



Re Interpreting mans' connection to the landscape
through the conservation of a tin mine on Devils Peak.

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Contents

Abstract - 2

Introduction -4

Site Then. Pre 1963 -8

Industrial Archaeology- 24

Site Now. Post 1963- 26

Site Activation - 36

Site Strategy -48

Conclusion - 65

References-66

List of figures- 69

Abstract

Hidden landscapes

The starting point of this study begins whilst driving through a field of vineyards just outside of Cape Town, about 15 kilometers from Napier. A sea of agricultural formlessness and sameness. This scene was interrupted by a large white blanket covering most of the hill side. It appeared ridged in its form yet fluid enough to take the shape of the landscape. The vast scale (or scale-less-ness) of the landscape became somewhat reduced to an area small enough to comprehend. This object lay seemingly foreign and unfamiliar and thus estranging my view of the landscape. This led me to question its meaning.

A google earth image of the exact site fortuitously captured the assembly of this artefact. The image illustrates its agricultural use, but more interestingly its reveals a series of processes of working upon the landscape. The large seemingly monolithic object reveals its individual parts, method of assembly and human labour. Embedded within the artefact too are energies- human and mechanical- which are impossible to observe in the finished artefact.

Through being able to unveil the various methods and steps of this process made richer my knowledge of the landscape and therefore, I argue, helped better understand the human connection to landscape.



Fig 01. Landscape between Caledon and Napier, Western Cape



Fig 02. Aerial view of the construction of covered landscape, Google earth

Introduction

This is an exploration of how architecture can reveal to us a hidden human understanding and connection to the historic landscape.

The structure of this document parallels that of the process of the investigation itself - a series of discoveries, which in turn generate concepts and site strategies for architectural intervention.

The particular landscape in question is an abandoned tin mine, forming part of Cape Town's historic industrial landscape. Situated at the foothills of Devils Peak, an area formally known as Prospect Hill, the site was mined for tin from 1910 to 1914 and has laid abandoned since. A century later and the site resembles little of its former self. Stripped of its equipment and machinery soon after its closure, all that remains are the working platforms, concrete flumes and the mine shaft itself. The project investigates how man's exploitative use of this site can reveal hidden technologies and understandings of man's connection to the landscape through the temporal.

The years that followed the mine closure saw the use of the landscape shift from that of mainly exploitative to that of preservation. The project uses this shift to explore two contrasting interpretations of man's connection to this landscape. 1963 marked the year that the Table Mountain Nature Reserve was proclaimed. The reserve would protect that part of the mountain above the 500ft contour line (Hey, 1994). By doing so the reverse would encapsulate the site of the tin mine. I argue that this shift to preserve has resulted in the tin mine being viewed or understood as a scar upon the landscape. Rather than attempting to fix this scar, the intent of the project seeks to better understand the way it is perceived, and in doing so attempting to alter ones perception of the tin mine and its ruins towards a spatial nature which one can be appreciated in today's context.

The projects theatrical framework stems from the field of Industrial Archaeology, providing a tool for interpreting the historic value of the site and to develop strategies for its conservation.

Cape Argus, 10 June 1910

TIN NEAR CAPE TOWN.

REPORTED DISCOVERY.

AT FOOT OF DEVIL'S PEAK.

We are informed that an area believed to carry some rich tin ore has been discovered on the land lying between the foot of Devil's Peak and Upper Buitenkant-street, and including portions of the properties of Messrs. Mellish, Jurgens Walsh, and the Cape Town Municipality. Our informant, who states that he saw the samples carrying splendid crystals of cassiterite, advises that the discovery was actually made some months ago by Mr. Ross well known as the prospector to the No. 7 Syndicate.

It is stated that Mr. Ross came upon the find by accident, when sheltering under a boulder during a heavy rain storm.

It is interesting to recall that the Jurgens portion of the area was sold recently at a nominal figure by public auction on the Grand Parade.

Fig. 03 Tin mine site plan, processes

The project proposes this dormant site be revived through introducing an electronic waste recycling facility. The e-waste facility acts as an introduction to the site, creating a didactic landscape of experiences, through which education about the tin mine and its comparatively landscape-rooted technologies is made possible. In turn the site proposes a suitable resting place for these obsolete technologies.

This e-waste is born out of society's demand for the latest technologies and electronic devices. As our demand increases so does our consumption rate. Over recent years the issue has become an increasingly problematic for cities. The rate at which technologies are overwritten by their more contemporary versions, rendering them replaced or 'obsolete' is ever increasing- thus placing pressure on our landfills. The problem does not stop at the sheer volume of e-waste, but also includes its environmental effects on the landscape. E-waste contains toxic metals and plastics which, if not disposed of correctly, leech their way into the earth. So, whilst cities and their people are being thrust into technological delirium, the other side of the story paints a whole different picture. Our creation of these e-waste landscapes tells a story of society's greed and technological fixation, a civilization of wants and of immediate gratification at the cost of the natural landscape.

However recently, attitudes towards e-waste have been changing. Many have seen the potential of e-waste as a secondary source of raw material, as such electronics are being stripped of the precious metals and sold or put back into the productive system as recyclable/ reclaimable entities.

The architectural response embraces these complexities of our contemporary technological lives where through intervention seeks to mediate the turmoil and respond in a manner which can enable society to strengthen its understanding of this landscape.



Fig. 04 Locality plan

Site Pre 1963

Pre 1963, the site offered rich resources to the city of Cape Town. Tin ore, discovered by a local prospector by the name of Mr. Ross. The land was soon bought by local business men and in the early part of 1910 Mr. Ross (and the No. Syndicate) began Cape Town's first commercial mining exploration. Within a year the price of tin had risen sufficiently that on 1 April 1911 the companies name made an appearance on the Cape Town Stock Exchange (Spargo, 1999).

The ore was being hauled out of a 55m deep shaft not too far from where Mr. Ross had made the initial discovery. (1) The mine at its peak was reportedly producing ore that yielded 2,5 percent tin. At the time, tin would have been used to manufacture tinfoil and tinfoil (Hey, 1994). The tin ore was hauled across the site to where a series of concrete platforms were located (3). These platforms were wedged into the mountain providing large flat working surfaces. These were used to handle and sort the unprocessed ore prior to crushing (Spargo, 1999). The crushing of the ore was done by a 5



Fig. 05 Location where tin was first spotted

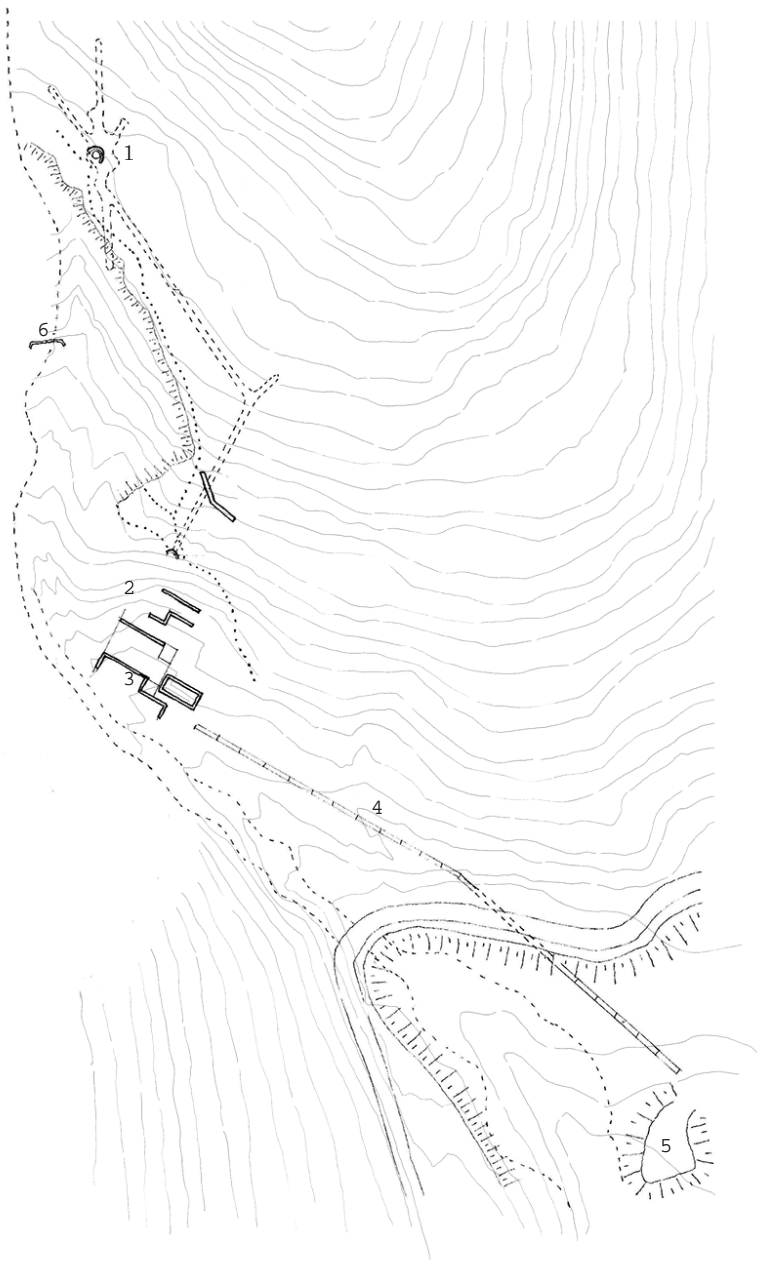


Fig. 06 Tin mine site plan, processes

stamp battery (4). This process would effectively crush the material enabling the tin ore to be separated from the rock. Once crushed, the material was fed via a stream of water through a series of concrete flumes (5). The concrete flumes ran for about 350m where the tin was separated from the rock. The waste water was collected in a tailings dam at the bottom of the site (6). The water on site was obtained through a dam situated further upstream (7). The water then fed the main header dam by means of a steel pipe located next to the working platforms (Hey, 2004).

The reason for the closure of the mine is not clear although speculation has suggested that the quality and quantity of the ore could not be maintained (Spargo, 1999). The mine simply ran out of ore.

More than just understanding the site through a series of processes and flows of material, the site can be understood through various concepts and methods of working, namely resistance, tunnelling, the hand, the machine and working with matter. These concepts determine the way in which the site was constructed and utilized. Furthermore these methods of working display principals of craftsmanship, which refer to the ability or desire to do a job well for its own sake (Sennet, 2008).



Fig. 07 Construction of the battery Site (Concrete working platforms)

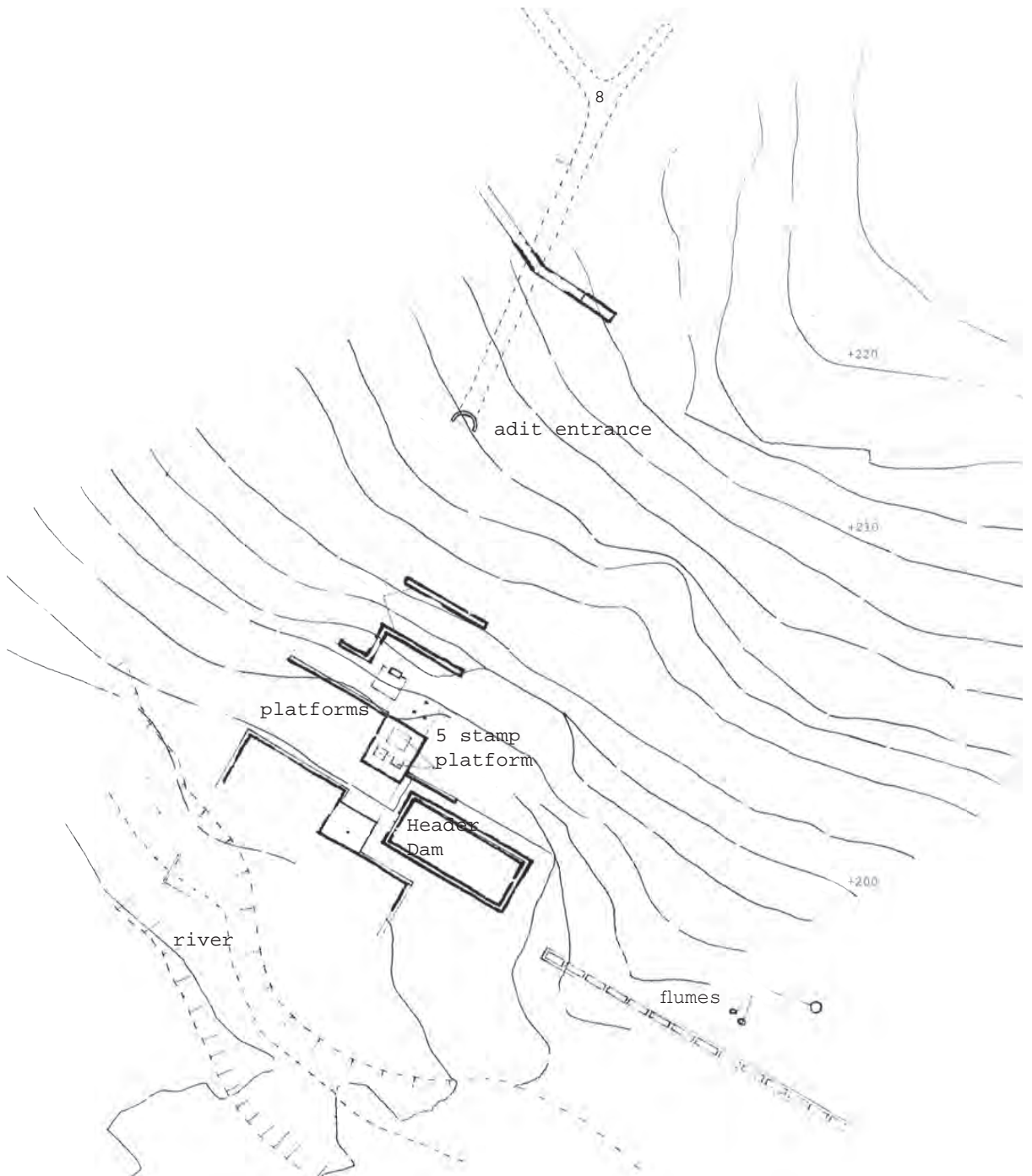


Fig. 08 Tin mine works plan, crushing process



Resistance

The physical concept of gravity implies working with the natural fall of the landscape, to employ it as an aid in creating the most efficiently functioning process possible. This approach is generated from the idea of working with and not against resistance (Sennet, 2008). One can see the site as a series of processes, each positioned in relation to one another and its level on site. Resistance is produced from steep nature of the topography. Instead of working against the slope, each process become a series of steps and level changes which assist rather than resist the hauling of matter. The process effectively overcame resistance by accurately spatially organising the process on site.

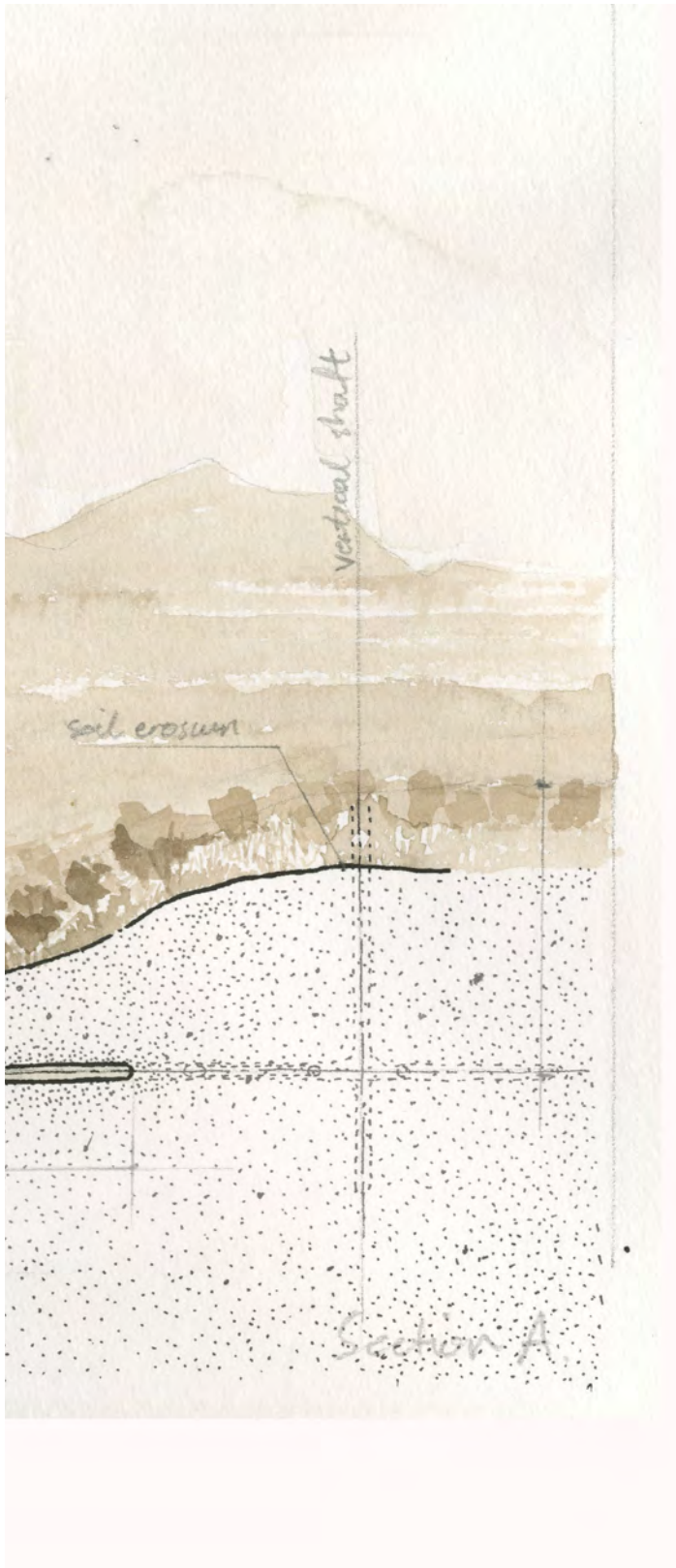
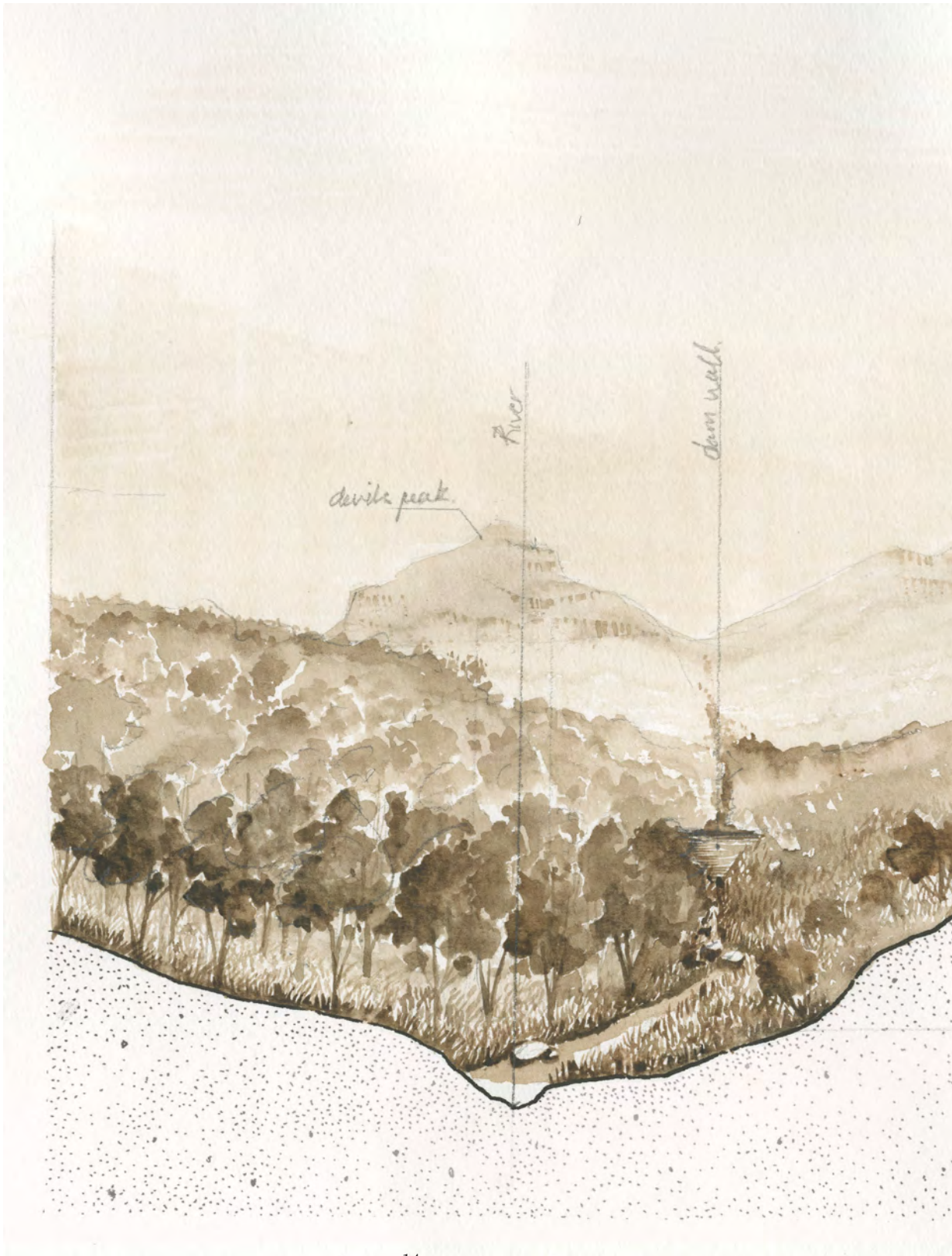


Fig. 09 Section through The working platform and start of the horizontal adit. Illustrating the use of the topography.



