MARKER DRAFT: Emily Du, Anthony Hunter, Syomay Yohannes, Ali Abbas Jafri, Aditya Pathak

Introduction

Assuming that in ten-thousand years humanity still exists, as a group we presumed that civilization's development will remain focused on technological improvements and designs. After deciding how the future would look we wanted to establish who would be at the greatest risk of exposure to help guide us towards the most effective design. We initially were looking towards ways of preventing people from accessing the region but those were deemed not feasible to construct with very low likelihood of it being effective. We came to the realization that no matter how hard you try to prevent someone from getting somewhere they will find a way. Your efforts may only motivate them further. We then shifted our focus towards communication rather than prevention.

Our goal when designing this marker was to communicate a possible danger of illness, and how to contract it to whoever will approach this area in ten-thousand years. Assuming that humans will biologically remain the same, with the five senses still being a viable method of understanding concepts, our marker relies on an individual's sense of sight and touch to interact and comprehend our warning. There is a lack of written language in our design, as we acknowledge languages evolve, and that it is unlikely that humanity will have a universal form of communication that we use today. Deterioration is also a factor that must be considered when building a structure that is meant to last for a prolonged period, which makes us consider both weather-resistant materials and reinforced designs that won't be easily damaged from passerby and wildlife. To communicate the progression of illness caused by radiation we aim to create a way for any human that lives on earth to easily understand the flow of time regardless of the writing system. The Hanford site is large, we want to make sure our markers/warnings are seen by anyone passing through otherwise our efforts will be for nothing. Our maker is a 10ft tall and 3 ft wide (triangle/pyramid) structure made from stone with an uneven rocky terrain surrounding it, placed on the exterior of this contaminated area, which depicts a story of a man who interacts with the radiation found in this location and succumbed to an illness because of it.

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Social Context

Nobody can predict who will stand on the Central Plateau more than 10 decades from now, not even the 1991 WIPP Futures Panel, which faced the same problem but, instead of forecasting, chose to build scenarios. So we borrowed that method. Our markers will have to work across a wide range of futures, and here are three future checkpoints we could test them against.

The first checkpoint is at 1000 years

We expect this society to be continuous with the present. English, however, may have changed significantly, similar to how Chaucer's English is hard for us. But written records, archives, and institutions probably still exist. The Hanford Site will still be a landscape that people can recognize. Tribal nations inhabiting the site, such as Yakama, Umatilla, Nez Perce, and Wanapum, will likely still be here, and so will all their oral traditions that carry knowledge across generations. An Australian study of a coastal flood suggests that oral memory can preserve specific information for 7000 years or more (Nunn & Reid, 2016). The main problem at this point would be forgetting by accident. Institutional control could fade, budgets could shrink, and the Plateau could look like cheap, flat land along a river. Land expansion and well drilling might be the likeliest intrusions.

But then comes year 5000

This is where the confidence drops significantly. This is longer than any recorded history. There could either be a technological collapse or a boom; neither should be ignored. Tainter (1988) argues that complex societies can collapse when the cost of maintaining complexity is more than its returns, and that collapse can occur in cycles. So let's assume that *some* people at this point can read and some can't, and that scientific knowledge is present and lost at the same time. The most important thing at this point would be climate. Archer and Ganopolski (2005) suggest that large carbon emissions could delay the next glaciation by tens of thousands of years, but we trust that with a loose string. The Missoula floods that carved the Channelled Scablands (Bretz, 1923) are a reminder that this landscape has been rearranged violently before, and future water or/and ice could not only expose buried material but also push people toward the plateau.

And finally, the 10000.

We assume nothing. The people may speak a language unrelated to ours, hold opposite ideas about death and sacred ground, and could have absolutely no records of the 20th Century. The Markers Panel worked from the same idea and designed messages in layers, starting with the fact that humans built this place and then moving towards a technical explanation (Trauth et al. 1993). Our design also follows that structure, so that a potential visitor gets something useful at every level of understanding.

However, whether the markers repel or attract is the hard question. Sebeok (1984) argued that no sign carries any meaning on its own; the meaning corresponds to the interpretation from the community around it, which is why he proposed an idea of "atomic priesthood" to keep this warning alive through ritual and story. We don't necessarily recommend a priesthood. However, we take the point seriously. Key and Prindle (2017) suggest a harsher idea, arguing that intention can't be controlled over all this time. But maybe there is some sort of a vague, nuanced answer. We want to avoid making this marker look like treasure or a temple. People have looted tombs since the beginning of tombs. Big, dramatic structures can signal that something valuable lies inside. So instead, we make it look rough and worthless, and communicate that in every language and image we use. Obviously, we can't prove this works, since we can only extract evidence from the past. And it shows that curiosity and greed are older than anything else.

Communication

Our communication strategy is meant to warn future generations about the dangers of the Hanford Nuclear Reservation. We want people to understand three main messages: the land is dangerous, the danger may not be visible, and people should not enter, dig, or disturb the area. Since we cannot know what languages or symbols people will understand thousands of years from now, our design uses both written and image-based messages. We have simple and more detailed messages so that people have different ways of understanding the warning. This follows the WIPP Markers Panel's argument that redundancy is important because using multiple forms of communication makes a message more likely to survive over time (Trauth et al., 1993).

For our written messages, we propose using English and Spanish. We chose these languages because they are commonly used in the United States today and allow the warning to reach more people in the present. However, we understand that languages change over time and may not exist in the same form in 10,000 years. Because of this, we do not want written messages to be the only way people understand the danger. Instead, the written messages support the images and give more direct information. Our simple written message will state: **"DANGER: RADIOACTIVE MATERIALS ARE BURIED IN THIS AREA. DO NOT ENTER OR DISTURB THE LAND."** In Spanish, it will state: **"PELIGRO: HAY MATERIALES RADIACTIVOS ENTERRADOS EN ESTA ZONA. NO ENTRE NI ALTERE EL TERRENO."** These messages are chosen to be short and direct, so someone can quickly understand that they should stay away from the area.

With the simple warning, we want to include a more detailed written message that explains why people should not enter the area. The English version will state: **"Entering this area can expose you to radioactive materials and cause serious harm. Do not dig, remove materials, or disturb the land. Stay away to protect yourself, other living things, and the environment."** The Spanish version will have the same information. We chose to include a more detailed message because just telling someone to stay away may not explain why the land is dangerous. The additional explanation makes it clear that disturbing the ground could expose people and other living things to harmful materials. Having both simple and detailed messages shows future generations more information instead of relying on one short warning.

