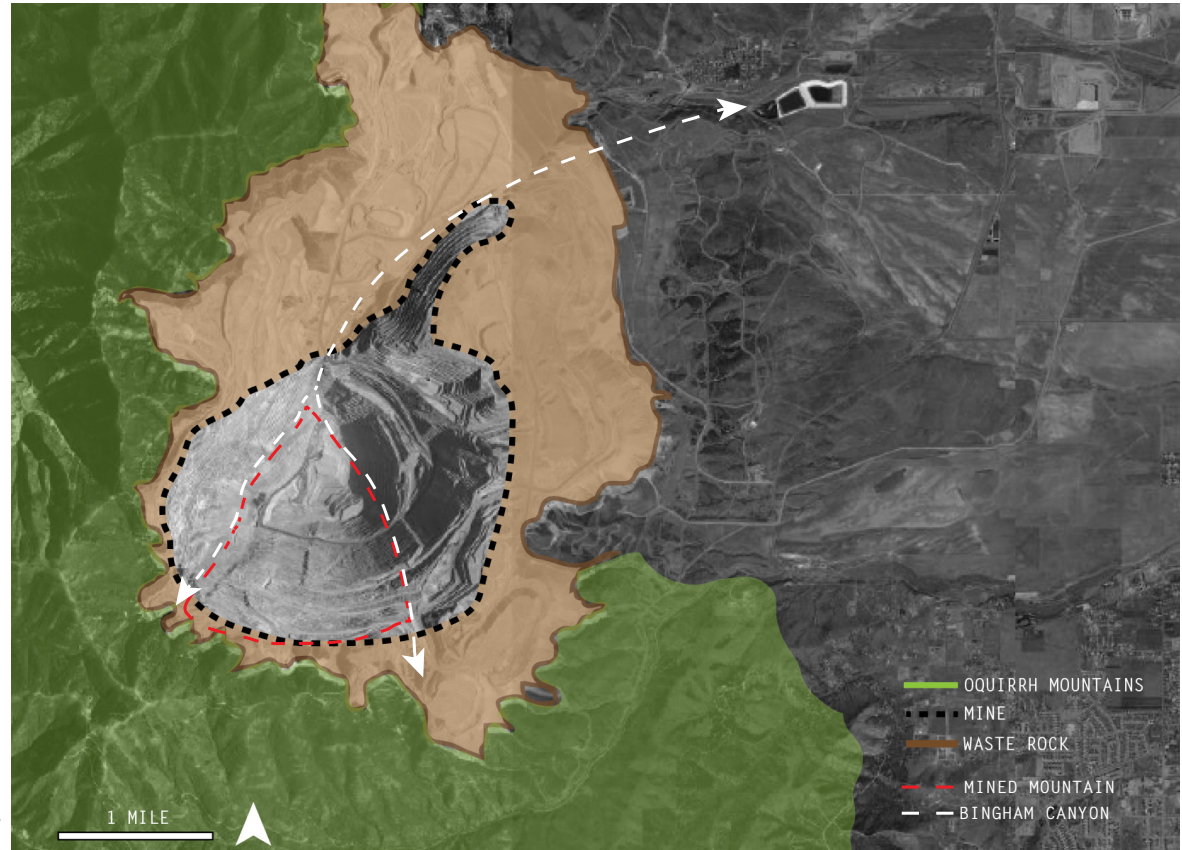


Figure 3.1.10 - Existing conditions.
Courtesy of author

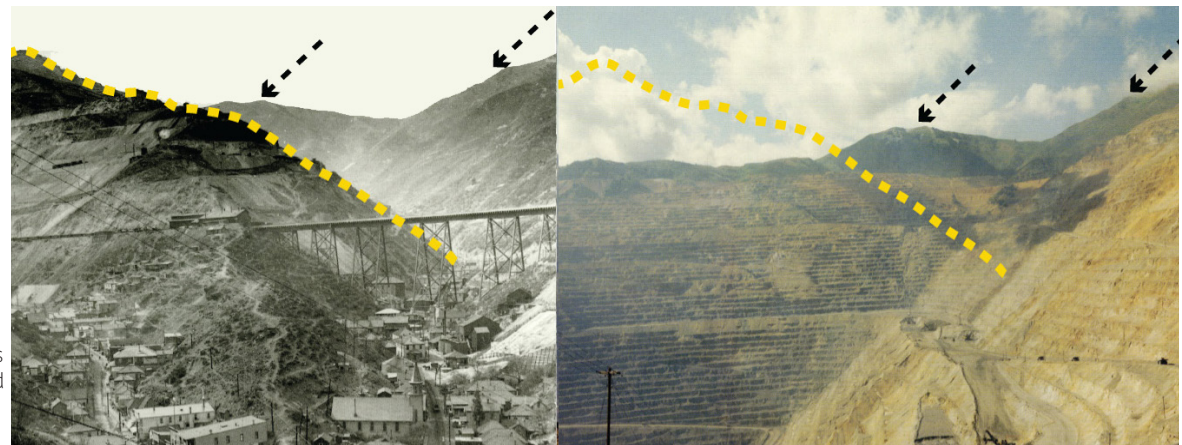


Figure 3.1.11 - Bingham Canyon (left) vs
Bingham Canyon Mine (right). Goin and
Raymond, *Changing Mines in America*,



Figure 3.2.1 - Mine tourism in 1944.
Photo courtesy of Eldon Bray, *Copperfield Remembered*

3.2 TOURISM AT THE BINGHAM CANYON MINE: INDUSTRIAL NOSTALGIA

Since the 1930s the mine has become a destination for local and distant tourists (see figure 3.2.1). Built in 1942 the visitor center and observation platform has been a driving force in promoting the company to the public, the advertising benefits of metals, especially copper, to our modern life. The site has housed a visitor center that has been relocated many times because of the changing topography of the mine. Today the visitor center is located at the north side of the rim of the open-pit mine, attracting almost 160,000 international, in and out-of-state visitors every year (Rudd & Davis, 1998). According to Rudd this kind of industrial tourism focuses on sites of the industry from 1950s and 1960 due to nostalgia for the work place from that time. Companies that own industrial sites use tourism as a means of easing economic stress, and as a public relations tool to create a positive public image (Rudd & Davis, 1998).

Rudd and Davis argue that the Bingham Canyon Mine exploits tourism in order to create a positive public image. They claim that the mining company, Kennecott Utah Copper, has crafted the visitor's experience to emphasize the depth of their commitment to the environment and the community. The public has been concerned with environmental degradation and the reliability of the company as a major employer. Therefore the exhibits and educational films

all emphasize the company's achievements in response to these issues. At the visitors center (see figure 3.2.2) the company presents the mine as a natural landscape to neutralize the public perceptions of the area as being a damaged landscape (Rudd & Davis, 1998).

The visitor's experience is crafted in order to make it feel like as if one is visiting a national park (Rudd & Davis, 1998). The authors note that the visitor is welcomed at a single entrance booth where the fees are collected based on the type of vehicle, similar to the national parks. The architecture and landscape of the observation area and the visitor center add to the "natural" atmosphere of the mine. The displays inside the center explain the mining process and highlight important aspects of the site are again modeled after those of national parks exhibits. The fact that the U.S Department of Interior designated the Bingham Canyon Mine a national historic monument plays a very important role in the "natural" image that Kennecott seek to present. The authors point out that this image is suggested in slogans like "industrial Grand Canyon". The presentation of copper as "a gift from mother nature" also seek to legitimize the company's right to extract ore. Additionally, the visitors are reminded that the company provides jobs to the community and therefore is a good neighbor.



Figure 3.2.2 - Mine Tourism in 2012.
Photo courtesy of author

3.3 DESIGN PROBLEM AND STRATEGIES

In 2009 Rio Tinto, the mother company of Kennecott Utah Copper, announced a closure plan of the Bingham Canyon Mine, which could occur in 2036. While the company is responsible for reclaiming the land after closure, the pit will be left unreclaimed. The status of the site as a National Historic Monument relieves the company of doing anything beyond dismantling equipment and structures. The question remains as to the future condition of the Bingham Canyon Mine as a ruin, its landscape bearing the unmistakable imprint of the past and as a remain, at the same time, with its structures.

This design intervention seeks to reveal both the natural and historic aspects of the mine and its past communities. As seen in figure 3.1.11, the workers towns of Bingham Canyon have been obliterated by the processes of mining. Some buried while others remain only as invisible traces suspended at an elevation of almost 6000 ft.

This thesis seeks to reveal the historic and natural aspects of the site in an architecture that similarly seeks to capture the scale and changing face of the terrain of the Bingham Canyon in the future. Strategies might include leaving the pit the way it is while physically integrating the

architecture into the mine by carving to reveal old layers of Bingham Canyon. Bridging, tunneling and observing are all part of the spatial language derived from the mining process itself (see figures 3.3.1-4). These utilitarian processes could be translated into programmatic elements that would narrate the natural and industrial story of the mine, while connecting it to its future use of industrial tourism and site monitoring and maintenance. The future users of the site include tourists, cyclists, hikers, scientists and mining company employees.