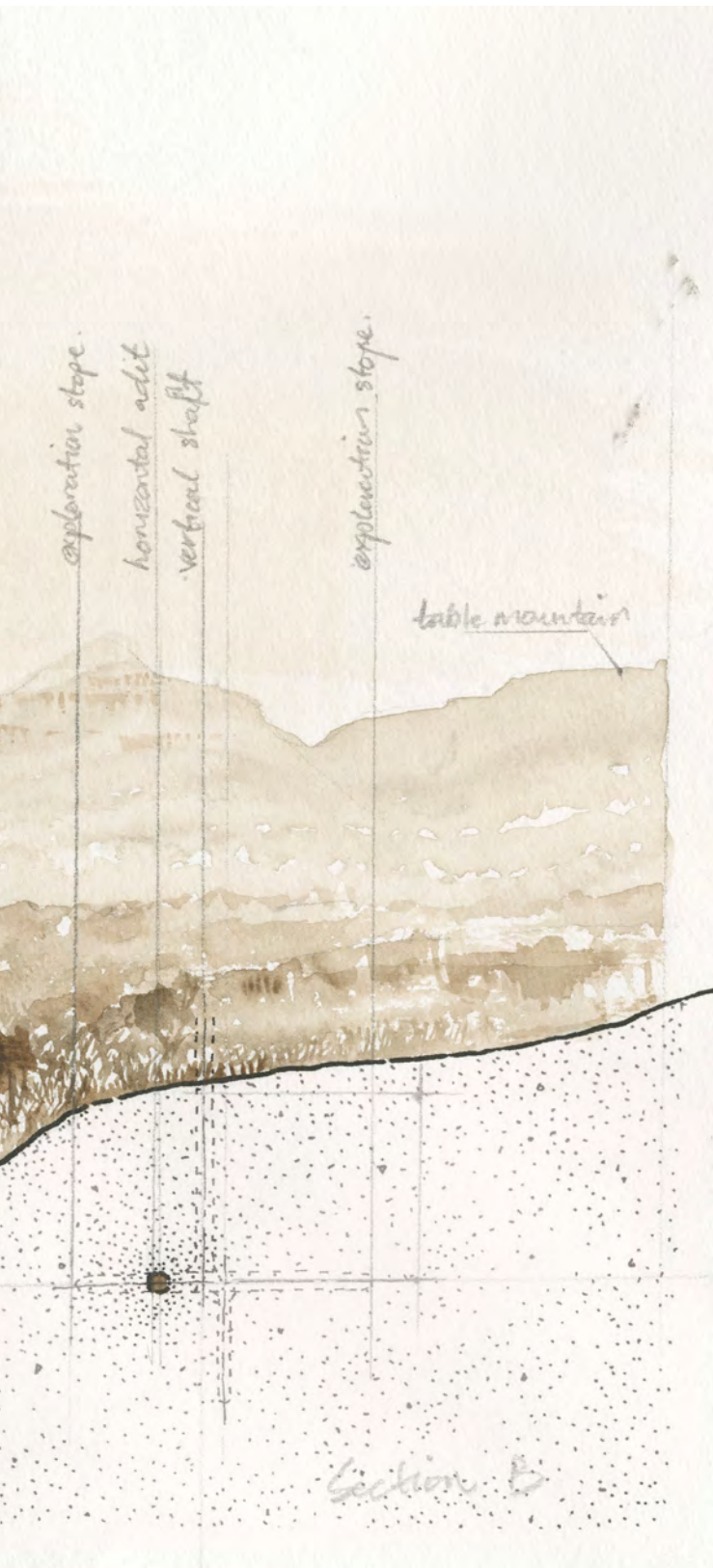


Fig. 10 Section through valley and horizontal adit

Tunnelling

By January 1912 reports had emerged of a vertical shaft 55m in depth (Spargo, 1999). Refer to fig. 6 (1)The vertical shaft was a result of near vertical quartz veins which ran through the cassiterite rock. (2)The horizontal tunnel at the base of the vertical shaft explored flat-laying quartz veins (Spargo, 1999). The horizontal adit was a later addition to the underground network serving as access for base workers and unprocessed ore, from the base of the vertical shaft to the reduction works.

The dimension and shape of the tunnel was determined by the technique used to excavate as well as the required space need to operate within. Fig. 11 shows a exploration into the mine. The method used to tunnel underground would have been drilling and blasting (Spargo, 1999).

In 1540 Vannoccio Biringuccio wrote *Priotechnia*, described mining techniques which sort to work with and not against the nature of the earth. Also known as path of least resistance (Sennet, *The Craftsman*, 2008). Fig. 12 shows how this technique of tunneling works with the direction of the rock strata.

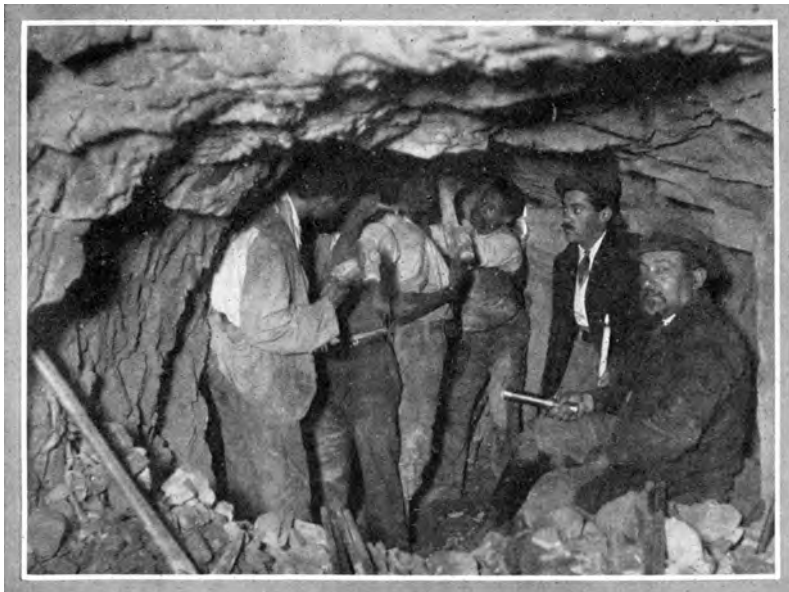


Fig. 11 Inspection of the stope.

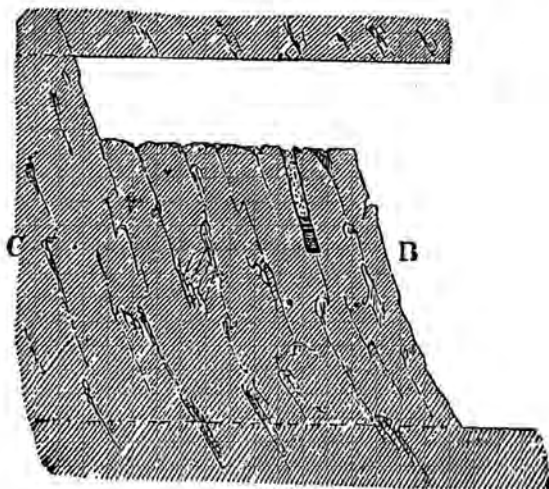
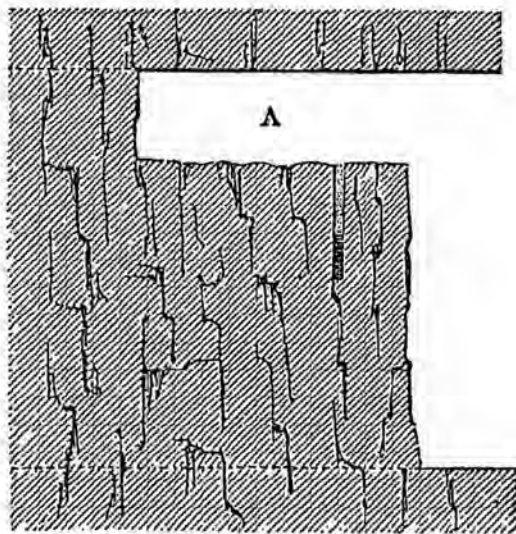


Fig. 12a Fig 12b Methods for drilling and blasting through strata

The hand

At the peak of its productive period the mine had employed as many as 100 workers (Spargo, 1999). These workers had been employed throughout the site to preform manual tasks. Therefore common to all the processes is the presence of the human hand. The act of human judgement and the ability of the hand to respond accordingly to the landscape was an important concept in the way the mine operated.

Working by hand upon the landscape allows for an understanding that is different to that gained through looking. The experience of touch creates what is known as 'unbound data'. This information allows the body to organise movements which best respond to the task at hand (Sennet, *The Craftsman*, 2008). Therefore one can speculate as to how techniques and tools were adjusted to suit the site conditions.



Fig. 13 Entrance to the Horizontal adit.

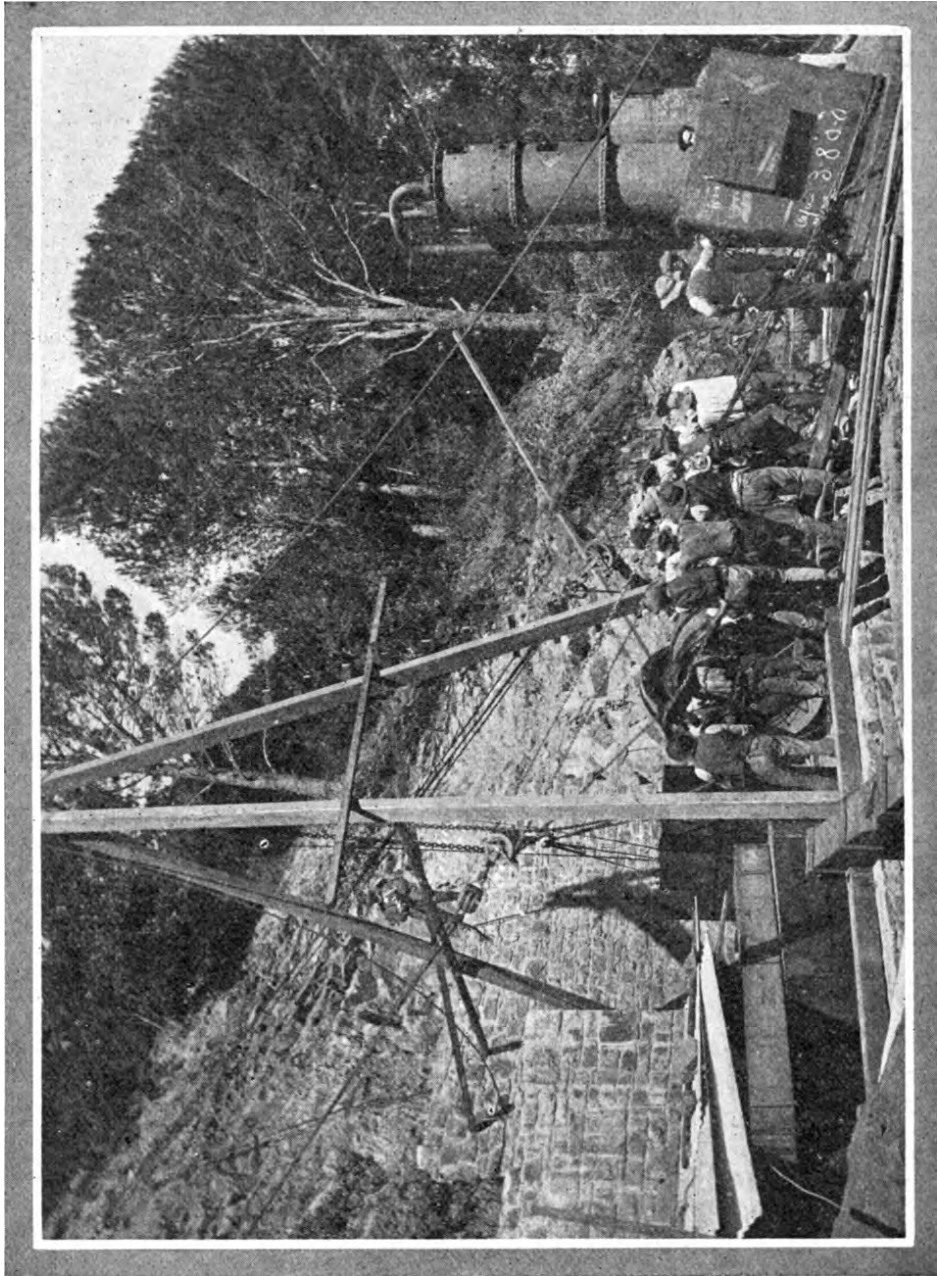


Fig. 14 Hauling the 5 Stamp battery in place.

The machine

The most significant development of the tin mine was the introduction of the 5 stamp battery (fig.14 shows its construction on site). The mine managed to produce 430 tons of tin ore in November 1911 (Spargo, 1999). No doubt the use of the 5 stamp greatly improved the efficiency of processing ore on site.

This mining machinery was utilized to enable mining operations to work more efficiently on site and perform tasks more effectively than the human hand. These kinds of machines are referred to by Richard Sennet as 'robotic machines' (Sennet, 2008). These machines serve to replace the human counterpart of the ore extraction process. They work faster, are stronger and never tire, allowing for greater processing potential.

Although very little evidence remains of the machinery used on site, one can speculate that besides the 5 stamp the site would have also possessed a hopper. This is used to gravity feed material to the 5 stamp.

These machines assist the mining processes by overcoming the resistance of site as well as the limitation of the human hand.

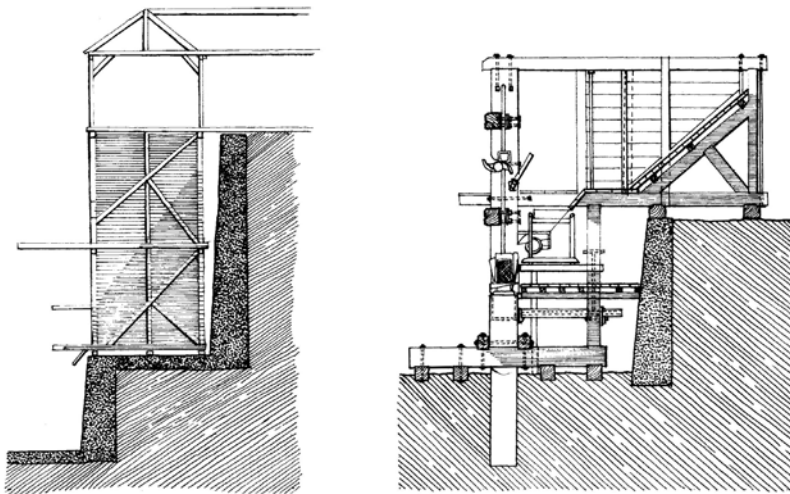


Fig. 15 An idea of the hopper systems which were used

Matter of efficiency

The use of water on site was particularly important for numerous processes which include; drilling, crushing the ore and separation of crushed material. It was therefore no coincidence that the position of the reduction works is in such close proximity to the river.

As much as the winter months provided the site with a steady flow of water, the dryer summer months meant that water would have become rather scarce. As such, the site would have employed a system of recycling water. The water which was used in the operation of the flumes was collected in the tailings dam, where the pulp (the sandy remains of the separation process) was left to settle, before pumping the clear water back to the header dam for reuse (Hey, 1994).

The preliminary hand sorting process would have served to reduce the quantity of the ore being processed through the beneficiation steps, thereby saving both power in the case of the stamp battery and water in the case of the flumes (Spargo, 1999). Efficiency was therefore an important concept in the operations of the mine and its success.

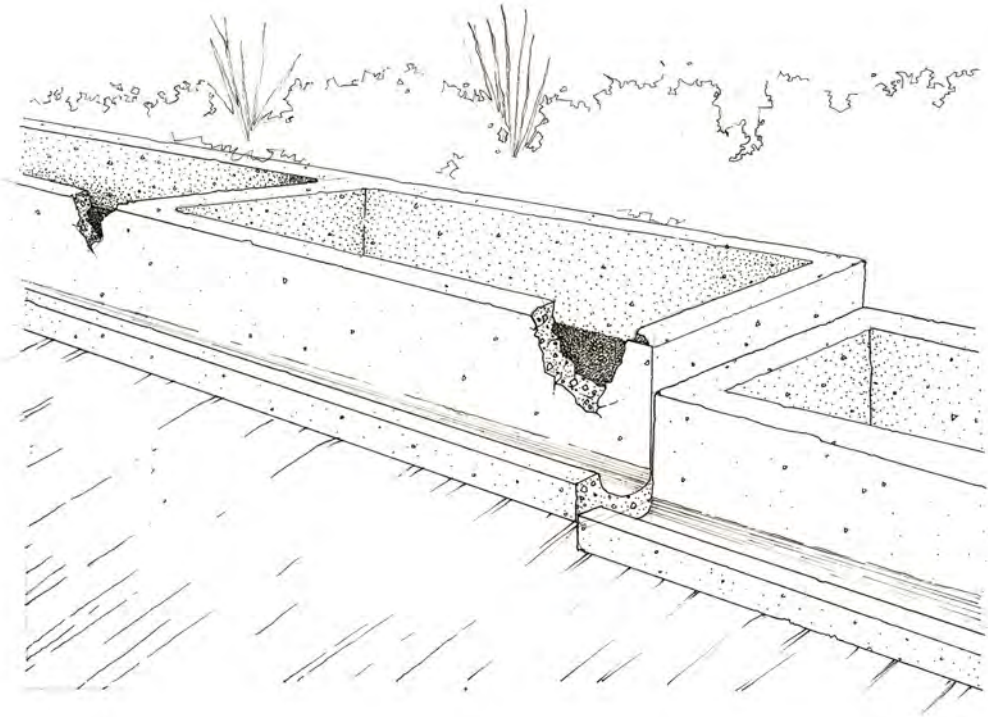


Fig 17. Concrete flumes used to separate tin from the crushed ore

Industrial Archaeology

As a means of exploring the history of site, industrial archaeology provides a tool that allows an examination of evidence beyond its physical state to reveal a much richer value. What this means is that an industrial archaeological investigative approach responds not only to the physical characteristics of the site, but also those that inform its' broader context; economic and socio-cultural. These in turn contribute to a more complete understanding of its historic value. As an architectural tool or method it attempts to steer clear of approaches which only focus on historical matter as an aesthetic treatment or superfluous reference. Often is the case in contemporary architecture that historic ruins are aesthetized during design process and therefore lose the ability to be understood as anything further. Thus Industrial archaeology is a starting point to begin to uncover other ways of conserving the tin mine.