For our image-based messages, our design uses a story carved into stone pillars. We wanted to show a sequence of events because we think that showing what happens to a person can help explain the danger without depending on words. The story begins with a person entering the area. The next image shows the person digging into the ground but finding nothing. This is so that we can explain that there is no reason to disturb the land. After, the person leaves the area, but a radiation symbol remains beside or follows them. We added this symbol to represent how radioactive contamination can affect someone even after they have left the location. The next images show the person becoming sick and eventually dying. This part of the story shows that exposure can have serious results, even if the results are not immediately visible.

We also included a growing plant throughout the images to represent the passage of time and help people understand the order of the story. The plant begins small and becomes larger as the sequence continues. We want the images to be read from left to right and from top to bottom so that the story has a clear direction. The radiation symbol is especially important because it represents an invisible danger that people cannot recognize just by looking at the land. We know that symbols can have different meanings depending on a person's culture and experiences, so we can’t guarantee that everyone will interpret the images exactly as we wanted. But combining recognizable human actions with repeated symbols gives the warning more than one way to explain the meaning of it.

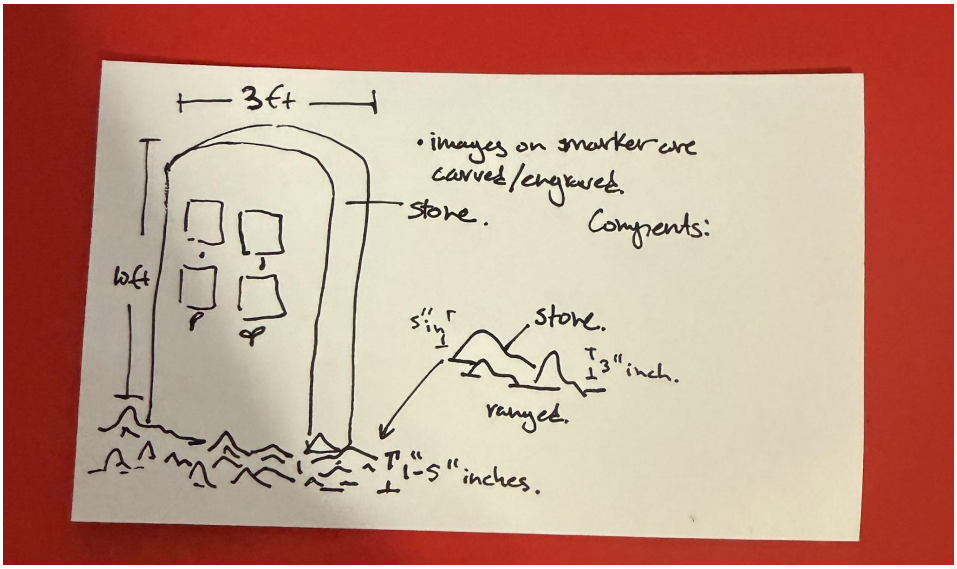
Another important part of our communication strategy is repetition. We want to place about 55 stone pillars around the perimeter of the site, with each pillar containing the same written

warnings and visual story. If some markers become damaged, buried, or removed over time, others will still remain. This connects to the WIPP committee's argument that using multiple forms of communication helps preserve information for future generations (Trauth et al., 1993). Our approach also considers how the Hanford landscape itself communicates the site's nuclear history and long impact (Keeley & Prindle, 2018). Even if future generations cannot understand the language or recognize every symbol, we hope the combination of messages will make it clear that the land is dangerous and should not be disturbed.

Design

Our marker design is a stone pillar which is 10 feet tall and 3 feet wide. In addition, we plan on including a man-made rough terrain created from stones shaped into irregular triangles, mimicking the pointed edges of thorns.These thorn-like structures range 1-5 inches in height above and embedded into the ground surrounding the pillars with a radius of 2 feet. With a total of 55 markers placed around the perimeter of this location, estimated 3 miles from each other on the exterior. Each individual pillar will have cravings that depict a story of a man who breaches this contaminated zone, digs underground for a presumed treasure, only to find nothing which leads him to leave the area, and after many years he starts to get ill and eventually succumbs to his sickness and dies.These images are depicted in a left to right order, up to down, and have a growing plant to clarify the sequences of events.

Visual Rendering



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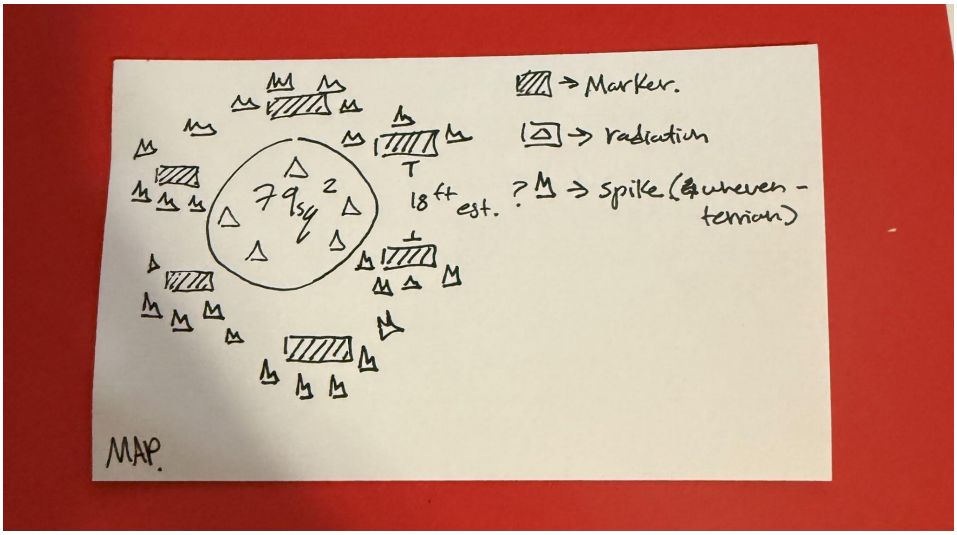