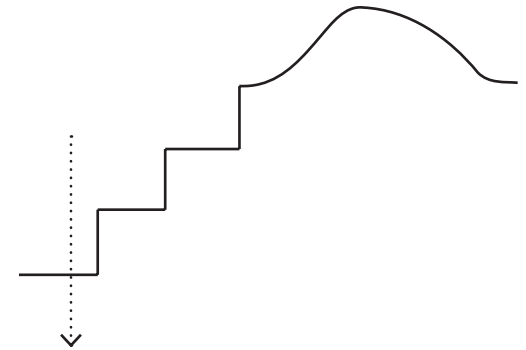


Figure 3.3.1 - Drilling & Blasting

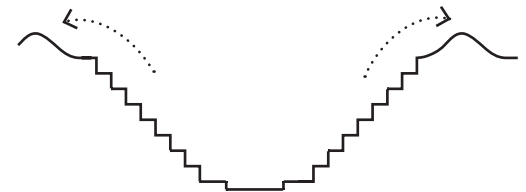


Figure 3.3.2 - Carving

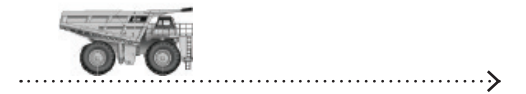


Figure 3.3.3 - Loading & Hauling

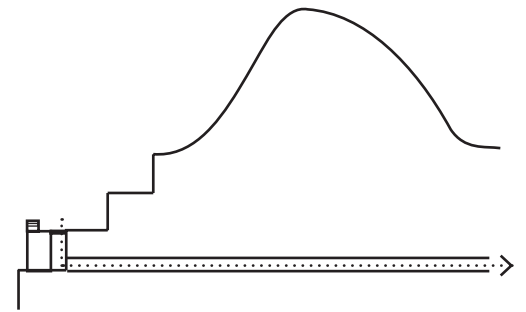


Figure 3.3.4 - Crushing & Conveying

4. DESIGN PROPOSAL

4.1 OPEN PIT MINING AS NARRATIVE : FIVE INTERVENTIONS

As the mine is abandoned, its previous character as a place of extraction and production will certainly diminish and fade away with time. The processes of copper mining as a conceptual premise to intervene are what constitute this memorial. The process starts with drilling, blasting, loading then hauling the material on trucks using ramps into the in-pit crusher. Afterwards the material is conveyed on a conveyer belt that goes into a three-mile tunnel to the concentrator near Copperton, the current company town. From the concentrator the material gets transported to the smelter near the Great Salt Lake (see figure 4.1.1).

The thesis proposes four built interventions linked to a circulation path. Going beyond experiencing the site as a recreational place, it is important to point out the presence of a pit-lake in the future as part of the experience. In order to deal with issue of continuous acid mine drainage the first intervention proposes a water monitoring and research facility. The last three interventions include a rest stop, a museum, and a marker on the ore tunnel. All of these interventions have a common theme of mediating the scale of the mining landscape, and at the same time educating the visitor about the mine's industrial past.



drilling



blasting



loading & hauling



crushing



refining & smelting



concentrating



conveying

Figure 4.1.1 - Mining process
<http://www.experienceproject.com/stories/Love-Outdoor-Art-Of-Utah/1751339>

4.2 WATER QUALITY MONITORING AND RESEARCH FACILITY

This intervention is about tackling the issue of acid mine drainage (see figure 4.2.1). This aspect of the changing landscape of the pit is a dynamic one. According to the Utah Department of Water Quality, once the mine shuts down and water pumping is reduced, the pit will be allowed to flood to the 4900 feet level. This assures that the contaminated water from the pit-lake will not reach other parts of ground water in the nearby areas. Water will be pumped from the pit and treated off site then brought back to the pit. However more ground water will seep into the lake in addition to the water shed from the surrounding mountains, which will be mixed with heavy metals that have been exposed throughout time. For that reason there is a need to monitor the quality of the water by taking weekly samples from different parts and different depths of the lake to determine the quality of the water.

This intervention seeks to respond to the needs of water quality engineers and researchers who will be participating in this process. In a similar case in the Berkeley Pit in Butte, Montana, researchers from Montana Tech. have taken samples from the lake and have found chemicals that could treat migraines and some types of cancer (see figure 4.2.2) (Stierle, 2006). This facility will be located in the pit-lake on a floating barge system and



Figure 4.2.1 - Acid mine drainage (orange) at Bingham Canyon Pit. Photo courtesy of Sam Scholes



Figure 4.2.2 - Pit-Lake at Berkeley Pit in Butte, Montana.
<https://confluence.furman.edu:8443/display/Lipscomb/Mining+Pollution>

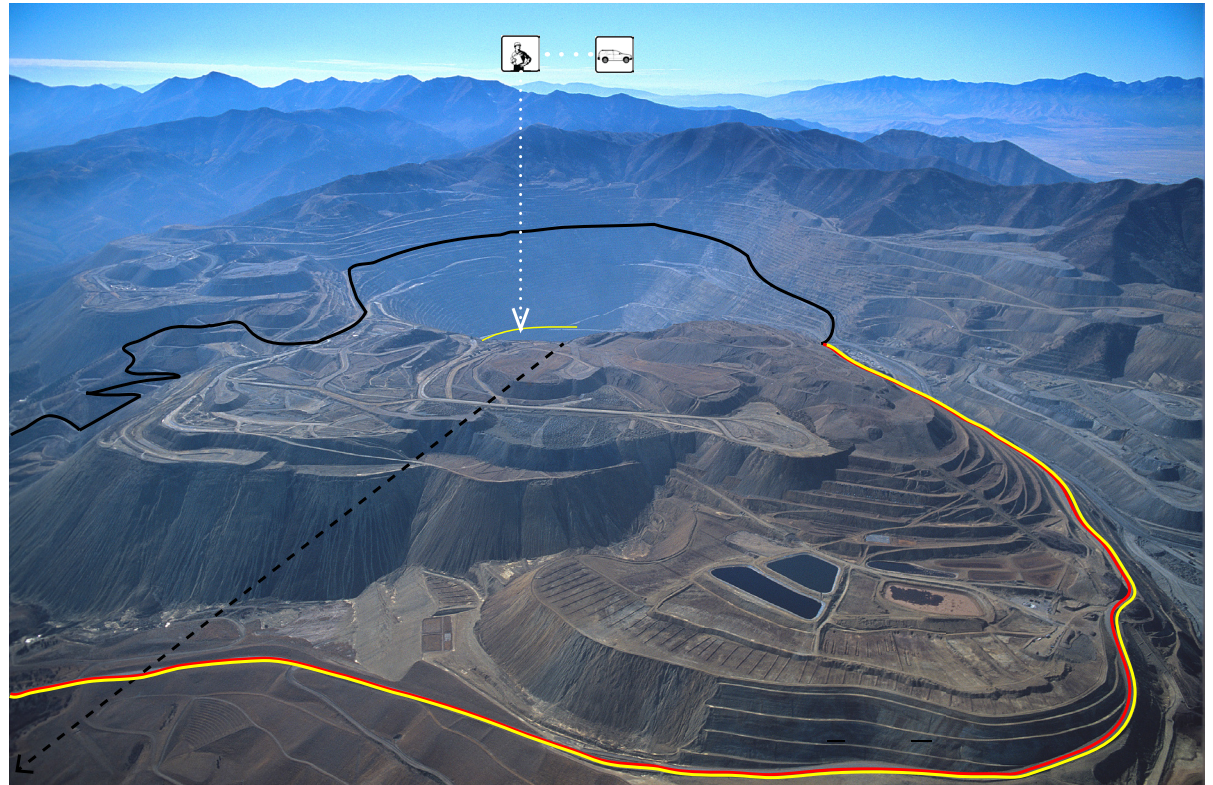


Figure 4.2.3 - Engineers & Researcher access route (Yellow). Original photo courtesy of Jim Wark, *Airphoto*

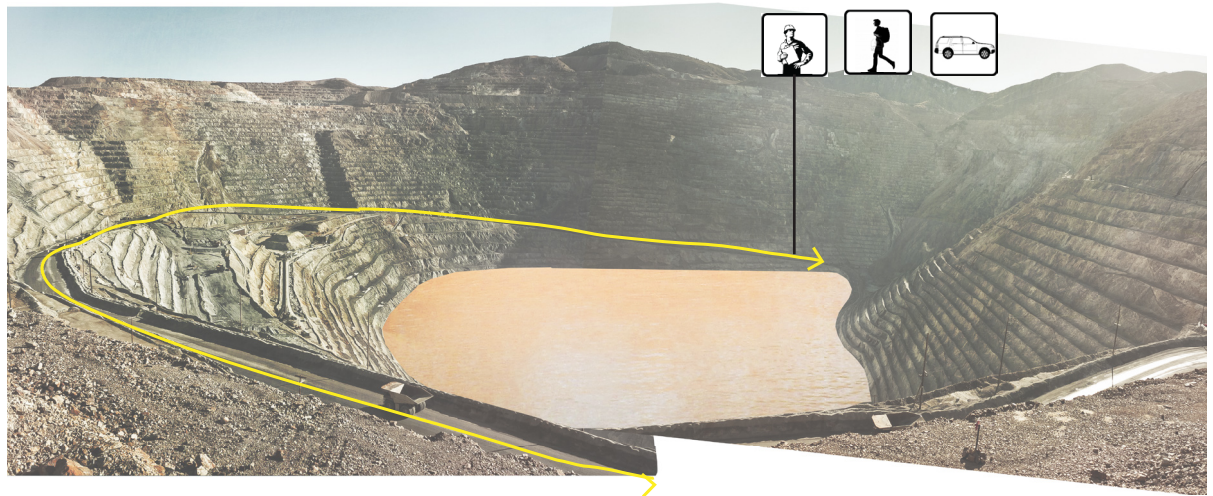


Figure 4.2.4 - Engineers & Researcher access route & future pit-lake. Original photo courtesy of Stefan Georgi

will be accessed from the existing ramp inside the pit (see figures 4.2.3-4). It will house a research lab, two housing units and a work space that engineers, researchers and students can gather to share research results (see figure). Weekly water samples would be taken from the lake by inserting a submersible pump from a boat from different parts of the lake and brought back to the lab (see figure 4.2.5).

This research facility will use solar and wind as sources of energy to light the interior of the spaces and to charge the pump (see figure 4.2.6). Different from a typical floating barge system, the spaces will be elevated from the surface of the barge in the case of seepage of acid water from the lake into the barge (see figures 4.2.7-8). In addition the pre-fab housing units, lab and work place will have shutters that will be in a horizontal position parallel to the surface of the barge to further protect the surfaces from acid water. For additional protection these structures will be made from fiberglass to avoid corrosion.