Of recent, industrial archaeological research has broadened its views from that of purely preservation, protection and management, to new territories of research and practice. This new perspective satisfies the need for the discipline to adapt to the challenges faced by the pressures of modern development in order to secure its value (Rhodes, 2010). Industrial archaeology, as with other forms of archaeology, is foremost a means of preservation, conservation or restoration of valuable cultural heritage (Icomos, 2000). In some circumstances the value of a site is such that National or World Heritage status is a justified means of preservation and management. The tin mine however does not hold such value. Although attempts to restore and preserve the tin mine have been previously proposed by Peter Spargo (a Professor of archaeology at the university of Cape Town). Spargo's report concluded that the tin mine was of significant value and required restoration (Spargo, 1999). However the city's response was not in favour and suggested that it was the responsibility of the mining industry to 'acknowledge their past' (Mr Neville Riley, 1982, The August).

Mining, in general, hasn't featured within the significant history of Cape Town nor its citizens and therefore a purely restorative approach I believe would seize to add value to the landscape. Therefore the projects interest lays in the conservation of the tin

mine. The relationship of architecture and industrial archaeology thus becomes a fine balance between what to conserve whilst bringing the site up to date and relevant to within a modern society. Its' future is reliant on its adaptive reuse.

Understanding what to conserve or preserve can be better understood by the use of two terms, tangible and intangible. Tangible can be understood as the physical remains of an industrial practice such as building, monument, landscape or in this case ruins. These are strong visual references of the past which most of society are familiar with (Rhodes, 2010).

Intangible on the other hand encompasses those things that are expressed, felt and learnt but leave no physical presence. It can be acknowledged as a practice, ritual or skill of a community or culture. It is often recognized through knowledge and practices concerning nature, the universe and traditional craftsmanship (Rhodes, 2010). The tin mine offers the potential to explore these intangible qualities of working on, with and within the landscape.

The direction of this investigation takes to exploring the conservation of the site's ethereal temporal qualities, both present and the past, in order to understanding the value and meaning of this historic industrial landscape. The conservation and its corollary non-preservation, allows an architectural response which can embrace the natural creation-deterioration cycle which gives this site its unique character. The objective of preservation seeks freeze artefacts to ensure its value. Conservation on the other hand seeks to ensure value through future use, even once the historic artefact becomes irrelevant.

Mining has a long history of working with matter and as such has developed methods and techniques in order to overcome obstacles in the landscape, even more so allowing the landscape to greater improve the efficiency of the process. These methods of working have left no physical reminder to us on site, instead they hidden within site, they are the intangible relicts. Plato's definition of technology includes those which are both physical and non-physical. Explaining that technology is also that of knowledge and acquisition (Jin, 2005). In light of this definition, these principals such as; Resistance, Tunnelling, the hand, the machine and matter efficiency can be described as technologies which were once present on this landscape but have now become obsolete. A way of working and interpretation of the landscape which has fallen out of favour and been lost within the site. This is the sites intangible value, and forms the conservation interest in this project. Industrial Archaeology can be viewed as a tool for architecture to respond to site beyond the physical relicts of historic sites and revive these dormant layers.

Site Now. Post 1963

Although the historical value of the site can be explored through industrial archaeology there is still a need to understand the site's value within the landscape today. This allows for an architectural response which can perform a dual role of acknowledging both the past and present. The tin mine as a ruin offers the landscape a unique character. The few remaining visual references are inadequate to distinguish it as a tin mine, and thus read as strange and unfamiliar relics which lack a distinct identity. This provides a curiosity to the eye and inquisitiveness to the imagination. The nature of the site is one which offers the potential for spaces of play, inquiry and discovery. Its' present value lays within its ability to estrange the landscape and create a space which encourages activities of transgression. These spaces need not be interpreted negatively, but rather as alternative spatial practices which enable people to explore and discover a new understanding of place, and better appreciation of the complexities of contemporary life (Sennet, 1990). Thus adding richness to the landscape.

These qualities make up what is known as a Terrain Vague. The term is used to define spaces which are unfamiliar and unknown, often falling outside of the established order of a place (Rubio, 1995). The tin mines location within the Table Mountain Reserve is an example of this. The order to the landscapes is established through the ambition of the Reserve to preserve the land. The tin mine upsets this order both aesthetically and functionally. Its lack of a clear function and lack of re-development of the site over the past century has attracted alternative spatial practices.

What was once a site of social and economic development has become suspended. This suspension of use creates what has been termed a time gap, allowing the site to develop its transgressive characteristics over a number of years (Pamela Shaw, 2009) (Doron, 2007). Essentially the Reserves need to preserve the landscape has meant that the site has been open for re appropriation.

The area of the site which has most been mostly re utilized due to this lack of order has been the concrete working platforms. Fig.20 shows small groups of graffiti artists who have taken advantage of this loss of order, expressing their works of art on the stone retaining walls behind each platform. Sections of the platforms show



Fig 18. The site at present. looking up the valley with the working platforms on the right.

10 June 1910- Tin Discovered

1912

Work Seized 1913-

Aerial 1926

Cable Way 1929

Aerial 1943

National Park 1998

Aerial 2001

Section 2014

Recreational Activity

Commercial Forestry

River

Water Management

Water Power

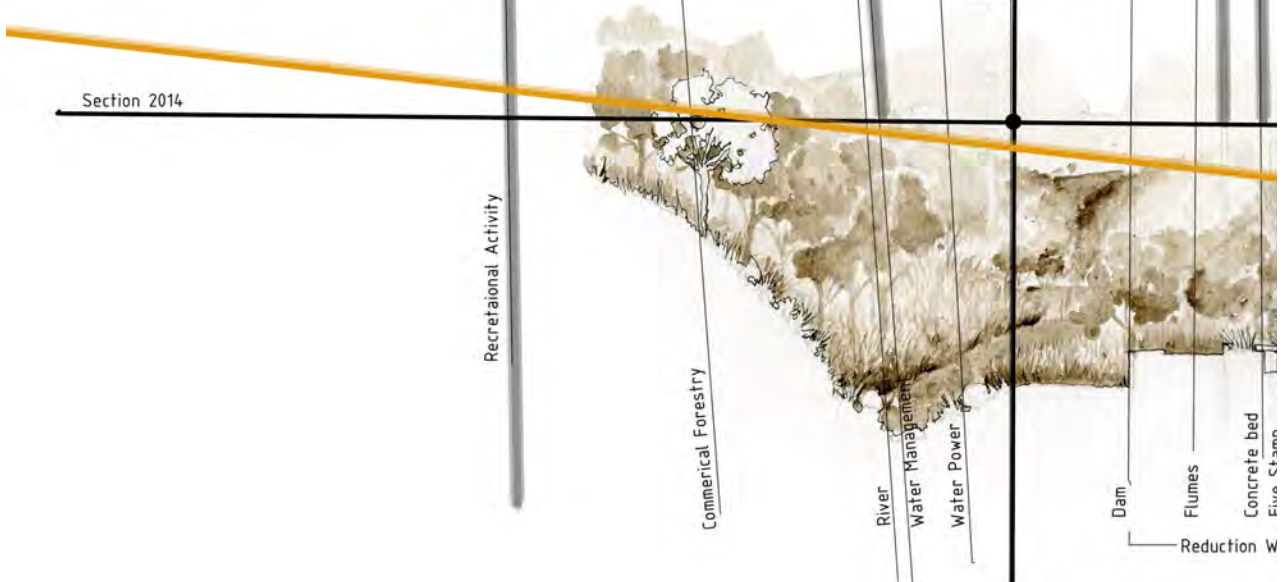
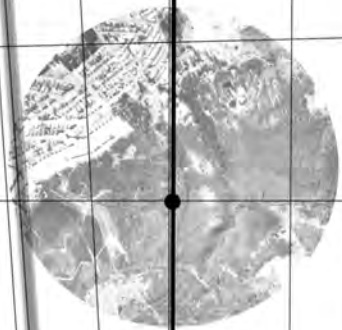
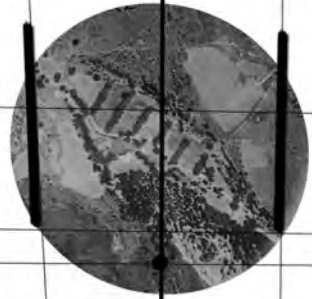
Dam

Flumes

Concrete bed

Flow Channel

Reduction W



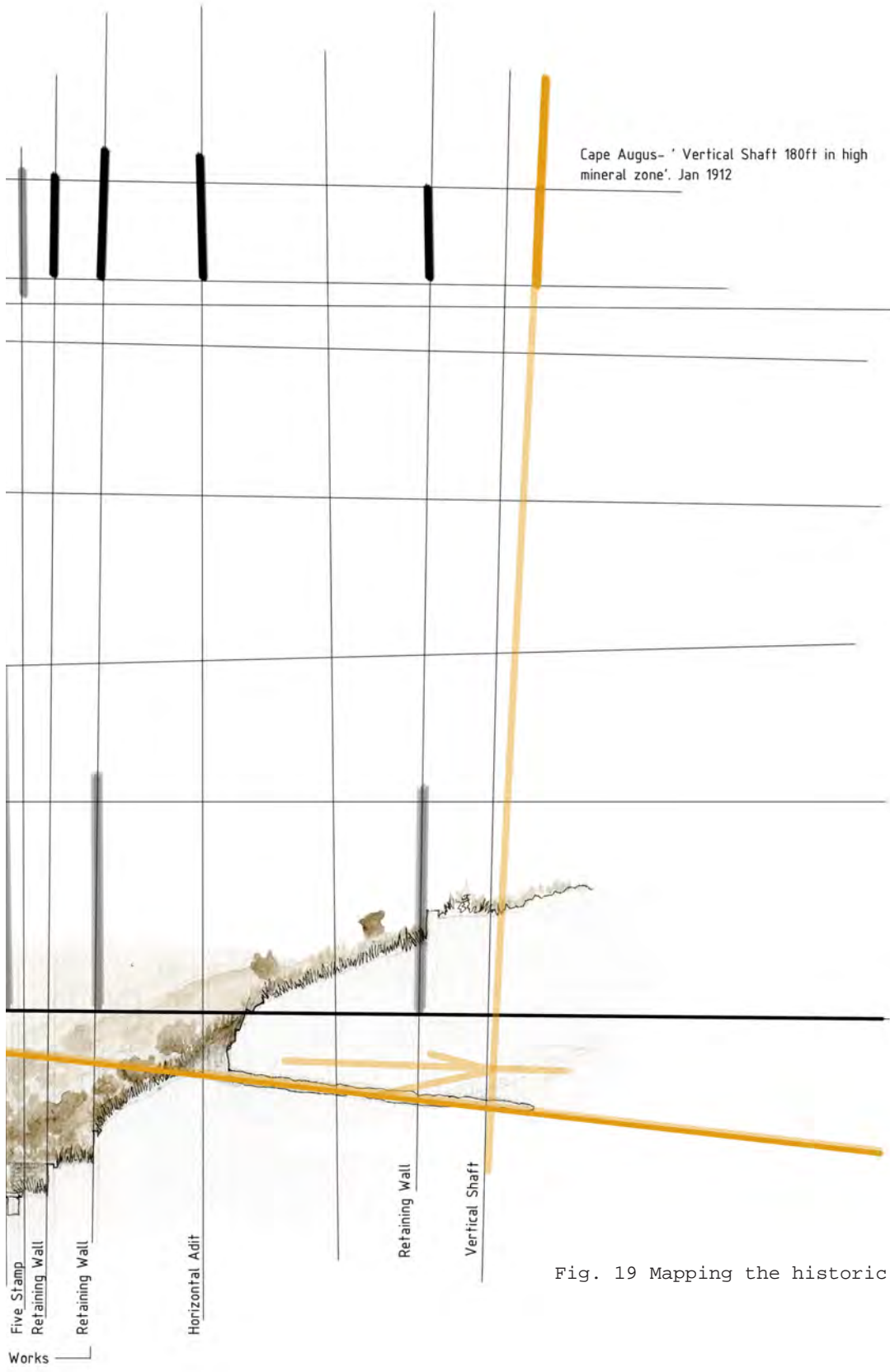
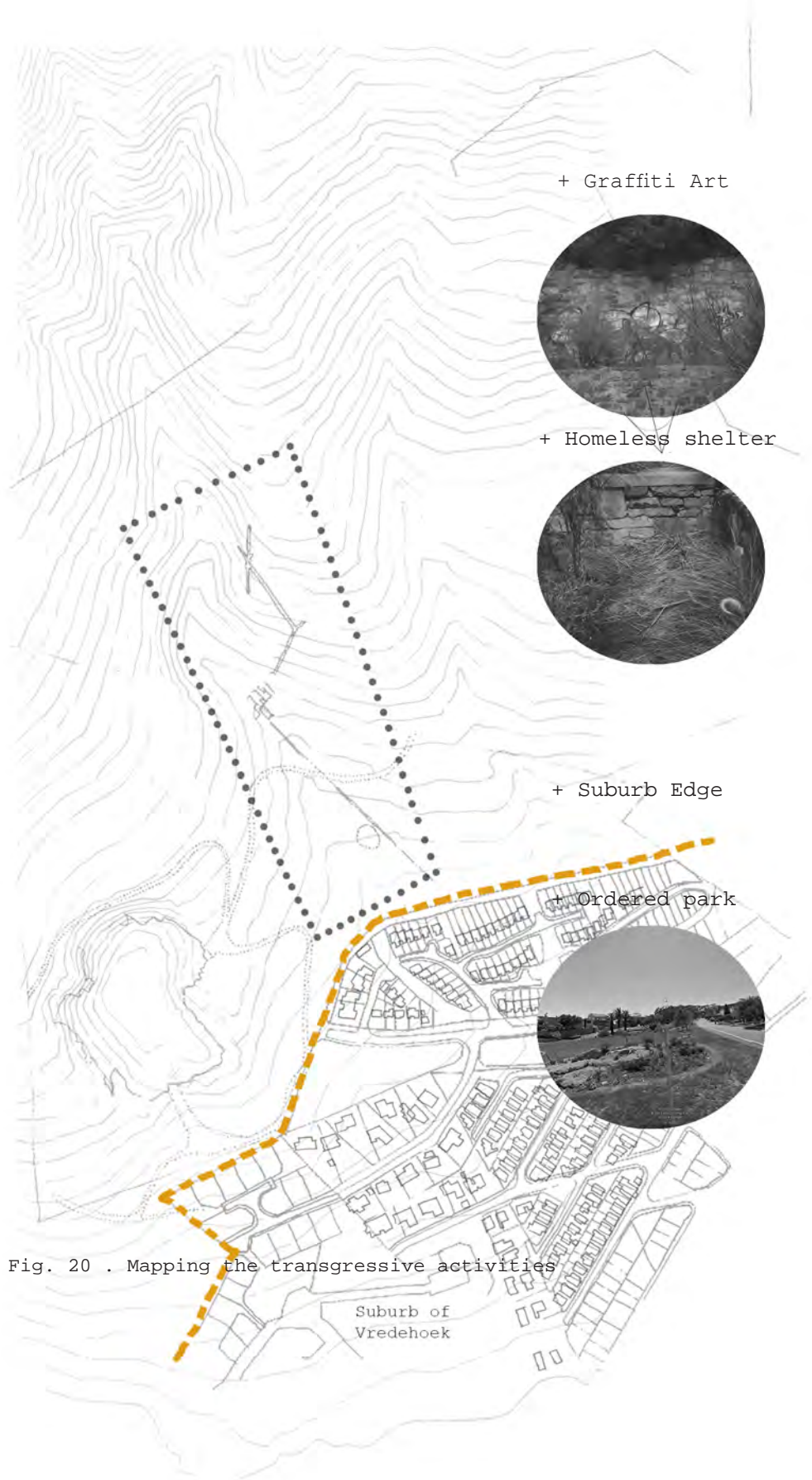


Fig. 19 Mapping the historic use-pattern

signs of homeless shelters and on various visit to the site lay evidence of ashes from small fires. Mountain bikers and hikers traverse through the site, mostly upon an established contour path. The ruins itself are nestled within a valley and have a sense of privacy from the rest of the mountain which adds to allure of transgressive activities.

Apart from function, terrain vague is also defined through an understanding of its intangible qualities such as; flows, energies and rhythms (Rubio, 1995). These qualities have been established through its use and re use over a periods of time. These qualities are not permanent, they inevitably vary, change and fluctuate. One's experience of the space and such qualities can be subject to the time of visit, who may be occupying the site and what the site is being utilized for. Terrain vague, as like industrial archaeology, questions the intangible makeup of the site, as well as the tangible, and therefore cooperate in the conservation of the site.

An architectural response should look to celebrate these qualities and spaces of the unknown. To further make strange the landscape rather than recognisable (Rubio, 1995). To highlight the void rather than form, it's intangible rather than purely its tangible state. Sustaining the terrain vague nature of the site whilst trying to bring to light it's historically value.



+ Graffiti Art



+ Homeless shelter



+ Suburb Edge

+ Ordered park



Fig. 20 . Mapping the transgressive activities

Suburb of
Vredehoek

Flows.

Situated adjacent to a small stream, the site has a near constant flow of water. Identifying its possible influences on the site and how they manifest in its spatial use.

The mappings speculate the ability of this matter flow to change the nature of the site. The ability to create temporal divides, edges and boundaries with the changing rate of flow. The intensity of flows varies with the increase or decrease of inherent topographical gradient. The intensity of flow is also varied by the intervention of a small dam which regulates the amount of water entering the Vredehoek suburb.