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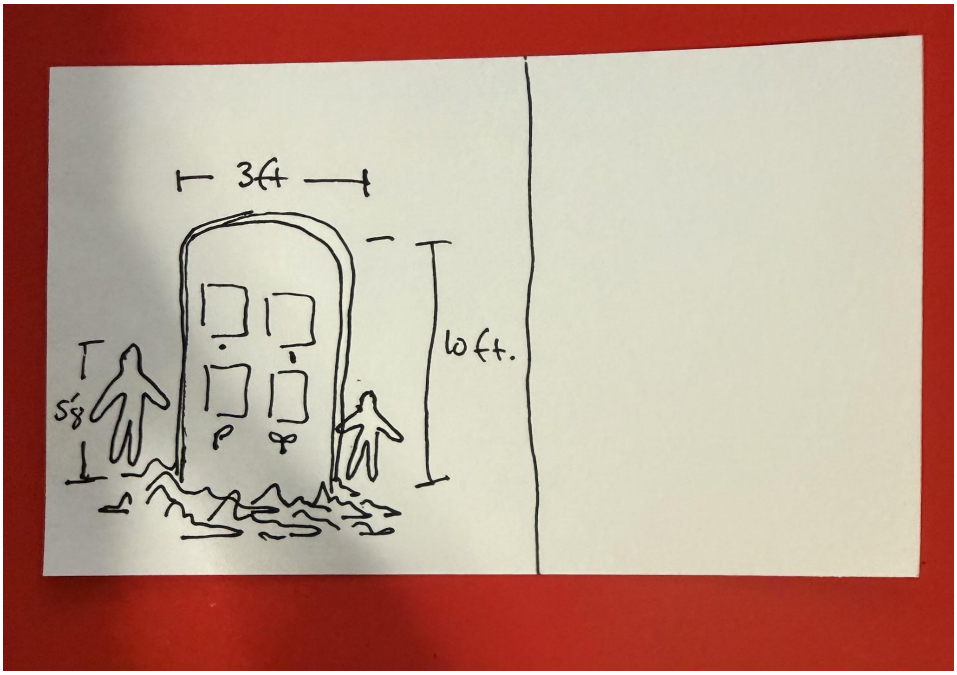

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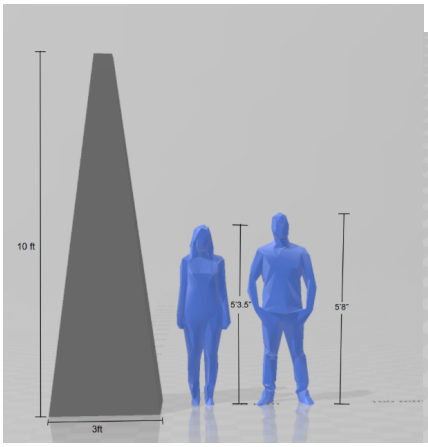

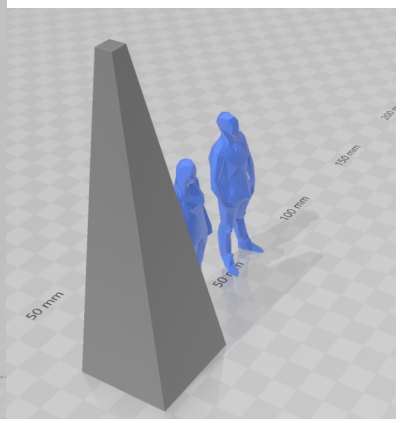

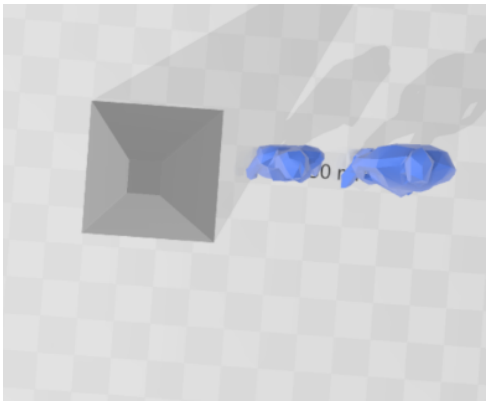

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(Draft Map Will make final version with GIS)

Reasoning

We chose this design in particular because it achieved our goal of being easily noticed from a distance and prevents heavy foot-traffic and crowding in this area.The stone pillars it-self aren't as effective as a fully enclosed wall, but still create a threshold that implies one shouldn't be entering. Their height and width are specifically designed to be viewed from a minimum of half a mile distance, with the current average American male's height being 5 '8; we chose to construct this marker to be 10 ft to ensure viewing. We made the marker's width 3ft as it is meant to function as a support and withstand environmental weathering. In the article "Using Design to Effect Change" (Anthony 2023), Jessica Anthony mentions how hostile architecture is typically used to prevent homeless individuals from resting in certain areas for a prolonged time, examples being divided benches, or intentional blockage in curbs. Anthony notes how hostile architecture is also referred to as a defensive design, as while it prevents comfortability it also can subconsciously prevent approaches from its appearance. The idea of making a space have minimal construction but effective interactions with either wildlife or people, is both cost-

effective and can communicate clearer without unnecessary details or distractions. The thorn shaped architecture is meant to depict this. To prevent easy access into the area, we made the thorn's height range from 1" to 5", this choice creates an uneven terrain that even individuals wearing shoes would struggle to cross over quickly and pain-free. Despite a possibly messy design we decided that since this detail in our marker is substantially smaller and visibly lowered compared to other components in our design, we deemed it not distracting to the point where communicating is impossible. We chose to not add any vibrant coloring to our design, as its measurements and placement are likely to be noticed by people who attempt to enter this zone. Overall, we chose to value function over attention in this design, so while our markers are noticeable from a distance, they aren't large or appear in a way where it draws people to view it for the sake of it, nor is it attention seeking with vibrant colors or an astonishing height or shape.

For the depicted carvings, the story itself is meant to communicate that entering and interacting with this land will lead to sickness and death after a prolonged amount of time, and that there is nothing of value being protected other than an individual's wellbeing behind our markers. The man's actions were meant to represent a possible motivation for a person to breach this area, as the man depicted in the story is searching for possibly economically viable minerals and or treasures only to be left empty handed. The following depiction of him falling ill is depicted as a consequence of touching the radiation shown in a symbol of a (triangle) representing radiation which attaches onto him and continues to follow him till his death. The growth of a plant serves as a visual representation of a linear timeline, guiding the viewer through the narrative, and avoiding any possible misinterpretations of the message. The beginning of the story is visually aligned with the imagery of a seed in the ground, and the ending is paired with a blooming plant.