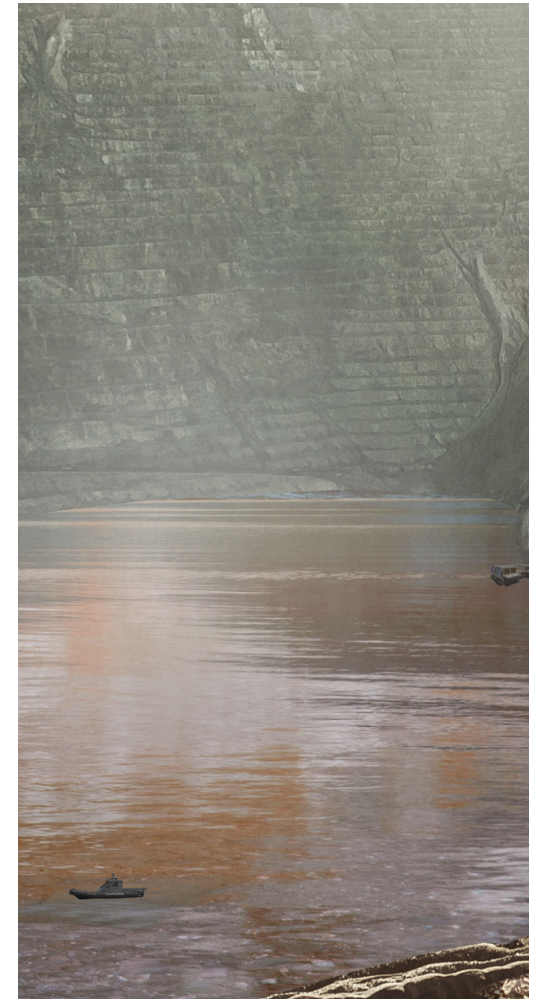


Figure 4.2.5- Future pit-lake, research and monitoring facility and boat. Original photo courtesy of Stefan Georgi

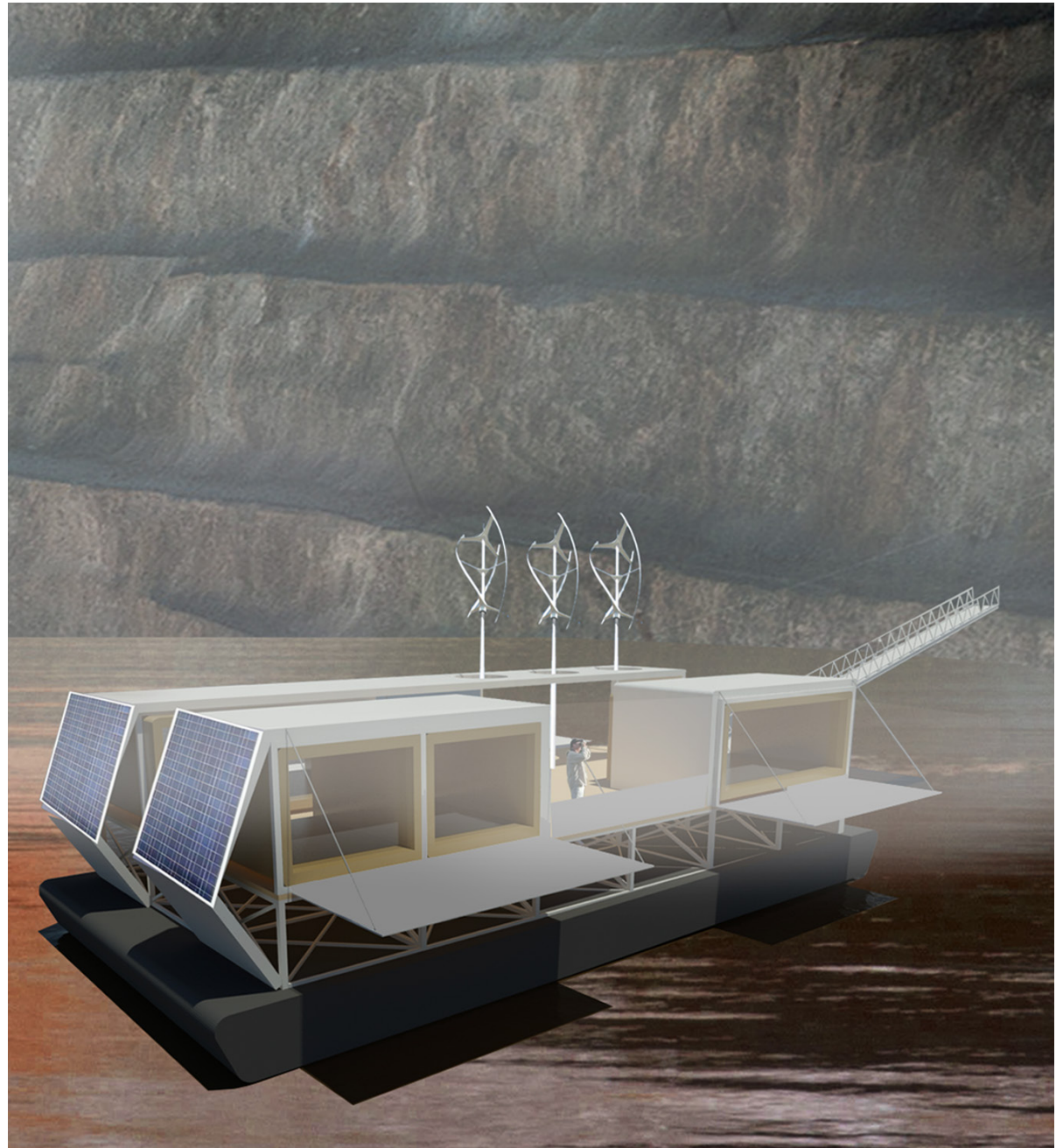
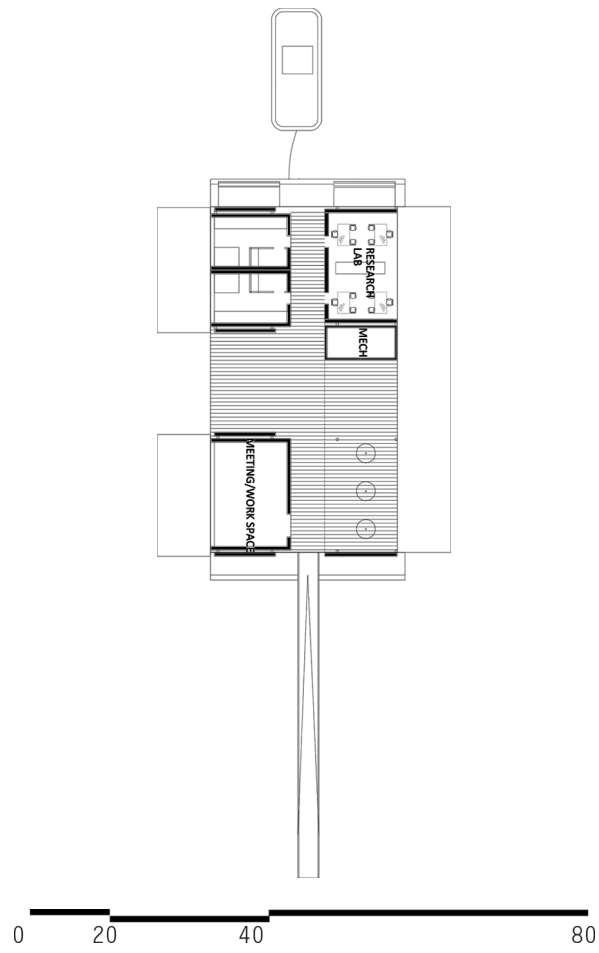