Fig. 21 . Mapping flow of water currently on site

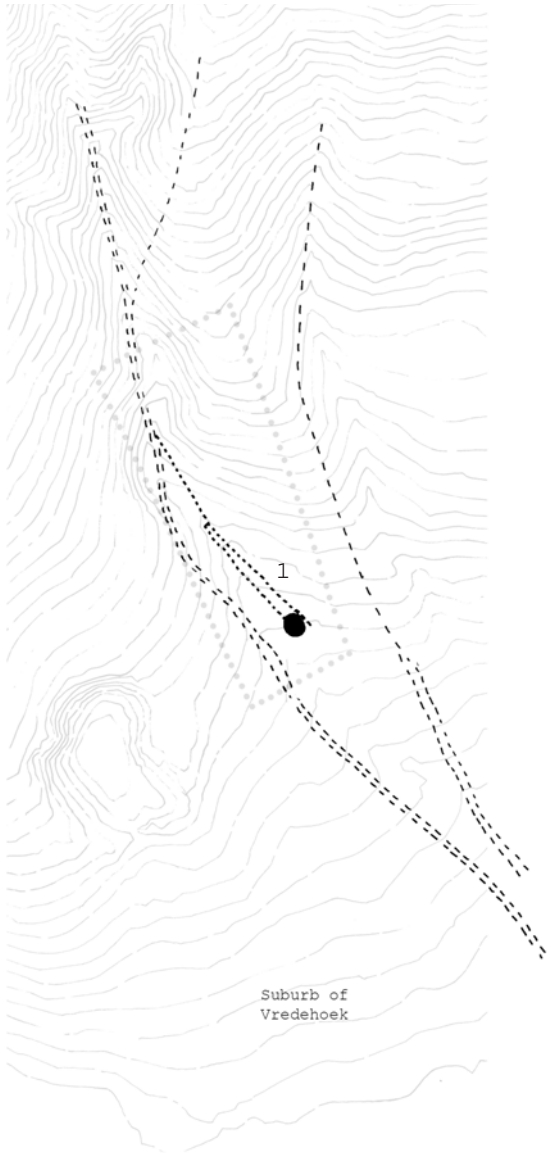


Fig. 22 The historical flows of water.
 (1) the flow of water during the mining process

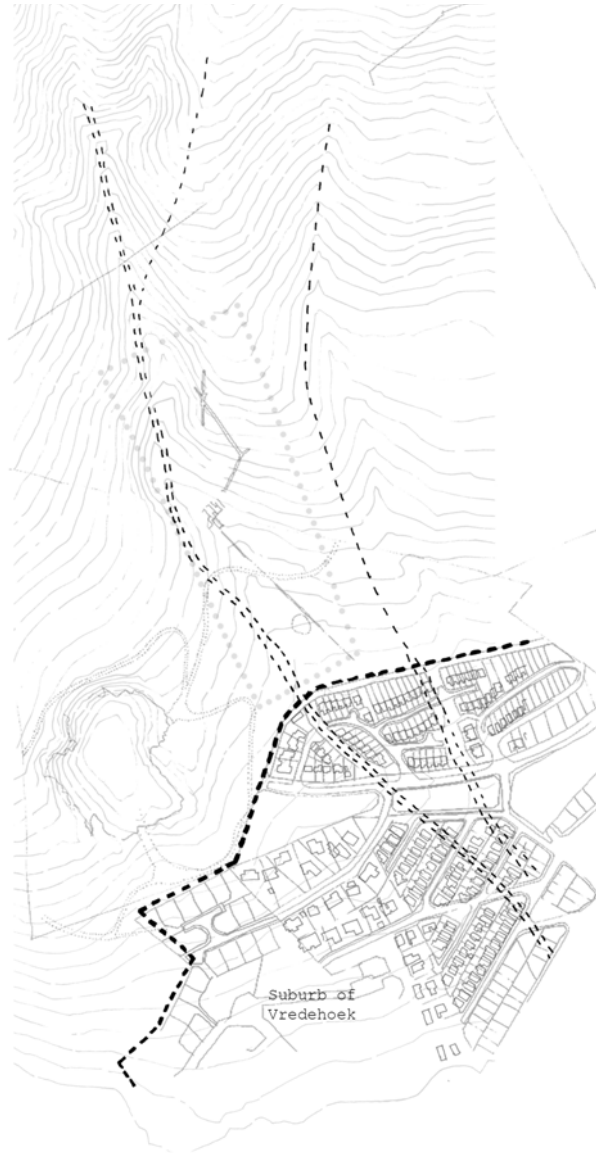


Fig. 23 Flows of water currently on site. The mapping start to develop rhythms which have have formed slowly over time.

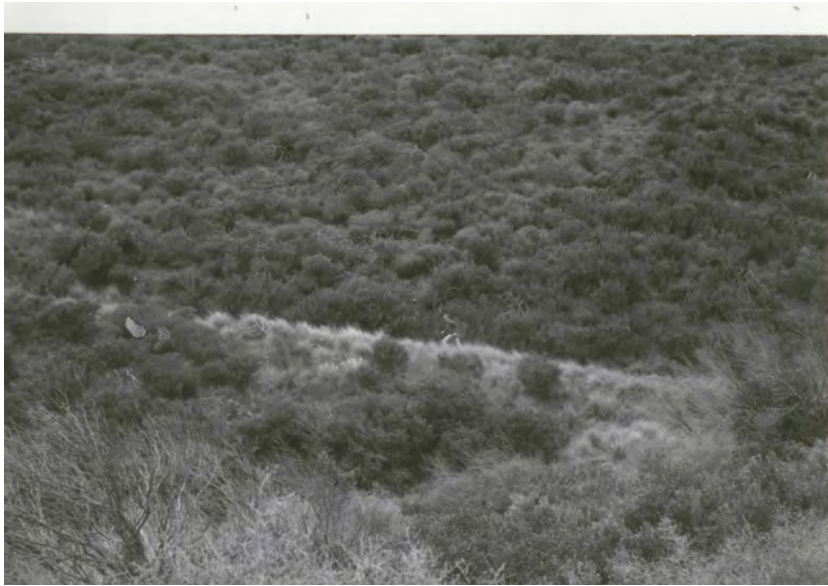


Fig. 24 . Mapping the recreational activities

Energies.

The site is utilized primarily for recreational activities. Both hiking and mountain bike trails cross the site providing an active layering to the already transgressive nature of the site.

The intensity of these energies fluctuates as mountain bikers and hikers pass by. Each of these activities on site provides a unique energy. The gradient of the topography also concentrates human energies at certain points.

Rhythms.

The manner in which the site is experienced is also subject to an occupation- time factor. Mapping the uses against days the week reveals the rhythm-use patterns. This pattern fluctuates and shifts throughout this given period.

Void of activity, week day periods have an airy quality. Opposed to this, weekend periods offer frequent interactions with other users. Installing a better sense of safety on the mountain. Climatic conditions play their part and result in a fewer users over rainy periods and winter months. Mapping these rhythm- use patterns extracts not only the quantitative but also the qualitative aspects of the site.



Fig. 24 The historical movement patterns were linear and take the most direct and efficient path for the effectiveness of the process.



Fig. 25 Currently movement patterns show paths which has developed along the contours. These diagrams illustrate the different energies and the rythmns which have been created on site.

Site Activation

Imperative to the conservation strategy of the tin mine, a new interpretation of the landscape and site needs to be formed. This interpretation needs to re orientate people's perception of not only the physical remains of the tin mine and its adaptive reuse, but too its potential role in our future lives. The strategy is to activate this dormant site by projecting upon it a programme which may respond to both past and present layers. The project proposes that an e waste recycling facility can achieve this. Through investigating how we can learn to put back into the earth by utilizing the methods and principals used during extraction of the resources.

E waste is a result of our contemporary technological lifestyles, these methods and principals of the tin mine are potentially ways which can assist in response to the problem. These methods are reutilized within the e waste process and in doing so can be made relevant and accessible to contemporary society. More than just providing new concepts and methods of working with matter, the site allows for a new method of extracting precious metals from disused electronics called Bio Mining. This process uses naturally occurring bacteria to recover precious metals from e waste (mainly circuit boards) (Abhilasha Bharadwaj, 2012). These naturally occurring bacteria can be often found in flooded disused mine shafts (Abhilasha Bharadwaj, 2012). As is the case in the Vredehoek tin mine. The recycling facility becomes a working archive of obsolete technologies.

In this way the site is seen as a potential an asset or public amenity which helps relieve (and celebrate) the down sides to our technological greed. The programme also transgresses traditional spatial boundaries in the attempt to rid society of it's out of sight out of mine mentally towards e waste. The facility is envisioned as assets to the public rather than an eye sore or health risk.

Essentially the working principals are revived through the process of the new programme. The architectural intent is for the facility to become an introduction to the landscape which allows for a new way of better understanding the landscape and tin mine.

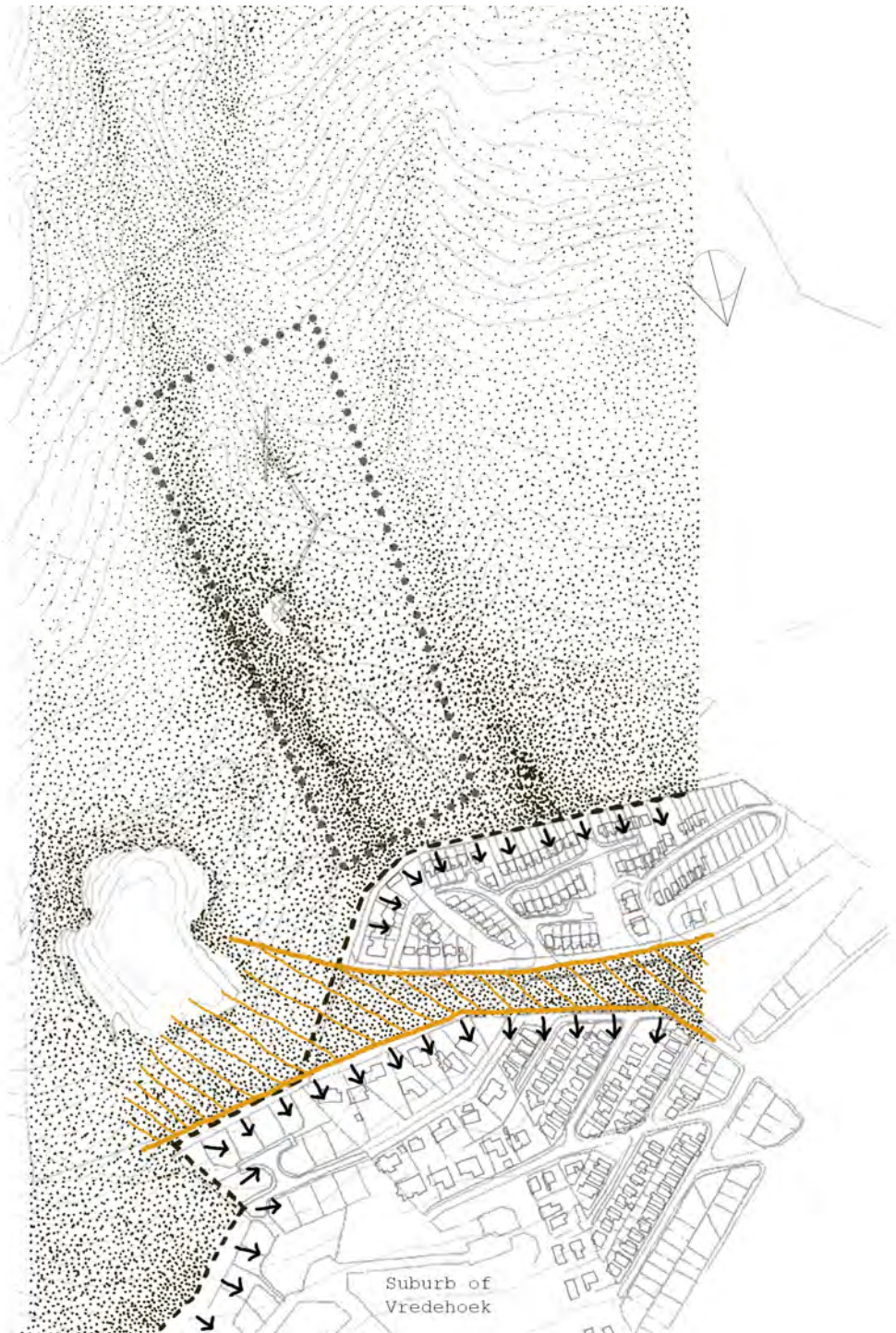


Fig. 26 Map illustrating orientation of suburban homes. The built form creates a natural 'gateway' onto the site. This becomes the starting point for the proposed new introduction to site.



Fig. 27 Identifying the gradient of the process o site



Fig. 28 The process line starting at the 'entrance' to the mountain and finishing at the tailings dam.



Fig. 29 Process line establishes a new introduction to the landscape. 1. Entrance 2. Gravity 3. The machine 4. Matter efficiency



Fig. 30 The process line starting at the 'entrance' to the mountain and finishing at the tailings dam.

Programme study

The current industrial process model employed by these facilities can be described as linear or linearly arranged. The ewaste arrives, is dismantled and broken down into its components, and leaves to landfill or is exported for further processing. The architectural intervention seeks to interject on this linear model through the introduction of integrative public functions.

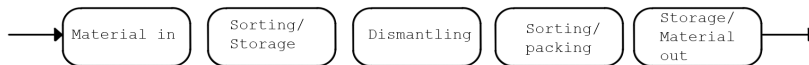


Fig. 31 Current linear model.

The Maitland Material Recovery facility was a pilot project started in 2008 in Cape Town. The aim of the facility was to develop and test a new system that could be replicated in developing countries (Schluep, 2008). This system looked to install feedback loops, attempting to fulfil the need to stem the flow of e waste to landfill sites. As opposed to the linear flow of matter which is adopted currently, the feedback flow diagram is designed to create multiple tributaries where material can be fed back into the productive system, potentially becoming a secondary source of material. This is achieved through inserting new programme such as a repair and refurbishment. Only once the material is passed the 'point of no return' is it to be considered e waste (Schluep, 2008). The architectural programme is formulated using this model as a guide. Technological archives become integrated public space. These spaces are experienced in parallel to the industrial processes.

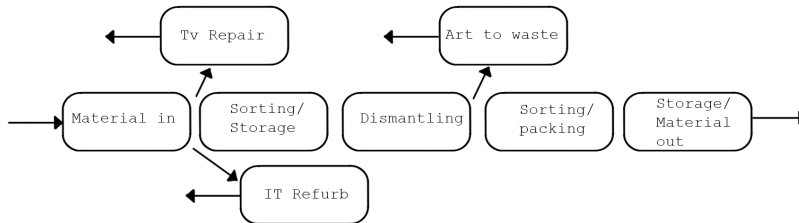


Fig. 32 Maitland model including strategies for feed back system.

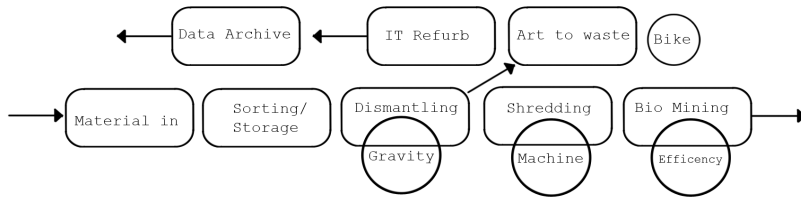


Fig. 33 Proposed model diagram. Intergrated feedback loops and public programme.

Fig. 34 and Fig. 35 illustrate the typical method of recycling currently in South Africa. As is illustrated, the majority of the process is achieved through manual labour. Working by hand develops skills and a craftsman like working principals. Through the study of the tin mine, the project proposes this method of working can be improved through introducing the concept of a gravity fed system. The study of this process denotes the understanding of how to effectively work with material in order to make efficient the proposed facility.

E Cycle recycling facility, Paarl,
Western Cape.



Fig. 34 (1) Drop off and pick up area.
(2) At the entrance a weighing station.
All e waste is weighted on arrival and
on departure.

(3) Printers and monitors piled together
in stock pile. (4) Manual dismantling of
Pc tower. Electronics are transferred
from the stock pile to workstations by
hand.



Fig. 35 (5) upon arrival electronics are inspected, those which can be repaired are sent to be refurbishment for re sale. (6) Workstation, stock pile and staff common area (wendy house).

(7) CRT Storage in a skip placed outside. (8) dismantled material packed and stored for collection.

Spatial analysis

These diagrams illustrate the typical layout of an e waste recycling facility. This current typology resembles a typical industrial factory or warehouse. Its processes are housed under long span roof system and set upon a single level open floor plate, usual with a rectangular footprint. This has its advantages. As like most industrial processes the need for open plan flexibility is important. Although the singular levelled floor space provides flexibility, the negative result is that the movement of waste material from storage to workstations becomes a source of resistance. Having to manually manoeuvre waste around the facility. This would greatly be improved by applying the principal of a gravity fed system. The proposed functional relationships between industrial process and public functions require a more complex spatial resolution to achieve the desired architectural result.

+Corn Cycle E waste Facility

Location: United States

Dimension: 70ft by 175ft - 12 250ft

Schedule of Accomodation:

- 1.E waste intake
2. E waste Sorting
3. IT Reurbishment
4. Offices
5. Manual dismantling
6. Secondary sorting
7. Out going matter

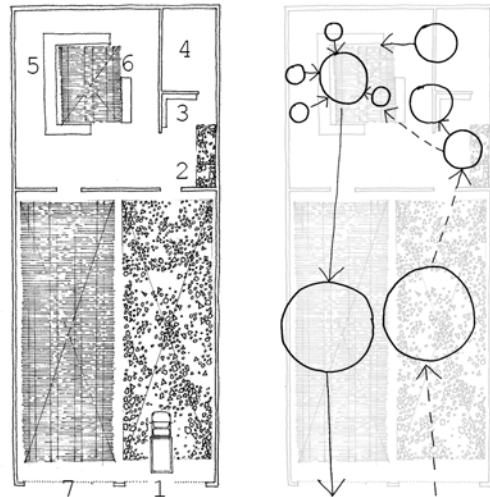


Fig. 36

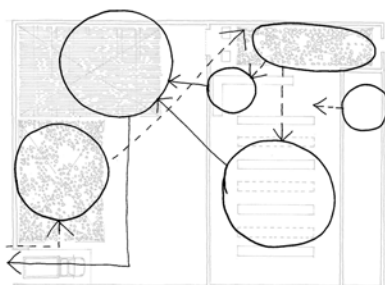
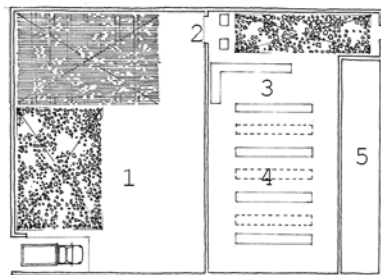


Fig. 37

+Recycling Partner E waste

Location: Germany

Dimension: 90ft by 150ft- 13500ft

Schedule of Accomodation:

- 1.E waste intake
2. E waste Sorting
3. CRT recycling
4. Manual Dismantling
5. Offices
6. Out going matter

+Maitland Material Recovery

Location: Cape Town, South Africa

Dimension: 355msq

Schedule of Accomodation:

1. E waste intake
2. Out going matter
3. Manual dismantling
4. Tv repair
5. CRT storage
6. Research/ waste to art
7. Safe
8. Kitchen
9. Refurbishment
10. Offices
11. Restrooms
12. External storage

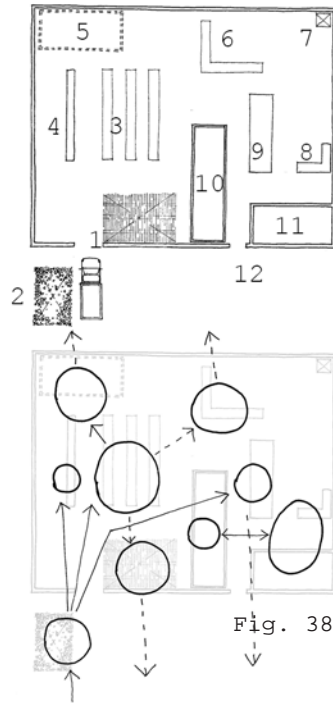


Fig. 38

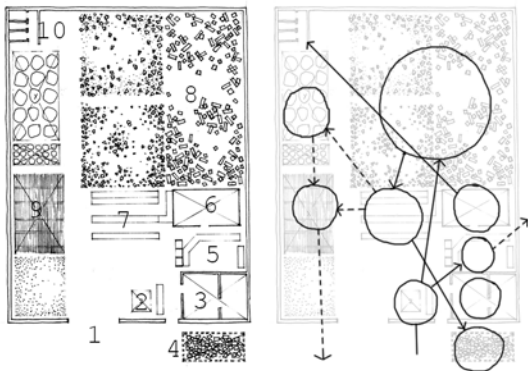


Fig. 39

+E Cycle

Location: Paarl, Western Cape

Dimension: 60m X 35m

Schedule of Accomodation:

1. E waste intake
2. Weighing station
3. Offices
4. CRT storage
5. Refurb station
6. Staff
7. Dismantling
8. Storage
9. Out going material
10. Toilets

Bio mining.

Bio mining or bio leaching is a process of extracting or recovering precious metals such as; gold, copper and tin solder, from disused electronic components. Bio mining technology has been previously used in mines and recovery of metallic tailings in dams. The process is based on column leaching. This method utilizes vertical glass tubes packed with material (e waste), and then flooded with water containing bacteria. The tubes are then subjected to compressed sterile air (Abhilasha Bharadwaj, 2012). The advantage of this method of metal recovery is that it is cheaper and does no harm to the landscape. Opposed to chemical processes like Pyrometallurgical which require high amounts of energy, also producing toxic waste (Vasconcelos, 2013).