Materials

We recommend building the markers from large, solid blocks of hard igneous rock: locally quarried basalt for the main structures, with granite as an alternative for carved surfaces. Stone meets every goal on our list. It is durable, too heavy to move or steal, and has almost no resale value, so there is little reason to scavenge it. We would avoid metals entirely, because metal is worth recycling and invites theft. The statues should be thick and simple in shape, with

deeply carved features, since thin parts and shallow engraving are the first things to break or wear away.

Stone also has the best track record of any material we looked at. The federal plan for the Waste Isolation Pilot Plant (WIPP) in New Mexico made the same choice, calling for granite perimeter monuments 25 feet tall, each made of 20 tons of solid material (U.S. DOE). A geology textbook comparison shows that after a century in a rainy climate, limestone lettering is nearly erased while granite and slate change only slightly (Understanding Earth). Dry climates are gentler still: the carvings on Cleopatra's Needle obelisk survived roughly two thousand years in Egypt's arid air.

Stone is cheap as a material. The real expense is quarrying, carving, and hauling very large blocks. Later reviews of the WIPP design warned that quarries and equipment capable of producing granite monoliths that large no longer exist, and that hauling big granite pieces long distances by rail creates its own risks for present-day workers (Klein et al. 2016). This is why we favor basalt: the Central Plateau sits on the Columbia River basalt flows, so the rock can come from nearby, which cuts transport cost and risk.

The Central Plateau is a windy shrub-steppe desert. Hanford's weather station records normal precipitation of only 6.98 inches a year and a normal average temperature of 53.6°F, but the extremes are wide, from a high of 113°F in 2002 to a low of -14°F in January 2004 (PNNL). Wind is constant, with an average of 26 days a year when gusts reach 40 mph or more and a recorded peak of 61 mph. The main threats to the markers are therefore windblown sand slowly scouring carved surfaces, freeze-thaw cracking, drifting sand burying low features, and range fires.

Looking ahead, a 2026 state climate report expects eastern Washington to see more multi-year droughts and heat spells, with yearly precipitation staying about the same while more of it falls as rain instead of snow and storms grow more intense (Inside Climate News). Hotter, drier conditions mean more wildfire, which stone survives but which can crack or flake its

surface. Over 10,000 years the climate could change far more than any current projection covers, so we designed for both drier and wetter conditions.

The markers are designed to need no maintenance, because we cannot assume anyone will be responsible for them in the far future. While the government still controls the site, the Department of Energy would inspect and repair them. After that, the design relies on redundancy: many markers instead of one, plus buried backups protected from weather. WIPP uses the same idea, with nine-inch granite discs buried two to six feet deep across the site (U.S. DOE). For this reason we do not recommend the speaker idea as a long-term element, since electronics need power and replacement parts and would fail within decades.

Uncertainties

Resolved Uncertainties

When we first started drafting ideas we agreed longevity is one of the largest concerns when tasked with making something that is supposed to last twice as long as any human civilization on record. The union between our design choice and material choice should give our warning the best possible chanse of overcoming this obstacle if left undisturbed. Over such a long time period you have to start accounting for events beyond the normal weathering stone would experience. The location of Hanford in relation to the convergent plate boundary off of our western coast as well as the presence of faults in the area makes us concerned that there will be one or several geological events that may make our design less effective. To combat this we are not just doing one marker but dozens across the border and interior of the Hanford area. Of course this is not a perfect solution but when you are working at this time scale you need to establish some level of acceptable risk.

Since our design is somewhat shorter than twice the height of a person it is possible for a traveler to pass through the border without spotting/investigating our warning markers. We are relying on safety in numbers to address this issue. As someone moves farther into the Hanford site they will be more likely to spot a marker. The hope is that the increased frequency and potentially seeing multiple of the markers will get a traveler to stop and investigate before proceeding. As discussed in the 99% invisible article, communicating with people through a mural could have the unintended effect of them reading it backwards. We tried to address this by having the mural

depict the growth of a plant. This concept should be understandable regardless of the reading/writing system. Even if they somehow read it backwards the plant would be shrinking. Even if not as effective reading it backwards should still associate being in the area as something that would cause loss.

Unresolved Uncertainties

The main two uncertainties that we could not address with this design were unintentionally attracting people to an area and building something permanent. Regardless of how mundane a structure is, people tend to take interest in the unknown. We wanted to steer away from the idea of having a large-scale eye catching structure like the spiked earth but humans are naturally curious, people want to figure out the meaning of a structure and see if there is anything significant about it. Unfortunately sometimes people only learn when they see other people pay the price for their mistakes. If this is a repeated pattern across the globe we may end up creating pilgrimage sites rather than barriers until people realise it's making them sick. No matter how many warning signs we put up, people still do things against their own interest. Secondly the problem of permanence is a difficult thing to solve. Despite our efforts to make the markers last through hostile weather and extreme geologic events, people may be their own worst enemy. Rather than respecting the warning people may take pieces of or remove the markers to put into museums. A lot can happen in ten thousand years, we often act against our best interests knowing or unknowing.