Figure 4.2.6 - Research and water monitoring facility

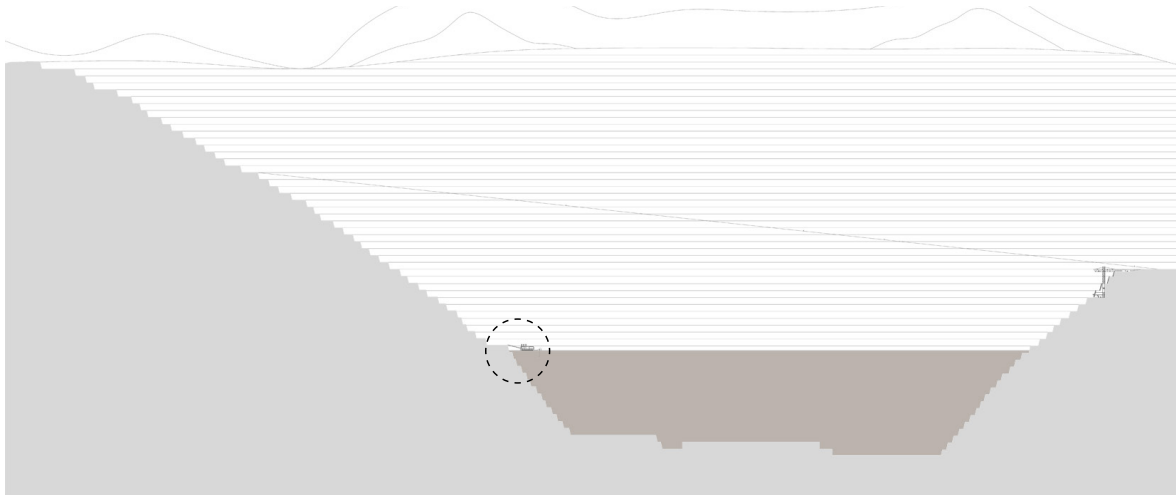


Figure 4.2.7 - North-south site section

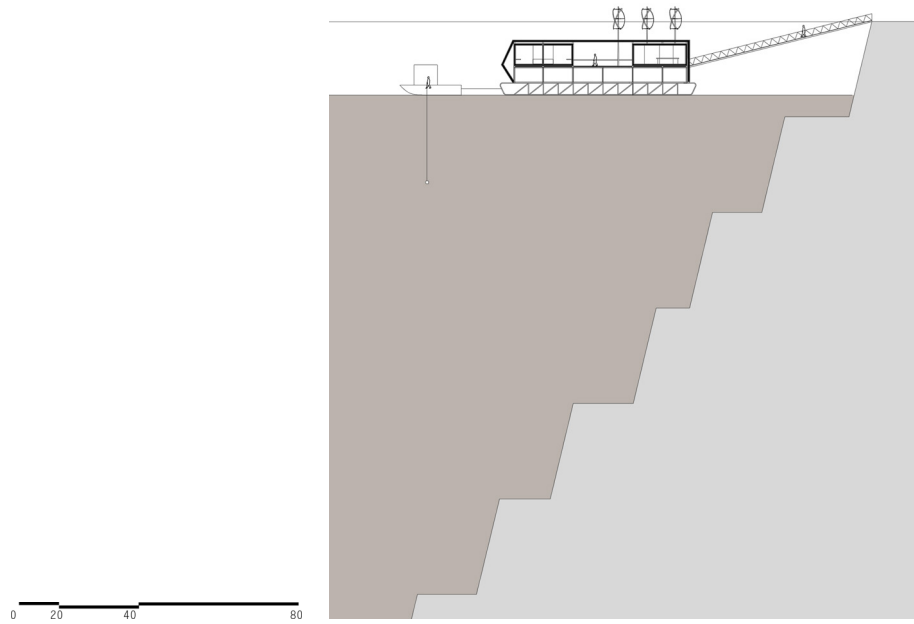


Figure 4.2.8 - Section through housing units



Figure 4.3.1 - Part of the existing ramp.
Photo courtesy of Sam Scholes

4.3 CIRCULATION PATH: REST STOPS & ORE TUNNEL REUSE

This circulation intervention is related to the recreational part of the future use of the mine. Since the carved landscape is what attracts the public to this site, the future visitor should be able to experience how this process was done in the past to learn about the mine's industrial past while being able to experience the scale of the pit itself. After looking at the miles of roads inside and outside the pit, the only path that educates the visitor about movement of material is the existing truck ramps (see figure 4.3.1).

The journey starts from the southeast side of the pit. The hiker or cyclist can climb up the mountain on the side of pit, and experience the piles of waste rock as they reach the ramp. As the visitor circulates down the ramp they slowly experience the amount of earth that has been sacrificed to access ore throughout the years (see figures 4.3.2-3). The time that it takes for the hiker or cyclist to experience the elevation change is incomparable with the time that the forces of geology required to form the erased mountain. The visitor hikes down the ramp in a spiral movement following the contours of the pit and the route taken by the trucks (see figures 4.3.4-9). Here the visitor learns about the carving process and movement of material.

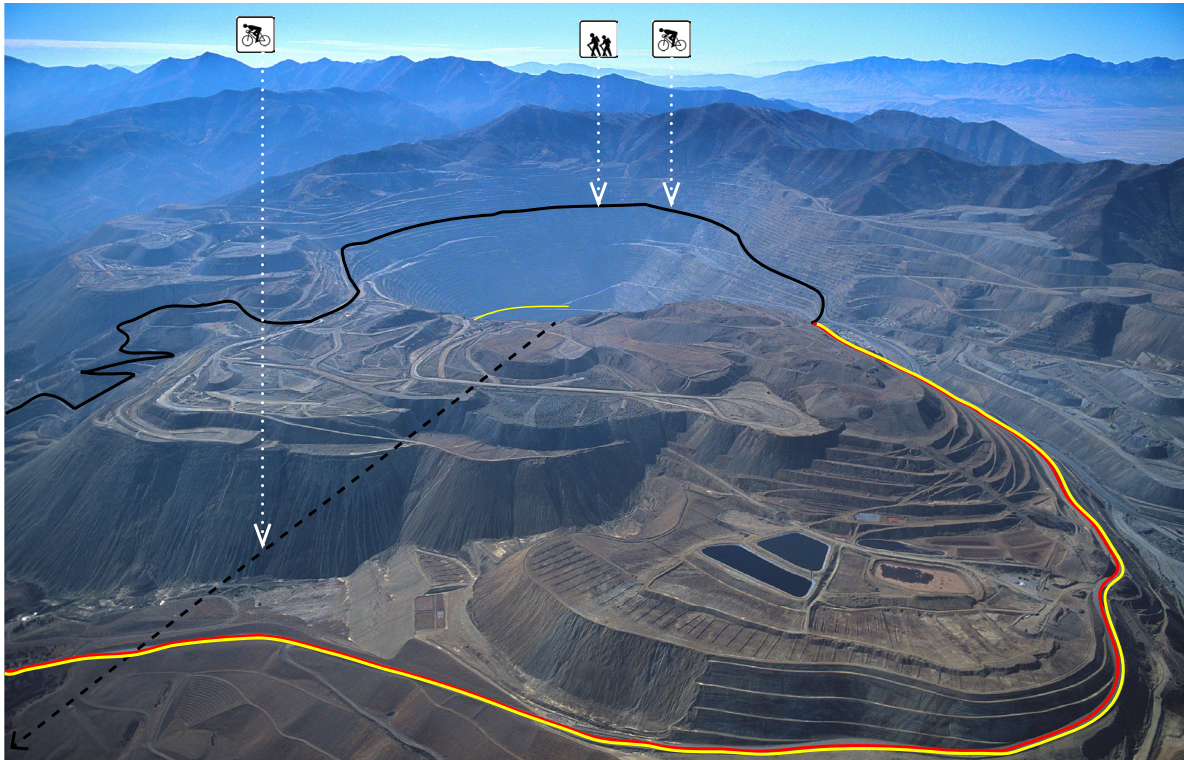


Figure 4.3.2 - Hiking path (Black). Original photo courtesy of Jim Wark, *Airphoto*

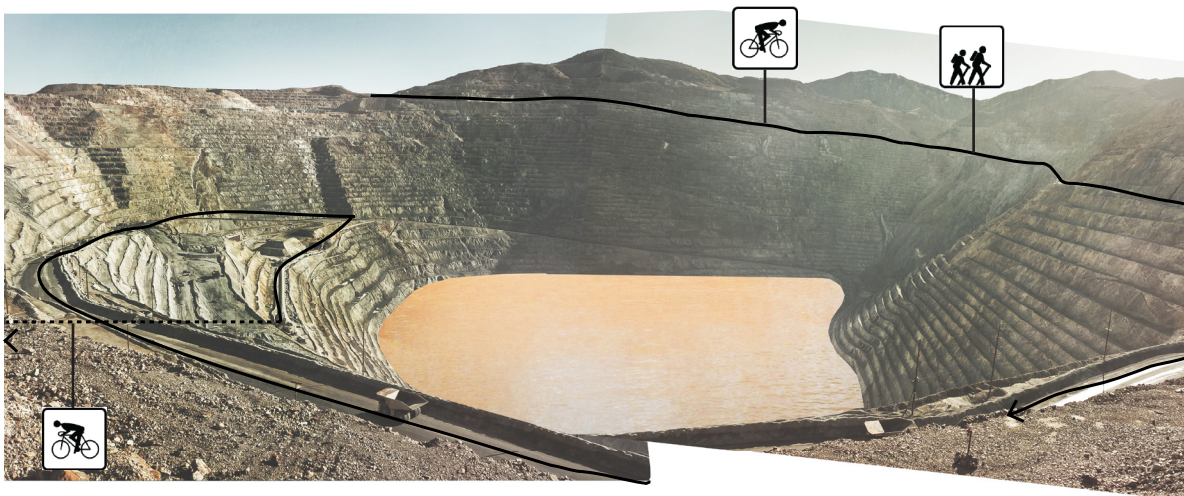


Figure 4.3.3 - Hikers & cyclists access route. Original photo courtesy of Stefan Georgi