Indigenous microorganisms present in the abandoned mines can be isolated and adapted to the toxic environment to improve the metal extraction yield (Abhilasha Bharadwaj, 2012). The current condition of the mining tunnel correctly provides an environment for these naturally accruing bacteria to grow. The majority of the mine is flooded in ankle high water and the source of the water is said to be due to a completely flooded shaft (Hey, 1994). The tin mines disused tunnels become a source for these naturally accruing bacteria and can be re mined. This process allows e waste to become a secondary intake of raw material. In mining terminology a secondary 'ore'.

On site the bio mining facility is overlaid on top of the disused tailings dam, this connects both old and new processes physically and functionally.

This sets up a design opportunity to celebrate old and new processes of metallic separation.

The bio mining process allows for the concrete flumes to be restored as a means of sourcing water from the flooded mine shaft. This process activates the old tin mine by reintroducing the flow of water on site.

The overlay of old and new processes strive to collage the landscape, where both can be read individually or as one system, responding to both past and present layers simultaneously.

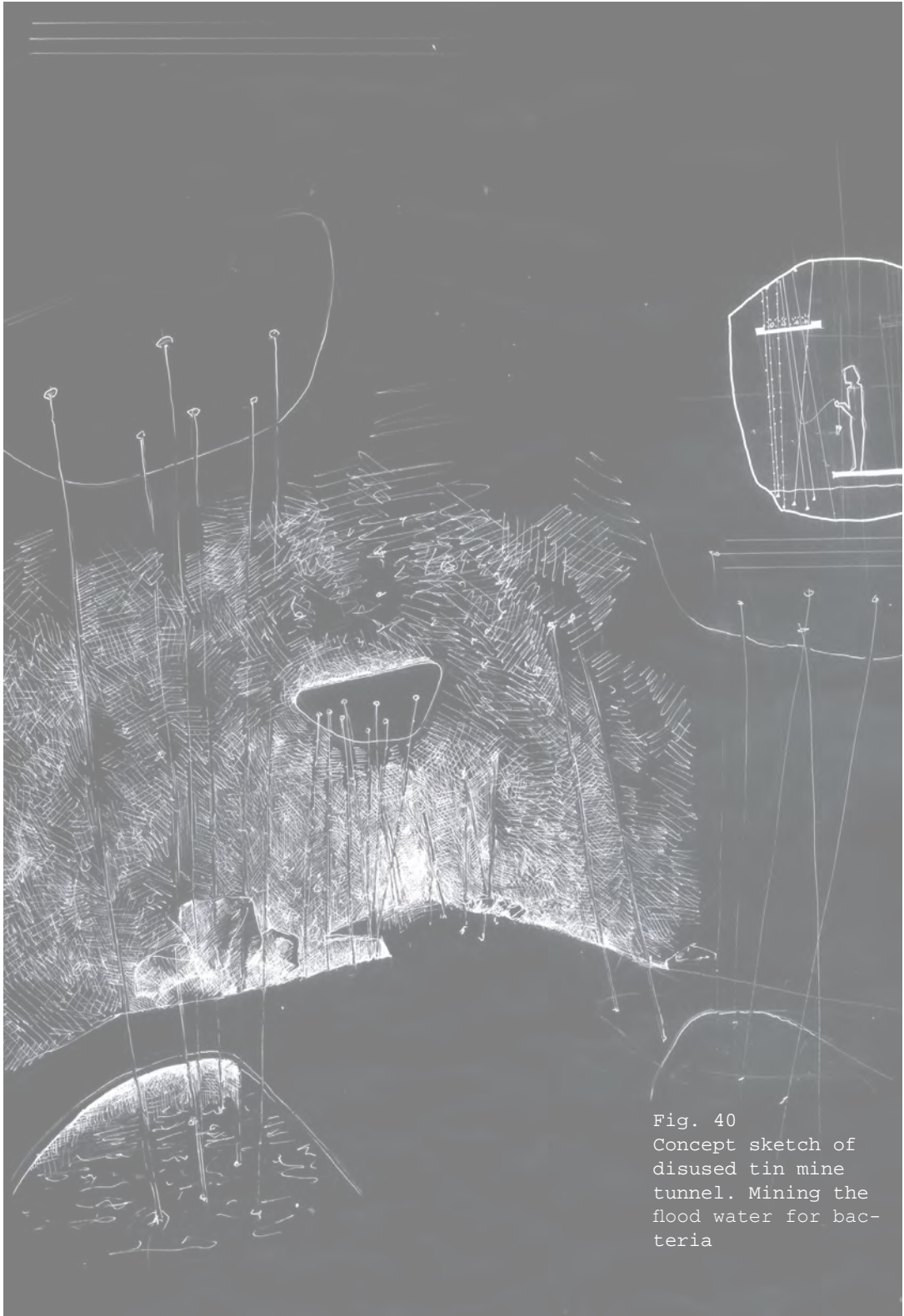


Fig. 40
Concept sketch of
disused tin mine
tunnel. Mining the
flood water for bac-
teria

Site Strategy

The analysis of the historic and new layers on site has informed working principals and methods which are integrated within the new process. These principals in turn become strategies for placing the process on site, proposing how these principals might manifest spatially.

It investigates how programme can revive site and how site can sustain programme, the architecture being the mediator between the two.

Gravity

The use of gravity in the resolution of the project looks to work with and not against. This approach proposes an illusion which exaggerates gravity through a heavily embedded relationship with the landscape, seeking to explore methods on building within the earth surface. Therefor gravity becomes a definer of landform architecture. Placing the process on site is considered through understanding the level relationship between building, landscape topography and process (programme).



Fig 41. 1:2000 Site model showing the old process in green and the new in orange.(1) Start of the process line. The topography falls from point 1 to 2. (3) The revival of the concrete flumes, water flows down the slope to point 3.

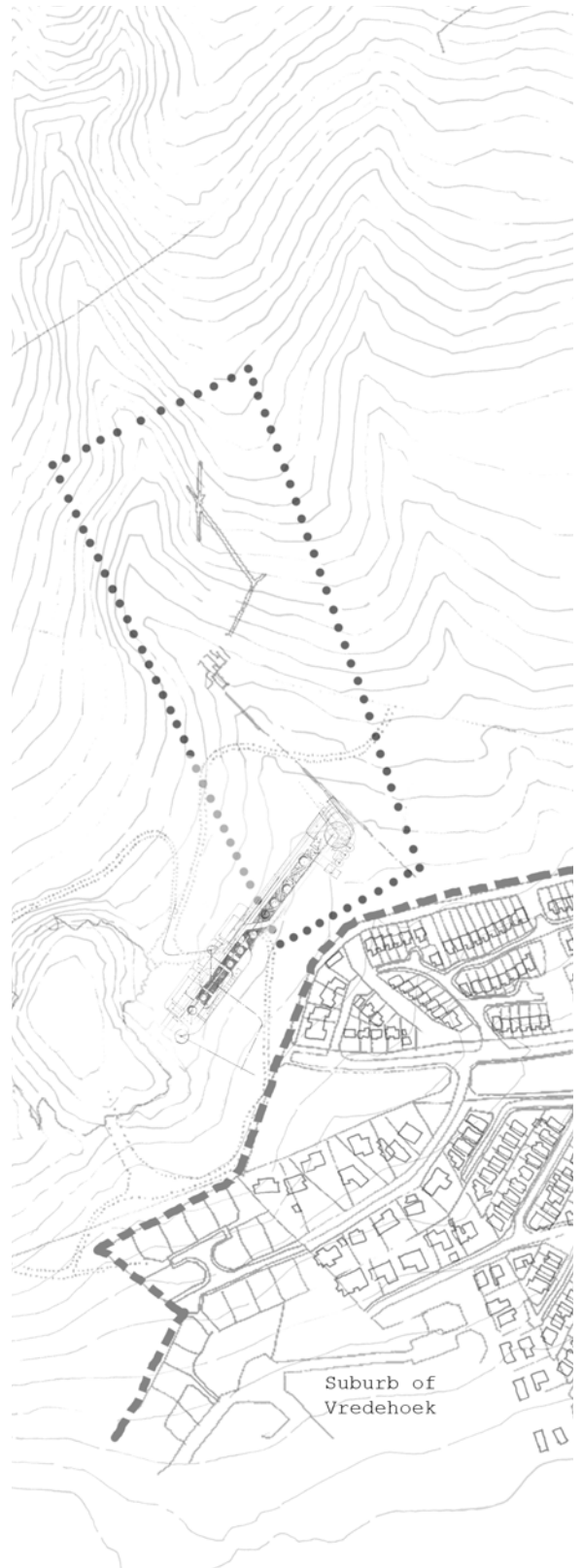


Fig. 42 1:500 Site model investigating the appropriate levels as well as starting point of the process.



Fig. 43
 1. Material drop off
 2. Public/IT Reurb
 3. Material processing
 4. Bridge
 5. Bio Mining

+Spatial flow diagram plan



2. GROUND FLOOR PLAN

scale 1:200







3. U. GROUND FLOOR PLAN

Scale 1:200





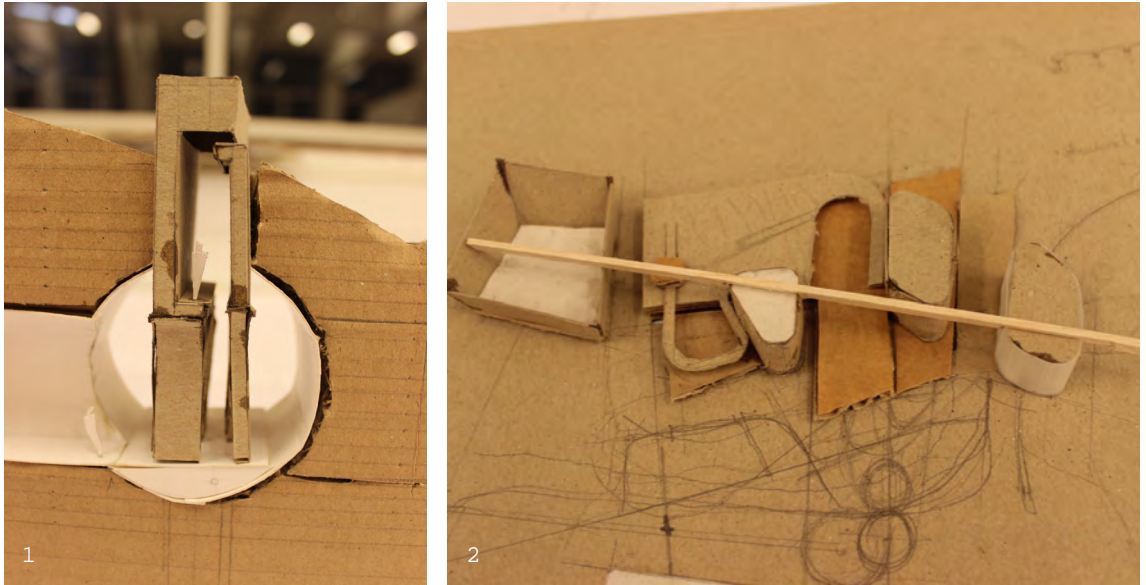


Fig. 46(1) Initial investigations into a subterranean building. The architectural element mediates between above and below ground. Elements which project through the earth estrange the landscape above.

Form.

The architectural form is envisioned as a series of objects which make strange the landscape, preserving its vague characteristics. The act of estrangement as defined by Viktor Shklovsky, is the method of defamiliarizing one's self with an object. This is applied to prolong one's reading and understanding, stating that an object is not just an object, but a symbol or sign (Shklovsky, 1990).

This approach prompts an exploration into the manipulation of the architectural element or object. This technique is commonly used in contemporary art, where the art is in the reading of the object rather than the object itself (Shklovsky, 1990). The process of estrangement is achieved through defamiliarizing commonly understood elements such as; windows, doors, roof, wall. Therefore architectural form is lost within the landscape doesn't give one an immediate sense of gratification. Form denies traditional or common understandings. This technique guards against formalising the terrain vague nature of the site.

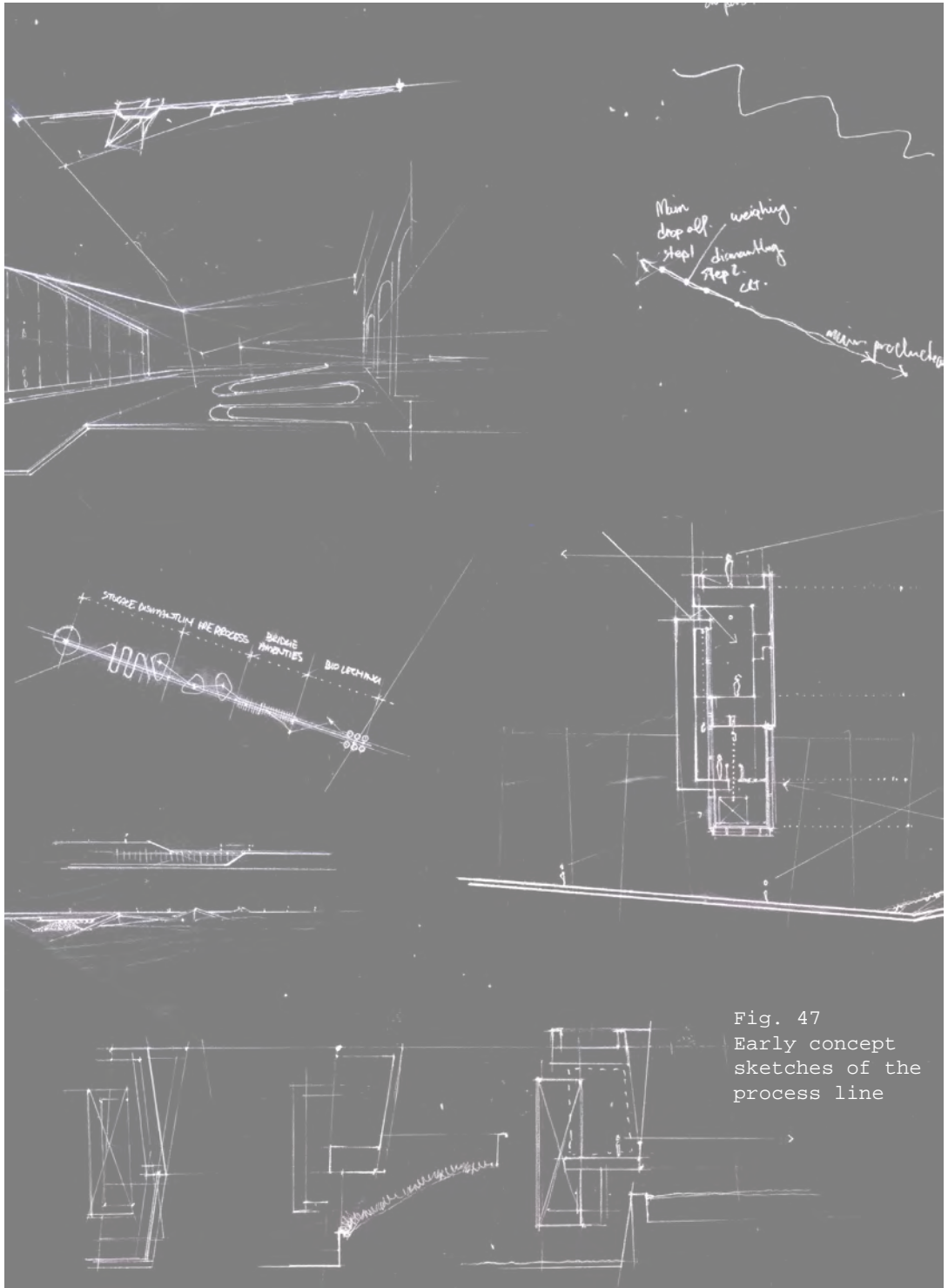
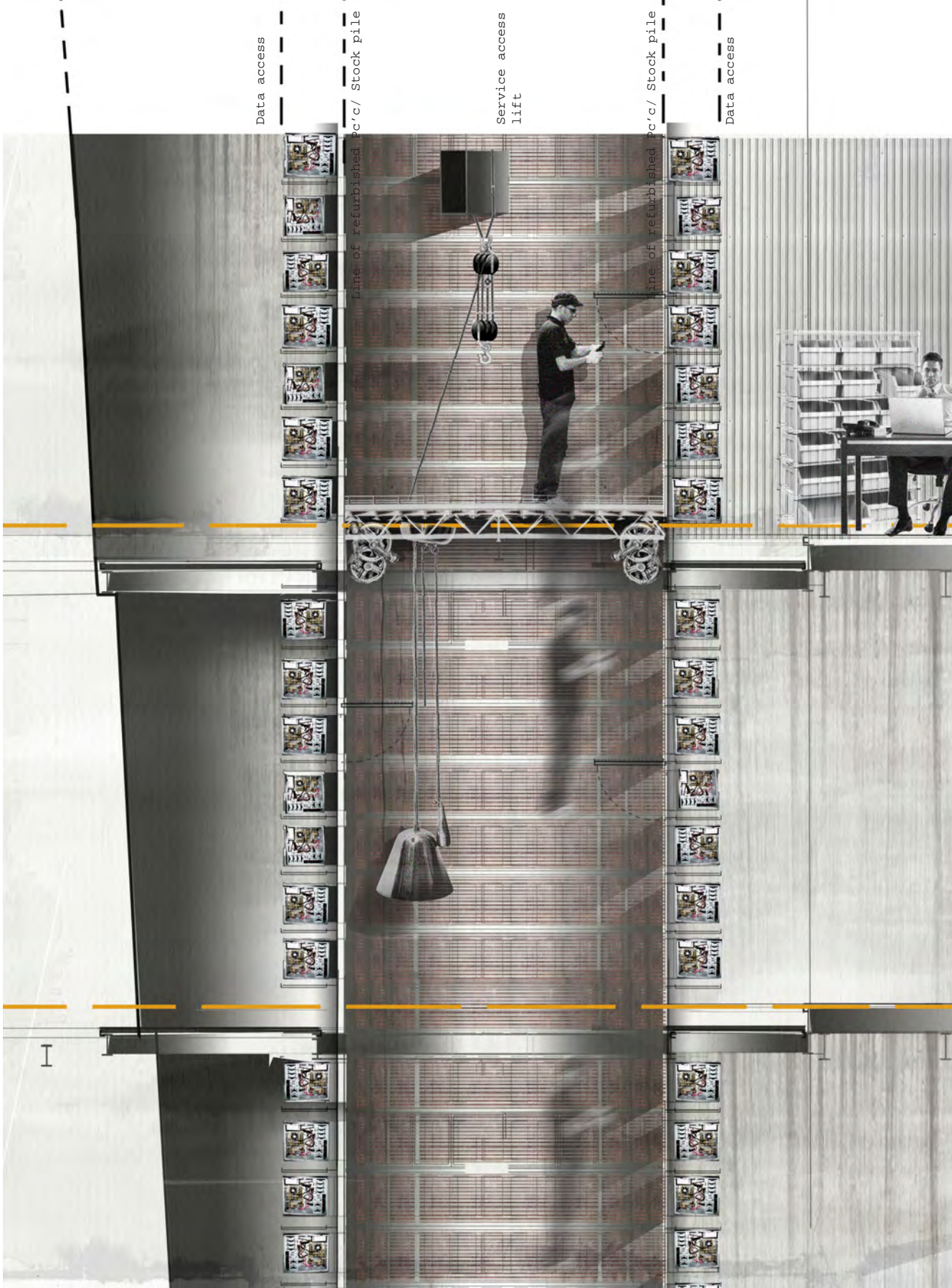


Fig. 47
Early concept
sketches of the
process line



Data access

Line of refurbished Pc's/ Stock pile

Service access lift

Line of refurbished Pc's/ Stock pile

Data access

I

Refurbishment



IT Refurbishment

Public (educating
concept of gravity)

Dismantled on lower
Levels

Fig. 48 The concept of gravity is portrayed on site through the introduction of a data storage tower. The tower of refurbished Pc's is utilized as a means to access data from old CD's and Floppy disks. Also becoming a 'stock pile' for the dismantling process. The cylindrical form explores the potential 'form of waste', whilst becoming a point of public education as to the concept of a gravity fed system.