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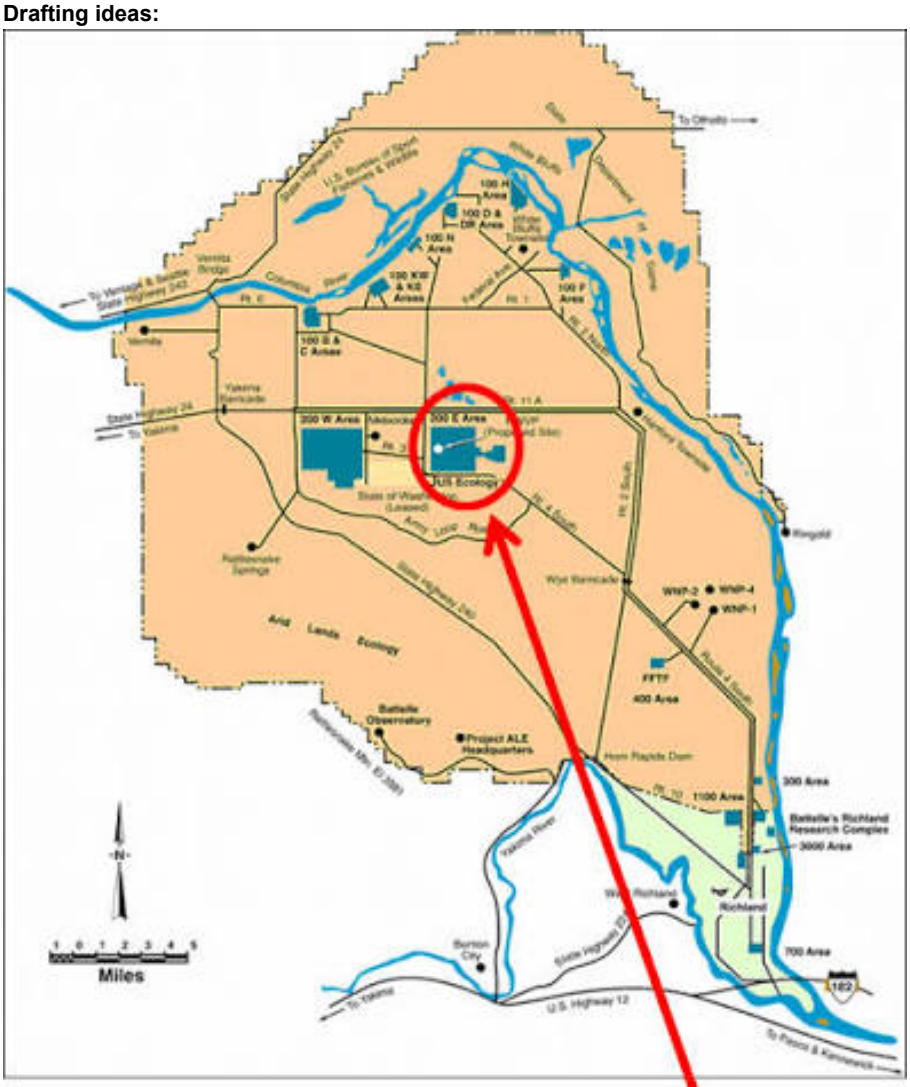
DISCUSS MEETING TIME THIS WEEK

- Friday (Nov 13)
- Time:

Drafting ideas:



Hanford's 200 East Area
(Home of the PUREX Plant & Tank Farms)

https://experience.arcgis.com/experience/12b40e9351fb4f3696940fc9e065fb8b

Social Context: What will the future look like in 10,000 years:

- **High tech (advanced) future -> population is massive (growth)**
- **Robots machinery to give a higher output of food for a massive population.**
- **Diet: not fully vegetarians (meat is still dietary factor)**
- **Fashion: not relevant**
- **Pipes - water travel!!**
- **Work (Automation is more prevalent but someone who deals with the machinery would be at higher risk)**
- **Animals (interacting with site)**
- **The average person (ref. person): engineer/mechanic for farm bots (automated machinery)**

Ref. person:
(a person who interacts the most with possible containment) - maintaining closest interaction with radiation.) which could be a farmer engineer or mechanic in our future.

Design:

+ Sign (story) to show that this "place" is dangerous (will make you sick) and the food from this area (or beyond the barrier) will harm you.
+ Speaker - frequencies
+ Something that repels (smell? - the 5 senses)
+ Barrier to prevent groundwater contamination for irrigation (water)
+ Vibrations
+ Culture
+ Physical marker (structure) to show danger
+ Intimidating

Materials:

- **Should be durable (people shouldn't be able to break it easily)**
- **Should be heavy (DONT STEAL) hard to move**
- **Not valuable material**
- **Not famous, magnificence, want to see and want to take**
- **Higher guilty materials would last (for like pipes - NOT EXPOSED)**
- **Guarded?**
- **Look at past data that has lasted**

Uncertainties:

- **What kind of (Land usage)**
- **The land will look like**
- **Who is gonna be stupid (IQ levels)**

Communications:

- **Message:** to show that this “place” is dangerous (will make you sick) and the food from this area (or beyond the barrier) will harm you.
- **Language -** stay way (stick to visuals) but still can add
- Visual - what symbols what drawings (how will a human be depicted)
-

(put whatever stuff down the goal is to get ideas and then edit/narrow)

Speaker idea - placing speakers around the perimeter of the area that blast frequencies to annoy people and animals to the point where the surrounding area will be cleared of both humans and creatures.

Idea: Standard Symbology – International standard to label radioactive waste zones and waste containers.

- Lower cost solution
- Once a zone is recognized to be dangerous other similarly labeled zones will be approached with caution.

Idea: Diagram of effects – Make a series of statues of a person progressing through radiation poisoning. Have the people face in the direction that the symptoms get worse to give a sense of moving forward in time regardless of the writing system.

- Communication free of symbolic drift or required knowledge of any specific language
- Could help people understand what is can and will happen to them if they stay in the area

Idea: Impassible landscape – Find the most hostile mountainous environment and bury the waste deep underground.

- Would be difficult for people to accidentally get exposed
- If someone does discover the waste it would make it less likely for other people to journey to it due to the potential difficulty of it.

Meeting Recap:

We discussed ideas for how to communicate time, how to scale the drawings and how the electrified wall will work. I would recommend reading through the sections we have written. We are thinking of shifting the design to focus more on communication (The Mural) rather than making an impassable barrier. No matter how we approach blocking off the area there is always a way for people to get around it. Making them understand why they should avoid it is a higher priority. For depicting time we wanted to have a person moving over the wall and interacting with the soil in some way simultaneously we are going to have a diagram of a plant growing. Hopefully the imagery of a person moving forward and the growth of a plant should prevent any confusion regardless of the writing system.





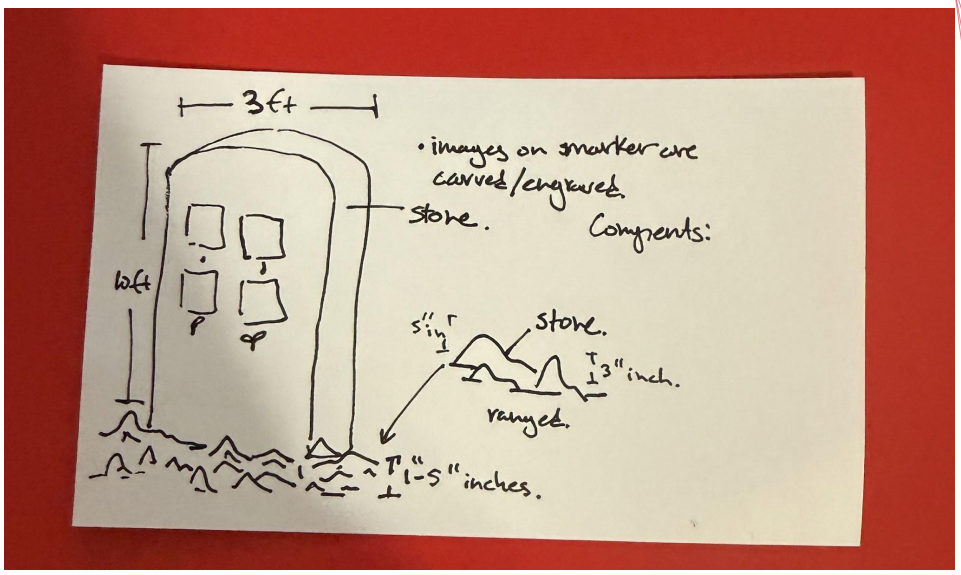
Plateau, a 79 square mile portion of the site. Your marker/warning system must effectively communicate hazards to future generations for the next ten thousand years.Your commission will produce a report that describes the design itself as well as the thinking behind it. This is a collaborative project, with each member of your team taking the lead in one specialty area. **citing sources to support design choices and assumptions.**