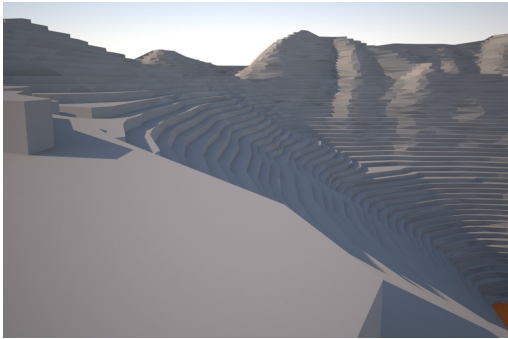


Figure 4.3.4 - 1

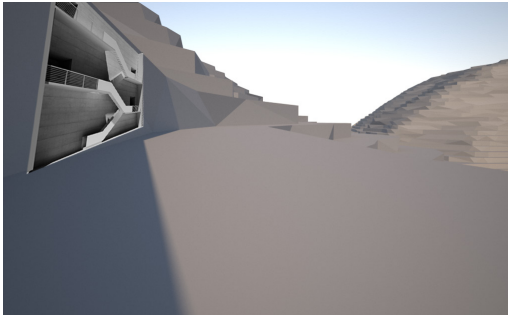


Figure 4.3.5 - 2

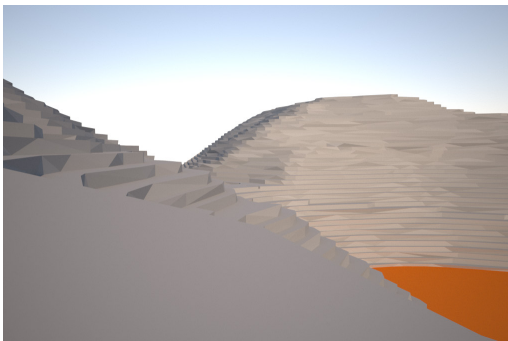


Figure 4.3.6 - 3

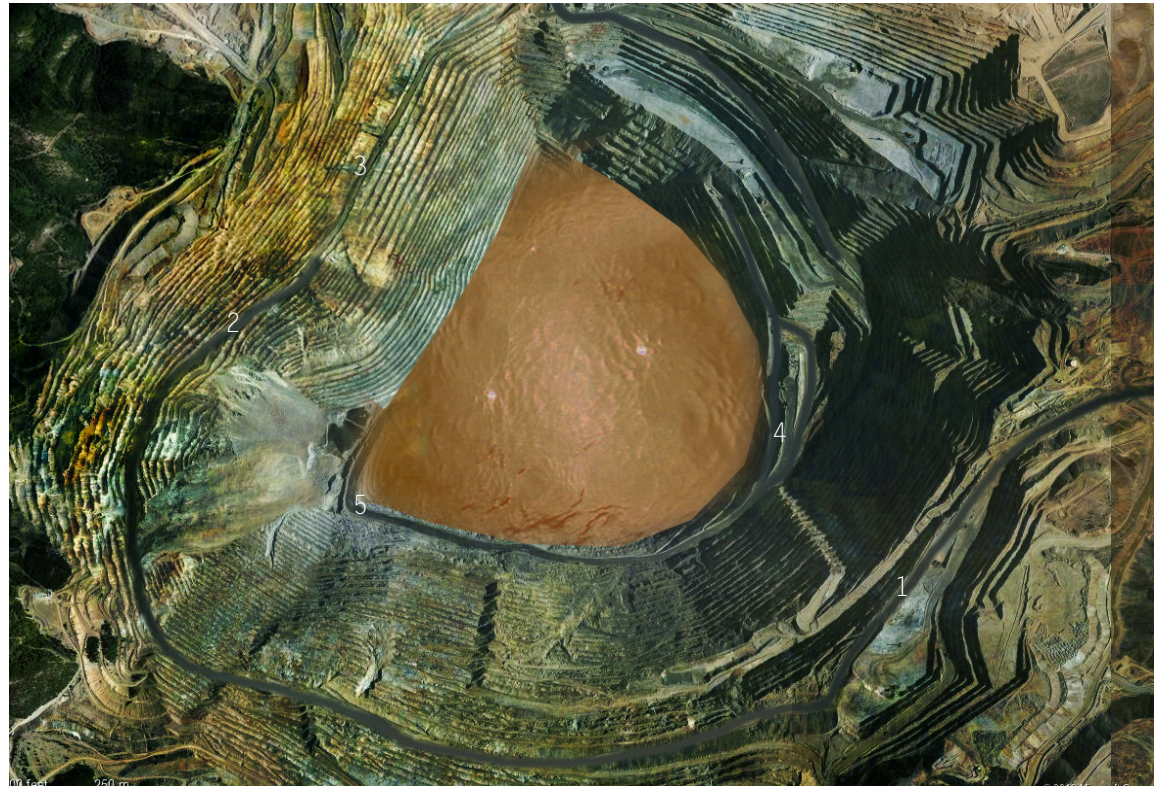


Figure 4.3.9 - Site plan showing path, and future pit-lake

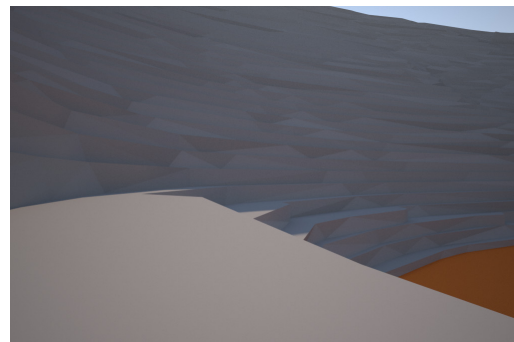


Figure 4.3.7 - 4

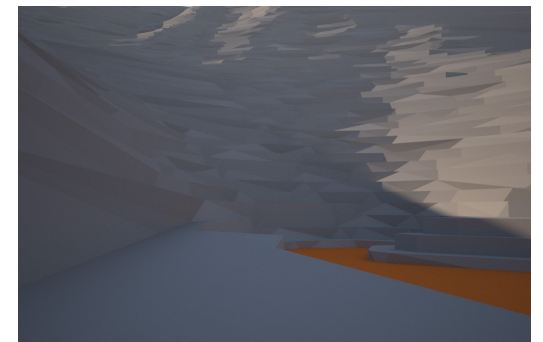


Figure 4.3.8 - 5

4.3.1 INTERVENTION ALONG HIKING PATH: MEDIATING SCALE

Along that journey the hiker or cyclist gets to experience the overwhelming scale of the void (see figure 4.3.1.1). This intervention seeks to emphasize the terraces as the main element that forms that pit while giving the visitor a place to rest (see figure 4.3.1.2).

This rest stop is cut through the rock to expose the texture of the earth but also to create a well-defined space that spans the entire 50 feet height of the terrace. The hiker climbs stairs that lead to spaces that are carved into the pit terrace (see figure 4.3.1.3). Through that journey the visitor experiences the full height of the terrace and the angle at which it was cut. These spaces are meant to provide basic shelter for hikers, but also to mediate between the scale of the void and that of the hiker. Through these spaces one can observe the pit in a small confined space to not always feel overwhelmed with vastness of this landscape.

4.4 REUSE OF ORE TUNNEL: CONVEYING

After getting an idea of the carving process through the hiking path, cyclists will be able to leave the site through the ore tunnel that is presently used to convey the crushed ore three miles to the concentrator near Copperton. The horizontal surface will be paved and divided into two lanes of bicycle infrastructure routes (see figure 4.4.1). On the outside

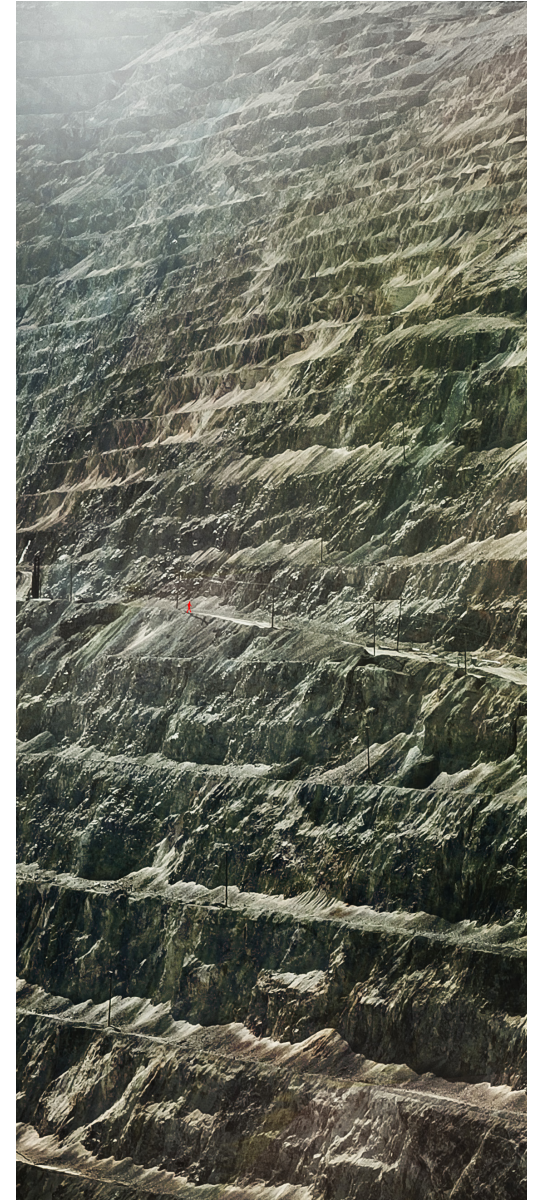


Figure 4.3.1.1 - Hiking path and aged terraces after closure. Original photo courtesy of Stefan Georgi