Refurbished TV stock
pile



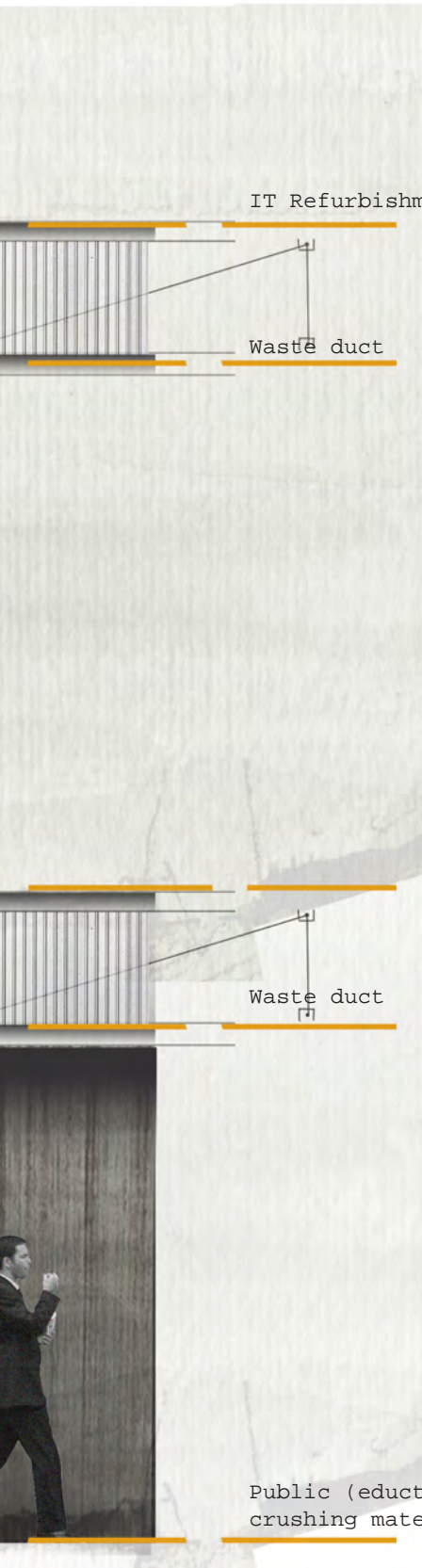


Fig. 49 The concept of crushing matter is portrayed through an refurbished television sets. This provides a 'cinema' like experience where public can be educated about both historic and current methods of crushing matter on site. This again becomes a 'stock pile', the objective is to create a new experience of waste (dispelling preconcieved ideas) whilst slowing the linear flow of electronics into landfill sites.

Public (education of
crushing material)



Fig. 50 (1)The idea of the process line is seen as an expressive element on the landscape, to which functions clip onto.(2)(3) The idea of the process line developed to become the building, more than just a process line but too a public amenity.

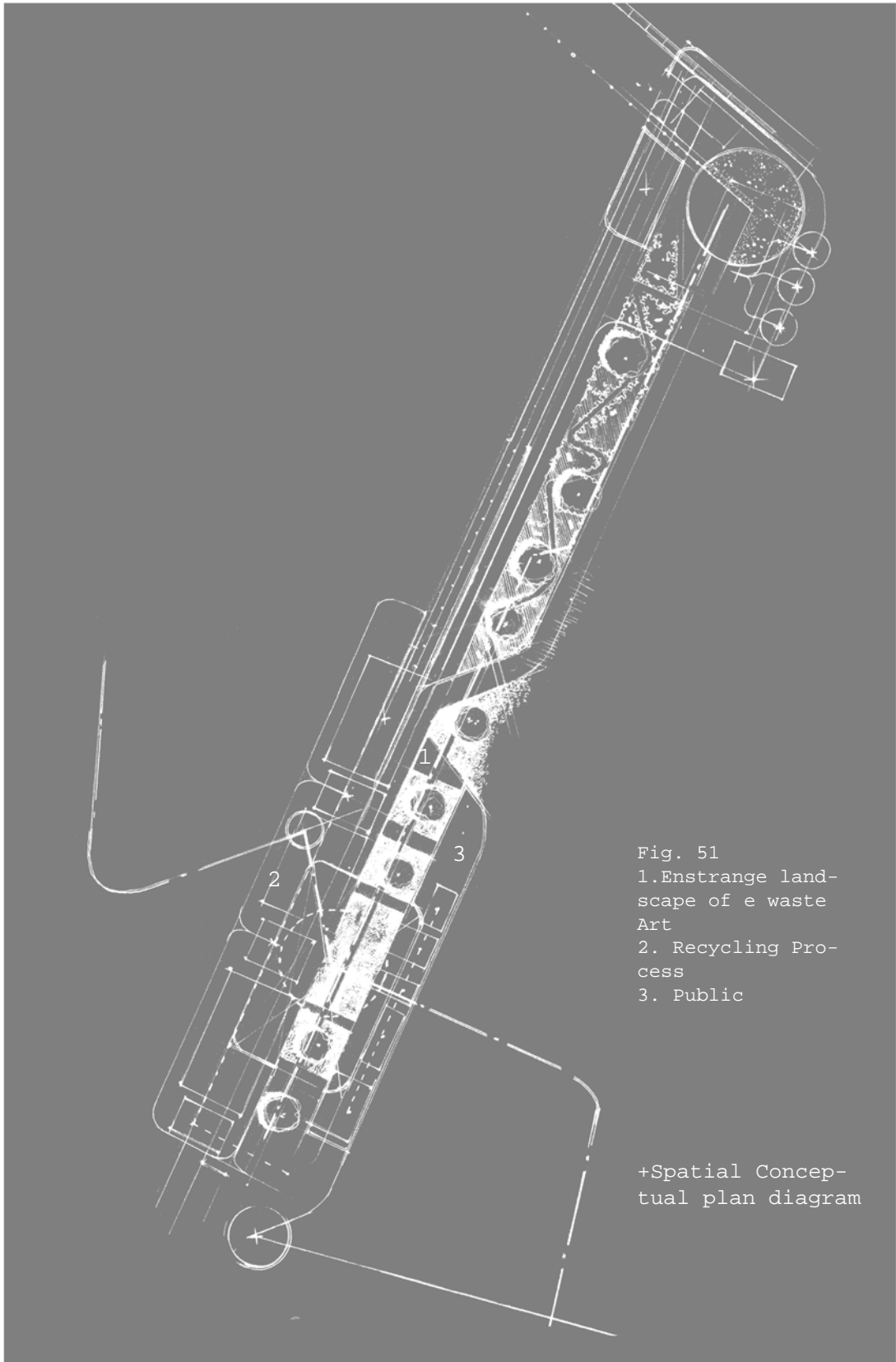


Fig. 51
1. Enstrange landscape of e waste Art
2. Recycling Process
3. Public

+Spatial Conceptual plan diagram

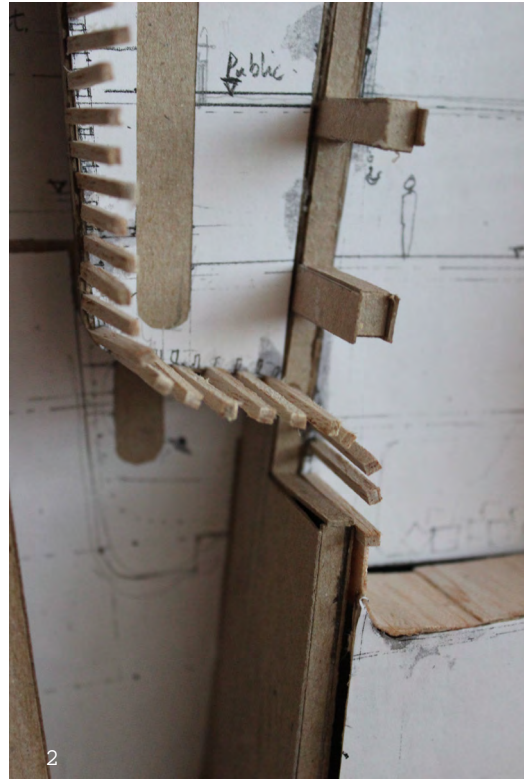
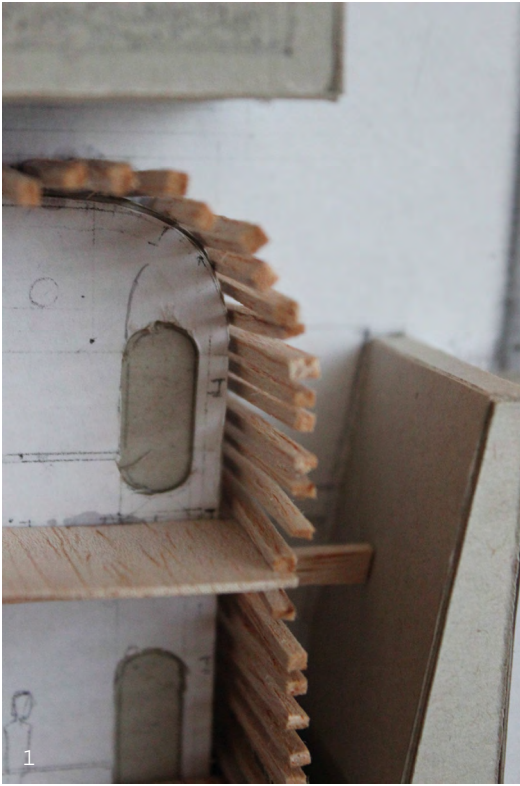


Fig. 52 (1)(2) development of the section. The rounded edges serve to catch any falling waste components. filtering them to the below conveyor.

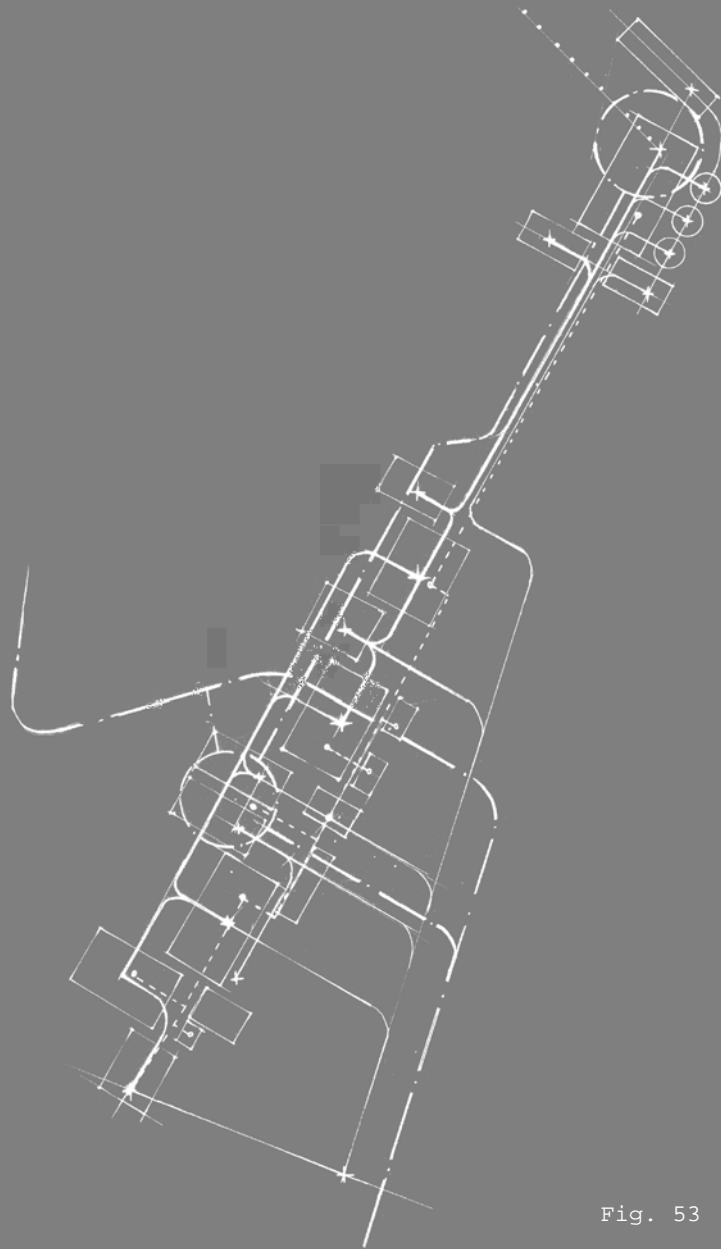


Fig. 53

+Spatial flow dia-
gram section

- path
- - - Human flow
- Matter flow

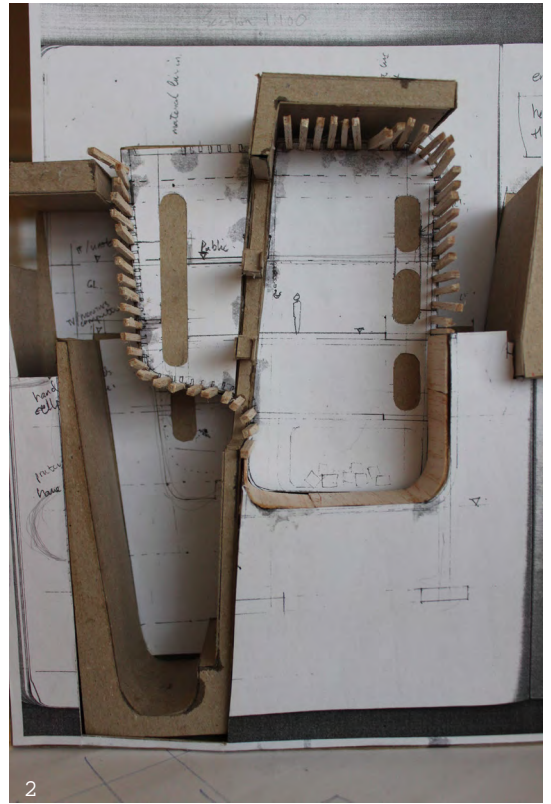
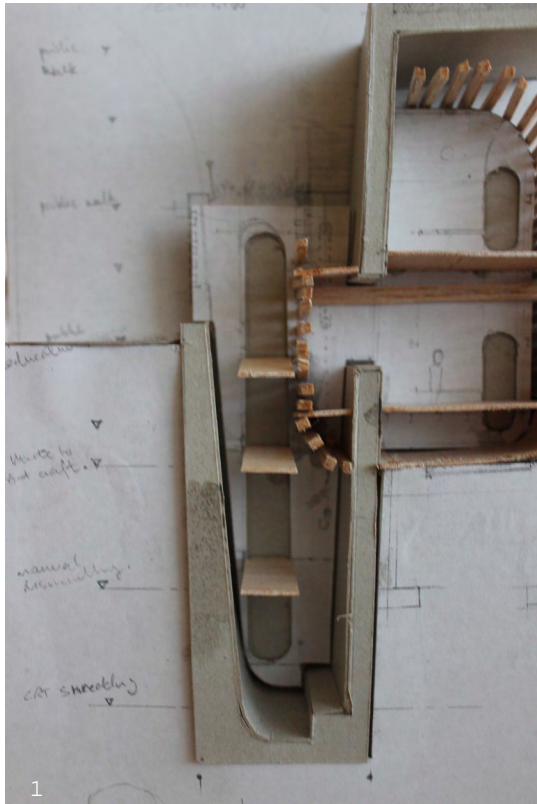


Fig. 54 (1)(2) The development of the section

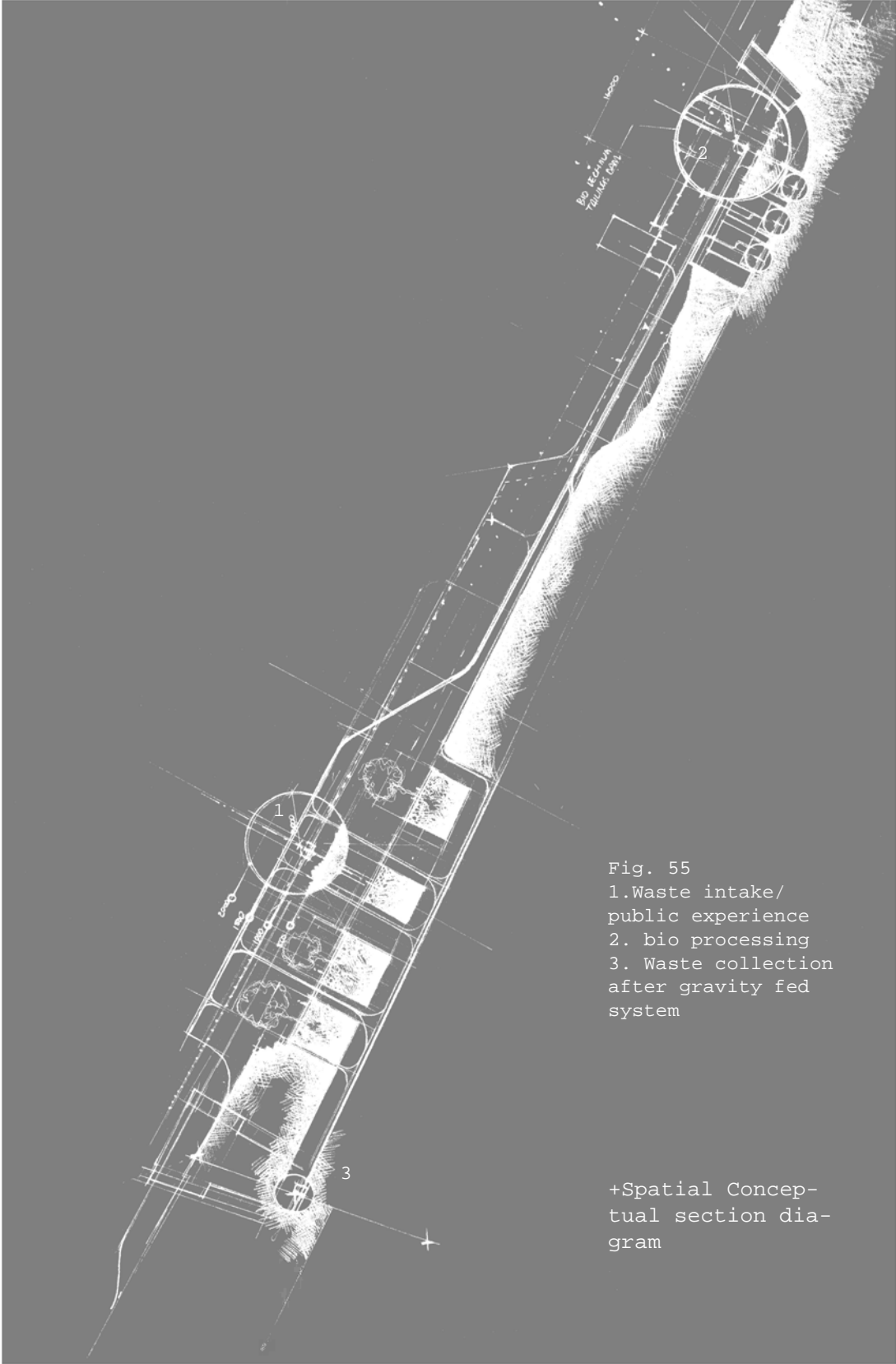
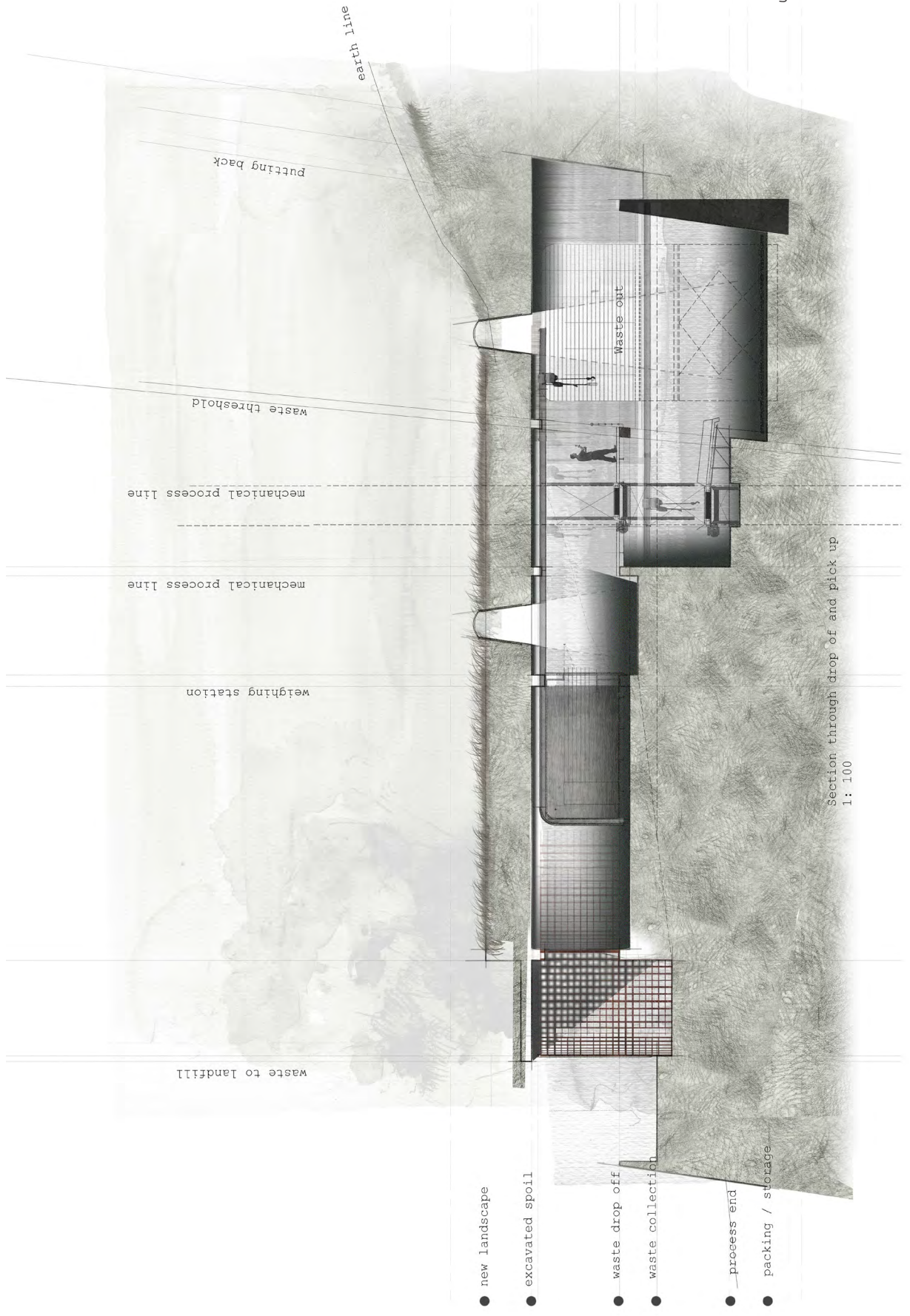