What do your markers look like? How many markers are you imagining and where will you place them on site? Why did you choose this design in particular? Please provide visual renderings of your design (in place, to scale) as well as a detailed written description of its components. Describe the thinking behind each of your design choices (i.e. why this shape, size, structure, color? What specific effect are you hoping to achieve with your design?)

Design

Our marker design is a stone pillar which is 10 feet tall and 3 feet wide. In addition, we plan on including a man-made rough terrain created from stones shaped into irregular triangles, mimicking the pointed edges of thorns.These thorn-like structures range 1-5 inches in height above and embedded into the ground surrounding the pillars with a radius of 2 feet. With a total of 55 markers placed around the perimeter of this location, estimated 3 miles from each other on the exterior. Each individual pillar will have cravings that depict a story of a man who breaches this contaminated zone, digs underground for a presumed treasure, only to find nothing which leads him to leave the area, and after many years he starts to get ill and eventually succumbs to his sickness and dies.These images are depicted in a left to right order, up to down, and have a growing plant to clarify the sequences of events.

Visual Rendering



Commented [1]: I made a lot of assumptions to our design wise (like measurements) PLEASE let me know if we need to change anything - and the new measurements please

Commented [2]: replace materials - note

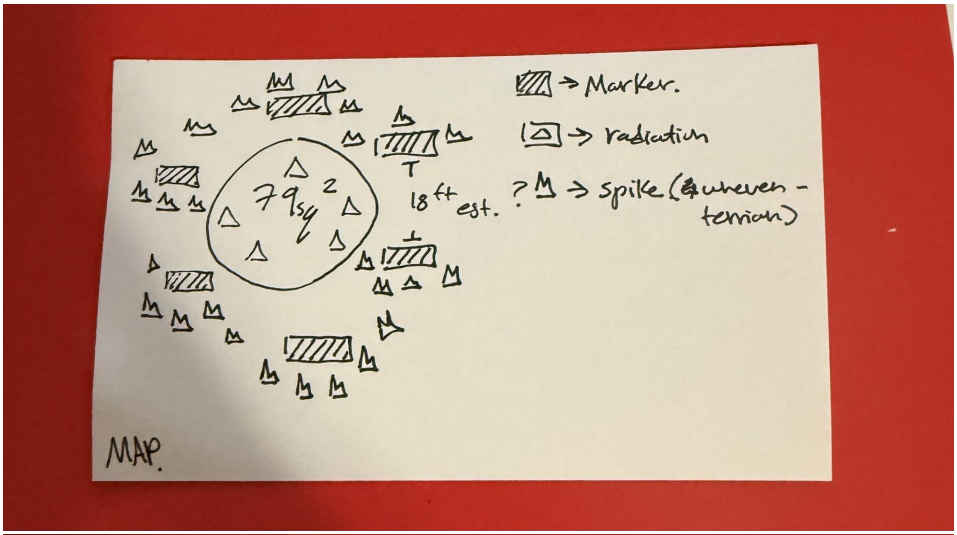
Commented [3]: guys I wont lie I really can't draw that well -> do we wanna use a software or something else for a clearer representation?

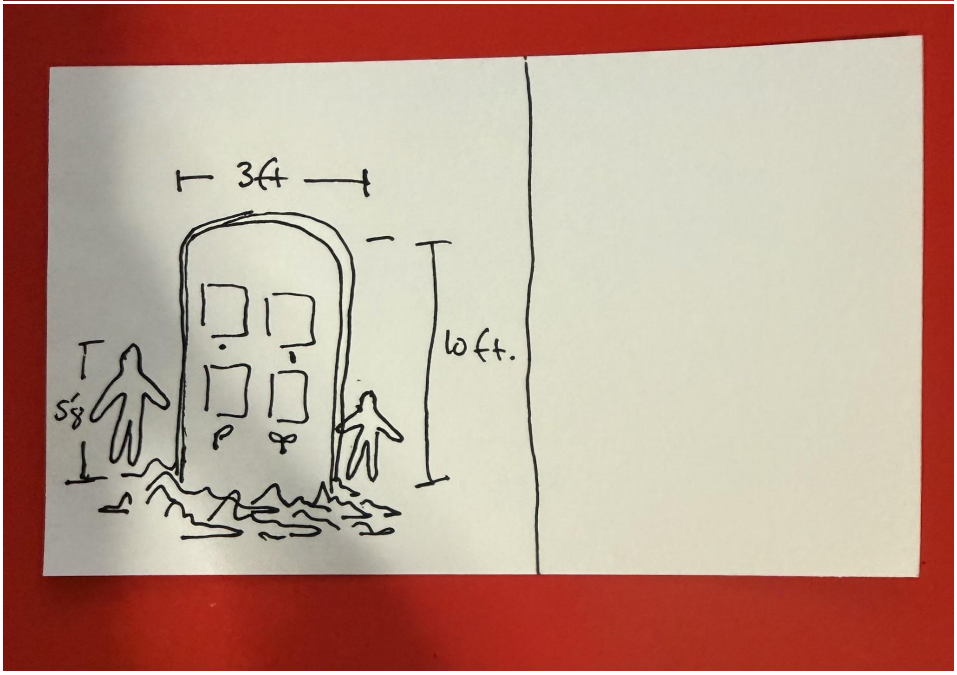
Commented [4]: also for the carved story -> I need help on the storyline specifics (I can attempt to draw again but I think my humans need work)

Commented [5]: I can draw out something after I finish editing my section this morning. I have a source related to our current design that we can discuss during the meeting.

Commented [6]: sounds good thank you I can hand over my previous sketches (of this new design) as a blueprint too if that would be helpful

Commented [7]: Sure thing.