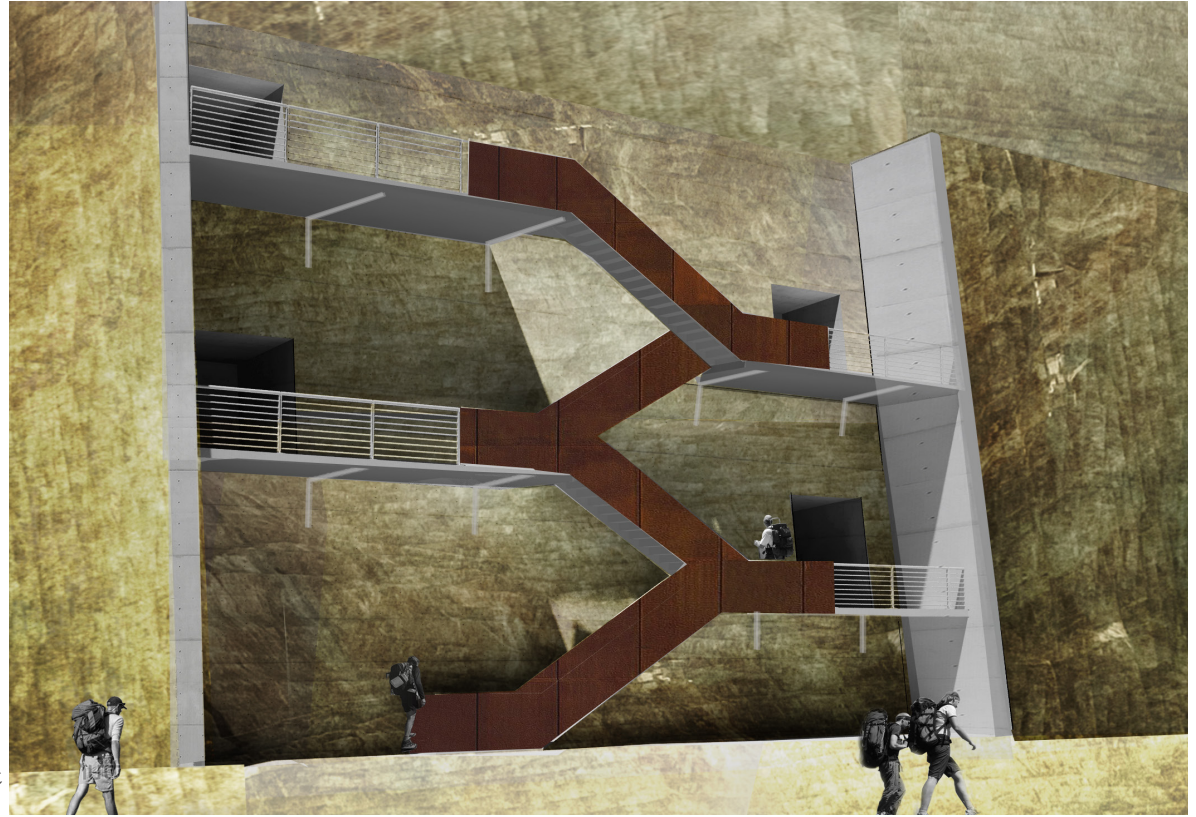


Figure 4.3.1.2 - Approaching the Rest Stop: Mediating scale

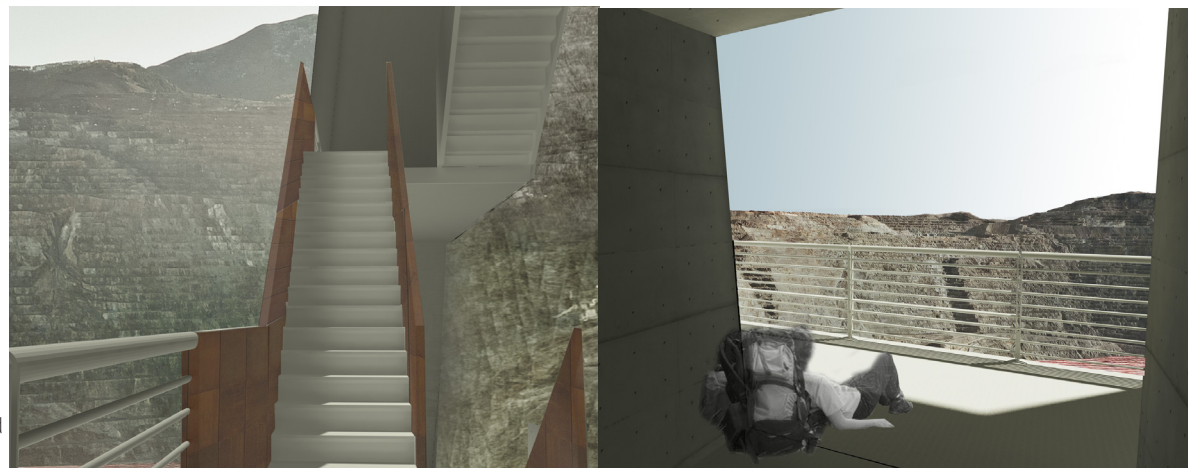


Figure 4.3.1.3 - Going up into the carved space: Mediating scale

surface, the third built intervention proposes marking the tunnel on the landscape through light wells that bring in light and air to the tunnel (see figure 4.4.2). These light-wells extend way above the ground level revealing the presence of the tunnel that today is not visible on the landscape. This will show the length of tunnel and give the cyclist an idea of the large scale at which this mine operates.



Figure 4.4.1 - Light-wells marking the tunnel on the landscape. Original photo courtesy of Ryan Houston



Figure 4.4.2 - Interior of tunnel. Kieran Hamilton Photography.
<http://sumpix.wordpress.com/2011/06/26/the-innocent-tunnel/>

4.5 MUSEUM

The journey to the museum starts with driving through the existing highway infrastructure (see figure 4.5.1). The museum is situated where Bingham Canyon splits east and west of the eroded mountain. Upon arrival the visitor descends into a space that is carved out of the fill that was dumped over the communities of Bingham Canyon (see figure 4.5.2). This cut through the landscape is meant to start a shift in the visitors thinking about moving down to the original level of Bingham Canyon seen in the site section (see figure 4.5.3). The tourist arrives at a lobby, information desk and a lounge in a space embedded within the rock. Similarly on the left side lockers and restrooms are provided for hikers and cyclists that want to store any of their belongings (see figure 4.5.4).

Here the visitor is put in a narrow space that creates a contrast between the large scale of pit and the human scale. Continuing further, the visitor then reaches a threshold where he/she is about to enter the pit walking on a bridge covered only by the steel structure that holds the bridge itself (see figures 4.5.5-6). The visitor now is not confined by any barriers but instead gets a comprehensive view of the pit. After reaching the end of the cantilevered part of the bridge the visitor circulates back to a freight elevator allowing the next group of tourists to get a view.