Fig. 55
1. Waste intake/
public experience
2. bio processing
3. Waste collection
after gravity fed
system

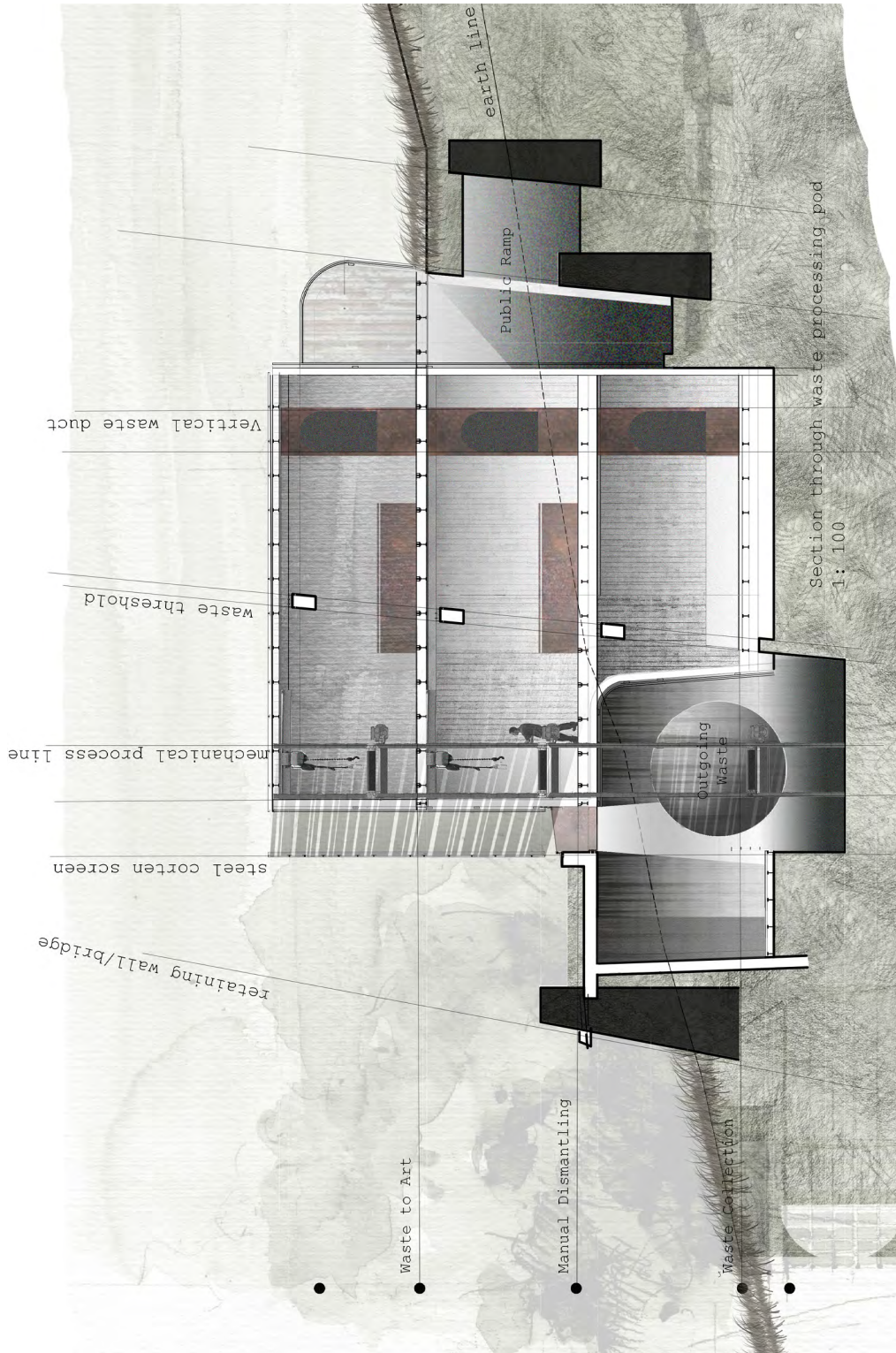
+Spatial Concep-
tual section dia-
gram

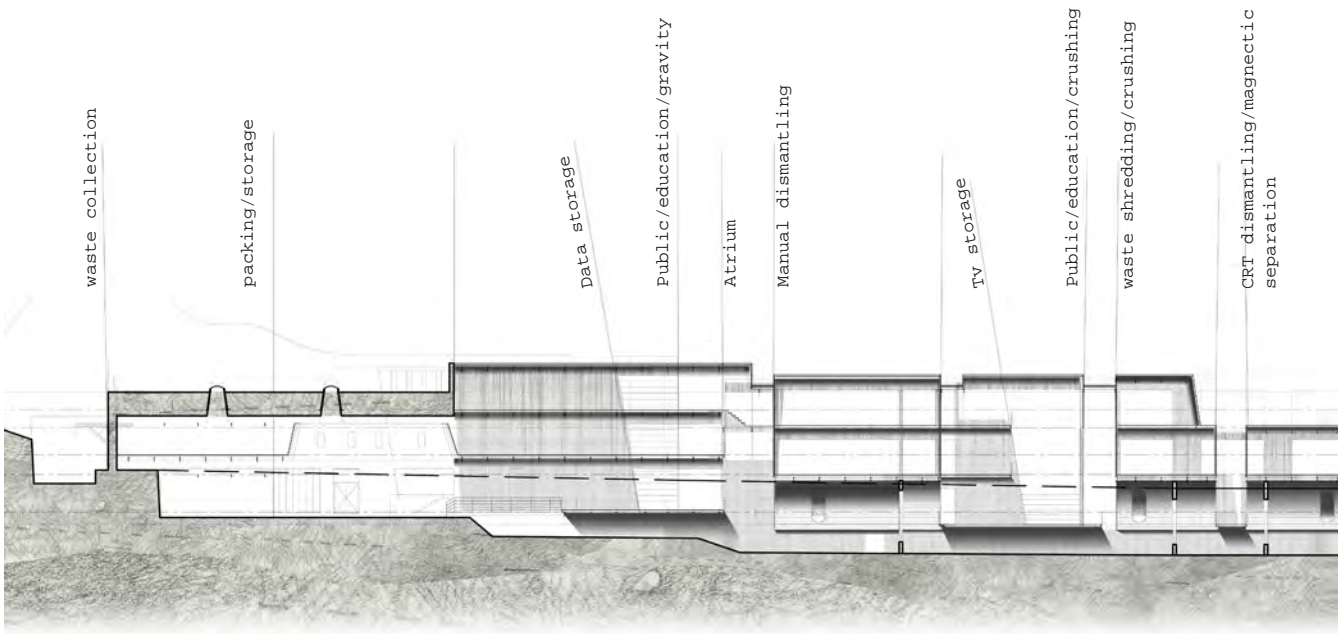


- new landscape
- excavated spoil
- waste drop off
- waste collection
- process end
- packing / storage

Section through drop of and pick up
1: 100

Fig. 57





waste collection

packing/storage

Data storage

Public/education/gravity

Atrium

Manual dismantling

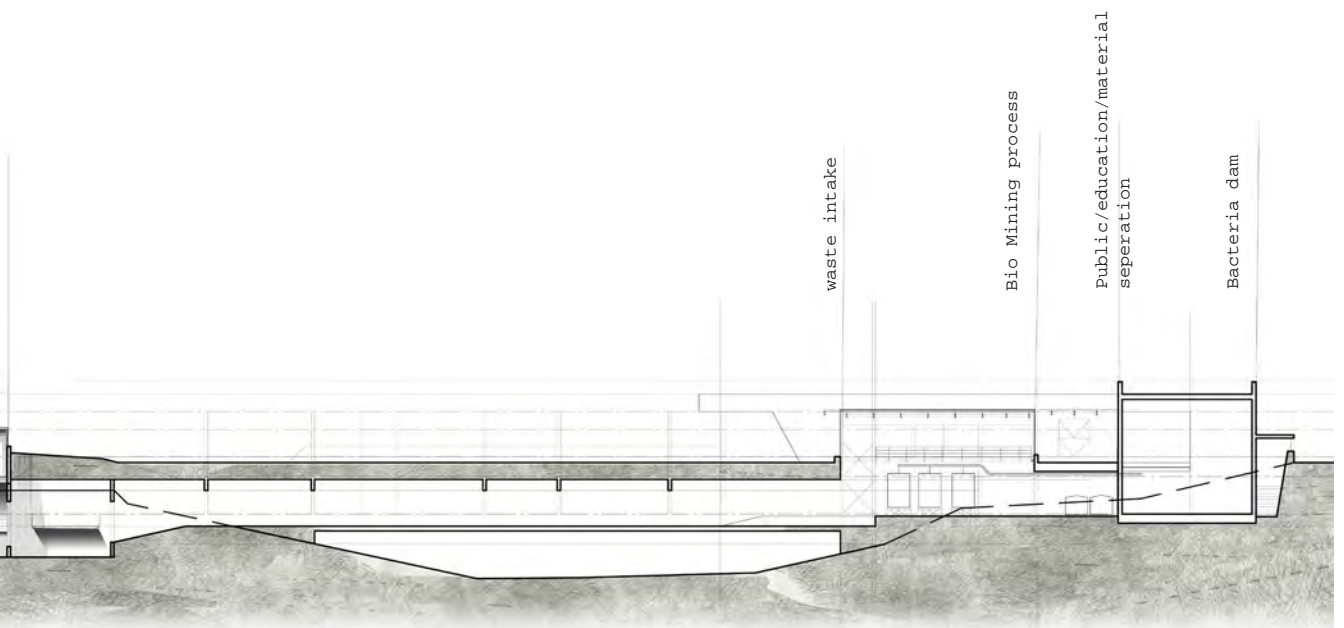
tv storage

Public/education/crushing

waste shredding/crushing

CRT dismantling/magnetic separation

Fig. 58 Longitudinal section



Structure

The structural and detailing strategies are generated from the underlying idea of this investigation, namely obsolete technology. In the spirit of investigation the architectural response suggests that this process may itself become obsolete. As the issue of e waste begins to grow in our cities new technologies and methods will become readily available. The structure is therefore conceived as a 'clip-on clip-off' system.

Typically the structural typology of industrial buildings is long span steel truss or open web beams. This structural solution creates the desired open free plan necessary for industrial processes. Functionally however the proposed flow model for such an e waste recycling plant differs from that currently used both locally and internationally. The mixing of public and industrial programme suggests this generic industrial structural solution would be spatially inadequate to achieve the desired architectural outcome. Therefore the challenge of structural solution is one which can mediate between articulating public programme whilst simultaneously responding to the spatial and flexibility requirements of an industrial process.

The structural system is therefore resolved as two systems. Retaining walls which sculpt and re contour the landscape and steel framed pods which house industrial processes.

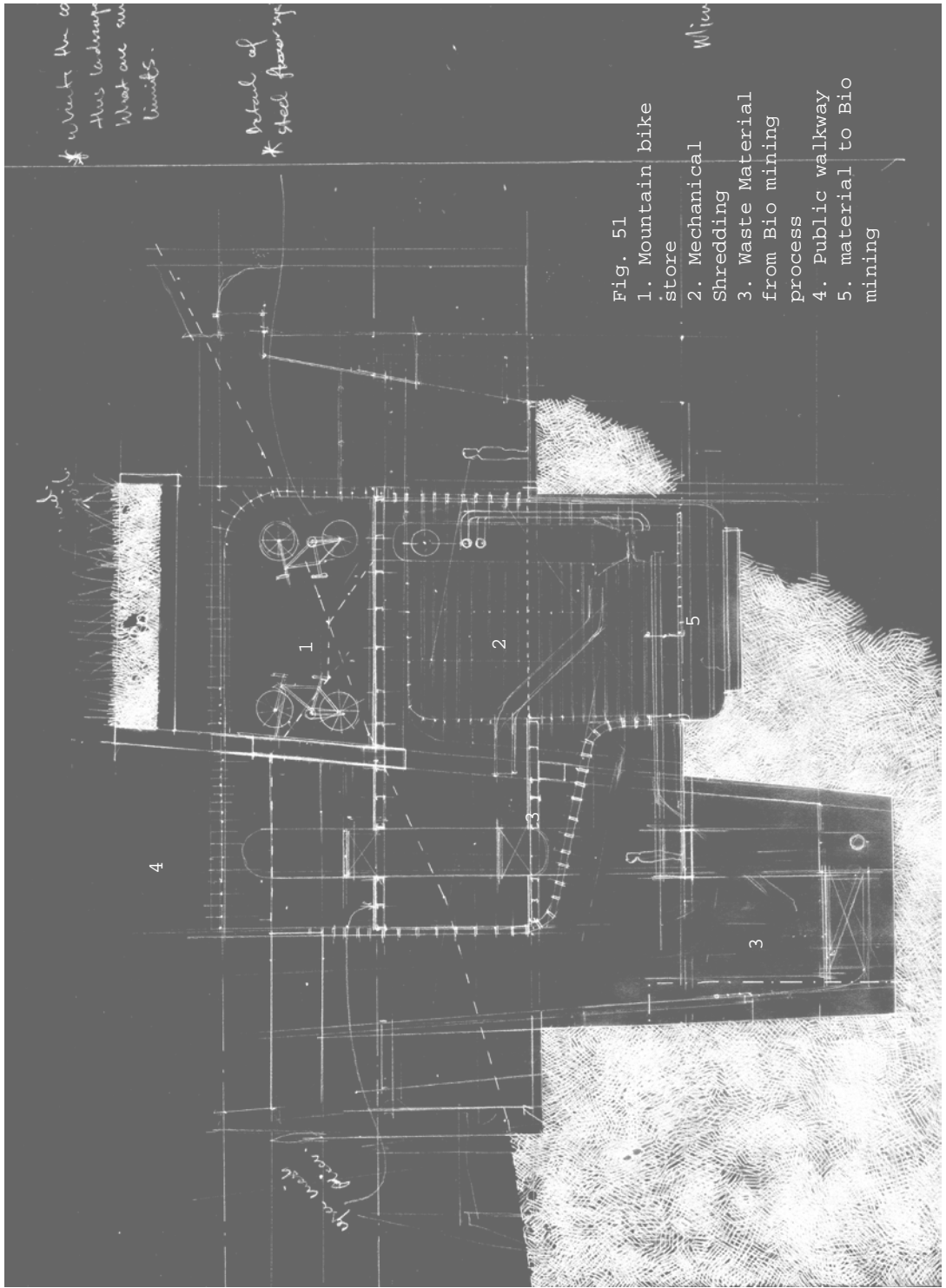
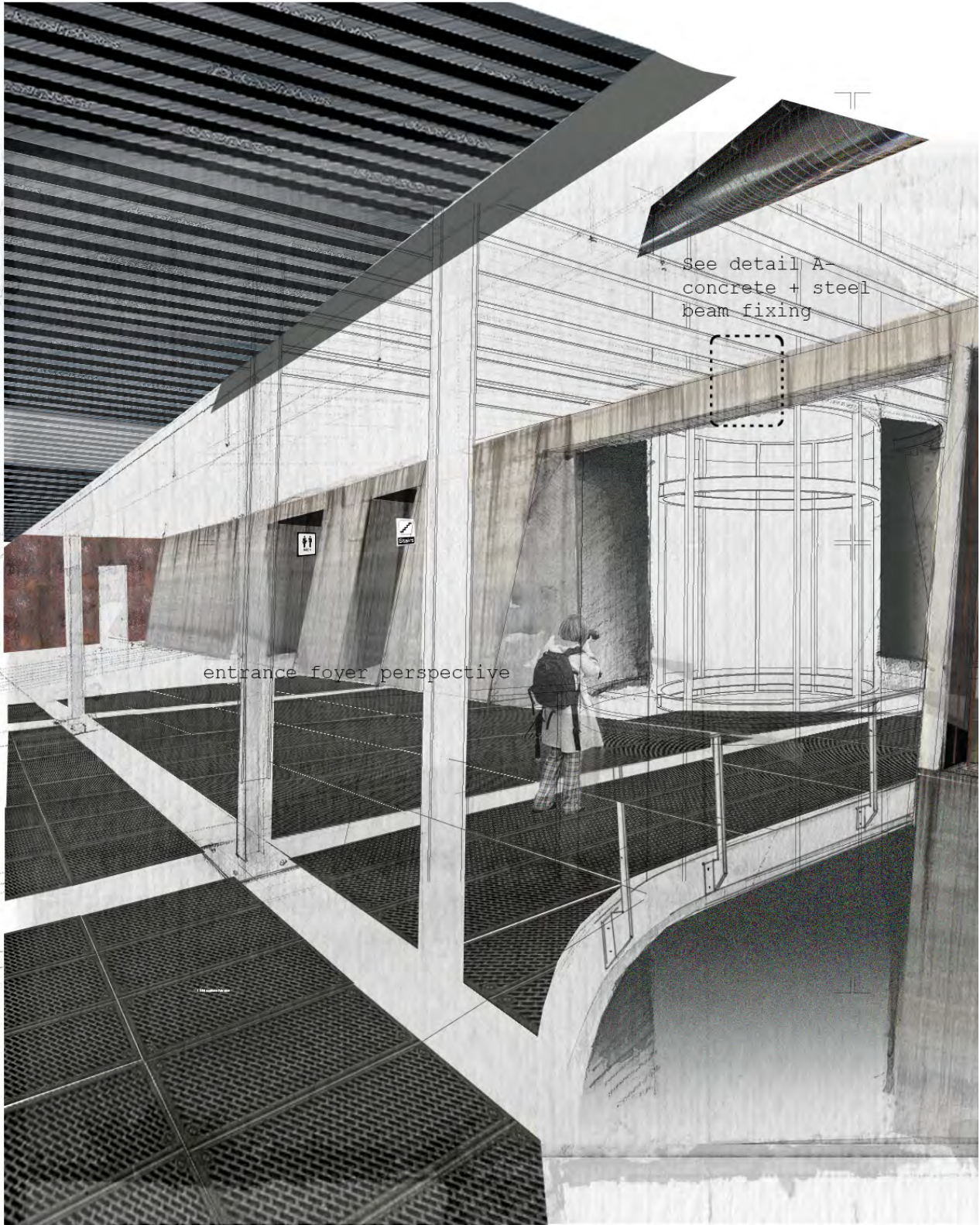