→ Marker.
→ radiation
? → spike (& uneven - terrain)
T
18 ft est.
MAP.


3ft
10 ft.
5ft

Reasoning

We chose this design in particular because it achieved our goal of being easily noticed from a distance and prevents heavy foot-traffic and crowding in this area.The stone pillars it-self aren't as effective as a fully enclosed wall, but still create a threshold that implies one shouldn't be entering. Their height and width are specifically designed to be viewed from a minimum of half a mile distance, with the current average American male's height being 5 '8; we chose to construct this marker to be 10 ft to ensure viewing. We made the marker's width 3ft as it is meant to function as a support and withstand environmental weathering. In the article "Using Design to Effect Change" (Anthony 2023), Jessica Anthony mentions how hostile architecture is typically used to prevent homeless individuals from resting in certain areas for a prolonged time, examples being divided benches, or intentional blockage in curbs. Anthony notes how hostile architecture is also referred to as a defensive design, as while it prevents comfortability it also can subconsciously prevent approaches from its appearance. The idea of making a space have minimal construction but effective interactions with either wildlife or people, is both cost-effective and can communicate clearer without unnecessary details or distractions. The thorn shaped architecture is meant to depict this. To prevent easy access into the area, we made the thorn's height range from 1" to 5", this choice creates an uneven terrain that even individuals wearing shoes would struggle to cross over quickly and pain-free. Despite a possibly messy design we decided that since this detail in our marker is substantially smaller and visibly lowered compared to other components in our design, we deemed it not distracting to the point where communicating is impossible. We chose to not add any vibrant coloring to our design, as its measurements and placement are likely to be noticed by people who attempt to enter this zone. Overall, we chose to value function over attention in this design, so while our markers are noticeable from a distance, they aren't large or appear in a way where it draws people to view it for the sake of it, nor is it attention seeking with vibrant colors or an astonishing height or shape.

For the depicted carvings, the story itself is meant to communicate that entering and interacting with this land will lead to sickness and death after a prolonged amount of time, and that there is nothing of value being protected other than an individual's wellbeing behind our markers. The man's actions were meant to represent a possible motivation for a person to breach this area, as the man depicted in the story is searching for possibly economically viable minerals and or treasures only to be left empty handed. The following depiction of him falling ill is depicted as a consequence of touching the radiation shown in a symbol of a (triangle) representing radiation which attaches onto him and continues to follow him till his death. The growth of a plant serves as a visual representation of a linear timeline, guiding the viewer through the narrative, and avoiding any possible misinterpretations of the message. The beginning of the story is visually aligned with the imagery of a seed in the ground, and the ending is paired with a blooming plant.

Commented [8]: we gonna need to figure this out yall

Citations:

Antony, Jessica. "Using Design to Effect Change." *Bootcamp*, 11 Jan. 2023, https://medium.com/design-bootcamp/using-design-to-effect-change-d19f04437a8a.

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https://medium.com/design-bootcamp/using-design-to-effect-change-d19f04437a8a



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https://en.wikipedia.org/wiki/Hostile_architecture#/media/File:Boulons_anti-sdf_sur_un_perron_(Marseille,_France).jpg these are used to prevent homeless people from laying down/resting -> while they don't necessarily stop entry we may get information or use a variation of this design - (like smaller but more compacted) to replicate a hurting sensation/feeling on people's feet as they get closer to the site?

(put whatever stuff down the goal is to get ideas and then edit/narrow)

Speaker idea - placing speakers around the perimeter of the area that blast frequencies to annoy people and animals to the point where the surrounding area will be cleared of both humans and creatures.

Communication: What specific messages are you communicating to future generations? Your design must include both written and image-based messages. Your design must include both simple and more detailed messages (remember the WIPP member committee's argument that "Redundancy of message communication is important to message survivability"). For the written messages, what language or languages will you use and why? For the image-based messages, how did you think about meaning, symbols, and sequencing? Please provide transcripts for your written messages and visual renderings for your image-based messages (along with captions for their meaning). Please describe the thinking behind your communication strategies in each form.

Some ideas for written message

- **“Entering will cause deathly illness”**
- **“**

Goal due before Nov 20th: DRAFT/REVISE more on your section! (we will edit this together during the group meeting)

Materials — Ali Abbas Jafri
What materials do you recommend for the construction of this design and why? How do you predict the markers will withstand weathering and time? Will they require maintenance and, if so, who will do that work? Please include research about material durability and cost, environmental conditions at the Central Plateau (both current and future projections, including climate change), and overall physical longevity of your design.

We recommend building the markers from large, solid blocks of hard igneous rock: locally quarried basalt for the main structures, with granite as an alternative for carved surfaces. Stone meets every goal on our list. It is durable, too heavy to move or steal, and has almost no resale value, so there is little reason to scavenge it. We would avoid metals entirely, because metal is worth recycling and invites theft. The statues should be thick and simple in shape, with deeply carved features, since thin parts and shallow engraving are the first things to break or wear away.

Stone also has the best track record of any material we looked at. The federal plan for the Waste Isolation Pilot Plant (WIPP) in New Mexico made the same choice, calling for granite perimeter monuments 25 feet tall, each made of 20 tons of solid material (U.S. DOE). A geology textbook comparison shows that after a century in a rainy climate, limestone lettering is nearly erased while granite and slate change only slightly (Understanding Earth). Dry climates are gentler still: the carvings on Cleopatra's Needle obelisk survived roughly two thousand years in Egypt's arid air.

Stone is cheap as a material. The real expense is quarrying, carving, and hauling very large blocks. Later reviews of the WIPP design warned that quarries and equipment capable of producing granite monoliths that large no longer exist, and that hauling big granite pieces long distances by rail creates its own risks for present-day workers (Klein et al. 2016). This is why we favor basalt: the Central Plateau sits on the Columbia River basalt flows, so the rock can come from nearby, which cuts transport cost and risk.

The Central Plateau is a windy shrub-steppe desert. Hanford's weather station records normal precipitation of only 6.98 inches a year and a normal average temperature of 53.6°F, but the extremes are wide, from a high of 113°F in 2002 to a low of -14°F in January 2004 (PNNL). Wind is constant, with an average of 26 days a year when gusts reach 40 mph or more and a recorded peak of 61 mph. The main threats to the markers are therefore windblown sand slowly scouring carved surfaces, freeze-thaw cracking, drifting sand burying low features, and range fires.