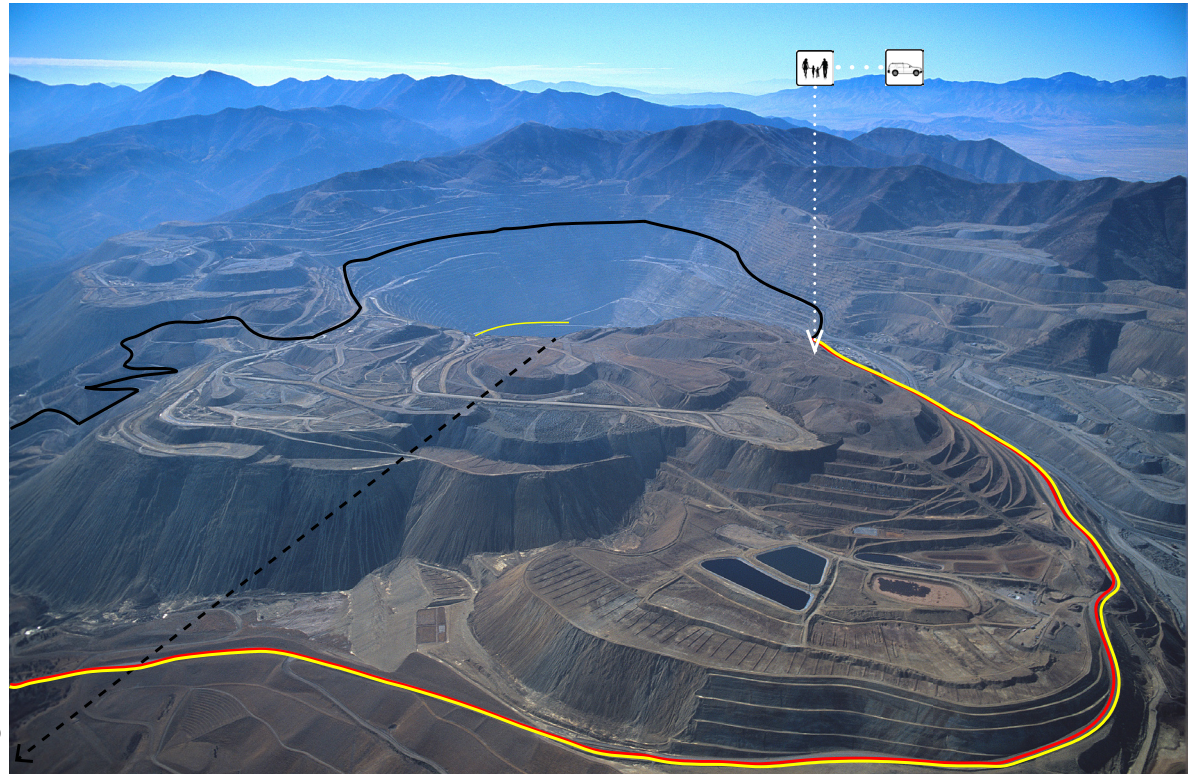


Figure 4.5.1 - Car access (Red). Original photo courtesy of Jim Wark, *Airphoto*



Figure 4.5.2 - Descending down towards lobby

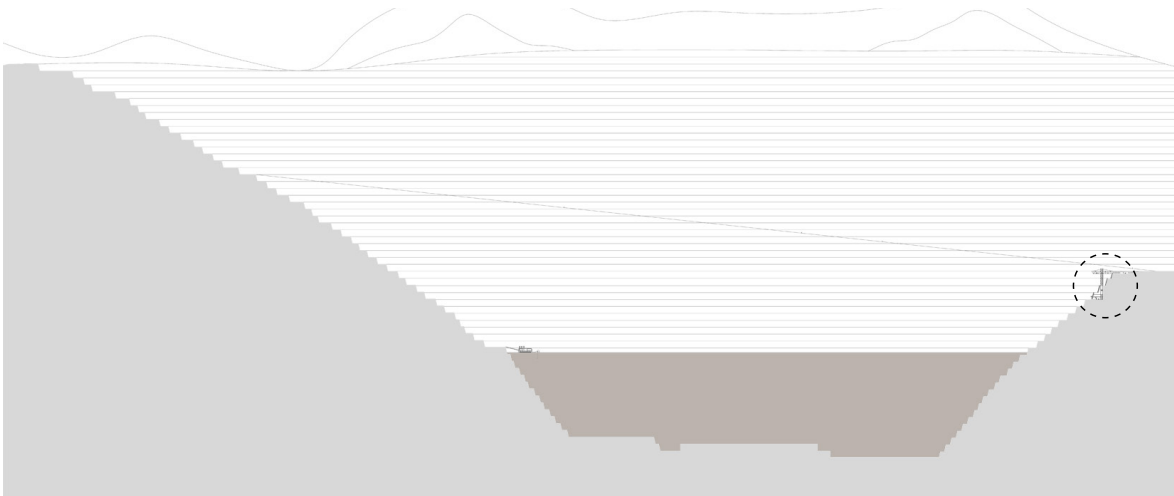


Figure 4.5.3 - North-South site section

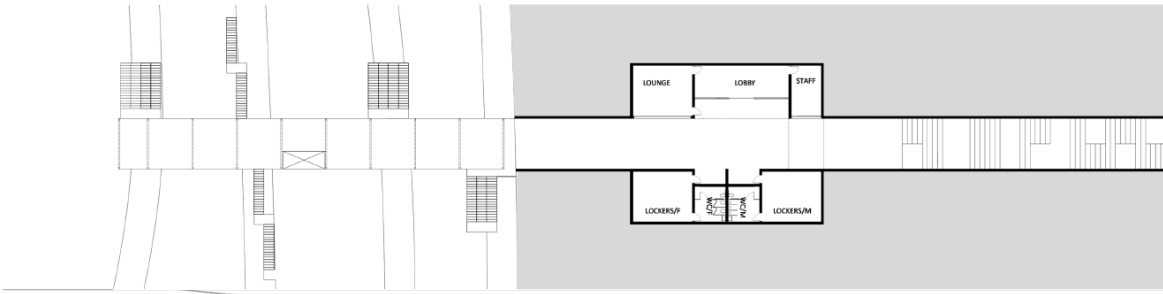


Figure 4.5.4 - Upper level floor plan

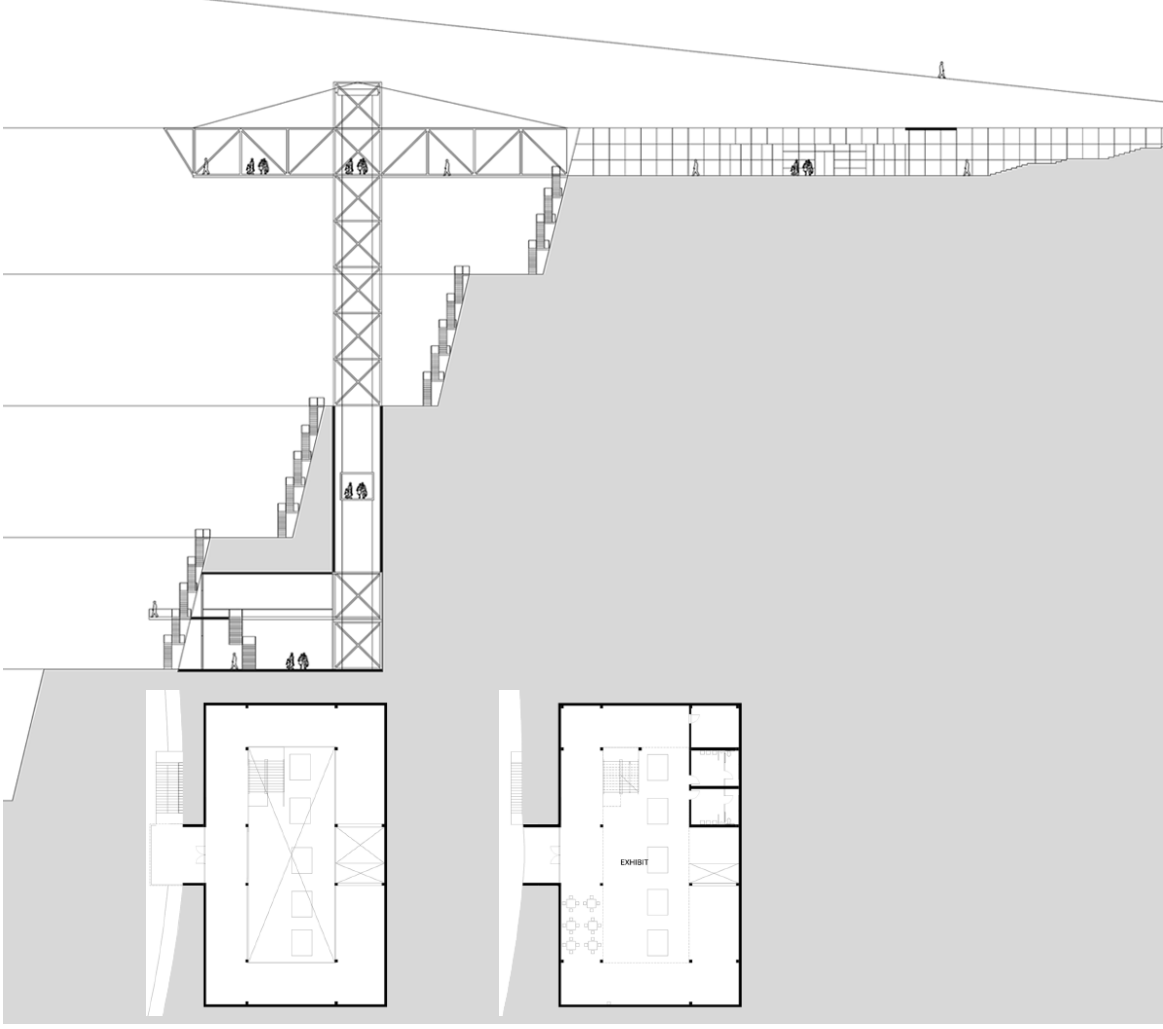
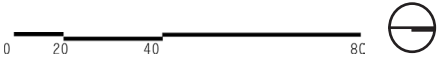


Figure 4.5.5 - Section through exhibit and lower floor plans



Traveling through the elevator car all the way down to the original elevation of Bingham Canyon, you arrive at the interpretive exhibit space that is carved through the rock (see figures 4.5.6-7). In the exhibit space the visitor will learn about the evolution of the mine while experiencing the depth of the dumped wasterock. Another option of circulating down would be through exterior stairs that give the tourist or hiker a slower and more comprehensive way to experience that narrative (see figures 4.5.8-10).

The purpose of this intervention is not to negatively inform the visitor about how mining destroys the landscape, as this is already abundantly clear from miles away through the presence of waste rock on the landscape. It is to create a narrative of the place. That is, these communities were created for the purpose of extracting ore and the economic success of the mine, which led to its growth, proved to be the undoing of the communities themselves. This importance of this place as a symbol of a consumerist culture is communicated to the visitor; a message that goes beyond the aesthetic experience that the typical tourist gets today.



Figure 4.5.6 -Approach to cantilevered bridge

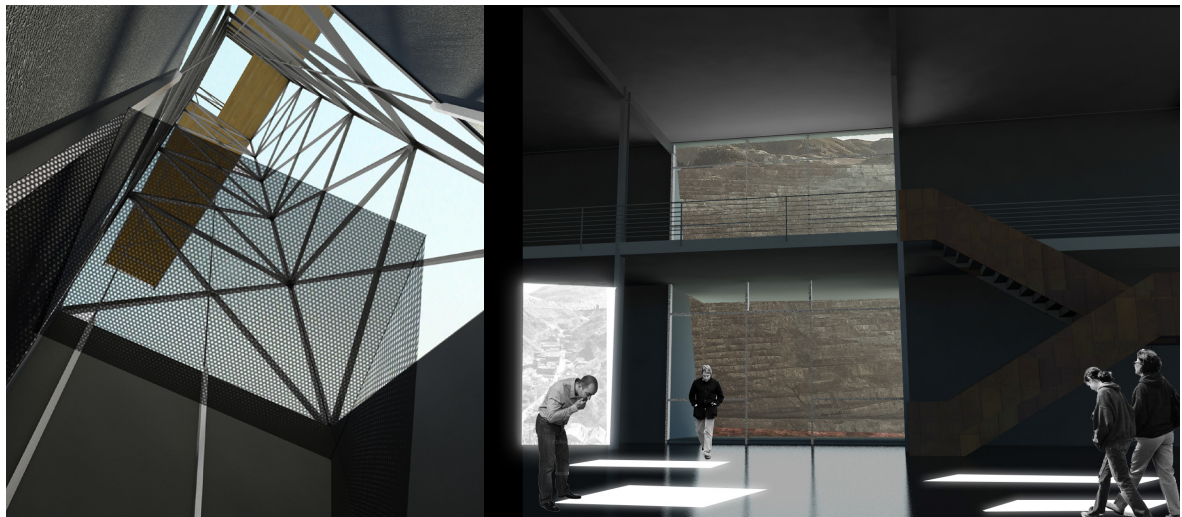


Figure 4.5.7 - Freight elevator (left), underground exhibit (right)