Fig. 51

- 1. Mountain bike store
- 2. Mechanical Shredding
- 3. Waste Material from Bio mining process
- 4. Public walkway
- 5. material to Bio mining

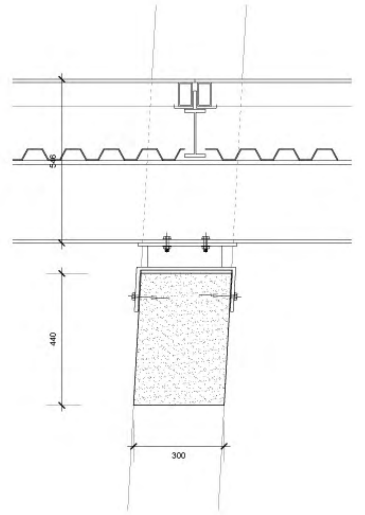
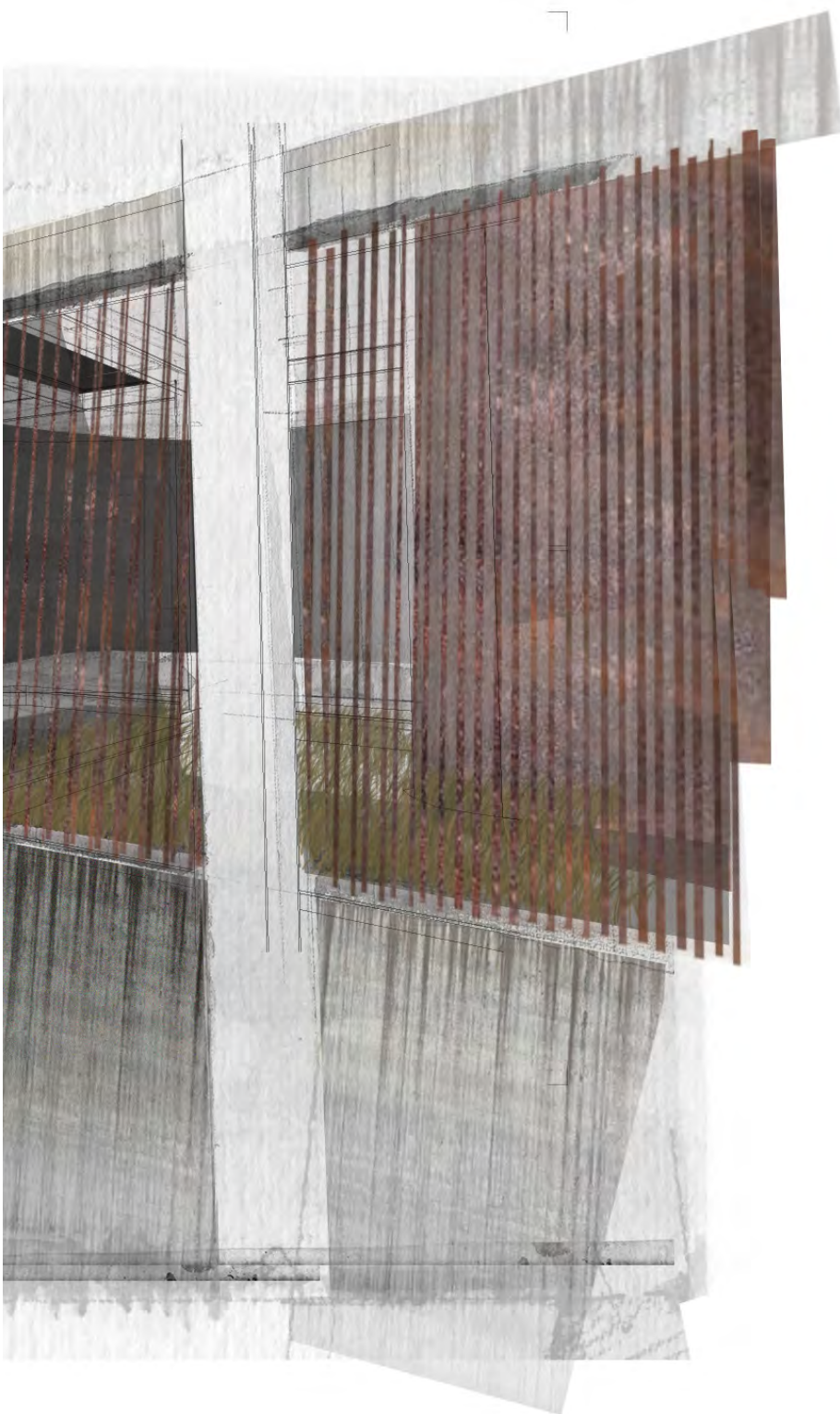


See detail A-
concrete + steel
beam fixing

entrance foyer perspective

entrance foyer perspective

Detail A- concrete +
steel beam fixing



Spoil

The spoil generated through the excavation process is utilized to reform the landscape, creating a supplementary manufactured terrain. This terrain serves as a connection from one end of the site to the other for both users and material flow. Furthermore the terrain is envisioned as an experimental testing ground for electronic waste. This controlled terrain allows for the development and research of the effects of hazard electronic waste on the landscape.

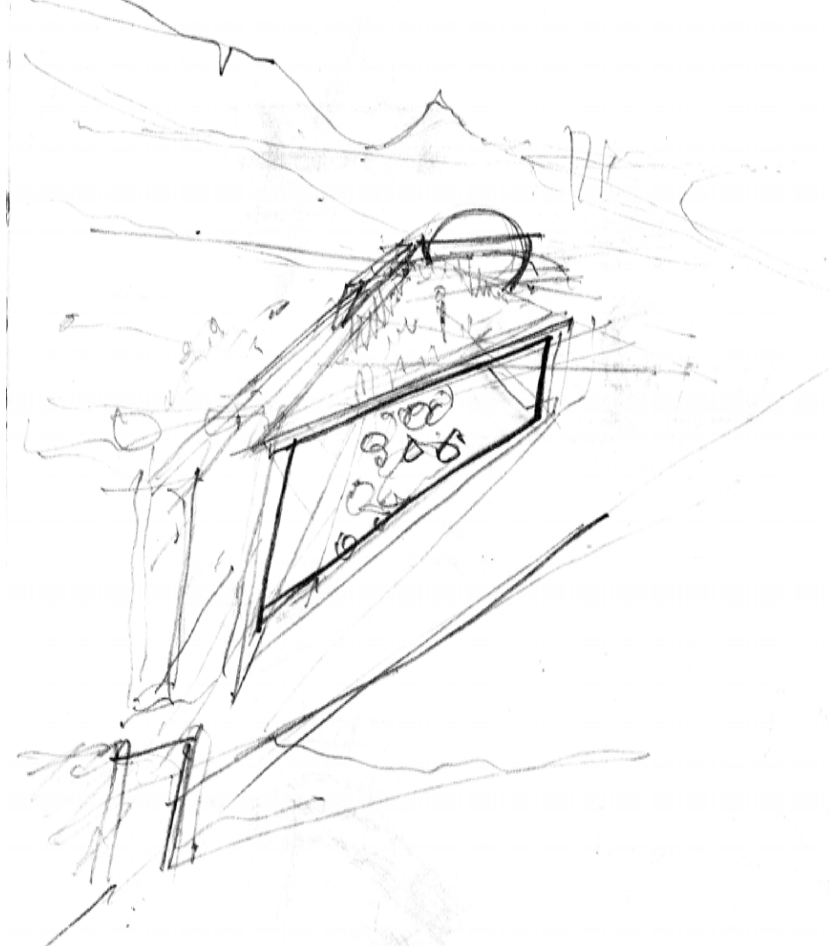


Fig. 52 Concept Sketch illustrating the manufactured landscape.

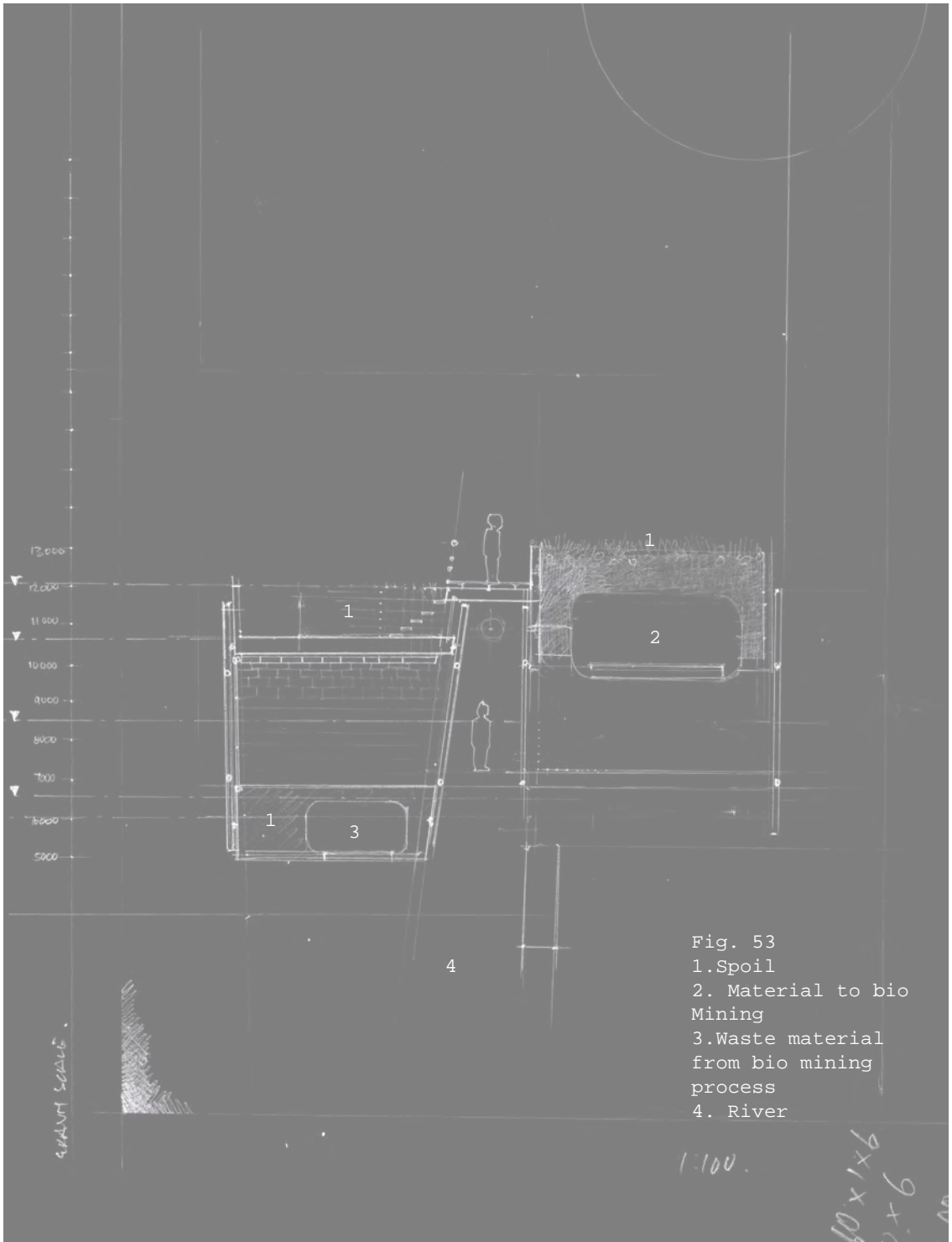


Fig. 53
 1.Spoil
 2. Material to bio Mining
 3.Waste material from bio mining process
 4. River

Materiality

One of the structural investigation was to seek a use for e waste as a structural or building element. The idea proposed the question: how can the architecture embed (instead of landfill) e waste?



Fig. 54. Silicon mold

Fig. 55 Setting the dismantled components in resin.

Fig. 56 Technological time capsule . The idea of embedding Disused electronics in resin to form bricks.

Conclusion

The objective of this project was to investigate was to explore hidden and lost technologies within a historic landscape. The architectural response is envisioned as a mediator between man and the landscape, bringing to light the constituent human processes and technologies.

The final outcome proposes a resolution, not simply a solution. By proposing the potential demise of the process, the reading of the landscape does not stop. Instead it continues in a state of change, embracing the creation- deterioration nature of the site (ruins and e waste). The site is read as a signifier about what was, what is and what might be. But rather than dwelling in the guilt and sorrow that our lifestyles have inflicted on the landscape, the project chooses to make it a point of celebration. They are these complexities of modern life which connect us to the landscape. Through this architectural intervention this landscape is a trace of who we have left behind, who we are and who we may become.

Not an architecture which attempts to freeze the landscape in a moment in time, but a space which allows us to dig, uncover and excavate something which connects ourselves to the landscape.

References

- Abhilasha Bharadwaj, Y.-P. T. (2012, June 5). From Biomining of mineral ore to bio urban mining of industrial waste. Retrieved from Juju Bandung: <http://jujubandung.wordpress.com/2012/06/05/from-biomining-of-mineral-ores-to-bio-urban-mining-of-industrial-waste-2/>
- Casella, E. C. (2005). *Industrial Archaeology: Future Directions*. New York: Springer.
- Doron, G. (2007). Dead Zones, Outdoor Rooms and Architecture of Transgression. In K. F. Stevens, *Loose Space: Possibility and Diversity in Urban Life* (pp. 210-227). London: Routledge.
- Edensor, T. (2007). Social Practices, Sensual Excess and Aesthetic Transgression in Industrial Ruins. In K. F. Stevens, *Loose Space: Possibility and Diversity in Urban life* (pp. 234-252). London: Routledge.
- eWASA. (n.d.). Welcome to eWASA. Retrieved from eWASA: <http://www.ewasa.org/index.html>
- Franks, K. (2007). *Loose Space: Possibility and Diversity in Urban Life*. New York: Routledge.
- Hill, J. (2001). *Architecture: The Subject Matter*. London: Routledge.
- Hey, D. (1994). *The Mountain: An Authoritative guide to the Table Mountain chain*. Cape Town. Tafelberg
- Icomos. (2000). *The Burra Charter: The Australia icomos charter for places of cultural significance*. Australia : Australia ICOMOS.
- Jin, Z. (2005). *Global Technological Change: From Hard Technology to Soft Technology*. UK: Intellect Books.
- Mar, A. D. (1912). *Stamp Milling: a treatise on practical stamp*

milling and stamp mill construction. New York: McGraw-Hill book company.

Pamela Shaw, J. H. (2009). *The Qualities of Informal Space: (Re) appropriation within the informal, interstitial spaces of the city. Occupation: Negotiations with Constructed Space* (pp. 1-10). Brighton : University of Brighton.

Philipp Oswalt, P. M. (2007). *Patterns of the Unplanned* . In K. F. Stevens, *Loose Space: Possibility and Diversity in Urban Life* (pp. 271-288). London: Routledge.

Rhodes, C. B. (2010). *Archaeology and International Development in Africa* . London: Gerald Duckworth & Co Ltd.

Rubio, I. d.-M. (1995). *Terrian Vague*. In *Anyplace* (pp. 118-123). Cambridge: MIT Press.

Schlupe, M. (2008). *A material recovery facility in Cape Town, South Africa, as a replicable concept for sustainable e waste management*. (pp. 1-31). Switzerland: Hp, Global Digital Solidarity Fund, EMPA.

Sennet, R. (1970). *The uses of disorder; Personal Identity and City Life*. England: Penguin Books Ltd.

Sennet, R. (1990). *The Conscience of the Eye, the design and social life of cities*. London: Faber and Faber Limited.

Sennet, R. (2008). *The Craftsman*. London: Yale University Press.

Shklovsky, V. (1990). *Theory of Prose, Viktor Shklovsky: Translated by Benjamin Sher*. London: Dalkey Archive Press.

Shonfield, K. (2001). *Two Architectural Projects about Purity*. In J. Hill, *Architecture- The Subject is Matter* (pp. 30-43). London: Routledge.

Sibley, D. (2001). *Comfort, Anxiety and Space*. In J. Hill, *Architecture- The Subject is Matter* (pp. 108-118). London: Routledge.

Spargo, P. (1999). *The history, preservation and restoration of*

Vredehoek tin mine, Devils Peak, Cape Town. Cape Town:
Cape Town City planning dept.

Stravrides, S. (2007). Heterotopias and the experience of Porous Urban Space. In K. F. Stevens, *Loose Space: Possibility and Diversity in Urban Life* (pp. 174-192). London: Routledge.

Vasconcelos, Y. (2013, Dec). Mining Microbes. Retrieved from Pequisa FAPESP: <http://revistapesquisa.fapesp.br/>

List of Figures

Note: All images are produced by author unless otherwise stated

Fig 02, Google maps, 2014 , hidden landscape- Napier , <https://www.google.co.za/maps/@-34.2647889,19.5111876,14z>, viewed 10 March 2014

Fig 03, Tin Near Cape Town, 1910, The Augus, The history, preservation and restoration of Vredehoek tin mine, Devils Peak, Cape Town. Cape Town. Cape Town City planning dept.

Fig 05, Spot where tin was first discovered. 15 Nov 1911. Cape Times weekly. Developing a local mine. Cape Times. Retrieved National Library

Fig 07, General view of battery site shewing machine being erected for 5 stamp battery ect. 15 Nov 1911. Cape Times weekly. Developing a local mine. Cape Times. Retrieved National Library

Fig 11, At work in No.2 Adit-207 feet in. 15 Nov 1911. Cape Times weekly. Developing a local mine. Cape Times. Retrieved National Library

Fig. 12a, Fig. 21- Longitudinal Section,1970, Ink, Burgoyne, J, Blasting and quarrying of Stone. London: Crosby Lockwood and Son.

Fig 12b, Fig 23,1970, Ink, Burgoyne, J, Blasting and quarrying of Stone.

Fig 13, Entrance to No.2 Adit. 15 Nov 1911. Cape Times weekly. Developing a local mine. Cape Times. Retrieved National Library

Fig 14, Battery Site- Hauling mortar box in position. 15 Nov 1911. Cape Times weekly. Developing a local mine. Cape Times. Retrieved National Library

Fig 16. Fig. 31-Wooden mortar block five stamp. Mar, A. D. 1912. Stamp Milling: a treatise on practical stamp milling and stamp mill construction. New York: McGraw-Hill book company. pg 81