Looking ahead, a 2026 state climate report expects eastern Washington to see more multi-year droughts and heat spells, with yearly precipitation staying about the same while more of it falls as rain instead of snow and storms grow more intense (Inside Climate News). Hotter, drier

conditions mean more wildfire, which stone survives but which can crack or flake its surface. Over 10,000 years the climate could change far more than any current projection covers, so we designed for both drier and wetter conditions.

The markers are designed to need no maintenance, because we cannot assume anyone will be responsible for them in the far future. While the government still controls the site, the Department of Energy would inspect and repair them. After that, the design relies on redundancy: many markers instead of one, plus buried backups protected from weather. WIPP uses the same idea, with nine-inch granite discs buried two to six feet deep across the site (U.S. DOE). For this reason we do not recommend the speaker idea as a long-term element, since electronics need power and replacement parts and would fail within decades.

Sources

Hanford Site Climatological Data Summary 2003 (PNNL-14616): https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-14616.pdf
Hanford Site Climatological Data Summary 2002 (PNNL-14242): https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-14242.pdf
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11/13/26 meeting recap

Goal due before Nov 20th (friday): DRAFT/REVISE more on your section! (we will edit this together during the group meeting)

Social Context

Nobody can predict who will stand on the Central Plateau more than 10 decades from now, not even the 1991 WIPP Futures Panel, which faced the same problem but, instead of forecasting, chose to build scenarios. So we borrowed that method. Our markers will have to work across a wide range of futures, and here are three future checkpoints we could test them against.

The first checkpoint is at 1000 years

We expect this society to be continuous with the present. English, however, may have changed significantly, similar to how Chaucer's English is hard for us. But written records, archives, and institutions probably still exist. The Hanford Site will still be a landscape that people can recognize. Tribal nations inhabiting the site, such as Yakama, Umatilla, Nez Perce, and Wanapum, will likely still be here, and so will all their oral traditions that carry knowledge across generations. An Australian study of a coastal flood suggests that oral memory can preserve specific information for 7000 years or more (Nunn & Reid, 2016). The main problem at this point would be forgetting by accident. Institutional control could fade, budgets could shrink, and the Plateau could look like cheap, flat land along a river. Land expansion and well drilling might be the likeliest intrusions.

But then comes year 5000

This is where the confidence drops significantly. This is longer than any recorded history. There could either be a technological collapse or a boom; neither should be ignored. Tainter (1988) argues that complex societies can collapse when the cost of maintaining complexity is more than its returns, and that collapse can occur in cycles. So let's assume that *some* people at this point can read and some can't, and that scientific knowledge is present and lost at the same time. The most important thing at this point would be climate. Archer and Ganopolski (2005) suggest that large carbon emissions could delay the next glaciation by tens of thousands of years, but we believe that with a loose thought. The Missoula floods that carved the Channelled Scablands (Bretz, 1923) are a reminder that this landscape has been rearranged violently before, and future water or/and ice could not only expose buried material but also push people toward the plateau.

And finally, the 10000.

We assume nothing. The people may speak a language unrelated to ours, hold opposite ideas about death and sacred ground, and could have absolutely no records of the 20th Century. The Markers Panel worked from the same idea and designed messages in layers, starting with the fact that humans built this place and then moving towards a technical explanation (Trauth et al. 1993). Our design also follows that structure, so that a potential visitor gets something useful at every level of understanding.

However, whether the markers repel or attract is the hard question. Sebeok (1984) argued that no sign carries any meaning on its own; the meaning corresponds to the interpretation from the community around it, which is why he proposed an idea of “atomic priesthood” to keep this warning alive through ritual and story. We don’t necessarily recommend a priesthood. However, we take the point seriously. Key and Prindle (2017) suggest a harsher idea, arguing that intention can’t be controlled over all this time. But maybe there is some sort of a vague, nuanced answer. We want to avoid making this marker look like treasure or a temple. People have looted tombs since the beginning of tombs. Big, dramatic structures can signal that something valuable lies inside. So instead, we make it look rough and worthless, and communicate that in every language and image we use. Obviously, we can’t prove this works, since we can only extract evidence from the past. And it shows that curiosity and greed are older than anything else.

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Uncertainties

Resolved Uncertainties

When we first started drafting ideas we agreed longevity is one of the largest concerns when tasked with making something that is supposed to last twice as long as any human civilization on record. The union between our design choice and material choice should give our warning the best possible chanse of overcoming this obstacle if left undisturbed. Over such a long time period you have to start accounting for events beyond the normal weathering stone would experience. The location of Hanford in relation to the convergent plate boundary off of our western coast as well as the presence of faults in the area makes us concerned that there will be one or several geological events that may make our design less effective. To combat this we are not just doing one marker but dozens across the border and interior of the Hanford area. Of course this is not a perfect solution but when you are working at this time scale you need to establish some level of acceptable risk.

Since our design is somewhat shorter than twice the height of a person it is possible for a traveler to pass through the border without spotting/investigating our warning markers. We are relying on safety in numbers to address this issue. As someone moves farther into the Hanford site they will be more likely to spot a marker. The hope is that the increased frequency and potentially seeing multiple of the markers will get a traveler to stop and investigate before proceeding. As discussed in the 99% invisible article, communicating with people through a mural could have the unintended effect of them reading it backwards. We tried to address this by having the mural depict the growth of a plant. This concept should be understandable regardless of the reading/writing system. Even if they somehow read it backwards the plant would be shrinking. Even if not as effective reading it backwards should still associate being in the area as something that would cause loss.

Unresolved Uncertainties

The main two uncertainties that we could not address with this design were unintentionally attracting people to an area and building something permanent. Regardless of how mundane a structure is, people tend to take interest in the unknown. We wanted to steer away from the idea of having a large-scale eye catching structure like the spiked earth but humans are naturally curious, people want to figure out the meaning of a structure and see if there is anything significant about it. Unfortunately sometimes people only learn when they see other people pay the price for their mistakes. If this is a repeated pattern across the globe we may end up creating pilgrimage sites rather than barriers until people realise it's making them sick. No matter how many warning signs we put up, people still do things against their own interest. Secondly the problem of permanence is a difficult thing to solve. Despite our efforts to make the markers last through hostile weather and extreme geologic events, people may be their own worst enemy. Rather than respecting the warning people may take pieces of or remove the markers to put into museums. A lot can happen in ten thousand years, we often act against our best interests knowing or unknowing.

Uncertainties Citations:

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