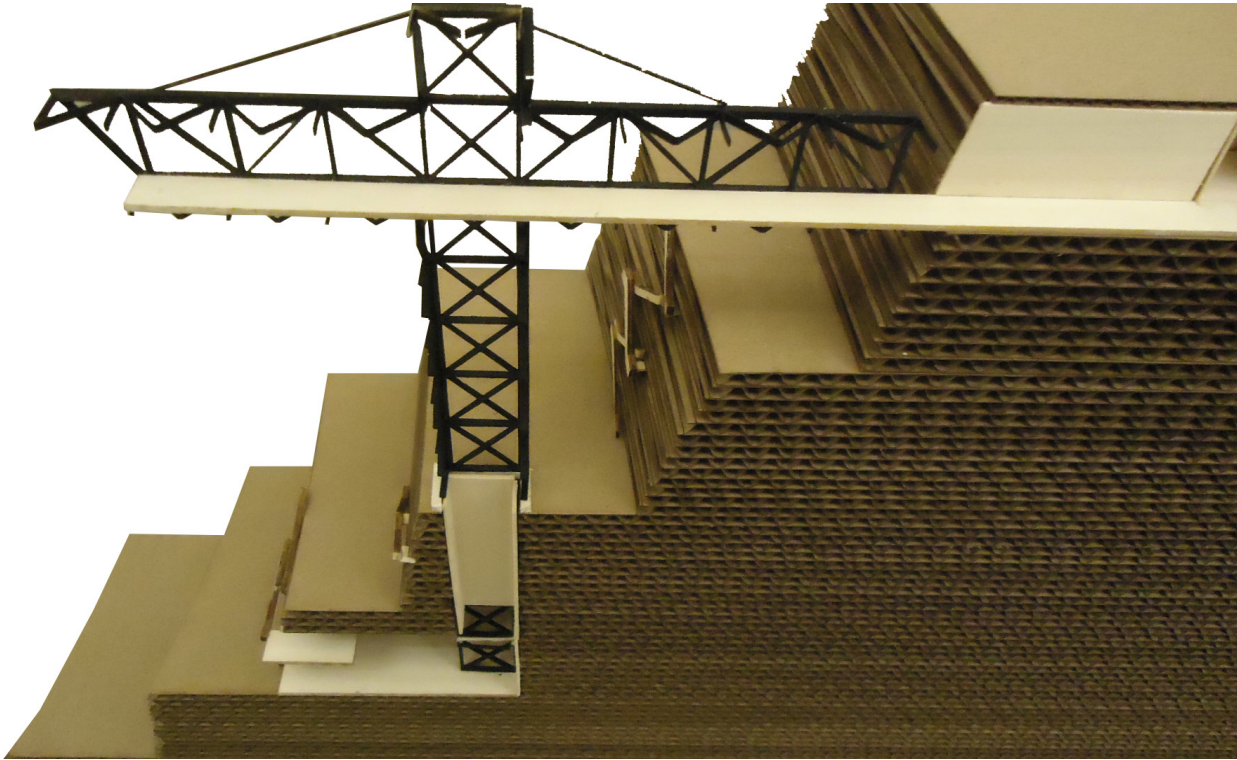


Figure 4.5.8 - Section model through exhibit space

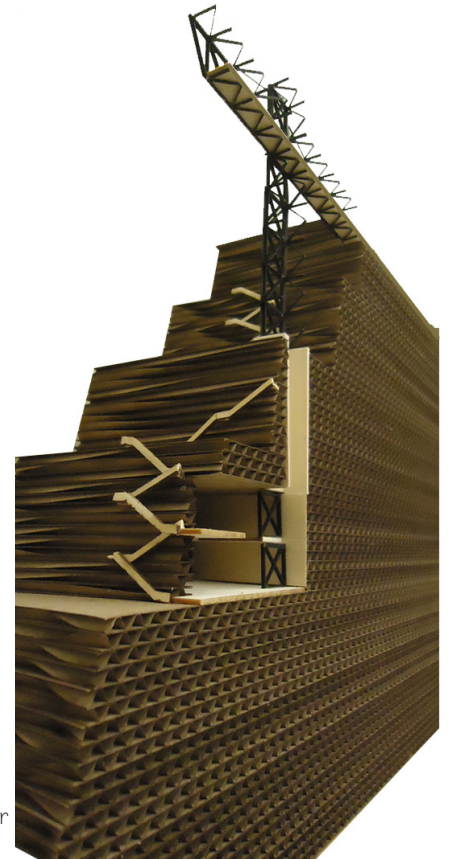


Figure 4.5.9 - Exterior stairs leading to exhibit

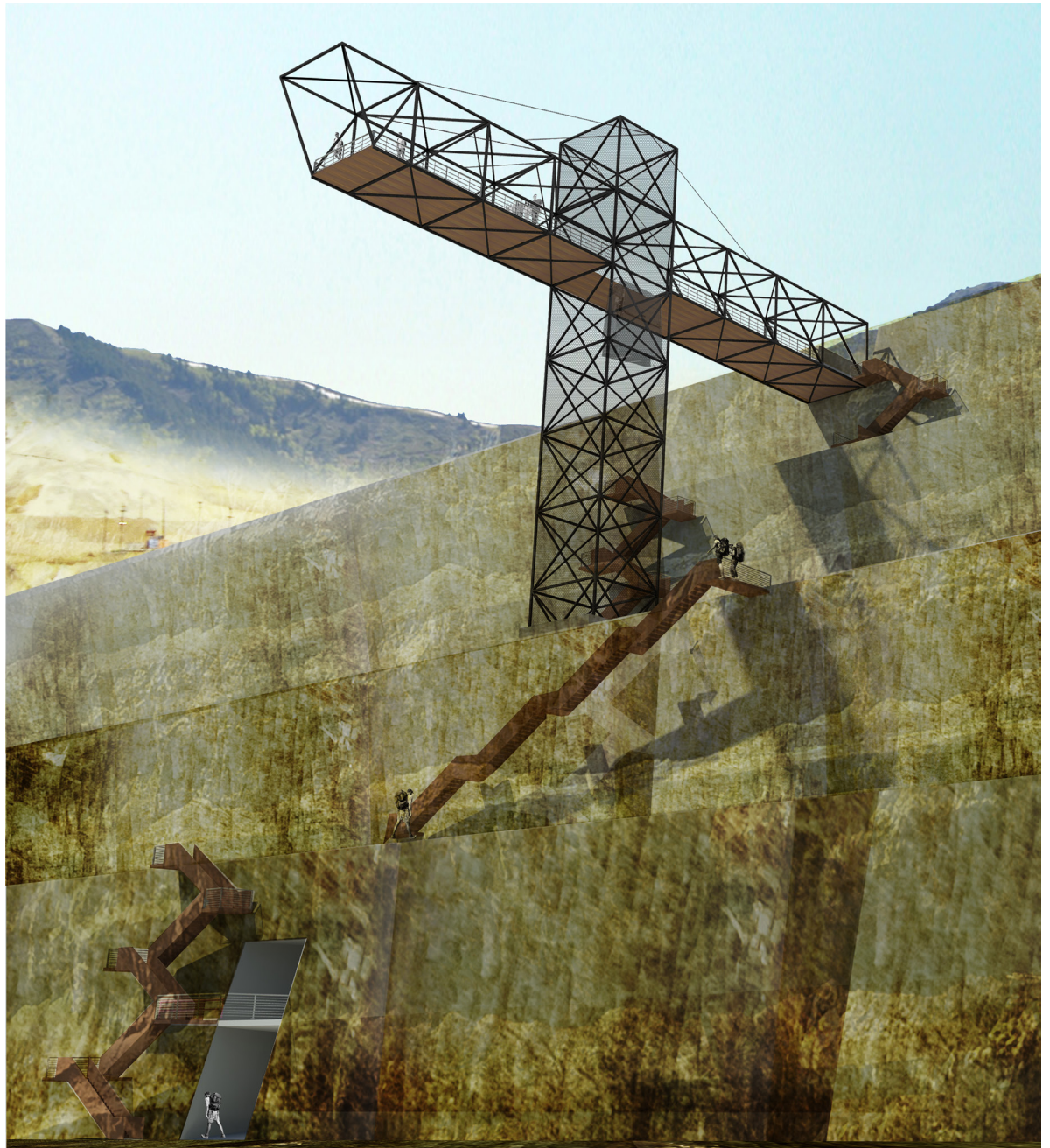


Figure 4.5.10 - Exterior View

5. CONCLUSIONS

The current heritage tourism at the Bingham Canyon Mine is proof of the public's fascination with the American industrial sublime. For that reason, the thesis argues for the idea of inhabiting the mine after its closure. Through identifying the future users, of the mine the proposed interventions were able to provide a space that allows the mine as an educational and recreational landscape.

The mining landscapes in America presents visual challenges to the modern viewer, through sending conflicting messages of attraction and repulsion. As the scale of these landscapes increases, the gap between their scale and that of the visitor widens adding another visual and physical challenge. The architecture was thus charged with the task of mediating the scale of the mine and educating the visitor about the mine's industrial past. It also needed to refer to the language of the built fabric of a mining district, thereby creating an identity for the place. In addition to the visual challenges, architecture was able to deal with what is perhaps the most dynamic aspect of the Bingham Canyon Mine found on the pit-lake and its evolving condition as a landscape - its reappropriation by nature.



Figure 5.1 - Museum, research facility and rest stops. Original photo courtesy of Stefan Georgi

BIBLIOGRAPHY

- Berger, A. (2002). *Reclaiming the American West*. New York: Princeton Architectural Press.
- Francaviglia, R. V. (1991). *Hard places: reading the landscape of America's historic mining districts*. Iowa City: University of Iowa Press.
- Giedion, S. (1969). *Mechanization takes command: a contribution to anonymous history*. New York: Norton.
- Nye, D. (1994). *American Technological Sublime*. Cambridge, MA, M: MIT.
- Nye, David E. *Technologies of Landscape: From Reaping to Recycling*. Amherst: University of Massachusetts, 1999. Print.
- Treib, M. (2009). *Spatial recall: memory in architecture and landscape*. New York: Routledge.
- Wines, J. (2000). *Green Architecture*. (P. Jodidio, Ed.) Köln: Taschen.
- Crump, S. (n.d.). Utah History Encyclopedia. Retrieved February 14, 2012, from <http://www.media.utah.edu/UHE/b/BINGHAMCANYON.html>
- Dunn, M. (1973). Bingham Canyon. Salt Lake City, UT: Publisher's Press.
- Goin, P., & Raymond, C. E. (2004). *Changing Mines in America*. Santa Fe, NM: Center for American Places.
- Rudd, M., & Davis, J. (1998). *Industrial Heritage Tourism at the Bingham Canyon Copper Mine*. Journal of Travel Research, Vol. 36, 85-89.

Stierle, Don, and Andrea Stierle. "Bioprospecting in the Berkeley Pit."
PitWatch. 9 Dec. 2012 <<http://www.pitwatch.org/2006.htm>>.

ONLINE RESOURCES

Ground Water Quality Discharge Permit Statement of Basis. Publication Mar.
2010. Sept. 2012

<http://www.waterquality.utah.gov/PublicNoticesArchive/2011/BinghamCopper350010_SOB_2011_mod.pdf>.

Problems with Bingham Canyon Mine. Publication. Mar. 2012

<http://www.earthworksaction.org/files/publications/FS_Problems_BinghamCanyon_2011_low.pdf>.

"Bingham Canyon Visitor Center." Bingham Canyon Visitors center. 17 Jan.
2012. 12 May 2012

<<http://www.utahrails.net/ingham/ingham-visitor-center.php>>.

"Sanborn Fire Insurance Maps." Sanborn Fire Insurance Maps. 12 Sept. 2012

<<http://content.lib.utah.edu/cdm/search/collection/sanborn-jp2/searchterm/Bingham/field/city/mode/all/conn/and/cosuppress/>>.

Hamilton, Kieran. The Innocent Tunnel. Kieran Hamilton Photography. 12 Dec.
2012

<<http://sumpix.wordpress.com/tag/innocent-railway/>>.